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PAEDIATRIC NON REGIONAL ANAESTHESIA ACUTE PAIN MANAGEMENT

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Introduction: Pain is a multidimensional phenomenon with sensory, physiological, cognitive, affective, behavioural and spiritual components. Emotions (affective component), behavioural responses to pain (behavioural component), beliefs, attitudes, spiritual and cultural attitudes about pain and pain control (cognitive component) all alter the way that pain is experienced (sensory component) by modifying the transmission of noxious (unpleasant) stimuli to the brain (physiological component).

Optimal pain management begins with accurate and thorough pain assessment. Pain assessment enables health-care providers to treat pain and alleviate needless suffering. It should be carried out at regular intervals because the disease process and the factors that influence it may change over time and regular assessment permits the measurement of the efficacy of different treatment strategies in relieving pain. The pain assessment process involves the child, the parents or caregivers and the health-care providers.

Children experiencing pain can be limited in their physical activities as well as in their development because they face difficulties in concentrating and learning. If their pain is not managed well, their quality of life can be affected, resulting in impaired physical functioning, anxiety, fear, stress and sleep disruption (*1, 2*). In addition to the measurement of pain intensity, duration, frequency and location, emotional function should also be assessed.

Optimal pain management may require a comprehensive approach comprising a combination of non-opioid, opioid analgesics, adjuvants and non-pharmacological strategies. A comprehensive approach is possible even in resource-limited settings.

Correct use of analgesic medicines will relieve pain in most children and relies on the following key concepts:

- using a two-step strategy
- dosing at regular intervals
- using the appropriate route of administration
- adapting treatment to the individual child.

The latter three principles were introduced by WHO as "by the clock", "by the mouth" and "by the individual" in 1986, together with the introduction of the three step-ladder of pain relief. This three step ladder has been abandoned now for children in favour of a two-step approach (*3*).

Although there are a limited number of analgesic medicines that can be safely used in children, it is still possible to provide adequate analgesia with a two-step approach. This two-step strategy consists of a choice of category of analgesic medicines according to the child's level of pain severity: for children assessed as having mild pain, paracetamol and ibuprofen should be considered as first options and in children assessed as being in moderate to severe pain, the administration of an opioid should be considered.

In children above three months of age who can take oral medication and whose pain is assessed as being mild, paracetamol and ibuprofen are the medicines of choice. For children below three months of age, the only option is paracetamol. No other non-steroidal anti-inflammatory drug (NSAID) has been sufficiently studied in paediatrics for efficacy and safety to be recommended as an alternative to ibuprofen. Although there is evidence of the superior analgesic properties of ibuprofen versus paracetamol in acute pain, this is considered low-quality evidence because studies were performed in acute pain settings and because of the absence of long-term safety evidence for its continuous use in persisting pain. Both paracetamol and ibuprofen have potential toxicity: there are concerns about potential renal and gastrointestinal toxicity, and bleeding with ibuprofen and other NSAIDs; and there are risks of hepatotoxicity and acute overdose associated with paracetamol. They are widely available in child-appropriate dosage forms, such as oral liquids, and are relatively inexpensive. However, development of appropriate oral solid dosage forms for both medicines should be a priority. An oral solid formulation will be better accepted by children, if it is divisible and dispersible, allows easier administration by health-care providers and caregivers, requires only a small quantity of water for administration, and ensures a more accurate dosage than traditional tablets.

The second step: moderate to severe pain. If pain severity is assessed as moderate or severe, the administration of a strong opioid is necessary. Morphine is the medicine of choice for the second step, although other strong opioids should be considered and made available to ensure an alternative to morphine in case of intolerable side-effects. The decision to prescribe and administer opioid analgesics bypassing the first step should be based on a clinical judgement of the severity of a child's pain, on careful considerations of the disability caused by pain, on the cause of the pain, and expected prognosis and other aspects.

The two-step approach is a more effective strategy for the pharmacological management of pain in children than the three-step analgesic ladder, which was introduced by WHO in 1986. The three-step analgesic ladder recommended the use of codeine as a weak opioid for the treatment of moderate pain, while the two-step approach considers the use of low doses of strong opioid analgesics for the treatment of moderate pain.

The benefits of using an effective strong opioid analgesic outweigh the benefits of intermediate potency opioids in the paediatric population and although recognized, the risks associated with strong opioids are acceptable when compared with the uncertainty associated with the response to codeine and tramadol in children. However, as new data emerges on the safety and efficacy of tramadol or other alternative intermediate potency analgesics for the management of persisting pain in children, the two-step strategy may be revised.

Codeine: Codeine is a "*weak*" opioid that is widely available and has been previously recommended to control moderate pain. However, it presents well-known safety and efficacy problems related to genetic variability in biotransformation. Codeine is a prodrug that is converted into its active metabolite morphine by the enzyme CYP2D6. The efficacy of a prodrug depends on the amount of active metabolite formed. Variable expressions of the enzymes involved in the biotransformation of prodrugs can lead to substantial inter-individual and inter-ethnic differences in the conversion rate and the plasma concentration of the active metabolite. In the fetus, CYP2D6 activity is absent or less than 1% of adult values. It increases after birth, but it is estimated to be no higher than 25% of the adult values in children below five years. As a consequence, the analgesic effect is (very) low or absent in neonates and young children. Furthermore, the percentage of poor metabolizers can vary in ethnic groups from 1% to 30%, resulting in ineffectiveness in large numbers of patients, including children (*4, 5*). Conversely, individuals who metabolize codeine quickly and extensively are at risk of severe opioid toxicity, given the high and uncontrolled conversion of codeine into morphine (*6*).

Tramadol is another analgesic with opioid effects that has been considered for the control of moderate pain. However, there is currently no available evidence for its comparative effectiveness and safety in children. Furthermore, tramadol is not licensed for paediatric use in several countries. More research on tramadol and other intermediate potency opioids is needed.

Treating pain at regular intervals: When pain is constantly present, analgesics should be administered, while monitoring side-effects, at regular intervals ("by the clock" and not on an "as needed" basis).Medication should be administered on a regular schedule, rather than on an "as required basis", unless pain episodes are truly intermittent and unpredictable. Children should, therefore, receive analgesics at regular intervals, with the addition of "rescue doses" for intermittent and breakthrough pain.

Treating pain by the appropriate route: Medicines should be administered to children by the simplest, most effective, and least painful route, making oral formulations the most convenient and the least expensive route of administration. The choice of alternative routes of administration, such as intravenous (IV), subcutaneous (SC), rectal or transdermal when the oral route is not available should be based on clinical judgement, availability and patient preference. The intramuscular (IM) route of administration is painful and is to be avoided. The rectal route has an unreliable bioavailability, both for

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paracetamol and morphine, which limits its applicability (*7*). The feasibility of employing different routes of administration depends on the setting.

Opioid analgesics should be titrated on an individual basis, so the dose should be adapted in steps until the correct dosage has been found, based on the patient's reaction to the medicine. There is no specific or maximum dose of opioids that can be predicted in any individual case. The correct dose should be determined in collaboration with the patient to achieve the best possible pain relief with side-effects acceptable to the patient. The use of paracetamol and ibuprofen (and other NSAIDs) should be restricted to the recommended dosing regimen based on the age and weight of the child to avoid serious toxicity. Consideration should also be given to certain conditions that influence the capacity of the child to metabolize paracetamol and ibuprofen, such as malnutrition, poor nutritional state and administration of other medicines. To obtain a dose that provides adequate relief of pain with an acceptable degree of side-effects the doses of morphine or other strong opioids need to be gradually increased until effective. Unlike paracetamol and NSAIDs, there is no upper dosage limit for opioid analgesics because there is no "ceiling" analgesic effect. The appropriate dose is the dose that produces pain relief for the individual child. The goal of titration to pain relief is to select a dose that prevents the child from experiencing pain between two doses using the lowest effective dose. This is best achieved by frequent assessment of the child's pain relief response and adjusting the analgesic doses as necessary.

Adjuvant medicines: Adjuvant medicines have a primary indication other than for pain management, but have analgesic properties in some painful conditions. They may be co-administered with analgesics to enhance pain relief. Different categories of medicines have been investigated to determine their potential as adjuvants in relieving pain and in specific cases, such as neuropathic pain, bone pain and pain associated with muscle spasm. There are no studies in children to support adjuvant use of corticosteroids for pain relief and corticosteroids are identified with well-known adverse effects, particularly with chronic use. Corticosteroids are indicated in the management of specific other conditions, such as for the reduction of peritumour oedema, for raised intracranial pressure in CNS tumours, and for the treatment of neuropathic pain due to spinal cord or peripheral nerve compression.

There are no systematic reviews, randomized control trials or other studies on the use of bisphosphonates in the treatment of bone pain in children. In adults, one systematic review suggests that bisphosphonates provide modest pain relief for patients with painful bony metastases (*8*).

However, the use of bisphosphonates in adults is associated with potentially devastating adverse effects, such as osteonecrosis of the jaw. Additional data on the safety and efficacy of bisphosphonates in children is needed to evaluate the potential of these medicines for bone pain.

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STEROIDS AS ANALGESICS IN POSTOPERATIVE PAIN

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Steroids have long been considered to have more drawbacks than benefit in the perioperative setting. Chronic treatments with steroids were committed to be substituted during the perioperative period to avoid acute adrenal insuffisiency. Otherwise the use of steroids was associated with the risk of septic complication. More tan ten years ago, the postoperative antiemetic preventive effect of dexamethasone, has been demonstrated leading to more extensive administration in the perioperative period. Other effects of steroids were then documented, leading to a routine admnistration in patients scheduled for surgery.

Steroids used for intravenous administation are : hydrocortisone, prednisolone, methylprednisolone and dexamethasone. The latest has the highest glucosteroid activity compared to hydrocortisone. With regard to the anti-inflammatory effect, dexamethasone 0.75 mg is equivalent to cortisol 20 mg.

Systematic review of the antimetic effect have documented that dexamethasone prevents early and late nausea and vomiting in adults and children [1]. The preventive antiemetic effect of dexamethasone is equivalent to that of setrons with a relative risk reduction of 25%. The combination of the two agents is more effective than each single drug used separately. Since dexamethasone requires a certain delay of action it is administered at the induction of anaetshesia. The number-needed-to-treat to avoid early nausea and vomiting depends on the incidence of these side effects but is commonly ranging between 4 and 10. The use of dexamethasone depends consequently on the incidence of PONV, when more than two risk factors are documented dexamethasone is administered separately or in combination with droperidol and / or setrons [2]. Dexamethasone is not only effective in a large population of patients and procedures, but also in selective surgical procedures such as cholecystectomy or tonsillectomy [3,4]. In ambulatory surgery, the prevention of PONV is an integral part of patient'care allowing reducing the duration of hospital stay. Consequently, patients feel more comfortable when receiving dexamethasone preoperatively.

Beside their antiemetic properties, dexamethsaone and other steroids produce analgesia in postoperative patients. This effect is related to the inhibition of prostaglandins synthesis due to blockade of phospholipases and cyclo-oxygenases. In addition, steroids inhibit the development of mechanical hyperalgesia in laboratoy animals. An exhaustive systematic review has confirmed the analgesic effect of dexamethasone and steroids in randomized clincal trials including various surgical procedures [5]. The administration of dexamethasone (at least 8 mg in adults) not only decreases pain intensity in the immediate postoperative period and lately but also reduces by 40% postoperative opioid on demand administration (NNT to avoid the use of opioid = 8). This effect is more important when steroids are given before anaesthetic induction. The analgesic effect of steroids hase been confirmed in several surical procedures. A significant number of studies have been perfomed in patients scheduled for tonsillectomy [6, 7]. In this setting, dexamethasone not only reduces the incidence of nausea and vomting but also the intensity of postoperative pain. Nevertheless, the administration of dexamethasone also increases the risk of reintervention especially for local bleeding. A single dose of steroid also improves postoperative pain control after molar extraction and othognatic surgery and reduces postoperative oedema and facial swelling. Dexamethasone is equally effective to NSAIDs in this setting and the combination of the two is more effective than each drug taken separately. Steroids have been used in local infiltration for spine surgery with benefical effect on postoperative pain control. Steroids are given in visceral surgery such as cholecystectomy as part of multimodal anagesia.

More recently, it has been documented that the combination of dexamethasone to a local anaesthetic solution increased the duration of the sensory and motor blocks while improving postoperative pain control. This effect is however comparable when dexamethasone is administered intravenously instead of perineurally [8].

Steroids also improve fatigue in sick patients and postoperatively. This effect has been evaluated after cholecystectomy, breast surgery, and cardiac surgery. The fact that patient experience less frequent side effects, is likely to be part of an explaination but not only. Among other beneficial effects of steroids documented in the postoperative peroid one must report the reduction of the severity of sorethroat after orotracheal intubation, earlier deambulation after major surgery occasionally resulting in decreasing the duration of hospital stay. In cardiac surgery a metaanalysis of RCTs have pointed out that the administration of steroids may decrease the incidence of postoperative atrial fibrillation likely due to their anti-inflammatory [9].

The potential impact of steroids on healing, surgical anastomosis and septic complications is a concern. Nevertheless, up to now, no clinical trial or metaanalysis has demonstrated any deleterious effect of steroids from this point of view. A careful survey of this issue is nevertheless required.

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NEUROPATHIC PAIN – AN UPDATE OF THE CURRENT PHARMACOLOGICAL THERAPIES

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1. Introduction: According to the definition of IASP (1994), the term neuropathic pain (NP) refers to all pains initiated or caused by a primary lesion, dysfunction or transitory perturbation in the peripheral or central nervous system.

In 2002 and 2004 a new definition for neuropathic pain has aroused and has been established. According to Hansson et al. and Cruccu et al., neuropathic pain is defined as pain caused by a lesion in the peripheral or central nervous system. However, since the sensitivity of the nociceptive system is modulated by its adequate activation (e.g., by central sensitization), it has been difficult to distinguish neuropathic dysfunction from physiologic neuroplasticity.

In 2008, a more precise definition of NP has been developed by a group of experts from both the neurologic and the pain community. According to Treede et al. NP is pain arising as a direct consequence of a lesion or disease affecting the somatosensory system. This revised definition has the advantage that it fits into the nosology of neurologic disorders. The reference to the somatosensory system was derived from a wide range of neuropathic pain conditions ranging from painful neuropathy to central post-stroke pain.

Because of the lack of a specific diagnostic tool for neuropathic pain, a grading system of definite, probable, and possible neuropathic pain is proposed. The grade possible can only be regarded as a working hypothesis, which neither excludes nor diagnoses neuropathic pain. The grades probable and definite require confirmatory evidence from a neurologic examination. This grading system is proposed for clinical and research purposes.

Neuropathic cancer pain: a neglected category of NP: Apart from the well-known neuropathic pain, the latter is also commonly encountered in cancer patients and is considered a well-established entity for more than 20 years. Approximately a third of cancer patients experience NP either mixed with nociceptive components or as a single, autonomous entity. As advances in cancer diagnosis and therapeutic approach prolong life expectancy, physicians' efforts should also target to the improvement of patients' quality of life.

An absolute distinction between cancer and non-cancer related NP is perhaps artificial. Neuropathic Cancer Pain's (NCP) pathophysiology basically remains similar to non-cancer NP, with common mechanisms between the two conditions. Research on NCP showed distinct differences in the signature of neuroreceptors/transmitters' alterations and that neuronal function is disrupted or damaged. NCP possesses unique characteristics and exhibits an incomparable molecular signature. However, therapy similarities to non-cancer related neuropathies, may explain the ability of drugs (e.g. gabapentinoids) in treating cancer pain, indicating possible neuropathic components. Symptomatic treatment of neuropathic pain is relatively uniform, independent of etiologies (e.g. traumatic, metabolic, inflammatory), but differs from that of nociceptive pain.

2. Pharmacological management of neuropathic pain: It is generally accepted that pharmacotherapy remains the mainstay of NP management. At present, variable agents are used to treat NP, but despite the advances in understanding the pathophysiological mechanisms, management of NP remains suboptimal. Intractable NP remains an important epidemiological, clinical and economical burden worldwide, posing significant societal impacts.

The European Federation of Neurological Societies (EFNS) Task Force has suggested specific guidelines on the pharmacological treatment of NP. Typical analgesics have little efficacy in neuropathic pain, with the exception of Tramadol and Strong Opioids.

2.1. Tramadol Hydrochloride: Tramadol is a norepinephrine and serotonin reuptake inhibitor (SNRI), centrally-acting analgesic, which has direct, but weak opioid action (metabolite with major μ-opioid agonist effect) and indirect monoaminergic action (like tricyclic antidepressants). It is also devoid of immunosuppressive activity. Randomized controlled trials have yielded positive results from tramadol and tramadol/acetaminophen combination in PDN, PHN and various NP states. In all trials, tramadol, titrated to a maximum dosage of 400 mgr/day significantly relieved pain, compared to placebo. Its beneficial effects on allodynia and quality of life are also reported. The most frequent side effects of tramadol include dizziness, nausea, constipation, somnolence and orthostatic hypotension.

2.2 Opioid Analgesics: The role of opioids in neuropathic pain has been under debate in the past but is nowadays more and more accepted. However, higher opioid doses are often needed for neuropathic pain than for nociceptive pain. Opioids act through the descending inhibitory pathways modulating nociceptive impulses in the dorsal horn.

Most of the treatment data are evidence of level II or III, and suggest that incorporation of opioids earlier might be beneficial. Buprenorphine shows a distinct benefit in improving neuropathic pain symptoms, which is considered a result of its specific pharmacological profile.

Controlled-release oxycodone has been applied, because it is safe, well tolerated and effective. Co-administration of oxycodone and paracetamol resulted in a low-dose synergic combination in different pain types. However, it is unlikely that opioids will replace antidepressants and antiepileptic drugs for NP therapy.

2.3. Adjuvant analgesics: Since NP may be partially or completely unresponsive to primary analgesic treatments, medical therapies for NP tend to involve adjuvant analgesics. An adjuvant analgesic is an agent, whose primary indication is other than pain, exerting analgesic effects in certain painful conditions. Interestingly enough, adjuvants also hold opioid-sparing effects.

Tricyclic antidepressants (TCAs): TCAs inhibit norephinephrine and serotonin reuptake, followed by augmentation of biogenic amines' activity. Their action includes sodium channels' modulation in the periphery and NMDA antagonism. As a result, TCAs enhance dorsal root inhibition and reduce peripheral sensitization.

TCAs are started with a low bedtime dose (10–25 mgr), which is gradually increased or titrated weekly, every 3–7 days (by 10–25 mgr/day), usually up to 150 mgr, or until further dose increase is forbidden due to adverse effects. An adequate trial of a TCA should have duration of 6–8 weeks, with at least 1 to 2 weeks at the maximum tolerated dosage.

Common side effects of TCAs are sedation, anticholinergic consequences (dry mouth, constipation, postural hypotension and weight gain). Cohen et al. has estimated that TCAs' long term administration is associated with a 2.2-fold greater relative risk of myocardial infarction and a 1.7-fold increase in overall mortality.

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Other antidepressants: Selective Serotonin Reuptake Inhibitors (SSRIs) produce fewer side effects and are better tolerated than TCAs. At present, in NP treatment there is insufficient evidence to support the use of SSRIs.

Sustained release bupropion, a Norepinephrine and Dopamine Reuptake Inhibitor (NDRI) is more effective than placebo in patients with NP of peripheral and central origin. It has a low incidence of sexual dysfunction and is associated with weight loss. Side-effects include agitation and insomnia. For NP it is given at a dosage of 150 – 300 mgr daily.

Venlafaxine has a different chemical structure compared to TCAs and SSRIs. It inhibits norepinephrine and serotonin reuptake (SNRI) and it is used for the treatment of NP at a dose of equal or greater to 150 mgr daily. In a randomized, 3-period, crossover trial of venlafaxine and imipramine administered in patients with painful polyneuropathy Sindrup et al showed that both antidepressants resulted in superior pain relief, compared with placebo, with no differences between them.

Duloxetine is a newer dual uptake inhibitor, which belongs to SNRIs. Food and Drug Administration (FDA) has approved duloxetine for treatment of painful diabetic neuropathy (PDN) treatment. It has minimal or no effect on blood pressure and body weight and it has few sexual adverse effects in studies published up to now. Duloxetine doses range between 60 and 120 mgr/day, without any significant differences between the two doses, but with better effect versus placebo. Improvement should be noted in 1 to 2 weeks at 60 mgr before increasing the dose, which should be considered prior to further dose elevation. Frequent adverse events observed are nausea, somnolence, dry mouth, constipation, diarrhea, hyperhidrosis and dizziness. Duloxetine induces little or no cardiovascular side effects, but rare cases of hepatotoxicity have been published. Discontinuation rates are estimated to be between 15% and 20%.

The advantage of venlafaxine and duloxetine application in NP treatment is that, apart from pain relief, they can serve a useful therapeutic role for clinical depression.

Antiepileptic drugs (AEDs) – Gabapentinoids: Gabapentin is an AED, holding the broadest evidence for efficacy in NP treatment, due to central sensitization reduction. Loss of inhibitory regulation in the dorsal horn contributes to spontaneous firing of nociceptive pathways, through complex mechanisms. Levels of gamma-aminobutyric acid (GABA), a dorsal horn inhibitory transmitter, are reduced and GABA receptors in dorsal horn neurons are down regulated. Gabapentin, an anticonvulsant structurally related to GABA and not acting on GABA receptors, is efficacious for the treatment of NP of various etiologies.

It has an FDA-approved indication for post-herpetic neuralgia (PHN) in the United States and is licensed for the treatment of NP in the UK. At least eight published double blind, placebo-controlled randomized trials of gabapentin for chronic NP therapy exist in literature. These studies examined patients with PHN, PDN, mixed NP syndromes, phantom limb pain, Guillan-Barre syndrome and acute or chronic pain from spinal cord injury. Gabapentin at dosages up to 3600 mgr daily significantly reduced pain versus placebo; improvement in sleep, mood, and quality of life were also reported. Results from basic experimental studies, employing animal cancer pain models, as well as from clinical ones, confirmed that gabapentin is effective in treating NCP. Side effects of gabapentin include somnolence, dizziness and less commonly gastrointestinal symptoms and mild peripheral oedema. All these effects require close monitoring and dosage adjustment, but usually not drug discontinuation.

Pregabalin has been FDA approved for PHN and PDN and its action is similar to that of gabapentin, with a significantly greater affinity for the a2-δ subunit of voltage-gated calcium channels versus gabapentin. Pain improvement is noted as early as from the second day. It is not metabolized in the liver and, as a result, important pharmacokinetic drug-drug interactions do not occur. However, the dosage must be adjusted for patients with renal dysfunction. Its side effects are mild to moderate (dizziness, somnolence, headache, dry mouth and peripheral oedema). Pregabalin discontinuation rates range from 0 (150 mgr/day) to 20% (600 mgr/day).

In a prospective head-to-head, randomized, open label study, we included 120 cancer patients with definite NCP, resistant to a combination of paracetamol, codeine, non-steroidal anti-inflammatory drugs and methylprednisolone. Patients were randomly divided into two groups (pregabalin versus opioids). In the first group pregabalin was added and titrated up to 600 mgr/day, until significant pain relief or poor tolerability where observed (whichever occurred first). In the second group, transdermal therapeutic system (TTS) of fentanyl 25mcg/h was added and the dose was escalated by 25 mcg/h every 72 hours, up to a maximum dose of 125 mcg/h, until significant pain relief or problematic tolerability. We concluded that the prompt use of a neuropathic pain-specific adjuvant, such as pregabalin, in NCP may lead to better control of the neuropathic component, with opioid-sparing effect.

Topical antineuralgics: Lidocaine 5% patch or gel: Topical lidocaine is available as a 5% patch or gel. The efficacy of lidocaine patch has been demonstrated only in patients with PHN and focal NP syndromes, expressed with allodynia. In our department, we have used the 5% lidocaine patch in 36 patients in an open, observational study, for the treatment of NP of diverse origin. The therapy had a duration range of 2 months to 4 years, resulting in good and very good analgesia in 50% of patients.

Lidocaine patches have been used in NCP where allodynia exists.

Topical antineuralgics: Capsaisin 8% patch: Capsaicin is the active component of chili peppers, which are plants belonging to the genus Capsicum. Capsaicin is an agonist for the transient receptor potential vanilloid I receptor (TRPVI), which is an ion channel-receptor complex expressed on nociceptive nerve fibers in the skin. Topical administration of capsaicin causes an initial enhanced stimulation of the TRPVI -expressing cutaneous nociceptors that may be associated with painful sensations. This is followed by pain relief thought to be mediated by a reduction in TRPV 1expressing nociceptive nerve endings.

A high concentration capsaicin patch (8%), applied to the skin for 60 min in 402 patients, was found to be more effective in treating NP versus a low concentration patch. Adverse effects were primarily attributable to local capsaicin-related reactions at the application site. The patch has also been used for the treatment of painful HIV neuropathy. In our department, we have used the Capsaisin 8% patch in patients with pain related to chemotherapy-induced peripheral neuropathy in an open, observational study with good, unpublished yet, results.

3. Conclusions: In conclusion, NP is a complex pain problem that is often refractory to treatment. Multiple aetiologies can lead to the experience of NP. Present therapeutic strategies rely heavily upon pharmacotherapy. Combination of drugs, with completely different mechanisms of action is the optimal approach.

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OPIOIDS DRUG THERAPY IN ACUTE POSTOPERATIVE PAIN

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Purpose/Objective: To describe tecnique, advantages and side effects of IV opioids Patient Controlled Analgesia (PCA) in treatment of post-operative pain.

Materials and Methods: We reviewed opioids mechanisms of action, their side effects and IV PCA technique with advantages and disadvantages.

Results: In a quantitative systematic review there was little difference in pain control in favor to PCA compared to continuous iv opioids. Patients preferred PCA to conventional treatment and there was some evidence of fewer postoperative pulmonary complications with PCA.

In a meta-analysis it was demonstrated that PCA provided better pain control and greater patient satisfaction than conventional parenteral 'as-needed' analgesia. Different results may depend on inclusion criteria: meta-analysis included studies in which patients received continuous background infusions or non-opioid analgesics and partial mu agonists.

Finally, patients using PCA consumed higher amounts of opioids than controls, had higher incidence of pruritus but similar incidence of other adverse effects.

Conclusions: IV opioids PCA is effective post-operative pain treatment, well-accepted by most of patients.

Nevertheless, problems with PCA are discussed. New approaches may be equally efficacious but easier to use, less invasive, less prone to error.

Opioids-induced immune-modulation should be more considered: in cancer surgery use of regional anesthesia and analgesia may act positively on cancer recurrence.

LOW BACK PAIN: MECHANISMS, MANAGEMENT, TREATMENT

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Low back pain is still a major health care and socio economic burden. A systematic review on the global prevalence of low back pain found an estimated point prevalence of 11.9% and a 1-month prevalence of 23.2%. The highest prevalence is found among female individuals and those aged between 40–80 years. [1] Considering the projected aging the number of patients suffering low back is likely to increase over the next decades.

The first step in the management of patients with low back pain consists of a diagnostic triage to exclude back pain that arises from other structures such as retroperitoneal structures, the hips etc. [2]

The so called red flags (see table 1) draw the attention to potentially underlying serious diseases. Prior to designing any treatment plan the clinician will exclude inflammatory/metabolic causes (diabetes, ankylosing spondylitis, Paget's disease, arachnoiditis, sarcoidosis). [3]

Acute low back pain usually respond well to pharmacologic analgesic treatment. Part of the patients, however, are refractory to pharmacological treatment and the low back pain evolves to a chronic problem. Although it was often stated that only approximately 10 % of the patients would continue to suffer chronic pain, [4] later studies showed that 62% of the patients have recurrent episodes of low back pain at 12 months, 16 % is still unable to work 6 months after the first diagnosis and 33% has repeated episodes of incapacity to work during the first year. [5] A recently published systematic review regarding the clinical course of aspecific low back pain in primary care found that 65% of the patients still have pain at 1 year after onset. [6]

In approximately 5–10% of the patients a specific cause, such as tumor, infection, vertebral fracture, Bechterew or other can be identified.[4] The remaining 90–95% used to be considered as aspecific. Those so called aspecific types of low back pain are further classified as being of mechanical origin or radicular pain. Potential causes of low back pain of mechanical origin are: the zygapophyseal (facet) joints, the sacro-illiac joint and the intervertebral disc. [7–9] Interventional pain management techniques can be considered when the conservative treatment fails to provide satisfactory pain relief or causes unbearable side effects. The target specificity of the interventional pain management techniques requires identification of the causative structure and the involved level. Because there is no golden standard for establishing the diagnosis of low back pain, a diagnostic procedure consisting of: history taking, clinical examination and adapted additional examinations is outlined for the different types of low back pain. The treatment selection is based on the available evidence, besides, the potential benefits should be carefully weighed against possible side effects and complications.

The two most frequently occurring pain problems in a pain clinic are: low back pain originating from the facet joints and lumbosacral radicular pain. The radiofrequency facet joint denervation and the epidural administration of corticosteroids figure amongst the most frequently performed interventional treatments. Therefore, we concentrate on those two most frequent diagnoses.

Low back pain originating from the facet joints: The prevalence of lumbar facet joint pain has been reported to vary between 5% to 90%, depending on the used diagnostic tests. However, when selected patient populations were studied, the prevalence ranged between 5% and 15%. [10, 11] Osteoarthitis and degenerative disease are often indicated as cause of facetogenic pain, which also explains the increasing prevalence with age. [12, 13]

The findings of the provocation studies in volunteers allowed to identify a typical distribution pattern of the pain[14–17]

Physical examination: No physical examination is pathognomonic for the diagnosis lumbar facet pain.

The well-known Revel criteria for lumbar facet joint pain were defined based on the correlation between the physical examination and the symptoms with the response to placebo-controlled nerve blocks. [18, 19] A systematic review on tests that identify the facet joint as source of low back pain found that the Revel criteria and CT scan were most often used as index test. However, none of the 7 individual items from the Revel criteria were found to

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provide positive or negative likelihood information. [20] Paravertebral tenderness is believed to be indicative for facet joint pain. [21]

The role of medical imaging: The primary role of radiological examination is to exclude malignancy, compression fracture, or spinal infection. [22, 23] Degenerative facet joints can best be visualized with computed tomography examination. [24] Magnetic resonance imaging is believed to be somewhat less sensitive, although the classification of degenerative facet joints is based on MRI. [25]

Abnormal radiological findings correlate in half of the studies with a positive response to diagnostic blocks, while in the other half no correlation could be found.

The diagnostic blocks of the articulations that showed hypercaptivity with computed tomography-single-photon emission computed tomography fusion (CT-SPECT) resulted in (temporary) pain relief in 36 of the 37 patients. [26] These findings suggest a potential role for CT-SPECT in the diagnosis of lumbar facet joint pain.

Diagnostic – prognostic blocks: A survey of an expert panel resulted in the establishment of 12 indicators for facet joint pain. Pain relieved by fluoroscopically guided double-anesthetic blocks of the medial branch of the dorsal ramus supplying the facet joint was accepted as a positive indicator by 85 % of the experts. [27]

Diagnostic –prognostic blocks are recommended in guidelines prior to performing a radiofrequency (RF) facet joint denervation, in order to confirm the involvement of the facet joint. [28]

There are currently seven randomized controlled trials (RCT's) on RF facet denervation. [29–35] In all these studies the diagnosis was confirmed by means of a diagnostic block, but the technique, the medication used, the targeted structure and the interpretation of the outcome of those blocks varied widely. In one study, approximately 10% of the patients were ultimately selected for the RF treatment [35], while this was the case for 92% of the patients in another study. [31] In this latter study the RF treatment was not better than sham intervention. The patients were selected with an intra-articular block with local anesthetic and corticosteroid. The block was judged positive if the patient reported "significant" pain relief during 24h within the week after the injection. The high inclusion rate may be suggestive for a high number of false positive blocks. In the studies where patients were selected with diagnostic medial branch blocks, the percentage of patients included in the study is much lower (10–31%) but the outcome of the RF treatment is positive compared to sham intervention. [30, 35] Furthermore, in a recently published prospective triple cross-over study it was concluded that a single intra-articular facet joint block with local anesthetics is not useful to detect the facet joint responsible for the pain. [36] When local anesthetic is injected at the level of the medial branch of the dorsal ramus false positive and false negative outcome may be noted. To increase the accuracy of the diagnostic blocks, controlled blocks have been proposed. This means that the injection is performed twice with two different local anesthetics, each with a different duration of action. To conclude that the injected level is the causative level, the patient should experience pain relief for the duration of action of both local anesthetics. [35]

As for the selection of a treatment it is recommended to evaluate the balance between the potential benefit and the patient burden. With controlled diagnostic blocks the rate of false positive blocks will be reduced, but at the same time the number of false negatives will increase. Increasing the number of blocks increases the burden to the patient.

A randomized controlled trial estimated the cost per successful radiofrequency treatment when patients were selected based on clinical examination alone, with 1 diagnostic block or with 2 comparative blocks. Radiofrequency treatment of patients selected with clinical examination has the lowest cost per successful treatment, whereas the highest costs per successful radiofrequency treatment is generated when performing this procedure after one single diagnostic block. [37] The highest success rate is observed in the group who received 2 diagnostic blocks.

However, 64% of the patients treated after two diagnostic blocks and 39% of the patients treated after one block had a successful outcome. This means that for a 25% increase in successful outcome after radiofrequency treatment, 100% more diagnostic interventions are needed. [38]

In a recent publication, it was observed that no optimal threshold for designating a diagnostic block as positive, above 50% pain relief, could be calculated. Employing more stringent selection criteria for lumbar facet RF is likely to result in withholding a beneficial procedure from a substantial number of patients, without improving success.[39]

Summary of the diagnosis of lumbar facet joint pain: A working diagnosis can be made based on the history, the pain distribution and the clinical diagnosis. Medical imaging is predominantly used to exclude the red flags, although CT-SPECT may be indicative for the involved level, and could be a valuable tool when envisioning surgical treatment. Based on the available evidence RF facet denervation can be recommended for the management of chronic facet joint pain. There is evidence that the treatment outcome improves when the patient selection is fine tuned. One positive diagnostic medial branch block, that is correctly evaluated improves patient selection and treatment outcome. A cutoff of 50% pain relief after a diagnostic block was documented to be a valuable tool to improve treatment outcome, there is no reason the select a higher cutoff value.

Lumbosacral radicular pain: Lumbosacral radicular pain is characterized by a radiating pain in one or more lumbar or sacral dermatomes; it may or may not be accompanied by other radicular irritation symptoms or symptoms of decreased function. In addition, patients often report paresthesia in the affected dermatome. The distribution of pain along a dermatome helps to determine the level involved; however, there is large variation in radiation patterns [3, 40]

The most frequent cause of lumbosacral radicular pain is a herniated disc, although certainly in patients over 50 years degenerative changes of the spine (eg, stenosis of the foramen intervertebrale) cause radicular pain. [3]

Physical examination: The straight leg raising test, often referred to as the Lasègue test is the most popular clinical examination for lumbosacral radicular pain. If radicular pain can be elicited with an angle of less than 60 to 75°, there is a large chance that a lumbar disc is herniated [41].

The crossed Lasègue test is the only examination with good specificity, but this comes at the expense of the sensitivity . [41] Therefore a combination of both tests in recommended.

Neurological signs such as paresis, sensory loss, or loss of reflexes are not specific. [42] Tarulli et al [3] described the signs that are indicative for the involvement of the different levels: L4 involvement (lessened patellar reflex, foot inversion) or an L5-S1 hernia (Achilles tendon reflex), L5 motor paresis may be accompanied by the "stomping foot".

Medical imaging: Medical imaging, primarily magnetic resonance imaging (MRI), can confirm the presence of a herniated disc; this technique is preferred because of the better visualization of soft tissues and the lower radiation dose. [43] The specificity of the medical imaging techniques, MRI and CT scan is very low. Abnormal findings can also be seen in an asymptomatic population and there is little correlation between the severity of the radiculopathy and the disc herniation. [44]

Electrophysiological investigation: Electromyography (EMG)/nerve conduction studies (NCS) may be used to differentiate lumbar radicular syndrome from peripheral neuropathy.[45] Quantitative sensorial testing (QST) was shown to provide predictive information regarding the outcome of epidural corticosteroid injection therapy. [46]

Selective segmental nerve blocks: To confirm the presumed causative level, one or more selective nerve root blocks are recommended. To increase the specificity the use of a limited amount of local anesthetic (max. 1 mL) is mandatory. When different levels must be tested, this should happen in separate sessions. [44]

Summary of the diagnosis of lumbosacral radicular pain: The radiation pattern of lumbosacral radicular pain is indicative for the involved level. The most frequently used examination is the Lasègue and the crossed Lasègue test. MRI may confirm the presence of disc herniation at the presumed causative level. Medical imaging as such is not specific because abnormalities are also noted in asymptomatic patients. Electrophysiological investigation can help to differentiate between lumbar radicular syndrome and peripheral neuropathy.

Conclusions and future perspectives: Since the introduction of the Evidence-Based Medicine in the early nineties of the previous century, guidelines have proliferated. Unfortunately some of those guidelines on the same subject issue contradictory recommendations. [47–51] However, those guidelines can be used by health care authorities and policy makers to decide on financing a treatment, which provides them an extra dimension, above the attempted rationalistic use of the best available treatment for the specific patient. Not surprisingly that different interest groups may give another interpretation to the available evidence. [48]

For interventional pain management techniques it is observed that the treatment outcome improves when the patients are more accurately selected. [38, 52] Therefore, in case of low back pain, the pain diagnosis should be

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fine-tuned to allow identification of the most probably causative structure and level, prior to deciding on an interventional treatment. [36]

The extend of the problem low back pain will increase in parallel with the aging of the population. There is currently a tendency towards "mechanism based treatment" as well for the pharmacological treatment as for the interventional treatment. This means that the translational research is developing fast, and will definitely generate valuable information with regard to the underlying disease mechanism as well as the mechanism of action of pharmacological and interventional treatment options. This knowledge will help selecting the best treatment for each individual patient. Low back pain is however not an "isolated" diagnosis, identifying the cause of the pain often requires a multidisciplinary evaluation. The management will also evolve more and more to a multidisciplinary and multifactorial approach.

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NERVE INJURY – HOW CAN RISK BE MINIMIZED?

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Introduction: Prior to the introduction of ultrasound-guided regional anesthesia (UGRA), little information was available on the location of the needle necessary to accomplish successful and safe nerve blockade. This lack of information is because localization techniques without ultrasound guidance depend on an indirect assesment of the needle location, such as electrical current intensity or patient reports of paresthesias (needle-nerve contact). The introduction of UGRA allowed for greater precision of needle placement and deposition of the local anesthetics (LA) and helped in our understanding of many aspects of PNBs (1). Several recently published clinical reports document the inadvertent intraneural placement of the needle and subsequent injection of LA without clinically apparent neurologic injury.

The purpose of this lecture is to define a functional anatomical classification of perineural-intraneural injections and define a rational clinical algorithm based on the presently known information and available technology, to minimized the risk of post-block nerve injury.

Anatomy of the Peripheral Nerve: Histologic peripheral nerve anatomy, Figure 1.

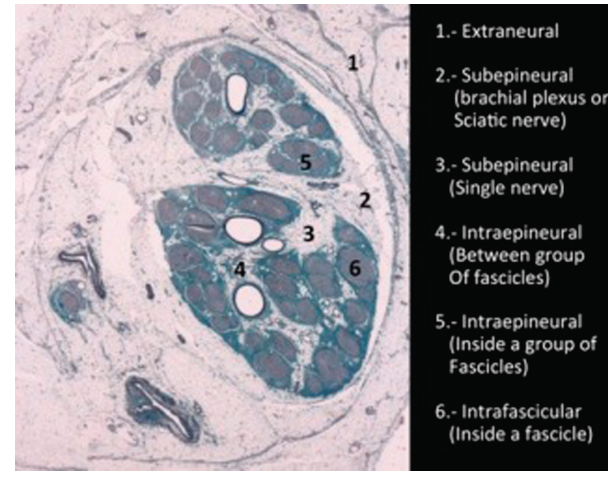

FIGURE 1. Histological anatomy of the peripheral nerve.

Axons are the essential conducting units of peripheral nerves. Axons are surrounded by supporting connective tissue called the *endoneurium*. With their adjacent endoneurium, axons are protected by a dense layer of cells organized into a surrounding membrane called the *perineurium*. The perineurium creates both a physical and chemical barrier, which translates into a degree of protection for the peripheral nerve fascicles. When fascicles are bundled together into fascicular bundles, they are embedded in the *interfascicular epineurium*. The fascicles, or groups of fascicles, are embedded in a varying degree of protective fibro-adipose tissue called the *epineurium*. The epineurium is classified into two distinct anatomical structures: (i) the *interfascicular* epineurium and the (ii) *outer* epineurium (epineurial sheath) that hosts the nerve contents (define the anatomical structure) and connects the nerve to the neighboring structures.

Functional anatomy of the peripheral nerve: From the functional anatomy standpoint with respect to UGRA, peripheral nerves consist of two distinctly different parts: the *epineurium* or connective tissue of the nerve, and the conducting (neurologically functional) elements of the nerve *fascicles,* often organized into *bundles of fascicles*. Peripheral nerves and plexuses have varying proportions of epineurium and the number of fascicles and/or *fascicular bundles*. In general, fascicles comprise between 20% and 70% of the cross-sectional surface of a peripheral nerve. Different fascicular patterns also exist at various cross-sectional levels, even within one single nerve. The number

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and size of the fascicles are more numerous in areas where nerves traverse mobile areas such as in the vicinity of the joints.

Multiple elaborate inter-connections exist among the fascicles throughout the path of the peripheral nerve on its journey from the neuraxis to the periphery. Fascicles divide and re-group, inter-connect, and form new groups, clusters, divisions, bridges, and other elaborated organizational forms called intraneural plexuses. Elaborated patterns occur, particularly when the rami separate or when the nerves divide or diverge. Along their path towards distal locations, nerves are often accompanied by blood vessels and held together by loose, fibrous tissue organized into *neurovascular sheaths*. At other times, nerves pass through, underneath, or between the muscle fasciae. Various tissues, which surround peripheral nerves, present functionally as nerve sheaths and serve both as a conduit for the injected local anesthetic, as well as a protection against trauma. These tissues sheaths should not be confused with *outer epineurium,* a thickened outer section of epineurium that connects the nerve to the neighboring structures.

From a hydrodynamic point of view, the various tissues that comprise a peripheral nerve can be also divided into the loose, high-compliance, expansible connective tissue - *epineurium* and the low-compliance, disruptable *fascicles* and *fascicular bundles*, densely packed into collagen. The anatomical differences between fat-connective tissue and fascicles or fascicular bundles serve as a logical explanation as to why an injection into the latter requires more force (pressure) to initiate an injection when compared to injecting into the loose connective epineurium tissue.

Intraneural injections in patients: The absence of neurologic injury with intraneural injections during sciatic popliteal block is at apparent odds with conventional thinking that intraneural injection invariably leads to nerve injury. However, the physical location of the needle insertion, injection and magnitude of the hydraulic forces used to inject are the key factors that determine whether or not neurologic injury will result from an intraneural injection. The low incidence of complications after intraneural injections with sciatic popliteal block (SPB) is likely due to the anatomic characteristics of the sciatic nerve within the popliteal fossa where epineurium comprises the bulk of the nerve. In other words, since connective tissue of the sciatic nerve comprises up to 80% of the cross-sectional area of the sciatic nerve at this level, the needle trajectory favors the path of lesser resistance through epineurium, rather than through more densely packed fascicles. Studies in animal models suggest that low-pressure injection for sciatic nerve block indicates perineural or inter-fascicular, rather than intrafascicular injection. In patients, resistance to injection was reported as "normal" in all studies with intraneural injections that resulted in no neurologic complications. In contrast, motor response during low current-intensity nerve stimulation, high injection pressure, and pain on injection were simultaneously present in several instances with suspected intraneural intrafascicular needle insertion. Since none of the monitoring methods may be fail-safe with regards to causing nerve injury, their use in combination is suggested as routine monitoring methods to help reduce the risk of an intraneural-intrafascicular injection.

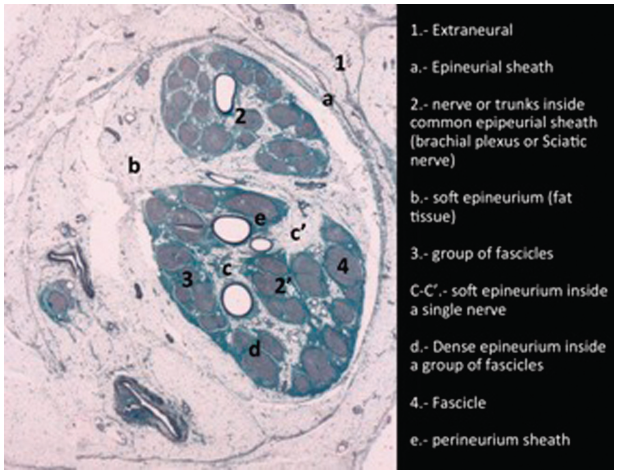

FIGURE 2. Theorical injection points based on histological anatomy of the peripheral nerve

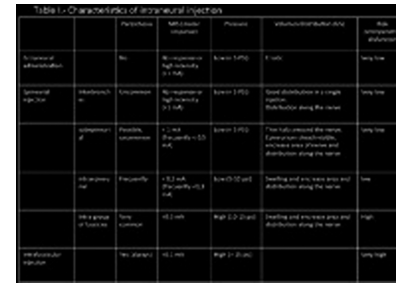

FIGURE 3. Classification of the peripheral nerve block injections according to the location of the injectate.

Concordant documentation is also important for assistance in understanding the factors involved with nerve injury associated with RA when it occurs.

Theorical injection points, expected clinical answer and risk of postoperative disfunction (figures 2 and 3).

Once the neural structure is known, it is easy to theorize concerning the different possible injection sites, considering its different compartments. Hence, we can classify injections as:

a) **Extraneurial injection:** Injection outside the epineurial cover. Of maximal security, probably there is an absence of neurostimulation answer at classical intensity (<0.5 mA), and a late-onset, occasionally incomplete blockade. The distribution of anesthetic along the nerve will be erratic, making it necessary to perform frequent redirection of the needle.

b) **Epineurial injection:** Injection inside the epineurial layer, but outside the perineurum (outside the fascicle). Its efficacy and security will be very dependant on the site of injection, and of the nerve's characteristics. It can be subclassified into:

i. Inter-branch or inter-nerve injection (figure 2; b): injection between complex nerves / trunks (plexus) grouped in the same epineurial tissue. When an injection is performed in the sciatic nerve or in a trunk, division or chord of the brachial plexus; we usually find ourselves in this space, and we will see a good distribution of the anesthetic drug along the nerve groups that conform the nervous unit, without need of moving or redirecting the needle. This injection is safe, with an elevated blocking efficacy, variable responses to neurostimulation (usually with answers to intensities greater than 1 mA), and low resistance to the drug injection, allowing for a clear definition of the nerves' limits afterwards.

ii. Subepineurial injection (single nerve) (figure 2; c') This injection is performed under the epineurial sheath. Injection in this site doesn't present a high resistance, and answer to neurostimulation is variable, but usually happens at standard intensity (0,5 mA). Drug distribution happens along the nerve (thin subepineurial distribution), with a displacement of the nerve (due to the injection's pressure), followed by an extraneurial disposition of the drug. Administration at this site associates with a low risk of post-blockade neurological dysfunction.

iii. Intraepineurial injection (single nerve) (figure 2, c). This injection happens in the centre of the neural area (between fascicles or fascicular groups). When the needle is placed in this space, we will usually observe clinical signs (paresthesias) and a response to low-intensity neurostimulation (<0.5 mA, frequently <0.3 mA). Injection of drug at this level will show displacement of fascicular groups or isolated fascicles (swelling), and clear echogenicity changes in the nerve. This injection must be avoided, since there is a greater (although infrequent) risk of post-block dysfunction. When we visualize this in the screen of our ultrasonograph, injection must be stopped and the needle must be slightly withdrawn before we proceed.

iv. Intraneurial injection (Inside a group of fascicles) (Figure 2, d). This happens when injection is performed inside a group of densely united fascicles (with a high content of collagenous, and a low content of adipose, tissue). This will present with paresthesia, response to a low intensity neurostimulation (<0,3 mA), and high resistance to drug injection. It has a high risk of post-blockade dysfunction, with an ultrasound image identical to the one described in the previous section (Swelling).

c) **Intrafascicular injection:** This happens inside the fascicle. It is probably impossible to perform in awake patients (the risk will hence be when performing it in anaesthetized patients). The neural damage, in this case, is guaranteed. There is a high resistance to injection, with response to minimal

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neurostimulation intensity, etc. Again, the ultrasound image will be undistinguishable from the previously described swelling.

Ultrasonographic signs of neural punction and intraneurial injection: At the start of loco-regional anesthesiology, the nerve block technique was closely related to the injection of cocaine into the nerve, this behavior being known as 'intraneurial injection'. Thus, Victor Pauchet, in his book "L'anesthesie Regionale", defines what happens after an intraneurial injection*: "A fusiform enlargement of the nerve ensues that disappears quickly. The injectate diffuses along both sides, that is why an intraneurial injection can exit through the branches that leave the nerve close to the injection site"*. This signs have recently been reconsidered as signs of intraneurial injection.

In specialized anesthesiology literature, the definition of intraneurial injection is not clear; despite the peripheral nerve is a clearly characterized structure, as we have explained in the previous section. Intraneurial injection must be defined as drug injection inside the peripheral nerve. We can then divide intraneurial injection into intrafascicular injection, as the one performed inside the nerve fascicle (with disruption of the perineurum); or intraepineurial-extrafascicular injection, which happens inside the epineurial tissue.

We can nowadays identify signs that will suggest the administration of anesthetic drug in the intraneurial tissue. Nevertheless, these signs are still too loosely defined, or are of difficult identification or interpretation, to be helpful in forming the criteria that assures us we have performed an intraneurial injection. The main inconveniences of imaging techniques are that, in many occasions, they are incapable of delineating the nerves' limits, much less to identify fascicles. That's why ultrasound has a low predictive capacity in defining the site of injection, and thus of predicting the possible risk of post-block dysfunction.

Ultrasound signs of puncture and/or intraneurial injection are varied and observer-dependant. The established criteria should be capable of answering to two different situations. Firstly, to evaluate the incidence of intraneurial injection in non-ultrasound guided anesthetic techniques (i.e: neurostimulation-guided techniques); and, secondly, to evaluate the incidence in ultrasound-guided techniques, were puncture control is performed in real-time. In both situations, there will be signs of higher or lower specificity:

US-guided regional anesthesia. Dynamic signs of neural puncture and injection:

a. Viewing the needle inside the nerve (not demonstrable clinically nowadays, due to ethical considerations)(Figure 4). Neural puncture is an occasional, undesired observation; what can usually be observed is neural injection. Control and viewing of the needle tip is good when we perform an 'in plane' technique, and when the puncture angle is less or equal to 30º.
b. Dynamic view of the area's increase. Direct vision of the nerve's distension, with fascicle separation (increase of the neural diameter) when we start drug injection (3,5,6,9) (Figure 5,B).
c. Separation of the fascicles and/or fascicular bundles by the injectate (Figure 5,B).

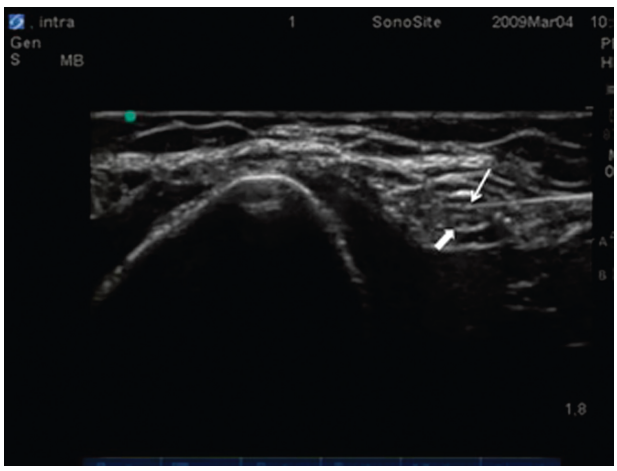

FIGURE 4. Example of direct US sign of intraneural injection: Needle into the ulnar nerve.

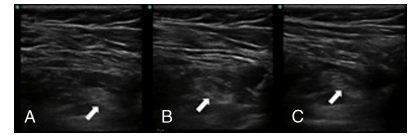

FIGURE 5. Example of direct US sign of intraneural injection. Swelling and fascicles separation in femoral nerve block.

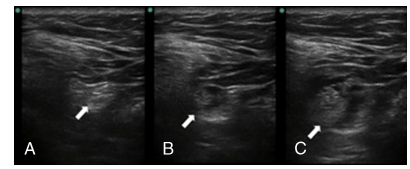

FIGURE 6. Example of direct US sign of intraneural injection. Swelling, fascicles separation and epineurial sheath view during popliteal block at point of sciatic nerve division.

d. Elastic reduction of the area when ceasing drug injection (Figure 5,C). This suggests elastic distention of the epineurium, which will disappear when there is rupture of the epineurial cover or anesthetic diffusion along the neural structure, as suggested by Pauchet in 1914.
e. Viewing the epineurial sheath after injection. Thin layer of collagen around the nerve (Figure 6,C).

Static US signs of neural injection:

a. Increase in the nerve's area and diameter due to the anesthetic's expansive effect at the site of injection (Figure 6, B).
b. Diffusion of the anesthetic, creating a fine halo, in proximal and distal senses and along the nerves branches (Figure 6, C).
c. Nerve swelling. Change in echogenicity due to edema effect or to increase in the aqueous proportion in the tissues. It's correlated with an increase nerve area (Figure 6,C).
d. Viewing the epineurial sheath after injection. Thin layer of collagen around the nerve (Figure 6,C).

Risk of nerve damage associated to nerve puncture and intraneurial injection: The neurologic consequences of an intraneural needle insertion and injection of local anesthetic depend on many factors, such as the design of the needle tip, injection force, and the chemical structure and concentration of the injectate. However, the anatomic specifics of a given nerve and how its organization can protect it against external injury may be the most significant factor that determines the likelihood of injury. Additionally, any preexisting pathology of the peripheral nerve also contributes to the risk of post-block neurologic symptoms.

There are various nerve characteristics that may condition a higher or lesser degree of risk in case of intraneurial puncture or drug injection. These are:

a) The relationship between the epineurial and neural tissues (between epineurial areas and fascicles). The epineurium acts as a sustaining tissue, protecting the fascicles. Hence, nerves with a greater quantity of epineurial tissue (i.e. the sciatic nerve) will be harder to damage by puncture.
b) The size of the fascicles and fascicular groups. Inside the nerves, fascicles can be of a different size; either thickly clustered forming fascicular groups, or more or less isolated in the epineurium. Thickly clustered fascicles will be easier to damage by direct needle puncture, whereas isolated fascicles will be more susceptible to damage by drug injection, due to the breaking of communicating bridges between fascicles (interfascicular plexus).
c) Elongation capacity of the fascicles and lassitude of epineurial tissue. Nerves that are under stretch forces and those that present attachments or loss of elasticity present a higher risk of damage both by needle puncture and by drug injection.
d) Neural vascularisation. Vessels, as fascicles, can be damaged by needle puncture or drug infusion. They present the same anatomical qualities that those described for the fascicles, and they can thus be equally damaged.

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Intraneurial hematoma, or of the nerve's *arteria nutriens* is a pathogenic mechanism to be remembered.

Practical considerations and current recommendations: Because an intraneural injection is much more likely to occur in the non-conducting connective tissue elements of the peripheral nerve (interfascicular epineurium) rather then into the fascicles, it is not surprising that neurologic injury is uncommon during PNBs. In fact, it appears that the long-established practice of low current-intensity nerve stimulator guidance during PNBs often results in intraneural but extrafascicular placement of the needle and injection. This not surprising since a motor response to nerve stimulation at low current intensities (0.3 - 0.5 mA) can be accomplished only when the needle tip is placed within the nerve or pressed against the outer epineurium.

The absence of neurologic complications reported in a recent small series, however, should not be mistakenly interpreted in that way that the indiscriminate practice of intraneural injection in all PNB models is a safe and recommended practice. Based on the available information and collective clinical experience, injection within epineurium of the sciatic popliteal nerve or within tissue sheaths (space) that envelope major plexuses (e.g., brachial plexus) are often done and considered a common and acceptable practice. However, intraneural injection with other peripheral nerves may be associated with an unacceptable risk of complications and *cannot* be recommended. This is due to the fact that most peripheral these nerves have a greater nerve to connective tissue ratio, and less defined outer epineurium, making them more prone to disruptive injury to the fascicles. The smaller proportion of the connective tissue in these nerves also allows perineural injections to be effective even with small volumes of local anesthetic, making intentional intraneural injections unnecessary altogether.

Summary: Intraneural but extrafascicular injection of local anesthetics is a common occurrence with low-current intensity nerve stimulator-guided popliteal sciatic nerve blocks. Such injections appear to be associated with high success rate and low risk of neurologic injury when the motor response is not present at >0.3mA (0.1 msec), injection pressure is low (<15 psi) and/or the patient is asymptomatic. Therefore, based on the available data it may be suggested that the goal of ultrasound-guided blocks of the brachial plexus and popliteal sciatic nerve should be similar to that of nerve stimulation – injection within the outer epineurium or tissue space (sheath), but outside of the fascicles or fascicular bundles. By contrast, no data exist to suggest that injections into nerve roots (including interscalene blocks) or intraneural injections with distal peripheral nerves are equally safe, and therefore they cannot be recommended as safe practice.

Since none of the methods of nerve localization are fail-safe, a multimodal combination of needle tip location monitoring via ultrasound, electrostimulation, and assesment of resistance to injection is recommended. FIGURE 7

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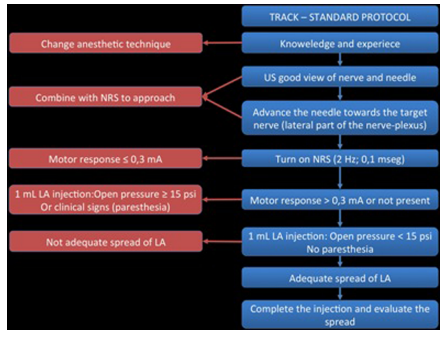

FIGURE 7. Monitoring during nerve blocks: combining ultrasound, nerve stimulation, open-pressure and spread during injection.

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MANAGEMENT OF CHRONIC PAIN IN OBESE PATIENTS. SPECIAL GUIDELINES?

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Management of chronic pain in obese patients

Definitions:

- Overweight is a body mass index (BMI) of 25 kg/m2 or greater but less than 30 kg/m2
- Obesity is a BMI greater than or equal to 30 kg/m2
- Extreme obesity is a BMI greater than or equal to 40 kg/m2.
- Abdominal obesity is waist circumference > 40 inches in men or > 35 inches in women. OR waist/hip ratio > 0.9 for men and > 0.85 for women

Prevalence of obesity: Overweight/obesity is a global growing epidemic especially within the United States and Europe.[1,2]

Obesity is an expensive disease that is associated with significant disability.[3]

Obesity is the leading cause of preventable deaths and chronic disease.[4]

Obesity and low back pain: Lifetime prevalence of LBP is estimated to be 70-85% with point prevalence rate around 30%.[5]

Thirty-three studies were included in a recent meta-analysis that showed obesity was associated with increased prevalence of low back pain in the past 12 months, seeking care for low back pain, and chronic low back pain.[6] The results remained consistent after adjusting for publication bias and limiting the analyses to studies that controlled for potential confounders such as physical or psychosocial factors.

The association between obesity and the prevalence of low back pain is stronger for women than for men.

This gender-related difference can be explained by:

1- Hormone-related obesity and associated changes in pain sensitivity.[7]

2- Differences in the distribution of body fat mass or proportion of lean body mass (BMI). [8] In men, high BMI may reflect high muscle mass while in women, it may indicate amount of adipose tissue.

The majority of the reviewed studies were cross-sectional. Therefore, the association between obesity and low back pain could be bidirectional; that is, obesity may cause low back pain, or obesity can be a consequence of low back pain.[6]

Obesity is more likely in people who are sedentary during work or leisure activities. Low back pain could also lead to physical inactivity and hence to increased adiposity. Obesity and low back pain could also be comorbid conditions that share common risk factors.

Possible mechanisms for LBP in obesity:

1- Obesity can increase the mechanical load on the spine by causing a higher compressive force or increased shear on the lumbar spine structures during various activities.

2- Obese people may also be more liable to incur accidental injuries.[9]

3- Inflammatory effects of adiposity: Obesity may cause low back pain through systemic chronic inflammation. Obesity is associated with increased production of cytokines, acute-phase reactants and activation of pro-inflammatory pathways.[10] Obesity alone may increase one's risk for peripheral neuropathic disorders.[11]

4- Obese individuals were shown to be significantly more pain sensitive than non-obese. 12,13However, other studies in human and animal models have shown the opposite-decreased pain sensitivity in obese individuals.[14,15]

5- Abdominal obesity, hypertension and dyslipidemia (the metabolic syndrome) may be involved in the patho-mechanical pathway of low back pain.

6- Obesity is associated with disc degeneration. [16] Spinal mobility decreases with increasing body weight which may interfere with disc nutrition. [17]

Possible mediators and shared pathways between obesity and pain:

Sex
Age
Smoking
Diet
Physical activity
Socioeconomic and lifestyle factors
Height/stature
Distribution of body fat and waist circumference [18]

Low back pain and associations with body fat distribution and height: Cross-sectional study in The Netherlands examined the associations of low back pain symptoms with waist circumference, height, waist to hip ratio and body mass index.

The prevalence of low back pain in men and women in the past 12 months were 46% and 52%,

Women who are overweight, or those with a predominant abdominal fat mass, indicated by large waist circumference, are at greatly increased risk of low back pain. Associations between anthropometric measures and low back pain are much weaker in men.[18]

Obesity and musculoskeletal pain:

- Osteoarthritis (OA) is the most common joint disorder, affecting more-than 25 million Americans[19], and the leading cause of disability among older Americans.[20]

An Australian population-based research showed that the odds of hip and knee arthritis and OA was up to 7 times higher for obese individuals, compared with underweight/normal weight individuals. Moreover obese individuals with arthritis or OA reported more pain, greater stiffness, worse function, and greater disease severity.[21]

Those who became overweight earlier in adulthood showed higher risks of lower limb OA. Waist/hip ratio (WHR) at time of examination did not associate with OA independently of BMI, except in women-only analysis. Waist circumference was associated with lower limb OA risk.[22]

- Obesity is a risk factor for fibromyalgia in adults [23] and musculoskeletal pain in adolescents.[24]

Obesity and migraine: Obesity as a risk for chronic migraine. [25]

Obesity is an inflammatory state in which multiple pain-generating hormones are produced and released from fat cells, including calcitonin gene-related peptide, substance P, tumor necrosis factor-a, and interleukin-6. During a migraine, there is a similar release of these same pain-promoting hormones and neurochemicals.

Both gastric bypass and gastric lap banding show promise in reducing migraine frequency.[26]

Effect of Treatment on Pain and Weight Outcomes:

- Lifestyle Intervention/Behavioral Weight-Loss Treatment

Lifestyle interventions encourage weight loss through diet, exercise, and behavior and thought modification.

The Arthritis, Diet, and Activity Promotion Trial (ADAPT) examined the effectiveness of exercise and dietary intervention on improving pain outcomes in overweight/obese older adults with knee OA. [27,28] Three hundred sixteen adults were randomized into diet only, exercise only, diet plus exercise, and healthy lifestyle (control) groups. Primary outcome variables included physical functioning, pain, and mobility.

Although the diet- only group experienced greater weight loss compared with the healthy lifestyle group, no pain-related improvement was evident. In the exercise-only group, the only significant improvement was in mobility. However, the diet and exercise group had significant improvement in physical functioning, self-reported pain, mobility, and weight. Dietary modification coupled with exercise appears most effective in enhancing outcomes in nonsurgical interventions

There is little information on the prevention of low back pain with weight reduction via lifestyle modification.[6]

- Bariatric surgery appears to have a positive effect on pain outcomes

Surgical intervention results in a greater reduction of musculoskeletal pain.[29]

Patients with lower-limb pain (e.g., foot, knee) reported significantly greater improvement in quality of life than those with LBP, often meeting or exceeding community norms.[30]

Results suggest that even modest weight loss may be beneficial and that the extent of weight loss is not necessarily predictive of enhanced pain outcomes.[31]

There is also preliminary evidence that weight reduction after bariatric surgery may result in recovery from low back pain. [32,33]

Does obesity affect the treatment outcomes for LBP?:

- Obesity was shown to affect outcomes following the treatment of symptomatic lumbar disc herniation.

An as-treated analysis was performed on patients enrolled in the Spine Patient Outcomes Research Trial (SPORT) for the treatment of lumbar disc herniation.[34]

At 4-year follow-up evaluation, improvements over baseline in primary outcome measures were significantly less for obese patients as compared with non-obese patients in both the operative treatment group and the

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non-operative treatment group. The benefit of surgery over non-operative treatment was not affected by body mass index.

Obese patients realized less clinical benefit from both operative and non-operative treatment of lumbar disc herniation. Surgery provided similar benefit over non-operative treatment in obese and non-obese patients

- Obesity was shown to affect outcomes following the treatment for lumbar stenosis (SpS) and degenerative spondylolisthesis (DS).

An as-treated analysis was performed on patients enrolled in the Spine Patient Outcomes Research Trial (SPORT) for the treatment of lumbar spinal stenosis (SpS) or degenerative spondylolisthesis (DS). [35]

At 4-year follow-up, operative and non-operative treatment provided improvement in all primary outcome measures over baseline in patients with BMI of less than 30 and 30 or more. For patients with SpS, there were no differences in the surgical complication or reoperation rates between groups. Patients with DS with BMI of 30 or more had a higher postoperative infection rate (5% vs. 1%) and twice the reoperation rate at 4-year follow-up (20% vs. 11%) than those with BMI of less than 30.

Obese patients had a significantly greater treatment effect than non-obese patients with SpS (Oswestry Disability Index, P = 0.037) and DS (SF-36 PF, P = 0.004) largely due to the relatively poor outcome of non-operative treatment in obese patients.

The authors concluded that; obesity does not affect the clinical outcome of operative treatment of SpS. There are higher rates of infection and reoperation and less improvement from baseline in the SF-36 physical function score in obese patients after surgery for DS. Non-operative treatment may not be as effective in obese patients with SpS or DS.

Opioids for chronic pain in obese patients: The two most important factors that play an important role in prescribing opioids for chronic pain in obese patients are sleep apnea and risk for addiction.

Obesity and OSA:

- Obesity is considered a major risk factor for the development and progression of OSA.

The prevalence of OSA in obese or severely obese patients is nearly twice that of normal-weight adults. Furthermore, patients with mild OSA who gain 10% of their baseline weight are at a 6 fold increased risk of progression of OSA, and an equivalent weight loss can result in a more than 20% improvement in OSA severity.[36]

- The use of opioids has been associated with development of sleep-disordered breathing, including central apneas, nocturnal oxygen desaturations, and abnormal breathing patterns. [37]

Obesity and addiction: Neuro-functioning imaging revealed the similarity and the overlapping brain circuits between obesity and drug addiction.

Drug addiction and obesity appear to share several properties. Both are disorders in which the saliency of a specific type of reward (food or drug) becomes exaggerated relative to, and at the expense of others rewards. Both drugs and food have powerful reinforcing effects, which are in part mediated by abrupt dopamine increases in the brain reward centers. [38,39]

Obese and drug-addicted individuals suffer from impairments in dopaminergic pathways that regulate neuronal systems associated not only with reward sensitivity and incentive motivation, but also with conditioning, self-control, stress reactivity and interoceptive awareness.

Recent advances in obesity treatment: Occipital Neuromodulation was shown to decreases body mass and modifies Autonomic Nervous System activity in morbidly obese patients.[40]

A combination tablet was approved by the Food and Drug Administration in 2012 that contains phentermine and topiramate in a single tablet. This might prove helpful in preventing chronic migraines in obese patients.

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LOCAL ANESTHETIC SELECTION FOR SPINAL ANESTHESIA: CURRENT ROLE OF PRILOCAINE AND CLOROPROCAINE

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Lidocaine had been used for spinal anesthesia for decades when the first reports of transient neurologic symptoms (TNS) were published in 1993 (Schneider M et al. Anesth Analg 1993). The rate of TNS after lidocaine spinal varies from 10 to 40% (Tarkkila P et al. Br J Anaesth 1995; Pollock JE et al. Anesth Analg 2003; Freedman JM et al. Anesthesiology 1998; Hampl KF et al. Anesth Analg 1996). Various drugs have been considered to replace lidocaine, including mepivacaine (with an incidence of TNS of up to 30% (Hiller A et al. Br J Anaesth 1997; YaDeau JT et al. Anesth Analg 200)), low-dose bupivacaine (extremely variable in the duration of the block (Liu SS et al. Anesthesiology 1996)), procaine (which in one study (Hodgson PS et al. Reg Anesth Pain Med 2000) resulted in a 15% incidence of nausea, 15% failed blocks, and TNS in 6% of the cases), articaine (Snoeck M. Local Reg Anesth 2012), as well as prilocaine (Zaric D. Cochrane Database Syst Rev 2009) and 2-chloroprocaine (Goldblum E et al. Acta Anaesthesiol Scand 2013), which were both recently approved for intrathecal use in Europe.

This talk will focus on these last two agents.

Chloroprocaine (2-chloroprocaine, CP) is an amino- ester local anesthetic with a fast onset and a short duration, approved by the Food and Drug Administration (FDA) in the United States for peripheral nerve blocks and epidural anesthesia, and recently approved in Europe for spinal anesthesia.

In 1952, Foldes and Mc Nall (Anesthesiology 1952) described 214 cases of CP spinal using between 82.5 and 100 mg. Sensory anesthesia (defined as the time to regression of pinprick anesthesia to the level of the inguinal fold) lasted for 82 ± 2.8 min for plain CP, and 121 ± 3.0 min with the addition of epinephrine. However, possibly because of the success of lidocaine, CP was not widely used as a spinal agent.

In the early 1980s, several reports of neurologic deficits possibly associated with intrathecal injection of large volumes of CP intended for epidural blockade were published (Reisner LS et al. Anesth Analg 1980; Ravindran RS et al. Anesth Analg 1980; Moore DC et al. Anesth Analg 1982). After 1956, the commercially available CP preparation, Nesacaine-caudal and epidural (CE), contained sodium bisulfite as a preservative. Animal studies (Gissen AJ et al Reg Anesth 1984; Gissen A. Clin Anesthesiol 1986; Wang BC et al. Anesth Analg 1984) showed that exposure of rabbit nerves to Nesacaine-CE led to an irreversible block. If the same solution was buffered to a pH of 7.3, however, there was complete recovery. A solution of 2 mg/mL sodium bisulfite without CP similarly led to irreversible block only at low pH. The authors hypothesized that the release of sulfur dioxide was the mechanism for neurotoxicity. Disodium ethylenediaminetetraacetic acid (EDTA), used as a preservative in Nesacaine-methylparaben-free (MPF) to replace sodium bisulfite, caused spinal nerve root focal degeneration in rats (Wang BC et al. Anesth Analg 1992). These findings suggested that the preservatives were responsible for the neurotoxicity rather than the CP.

However, in another study, rats with intrathecal catheters given preservative-free CP had more histological injury than those given CP with 2 mg/mL sodium bisulfite. The injury with bisulfite alone was the same as with saline (Taniguchi M et al. Anesthesiology 2004). A possible role of the different activity between species of sulfite oxidase, which catalyzes the oxidation of sulfites to the less-toxic sulfates, has also been hypothesized to account for these discordant results (Drasner K. Anesth Analg 2005; Cabre F et al. Biochem Med Metab Biol 1990). The issue of the neurotoxicity of CP and of the preservatives remains unresolved.

Na and Kopacz (Anesth Analg 2004) demonstrated that preservative- free CP is slightly hyperbaric relative to cerebrospinal fluid (CSF) before any addition of dextrose (20mg/ml and 30mg/ml CP have a density of 1.00123 g/ml and 1.00257 g/ml, respectively, while the density of CSF varies between 1.00028 and 1.00100 g/ml). The pH of the preservative-free solutions varies between 3.26 and 3.52.

In Europe, preservative-free CP is now available as a 10 mg/mL solution (Ampres, Sintetica, Mendrisio, Switzerland), which was recently approved for intrathecal use. CP is currently available in the United States as a preservative-free solution (Nesacaine-MPF® from Astra Pharmaceuticals, Wilmington, DE, USA; and generic CP from Bedford Pharmaceuticals, Bedford, OH, USA; both are packaged in a brown vial to avoid photodegradation) as well as with sodium bisulfite as a preservative (generic CP from Abbott Laboratories, Chicago, IL, USA; packaged in a clear vial). It should be noted that the concentration of bisulfite in the current Abbott preparation (1.8 mg/mL) is less than that of the original solution associated with the neurotoxicity (2.0 mg/mL). In view of the fact that all recent human studies were performed using preservative-free CP, the solution containing sodium bisulfite may not be advisable for spinal anesthesia.

CP has been used in doses varying from 30 to 60 mg, with and without fentanyl. Multiple experimental and clinical, as well as retrospective studies, have been published (Smith KN et al. Anesth Analg 2004; Kouri ME et al. Anesth Analg 2004; Warren DT et al. Anesth Analg 2004; Vath JS et al. Anesth Analg 2004; Davis BR et al. Anesth Analg 2005; Gonter AF et al. Anesth Analg 2005; Yoos JR, et al. Anesth Analg 2005; Kopacz DJ. Reg Anesth Pain Med 2005; Casati A et al. Anesth Analg 2006; Casati A et al. Anesth Analg 2007; Lacasse MA et al. Can J Anaesth 2011; Forster JG et al. Acta Anaesthesiol Scand 2011; Hejtmanek MR et al. Acta Anaesthesiol Scand 2011; Vaghadia H et al. Acta Anaesthesiol Scand 2012).

Prilocaine (PR) is also an amide local anesthetic and has been used for over five decades for spinal anesthesia. It was first introduced in 1960 and has been used for infiltration, peripheral nerve block, and epidural anesthesia. In the liver, prilocaine is primarily metabolized by amide hydrolysis to σ-toluidine and N-propylalanine. σ-Toluidine is subsequently hydroxylated to 2-amino-3-hydroxytoluene and 2-amino 5-hydroxytoluene, metabolites responsible for the occurrence of methemoglobinemia. A high dose of prilocaine

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(more than 8 mg/kg) is needed to cause a clinically apparent methemoglobinemia in the healthy adult.

A hyperbaric formulation of 5% prilocaine was used as standard medication for spinal anesthesia in the UK until 1978 and in France until 1998. The drug was then withdrawn from the market for commercial reasons and because of the poor stability of the solution during the manufacturing process (Hillman KM. Anaesthesia 1978; Robertson DH. Anaesthesia 1978).

A formulation of 2% plain solution is currently marketed in Germany (Xylonest 2% - AstraZeneca) for epidural and intrathecal administration. A hyperbaric formulation (2% with 60 mg/mL dextrose) is marketed by Sintetica as Prilocaine hyperbar in Switzerland, and by other companies as Prilotekal in the UK and Takipril in Germany, Austria and Italy.

Studies on intrathecal prilocaine (Fisher A. Anesthesia 1971; König W et al. Anaesthesia 1997; Martinez-Bourio R et al. Anesthesiology 1998; Hampl KF et al. Anesthesiology 1998; Ostgaard G et al. Acta Anaesthesiol Scand 2000; de Weert K et al. Anaesthesia 2000; Kishimoto T et. al. Anesthesiology 2002; Hendriks MP et al. Br J Anaesth 2009; Camponovo C et al. Anesth Analg 2010; Black AS et al. Br J Anaesth 2011) have mostly sought to delineate two things: the incidence of TNS compared to lidocaine and the onset and the duration of sensory/motor block in patients receiving intrathecal prilocaine as compared to the more commonly used agents such as bupivacaine or lidocaine.

Tables 1, 2 and 3 summarize the characteristics of CP and PR used intrathecally according to the various clinical studies, and the reported incidence of TNS with these two medications. Table 4 summarizes recommended doses of either medication according to the expected duration of the procedure.

Times are given as mean ± standard deviation or mean (range). The shortest and longest times from the various studies are given for each dose

H: hyperbaric; P: plain; F: fentanyl; N/A: not available; CI: confidence interval; values are given as mean ± standard deviation unless otherwise stated.

In conclusion, both chloroprocaine and prilocaine are safe and effective medications for short-acting spinal anesthesia, and provide a reliable alternative to lidocaine. Both appear to have a very low incidence of TNS. The dose administered can be adjusted based on the expected duration of the procedure. Only prilocaine is available in a hyperbaric formulation and should be used when a saddle block is desired for perianal procedures. As these medications are more widely used in Europe, and possibly off-label elsewhere, the body of literature on their use will expand, and our knowledge about them will be refined.

TABLE 1. Range of the duration of block using intrathecal chloroprocaine according to published studies.

Dose	Sensory regression to L1 (min)	Complete sensory regression (min)	Time to ambulation (min)
30 mg	42±30 to 76±11	98±20 to 131±15	85(45–198) to 131±15
40 mg	53±19 to 84±35	95±8 to 155±55	95±9 to 225±67
45 mg	75±14	116±15	119±15
50 mg		95 (68–170)	103 (70–191) to 185 (30–355)
60 mg	92±13	132±23	133±20

US GUIDED RA - UPDATE ON EVIDENCE BASED OUTCOMES

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Abstract: Introduction: The last decade has seen a tremendous explosion in the popularity of ultrasound (US)-guided regional anesthesia, with an accompanying proliferation of scientific research supporting its use. This lecture will cover some of the major topics and outcomes of interest which have been the focus of recent research into US-guided regional anesthesia.

Efficacy: The efficacy of US-guided regional anesthesia is no longer in doubt. US-guided techniques have been well-described for all major blocks of interest, and these have been widely disseminated through articles in the peer-reviewed literature, as well as through workshops and educational websites. Technological improvements in ultrasound equipment, block needles and peripheral nerve catheters have contributed to the ease of performance of US-guided peripheral nerve blocks; however there is still clearly a learning curve, and one of the promising areas of research at present is in the refinement of the various US-guided block techniques to make them simple yet effective. The advantages of US-guidance over more traditional methods of nerve localization have also been demonstrated in randomized controlled trials and systematic reviews; in general the use of US leads to increased block success rates and shorter times to readiness for surgery.

TABLE 2. Range of the duration of block using intrathecal prilocaine according to published studies.

Dose/solution/baricity	Time to resolution of motor block (min)	Time to void (min)
20 mg 2% P (+ 20 mcg F)	N/A	205 (95% CI 185–220)
40 mg 2% H	92±36	195±60
50 mg 5% H (non-randomized)	87±42.2	N/A
50 mg 2% P	184±46	227±45
50 mg 2% H	165±37	253±55
60 mg 2% H	118±37	218±56
60 mg 2% P	157±41	277±85
80 mg 2% P	197±42	N/A

TABLE 3. Incidence of TNS following intrathecal chloroprocaine and prilocaine according to published studies

Studies	Chloroprocaine	Prilocaine
Prospective studies	1/838 (0.1%)	4/307 (1.3%)
Retrospective studies	4/4000 (0.1%)	0/5000 (0%)

TABLE 4. Recommended doses of intrathecal chloroprocaine and prilocaine according to the expected duration of the procedure.

Expected duration	Dose of intrathecal chloroprocaine (mg)	Dose of intrathecal hyperbaric prilocaine (mg)
Perianal procedure < 30 min	Not recommended (use hyperbaric drug)	10-20 (saddle block)
< 40 min	30	40
60 min	40-45	60
90 min	60	80

Safety: The answer to the question of whether US-guidance has led to similar improvements in the safety of regional anesthesia is less clear. In theory, the increased accuracy promised by the use of US should lead to decreased risk of complications such as nerve injury, damage to associated structures, and local anesthetic systemic toxicity. Convincing evidence for this has yet to emerge, due partly to the relative rarity of such complications. This has been addressed to some extent by the publication of data from large clinical databases of ultrasound-guided regional anesthesia. What has become clear is that the technology alone does not guarantee safety; operator skill plays a significant role as well. With respect to nerve injury, the focus has shifted from "How close can we get to the nerve and still be safe?" to "How far can we stay away from the nerve and still be effective?". There is increased understanding of the anatomy of nerves and the existence in almost all cases of a paraneural sheath which dictates local anesthetic spread around the nerve. One area where US does appear to have had an impact is on the incidence of local anesthetic systemic toxicity, and this can be attributed to the use of lower volumes of local anesthetic permitted by increased precision, and education on how to recognise and avoid intravascular injection.

Upper limb: Developments in US-guided regional anesthesia of the upper limb have centered on two main areas. The first deals with peripheral nerve blockade for shoulder surgery. There has been a large amount of research into strategies to prevent phrenic nerve blockade when performing interscalene

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block, either by reducing local anesthetic volume, or selective targeting of nerve roots. Alternative techniques, i.e. axillary nerve block and suprascapular block, have also been described as a possible solution. It is also recognized now that the brachial plexus in this area is vulnerable to injury and that more conservative approaches to needling and injection are possible without compromising effectiveness. The second area of research has been into the optimal US-guided peripheral nerve block technique for regional anesthesia of the lower arm. Randomized controlled trials have examined the relative efficacy of various techniques of performing supraclavicular, infraclavicular, and axillary blocks. Other trials have directly compared the different approaches with each other.

Lower limb: Much of the recent literature on US-guided blocks of the lower limb has focused on the popliteal nerve block. Several things have become apparent: first, that targeting the popliteal sciatic nerve below its bifurcation is more effective than targeting it above; second, that injection at the bifurcation itself may be the most effective technique; and third, that there is a paraneural sheath around the sciatic nerve and its two branches which is distinct from the epineurium, and should be entered to produce appropriate local anesthetic spread. The other block that is currently of interest is the adductor canal block, as an alternative to femoral nerve block for analgesia of the knee. The main advantage seems to be motor-sparing of the quadriceps muscle; however research is ongoing into the clinical efficacy and utility of this block, and related to this, the clinical anatomy of the adductor canal.

Truncal blocks: There has been growing interest in US-guided thoracic paravertebral blockade, partly as a result of preliminary research suggesting benefit from opioid-sparing anesthetic techniques in breast cancer surgery. As with any new technique, much of the research to date has explored the anatomical basis and feasibility of various approaches, and descriptions of its efficacy in small case series. In contrast, the literature on the transversus abdominis plane (TAP) block has reached a mature stage, with the appearance of several systematic reviews on its efficacy and clinical utility. The relevance of these systematic reviews is somewhat hindered by the recent realization that not all USG TAP block techniques are the same, and this may partly account for the conflicting findings of the various published trials.

Neuraxial block: The application of US guidance to central neuraxial blockade has lagged behind that of peripheral nerve blockade but is now becoming more established. Most of the research to date has concentrated on the lumbar spine. There are several authoritative reviews describing the technique, and most recently a systematic review and meta-analysis providing evidence for the clinical efficacy of US-guided lumbar neuraxial procedures.

Conclusion: The acceptance of US-guidance as a standard modality of nerve localization in regional anesthesia has been accompanied by a shift in research focus away from the technical aspects of US-guided nerve blocks to the impact that this has on relevant patient outcomes.

SEDATION FOR REGIONAL ANAESTHESIA: WHAT ARE THE OPTIONS?

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Sedation for Regional Anaesthesia: What Are The Options?: Sedation has been termed as the act or process of calming. The desired components of this are anxiolysis, amnesia and/or altered conscious level. Analgesia may also be required to tolerate the regional block, or to supplement an incomplete block. There are many definitions of sedation; however it is really a spectrum of consciousness from fully awake to general anaesthesia. The desired target for non-anaesthetists is "conscious sedation" which relies on the maintenance of verbal contact. This is intended ensure patients are kept awake enough to avoid cardio-respiratory depression, in particular avoid airway obstruction. This is important when non-anaesthetists are administering sedative drugs. The Safe Sedation Practise Document produced in the UK is quite typical in mandating that loss of verbal contact means general anaesthesia and this should only be done by individuals with training in anaesthesia, and access to anaesthetic equipment [1]. Sedation for regional anaesthesia is usually to facilitate block placement, and for tolerating lying awake and relatively still for the duration of the operation (which can be challenging even with an excellent functional block). It appears to increase patient satisfaction [2]. For regional anaesthesia, as this is usually delivered by anaesthetists; or at least under their supervision, this can be deeper sedation.

Patients request sedation for a variety of reasons; however, provision of sedation generally improves patient satisfaction [2]. Anaesthetists use sedation to facilitate patient cooperation during block placement, and also to make it more pleasant for the patient to lie awake during the subsequent procedure.

However, sedation can be associated with complications of its own, e.g. airways events, desaturation, hypotension and disinhibition [3]. When bordering on general anaesthesia some of the benefits of regional anaesthesia may be lost, and consideration must be made to whether it is safe to place the block in an obtunded patient. If deep sedation is used so the patient is unaware of the procedure, it may sometimes be better to provide proper general anaesthesia with a secure airway than deep anaesthesia that some glibly refer to as "anaesthesia without an airway".

Whereas some sedatives have intrinsic analgesia properties, such as ketamine or nitrous oxide; often sedatives are given with opioid analgesics to avoid or mitigate the pain of the regional anaesthetic procedure itself. This may be termed analgosedation. Some caution should be used when giving more than one drug, as these can reach peak effect at different times and also may pharmacokinetic and/or pharmacodynamic interactions [4–6]; particularly hypnotics with opioids have synergistic rather than simply additive actions. It can be useful to use pharmacokinetic/dynamic modelling to consider logical ways to co-administer drugs [7].

Intravenous Sedatives:

1. Benzodiazepines: theoretically any benzodiazepine can be used to provide sedation. However midazolam is the most popularly used agent owing to its relatively rapid onset and offset compared to the alternatives diazepam, lorazepam. There are few anaesthetists would perform major regional anaesthesia without intravenous access. So it seems most logical to give midazolam intravenously. It is also possible to give it sublingually or intranasally. Though popular in children, the volume required in adults limits its usefulness.

Midazolam gives good amnesia and anxiolysis [8,9]. The most common regimens for midazolam involve relatively frequent titration of dose until the patient reaches the desired sedation level. An example of a dose regimen would be what we used in a dental study in young adults: 2mg initial bolus followed by 1 mg every 1 minute [10]. It is recognised that the elderly are more sensitive, and many would titrate much more cautiously e.g. 1mg i.v. initially, then 0.5mg increments. The main problem with midazolam is that its pharmacodynamics have a relatively slow onset. The $t_{1/2\ ke0}$ (the half life for midazolam in the plasma equilibrating with the brain) is relatively slow at around 9 minutes [11]. This means that when the patient has reached the desired sedation level, and drug administration stops, that the clinical effect of the drug (effect-site concentration) is still rising for another 10 minutes. This perhaps explains the reports of prolonged hypoxia after the use of midazolam in elderly for upper GI endoscopy [12]. The offset of midazolam is slower than propofol leading to delayed return of cognitive function and readiness for discharge [10]. Possible problems are respiratory depression, reduction in blood pressure and paradoxical excitement [13].

A major advantage of midazolam (and other benzodiazepines) is the availability of a reversal agent, namely flumazenil, which can reverse the sedative and respiratory depressant effects. However, anaesthetists should be wary that the half-life of flumazenil is relatively short, and its effects may wane before the midazolam has been eliminated.

2. Propofol: Propofol is an excellent sedative mainly due to its pharmacokinetics and dynamics. Its onset is faster (it has a shorter ke0) than midazolam and recovery quicker [10]. It offers excellent anxiolysis, and has even been used as a premed. It is in fact a better anxiolytic than midazolam [10]. However, provides less amnesia at low doses; but obviously provides anaesthesia at high doses. It also causes respiratory depression, reduction in blood pressure, and paradoxical excitement [3]. There is no reversal agent, so with over-sedation you must stop drug administration, and provide supportive care until the drug level reduces.

Its main limitation is that it generally needs quite sophisticated mechanism of delivery. Intermittent bolus provides fleeting sedation with frequent over and under-sedation. It has been delivered by patient controlled sedation (a popular regimen is 18mg with a 1 minute lockout), but patients seem to prefer a TCI based method of administration [14]. Lots of dose/lockout combinations have been tried, but the pharmacokinetics make it quite difficult to provide steady levels of clinical sedation. Anaesthetists have deliver propofol sedation by infusions for more than 20 years [15]. The target plasma concentration (1–3.0 $\mu g.ml^{-1}$) [10] or effect-site concentration required by the individual for optimum sedation is quite variable (1–2.5 $\mu g.ml^{-1}$) [16] and requires careful titration. The use of effect-site modelling may give a good idea of when the clinical effect should have stabilised aiding logical titration. Machines are under development that allows patients

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to alter the target propofol concentration by pressing a demand button (Patient Maintained Sedation). These show great promise, but require further development [10].

Although primarily an anaesthetic drug it has been given with a surprisingly good safety profile by non-anaesthetists , such as General Practitioners and nurses [17,18]. Conversely it has been used in emergency departments with quite a poor safety profile [19]. The ESA has come out quite strongly against its use by non-anaesthetists [20]. Despite this it remains popular with non-anaesthetists because of its many desirable qualities.

3. Ketamine: It provides excellent analgesia [21], and a dissociative state quite unlike other sedatives. Its main attraction is its relative lack of cardio-respiratory sedation. It has been used extensively for sedation e.g. frequently for positioning patients with fractured neck of femur for subsequent spinal anaesthetic. It is also popular in burns dressing changes [22], paediatric sedation [23]. Hallucinations and nausea are dose dependant and less likely at lower doses e.g. 0.1-0.2mg/kg. Ketamine has been used in combination with propofol, providing quite deep levels of sedtion with analgesia without much cardio-respiratory depression. However good safety data are lacking, and recovery seems slow [24].

4. α2 adrenoceptor agonists: Clonidine and more recently dexmedetomidine have been used to provide anxiolysis, sedation and analgesia. Clonidine provides little respiratory depression or nausea even at high doses, it also can provide amnesia [25]. It cardiovascular effects are controversial, but most accept it causes hypotension [26] and bradycardia at high doses (greater than 2 $\mu g.kg^{-1}$). Its main limitation is its prolonged elimination half-life (14hours). Dexmedetomidine is better in this respect, with an elimination half-life of 2 hours. It can however cause hypotension and nausea and vomiting . It is becoming popular in intensive care [27], but there are limited reports of its use for procedural sedation and regional anaesthesia.

Inhaled Sedatives: Sevoflurane: sevoflurane is an inhalational anaesthetic. It can be used in sub anaesthetic doses to provide sedation quite successfully [28]. The main difficulty is in providing inhalation without contaminating the operating room environment. Most countries legistlate maximum allowable levels. These are generally easy to achieve with controlled airway and circle delivery systems and anaesthetic gas scavenging; however this is less easy with open delivery systems. Like all inhaled anaesthetics it is possible to pass through Guedel's stages of anaesthesia, hence excitation (disinhibition) is possible, as is over-sedation with the provision of anaesthesia.

Nitrous oxide[29]: Nitrous oxide has been used for conscious sedation for several decades. It is particularly popular for dental surgery in conjunction with local anaesthesia. It is usually administered in a 50:50 mix with oxygen. It causes anxiolysis probably due to GABA-A inhibition and analgesia due to NMDA inhibition. Its desirable properties in this dose range include rapid onset (low blood-gas solubility), unlikely oversedation (MAC is 105%), few cardiovascular and respiratory effects, minimal metabolism (1%) and rapid excretion via exhalation. It can cause both pleasant (euphoria, relaxation, warmth and pleasure) and unpleasant (vertigo, hallucinations and nightmares in 1-3% and nausea and vomiting in 0.5%) subjective effects. Serious adverse events such as bradycardia, or reduced consciousness are rare (<1/1000). There are also issues about environmental contamination for healthcare personnel, which limit its usefulness. However, it can be used quite easily to briefly reduce procedure related pain and anxiety.

Intravenous Opioids: Many short acting synthetic opioids can be used for intermittent boluses to reduce procedure related pain such as fentanyl, alfentanil and sufentanil. However remifentanil has become popular for sedation because of its rapid onset and offset and reliable kinetics by infusion. All opioids can cause respiratory depression, apnoea and hypotension in overdose. They are synergistic with hypnotics (propofol, midazolam, volatile anaesthetics) in that small doses of opioid greatly increase the depth of anaesthesia [30]. Care must be taken when titrating both a hypnotic and opioid concurrently as it is very easy to oversedate.

Remifentanil has been used successfully to supplement cervical plexus block in awake carotid endarterectomy, and is very popular for bronchoscopy and awake intubation [31]. It may be useful for supplementing incomplete blocks [32] However it produces little anxiolysis or amnesia compared to propofol. It commonly causes nausea and pruritis. Respiratory depression is possible, but unlikely at lower infusion levels. Target Controlled Infusions are possible, and widely used for fibreoptic intubation [31] there are some emerging data that suggest these are superior to standard infusion rates. It seems that hypoventilation and apnoea are unlikely under TCI remifentanil target of 2.0 $ng.ml^{-1}$ and more likely above 3.0 $ng.ml^{-1}$ [33]. However it is worthwhile titrating slowly to avoid this. If using manual infusions, you must be aware the variation in Cp/Ce is greater [34] and titration should be cautious. However a bolus dose of 0.25 $\mu g.kg^{-1}$ followed by an infusion of 0.05 $\mu g.kg^{-1}.min^{-1}$ will yield a final Cp & Ce of approximately 1–1.2 $ng.ml^{-1}$ at steady state. Whereas higher rates such as 0.5 $\mu g.kg^{-1}$ bolus followed by 0.1 $\mu g.kg^{-1}.min^{-1}$ will yield Cp/Ce in the 2–2.5 $ng.ml^{-1}$ range.

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CAUDAL BLOCK: STATE OF THE ART APPROACHES, DRUGS SPREAD ETC.

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Anatomy and phyisiology

Understanding the anatomic differences between adults and infants is crucial to administer regional anesthesia in children safely.

The spinal cord terminates at a much more caudad level in neonates and infants than in adults. The conus medullaris ends at approximately L1 in adults and at the L2 or L3 level in neonates and infants. This dissimilarity is a result of different rates of growth between the spinal cord and the bony vertebral column in infants. However, at approximately 1 year of age the conus medullaris reaches an L1 level similar to that in an adult. The dural sac in neonates and infants also terminates in a more caudad location, usually at about the level of S3 compared with the adult level of S1.

In adults, the interspace nearest to the line across the top of both iliac crests, the intercristal or Truffier's line, corresponds to the L3-4 interspace. However, neonates and infants have a proportionately smaller pelvis than adults, and the sacrum is located more cephalad relative to the iliac crests. Therefore, Truffier's line crosses the vertebral column at the L4-5 or L5-S1 interspace, well below the termination of the spinal cord.

The sacrum of children is also more narrow and flat compared with that in the adult population. At birth, the sacral plate, which is formed by five sacral vertebrae, is not completely ossified and continues to fuse until the child is approximately 8 years of age but can continue up to 21 yearsr of age. There is also a 6% of sacral agenisis in normal population.

The incomplete fusion of the sacral vertebral arch forms the sacral hiatus. The caudal epidural space can be accessed easily in infants and children through the sacral hiatus. Because of the continuous development of the sacral canal roof, there is considerable variation in the sacral hiatus. In children, the sacral hiatus is located more cephalad compared with that in adults. This makes it more likely to have an accidental dural puncture during performance of a caudal block in infants because the sacral hiatus is closer to the more caudad dura. Therefore, precaution is mandatory and in infants the caudal needle must never be advanced too far into the caudal epidural space.

It has also been suggested that the epidural fat is less densely packed in children than in adults. This loosely packed epidural fat may not only facilitate the spread of local anesthestic, but it may also allow, in some cases, the advancement of epidural catheters from the caudal epidural space to the lumbar level.

Cerebrospinal fluid volume is larger on a mL/kg basis in infants and neonates (4 mL/kg) compared with adults (2 mL/kg) and two thirds of this volume is located in the spinal canal. In addition, the spinal cord in neonates is mainly nonmyelinated.

Most pediatric patients receive caudal blocks in conjunction with general anesthesia. My personal recommendation is to keep the patient under spontaneous ventilation, at least during the performance of the block and a bit longer. Any change in the respiratory pattern of the child (observed by capnography) will alert us of possible complications (pain on injection, systemic absorption of local anesthetic, failed block etc…).

Techniques: Regional anesthesia techniques in children are usually performed under genral anesthesia (GA). I personally recommend, as a safety mesure, to keep the patient under GA but in spontaneous ventilation while performing the neuroaxial block. Pediatric anesthesiologists are commonly used to doing several procedures under GA with the patient under spontaneous ventilation (ie, i.v. placement), and are therefore used to airway management in these situations.

Indications: A single-shot caudal epidural blockade offers a reliable and effective block for pediatric patients undergoing urologic, general, and orthopedic surgery involving the lower abdomen and lower limbs. A single-shot caudal epidural may not be suitable for higher o long surgery because it has a limited dermatomal distribution and a short duration of action. New local anesthetics, adjuvants and caudal catheters may sometimes overcome these limitations. However, in my opinion, when a surgery in a specific patient can't be covered with a single shot caudal it means the patient deserves a lumbar epidural.

Needles: A variety of needles are available for single-shot caudal blockade. The size or type of needle does not appear to affect the rate of success or the incidence of complications of caudal blockade. Touhy needles (18G or 20G, 5cm long) or short-bevel 22-gauge needles (<4 cm in length) with stylets offer a better tactile sensation when the sacrococcygeal ligament is punctured. The use of a styletted needle may reduce the risk of introducing a dermal plug into the caudal space, although an epidermal cell graft tumor in the epidural space has yet to be reported. A 22-gauge Angiocath can also be used and some authors believe it is easier to detect intravascular placement and interosseous placement. To avoid tissue coring with these angiocatheters, the needle must be removed before any injection is made.

Technique for performing a single shot caudal epidural block: Patients are placed in a lateral decubitus position with the knees drawn up to the chest. The back of the patient is prepped with non-alcoholic chlorhexidine and a

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transparent plastic drape is used. The landmarks for caudal epidural block are easily identified in children: the intercristal line and the coccyx form an equilateral triangle and palpating its bisector cephalad from coccyx, the sacral cornua can be felt on either side of the midline, approximately 0.5-1cm apart. The sacral hiatus is felt as a depression between two bony prominences of the sacral cornua. Under sterile conditions, the needle is inserted in the highest part of this depression and advanced into the sacral hiatus at approximately a 70-degree angle to the skin until a distinctive "pop" is felt as the sacrococcygeal ligament is punctured. After this puncture, the angle of the needle should be reduced to approximately 20 to 30 degrees while the needle is advanced 2 to 4mm into the caudal canal. If using an angiocatheter, the plastic catheter of the needle should easily advance into the caudal epidural space.

The signs of correct needle placement are: loss of resistance or "pop" felt as sacrococcygeal membrane is pierced, the absence of subcutaneous bulging and the lack of resistance upon injection of local anesthetic (which would indicate intraosseous placement). Gentle aspiration through the needle should be clear for blood and cerebrospinal fluid. A negative response to a test dose of epinephrine may also be used to rule out intrathecal and intravascular placement.

Ultrasound- guided single-shot caudal epidural block: Ultrasound has been used to provide real-time images to guide needles into the caudal space and is highly recommended. It is highly recommended to examine the anatomy with ultrasonography in all children before doing the block and especially in difficult cases such as patients with scoliosis or sacral dimples.

The patient is placed in the lateral position, with the US machine opposite the operator. The patient is prepped and the US probe is sterilly covered. A linear probe with a large footprint is preferable as it allows more intervertebral spaces to be imaged at a time. The probe is positioned first in a sagittal midline position over the lower sacrum. The dural sac, sacral hiatus and sacrococcygeal membrane (SCM) are identified. With the SCM in the middle of the image the probe is then rotated 90 to the axial plane and the exact position of the cornua is defined. These movements can be done in the opposite order but a complete exploration of the space in both axis is recommended. After this preprocedural ultrasound assessment of the caudal anatomy the needle can be introduced in the sacral hiatus in either axis. To ensure optimal caudal placement of the needle a bolus of saline or local anesthetic is administered under ultrasound guidance (probe in midline sagittal axis) and the dura might be seen displaced ventrally, specially in younger children. The spread of local anesthetic can be monitored by moving the probe cephalad up the spine in a paramedian sagittal axis.

Continuous Caudal Epidural to Lumbar Space: Continuous caudal epidural analgesia may overcome the limited duration and segmental effect of a single-shot technique. Caudal catheters advanced to a lumbar level can be used for surgery involving dermatomes below T10. This technique may carry a smaller risk of dural puncture or spinal cord trauma than a direct lumbar epidural approach in infants less than 1 year of age. Above 1 year of age, my personal opinion is that a lumbar epidural should be performed if a single shot caudal block is insufficient for the particular surgery. Pediatric anesthesiologists caring after infants undergoing major surgery must be trained in placing lumbar epidurals in these patients or seek for another anesthesiologist to do it.

The technique for needle insertion for continuous caudal analgesia is very similar to the single-shot caudal approach. An intravenous catheter (an 18-gauge angiocatheter for a 20-gauge epidural catheter or a 16-gauge angiocatheter for a 19-gauge epidural catheter) or an 18-gauge Tuohy needle is inserted through the sacrococcygeal ligament as described for the single-shot technique. If the angiocatheter is used, the complete set (needle and catheter) should not be advanced more than 1 cm into the sacral canal. After withdrawing the metal needle, the plastic sheath is gently advanced completely into the caudal space. This allows the epidural catheter to easily pass through the plastic sheath. If a Tuohy neelde is used, the catheter is threaded through it after removing the stylet.

However, because the catheters don't travel linearly in the epidural space, measuring the length of catheter against the back of the patient doesn't accurately determine reaching the targeted surgical level. Therefore the location of the catheter tip should be verified using an objective test (ultrasound or Tsui test). A third "sterile hand" (assistant) is necessary when assessing with ultrasound the spread of local anesthestic trhough the catheter tip. Minor resistance to the passage of the catheter can usually be overcome by simple flexion or extension of the patient's vertebral column and/or by simultaneously injecting normal saline. Studies have suggested that caudal catheter placement should be limited to patients younger than 1 year old, owing to the development of a lumbar curve during infancy that prevents easy cephalad advancement of the catheter. In my opinion, catheters should be placed as close to the surgical dermatome as possible, at least in children older than 1 year of age. Appropriate regional pediatric and ultrasonographic training is therefore absolutely recommended.

Confirmation of correct epidural needle/catheter placement: Radiographic methods: X-ray imaging in conjunction with a contrasting agent precisely identifies the tip of the catheter at a specific spinal level. However, without contrast, a radiograph cannot distinguish inadvertent intrathecal or subdural catheter placement from proper epidural placement. In addition, standard x-ray does not allow the anesthesiologist to adjust the position of the catheter during insertion unless fluoroscopy is used. Although fluoroscopy permits the real-time monitoring and adjustment of advancing catheters, it requires additional set-up, incurs increased expense and, above all, increases the child's exposure to ionizing radiation. As a result, fluoroscopy is not recomended in routine pediatric patients. It may be indicated in difficult and/or special circumstances such as long-term epidural catheter placement for cancer pain.

Epidural Stimulation Test: Low-current electrical stimulation has been suggested to monitor and guide the position of the epidural catheter during insertion. The epidural stimulation test can be used to confirm the epidural catheter placement through stimulation of the spinal nerve roots (not the spinal cord) with lowelectrical current conducted through normal saline in the epidural space via an electrically conducting catheter.

The stimulating catheter set-up requires the cathode lead (black for block) of the nerve stimulator to be connected to the epidural catheter via an electrode adapter while the anode lead is connected to an electrode on patient's skin as the grounding site. To avoid misinterpretation of the stimulation response (eg, local muscle contraction may be confused with epidural stimulation), the ground electrode is placed on the lower extremity for thoracic epidurals and on the upper extremity for lumbar epidurals. Correct placement of the epidural catheter tip (1–2 cm from the nerve roots) is indicated by a motor response elicited with a current between 1 and 10 mA. A motor response observed with a significantly lower threshold current ($<$1 mA) suggests that the catheter is in the subarachnoid or subdural space, or is in close proximity to a nerve root. In these cases, a motor response is elicited with a significantly lower threshold current because the stimulating catheter may be very close ($<$1 cm) to the nerve roots or because it may be in direct contact with highly conductive cerebrospinal fluid. The safety of this epidural stimulation test is not completely known but the risk of a brief intermittent electrical stimulation should be low comparing to the spinal cord stimulation used for chronic pain.

Ultrasound: Appropriate training in ultrasound assited neuroaxial pediatric blocks is strongly recommended

Ultrasound allows real-time identification of regional bony landmarks and of the dural sac in the caudal area. With little training, it is easy to obtain a very precise estimation of epidural space depth.

Ultrasound offers visibility of a needle within the epidural space in neonates and in the caudal space of most children.

Ultrasound guidance can directly detect catheters during advancement in young infants and can confirm epidural catheter placement via surrogacy during injection of fluid in older children.

Ultrasound assessment of the spread of local anesthetic was initially thought could be a predictor of the dermatome reached. Recent studies have however shown that the speed of injection of the local anaesthetic does not affect its cranial spread during caudal blockade in infants and children. Moreover, this has been found is due to a secondary spread of the caudal block in two patterns: a horizontal intrasegmental redistribution and a longitudinal cranial spread. The observed bi-directional movement of cerebrospinal fluid (coined 'the CSF rebound mechanism') explains major part of the difference between the initial ultrasound-assessed cranial level and the final level determined by cutaneous testing. Therefore, more studies with ultrasonography are nowadays being done to determine how to predict in the spread of local anesthetic.

Local anesthetic solutions for caudal anesthesia & analgesia: Bupivacaine and the l-entiomers ropivacaine and levobupivacaine are the most commonly used local anesthetics for neuraxial anesthesia in children. Lidocaine is not often used because of its short duration of action and excessive motor block.

Ropivacaine has a higher therapeutic index than bupivacaine. At low concentrations, ropivacaine may produce less motor block and comparable analgesia with a decreased incidence of cardiac and central nervous system toxicity. Because of its possible vasoconstricting properties, ropivacaine may undergo slower systemic absorption than bupivacaine. This may have clinical implications when a prolonged local anesthetic infusion is used in children with impaired hepatic function.

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Levobupivacaine, the S (−)-isomer of bupivacaine, is less likely to cause myocardial depression and fatal arrhythmias and is also less toxic to the central nervous system than racemic bupivacaine.

Local anesthetic concentration and volume are important factors in determining the density and level of blockade. Body weight is usually a better correlate than patient age in predicting spread of local anesthetic after a caudal block.

Knowledge of total drug dose is important to avoid local anesthetic toxicity in pediatric patients. The maximal safe dose of bupivacaine is 2–4 mg/kg. The maximal safe dose of ropivacaine or levobupivacaine is 3–4 mg/kg. For caudal use, the optimum concentration of bupivacaine is 0.125–0.175%. Compared with the 0.25% preparation, this concentration provides a similar duration of postoperative analgesia (4–8 hours) but with less motor blockade.

Dose is better calculated in children on a milligram per kilogram basis rather than predicted volumes as in adult regional anesthesia. Therefore, most clinicians prefer administering doses on a volume-per-weight basis. Using bupivacaine 0.125% or ropivacaine 0.2% the following volumes are a practical guideline for single shot caudal blocks:

0.5 mL/kg provide sacral sensory block (genital or leg surgery)

0.75 mL/kg provide low lumbar sensory block (inguinal or thigh surgery)

1.0 mL/kg may provide T10 sensory block in small children (umbilical or hip)

1.25 mL/kg have been administered to provide a more cephalad block in infants

These doses should be kept to a maximum volume of 20 mL. If these recommended doses are insufficient for a particular case, then a continuous epidural instead of a single shot caudal should be performed.

For continuous epidural infusion, a commonly accepted dosage guideline of bupivacaine is 0.2 mg/kg/h for neonates and 0.4 mg/kg/h for older children. Cumulative toxicity is a concern even at lower rates of local anesthetic solution infusions. For ropivacaine, an infusion of 0.1% ropivacaine at 0.2 mg/kg/h in infants (lasting no longer than 48 hours) and 0.4 mg/kg/h in older children has also been shown to be effective and safe.

Adjuvants to local anesthetic solutions: Various adjunvants can be used in pediatric caudal blocks, either as a marker for an inadvertent intravascular injection or to prolong the duration of a single shot block.

Epinephrine: The most commonly used adjuvant for single-shot caudal anesthesia is epinephrine (adrenaline) in a concentration of 1:200.000. Epinephrine may be used as a marker for an inadvertent intravascular injection. The specificity of ECG changes (ie. >25% increase in T wave) after the injection of an epinephrine test dose (0.5 mcg/kg), on the other hand, can help predict intravascular injection.

Opioids: Epidural opioids may enhance and prolong analgesia. However, opioid use in an ambulatory setting may not be advisable because of the potential for respiratory depression (rare?) and other unfavorable side effects (ie, nausea and vomiting, itching, urinary retention). As a result, the use of caudal epidural opioids in children should probably be restricted to special clinical situations in an inpatient setting.

The addition of 1 mcg/mL of fentanyl to 0.1% bupivacaine for continuous epidural infusions has also been used with success in neonates and children in a well-monitored inpatient setting. However, whether there is benefit for fentanyl as an additive in children undergoing single-shot caudal blockade is still debated amongst pediatric anesthesiologists.

I personally don't use caudal opioids in my daily clinical practice unless a catheter is.

Clonidine: Clonidine is an α1-agonist that acts by stimulating descending noradrenergic medullospinal pathways; this inhibits the release of nociceptive neurotransmitters in the dorsal horn of the spinal cord. The addition of clonidine (1–5 mcg/kg) can improve the analgesic effect of local anesthetics for single-shot caudal blockade aswell as prolong its duration of action. For continuous epidural infusions, clonidine 0.1 mcg/kg/h has been used with good effect. It should be cautioned that higher doses have been associated with sedation and hemodynamic instability (hypotension and bradycardia). In addition, epidural clonidine blunts the ventilatory response to increasing levels of end-tidal carbon dioxide (PCO2). Although respiratory depression does not appear to be a common problem, apnea has been reported in neonates. Therefore, clonidine should be used with caution in neonates or young infants.

My personal practice includes using clonidine in continuous epidural infusions at 0.1 mcg/kg/h in kids over 1 year of age.

Ketamine: The addition of preservative-free S-ketamine to single-shot caudal block prolongs the analgesic effect of local anesthetics. At low doses (0.25–0.5 mg/kg), ketamine is effective without noticeable behavioral side effects. Ketamine 1 mg/kg can also be used as an effective caudal analgesic solely without the addition of local anesthetic solution. The combination of S (+)-ketamine (0.5–1 mg/kg) and clonidine (1 or 2 mcg/kg) has been shown to provide effective analgesia after inguinal herniotomy in children with prolonged duration of effect (>20 hours) without any adverse CNS effects or motor impairment.

However, these reports probably don't have enough statistical power to draw definitive conclusions to strongly recommend ketamine for neuraxial use. In neonates, an additional concern regarding use of ketamine in neonates relates to a controversial series of animal studies suggesting that ketamine can produce apoptotic neurodegeneration in the developing brain. Other infant animal studies have demonstrated that ketamine may have a neuroprotective effect.

I have no personal experience with the use of preservative-free S-ketamine as an additive to local anesthetics.

Today, there is no role for midazolam or neostigmine as adjuvants to epidural local anestheticcs.

Complications Associated with Caudal Analgesia: Every anesthesiologist administering pediatric anesthesia should know how to perform a caudal block because it is easy, effective and very rarely associated to complications.

Infection: Serious infectious complications with single shot caudals are extremely rare but can potentially occur in the form of sacral osteomylitis. Perforation of the rectum may occur if the caudal needle is angled too steeply but is extremely rare if a careful technique is used.

However, there is some concern regarding the prolonged use of caudally placed catheters owing to the proximity of the sacral hiatus to the rectum. Although studies have not found clinical evidence of higher infection rates with the caudal approach, bacterial colonization is definitely higher. Staphylococcus epidermidis is the predominant microorganism colonized on the skin and catheters of lumbar and caudal epidurals. Gram-negative bacteria have also been demonstrated on the tips of the caudal catheter.

My personal recommendation: only place caudal catheters when absolutely necessary; use strict aseptic technique and take care to avoid local tissue trauma; tunnel the catheter and fix it with transparent occlusive dressing in a cephalad direction. Daily inspect the dressing and entry site, but there is no need to change the dressing around the clock unless necessary. Monitor the patient's temperature and remove the catheter if a persistent fever >38º C without other cause appears. In adittion, I also recommend to culture the tip of all the neuroaxial catheters you place. If a result comes back as positive, the number of colonies, the type of microorganism, and the clinical individual assessment must guide the therapeutical approach.

Postdural Puncture Headache: Dural puncture during caudal epidural analgesia is uncommon if caution is taken to avoid advancing the needle too far into the sacral canal. Treatment for postdural puncture headache (PDPH) includes bed rest, oral or intravenous hydration, simple analgesia such as regular acetaminophen, nonsteroidal antiinflammatory agents, and antiemetics. Bed rest, although relieving the severity of the headache, has no effect on the incidence or duration of PDPH. Hydration should be maintained to continue cerebrospinal fluid production and to avoid dehydration. Simple analgesics may be all that is required until there is spontaneous resolution of symptoms. In adults, caffeine has been used for both prophylaxis and treatment for PDPH. Caffeine causes cerebral vasoconstriction by blocking adenosine receptors, which dilate vessels when activated. Reducing cerebral blood flow decreases the amount of blood in the brain and may lessen the traction on pain-sensitive intracranial structures, relieving PDPH. Caffeine is not frequently used in children for relief of PDPH, and an optimal dose is not known. The use of epidural blood patch to treat PDPH has been used with success in adults since 1960. There are now many reports of its successful use in children as well. In children, it is recommended that approximately 0.3 mL/kg is injected in the awake or mildly sedated patient, if possible, to detect the appearance of radicular symptoms.

Total Spinal Anesthesia: Significant changes in blood pressure are uncommon in pediatric patients after the proper administration epidural analgesia. A high sympathetic single-shot caudal block to T6 evoked no significant changes in heart rate, cardiac index, or blood pressure in children. Even when thoracic epidural block is combined with general anesthesia, cardiovascular stability is usually maintained in otherwise healthy pediatric patients. Hypotension should prompt anesthesiologists to immediately rule out a total spinal and/or intravascular injection leading to local anesthetic toxicity. If a total spinal occurs, supportive measures must be provided until the effect of the block has dissipated.

Local Anesthetic Systemic Toxicity (LAST): Local anesthetic toxicity can occur from accidental intravascular injection into epidural blood vessels. This complication can be avoided by using careful and gentle aspiration with an appropriate small sized syringe. Sometimes vessels are so small that can collapse easily on aspiration; consider opening to air to look for free flow. Doses

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should be administered in small increments. For single-shot caudal, toxicity is more likely to occur when sharp-tipped needles are used.

Local anesthetic toxicity can also occur by systemic absorption. Neonates and very young infants are at greater risk for local anesthetic toxicity with continuous epidural infusion. Seizures have been reported in children receiving continuous infusions of local anesthetics. This can be avoided by using dilute solutions of local anesthetics and during not more than 48h in neonates.

All personnel of a ward where epidural infusions are cared after should be trained in the treatment of local anesthetic systemic toxicity (LAST). In addition, the guidelines for LAST treatment and a complete record of the technique and infusion used in each patient should always be readily accessible.

Neurologic Injury: Major complications from either single-shot or continuous epidural blocks are rare if proper technique is used. A large prospective study, which summarized data from over 15,000 central blocks in children, reported no incidence of permanent neurologic injuries and concluded that the incidence of complications is rare. However, three infant deaths and two other incidencesof paraplegia and quadriplegia were reported in another large retrospective report published in 1995 with over 24,000 epidural blocks in children. This study also reported two cases of transient paresthesia. Nevertheless, none of these adverse effects happened with caudal blocks.

Epidural Hematoma: Epidural hematoma associated with pediatric epidural analgesia is extremely rare. This may be because anticoagulation protocols are rarely indicated during the perioperative period in pediatric patients. There are no reports of epidural hematomas associated to caudal blocks. Nonetheless, epidural analgesia may be avoided in patients with clinically significant coagulopathy or thrombocytopenia. The guidelines for use of epidural anesthesia in anticoagulated adult patients could probably also be applied in pediatric patients.

"My personal conclusions": A single shot caudal block is a technique all anesthesiologists dealing with pediatric anesthesia should master. Clonidine is a good adjuvant for local anesthetics in caudal blocks. A caudal catheter may be attempted in infants younger than 1 year of age but a lumbar epidural is preferred otherwise. Preprocedural ultrasound assistance and training in ultrasound guidance is strongly recommended.

The need of an assistant and the preservation of a sterile area have been considered "disadvantages" associated to the use of ultrasound in neuroaxial blocks. In my opinion, these are not drawbacks but advantages: emphasis in sterility can't be "a wrong message" and sharing ultrasound knowledge buys in more "team-work" among anesthesiologists.

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PAEDIATRIC REGIONAL ANAESTHESIA UPDATE

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Regional anaesthesia is now well established in paediatric anaesthetic practice. The primary reason for its reintroduction into paediatric practice in the 1980s was for postoperative pain management. News aspects of regional anaesthesia have reported especially local anaesthetics and adjuvants, ultrasonography guidance block and complications.

Local anaesthetics and adjuvants: The new long acting local anaesthetic causes less cardiovascular changes than bupivacaine (1, 2). Indeed the outcome of these inadvertent intravascular administrations was favorable. The reduced cardiac and central nervous system toxicity as well as less motor blockade with little difference in onset time or analgesic potency suggest that these agents may be more beneficial – particularly in infants and neonates. Ropivacaine and levobupivacaine are effective for peripheral nerve block, caudal and lumbar/thoracic epidural block.

A variety of agents are being used as adjuncts to regional anaesthesia (3, 4). The aim of using additives to local anaesthetics is to prolong the duration of analgesia with no or modest side-effects. All aspects of clinical safety have been recently reviewed based on the existing animal data (5). Today's main focus is on clonidine and dexamathasone. The addition of 2 $\mu g.kg^{-1}$ of clonidine offers clear advantages in central blocks. No advantage has been found with adding clonidine in peripheral nerve block. Due to the neurotoxicity, dexamethasone should be avoided from blocks, but 0.5 mg/kg iv dexamethasone can prolong duration of analgesia following a caudal block (6).

Ultrasonography guidance and regional blocks: The use of ultrasound as an aid for acurate placement of local anaesthetics is gaining in popularity for regional anaesthesia over conventional landmark-based techniques and nerve stimulation. Indeed, ultrasound was used in more than 80 percent of upper limb blocks and nearly 70 percent of lower limb blocks (7). Ultrasonography allows non-invasive real-time emaging of the relevant anatomical structures while the needle is placed under direct vision (8). The superiority of ultrasonography-guided block techniques to blind techniques relying on subtle sensations, which may be unreliable even in experienced hands. Lower limb surgery commonly requires the use of multiple nerve blocks. Thus, a central block is often chosen as each peripheral block has a potential for failure and the local anaesthetic dose available is limited. The use of ultrasonography allows the volume of local anaesthetic per block to be decreased by 30–50%, making it is easy to remain within maximum doses when performing multiple blocks while still achieving success.

Two controversial issues should be discussed: combining ultrasound guidance and nerve stimulation (9) and a risk of overuse of ultrasound for procedures which can be done safely and successfully without it, for example, penile block (10). It was found that the addition of nerve stimulation to ultrasound guidance lengthened block performance time and reduced the success rate (11), with no difference in the success rate of ultrasound-guided brachial plexus blockade (12). However ultrasound can permit to revisit sometimes our practice: using the equiangular triangle to identify the sacral hiatus may be inappropriate because the actual triangle formed by the sacral hiatus and posterior superior iliac spines is not equiangular (13). On the other way, there is a strong correlation between the needle insertion point and the weight of the neonate: the optimal needle insertion site was 3 mm from the anterior superior iliac spine (14).

Complications: Despite the fact that most regional anesthetic techniques are performed under sedation or general anesthesia, large prospective and retrospective studies have demonstrated a low complication rate, particularly with peripheral nerve blocks, and fewer long-term sequelae when compared with adults having the same procedure (15, 16). Most importantly, there were no deaths or serious complications leading to permanent injury. For single-injection procedures, the most common complication was inability to place the block or block failure (2% in Polaner'study) (8). Continuous block procedures had a higher complication rate—most commonly problems in catheter placement (such as kinking or dislodgement). In this group, the block failure rate was nine percent (8). Unfortunately individual potential disasters can and do happen. Recent reports of spinal cord injury following a thoracic epidural for appendicectomy, small bowel trauma (requiring laparoscopic resection) following an ilio-inguinal block, sacral osteomyelitis and subperiosteal hematoma following caudal block should focus on the routine use of safety rules (17).

In conclusion, regional blockade in infants and children appears to have a very high degree of safety. The use of new agents and new technologies, such as ultrasound-guided regional anaesthesia, has shown some promise toward increasing the safety profile of these already safe techniques.

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ANTERIOR DECOMPRESSION

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Introduction: Lumbosacral pain with leg radiculopathy, following nerve injury from a prolapsed intervertebral disc, is one of the most frequent causes of neuropathic pain [1]. Conventional patient management of neuropathic back and leg pain secondary to disc herniation includes surgery. Failed back surgery syndrome (FBSS)[2] is affecting around 10% to 40% of patients who have undergone lumbar spinal surgery [3], and among the sources of the pain are recurrence of disc herniation, arachnoiditis, epidural fibrosis, and various radiculopathies [4].

Epiduroscopy is a minimally-invasive percutaneous technique that permits direct endoscopic visualization of the epidural space and its delimiting anatomic structures under normal and pathologic conditions.[6-13] Epiduroscopy has been used for visualization of the lumbar epidural space since the 1930's when Burman used arthroscopic instruments to inspect cadaver vertebral columns. In 1936, Stern used the first myeloscope on a patient.[7] The 1990s saw the development of flexible, small-caliber endoscopes with corresponding image transmission systems that provided the technical capabilities needed to perform spinal endoscopy.[7] Possible advantages of epiduroscopy over open surgery include clear visualization and ability to target pathologies visually plus less damage to the paraspinal muscles and other normal tissues. Epiduroscopy can also be done under local anesthesia which reduces recovering time; patients are ambulatory immediately after the procedure.[7]

Schutze[7] highlights that the utility of the spinal epiduroscopy, offers a less invasive technique for diagnosing and treating spinal pain syndromes. Diagnostic indications involve distinguishing pathological and anatomical structures and circumstances, such as epidural fibrosis following invasive procedures and radiculopathies, performing biopsies, and smears, and removing irrigation fluid. Therapeutically, indications for spinal epiduroscopy include procedures such as direct application of pharmacologic therapy, lysis of scar tissue, catheter placement, and implantation of stimulation electrodes under direct vision.

Choy[14] reported his experience with the ND:YAG laser for treatment of lumbar disk herniations in 1998. With advances in the delivery system, the Thulium:YAG laser was introduced, due to its more favorable tissue effects[15,16] .

Anterior Epiduroscopy Procedure: The epidural space is a potential space filled with epidural fat between the dura and the bone and ligament of the spinal canal[17,18]. The pathology that leads to nerve root compression, such as intervertebral disk rupture, typically lies within this space. Approaches to the lumbar epidural space must be within the anterior or posterior epidural space, as defined by the nerve roots. Below the conus medularis, the cauda equina is freely mobile, and frequently there is ample room to maneuver a small flexible endoscope or other instrumentation[9].

The ideal patient is less than 60 years old, and has not had previous surgery. Unilateral L4/5 and/or L5/S1 disc related pathology.

For improving Fluoroscopy approach visibility, Bowel preparation, is done similar as a colonoscopy. Once in the Operating room patient is positioned in the prone position on examination table with a spacer placed under the hips in order to straighten the lumbar vertebral column and make the patient more comfortable.

Overall procedure is performed under local anesthesia and mild sedation: Injection of local anesthetic to the skin, subcutaneous tissue, and sacral hiatus . A Touhy needle is inserted under fluoroscopic guidance .A guide wire is inserted through the needle for 15-20 cm under fluoroscopic guidance A 15 blade is inserted along the wire to make a 2cm wide incision to the sacrococcygeal ligament. The subcutaneous fat is cleared from the ligament with the scalpel and hemostat and the hemostat is inserted into the hiatus and used to spread the sacral cornu, enlarging the opening in the ligament and taking down the filum termi-nale. A surgical forceps is then utilized to enlarge the S4 lamina, with repeated ro-tating and dilating action to create the laminotomy neces-sary for the flexible endoscope to be adequately rotated into the anterior epidural canal. After the laminotomy a dilator is then passed. This differs substantially from posterior epidural epiduroscopic approaches which do not routinely require dissection of the fillum terminale, cornu and S4 bony lam-ina[19].

The image intensifier is positioned for a lateral view, and the equipment is checked prior to insertion.

The laser should be in the inferior lumen of the steerable catheter, with the endoscope in the superior lumen. Deflection should be checked to verify that in the held position, the catheter moves left to right, as opposed to into the canal. The catheter is inserted under continuous fluoroscopic visualization, keeping to the ventral aspect of the canal. Rotation toward the desired treatment side is necessary as the laminotomy is entered to facilitate directionality to the anterior canal. The catheter is advanced under both fluoroscopic and endoscopic guidance. An evaluation of intraoperative electrophysiologic monitoring signal is routenelly used for monitoring and avoiding neural damage.

In order to provide endoscopic visualization, the potential space of the epidural space must be expanded with intermittent injec-tion of preservative free normal saline. A maximum volume of solution used should not exceed 200 ml and should average 110ml.

Once the area of intended ablation is confirmed, Thulium:YAG laser is used to mechanically remove adhesions and mobilize nerve roots. The position of the laser in the lat-eral view, is along the floor of the canal, against the posterior longitudinal ligament. In the AP view, the position is medial to the entry zone of the neural foramen. The laser fiber is advanced under direct visu-alization until it is in contact with the herniated tissue. The laser is fired, and advanced into the tissue while firing. If neuromonitoring is not used, an assistant should keep a hand on the ipsilateral leg to feel for a response. Typically, a release is felt as the laser penetrates the capsule that forms around a herniation, consisting of the posterior longitudinal ligament, annulus, and granulation tissue. The herniation is then reexam-ined, and the process repeated until sufficient decompression is obtained[10]. The process is repeated in a medial-to-lateral grid like pattern. The nerve root should be visualized free of compression as it passes through the foramen.

After the procedure, patients should be kept in a bed or comfortable reclining chair for at least 4 hours

Complications: Epiduroscopy is associated with postoperative pain is typically associated with the entry site. Transient nerve root symptoms are relatively com-mon, but usually resolve gradually. Some patients remains with neuropathic pain as preoperatively and deserves special imaging and neurophisiology

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tests for follow up. Significant spinal stenosis from facet and/or other bony hypertrophy decreases the operating room for the endoscope and increases the potential risk of complications. Epiduroscopy is associated with a known risk of retinal hemorrhage, although as of 2006, only twelve cases have been reported in the literature[20.]

Discussion: Richter et al[9] published 154 consecutive patients scheduled for Minimally invasive anterior epiduroscopic decompression, due to histories of severe back and/or leg pain with radiculopathic features, and failed conservative treatment options. There was a significant improvement in disability caused by low-back and/or leg pain as measured by the Roland–Morris Questionnaire (RMQ). The postoper ative level of pain significantly improved from preoperative, from 7.5 to 3.4, as measured by the VAS. Based on the modified MacNab scale, success was achieved in 82% of the patients at follow-up Overall, the patients demonstrated significant clinical recovery and improvement in both quality of life and overall pain levels.

Kim et al[12] concluded eighty-two percent of the patients treated with laser disc and neural decompres-sion reported positive treatment results as opposed to 45% receiving non laser neural decompres-sion adhesiolysis foraminoplasty. Patients in this study had following diagnoses: spinal stenosis (N = 60), lumbar disc extrusion (N = 26), and post-operative pain after lumbar disc surgery (N = 9) and chronic refractory LBP whose lesion was not identified via MRI tests (N = 3).

In 2001, Knight[21] reported on the outcome of 250 consecutive patients followed for a minimum of two years. Endoscopic laser foraminoplasty was performed on the patients who had back pain and sciatica in multilevel degenerative disc disease and 30% also had history of prior back surgery. The measurement evaluations used were Oswestry Disability Index and visual analogue pain scores. Sixty percent of patients reported good and excellent outcomes, based on the percentage change in Oswestry Disability Index of 50, with 95% of patients not requiring further surgical intervention.

Yeung[22] reports treating 500 patients underwent endoscopic discectomy. The first 100 cases involved laser treatment for disc decompression and ablation and were completed prior to 1993. An additional 400 cases were completed using a radiofrequency electrode instead of a laser. Yeung comments that with careful patient selection, successful surgical outcomes of endoscopic removal via laser or radiofrequency of extruded and migrated disc fragments is possible.

Richardson[23] reported results in 30 patients, with 19 of those patients identified with failed back surgery syndrome. A statistically significant number of patients experienced a reduction in long term chronic radicular pain and improved function. This improvement was maintained for one year.

Data regarding Minimally invasive anterior epiduroscopic decompression, still is very scant, and definite evidence cannot be drawn from referenced studies about the efficacy of the technique without having a control group. Nevertheless the improvement in disability scores observed suggests that epiduroscopy could be an option for pain management of radiculopathy related with anterior nerve root compression, with low severity and a low incidence of adverse outcomes.

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IS THERE AN ALTERNATIVE WHEN THERE ARE DISCREPANCIES BETWEEN CLINICAL EXAMINATION AND MAGNETIC RESONANCE IMAGING?

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Beginning in the 1980's, we and others[1] began exploring using lumbosacral epiduroscopy as an aid to diagnosing the location and nature of pathology in the spinal canal of patients with low back pain and/or radiating pain. We also explored using epidurosocpy as a tool for delivering treatment and for forecasting treatment outcome. For purposes of this discussion, lumbosacral epiduroscopy is defined as direct visualization of the lumbar and sacral epidural space with a percutaneously inserted flexible fiberoptic device that has a channel through which instruments can be inserted and fluids can be injected. Synonyms for

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this procedure include spinal canal endoscopy, spinal epiduroscopy, myeloscopy, spinal or lumbar epiduroscopy, and endoscopic adhesiolysis. In this presentation, I will discuss how epiduroscopy can be used an aid to resolving conflicting information obtained by clinical examination and magnetic resonance imaging.

History: In 1931 Burman[2] used arthroscopic equipment to examine the anatomy of vertebral columns removed from cadavers. Pool [3] reported results of examination primarily of the subarachnoid space of almost 400 patients in 1942. Varicose vessels, arachnoid adhesions of post-traumatic or post-inflammatory origin, neoplasms, the presence of inflamed nerve roots associated with clinical neuritis and the effects of an herniated nucleus pulposus or hypertrophied ligamentum flavum were among abnormalities recognized. However, significant advancement of epiduroscopy toward clinical application occurred only after introduction of flexible fiberscopes capable of delivering high quality images, especially with computer enhancement, and development of suitable light sources.

Current Status: Epiduroscopy is mostly focused on the L4, L5 and S1 areas because these are the most common locations of radiating pain involving the lower extremeties.[4] Abundant clinical experience and published data demonstrated the safety and efficacy of epiduroscopy.[5,6,7] Literature reports claim that visualization of pathological tissue and observation of targeted drug administration via epiduroscopy results in substantial and prolonged pain relief. Studies have shown that adhesions unreported by MRI can be identified by epiduroscopy.[8,9] Manchikanti et al[10] concluded that endoscopic adhesiolysis with the administration of corticosteroids is also a safe and possibly cost-effective technique for relief of chronic intractable pain failing to respond to other treatment modalities. There are many reports showing that epiduroscopy is a safe procedure if appropriate precautions.are taken.[5,6,8,10-17] The precautions include correctly placing the epiduroscope and limiting the rate and volume of fluid injected during the procedure.

Epiduroscopy equipment continues to be improved. Increased clarity of visualization and experience enhances the ability to recognize structures. Information is obtained by evaluating readily identifiable tissues such as dura, periostium, fat and scar tissue, and blood vessels. By assessing these structures relative to other clinical findings and outcomes of prior treatment, we believe advancement has been made in the interpretation of epiduroscopy findings. Eliciting pain by touching abnormal appearing stryctures with the tip of the epiduroscope provides evidence the abnormal tissue participates in the painful condition for which the patient is seeking treatment.

Anatomy and Physiology: As an epiduroscope is advanced through the sacral and lumbar bony vertebral canal it transverses an anatomical area referred to as the epidural space. It generally is stated that the epidural space is a potential space. However, we know this area between the dura and the walls of the bony vertebral canal is a real space filled with e.g. fat, nerve roots, and fibrous tissue. Successful application of epiduroscopy requires unique knowledge of the anatomy of the contents of the bony vertebral canal.

When we first started doing epiduroscopy, we examined the symptomatic side with emphasis on viewing the area where the nerve or nerves that innervate the symptomatic side transverse the epidural space and pass through the intervertebral foramen. As we gained experience with epiduroscopy, we found examination of the asymptomatic side unnecessary. We note the presence or absence and the character of the following tissue – fat, blood vessels and fibrous tissue as well as the presence of abnormal tissue and of inflammation. The scope tip readily exits a normal intervertebral foramen. Our goal is to find an area or areas of pathology that when touched by the tip of the epiduroscope, produces arousal and/or pain in the painful area ascertained during the pre procedure evaluation.

Abnormalities seen include discrete or diffuse inflammation, diffuse or discrete fibrosis that ranges from mild (through which the scope easily passes) to a dense, solid mass through which the scope cannot be passed. Increased vascularity (small and/or larger vessels) and/or engorged, distended blood vessels may be seen. Fibrous scars may be avascular or have varying degrees of vascularity.

Complications: To date, no complications unique to epiduroscopy have been reported in the literature. Complications generally reported associated with accessing the epidural space, inserting needles and catheters, and injecting fluids have been reported or may occur. These are: infections, epidural hematoma, bowel, bladder or dysfunction, headache, visual disturbances secondary to retinal hemorrhage, dysesthesia and residual pain at the injection site. Entry into the subarachnoid or subdural space may occur. If not recognized, this may lead to complications resulting from injection of drugs or fluid volumes appropriate only for epidural administration.

Epiduroscopy findings vs clinical examination and MRI finding: Elsewhere at this meeting we describe in detail how epiduroscopy, clinical examination and MRI findings correlate. The majority of clinically significant epidural pathology found by epiduroscopy was located at the L4 - L5 vertebral level, followed by L3 - 4. Pathology at other levels was far less common. As compared to the pain response to direct touch using epiduroscopy, clinical evaluation and MRI were of low specificity in the diagnosis of the correct vertebral level of clinical significant spinal pathology. [18]

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CONTINUOUS SPA FOR ORTHOPEDIC (AND ABDOMINAL?) SURGERY

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Background: Continuous spinal anaesthesia (CSA) remains a widely underutilized technique in modern anaesthesia practice. However, compared with other techniques of neuraxial anesthesia, CSA allows a patient-adapted incremental dosing of an intrathecal local anaesthetic for an analgesia need-dependent duration, compared to traditional single-shot spinal anaesthesia (SSPA) usually involving larger doses, a determined and almost unpredictable duration and spread increasing the potential for detrimental haemodynamic effects like hypotension. Continuous epidural anaesthesia (CEDA) leads to lesser motor block but also to suboptimal anaesthesia in sacral nerve root distributions.

For major orthopaedic surgery like total hip (THA) or knee (TKA) arthroplasty, regional anaesthesia has been shown to offer several advantages over general anaesthesia. (1) The most commonly used regional techniques are SPA and EDA which further offer the advantage of having catheter techniques to extend the blockade during the perioperative period. Combined spinal epidural anaesthesia (CSE) consists in an intentional subarachnoid blockade with a following epidural catheter placement during the same procedure. On the other hand, CSA is a technique for producing and maintaining spinal anaesthesia using smaller doses of local anaesthetic that are injected intermittently into the subarachnoid space through an indwelling catheter. (2)

Continuous spinal anaesthesia is a well-established technique that has been used successfully in many surgical procedures. Furthermore, it allows titration of the dose according to patient and to surgical needs providing safe anaesthesia due to minimal amounts of drugs and greater hemodynamic stability than are provided by single-dose spinal anaesthesia, particularly among elderly or high-risk surgical patients. (3,4)

History: Continuous spinal anaesthesia was first described 1907 by Henry Dean, a British surgeon, leaving a standard spinal needle in place for surgery for intermittent dosing o local anaesthetics for acute abdominal surgery. Due to the difficulties with reproducibility, CSA went largely unused until Lemmon described 1940 the use of a malleable needle placed in the subarachnoid space and a modified operating room table with an opening to guarantee access to the needle and attached rubber tubing. This technique was used for colon resections, gastrectomies, rectal resections, bile ducts and gall-bladder surgery, celiotomies, pelvic surgery and surgery of the lower extremities. (5) Touhy introduced 1944 the use of an intrathecal catheter through a 15-gauge Huber-tip needle for dosing local anesthetics after removing the needle. In 1990 Hurley and Lambert described a spinal microcatheter technique using a 32 gauge intrathecal catheter advanced through a 26-gauge spinal needle into the subarachnoid space. This new technique decreased the risks for postdural puncture headache (PDPHA) and lead to great popularity of CSA for a variety of surgical procedures.

After case reports of cauda equina syndrome were reported with the use of spinal microcatheters for CSA, these microcatheters (smaller than 24-gauge) were withdrawn 1992 from clinical practice in the United States (6,7) and because only large-bore catheters may be used in the United States, CSA is usually reserved for elderly patients out of concern for the risk of postdural puncture headache in younger patients. Investigations have shown that cauda equine and other neurologic symptoms are possible in the cases of abnormal pooling of local anaesthetic solution in the subarachnoid space producing local anaesthetic concentration which are higher than clinically used. Both in vitro and in animals experimental models, lidocaine at concentrations clinically available for spinal anaesthesia has been shown to produce evidence of neurotoxicity with consecutive permanent nerve damage. (8,9) This abnormal spread of injectate explains the initial inadequate block level in most of the reported cauda equina syndrome cases, leading to repeated local anaesthetic dosing which is thought to have contributed to the degree of nerve damage. Possibly, in rare cases the small bore and slow injectate flow of spinal microcatheters contribute to the likelihood of an abnormal pooling of local anaesthetic injectate. After publication of these results, clinicians are aware of the fact that an inadequate block after an initial dose through a spinal catheter is an indicator for abnormal spread of injectate and that further dosing has to be omitted, thus effectively eliminating the risk of serious neurotoxic sequelae. Therefore, CSA is still used with microcatheters in other countries outside the United States.

Safety: Only six larger studies including more than 100 patients on CSA with microcatheters 6,7,17,18 and Spinocath®,19,21 investigated the feasibility and safety of CSA. (10–15) Three of them reported low PDPH rates between 1.0%, and 1.7% without severe complications, and they all concluded that this technique was safe and feasible. Two studies about the efficacy of CSA for labor analgesia reported high PDPH rates of between 9% and 33.1%, possibly due to the younger age of the women additionally to the insertion of larger catheters. The only major complication was one case (0.8%) of paresthesia, which resolved entirely by the fourth postoperative day. (12) However, PDPH seems to be age-related as one study with only geriatric patients reported no cases of PDPH or other neurologic complications. (13) In a recent study Lux et al. performed a retrospective study on 1212 cases of lower limb surgery assessing feasibility and safety of CSA using microcatheters. No major complications were observed, tension headaches were described in 15.7% of cases, but PDPH were reported by only 1.5% of patients. Moreover, 98.4% of patients were satisfied with continuous spinal anaesthesia. (16)

CSA for orthopaedic surgery: Hemodynamic staibiliy is one of the major reasons for the use of CSA in orthopedic surgery. In a comparison of CSA with SSPA and CEA for lower extremity orthopaedic surgery in elderly patients, mean arterial pressure did not change in the patients who had CSA, compared to a drop of 15% in the CEA and of 19% in the SSPA group. (17) Minville et al. compared CSA with low-dose bupivacaine SSPA in elderly patients undergoing hip fracture repair. In the SSPA group, mean arterial pressure dropped by ≥ 30% in 51% of patients, whereas only 8% of patients with CSA showed this drop in mean arterial pressuse, despite having received less ephedrine (11 mg with SSA versus 4.5 mg in the CSA group) to support blood pressure. (18)

In patients with severe aortic or carotid stenosis even small drops in blood pressure are unacceptable. Therefore, SSPA may be more risky in one respect than general anaesthesia as SSPA can decrease systemic vascular resistance and blood pressure, and although vasoactive medications and controlled intravenous fluid administration may correct these changes, the unpredictable intrinsic haemodynamic effects of a spinal anaesthetic may persist for hours. The alternative, general anaesthesia with endotracheal intubation, can lead to initial hypotension within induction of anaesthesia followed by a brief but significant period of tachycardia and hypertension during laryngoscopy. Moreover, inhalational anaesthetic agents are potent vasodilators and myocardial depressants that possibly leading to deleterious drops in blood pressure and cardiac output. Therfore, CSA offers potential benefit in these cases where avoiding hypotension is critical. In CSA the titration of small doses of local anaesthetic given incrementally via an intrathecal catheter allows the block level and accompanying sympathectomy to be only as extensive as necessary for surgery. This limited block level minimizes the extent of sympathectomy and hypotension. The successful use of CSA for hip repair in patients with severe aortic stenosis has also been reported. In 1 case the patient showed atrial fibrillation with an aortic valve area of 0.8 cm^2, ejection fraction of 25%, moderate mitral regurgitation. Three doses of 0.5 ml of 0.5% plain bupivacaine (2.5 mg per dose) were given over 10 minutes, achieving a sensory block level of T8. Additionally, 3 doses of 2.5 mg of bupivacaine were given over the course of the 4-hour procedure to maintain haemodynamic stable anaesthesia despite 700 ml blood loss. (19)

Technique: The technique for CSA for lower extremity surgery is first to place the intrathecal catheter using a paramedian approach with a cephalad needle angulation, so that the threaded catheter approaches the cauda equina tangentially to minimize the risk and severity of paraesthesia. To avoid the use of microcatheters it can also be done with an epidural needle and catheter set with the initial needle location placed epidurally using loss of resistance or the needle can simply be inserted with the stylet in place. After epidural loss of resistance, the stylet should be reinserted and the needle advanced in small increments with intermittent stylet removal to check for CSF flow, which is usually brisk through a large needle. Once clear fluid is obtained, the stylet is reinserted to prevent unnecessary loss of CSF. The catheter is placed in one hand, and the stylet, is removed with the other and immediately replaced by the catheter. The catheter should be threaded no more than 3 cm into the subarachnoid space to avoid potential pooling of and abnormal spread of injectate. At final needle position, CSF should be aspirated leading to free flow of CSF to confirm correct placement. Care should be taken to eliminate air, as intrathecal air injection can produce a severe headache. Thereafter, 2.5–5 mg of 0.5% bupivacaine should be dosed intermittently, with 15–20 minutes between doses for patients in whom hypotension is a particular issue. Only in the cases of good spinal anesthesia spread, a redosing should be considered after 90–120 minutes based on the patient's sensory block level. To avoid abnormal pooling of local anaesthetic solution in the subarachnoid space only isobaric solutions should be used. For the postoperative period, the lowest possible concentration to treat pain should be used to allow motor control by the surgeon.

Conclusion: Continuous spinal anaesthesia is easy to perform, safe and offers a number of potential advantages over other forms of surgical anesthesia, especially for haemodynamic compromised patients. The use of microcatheters needs a more cautious management due to the risk of pooling of local anaesthetic solution in the subarachnoid space possibly leading to neurological complications.

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FAILED SPINAL ANAESTHESIA – THE FACTS

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Spinal anesthesia is still a very widely used technique. A recent study has shown in the UK that after trauma spinal anesthesia was the most frequent anesthetic technique used for hip fractures. However, some failure can occur which has been in the past reported in up to 15 to 20% of the cases. But more recent studies have shown that the incidence was reduced to 2 to 3 %. This lecture will emphasize on this 2 to 3 % and try to explain why in some cases despite correctly performed spinal anesthesia a failure can occur.

NEURAXIAL SAFETY CONNECTORS

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The Spinal Connector: In the United Kingdom, in the late 1990s, there were a series of high profile, fatal wrong route errors involving the delivery of drugs intended for intravenous delivery into the intrathecal space.

The most devastating wrong route, intrathecal error described was that of intrathecal injection of vinca-alkaloid drugs. Maladminstration of vinca-alkaloids intrathecally causes paralysis almost always leading to death. Internationally, there have been at least 55 reported instances of this tragic error[1]. This has occurred in oncological practice as there are a combination of treatment regimens that require the administration of drugs into both intravenous and intrathecal routes.

The National Health Service (NHS) has outlined efforts to be undertaken to reduce the incidence of wrong route intrathecal injection to zero. Following these errors, a series of non-engineered steps were introduced including education and training, limiting the pool of practitioners within a hospital and ensuring only units performing certain numbers of procedures were involved. The format in which vinca-alkaloids are produced has been altered to ensure that it is clear that they are for intravenous delivery alone. The introduction of these steps has since prevented further occurrences of these tragedies in the UK. The last reported incident was in 2001.

Despite the success of the non-engineered solutions, in 2009 the Health Select Committee approved the redesign of Luer connectors for prevention of wrong route errors. Luer connectors had become ubiquitous to connections in medical practice.

In 2009, the National Patient Safety Agency (NPSA) mandated that the connectors on systems for intrathecal delivery must not be cross compatible with intravenous devices by 1st April 2011[2]. Due to the difficulties in manufacturing an engineered solution to this problem there was some delay and the introduction date was moved back to 2012 for the spinal route and 2013 for epidural and peripheral regional devices.

These systems have since been developed, manufactured and released in to general clinical use, largely without the widespread clinical testing one would expect of medical equipment.

The ideal solution: In order for these new connectors to be acceptable and clinically useful, there are a number of preconditions that would be required. They must:

1. Prevent the complication that they are designed to stop.
2. Not introduce additional risk.
3. Ideally become an adopted standard
4. Require minimal or no training allowing seamless introduction.
5. Have minimal cost implication.

The current solutions have a number of issues.

Firstly and most importantly, in anaesthetic practice, they do not prevent the error of accidental delivery of drug intended for intravenous delivery. In order that this would be the case, the intrathecal drug would need to be presupplied in a syringe which would only connect to intrathecal connectors.

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At present this is not the case with any of the systems, they will all still allow clinicians to draw up any drug into an empty intrathecal syringe for delivery into the intrathecal space. Arguably, the advent of these connectors may cause less experienced clinicians to be more complacent in the preparation of these drugs. The systems do however prevent the potential error of delivering another drug prepared on the spinal injection tray, for example, local anaesthetic for the skin or opioid.

Perhaps less obvious are the additional risks that introducing new connectors entails. The most critical risk would be the potential for drawing up a drug that was required for intravenous delivery in an emergency (for example, adrenaline or atropine) only to find that in haste the syringe used was one only allowing intrathecal delivery thus incurring delay. There are also supply and storage issues in having different syringes of all required sizes for clinical areas where each type is required.

The NHS has not adopted a defined standard leading to different manufacturers producing individual (and incompatible) solutions. The risk here relates to ongoing infusion systems more than for single injection techniques. In patients who move between hospitals, or even different clinical areas within single hospitals, there is the potential that compatible equipment for infusion systems may not be available.

As the following investigations demonstrate, the dexterity and fine motor skills required in placing spinal anaesthesia mean that training in the subtle differences in the new connection are essential. This is difficult to roll out across a health service.

Finally, the new systems are more expensive than the preceding Luer connectors - this is not unreasonable given the cost of development but must be considered in the context of any health service without unlimited resource.

The new connectors in clinical practice: Although there is little published data relating the clinical use of these systems, there a few studies which should be reviewed:-

In 2010, prior to the widespread use of the new connector systems, Cook et al performed a simulation based evaluation of two of the early systems[3]. Both systems scored significantly lower than the Luer devices, although generally the connectors were rated as adequate. Disturbingly, these devices were both able to cross connect with Luer connectors i.e. they did not perform their primary function. The article concluded that the widespread introduction of these devices into clinical practice should not occur until independent formal evaluation had first been carried out.

More recently two studies looking at the clinical use of some of the available systems have been published. Kinsella et al, reported an evaluation of 4 non-luer needle systems[4]. In fact, only 2 different non-Luer connectors were assessed. Each system was evaluated 100 times in a non-urgent setting and a standardised questionnaire was completed. Once again, the equipment was felt to be less satisfactory than the Luer equipment. The new devices were associated with more technical problems – mainly relating to delayed appearance of CSF in the needle hub. However, there were more reported failures in the combined non-Luer group (25 out of 400 injections) compared with none in the Luer group. The inevitable bias that exists in practitioners already familiar with the Luer equipment was felt not to contribute significantly to the relative dissatisfaction with the new equipment. Although this study was criticised by proponents of the new connector system, it was a pragmatic approach to inform clinical decision making and hospital purchasing in an externally imposed, short timeframe.

In the most recent publication relating to these connectors, Sharpe et al evaluated 7 different non-Luer needles[5]. In a two-stage process, the investigators initially looked at the time for visualisation of fluid in the hub of the needle in a simulated lumbar puncture scenario. This was followed by 35 clinical evaluations of each needle. The simulation study showed that differences existed in the time taken to see simulated CSFat the needle hub. This difference may be more relevant in non-anaesthetic practice where sample collection may be delayed. The clinical evaluation demonstrated that the different systems were not felt to be equal with one system comparing favorably with the Luer and another significantly less favorably. This paper currently represents the widest clinical evaluation of the non-Luer systems although the absolute numbers tested were necessarily small.

There is already reported evidence of harm relating to the introduction of new equipment[6]. A case has been reported to the National Reporting and Learning Service where a patient had a spinal needle with a non-Luer connector inserted but there was no available and compatible non-Luer syringe. This resulted in a repeat dural puncture for the patient with a Luer needle but more serious harm would have ensued if this had happened in a time critical situation.

To date in the UK, only 55 acute trusts have fully adopted the non-Luer connector systems.

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PROXIMAL US GUIDED SCIATIC PLEXUS BLOCKS TIPS AND TRICKS

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Anatomy: The sciatic nerve (SN) has the largest caliper of all human peripheral nerves. The SN is the major branch of the sacral plexus (SP) which origins from the ventral rami of the spinal nerves L4-S3, and emerges through the greater sciatic foramen (GSF) between the piriformis muscle (PM) and the pelvic presacral fascia. In the GSF the SN descends between the sacrum medially and the ischial bone (IB) laterally, and it runs across the ischial spine (IS) and continue down in the midline between the ischial tuberosity (IT) and the greater trochanter (GT) into the posterior compartment of the thigh (PCT) under the hamstrings until it typically splits into the tibial nerve (TN) and the common peroneal nerve (CPN) in the popliteal fossa. The CPN splits in the deep peroneal nerve (DPN) and the superficial peroneal nerve (SPN). The SN supplies nerve branches to the hip joint, the posterior compartment of the thigh, the posterior part of the knee joint, the three osteofibrotic compartments of the leg, which are innervated by the DPN (anterior compartment), the SPN (lateral compartment) and the TN (posterior compartment), the ankle joint, and the foot.

This means that surgical anesthesia of the SN is required for surgery involving the foot, ankle, leg, knee, thigh or hip (1).

Choice of level of blockade: The anatomical level of blockade of the SN is selected based on the level of the surgical field and a contingent tourniquet. A tourniquet facilitates surgery by producing a bloodless field. Major hindfoot and ankle surgery (ankle arthrodesis, ankle alloplasty, calcaneal osteotomy) requires effective muscle relaxation of the leg for manipulation and traction. This mandates that the tourniquet is placed on the thigh which produces produces ischemic pain of the thigh muscles. A thigh tourniquet is also required for surgery of the distal thigh, knee, and leg. In the case of forefoot and midfoot surgery using an ankle or calf tourniquet anaesthesia can be performed with a popliteal sciatic nerve block or blockade of the more superficially located and more easily accessible TN and CPN in the popliteal crease. With this approach a supplementary saphenous nerve (SAN) block is usually required. The surgical block usually suffices for postoperative analgesia.

Regional anesthesia of the thigh to alleviate the ischemic pain produced by muscle compression from a thigh tourniquet comprises a proximal SN block, an obturator nerve (ON) block (innervating the adductor compartment of the thigh), and a femoral nerve (FN) block (innervating the anterior compartment of the thigh). A lumbar plexus (LP) block anesthetizes both the FN and the ON and usually also the lateral femoral cutaneous nerve (LFCN). A LFCN block is not necessary to alleviate thigh tourniquet pain, but it is required for surgery involving the lateral thigh or knee. The posterior femoral cutaneous nerve (PFCN) from the SP supply cutaneous innervation the posterior thigh and does not have to be anesthetized to alleviate tourniquet pain.

When a thigh tourniquet is required, many anesthesiologists limit the possible anesthetic options to spinal or general anesthesia. However a combination of proximal sciatic, a femoral and an obturator nerve block allows effective blockade of the entire lower limb whenever spinal or general anesthesia are not attractive choices or are contraindicated.

Surgical anesthesia of the hip or proximal thigh can be produced with combined LP and SP blocks as an alternative to spinal or general anesthesia.

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A proximal ultrasound guided (USG) SN block can be performed as an anterior approach to the SN block at the level of the minor trochanter, a subgluteal SN block, a transgluteal SN block or a SP block.

Anterior approach to the proximal USG SN block: The SN can be blocked at the level of the minor trochanter (MT) with an anterior approach as a proximal alternative to the popliteal sciatic nerve block. This approach allows effective anesthesia of the SN and the SAN with one single injection and is called the SPEDI block (2). The SPEDI block is indicated in trauma patients as it does not require repositioning of the patient for the block procedure. A curved array transducer is placed transversely on the medial thigh at the level of the MT in order to visualize both the SN and the SAN. The SN is visualized postero-medial to the MT between the adductor magnus muscle (AMM) and the gluteus maximus muscle (GMM). If the MT blocks the view of the SN, the transducer just has to be moved more medial. Sometimes the visualization of the SN is improved by shifting the transducer slightly distal to the MT. In that case the SN is visualized between the AMM and the long head of the biceps femoris muscle (BFM). At the level of the MT the SAN is juxtaposed lateral to the femoral artery (FA) between the sartorius muscle (SM) and the adductor longus muscle (ALM) proximal to the adductor canal (AC) in the medial thigh. The needle is inserted from the medial end of the transducer and the tip of the needle is aimed at the medial border of the SN below the posterior AMM fascia. The endpoint of injection is perineural spread of approximately 15 mL of local anesthetic. When the needle is retracted it is redirected towards the SAN lateral to the FA below the SM. Five mL of local anesthetic is injected around the SAN.

Subgluteal USG SN block: The SN can be approached proximally with USG in the subgluteal crease deep to the lowermost part of the GM and posterior to the quadratus femoris muscle (QFM) (3,4). The SN presents as a hyperechoic flattened spindle shaped profile in cross section in the fascial plane between the GM and the QFM. In lean patients a linear high frequency transducer is appropriate. In obese patients a curved array transducer is a better choice. The needle is inserted in-plane from the lateral end of the transducer. If the needle skin puncture is a few centimeters lateral to transducer, it is possible to make the angle of needle penetration more shallow. The end point is perineural injection of 15 mL of local anesthetic.

Sometimes the SN is not visible at this level – typically in older or obese patients. In that case a parasacral block of the SP is an effective alternative as a proximal SN block .

Transgluteal USG SN block: The classical proximal approach to block the SN is the transgluteal technique described by Labat almost 100 years ago. With this technique the SN is blocked where is runs across the IB posterior to the IS. It is possible to use US to block the SN at this level (3). However, with modern US guidance it is more feasible and effective to employ a more proximal approach with blockade of the SP.

USG SP block: The most effective technique for USG SP block is the socalled ParaSacral Parallel Shift (PSPS) technique (5). It is an effective proximal block of the SN. When it is combined with a LP block, it produces surgical anesthesia for procedures of the entire lower limb including the hip. With the patient in the lateral position, a curved array transducer is aligned between the PSIS and the midpoint of the line connecting the PSIS and the GT. In this position the concavity of the iliac bone is identified sonographically as a continuous hyperechoic bone line. The transducer is moved inferomedially with a parasacral parallel shift (PSPS). When the transducer beam arrives at the sciatic notch, the ultrasonographic continuity of the iliac bone line is interrupted. This is exactly where the SP exits the pelvis. The transducer is tilted slightly caudad and the hyperechoic SP is visualized in the fascial space between the presacral pelvic fascia and the triangular PM between the lateral border of the sacrum and the medial border of the IB. The pulsating inferior gluteal artery and its concomitant vein are located medially in the same fascial space.

The needle is advanced IP from the lateral end of the transducer until the needle tip touches the SP avoiding the inferior gluteal vessels. Ten to 20 mL of local anesthetic is injected with sonographic observation of perineural spread as the endpoint.

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CUTANEOUS NERVES OF THE ARM AND FOREARM – HOW SMALL CAN WE GO?

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Cutaneous nerves of the arm and forearm - how small can we go ?

The introduction of Ultrasound guidance for nerve blocks has revolutionised regional anaesthesia practice over recent years, improving success rate, reducing procedure time and volume required to achieve a successful nerve block. Advancing US technology has improved resolution capabilities of portable US machines and has allowed practitioners to identify not only the main plexus anatomy, but also smaller components of nerve plexus and individual peripheral nerves, which were previously beyond reliable detection. This has also sparked a renewed interest in peripheral functional anatomy and improved our understanding of nerve territories and innervations of peripheral structures. Clinical practice can be adapted using this understanding and achieve more selective peripheral nerve blockade to minimise undesired block effects and maximise analgesia.

This presentation will focus on the anatomy of smaller nerves of the arm and forearm and discuss block approaches for a variety of applications.

Medial cutaneous nerve arm (MCNA)/ Intercostobrachial nerve: The MCNA arises from the median cord and communicates closely with the intercostobrachial nerve to innervate the medial aspect of the upper arm. It pierces the deep fascia covering the axillary blood vessels and main plexus nerves at midhumeral level and branches into a number of smaller nerves. Its block is required for cubital tunnel release. It is best approached at the high axillary block at the level of the conjoint tendon with a combined subcutaneous infiltration superficial and deep to the deep fascia.

Medial cutaneous nerve of forearm (MCNF): Together with the medial cutaneous nerve of the arm (MCNA) the MCNF is formed off the medial cord of the lower trunk and in the axilla is closely associated to the ulnar nerve. It travels towards the elbow following the basilic vein and branches into a palmar and volar nerve supplying the palmar and volar ulnar aspect of the forarm. Both nerves remain close to the basilic vein until they reach the elbow crease where they travel over the anterior aspect of the medial epicondyle. Blockade of the nerve, often difficult to achieve with blocks above the clavicle, is required for surgery on the ulnar aspect of the forearm such as ulnar plating, ulnar shortening or skin grafting.

The nerve or its branches can be identified on US by moving the transducer at the lower third of the humerus from the brachial artery and median nerve towards the triceps muscle, releasing the transducer pressure to reveal the basilic vein where the main nerve or its branches tend to be on the 3 and 9 o'clock position of the vein. The ulnar nerve is seen further on the surface of the triceps muscle. Blockade of the MCNF is most reliably achieved at this level, which also allows median and ulnar nerve to be blocked with one needle approach. The branches of the MCNA are often seen in the superficial subcutaneous layer. **Lateral cutaneous nerve forearm (LCNF)**: The musculocutaneous nerve arises from the lateral cord of the brachial plexus and travels between long head of biceps and coracobrachialis muscle. It gives motor supply to the biceps and brachialis and continues between these two muscles moving towards the lateral aspect of the arm. At this point the nerve continues as the lateral cutaneous nerve of forearm. At the elbow crease the LCNF pierces the brachial fascia lateral to the biceps tendon and comes to lie next to the cephalic vein, between brachioradialis muscle lateral and biceps tendon (medial). It divides into an anterior and a posterior branch, with 30% dividing proximally and 70% distally. The nerve supplies skin on the lateral aspect of the forearm from the elbow to the base of the thumb. It's territory overlaps with the superficial radial nerve at the wrist and the medial cutaneous nerve forearm on the anterior aspect of the forearm. Blockade of the nerve is vital for operations on the radial aspect of the forearm such as arteriovenous fistula formation, radial plating, trapezectomy or De Quervains release. Advantages of blocking the nerve distal to the motor

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nerve is the preservation of biceps function and reduction of LA required to achieve longer lasting sensory block.

It is most reliably found at the elbow and can be blocked together with the deep and superficial radial nerve in one approach. Due to its smaller size 1-2 ml of LA are sufficient for a quick onset block. During the needle approach from lateral a 'give' needs to be appreciated as the needle penetrates the brachioradials muscle fascia to lie lateral to biceps muscle and next to cephalic vein.

Posterior cutaneous nerve of forearm (PCNF): The PCNF is a branch off the radial nerve which it follows through the spiral groove of the humerus to the lateral aspect of the arm, where the PCNF pierces the lateral intermuscular septum to lie in the subcutaneous layer. It divides into smaller branches to innervate the posterior aspect of the forearm. It's main branch or branches can be found over the prominence of the brachioradialis muscle at the level of the elbow. In muscular individuals the nerve will be flat on the muscle fascia, in more adipose patients is more clearly seen among subcutaneous fatty tissue. It requires to be blocked specifically for procedures on the posterior aspect of the forearm such as ganglion removals, wrist arthroscopy. It can be blocked with one needle puncture together with the radial nerve and LCNF by reversing the needle direction from anterior to posterior and changing transducer position form medial to the lateral epicondyle.

Superficial radial nerve (SRN): As one of the two endbranches of the radial nerve the SRN separates from the main radial nerve at the level of the elbow and continues under the brachioradialis muscle towards the wrist. At midforearm it is closely associated to the radial artery, placed in a triangular space radial to it. It emerges from under the brachioradialis tendon on the volar aspect of the forearm close to the wrist and divides into two smaller branches to innervate the base and radial aspect of the thumb via the digital nerve and volar radial aspect of the hand. It communicates with the LCNF and volar branch of ulnar nerve. It rarely requires blockade on it's own (eg. Dupuytrens affecting the first web space) and is usually blocked together with the deep radial nerve at the elbow or above. On US it can be followed from the elbow under brachioradialis muscle distally to its smaller branches and may blocked in one needle pass with the median nerve.

Posterior interosseous nerve (PION): As the radial nerve branches into deep and superficial radial nerve, the deep radial nerve continues as the main motor branch for the extensor muscles of the forearm and passes through the supinator tunnel (Ligament of Frohse) where it becomes the PION. The PION descends onto the interosseous membrane, at the wrist in a mirror position to the anterior ION, both of which supplying the wrist joint and MCP Joints. The PION can be identified at the supinator tunnel, after which it becomes more difficult to follow, however, it can be blocked on the interosseous membrane further distally. The main application for PION block is for chronic pain syndromes such as chronic wrist pain, potentially also for CRPS, or as a diagnostic block at the supinator muscle to confirm radial tunnel syndrome.

Anterior interosseous nerve (AION): The AION branches off the median nerve where it passes through the heads of pronator teres muscle at the elbow. It accompanies the IO artery on the interosseous membrane, supplies the deep flexors of the forearm and pronator quadratus muscle at the wrist. It needs to be blocked together with the PION for surgery on the wrist joint or MCP joints. It can be identified on US in the forearm next to the IO artery. Thereby it can be approached in the forearm and combined with a median nerve block instead of blocking the main nerve above the elbow, allowing a quicker onset of block.

Digital nerves: The digital nerves, formed by median and ulnar nerve, can be identified on each side of the flexor digitorum superficialis tendons un der the palmar aponeurosis in the palm of the hand for surgery on individual fingers. At this point a hockey stick probe will be required.

Discussion: It is possible to identify smaller nerves in the upper limb on US. There is a degree of variability and communication which limits block approaches to the main part of these smaller nerves in order to provide appropriate anaesthesia. Several objectives need to be balanced to achieve a patient centred outcome.

- The need for tourniquet block during surgery. This can be achieved either with a separate block using short acting LA to minimise motor block duration after surgery or as a single injection to cover both tourniquet and postoperative analgesia requirements. The latter option will lead to prolonged and unnecessary motor block when long acting LA is used.
- Several injections versus single injection: For a complete forearm block 5 nerves need to be blocked, in addition a tourniquet block needs to be considered. Radial nerve, LCNF and PCNF can be blocked with one needle approach at the elbow, first approaching RN and LCNF, then reversing the needle direction for the PCNF. Ulnar, median and MCNF can be blocked with one approach at midhumeral level. Depending on site of surgery more distal approaches are feasible, eg median and ulnar nerve for Dupuytrens surgery with shortacting tourniquet block. In the experience of the author, who performs first distal blocks, then tourniquet block, the majority of patients tolerate the procedure very well and prefer to gain motor function shortly after surgery whilst having longer lasting analgesia.
- Frequency of blocks performed. It may be unrealistic to maintain the expertise required to perform peripheral nerve blocks for only the occasional list. A proximal block will be more appropiate for the infrequent practitioner.
- Blocking too little too distal. It is imperative to know the surgeon operating to avoid missing overlapping nerve territories or different incisions from expected. If in doubt a proximal approach will be more appropriate.
- More injections, higher risk: The practice of differential regional blocks requires appropriate training in US guidance and remains a high skilled application to minimise risk of nerve injury and procedure discomfort to the patient. If peripheral blocks are performed, doing so before a tourniquet block adds to safety, speeds up onset of the most important part of the anaesthetic and allows testing of the block before tourniquet block may cloud assessment.

Summary: US guidance allows reliable identification of peripheral nerve structures for more selective and differential regional anaesthesia for surgery of the upper limb. This also has applications for chronic pain medicine. This practice requires a highly skilled practitioner to provide safe and reliable anaesthesia.

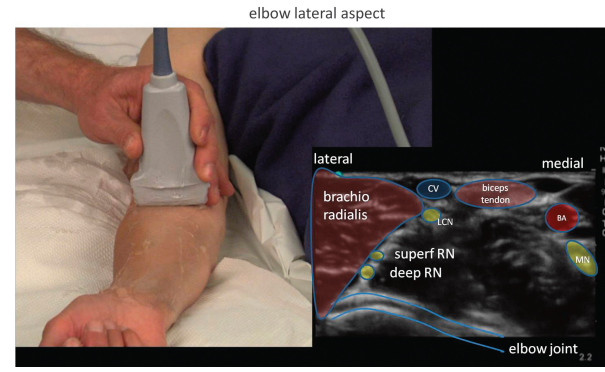

FIGURE 1. Lateral aspect of elbow.

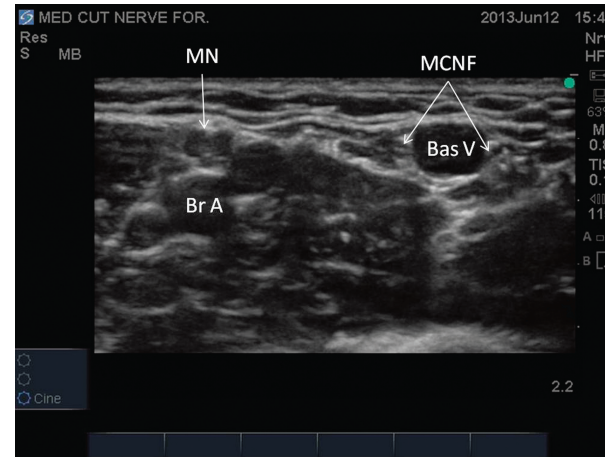

FIGURE 2. MCNF at 3 and 9 o'clock of basilic vein (BasV) and median nerve (MN) with brachial artery (BrA).

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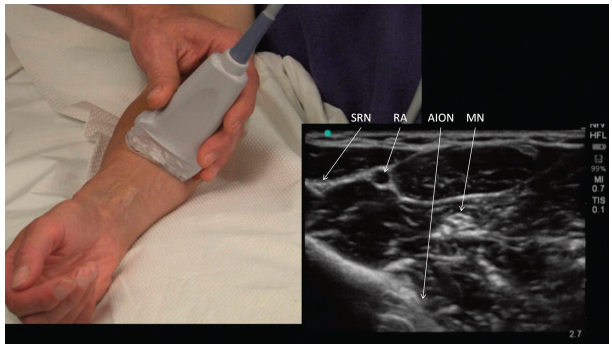

FIGURE 3. AION with artery deep on interoseous membrane with median nerve (MN) and superficial radial nerve (SRN) llateral to radial artery (RA).

US UPPER LIMB: NEEDLE INSERTION AND INJECTION SKILLS

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The use of ultrasound (US) has revolutionized our practice in regional anesthesia (RA) and that for many reasons.[1] [2]

1. The pre-procedure US scan allows us to visualize and confirm the anatomy and recognize anatomic variations.
2. US allow us to plan for needle approach to avoid unnecessary tissue trauma.
3. US give us the possibility to follow the needle under real-time visualization as it advances towards the target.
4. With US we are able to confirm correct placement of the needle tip by injecting small amounts of local anesthetic (LA) solution (Hydro localization).
5. Finally, it allows us to follow the spread of the LA solution and to make the necessary needle adjustments for the "best" spread around the target.

A thorough knowledge of anatomy is essential for performing a Peripheral Nerve Block (PNB) at the right level for the planned procedure. Besides anatomy, knowledge of the microanatomy of the brachial plexus is a basic requirement when performing Peripheral Nerve Blocks. The brachial roots differ histologically from the more peripheral nerves, making an "intraneural" injection risky for permanent nerve damage. [3]

Correct placement of the tip of the needle and thus avoiding intraneural injections means histologic knowledge of the different layers of a nerve. Actually, with the existing US machines, it seems impossible to see all the different layers, but an epineurial intraneural injection matches with nerve swelling and fascicular separation. An adjacent circumneural spread corresponds to an adventitial extraneural injection.[4]

The use of US doesn't exclude the use of a second confirmation technique to localize the right nerve, like a Peripheral Nerve Stimulator (PNS).[1] But it seems that, when using low current stimulation, a PNS together with US and a pressure monitor might be better to avoid intraneural injections. [5-7]

Besides a theoretical knowledge, some practical skills are necessary too. It is important to make a composition in the mind of the multiple 2D US tomographic scans to a 3D spatial view of the brachial plexus. This property will help us for an accurate approach of the target by the needle with the eyes focused on the screen. Needle approach can be in plane (IP) or out of plane (OOP), dependent of puncture level of the brachial plexus and the experience of the operator. Whatever approach, the needle may not be directed straight towards the nerve, but has to be approached tangentially without hurting the nerve.

An interscalene block is mostly performed by means of a single injection technique. From supraclavicular to more distal approaches a multiple injection technique seems to be preferred to a single injection technique for realization of a complete block of the upper extremity.[8]

Different needle approaches at the different plexus levels and multiple injection techniques can show some advantages, but mostly success is depending on the operator's experience.[9, 10] Visualization of spread and anesthetic solution volume/dose appear to have an important impact on the block effectiveness, intensity and duration. [11] (L. Sermeus, submitted)

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RA IN TRAUMA PATIENTS AND COMPARTMENT SYNDROME, THE EVIDENCE!

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Acute compartment syndrome (ACS) can occur in any closed compartment but is most commonly seen in the osteofascial compartments. It is caused by reduced tissue perfusion secondary to elevated pressure. ACS is principally of concern during emergency surgery, primarily of leg (1) and forearm fractures (2). The incidence is 4.3% in patients with tibial shaft fracture and 3.1% with diaphyseal forearm fracture (3). A number of case reports describe the occurrence of ACS following elective joint arthroplasty (4-5). Regional anesthesia is commonly used in trauma patients, soft tissue injuries and elective joint surgery. The benefits are proven and significant. From the patient's perspective, it seems obvious that the risk of ACS does not necessarily have to contraindicate the use of regional anesthesia. However, practice seems to be based on the opinion that sensory blockade and the relief of postoperative pain precludes any use of regional anesthesia (6) . Unfortunately, this perspective is not based on randomized-controlled trials that compare outcomes in patients at risk of ACS who have received a regional anesthesia technique versus those who have not. Rather, clinical practice is based on case reports and retrospective case series. Physicians opposed to the use of regional anesthesia report that the technique masks the pain related to ACS. However, it is well demonstrated that the sensitivity and positive predictive values of pain and passive stretch pain during ACS are equal for both at 19% and 14% respectively(7). On the other hand , it has been seriously postulated that compartment ischemia activates

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TABLE 1.

Reference	Surgery	Technique used	Comments
Hyder(18)	Intramedullary nail for a tibial fracture	3 in 1 block ; bupivacaine 0.5%	Pain in the calf and anterior part of the leg; anterior tibial compartment necrosis (peroneal nerve territory). 3-in-1 block held responsible for delayed diagnosis
Noorpuri(19)	Forefoot revision arthroplasty	Ankle block; bupivacaine 0.25%	Severe pain unrelieved by pain killers within 12 hours. Fascitomy without sequelae
Uzel and Steinmann(20)	Intramedullary nail for femoral shaft fracture	Femoral nerve block ; 20 mL ropivacaine 0.75%	Severe thigh pain and elevated anterior thigh compartment pressure. Fasciotomy without sequelae
Cometa(8)	Distal femoral and proximal tibial osteotomy	Continuous sciatic and femoral nerve blocks with ropivacaine 0.2%	Severe leg pain without other symptoms on second post-operative day. Tense calf on the operative side. Fasciotomy with sequelae.
Walker(21)	Left calcaneal osteotomy and Achilles tendon lengthening	Continuous popliteal block; initial bolus of 15 mL of bupivacaine 0.5% with epinephrine then ropivacaine 0.2% at 8 mL/hr	Increasing pain in the foot on day one. Cast removal and infusion stopped.
Aguirre(7)	Complex distal humerus fracture	Continuous infraclavicular block ; bolus 30 ml ropivacaine 0.5% then ropivacaine 0.3% at 6 ml/h plus an additional bolus of 5 ml.	Severe forearm pain 14 hours after surgery.; compartment pressure measured at 40 mmHg; Fasciotomy without sequelae

nociceptors via bradykinin, serotonin, adenosine and hydrogen ion excitation that can render ineffective the sensory blockade of regional anesthesia (7,8). The most important aspect in the management of ACS is early diagnosis with treatment onset in less than 6 hours (9).

NEURAXIAL BLOCKADE AND LOWER LIMB COMPARTMENT SYNDROME RISK: Neuraxial blockade can be used for anesthesia and/or postoperative analgesia in trauma and burns patients. Epidural anesthesia demonstrates several benefits compared with general anesthesia in reducing postoperative thromboembolic disease and respiratory complications (10-12). When the risk of ACS exists, the challenge for the anesthesiologist is to obtain motor and sensory blockade duration more or less identical to the duration of surgery. The use of short acting local anesthetics seems to be the solution. Epidural administration of lidocaïne 1.5% or 2-chloroprocaïne 3% results in a short duration of sensory blockade with, respectively, less than 220 minutes and 160 minutes (13). For postoperative analgesia with an epidural catheter, many studies show that the use of local anesthetic (LA) of low concentration allows excellent analgesia. The full regression of sensory block occurs within 2 to 4 hours after stopping the infusion (14-15). Several cases of ACS involving epidural analgesia have been reported (16). However, in most cases the infusion drug and concentration were not specified and subsequently it is difficult to attribute the delay of ACS diagnosis to the regional technique alone. For spinal anesthesia, an alternative is either the use of low doses of hypobaric bupivacaine or the use of continuous spinal anesthesia (which has never been associated with ACS). A randomized, double-blinded study of 150 patients undergoing elective unilateral orthopedic surgery with either hypobaric bupivacaine 0.15% 4.5mg (3mL; group 1), 6.0mg (4mL; group 2) or 7.5mg (5mL; group 3) reported a dose-dependent increase in the duration of the block from 1:55 +/- 00:20 hours (group 1) to 2/15 +/- 00:22 hours (group 2) and 3:15 +/- 00:31 hours (group 3) (17).

PERIPHERAL NERVE BLOCKADE (PNB) AND LIMB COMPARTMENT SYNDROME RISK: This is clearly the most contentious area. In all operating theaters and emergency units, patients have not benefited from PNBs due to the purported risk of ACS. It will be helpful at this juncture to appraise the published case reports to date(table).

In all described patients, the association between single shot or continuous PNB and delayed diagnosis of compartment syndrome is questionable. Most importantly, ischemic pain was present in all cases which was not relieved by a single shot or continuous infusion of LA administered at anesthetic or analgesic doses and which had been effective earlier in the postoperative period. Again we wish to stress that the choice of LA for surgical anesthesia and LA concentration for postoperative analgesia are the most important factors to avoid prolonged motor and sensory blockade. In the case of procedures not normally associated with severe post-operative pain, it seems to be appropriate to use short acting LA as lidocaïne, 2-chloroprocaïne and mepivacaïne (22) for surgical anesthesia. Plain lidocaïne 1.5% for axillary block has a duration of anesthesia of up to 175 minutes, whereas 2-chloroprocaïne 3% results in sensory blockade of up to 112 minutes and 101 minutes for sciatic and femoral block, respectively (23,24). For surgical procedures normally associated with significant post-operative pain, if a risk for ACS exists , a delay in starting the continuous infusion should be considered or the application of a very low concentration of local anesthetic preventing profound sensory and motor blockade might be appropriate(7).

CONCLUSION: The pernicious influence of tales and legends can be difficult to eradicate from our clinical practice. With regard to the role of regional anesthesia, primarily PNB, in masking the occurrence of ACS after trauma surgery, it appears that one is presumed guilty until proven innocent. (6) The risk of compartment syndrome should not contraindicate the use of regional anesthesia. However, its use remains controversial among orthopedic/trauma surgeons and anesthesiologists worldwide. It is very important to really understand the pathophysiology of this syndrome, the characteristics of the ischemic pain and the importance of rapid surgical management. The most important thing is the establishment of vigilant clinical monitoring for compartment syndrome after surgery. Until stronger evidence is available, clinical practice should not be based on unfounded fears that may be denying patients the benefits of regional anesthesia and analgesia.

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REMIFENTANIL FOR LABOUR ANALGESIA AND ANAESTHESIA FOR CAESAREAN SECTION

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Introduction: Theoretically, remifentanil, an ultra-short acting opioid, has an attractive pharmacodynamic and pharmacokinetic profile for obstetric anesthesia and analgesia. In recent years remifentanil has been promoted for labor analgesia (1,2). The rapid onset and offset would allow easy titration and feelings of self control so desired by parturients. When general anesthesia is required for Cesarean section, remifentanil is an attractive option and possibly will be the first opioid for routine use. Maternal hemodynamic changes associated with laryngoscopy and surgical incision can easily be managed. This is especially important in high risk preeclamptic, neurologic or cardiac patients. Despite high transplacental passage, because of its rapid fetal redistribution and esterase metabolism, neonatal half-life is extremely short-lived (2), eliminating prolonged neonatal respiratory depression. Also during Cesarean section performed with neuraxial anesthesia, remifentanil can be useful to treat breakthrough pain. The present review will focus on these issues in more detail.

Placental transfer of remifentanil: Kan et al. first evaluated the placental transfer of remifentanil and its neonatal and maternal effects when administered as an intravenous infusion (0.1 μg/kg/min) in nineteen pregnant patients undergoing non-emergent Cesarean section with epidural anesthesia (2). The observed remifentanil umbilical vein/maternal artery (UV/MA) ratio of 0.88 ± 0.78 suggests a significant degree of placental transfer. Rapid esterase metabolism and fetal redistribution is suggested by a remifentanil umbilical artery/umbilical vein (UA/UV) ratio of 0.29 ± 0.07. Both Apgar scores and neurologic and adaptive capacity scores demonstrated alert and vigorous newborns with minimal clinical opioid effects. In pregnant patients, the mean maternal serum concentration was less then 50% of the concentration previously observed in non-pregnant patients (6). An increased clearance, altered volume of distribution, lower plasma protein concentration and an increase in non-specific esterase activity can all account for these differences.

Ngan Kee et al. confirmed the high transplacental passage of remifentanil when given as a bolus during general anesthesia for Cesarean section (4).

Labor Analgesia with remifentanil.

Pain relief: Worldwide systemic opioids are routinely used for labor analgesia, with pethidine being the most popular, because of familiarity and low cost. When compared to placebo, the analgesic effect of pethidine is modest (5). Other authors have reported sedation but failed to demonstrate analgesia (6). Furthermore, it has been demonstrated that parenteral opioid analgesia is far less effective then epidural or combined spinal epidural analgesia (7). In some studies up to 35% of women were dissatisfied with opioid analgesia (7).

Several investigators compared remifentanil and pethidine (8-12). Remifentanil produced better pain relief then pethidine in most studies (8-12) but in several trials the improvement in visual analogues scores for pain was shortlived (10,12). Two recent meta-analysis confirmed that remifentanil is superior to pethidine during the early course of labour in terms of effective pain relief (13,14). Volmanen et al. compared remifentanil with nitrous oxide and noted slightly improved analgesia during early labour (15). Volmanen et al. compared remifentanil patient controlled analgesia (PCA) with epidural analgesia and noted lower VAS scores with epidural analgesia (16). Similar results were described by Ismail et al. and Douma et al. (17,18). In contrast, Tveit et al. did not report on the superiority of epidural analgesia as compared to remifentanil (19). The most recent meta-analysis however indicated that epidurals to provide better pain relief then remifentanil PCIA (14).

In most of these studies, remifentanil produced VAS scores between 30 and 60 mm, only slightly better than before initiation of analgesia. An effect that in most of these studies was shortlived and restricted to early labor. Although marginally better then with pethidine or nitrous oxide, these VAS scores compare unfavourably with VAS scores usually achieved with neuraxial analgesia techniques (Figure 1). Also remember that women request analgesia or additional epidural top-ups when VAS of 30 mm are reached. In several studies remifentanil was combined with nitrous oxide inhalation to treat labour pain, making interpretation of the analgesic effect of remifentanil problematic (8,9,15).

Remifentanil produces modest analgesia during early labour. The analgesic effect is marginally better than that of pethidine or nitrous oxide, but far worse than that of effective neuraxial analgesia.

Risks and side-effects.

Maternal side-effects: Parenteral opioids have well described maternal side-effects: nausea and vomiting, pruritus, sedation, respiratory depression and desaturation. This is also true for remifentanil PCA in labour. Both pruritus and nausea and vomiting induced by remifentanil are mild but occur with a frequency of up to 60% (8-11,15,16,20-23). Similar to what has been described for pethidine (2), remifentanil results in significant levels of sedation (10,15,16,20).

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However the most worrysome side effect of remifentanil is its potential to induce significant maternal respiratory depression. Blair et al. studied the % of the total PCA time spent with oxygen saturation below 94% and 90% in patients treated with PCA pethidine or remifentanil (10). These authors noted that on average 10% of the PCA time was spent with an oxygen saturation below 94% and 5% of the PCA time the oxygen saturation was lower than 90%. Many studies reported on the respiratory effects of the PCIA remifentanil, but surprisingly several studies made no reference to this complication. The definition of respiratory depression varied from study to study. If all studies that report on the respiratory effects are combined, 21% of patients treated with remifentanil experience some degree of respiratory depression (122 out of 591 patients treated, Figure 2). During in utero surgery, maternal sedation with remifentanil resulted in an increased pCO2 and a reduced pH (24). Therefore, most opinion leaders caution and advice to continuously monitor the parturient's oxygen saturation and have one-to-one midwifery care (9,23,25,26). Whether this is realistic probably depends on local practice, but certainly in my unit (and I suspect in many units) this is not a practical and feasible option!

In recent years, several case reports of serious maternal respiratory depression resulting in respiratory arrest, cardiopulmonary resuscitation and urgent Cesarean delivery for non-reassuring fetal status have been reported (27,28,29,30,31). Hence proponents of routine remifentanil use for labor analgesia are in vigorous discussions with opponents. This author already in 2005 warned for catastrophical respiratory events occurring and potentially lethal complications (32,33,34,35).

PCA remifentanil produces respiratory depression in one fifth of parturients, based on presently published data. Continuous oxygen saturation monitoring is mandatory when PCA remifentanil is used, until large, prospective trials have determined the safety of remifentanil.

Effects on labour outcome: Kayacan et al. and Nacitarhan et al. studied the effects of different opioids and local anaesthetics on isolated pregnant rat uterine muscle (35,36). Both local anaesthetics and opioids, including remifentanil, did decrease uterine muscle contractility. However, spinal and epidural local anaesthetics never reach plasma concentrations sufficiently high to induce the above-described effects, while opioids do reach relevant plasma concentrations.

Foetal and neonatal side-effects: Remifentanil readily crosses the placenta (2). It therefore might have potent effects on the foetus and newborn. During in utero surgery, maternal sedation with remifentanil has been shown to produce foetal immobility and loss of variability of the foetal heart rate (24). There have been reports of unplanned and unnecessary Caesarean delivery for suspected foetal distress resulting from opioid induced loss of foetal heart rate variability (37).

When remifentanil is given during Caesarean section prior to delivery of the foetus, a significant proportion of neonates requires mask ventilation, intubation or naloxone (38,39). Of course doses of remifentanil used in this setting are much higher than those used during labour analgesia, but it is advisable to have a person present during delivery who is skilled in neonatal resuscitation. Reynolds et al. clearly demonstrated that opioid analgesia (pethidine) during labour unfavourably affects neonatal acid–base status when compared with epidural analgesia (40).

Remifentanil PCA has significant effects on foetus and neonate. Large trials evaluating the effect on the neonate are urgently required before routine use of remifentanil can be promoted.

Remifentanil for use during Cesarean section: Fear of neonatal respiratory depression is the main reason why currently during standard general anaesthesia for C-section opioids are not administered prior to delivery of the fetus (41). However, the mother could benefit from opioids to blunt the stress response associated with intubation and surgical incision. When general anesthesia is required for Cesarean section, remifentanil is an attractive option even for routine use. Maternal hemodynamic changes associated with laryngoscopy and surgical incision is less pronounced. This is especially important in high risk preeclamptic, neurologic or cardiac patients. Because of its rapid fetal redistribution and esterase metabolism, neonatal half-life is extremely short-lived, eliminating prolonged neonatal respiratory depression. Also during Cesarean section performed with neuraxial anesthesia, remifentanil can be useful to treat breakthrough pain.

Sedation/analgesia during incomplete regional anesthesia for operative delivery: Kan et al. already demonstrated that low IV doses of remifentanil (0.1 μg/kg/min) provide mild to moderate levels of sedation in patients undergoing Cesarean section under epidural anaesthesia (2). Respiratory rate varied between 16 and 23 breaths per minute and oxygen saturation never decreased below 91%. Slight maternal respiratory acidosis was noted at blood gas analysis. Similar effects were observed by Van de Velde et al. and Missant et al. in second trimester pregnant women undergoing fetoscopic surgery using combined spinal epidural anesthesia and remifentanil sedation (42,43). Oxygen saturation remained within normal limits and mild respiratory acidosis was noted following repetitive blood gas analysis. Respiratory rate decreased but no periods of apnea or a respiratory rate below 8 were noted. This is in line with Babenco et al. who observed mild respiratory depression following a single IV bolus of 0.5 μg/kg remifentanil in volunteers (44).

Remifentanil seems a good agent to treat breakthrough pain during Cesarean section under regional anesthesia. This author uses bolus doses up to 75 μg followed by a continuous infusion at a rate of 0.1 μg/kg/min. Supplemental oxygen is administered and respiration is closely monitored as well as oxygen saturation. Of course, this strategy does not suffice if regional anesthesia is inadequate. It is only an option when mild discomfort or mild levels of pain are present.

Remifentanil and general anesthesia: Traditionally, general anesthesia is induced using thiopental and succhinylcholine with maintenance of anesthesia, prior to delivery of the fetus, using nitrous oxide and low concentrations of inhalation agents (41). Disadvantages of this technique include maternal awareness, inadequate analgesia and hypertensive responses following laryngoscopy, tracheal intubation and incision. The incidence and severity of these problems can be reduced using opioids such as alfentanil and fentanyl. However, opioids can result in low Apgar scores, neonatal respiratory depression and tracheal intubation of the newborn, as well as low neurobehavioral scores during the first days of life (45,46). Remifentanil, a new short acting opioid, offers similar advantages as other opioids in preventing maternal pressor responses, reducing the change for maternal awareness and reducing the risk of inadequate analgesia.

Neonatal effects of remifentanil administration: Several case reports have been published in which remifentanil was given as part of a general anesthetic technique and prior to delivery of the fetus. We have listed these case reports in table 1 (47-67). Basically these case reports described the use of remifentanil as part of a general anesthetic technique in high-risk obstetric patients that required general anesthesia as a result of concomitant medical disease. Remifentanil produced mild neonatal depression in about two thirds of neonates with Apgar scores less then 7 at 1 minute. At 5 minutes however the Apgar score was less then 7 in only 1 infant. Approximately 50% of newborns required brief mask ventilation. Also in some cases neonatal chest wall rigidity was reported (67).

As one of the first, Van de Velde et al. performed a prospective unblinded evaluation of remifentanil in parturients requiring non-emergent Cesarean delivery under general anesthesia due to contraindications for regional anesthesia (39). Ten patients were included in this prospective case series involving 13 neonates. A bolus of remifentanil 0.5 μg/kg was given intravenously, followed by a continuous infusion at 0.2 μg/kg/min. Anesthesia was induced with propofol using target controlled infusion (TCI) set at 5 μg/ml. TCI was reduced to 2.5 μg/ml following tracheal intubation. Succhinylcholine was given in a dose of 1.5 mg/kg to produce muscle relaxation and facilitate tracheal intubation. Maternal heart rate and blood pressure remained stable throughout laryngoscopy, intubation, surgical incision and surgery. One minute Apgar scores were less then 7 in 6/13 neonates. However at 5 minutes only 2 neonates had Apgar scores less then 7 and at 10 minutes Apgar scores were above 7 in all neonates. Brief mask ventilation was required in 6 infants (Table 2).

Remifentanil seems to be safe to the neonates, but brief neonatal respiratory depression can occur. Maternal haemodynamics remained stable. Van de Velde et al. concluded that, "in parturients undergoing non-emergent cesarean section under general anesthesia, remifentanil combined with propofol can be used provided adequate pediatric support is present to manage brief neonatal respiratory depression. Extrapolation of these results to a pregnancy carrying an acutely distressed fetus is premature."

Since then, several studies prospectively studied the neonatal effects comparing remifentanil administration with placebo prior to delivery (4,39,68-71). In term infants, the effects were minimal to non-existent (Table 3). In studies in which also preterm infants were included, remifentanil produced slightly more respiratory depression which was self-limiting and shortlived (Table 3). Heesen et al. summarized this nicely in a systematic review and meta-analysis and noted that the effects on the neonate of pre-delivery remifentanil during general anesthesia for caesarean section were limited and shortlived (69).

Maternal effects: Administration of remifentanil during general anesthesia for Cesarean section prior to intubation and incision and thus prior to

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delivery of the child, resulted in much more hemodynamic stability (4,39,68-72). This was the case both after single bolus administration (4) or after bolus and infusion administration (39). Also stress hormone release was attenuated by the administration of remifentanil (69,70). Hence, Heesen et al. supported the use of remifentanil prior to delivery because of increased hemodynamic stability, without the occurrence of more bradycardia or hypotension (72).

Remifentanil is an attractive short acting opioid which can be used for anesthesia for Cesarean section. Especially in the latter situation it can be useful to provide maternal haemodynamic stability without prolonged neonatal depression. However, pediatric support is mandatory to manage brief episodes of respiratory depression.

Conclusion: Remifentanil is an attractive short acting opioid which can be used for labor analgesia or anesthesia for Cesarean section. When used during general anesthesia for C-section, pediatric support is mandatory to manage brief episodes of neonatal respiratory depression.

This author cannot recommend routine use of remifentanil PCIA for labor analgesia. Although it has moderate analgesic effects, slightly better than other opioids such as pethidine, the analgesic effects are usually limited to early labor. However, based on currently published trials, the risk of respiratory depression is significant. Several case reports have been published with almost lethal outcome because of serious cardiorespiratory compromise. Remifentanil is a potentially lethal anesthetic that when inappropriately used routinely in labor wards, will ultimately result in a fatality which can be avoided. I can only recommend: STOP USING ROUTINE REMIFENTANIL PCIA FOR LABOR ANALGESIA ! Its use might be justified in selected cases. However, then one to one midwifery care, continuous saturation monitoring, anti-reflux valves on the IV line, anestehsia supervision and supplemental oxygen are required.

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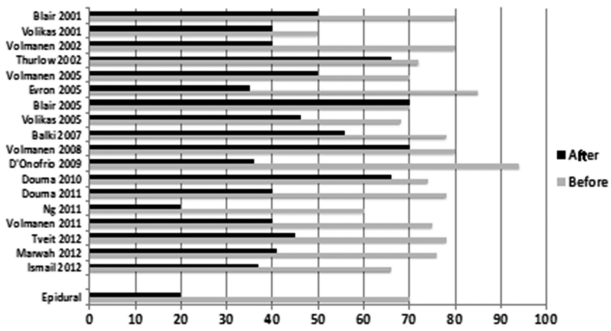

FIGURE 1. Visual analogue scale (VAS, mm) scores for labour pain before and after the initiation of epidural analgesia or remifentanil patient controlled analgesia (PCA) in different studies. The VAS scores for epidural analgesia reflect what is usually reported in the literature.

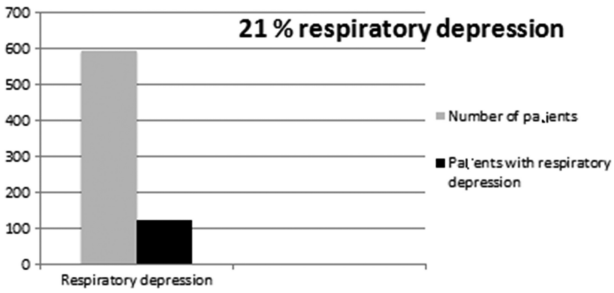

FIGURE 2. The total number of patients treated with remifentanil during labour in studies which report on respiratory side-effects of remifentanil and the number of patients who experience respiratory depression during remifentanil PCA in labour.

Case report + year	A1	A5	A10	Weight (g)	Mask	Duration mask (min)	ETT	Naloxone	NICU
Scott et al. 1999	6	8	8	NR	No	0	No	No	NR
Badaruddin et al. 1999	7	8	NR	3970	No	0	No	No	Yes
Johannesen et al. 1999	3	5	10	635	Yes	NR	Yes	No	Yes
Johnston et al. 2000	8	10	NR	1960	No	0	No	No	No
Manullang et al. 2000	6	9	NR	NR	No	0	No	No	No
Meriano et al. 2001	3	7	9	NR	Yes	1 minute	No	No	NR
McCarroll et al. 2001	6	8	NR	NR	NR	NR	NR	Yes	NR
Iriarangkiya et al. 2001	6	9	NR	3030	Yes	4 minutes	No	Yes	NR
Wadsworth et al. 2002	3	9	NR	3100	Yes	4 minutes	Yes	No	Yes
Wadsworth et al. 2002	3	7	NR	3150	Yes	NR	No	No	Yes
Orme et al. 2001	10	10	NR	3200	No	0	No	No	Yes
Orme et al. 2001	9	10	NR	3300	No	0	No	No	No
Orme et al. 2001	6	10	NR	3000	Yes	1 minute	No	No	No
Orme et al. 2001	5	10	NR	3400	No	0	No	No	Yes
Carvalho et al. 2001	7	9	NR	3027	Yes	2 minutes	No	No	No
Richa et al. 2005	8	10	10	3050	No	0	No	No	Yes
Rasmqpa et al. 2005	7	10	NR	NR	No	0	No	No	NR
Rasmqpa et al. 2005	8	10	NR	NR	No	0	No	No	NR
Alexander et al. 2005	8	10	NR	NR	No	0	No	No	No
Macfarlane et al. 2006	8	9	NR	NR	Yes	2 minutes	No	No	Yes
Bilehjani et al. 2008	8	9	NR	3200	NR	0	No	No	Yes
Foster et al. 2008	3	7	9	3030	Yes	4 minutes	No	Yes	No
Singh et al. 2008	4	8	NR	NR	Yes	1 minute	No	No	Yes
Onishi et al. 2012	9	10	NR	3000	No	0	No	No	No
Amini et al. 2010	8	9	NR	3050	No	0	No	No	No
Duman et al. 2010	7	9	NR	NR	No	0	No	No	No

TABLE 1. Overview of neonatal effects and neonatal outcome in published case reports in which remifentanil was administered prior to delivery.A1 – A5 – A10: Apgar at 1 minute, 5 minutes and 10 minutes.
Mask: Yes or no mask ventilation.
Duration Mask: duration of neonatal mask ventilation in minutes.
ETT: Need for endotracheal intubation.
Naoxone: need for naloxone administration.
NICU: need for admittance to the neonatal intensive care unit.

TABLE 2.

Patient	Apgar 1*	Apgar 5*	Apgar 10*	Weight (g)	Mask (min)	UA pH	UA pCO2	Base Exc
1	7	9	10	1250	1	7.364	50.2	
2	3	6	9	1410	5	7.233	64.5	−2.6
3	7	9	9	3830	None	7.370	54.2	4.3
4	7	8	9	1187	None	7.318	52.9	−0.2
	9	9	9	1750	None	7.340	45.1	−1.8
5	5	9	10	3100	2	7.297	57.0	−0.3
6	5	9	10	3050	3	ND	ND	ND
7	9	9	10	3370	None	7.319	53.3	−1.7
8	8	9	9	1750	None	7.270	54.2	−3.0
	8	9	10	1650	None	7.300	57.0	−0.3
9	2	6	8	2135	3	7.322	50.1	−1.1
	4	7	8	1660	None	7.300	57.3	−0.2
10	1	9	9	3600	2	7.205	52.8	−1.3

TABLE 3. Table summarizing the effects of pre-induction remifentanil during C-section under general anesthesia as reported in prospective studies in term neonatal populations and in mixed preterm/term neonatal populations.

TERM	Control (n=61)	Remifentanil (n=61)	MIXED	Control (n=21)	Remifentanil (n=82)
Apgar < 7 at 1′	18%	20%	Apgar < 7 at 1′	24%	48%
Apgar < 7 at 5′	0%	2%	Apgar < 7 at 5′	14%	13%
Mask ventilation	15%	17%	Mask ventilation	5%	23%
Intubation	0%	5%	Intubation	19%	18%
Naloxone	0%	3%	Naloxone	0%	0%

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EFFECTS OF FLUID INJECTION ON LESION SIZE DURING MONOPOLAR AND BIPOLAR RADIOFREQUENCY TREATMENT

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Introduction: Radiofrequency (RF) treatment is a frequently employed interventional pain medicine technique. The common forms of RF employed for interventional pain medicine include monopolar and bipolar RF. Monopolar RF is often used when small discrete lesions are needed to target neural structures that innervate the cervical and lumbar spine. For specific anatomical areas, one limitation of monopolar RF is the limited size of the created lesion. In order to overcome this limitation bipolar RF is employed, especially when a predictable and more extensive ablative lesion is desired. Bipolar RF has been used for such conditions as sacroiliac joint dysfunction, lumbosacral junction pseudoarticulation, and Raynaud's phenomenon in the upper and lower extremities.[1-6]

In order to effectively utilize monopolar and bipolar RF technology, it is important for practitioners to understand the electrophysiological principles and technical aspects of RF lesion creation. The goal of all RF lesioning techniques is to successfully treat the targeted structure while limiting damage to nearby non-targeted structures. Practitioners should also understand methods to modulate and optimize lesion size and shape. One method which can be utilized to modulate lesion size is the preinjection of fluids with specific chemical compositions. Herein and in the lecture, we will provide an overview on monopolar and bipolar RF and the effects of the preinjection of fluid on lesion size and shape.

Electrophysiological Principles and Technical Aspects of Radiofrequency Lesioning: General Principles

The electrophysiologic principles of RF define the size of a lesion. The ability to lesion specific tissues, while limiting destruction to non-targeted tissues in selected environments, is dependent on factors that influence energy delivery and local physiologic tissue characteristics.

Coagulation necrosis can be described by the Bioheat equation.[7]

Coagulation necrosis=(heat generatedñlocal tissue interactions)-heat lost

In a simplified thermal RF system, 3 primary factors determine heat generation and the size of the lesion: 1) distance from the active tip, 2) RF current density, and 3) duration of application of the RF current.[8]

Heat losses that influence RF lesioning include: 1) conduction (heat diffusion), 2) convection (circulation), and 3) low-resistance shunting.

Thermal Radiofrequency – Monopolar and Bipolar: Thermal RF involves the use of low-energy, high-frequency alternating current (300,000 to 500,000 Hz). Thermal RF results in irreversible cellular energy from focal high temperature tissue heating.[9] For a monopolar system, the equipment includes an RF electrode and a grounding pad. The RF electrode is placed in an RF cannula, which has an electrically insulated shaft and an uninsulated active tip. The high-frequency alternating current flows from the uninsulated active tip into the tissue. The ions in the tissue serve as the carriers of the electrical current. The alternating current produces frictional heating in the tissue surrounding the electrode.[8] In RF, heat flows from the tissue to the cannula. The primary source of heat for RF is the tissue surrounding the electrode. The grounding pad serves as a return path for the RF current. Lesioning does not occur at the grounding pad because of its large surface area. Temperature-controlled RF lesion systems are primarily employed in interventional pain medicine.

For conventional RF, the time of lesioning, tip size, and set temperature all influence the final lesion size. With Monopolar RF, lesions are in the shape of a prolate spheroid with coagulation occurring primarily in the radial direction perpendicular to the long axis of the electrode. Minimal lesioning occurs distal to the tip. Therefore, for monopolar RF the cannula should be placed with the shaft parallel to the target nerve.[10,11] When performing monopolar thermal RF it is important to understand the maximum tolerable margin of error for placement that is allowed with a specific cannula and radiofrequency settings that will still allow for a lesion to incorporate the full diameter of the targeted nerve (**Fig. 1**). The current interventional pain medicine monopolar lesion size is small, and the radius of the lesion is approximately 1 to 2 times the width of the electrode.[10,12]

In bipolar RF, a passive electrode replaces the grounding pad. The current is driven between the two electrode tips with lesioning occurring at each electrode and between the electrodes. Figure 2 demonstrates important bipolar lesion measurements. A 3-dimensional Cartesian coordinate system describes a bipolar lesion.

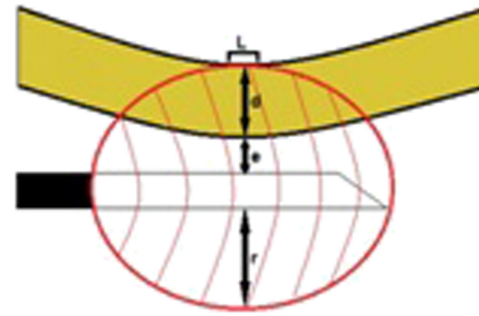

FIGURE 1. Schematic diagram demonstrating monopolar radiofrequency lesioning of a nerve (yellow structure) with an 18 gauge cannula. The cannula's active tip is white. The red circle highlights the zone of lesioning. d: diameter of the nerve, e: maximum tolerable margin of error, r: effective radius of lesioning, L: length of nerve lesioned. For an 18 gauge cannula with a 10 mm curved active tip the mean effective radius is 1.6 mm ± 0.5 mm.[13,14] If the theoretical nerve lesioned had a diameter of 1 mm then maximal tolerable margin of error would be 0.6 mm. The mean diameter of the cervical medial branches from C3 to C7 is less than 1 mm.[12] Figure adapted.[12]

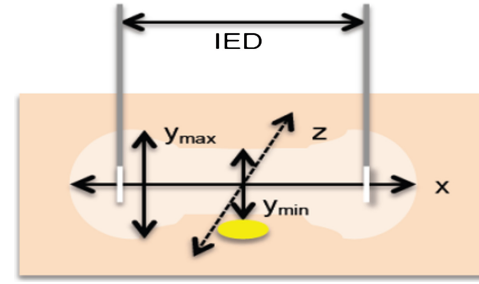

FIGURE 2. A schematic diagram demonstrating important lesion parameters for a bipolar configuration. x: maximum lesion length, ymax: maximum height, ymin: minimum height, z: maximum depth, IED: set interelectrode distance. The yellow dot represents a nerve that is not being treated secondary to incomplete lesioning in the middle of the lesion in the y-axis.

When performing bipolar RF, it is essential to understand specific configuration parameters that will influence lesion development (Table 1).[6] One parameter that is of crucial importance is the set interelectrode distance (IED). The goal should be to choose an IED that will allow for the ablation of the desired area and limit destruction to non-targeted structures. In addition, the IED should be set to limit hourglass lesioning which may result in missing the targeted structure. The maximum allowed set IED that will still allow for a continuous lesion will depend on multiple configuration parameters.[1,6,15]

TABLE 1. Bipolar Configuration Parameters Involved in Lesion Development

Technical Parameter
Active tip dimensions – size and length
Fluid preinjection composition
Fluid preinjection technique
Fluid preinjection volume
Interelectrode distance
Lesion time
Tip configurations – offset, angle, skew
Tip temperature

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Methods to Modulate the Local Tissue Environment to Increase Lesion Size: In the quest for the enlargement of the coagulation zone, methods to modulate the local tissue environment surrounding the RF cannula to allow for greater energy deposition have been investigated.[13-15] The development of controlled and defined larger lesions may assist with lesioning structures that are small and have variable courses. These larger lesions may assist in limiting technical failures by increasing the probability of incorporating the targeted nerve into the lesion. For example the innervation of the SI joint consists of nerves with diameters ranging from 0.292 to 0.997 mm.[16-18] Effectively targeting these nerves is challenging secondary to their small size and variable anatomic location. The chemical composition of the preinjected fluid has been shown to alter monopolar and bipolar RF lesion size and development. Increasing the sodium chloride (NaCl) concentration of the pre-injected fluid has been shown to significantly increase power output and lesion size.[13-15,]

Specifically, for bipolar radiofrequency the preinjection of fluid has been shown to alter final lesion size and shape.[15,19] The degree of influence on final lesion size depends on the chemical composition, volume, and selected injection technique for the preinjected fluid. Specific preinjected fluids have been shown to increase the allowed IED while limiting hourglass lesioning. For example, in a no fluid state separate lesions have been shown to occur when the set IED is greater than 12 mm with 22 gauge cannulae and 10 mm active tips. When 3% NaCl is preinjected, bipolar RF lesions with a high level of continuity in the vertical plane have been shown to occur at much larger horizontal diameters (i.e., IED of 17 mm).[15] The preinjection of fluid significantly alters the likelihood of success of having a complete lesion at a larger IED. In addition the preinjection of 3% NaCl has been shown to focus the lesion between electrodes and diminish the spread of lesioning outside of the electrodes.

In order to effectively employ lesion modulation with fluid preinjection it is imperative to understand the expected final lesion dimensions. In specific anatomical areas a larger lesion may not be desired. In addition, the risk of toxicity to non-targeted tissues, including central and peripheral nervous system structures, should also be considered prior to injecting specific fluids (i.e. high NaCl concentrations).

Conclusion: Radiofrequency is an effective therapeutic treatment for many painful conditions. Practitioners should understand the electrophysiological principles behind monopolar and bipolar RF. In addition, it is helpful to comprehend methods that may be used to enlarge lesion size, such as fluid preinjection. Preinjected fluid strategy should be considered when size enhanced lesions are desired and warranted.

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SACROILIAC JOINT TREATMENT HOW TO ACHIEVE BETTER RESULTS UNIPOLAR BIPOLAR OR SPECIFIC PALISADE TECHNIQUE?

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Since the finding that treatment directed at the sacroiliac joint (SIJ) may relieve low back pain in selected patients, infiltrations and radiofrequency (RF) procedures of the SIJ have become common practice in pain therapy. The SIJ is a common cause of low back pain; depending on the diagnostic criteria employed (clinical examination, intra-articular test blocks, medical imaging), the reported prevalence of SIJ pain among patients with axial low back pain varies between 16% and 30%.[1,2] Targets and RF parameters used for treatment of SIJ pain vary greatly.3 Gevargez et al.[4] performedthree lesions (at 90°C) in the ligamentum sacroiliacum posterior and one targeting the L5 medial branch, whereas Ferrante et al.[5] performed multiple bipolar intra-articular lesions at 90°C while Cohen6 performed single lesion (at 80°C) at the level of the L4-L5 medial branches and the S1–S3 (or S4) lateral branches. One study reported the use of pulsed RF therapy for the treatment of SIJ pain.[7] Cosman and Gonzalez presented the results of their in vivo and ex vivo research in which they try to increase the volume of the RF lesion, thus improving outcome after RF treatment of the SIJ.[8] In the ex vivo section the authors showed that by increasing the active tip length of the electrode on one hand and the electrode spacing on the other, the size of conventional bipolar lesions can exceed the size of monopolar and cooled RF lesions. The authors extrapolate these data to in vivo "palisade" treatment of patients with SIJ pain by placing five to seven RF cannulize perpendicular to the dorsal sacrum and producing four to six overlapping bipolar RF lesions between the dorsal sacral foramina and the ipsilateral SIJ. Although theoretically sound, no outcome data are presented and this idea needs further clinical elaboration. Still, good outcome after interventional pain therapy is fundamentally dependent on a correct primary diagnosis for which that treatment is installed. In reality, accurate diagnosis of SIJ pain based on history and clinical

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examination remains difficult. Different provocative maneuvers have been advocated which, individually, have weak predictive value but combined can help ascertain the diagnosis.[9,10] Diagnostic blocks are the gold standard for diagnosing SIJ pain but must be interpreted with caution, since false positive as well as false negative results occur frequently. As our understanding of the complex innervation of the SIJ increases, therapies are modified accordingly, resulting in more numerous and bigger RF lesions to interrupt SIJ nociception via the lateral branches. In a recent study by direction of the lateral branches but also the depth at which they course unpredictable. So after increasing the area of the RF lesion with bipolar or tripolar and cooled RF techniques, the next logical step is to increase the volume of the RF lesion. Despite the fact that the only placebo-controlled crossover study comparing the effect of cooled RF with monopolar RF treatment failed to show a significant difference,12 RF therapies evolve to ever bigger lesions. One must ask if insufficient pain relief after RF treatment of the SIJ is due to inadequate destruction of the lateral branches or if there are other factors in play. Indeed, findings of an anterior innervation of the SIJ from the lumbosacral plexus[13,14] could offer an explanation for failure of RF treatments directed at the lateral branches. This theory is supported by the finding that in spite of multisite, multidepartment lateral branch blocks, volunteers retained the ability to perceive capsular SIJ distension.15 Moreover, intraarticular diagnostic SIJ blocks could prove inadequate for detecting patients that could benefit from RF techniques of the lateral branches. Perhaps diagnostic blocks of the lateral branches could prove more proficient, although remarkably in a retrospective study by Cohen et al.,[16] lateral branch blocks did not correlate with positive outcomes. Because the lateral branches "fan out" after they exit the dorsal sacral foramina and neural anastomoses between different levels are present,17 it seems logical to concentrate RF techniques as close to the foramina as possible. Undeniably the size of the RF lesion needed to include the lateral branches will increase with distance from the dorsal sacral foramina. Ultimately, on one hand, equilibrium needs to be reached between the size of RF therapy and treatment result, since longer RF treatments with more tissue destruction will lead to more postprocedural pain and a higher risk of complications. On the other hand, the question remains, can we ignore the anterior innervation of the SIJ when treating SIJ pain with RF procedures?

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INHIBITION OF SOMATOSENSORY EVOKED POTENTIALS DURING SPINAL CORD STIMULATION

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SPINAL CORD STIMULATION (SCS): Spinal Cord Stimulation is a physical therapy largely used for the treatment of chronic pain all over the world. It is essentially based on an electrical stimulation applied at the epidural space of the spinal cord and has the most important indication for the treatment of chronic neuropathic pain syndromes. However, despite the large and increasing use for the treatment of chronic pain patients, its antalgic mechanisms remain largely unknown (Compton et al 2012).

SCS ANTIDROMICALLY ACTIVATES PERIPHERAL NERVE FIBERS: As any other electrical stimulation of the nervous system, SCS creates an ectopic generation of action potentials in the site of stimulation. Characteristically, ectopic generation of impulses is bidirectional, with action potentials travelling orthodromically and antidromically. As far as the SCS is considered, the orthodromic diffusion of the action potentials is mandatory for any supposed antalgic mechanism effected in the forebrain or at higher level. On the contrary, antidromic impulse generation is considered the prerequisite for a segmental, spinal effect, the gate effect included. However, the antidromic diffusion of impulses generated by the SCS is not limited to the collateral branches that interact at lower spinal levels with inhibitory interneurons and/or wide dynamic range neurons. In 1994 Hunter and Ashby published a paper in which they demonstrated that the electrical stimulation of dorsal columns by SCS antidromically activates peripheral nerve (Hunter and Ashby 1994). They found similar responses in sensory, motor and mixed nerve. The possibility to record those antidromic responses in pure sensory nerves confirmed that fibers travelling the dorsal columns are, at least in part, peripheral nerves and, in particular, the central branch of sensory T cells located in dorsal root ganglia. In fact, given that the synapses cannot be antidromically activated, the recordings in peripheral sensory nerve incontrovertibly demonstrated that there are not synapses between the peripheral nerve sensory afferents and dorsal columns nerve fibers. In 2008 our group partially replicated the study of Hunter and Ashby adding more information on latencies, amplitudes and waveforms of those antidromically activated responses in lower limbs.

SOMATOSENSORY EVOKED POTENTIALS (SEPs): The term Somatosensory Evoked Potentials (SEPs) refers to a standard neurophysiological test which assesses the function of the lemniscal (dorsal column) system (Cruccu et al 2008). The technique consists in the repetitive stimulation of a peripheral nerve, usually a mixed nerve, and in the recording of evoked responses at cortical level. SEPs are considered a sort of extension of peripheral orthodromic sensory conduction studies and have not cognitive components.

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Interestingly, the demonstration of the antidromic activation of peripheral nerves by SCS permits to confirm that the stimulations used for routine SEPs and for SCS act on the same, lemniscal system, although in opposite directions. In fact, the latencies of antidromic SCS-evoked responses are comparable to those of both experimental PESS recorded by epidural leads during lower limb nerve stimulation and lower limb routine SEPs obtained from lumbar vertebral sites.

SCS INHIBITS SEPs: In recent years two different research groups signaled that SEPs are attenuated by SCS (Polácek 2007, De Andrade 2010). In 2012 our group confirmed those results and demonstrated that the inhibitory effect of SCS on SEPs has a phasic component because it appears during the adequate electrical stimulation of dorsal columns and immediately disappears when the stimulation is turned off (Buonocore et al 2012). This sudden reversibility of the inhibitor effect suggests that the inhibition can be sustained by a "physical" (not metabolic) effect. In accordance with those considerations, the inhibition of SEPs by SCS can be explained by the neurophysiological mechanism called collision of impulses. Neurophysiological studies have indeed clearly demonstrated that when two impulses travel on the same fibers but in opposite directions they collide and disappear (Kimura 1976, Dumitru 1995).

IMPLICATION OF SCS INHIBITION OF SEPS FOR UNDERSTANDING THE ANTALGIC MECHANISMS OF SCS: The evidence that SCS is able to inhibit SEPs demonstrates that SCS can block the transmission of impulses generated in the lemniscal system distally to the site of stimulation. This demonstration could be important for the comprehension of antalgic mechanisms of SCS, at least for those patients whose pain is mediated by a ectopic discharges in peripheral large diameter-lemniscal system. The role played by the lemniscal system in neuropathic pain pathophysiology has gained new importance since 2008 when a new definition of neuropathic pain ("pain arising as a direct consequence of a lesion or disease affecting the somatosensory system") was proposed by the Special Interest Group of the International Association for the study of Pain (IASP) for neuropathic pain (Treede et al 2008) and later accepted by the IASP. The importance of the new definition relies in the observation that the somatosensory system is composed by both spino-thalamic and lemniscal system. Accordingly, it is now generally accepted that neuropathic pain can be transmitted by action potentials ectopically generated in large diameter fibers, those that in physiological conditions transmit only not painful sensations. The pathogenetic function of large diameter fibers in neuropathic pain was actually not completely new because it had already been signaled for different painful conditions in scattered articles by several authors (Campero et al 1998, Devor 2009).

Conclusion: The new definition of neuropathic pain attributes a clear pathophysiological role to lesions involving the lemniscal system, rarely related to painful conditions in the past. As a consequence, all the treatments that (neuro)modulate the lemniscal systems have gained a possible antalgic mechanism. The demonstration of the antidromic activation of peripheral large-diameter nerve fibers and, above all, of the inhibition of SEPs by SCS opened a new scenario for a better understanding of antalgic mechanism of SCS in peripheral neuropathic pain syndromes.

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MAGNETIC RESONANCE COMPATIBILITY. HOW TO DEAL WITH CURRENT GUIDELINES

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BACKGROUND: Over the last few years, there has been an increase in the use of implantable stimulation systems for the treatment of pain.[1] This technique is based on applying high-frequency electricity to the posterior columns of the spinal cord,[2] the spinal roots,[3] the cerebral cortex,[4] or even some areas of the skin,[5] using percutaneous or surgical leads connected to an implantable pulse generator (IPG). These devices are a great limitation to the performance of magnetic resonance imaging (MRI) scans, as their presence is a contraindication to MRI. In addition, because the world's population is ageing, there is a greater demand for diagnostic MRI, which has become the imaging procedure of choice for many indications. MRI provides enhanced soft tissue contrast, does not alter with bone tissue and may provide three-dimensional anatomical images that are very useful for both guiding diagnosis and treatment. In addition, patients are not exposed to the risks associated with ionizing radiation and iodinated contrasts. For these reasons, MRI is the imaging procedure that has grown the most over the last 10 years.[6] It is estimated that 60 million MRI scans are performed every year worldwide.[7] Implantable neurostimulation systems contain many metal components with ferromagnetic properties. MRI generates a powerful electromagnetic field and radiofrequency (RF) energy that can lead to risks to patients and to the appropriate operation of the device. For these reasons, up to 200,000 MRI scans are not performed in the United States every year because of the presence of an implantable device.[8,9]

Safety guidelines, practices, and policies shall be written,enforced, reviewed, and documented at least annually by the supervising physician. These guidelines should take into consideration potential magnetic field interactions for ferromagnetic objects in the MRI environment[8-11]. They should also consider potential hazards (e.g., from magnetic field interactions, heating, and induced electrical currents) posed by implanted objects and materials within the patient as well as other individuals in the MR environment[9,10].

Therefore, when electrically conductive material (wires, leads, implants, etc.) are required to remain within the bore of the MR scanner with the patient during imaging, care should be taken to ensure that no large-caliber electrically conducting loops (including patient tissue; see section H.5, below) are formed within the MR scanner during imaging.

Furthermore, it is possible, with the appropriate configuration, lead length, static magnetic field strength, and other settings, to introduce resonant circuitry between the transmitted RF power and the lead. This could result in very rapid and clinically significant lead heating, especially at the lead tips, in a matter of seconds to a magnitude sufficient to result in tissue

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thermal injury or burns. This can also theoretically occur with implanted leads or wires, even when they are not connected to any other device at either end. For illustration, the FDA has noted several reports of serious injury, including coma and permanent neurologic impairment, in patients with implanted neurologic stimulators who underwent MR imaging examinations. The injuries in these instances resulted from heating of the electrode tips[11,12].

Kainz et al[13]. examined heating effects on the implants surface, to obtain information on the temperature increase in MRIs in the vicinity of NPGs and their electrodes under realistic conditions. The measurements were performed in a 1.5 T MR Imager from Siemens (*Magnetom*) working at 63.6 MHz. The temperature was measured at four positions: at two points at the surface of the implant. The measured temperature increase of the implant itself was a modest value. An increase of about 0.25_C was shown. But at the lead tip, an increase of 2.1_C was measured

During an MRI exam, the patient is exposed to an electromagnetic radiation in the range of 8.5 to 340 MHz.Thermal effects, due to tissue heating caused by direct absorption of energy from the electric fields, and by induced currents as a consequence of Faraday's law[14] .

These effects constitute the basis of contemporary international safety guidelines, also known as the ICNIRP Guidelines[15] . This also has potential consequences for large implanted metallic devices such as certain metallic nonferrous infusion pumps. Faraday's law states that a moving or changing magnetic field will induce a voltage in a perpendicularly oriented electrical conductor. Lenz's law builds upon this and states that the induced voltage will itself be such that it will secondarily generate its own magnetic field whose orientation and magnitude will oppose those of the initial time-varying magnetic field that created it in the first place.

Thus, moving a large metallic but nonferromagnetic electrical conductor toward the magnet bore will result in the induction of a voltage and associated magnetic field which will orient in such a manner and at such a strength as to oppose the motion of the metallic object into the bore of the MR scanner[16.17].

Two types of magnetic field-induced movement of a metallic device may occur: deflection (translational movement) and torque (rotational movement). Due to the nature of the deflection force and torque, it is possible to isolate each type of movement and measure its magnitude separately. Deflection occurs in a region.

where a spatial magnetic field gradient is present. The deflection force will increase with the magnitude of the gradient. Typically, spatial gradients are greatest near the magnet portal. In contrast, the magnitude of the magnetic torque is proportional to the magnetic field strength. As a result, the torque is largest at the center of the magnet bore where the field gradient is negligible[18].

Active implantable devices containing components that are sensitive to theMR imaging environment can potentially experience alterations in operation. A device may be activated or deactivated when exposed to the static magnetic field, gradients or RF within the magnet bore or in the region surrounding the magnet. Preprogrammed instructions stored in programmable devices can also be altered or erased. Possible effects on device operation were assessed by monitoring device output during introduction to the static magnetic field, during imaging sequences, and after removal[19].

TYPES OF IMPLANTABLE DEVICES ACCORDING TO THEIR STATUS UNDER MRI: Adequate knowledge of the MRI technique and the implanted devices is required in order to manage patients with implanted devices who are to undergo an MRI scan. In the United States, there is a society that tests implantable devices — the American Society of Testing Materials (ASTM). The ASTM classifies devices into the following categories:

· MRI safe;
· MRI unsafe;
· MRI conditional.[20]

An MRI safe implantable system is made with non-conducting materials, has no metal components and is safe in all electromagnetic environments. These three conditions cannot be met in neurostimulation devices. However, there has been great development efforts in MRI conditional devices, to make them as safe as possible for MRI. MRI conditional devices are devices for which no risks or device malfunction have been reported in patients undergoing MRI scans in certain conditions. MRI unsafe devices are those which have been demonstrated to involve a risk of injury to the patient or nearby personnel. The United States Food and Drug Administration (FDA) uses the same classification, dividing implantable devices into safe, unsafe and unproven safety. The FDA has established the new concepts of head-only MRI compatible, full-body MRI compatible and unproven compatibility. Most of the compatible devices according to the FDA belong to the conditional category according to the ASTM.

EFFECTS OF MRI ON NEUROSTIMULATION SYSTEMS: There are three primary factors that can interact with the neurostimulation system:

1. The STATIC MAGNETIC FIELD, causing mechanical effects.
2. The RADIOFREQUENCY PULSES, causing thermal effects.
3. The CHANGES IN THE MAGNETIC GRADIENTS, causing induction effects.

1. MECHANICAL EFFECTS CAUSED BY THE STATIC MAGNETIC FIELD. Most MRI scans are performed at intensity levels of 1 to 3 Tesla (T), compared to the electromagnetic field of the Earth, which is 30 μT. The effect of this magnetic field becomes evident when certain metal objects are attracted to the MRI scanner. For this reason, metal and iron components are being used less in neurostimulation devices. However, they are still present.
2. THERMAL EFFECTS. Radiofrequency (RF) pulses may heat up the tips of the electrodes, as well as the IPG. Electrodes may act as antennae, conducting the energy generated by the magnetic fields to the adjacent tissues in the form of heat. This can result in damage to the tissues around the electrode or the IPG. The strength of the current generated in the electrodes and therefore the heating depend on the so-called SPECIFIC ABSORPTION RATE (SAR), which is a measure of the energy generated by the MRI and the type and position of the electrode.[22]
3. ELECTROMAGNETIC INTERFERENCE. The implanted device can be altered by changes in the magnetic gradients. This would result in changes in stimulation ranges, changes in stimulation parameters, and even in the IPG settings.

The electromagnetic energy generated by the MRI can be conducted through the stimulation system or cause electrical interference with the system components. The source of the electromagnetic energy is the pulsed RF and the variation of magnetic fields over time. The conversion of RF energy into heat and electrical energy depends on several factors: pulse parameters; absorption ranges in the body; spatial relationship of the device; and electrode factors such as composition, geometry, settings and orientation[23-25]. Importantly, electrodes can potentially act as antennae for the electromagnetic energy[26,27]

The final result of interaction will be the result of one, or a combination of the three main components, that make up the MRI environment: a strong static magnetic field including its associated spatial gradient; pulsed gradient magnetic fields; and pulsed radiofrequency fields. For a properly operating system, the hazards associated with direct interactions of these fields and the body of the patient is negligible. The safety concerns arise on the interactions of these fields with medical devices placed within the patients. The effects of MRI upon the different implantable devices and systems, including SCS, are dependent upon the physical mechanisms of action of such fields, i.e., the static magnetic field, the static magnetic field spatial gradient, the gradient magnetic field, and the radiofrequency field. When interacting with the implanted medical device, these fields can induce a rotational force (torque) upon the device, resulting in the tearing of surrounding tissues. Moreover, rotation to align the object with the field, translation force exerted upon the device, and acceleration of the object into the bore of the magnet (the so-called "missile effect"), may also result in tissue damage. Additionally, current induction due to the rate of change of the magnetic flux density over time (tesla/second), may result in device malfunction or failure and radio frequency induced currents may cause device heating and patient burns (thermal and electrical). Less concerning, but yet important, are the effects of the medical device on the operation of the MRI scanner, resulting in poor quality images due to excessive electromagnetic emission. In the presence of an implanted pulse generator (IPG) or lead in or near the imaging field of view, image degradation (distortion, artifacts, etc.) is to be expected.

RISKS TO PATIENTS WITH IMPLANTED NEUROSTIMULATION SYSTEMS UNDERGOING MRI: Many interactions can occur between MRI and the components of the neurostimulation system, including the electrodes, the connections and the IPG.

1. ELECTROMAGNETIC PULL. The electromagnetic field generates a mechanical force on the ferrous components of the devices, generating

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rotation, displacement or dislocation toward the magnet, which can result in significant damage to the patient.[28]
2. HEATING. The MRI generates RF energy which can heat up the electrode, causing significant tissue damage.[22] . Because there are no thermoreceptors at the epidural level, injury due to heating would go unnoticed during the MRI procedure.
3. UNWANTED STIMULATION. The voltage induced during the MRI procedure may cause unwanted and uncomfortable stimulation during the MRI procedure.[29,30]

RISKS TO THE DEVICE: The RF energy is conveyed to the neurostimulator by the electrode. This energy can damage the IPG and result in malfunction, leading to the need to reprogram or even remove the IPG due to:
– loss of communication and telemetry;
– loss of recharge capacity;
– accidental changes in the settings;
– changes in the stimulation parameters.[29]

Safe access to magnetic resonance imaging (MRI) for patients with implantable neurostimulation devices has been a long-standing medical need[22].The first MRI safe implantable neuromodulation system was approved recently in Europe and received CE-marking. Both devices are MRI conditional according to the ASTM. There is a logo on the devices and in the patient and physician information indicating the MRI safety status. Implantation of the MRI system required only slight technique modifications to accommodate the longer leads. These minimal modifications in implant technique are a minor trade-off for availability of safe access to full-body MRI for SCS patients. The torsional stiffness of the leads compensated for the additional length. Lead-related artifacts were insignificant in all of the MRI scan sequences. However, neurostimulator-related artifacts were significant and should be considered when doing abdominal/pelvic imaging.
Conclusion: Given the rapid technological advances, the medical personnel related to neuromodulation (PAIN SPECIALISTS) and imaging procedures (RADIOLOGISTS) should always be up-to-date in the knowledge about approved devices and the specific conditions for certain diagnostic procedures.

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SENSOR-DRIVEN POSITION-ADAPTIVE SPINAL CORD STIMULATION

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Spinal cord stimulation (SCS), also known as dorsal column stimulation, is effective in relieving chronic pain in neuropathic, vascular and some visceral pain entities. While the mechanism(s) for effecting pain relief may be complex, SCS effects are mediated through stimulation of the dorsal column sensory fibers. The dorsal column consists of large-diameter, heavily myelinated, high conductance sensory (Ab) fibers mediating tactile sensation and proprioception from the extremities and the trunk. Conventional stimulation of these fibers results in paresthesiae in the dermatomal areas supplied by these fibers. The dorsal column fibers are somatotopically organized such that primary sensory afferent projections of peripheral fibers are most medial for the most sacral fibers. As more cephalad located fibers enter the dorsal column of the spinal cord, they are located immediately lateral to the fibers corresponding to the lower dermatome[1].

Successful SCS depends on proper lead positioning. With conventional SCS, the endpoint is overlapping paresthesiae to the area(s) of pain, with an overlap of 80% or better sought in publications. Stimulation of dorsal column fibers result in paresthesiae that are often reported as pleasant in patients with SCS responsive pain. This is typically achieved by placing SCS leads as close as possible to the physiologic midline of the spinal cord. Leads placed too lateral would likely stimulate dorsal roots as they insert into the dorsal horn of the spinal cord. Stimulation of dorsal root fibers is known to cause discomfort as these induce a spasticity reflex resulting in anterior motor root stimulation and muscle contraction[1].

SCS induces action potential in the stimulated fibers. The current travels from the leads through the dura and the dorsal cerebrospinal fluid (dCSF) to the target nerves. However, around 90% of the current is dispersed in CSF and the thicker the CSF the higher the likelihood of unpleasant dorsal root stimulation. Positional changes affect the distance between the SCS lead(s) and the neural targets in SCS, particularly due to changes in dCSF thickness. CSF depth is not only different in various areas of the spinal column but also changes depending on position[2]. For instance, the prone position or lumbar spinal flexion result in increases in dCSF whereas in the supine position and in lumbar spine extension, dCSF is decreased[3]. Increasing dCSF results in less efficient stimulation whereas decreasing dCSF may result in overstimulation or jolting. Understimulation or overstimulation result in unpleasant perceptions and often require manual adjustment by patients of stimulation amplitudes.

Position adaptive stimulation involves the use of a 3-axis accelerometer and associated software, housed in the implantable programmable generator. While the relevant position changes occur at the lead tip, strong correlation was found with position changes detected in the generator. The system provides automatic adjustments for six positions: sitting or standing upright; lying supine; lying prone; lying on the right side; lying on the left side; and upright and active. After a period of conventional stimulation (usually on the order of 4 weeks) during which stimulation patterns are "learned" by the device, position-adaptive stimulation is activated. Position adaptive stimulation has been shown to result in decreased need for adjustments for patients and a more pleasant SCS experience[4].

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OPTIMAL HYGIENE FOR PERIPHERAL AND CENTRAL BLOCKS

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Even if their frequency is very low, infectious complications may occur with any regional anesthetic technique (peripheral and neuraxial). Moreover, the reported cases could be potentially severe. Therefore, prevention and precautions against the transmission of infection between patient and anesthetist or between patients (cross contamination) should be an important part of our practice.

- "Essential Components" Necessary for Proper Aseptic Technique Hand hygiene should be considered as the essential point for the prevention of infection. Hydroalcoholic solutions should be preferred to nonalcoholic antiseptics or to standard nonantimicrobial soaps (1,2). Wearing a surgical mask, a hat, and sterile gloves should always be respected (3). Antiseptic for skin disinfection: Alcoholic solutions have better antiseptic properties than aqueous solutions. Chlorhexidine would be more effective than iodine solutions.
- Specific techniques to prevent infectious complications related to neuraxial techniques (4): conducting a history, physical examination, and preprocedure laboratory evaluation; use and selection of neuraxial technique; use of sterile occlusive dressings at the catheter insertion site; use of a bacterial filter during continuous epidural infusion; limiting disconnection and reconnection of neuraxial delivery systems; management of an accidentally disconnected catheter; and limiting the duration of catheterization
- Perineural Catheter: Colonisation of perineural catheters is relatively common and infectious complications in patients with perineural catheter are regularly reported. The stay in intensive care unit, the duration of catheter use more than 48 hours, the absence of antibiotic prophylaxis, axillary and femoral location, the frequent changing of the dressing are reported risk factors (5).
-Ultrasound-Guided Procedures: Ultrasound-Guided Regional Anesthesia is becoming commonly used for block placement. Ultrasound probes are reusable instruments, which are ideal vectors for cross infection if not correctly protected and/or cleaned. The Spaulding classification for medical devices suggests that a non–protected probe could be considered as a "semi-critical" object that necessitates a high level of disinfection. To prevent the risk of cross contamination a strict antiseptic preparation of the probe should be considered. Before each procedure, the probes, cables and wires must be wiped, cleaned, and disinfected. The entire apparatus must be cleaned on a regular basis. The use of a sterile, single-use cover dedicated and adapted for the probe would be a right solution to protect it. This use permits a low level of disinfection of the probe between each patient, in the event of no perforation or tear of the cover during the procedure or its withdrawal. In the event of a crack or tear of the cover or of a soiled probe, a higher level of disinfection should be done. The probe must be cleaned with a detergent, and then be rinsed, dried and stored in a clean place at the end of each operating room program (6). At final point: sterile and single-use gel is recommended.

TABLE. Spaulding's Classification of medical devices and required level of processing

Application	Level of risk	Process
Enters sterile body tissues, including the vascular system	Critical	Sterilization or High-level disinfection
Comes in contact with non-intact skin or mucous membranes	Semi-critical	Intermediate-level Disinfection
Comes in contact with intact skin	Noncritical	Low-level Disinfection

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PERIPHERAL NERVE BLOCKS OF THE UPPER LIMB WITH ULTRASOUND-GUIDANCE: SUPRACLAVICULAR VS. INFRACLAVICULAR VS. AXILLARY APPROACHES

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Supraclavicular block: Supraclavicular approach is mostly indicated for distal humerus and elbow surgery although it can be used for analgesia of the entire upper extremity including the shoulder [1]. The plexus is localized at the level of trunks/divisions which are visible in ultrasound as groups of hypoechoic nodules between scalene muscles lateral and cranial to subclavian artery. Local anaesthetic injections between these structures may anaesthetize the entire brachial plexus, however in some patients the most caudal components of the plexus may be difficult to reach [2]. Another advantages of this approach is the avoidance of diaphragmatic paresis when using smaller volumes of local anaesthetics and lower incidence of neurological complications than after interscalene block [3,4].

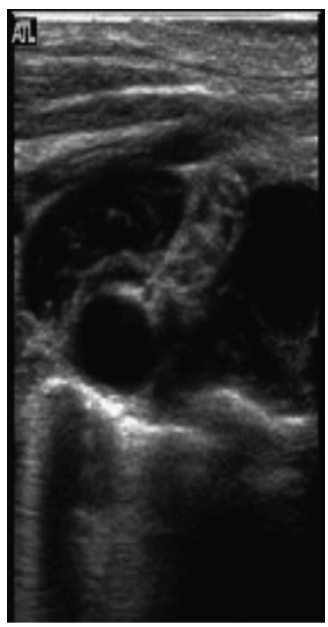

FIGURE 1. Infraclavicular BP

Infraclavicular block: This is a deeper approach used mostly for surgery distal to the elbow [2]. The plexus lies beneath the pectoral muscles. Axillary artery is a main landmark for injection. Lateral cord of the plexus is often visible, but the posterior and the medial cords may be more difficult to see. Two injections of local anaesthetic are usually made, one dorsal and one cranial to the axillary artery, however a single injection dorsal to the artery may be just as effective [5]. The volumes of local anaesthetics for the supra and infraclavicular approaches are also higher than for the axillary approach, usually between 30 and 40 ml.

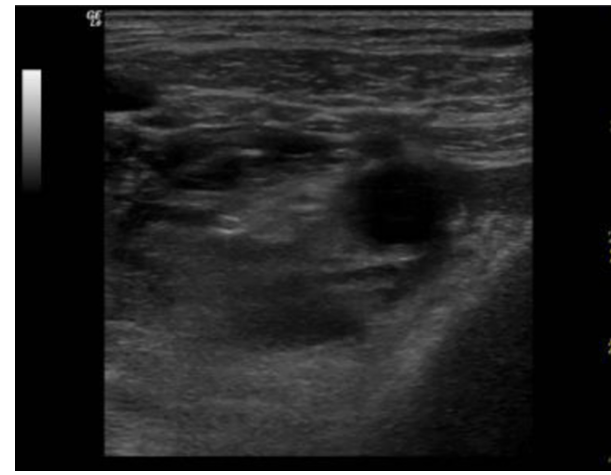

FIGURE 2. Infraclavicular BP

Axillary block: This is a block of 4 terminal nerves of the brachial plexus, mostly used for hand surgery. It is an alternative to the infraclavicular approach, which may be advantageous in obese or heavily buidt patients. It also allows major LA dose reduction [6] and may be less painful than the infraclavicular approach [7]. The nerves are hyperechoic, non-pulsatile and non-compressible. The musculocutaneous nerve is either seen between the short head of biceps and the coracobrachialis muscle or inside the coracobrachialis muscle. The median and the ulnar nerves are located superficially respectively cranial and caudal to the axillary artery. The radial nerve lies deeper, usually caudal to the artery and is most difficult to visualize.

Conclusions: These three approaches to the brachial plexus may used for surgical anaesthesia and pain management of the entire upper limb. Ultrasound-guidance facilitates block performance, increases block effectiveness

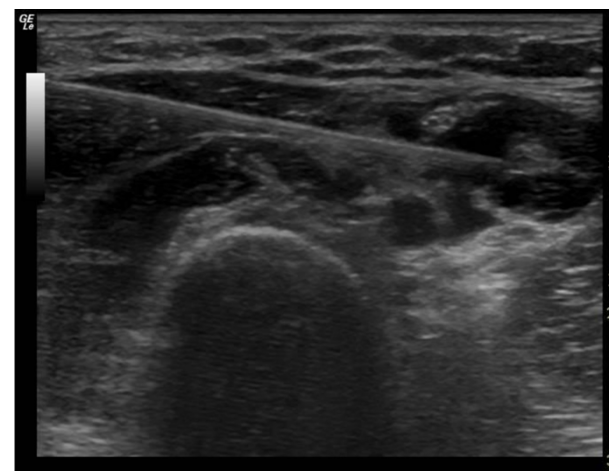

FIGURE 3. Axillary BP

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and reduces volumes of local anaesthetics. Ultrasound may also reduce the incidence of complications, but for the time being there is not enough data to confirm this hypothesis.

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ANTIMETASTATIC POTENTIAL OF AMIDE-LINKED LOCAL ANESTHETICS: INHIBITION OF LUNG ADENOCARCINOMA CELL MIGRATION AND INFLAMMATORY SRC SIGNALING INDEPENDENT OF SODIUM CHANNEL BLOCKADE

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Background: Lung cancer is the leading cause of death from cancer in males and the second leading cause of death in females[1]; effective treatment remains a challenge and requires a multidisciplinary approach. Even after complete tumor resection including radical lymphadenectomy, there is still a high rate of relapse due to undetected micrometastasis[2-4]. These newly formed metastatic sites might be a consequence of hematogenous dissemination of cancer cells occurring during the surgical resection[5]. Circulating tumor cells, detected in the blood 24 hours post-operatively, are an independent prognostic marker for cancer recurrence because of the ability of these cells to extravasate and metastasize[6]. The perioperative period might therefore be a therapeutic "window of opportunity" that should not be missed.

Regional anesthesia with local anesthetics in combination with general anesthesia is commonly used in patients undergoing tumor resection of the lung[7]. It is well known that amide-linked local anesthetics – as opposed to the ester-linked compounds – can exert inhibitory effects on inflammatory processes[8], e.g., as ropivacaine has been shown to attenuate experimental lung injury *in vitro* as well as *in vivo*[9]. Also, the systemic use of lidocaine in patients undergoing colorectal surgery led to a decrease in inflammatory cytokine release as well as a shortened length of hospitalization[10].

There is increasing evidence that inflammatory mechanisms may play an important role in the development and growth of cancer metastasis[11]. Cytokines such as Tumor Necrosis Factor-α (TNF-α) increase the expression of Intercellular Adhesion Molecule-1 (ICAM-1), a cell surface receptor required for leukocyte adhesion[12] and tumor invasion[13], in the NCI-H838 non-small cell lung cancer (NSCLC) cell line[14]. ICAM-1 also facilitates tumor cell extravasation via the binding of neutrophils[15]. TNF-α is known to induce activation of Src protein tyrosine kinase, which functions as a regulator of endothelial permeability[16]. Src-mediated phosphorylation of ICAM-1 is necessary for neutrophil adhesion to the endothelium during acute lung inflammation and injury[17], a process considered to induce vascular hyperpermeability[12]. Additionally, Src is involved in signaling epithelial-to-mesenchymal transformation and extravasation of cancer cells[18,19], processes that are necessary for solid tumor metastasis[20].

Recently published retrospective analysis of patients undergoing cancer surgery showed a possible benefit of the perioperative use of regional anesthesia. Long-term survival after colon cancer surgery[21] and cancer recurrence after radical prostatectomy for prostate cancer[22] or breast cancer[23] were significantly improved by epidural anesthesia/analgesia compared to patient-controlled analgesia (PCA) with opioids. The mechanism by which regional anesthesia might prove to be beneficial at the molecular level in this context is not yet known. We hypothesized that this effect might be related to the anti-inflammatory properties of local anesthetics.

The primary goal of this study was to determine whether amide-linked local anesthetics (ropivacaine and lidocaine) attenuate TNF-α-induced Src activation and ICAM-1 phosphorylation in NCI-H838 human lung cancer cells and whether these effects are due to the inhibition of voltage-gated sodium channels (VGSC). Secondly, we examined whether lidocaine, ropivacaine, or chloroprocaine inhibit migration of this cancer cell line *in vitro*.

Methods: NCI-H838 lung cancer cells were incubated with Tumor Necrosis Factor-α (TNF-α) as the inflammatory stimulus in absence or presence of ropivacaine, lidocaine, or chloroprocaine (concentrations ranging from 1 nM –100 μM). Src-activation and ICAM-1-phosphorylation in whole cell lysates (Western blot) as well as the cells' ability to migrate were assessed. Additionally, the role of voltage-gated sodium-channels (VGSC) in the mechanism of LA effects was also evaluated.

Results: Ropivacaine treatment (10 μM) of NCI-H838 cells for 20 minutes decreased basal Src activity by 48% (p=0.022), and both ropivacaine and lidocaine co-administered with TNF-α significantly decreased Src-activation as well as ICAM-1-phosphorylation, whereas chloroprocaine had no such effect. Migration of the lung cancer cells at 4 hours was inhibited by 28% (p=0.046) in presence of 1 μM ropivacaine and 24% by 1 nM lidocaine (p=0.01). Experiments with agonists (veratridine) and non-LA-antagonists (tetrodotoxin) illustrated that the observed inhibitory effects of the amide-linked LA on Src-dependent signaling were independent of VGSC inhibition.

Conclusions: Thus far, the potential beneficial effect of regional anesthesia to improve long-term outcome after cancer surgery has been attributed to inhibition of the surgical stress response and to the decrease in opioid requirements. It has been shown, that opioids even at clinically useful concentrations might promote migration and proliferation of tumor cells, e. g. in breast cancer[24,25]. This work reveals to the best of our knowledge a possible mechanism by which amide-linked local anesthetics might be beneficial in patients with cancer and/or undergoing cancer surgery and that this mechanism may be due, at least in part, to inhibition of Src tyrosine protein kinase, a key enzyme in cancer cell extravasation, growth and metastasis. Additionally, the observed effects are apparently independent of sodium channel inhibition. Future studies will focus on establishing the molecular mechanism of Src inhibition and the influence of this inhibition on ICAM-1 phosphorylation and function with comparison to established Src inhibitors.

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IMPACT ON COSTS

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Reports from the Organisation for Economic Cooperation and Development (OECD) have shown that in the last decades every industrialised country witnessed a significant increase in healthcare costs (1). Therefore, any effort to further reduce healthcare cost is highly appreciated. Economic evaluation of healthcare processes and treatments (cost-minimisation analysis, cost-effectiveness analysis, cost-benefit analysis) are of pivotal importance and decision-makers ask for relevant information concerning resources consumption and direct and indirect costs associated with different healthcare processes. (2)

Anaesthesia has been shown to have a marginal impact on direct costs in a surgical patient treatment, representing estimated costs of 5.6% of common surgical procedures. (3-5) However, in times of financial constrains anaesthesia expenses are also target for cost management. (2) Fast-track procedures in anaesthesia for ambulant surgery have been introduced to decrease in-hospital associated costs. (3) Although, its impact on indirect costs through a reshaping of the whole perioperative cares has not been extensively investigated so far.

The use of recovery discharge criteria for surgical outpatients with the concept of bypassing the post anaesthesia care unit (PACU) after regional anaesthesia has been associated with significant hospital cost and time savings with workload reduction over general anaesthesia in several outpatient orthopaedic surgery models. (2,7-9) However, pain and postoperative nausea/vomiting (PONV) are the top two reasons for prolonged hospitalization (4) or rehospitalisation (6) after ambulatory surgery with potentially negative impact on cost saving efforts of ambulant surgery programs.

This lecture will analyze the advantages of regional anaesthesia over general anaesthesia concentrating on the ambulant setting for orthopaedic surgery.

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IMPACT ON ORGAN PROTECTION

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Since the introduction of general anaesthesia and the first description of the use of spinal anaesthesia in humans, our specialty has evolved tremendously from being a service to the surgeons to a self-confident and patient-centered specialty with strong research facilitating evidence-based medicine. Today, we know – proven by clinical and experimental research as well as by the individual anaesthesiologist's experience in everyday practice – that the impact of the care we deliver to our patients goes way beyond inducing hypnosis and providing analgesia. We are actually able to positively influence our patients' outcome by choosing the "right" anaesthetic regimen.

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Regional anaesthesia and local anaesthetics: Regional anaesthesia, either used in combination with general anaesthesia or as the main anaesthetic technique and the continuous research and improvement of those techniques have led to the discovery of several beneficial effects: First of all, it has been shown that the use of regional anaesthesia are superior in terms of analgesia and adverse effects as compared to systemic opioids, e.g. in patients undergoing general, thoracic, gynecological, orthopedic or laparoscopic surgery[1]. Although still controversial, there is also some evidence that the perioperative use of regional anaesthesia might also be helpful in preventing the development of a chronic pain syndrome[2,3]. Regional anaesthesia, either as a continuous epidural catheter or a paravertebral block, has been shown to not only reduce opioid demands but also to decrease atelectasis and rate of pneumonia, improve recovery, thus improving patients' overall outcome[4,5]. In orthopedic surgery, where many procedures are performed under regional anaesthesia, patients undergoing total hip or knee replacement seem to benefit from the use of these techniques not only via the reduction of the operating time or the need for transfusion, but also from a significant attenuation of the risk of thromboembolic events as well as pulmonary embolism[6]. It is also well known, that regional anaesthesia has a beneficial effect on the patients' bowel function concerning recovery and prevention of constipation. Interestingly, these effects could not only be observed after the application of an epidural catheter but also after continuous intravenous infusion of the local anaesthetic lidocaine in patients undergoing colorectal surgery[7]. Evidence from animal experiments suggests, that systemic, anti-inflammatory effects of local anaesthetics might improve organ microcirculation, especially in the abdomen during sepsis[8-10]. Such properties of the local anaesthetics might be a possible explanation of the reported improved outcome of patients undergoing surgery for prostate, breast or colorectal cancer in terms of less recurrence and metastasis[11-13]. A very recent *in vitro* study from our own group showed, that the amide-linked local anaesthetics are able to attenuate inflammatory signaling cascades inside the tumor cells, which are crucial in the process of metastasis[14].

Volatile anaesthetics: Volatile anaesthetics have been proven to have protective properties on various organs, which exceed their known effects on patients' vigilance and on the circulatory system. A various number of studies have demonstrated cardio-protective effects of volatile anaesthetics[15] and the effects of either pre- or postconditioning in this setting have been studied extensively[16]. In the lung, volatile anaesthetics are able to induce organ protection: sevoflurane compared to intravenous propofol decreased levels of serum markers for cellular ischaemia-reperfusion injury and increased hemodynamic stability after thoracic-aortic occlusion in pigs[17], although it did not change the severity of remote acute lung injury in this model[18]. There is more evidence that sevoflurane might have protective effects on the lungs, e.g. in isolated rat lungs in ischaemia-reperfusion injury[19] or in experimental models of acute lung injury *in vitro* and *in vivo*[20-22]. A prospective clinical study with patients undergoing thoracic surgery with one-lung ventilation reported a significant reduction of inflammatory mediators as well as of postoperative pulmonary complications by sevoflurane as compared to propofol[23].

Intraoperative decreases in liver perfusion may result in a worsened outcome, especially during partial liver resections using the Pringle manoeuver (clamping of the hepatic artery and the portal vein in the hepatoduodenal ligament)[24]. Thus, it is of great importance for the anaesthesiologist to know how to avoid an ischemic injury to the remnant liver, e.g. via pharmacological preconditioning using sevoflurane. Results of a study from our own group showed a significant reduction of liver transaminases and postoperative complications in patients undergoing liver resection with inflow obstruction after pre-conditioning with sevoflurane compared to an anaesthesia exclusively maintained with intravenous propofol[25].

The role of volatile anaesthetics in cancer progression, recurrence and metastasis has still not been determined completely and remains controversial[26]. There is supporting evidence that these substances might either indirectly influence cancer cell spread via the modulation of the neuroendocrine and immune function or directly by modulating the expression of inflammatory mediators such as hypoxia inducible factor-1α (HIF-1α)[27,28] and vascular endothelial growth factor (VEGF)[29]. However, we have shown that the production of matrix metalloproteinases (MMP) by neutrophils is attenuated by volatile anaesthetics, thus possibly impacting on tumor cell extravasation[30].

Conclusions: Despite providing stress-free anaesthesia and sufficient perioperative analgesia to our patients, we anaesthesiologists are able to improve our patients' outcome by choosing the best anaesthesia regimen that fits our patient and his co-morbidities as well as the surgery planned. Thus, it is of great importance for the anaesthesiologist to know about the potential effects of the drugs he uses in his daily practice. These effects might go way beyond the induction of hypnosis or the reduction of pain and might have a huge impact on the individual patient's outcome.

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IMPACT ON OUTCOMES (LONG TERM POSTSURGICAL FUNCTION)

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INTRODUCTION: The patient undergoing orthopedic surgery rises the dual problem of the mandatory success on the functional status of surgery and pain exacerbation during joint movements required to obtain the expected result. The postoperative pain is justified by the overriding interest of the latter in the local or systemic consequences of surgery. The occurrence of perioperative physiological disturbances (cardiac, respiratory, neuropsychiatric) is usually found [1]. Reducing their impact through the use of a well done analgesia is widely accepted. [2] Although interest in terms of morbidity, an effective postoperative analgesia, continuous or not, could be formally reported in populations at risk [3, 4], the purpose of this analgesia is placed on the patient comfort level and especially the optimization of the early postoperative rehabilitation, the only guarantee of a good clinical and economic approach [5]. Regional analgesia techniques improve the surgical prognosis (outcome of surgery, duration of the postoperative phase) because they allow a more intense physiotherapy responsible for painful exacerbations [6]. The creation of a specific clinical pathway for orthopedic surgery, involving early and intensive physiotherapy care and pain control, mobilization by the establishment of an active program of regional analgesia, is one the of main objectives to ensure an optimal outcome in the medium term and substantial savings for the health care facility [7-9].

EARLY POSTOPERATIVE REHABILITATION: Early functional rehabilitation can restore a natural body function to allow easy and safe daily activity (flexion, extension, rotation). Postoperative mobilization generates an exacerbation of pain scores, promotes its rejection by the patient and results in prolonged immobilization of the joint [10]. The consequences of this were clearly demonstrated: bone resorption and reduced bone calcium mass, biochemical and ultrastructural changes in the cartilage, decreased resistance to ligament rupture, decreased protein synthesis with atrophy [11-13]. These changes are clinically present in 3 to 5 days and may be permanent after eight weeks. Active or passive mobilization is a key limiting factor of muscle-tendon adhesions, muscle atrophy, hemarthrosis and thromboembolic complications after surgery of the hip and knee. The fight against the painful episodes related to these mobilizations is a guaranty of surgical success.

FACTORS AFFECTING THE FUNCTIONAL RESULTS: It is essential to focus on the factors that are the cornerstone of the success of functional outcome in perioperative major orthopedic surgery.

- The "timing" of the rehabilitation period is important to consider. It must be early, progressive, initiated on the parameters of recovery of muscle strength and function of the joint, with limited time in the day periods (three periods of forty to sixty minutes) (14, Figure 1). Over the ERAS (Enhanced Recovery After Surgery) program is started, the sooner rehabilitation is effective and shortened stay.
- The type of surgery and how it is performed substantially interfere on the quality of postoperative functional recovery. Salmon and colleagues [15] in a prospective study of 160 patients, found an improvement of functional outcome, fatigue decerease and daily pain one month and six months after total hip or knee surgery. The authors note a difference in the quality and speed of recovery that prove more difficulties for knee arthroplasty (Figure 2, panels A and B). Similarly, the minimally invasive surgery reduces muscle deformities, and optimizes the quality and timeliness of post-operative rehabilitation.
- In case of fracture requiring hip replacement, the type of fracture and the patient's age. The unstable intertrochanteric fractures and the circumstances of their support (delay) increase the risk factors independently for mortality and poor postoperative recovery [16,17]. Patients in the fourth age (90-100 years) have little chance of functional recoveryaand are subject to frequent decompensation of their pre-existing conditions or delirium in the post-operative [18-20].
- The specific treatment of joint surgery patients by specialist staff (geriatricians, physiotherapists, psychologists) in the pre-and postoperative period improve significantly successful functional recovery [21,22, 23,24]. The concept of prehabilitation emerged recently. This support combined physiotherapy, psychological preparation, diet and insists on working in strength and endurance, with an avowed goal is to improve muscles performance before surgery (23,24). The preoperative preparation improves conditions for postoperative rehabilitation in muscle strenght and function and allows a reduction of postoperative pain. In this context, the rehabilitation intensified by the resistance work or electrical muscle stimulation and walking are highly recommended [25,26]. It is now well demonstrated on the one hand that the use of early automated continuous physiotherapy improves functional outcome of joint knee or hip surgery and decreases hopsital stay [25] and secondly that the implementation of an individualized multimodal postoperative rehabilitation program improves functional outcome of surgery for TKA and THA while allowing a significant reduction in hospital stay [26]. Individualized programs of “Fast Tracking” allow a reduction in hospital stays, improved postoperative quality of life, but require a large staff of physiotherapy, not necessarily available in all structures of care (27,28) .
- Patients sex has little influence on the quality of postoperative recovery

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- Perioperative Anemia: Few studies interested, so far, the impact of anemia on postoperative rehabilitation in the short and medium term after surgery. In a study including 208 patients after THA, the authors studied three groups: a placebo group, a group receiving erythropoietin for 14 days and a group receiving erythropoietin for 9 days [29]. The hemoglobin level, which was the main variable evaluated, increased in proportion to the number of days of erythropoietin but he did not find any difference in fatigue or performance of patients. No test or exercise performance, however, was evaluated. Lawrence et al. [30] studied a cohort of 5793 consecutive patients in 20 hospitals. The main result of this work was the linear improvement in physical performance of patients (within walking distance) with increasing levels of hemoglobin per red blood cell transfusion. This study demonstrates a causal relationship between the correction of anemia and improvement of postoperative rehabilitation (Figure 3). Conlon and colleagues [31] found in 87 patients undergoing THA a very clear relationship between the level of hemoglobin in the eighth postoperative day and quality of life of patients, assessed by SF-36, in the weeks following surgery (Figure 4). However the goal of functional rehabilitation technique based solely on reduction of hospital stay should be extended to more indicators for functional prognosis. Studies focusing on the recovery of range of motion in the first place, now supplanted by the evaluation scores given in charge of a patient or postoperative quality of life are now required to assess the contribution of a technical or analgesic rehabilitation program [7, 32]. The amplitude of a normal knee is 0 to 130 °. Flexion of 67 ° is required for the hip. It therefore seems obvious to collect the maximum degree of flexion achieved in a patient in the immediate post-operative recovery period. The multifactorial nature of this approach involves the type of surgery, duration of surgery, the importance of preoperative range of motion, the intensity of the therapy and the degree of analgesia provided. Both studies emphasize the interest of focusing needs against expected results. Colwell et al [33] reported that the use of 10 to 20 hours per day with passive continuous mobilization started at 30 ° of flexion and then increased by 10 ° day after knee rplacement surgery reduces postoperative hemarthrosis, generates a faster recovery of motion and accelerates rehabilitation with a decrease in average duration of hospital stay. Aarons et al [34] studied two consecutive rounds of 40 and 23 respectively replacements of hip and knee. Functional recovery was optimal and minimal pain generated for PTH 7 and 50 days. Instead patients undergoing knee had relatively little functional improvement at 50 days because of the very large pain in the perioperative period. One can also note that the use of a continuous passive motion, early work from the afternoon or the day after surgery can improve joint and functional performance in the medium term and a decrease postoperative pain (35). Edema and retention of intra-articular knee blood legitimately hamper rehabilitation and increase postoperative pain. These must be carefully monitored as part of a surgery without drains. The introduction of ice packs on the affected joint and postoperative continuous femoral block are two independent factors for a significant reduction of edema and analgesics.

THE CENTRAL ROLE OF THE ANAESTHETIST: WHAT KIND OF ANALGESIA?: The best analgesic approach to ensure quality of physical therapy is multimodal. The concept of multimodal analgesia is fundamental. The addition of the sites of action can counter the nociceptive, synergistic or additive associations, reduced doses of each analgesic and thus their side effects. These associations may be systemic or regional.

Systemic analgesia

PCA Morphine

It is suitable for intra-and inter-individual consumption of morphine by offering a high level of satisfaction. It allows only partially pain relief and is responsible for frequent side effects. Syngelin et al [36] reported, as other authors, limitation in movements after hip replacement and a 58% incidence of side effects associated with the method (29% nausea, vomiting, 19% urinary retention, 5% sedation). 48% of elderly people are able to use conventionally a PCA morphine (32% of the patients refused and 26% have a disability). Systemic analgesia is better than opiate by the IM route. In one of the few studies comparing patient-controlled analgesia and intramuscular, Colwell et al [33] in a randomized series of 195 patients undergoing hip and knee arthroplasties reported no significant difference between the groups regarding the quality of analgesia, the walking distance, the patient's mobility in bed, the ability to chair transfer and hospital stay.

Nonsteroidal anti-inflammatory

NSAIDs need to be used when the inflammatory part mediated by the surgery is important. Joint surgery is the stomping ground of NSAIDs. The choice of NSAID, through early mobilization, is based on the availability of a parenteral form and on its possible central analgesic action. Ketoprofen is used as IV dosage from 0.75 to 1 mg / kg twice daily. It provides effective analgesia for 8 hours in 67% of cases [37]. Renal safety of NSAIDs looks good in the absence of pre-existing condition and is limited to a transient increase in blood urea in 20% of patients. However, the increased probability of acute renal failure with age must make careful about the irrational use of these molecules. Similarly the role of anti-inflammatory currently demonstrated with continuous peripheral nerve blocks with local anesthetics is intended to reduce NSAIDs doses for the same functional outcome for the patient [38-40].

Epidural analgesia

The perimedullar techniques provide a satisfactory result in terms of rehabilitation but the price to pay is significant side effects. The local anesthetic association to low dose opiate allows the best compromise between quality of analgesia and limiting side effects. A larger joint mobilization is obtained during the first 72 hours. The walking ability of patients on average can be one day earlier than patients receiving intravenous morphine. A shorter hospital stay was also recorded. However in the majority of the studies, all patients were monitored in a pain clinic for three days (2% to 5% of episodes of respiratory depression and urinary indwelling catheter for all patients). On a large group of 262 patients, Williams-Russo et al [41] studied the early postoperative outcomes after knee replacement. The rehabilitation protocol for all patients was made on the first day with postoperative continuous passive motion and from the second day with physiotherapy exercises. Compared to a conventional analgesia, the choice of postoperative epidural analgesia has achieved some goals of functional recovery earlier as assisted stair climbing (7.9 ± 3.1 versus 9.5 ± 4.9 days, $P < 0.002$) and knee flexion to 90 ° (6.9 ± 2.1 versus 7.8 ± 3.2 days, $P < .03$).

CPNB

Painful paroxysms during postoperative rehabilitation associated with muscle spasms, are the main obstacle to early physiotherapy good quality, guaranteeing a good functional outcome. Despite the questions about the usefulness of a continuous block with respect to a block as a single injection [42,43)], the majority of studies confirm the much higher efficiency of a perineural catheter compared to other techniques after orthopedic surgery [44-47]. Very recent studies reinforce the place of the perineural catheter in the perioperative context of early functional rehabilitation after joint surgery. The interscalene analgesia catheter provides optimal relief better than PCA morphine, especially with PCA mode on catheter, which allows an improvement in the quality of early postoperative functional rehabilitation [48-50], although early joint mobilization is not currently recommended routinely after major shoulder surgery. On the lower limb, studies have confirmed the link between functional outcome and multidisciplinary management including such techniques of analgesia and intensive rehabilitation programs. A series of 62 patients received intravenous PCA morphine, anti-inflammatory and an ilio-fascial catheter after total knee arthroplasty. Three groups, randomized, were individualized depending on the drug administered in the perineural catheter at a flow rate of 10 ml / h (placebo groups, 0.1% bupivacaine and 0.2%) for a period of 48 hours. A morphine-sparing was found and increased range of motion in the early postoperative period. Early benefits achieved did not influence the result at six weeks [51]. In the hands of experts or non-experts the quality of analgesia and duration of hospitalization are optimized when a femoral catheter and a continuous block is used postoperatively (52,53). It is obvious that these very interesting results should be reviewed in the light of new data on hospital stays with new infiltration techniques of peri-and intra-articular injection of local anesthetics.For hospital stays, B Ilfeld and colleagues [52-54] clearly shown a benefit of the use of perineural catheter after surgery of the knee, shoulder or hip. These authors found an optimization in postoperative rehabilitation getting three functional criteria in patients undergoing TKA. Hospital stay is 46 H earlier in patients receiving a femoral catheter compared to those receiving PCA morphine [53]. This results in improving the quality of postoperative functional outcome of patients undergoing THR or TKR were also reported by Hebl and colleagues [55] and have motivated the development of North American recommendations on the need to "Total Joint Regional Anesthesia Programs ".Infiltration of high doses of local anesthetics demonstrated interesting results compared to other techniques . 200 to 300 ml ropivacaine 2mg/ml associated with ketorolac and epinephrine were injected in the knee or hip joint [56,57]. The authors demonstrated a significant improvement in postoperative analgesia and walking distance compared to systemic but also relative to a femoral block or epidural analgesia. The simplicity of the technique therefore argued in its favor. More recent studies focused

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on knee and hip surgery for quality of life and functional outcome challenged these findings and bring to the forefront the interest of continuous nerve blocks [58,59]. One of the limitations in the use of continuous nerve blocks is the risk of limitation of muscle strength for postoperative rehabilitation. This phenomenon is not directly related to the femoral block and must be thoroughly analyzed (60).

CONCLUSION: The best functional outcomes for our patients go through a postoperative rehabilitation after orthopedic surgery and complete organization. Creating acute pain services or structures for a comprehensive approach including all health care providers (patient, nurse, therapis, surgeon, anesthesiologist)is mandatory. Further studies are needed to analyze the impact of our practices on functional outcome.

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RA DATABASES AND DOCUMENTATION

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Many in regional anesthesia strongly believe that regional anesthesia has significant benefits. Without doubt regional anesthesia is superior to systemic measures in most relevant areas of acute pain treatment. However, "benefit" is ill defined and has many facets. Benefit has for at least over 50 years been accepted if it could be shown in randomized controlled trials (RCT). Among reasons, why RCTs cannot always answer questions are selection bias, low incidence rates of severe complications, difficult outcome measures, publication bias or costs. Moreover, the typical methods to summarize RCTs with metaanalytical techniques clearly has limitations. Therefore, the importance of analysis of registries in regional anaesthesia, in which real life treatments

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are documented, may also increase [1]. High quality registry studies have been described as being at the core of quality control and clearly overcome at least some of the shortcomings of RCTs. Incidence rates around a few percent may need > 10.000 patients to show a benefit or differences between treatments. This will hardly be achieved in regional anesthesia trials.

Mortality: Regan et al. [2] assessed mortality and complications in a cohort of 12,646 men undergoing hip fracture surgery during 1998 to 2005 and identified general anesthesia as a risk factor for mortality in adjusted models. van Lier [3] analyzed 541 consecutive patients undergoing major abdominal surgery with chronic obstructive pulmonary disease and found that pneumonia rates and 30day mortality is lower in propensity score adjusted patients having had epidurals. Neuman et al. [4] analyzed hip fractures in New York. Within two years 18,158 patients were treated in 126 hospitals. Regional anesthesia was associated with a lower adjusted odds of mortality (OR 0.71,

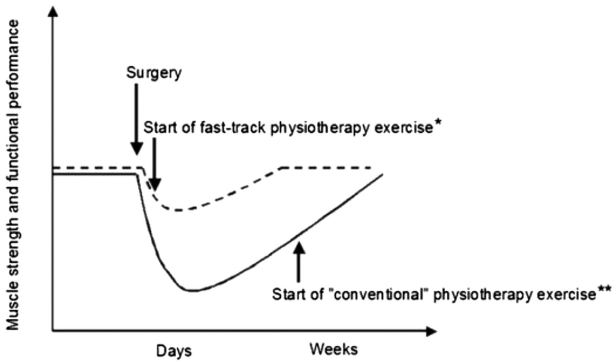

FIGURE 1. Principles of fast track physiotherapy exercise after THA and TKA.

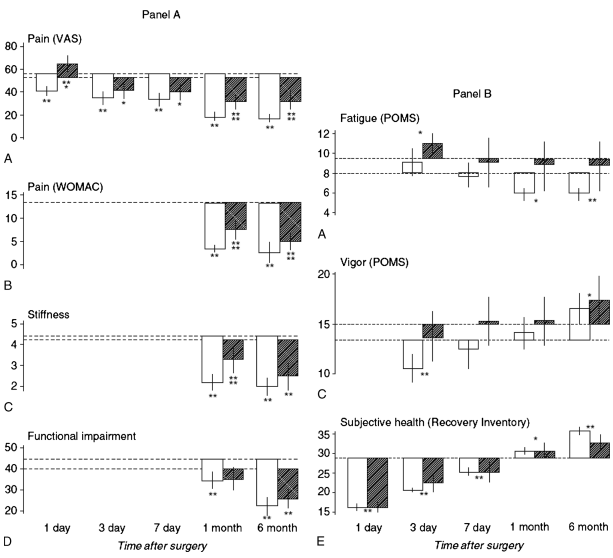

FIGURE 2. Panel A, Panel B : Impact of the lkind of surgery in the postoperative functional outcome (from Salmon P, Hall GM, Peerbhoy D, Shenkin A, Parker C. Recovery from hip and knee arthroplasty: patients'perspective on pain, function, quality of life and well-being up to 6 monts postoperatively. Arch Phys Med Rehabil 2001;82:360-66).

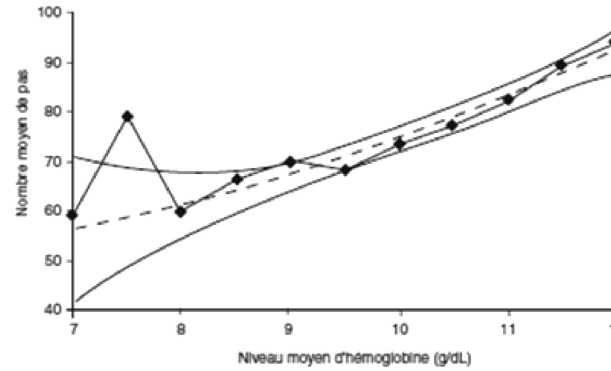

FIGURE 3. Relationship between Hb level and walking distance from Lawrence VA, Silverstein JH, Cornel JE, et al. Higher HB level is associated with better early functional recovery after hip fracture repair. Transfusion 2003 ; 43 : 1717-22.

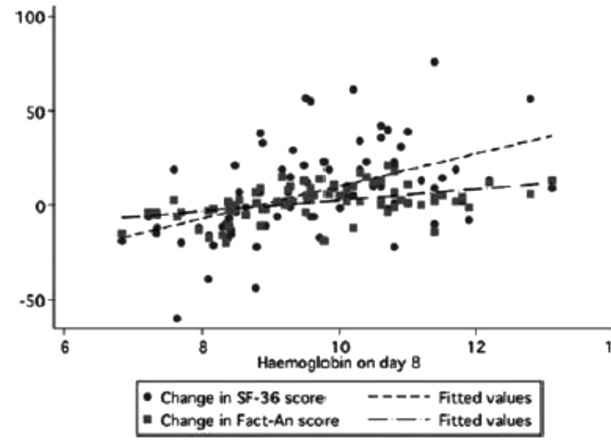

FIGURE 4. Correlation between HB level and quality of life (SF 36) from Conlon NP, Bale EP, Herbison GP, McCarroll M. Postoperative anemia and quality of life after primary hip arthroplasty in patients over 65 years old. Anesth Analg. 2008 ;106:1056-61.

95% CI 0.541; 0.932) and pulmonary complications (0.752, 95% CI 0.637; 0.887). Cummings et al. used The Medicare-Surveillance, Epidemiology, and End Results database to analyze 42,151 patients after open colectomy and found a significant association between epidural use and improved 5-year survival (HR 0.91, 95% CI 0.87; 0.94) [5]. Patients after primary joint replacement seem to have a higher thirty-day mortality when general compared with the neuraxial or neuraxial-general group was chosen (OR 1.83, 95% CI 1.08; 3.1 / OR 1.70, 95% CI 1.06-; 2.74, respectively) when data from 382,236 patients treated in 400 hospitals over 5 years are analyzed [6].

Morbidity: Recently, Memtzoudis et al. [7] were able to analyze 30,024 patients from 400 hospitals in the US with sleep apnea and found that patients having had neuraxial anesthesia had significantly lower rates of major complications than did patients who received combined neuraxial and general or general anesthesia. A group from Taiwan looked surgical site infection rates in 303,834 sectiones and found an increased risk when general anesthesia was used [8]. Similarly 3081 hip replacements were associated with higher infection rates when general anesthesia was used [9]. Pugely et al. [10] confirmed this association within the ACS NSQIP database. Moreover, the 14,052 cases of primary total knee arthroplasty showed after adjustment for potential confounders, that the overall likelihood of complications was significantly higher in association with general anesthesia (1.129; 95% CI 1.004; 1.269). Bhattacharya [11] analysed data from the National Surgical Quality Improvement Program (NSQIP) of 25,213 patients undergoing

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initial unilateral inguinal herniorrhaphy. Propensity-matched patients with regional anesthesia showed reduced rates of postoperative admission and 30-day morbidity. The same database has been analysed for 2,404 infrainguinal bypass surgeries [12] and also found that major systemic complications correlated with general (vs regional) anesthesia. The impact of chronic pain after surgery remains a major concern. At present there are no large databases available. Metaanalysis of RCTs point out that the number needed to treat is 4 to avoid chronic pain after thoracic surgery if regional anesthesia is used [13].

Functional outcomes: Only a limited number of registries have functional outcome data available. Egol et al. [14] identified patients in a registry of 600 patients with a distal radial fracture to show that finger range of motion and functional scores for patients who received regional versus general anesthesia was improved at all follow-up points.

Registries in regional anesthesia: Most registries in regional anesthesia are in a state of nascent. Single centre registries need long time periods to define incidence rates of e.g. of local anesthetic systemic toxicity [15]. Collecting data from many centres can be much faster to obtain incidence figures of interest. The Australasian Regional Anaesthesia Collaboration looked at neurologic complications after 7,156 peripheral blocks in a 3 year period [16] and the German Network for Regional Anesthesia described infection rates after 8,781 catheter within 15 months [17] and epidural hematoma rates within 2 years [18]. Taken together, registries offer an underused tool to analyse risks and derive best practise measures.

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HOW DIFFERENT IS THE CANCER PATIENT IN THE MANAGEMENT OF SPINAL ANALGESIA? UPDATE IN DECISION ALGORITHM REGARDING DEVICE SELECTION

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Intrathecal drug delivery (ITDD or IDD) represents a technique able to provide satisfactory analgesia by continuous infusion of drugs into the cerebrospinal fluid (CSF). The technique is based on the concept that the drug, by direct delivery into the CSF within the intrathecal space, avoids crossing the blood-brain barrier and therefore it is possible to use a dosage lower than oral, intravenous, transdermal or epidural administration. A further advantage of administering the drug directly into the CSF involves the possibility of using small doses capable of binding to the specific receptors, with a consequent reduction in systemic side effects and a more rapid and effective response. There are many receptors at the level of the spinal cord that can be used for the management of pain: opioid receptors (mu, kappa and delta), GABA, alpha-2, dopaminergic and NMDA receptors, as well as sodium and calcium channels. In patients suffering from chronic cancer or non-cancer pain and who complain of intolerable side effects as a result of their current therapeutic options, intrathecal analgesia has become a technique of choice whereas all other treatment options have been exhausted. Some studies have suggested that ITDD is effective in providing pain relief in 60-80% of patients with chronic malignant pain(1, 2). Pain is often regarded as the most feared symptom among cancer patients and can appear at any time during the course of the disease. Very frequently pain is also the first sign of cancer; pain is also associated with cancer treatment, and may present itself as acute or chronic. In addition, the worsening of the disease can result in pain worsening. It is common opinion that, before implanting a patient with an intrathecal pump, it could be useful a trial test as it could simulate the system which is then implanted. Recently, the group of experts of Polyanalgesic Consensus Conference 2012 (3) considered the trial questionable in the case of patients with cancer pain. In fact they believe that a trial (single-shot or continuous infusion for 72-96 hours) can hardly predict an Opioid Induced Hyperalgesia or pain modification in the event of cancer disease progression. There are numerous options for intrathecal administration ranging from tunneled external catheter connected to an external pump to a fully implanted system. The choice of device depends on several factors, including life expectancy, the cost, the availability of professional skills, the patient's wishes and the level of comfort. The percutaneous approach is favored because the catheter is easily positioned with the aid of fluoroscopy and is suitable for patients with limited life expectancy. Nonetheless, it is generally considered to be only a temporary option due to limitations such as a possible infection or catheter migration. Fully implanted drug delivery systems (intrathecal pumps) are suitable for long term use. Patient's daily life is not particularly limited by these systems. Patients will obviously need for subsequent assessments provided by a specialist multi-professional infrastructure that allows adequate follow-up and pump refill. The pump may consist of a non programmable and programmable device with the possibility to modify the administration rate via a wireless remote control. Obviously non-programmable (continuous rate) pumps are less expensive than programmable ones but lack of flexibility in the ability to vary the flow of the drug according to the needs of the patient. When deciding the type of pump to be implanted, we must assess the patient's needs and the adequacy of the system with respect to drugs administered. Programmable devices such as Medtronic SynchroMed II or Codman MEDSTREAM are able to administer a specific amount of drug in a variable manner; the dosage of drugs can be modified in a non invasive manner using the programmer. Moreover the technology developed by Medtronic,the so-called Patient Therapy Manager ®, proved to be of crucial importance, allowing to treat break through pain by programmable intrathecal bolus, offering to patients a decisive better pain treatment . In case of a suspected or actual malfunction, the programmable pump can be interrogated and / or switched off without the need to empty it. However, the battery that drives these systems generally has a duration of 5-8 years, so requiring a revision surgery to substitute it. Although the cost of treatment is an important consideration for any therapeutic area, the quality of life of cancer patients is important, and no patient should suffer when there is availability of effective treatments. In reality, the pain is associated with considerable social and economic costs worldwide. The lack of treatment or an unsuccessful treatment of pain is associated with a poor quality of life. Although the costs incurred at the time of pump implantation are significant, the long-term administration of opioids for intrathecal route is less expensive than treatment with oral opioid. The cost analysis showed that intrathecal administration is the most convenient way of opioids administration for patients who require long-term management of cancer pain (≥ 3-6 months).In cancer patients the placement of the pump should be planned to avoid in the future its exposure to any radiotherapeutic treatment. If a pump, especially the programmable ones, was implanted in the field of radiation, it might be advisable to consider a possible relocation. Obviously, the battery life of a programmable pump can be reduced if the pump is close to the radiation field, whereas if the pump is directly in the field of radiotherapeutic treatment may happen that the battery discharges completely or malfunctions occur.Pain has always been associated with a poor prognosis, but it is unclear whether the prognosis was related to pain or disease that causes pain. ITDD reduces the pain, toxicity drugs-related and has been associated with improved survival in patients with cancer pain refractory as it reduces the immune system depression (4,5). ITDDs also causes a statistically significant reduction in the level of fatigue and decreased consciousness, allowing a better preservation of the social function and a greater desire to live. (6,7).The selection of cancer pain patients considered suitable for ITDD thus may not be based only on single items, but, of course, a multifactorial consideration could help in the development of a patient-centered regimen treatment.

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DRUG SELECTION IN IDD: EVIDENCE FOR EFFICACY AND SAFETY. POLYANALGESIC CONSENSUS 2012

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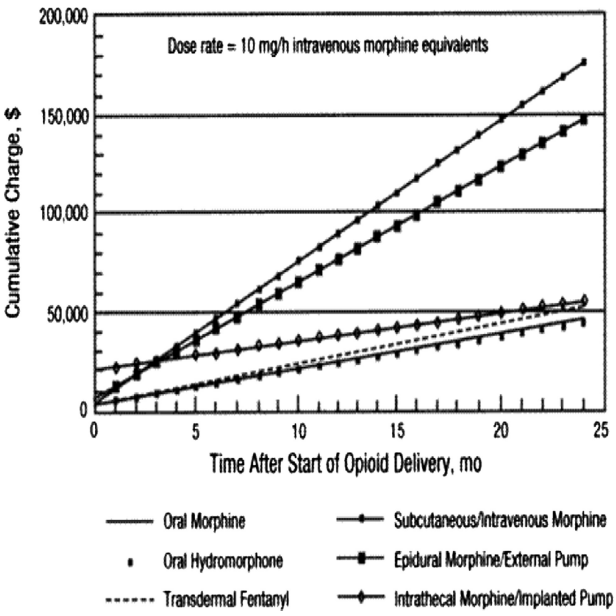
(Published in ASRA Newsletter Fall 2012): Intrathecal drug infusion is a cornerstone therapy in the management of a number of refractory chronic pain conditions. Intrathecal drug delivery systems allow targeted drug delivery to receptor sites in the spinal canal, thereby bypassing the blood brain barrier and first pass metabolism. Colloquially known as morphine pumps, intrathecal drug delivery systems (IDDS) have evolved from simple non-programmable pumps to more elaborate electronically-controlled devices capable of delivering complex regimens[1]. The identity of intrathecal agents delivered has also evolved from the traditional use of preservative-free morphine to include a number of other agents. Whereas only two intrathecal drugs are FDA-approved for pain relief (morphine and the peptide ziconotide), a number of medications are used intrathecally off-label. These include the opioids hydromorphone and fentanyl, the local anesthetic bupivacaine and the alpha-2 adrenergic agonist clonidine[2]. Of note, intrathecal baclofen is FDA-approved for the treatment of spasticity and has had only anecdotal efficacy in pain applications[3].

Indications for intrathecal therapy include refractory chronic pain from cancer and non-cancer related conditions[4]. Unfortunately, many patients with cancer-related pain have advanced disease and limited survival time[5]. Hence, the vast majority of IDDS-implanted pain patients suffer from non-cancer related pain; the most common diagnosis being lumbar post-laminectomy syndrome also known as failed back surgery syndrome[4].

A number of parameters determine the analgesic efficacy of intrathecal drug infusion therapy in patients with chronic refractory pain. These include proper patient selection and tailoring intrathecal agents and catheter position to patient's needs[6-8]. Proper patient selection includes identification of a pathological diagnosis that would explain the patient's refractory pain[7]. In that regard, treatment of a patient with cancer-related pain may entail different strategies than a patient with non-cancer related pain[9,10]. In addition, the candidate patient should have a favorable psychological profile. This may include absence of uncontrolled psychological disorders and patient motivation to lead a healthier lifestyle such as smoking cessation prior to pump trialing[11]. Additional patient characteristics that are critical determinants of outcome include pre-implant opioid dosage[12-14], patient's age[6,12,14] and physical location of majority of the pain[8]. Indeed, patients on high doses of opioids prior to IDDS placement require larger doses of opioids for trial and not only require more intrathecal opioids after implant but also tend to have worse pain scores[14]. Hence, some have advocated weaning off opioids prior to intrathecal pump trialing and implantation. This has resulted in maintenance of daily intrathecal morphine doses at 50-400 mcg/day after IDDS implant and limited opioid tolerance[13]. However, weaning off opioids may not be feasible in all patients (e.g. cancer pain patients). Similar to oral opioid administration for chronic pain, opioid dose escalation often sets in as a result of tolerance (non-cancer pain) and rarely consequent to disease progression (cancer pain)[6,8,12-19]. Opioid dose escalation can be problematic as it may lead to opioid induced hyperalgesia[20] and increases the risk for development of intrathecal granulomas[21]. Hence, maneuvers aimed at blunting opioid dose escalation would be beneficial. These include selecting patients on low doses of opioids prior to trial[13], avoiding implantation of IDDS in younger patients[6] and initiating bupivacaine along with the opiate (morphine or hydromorphone) from the outset of intrathecal therapy[8]. Animal studies and clinical experience with oral opioids in chronic non-cancer pain suggest an age-dependent opioid escalation whereby younger subjects escalate opioid doses and develop apparent tolerance at a much faster pace than older subjects[22,23]. Intrathecal opioid dose escalation occurred at a much faster pace in IDDS-implanted chronic non-cancer pain patients who were younger than 50 years old compared to patients older than 50[6]. Another potential way to blunt opioid dose escalation involves the use of intrathecal bupivacaine. Patients with chronic non-cancer pain who were trialed and initiated on bupivacaine in combination with morphine or hydromorphone from the outset of intrathecal therapy escalated their opioid doses at a much slower pace than those started on opioids alone[8].



from Neuromodulation: Technology at the Neural Interface, 2002; 2:77-87, http://onlinelibrary.wiley.com/doi/10.1046/j.1525-1403.1999.00077.x/full#f1

Tailoring intrathecal drug delivery to patient characteristics is critical to success of the therapy. The target sites of action of most intrathecal agents reside in the superficial laminae (substantia gelatinosa) of the dorsal horn of the spinal cord, at a depth of 1-2 mm from the surface of the cord[24]. For bupivacaine's analgesic effect, preferential targeting of sodium channels on fila radicularia of sensory nerve rootlets prior to entering the posterior aspects of the cord appears the likely mechanism of action[25]. Studies on a porcine model have shown much more limited spread of intrathecal agents than previously thought and preferential drug penetration on the side of the cord closest to the catheter[26,27]. Hence, every effort should be made to target the intrathecal catheter during IDDS placement to the posterior intrathecal space, in close proximity of putative drug target sites. This is particularly important in conditions where the pain is localized to a fairly restricted dermatomal area, such as isolated low back pain in patients with failed back surgery syndrome. In such cases, catheter position is critical especially when lipophilic agents (which have an even more restricted spread in the spinal space), such as bupivacaine or fentanyl, are used[8].

The medical literature supporting the efficacy of intrathecal drug delivery is limited[6]. Hence, consensus statements have been developed to guide physicians in the management of chronic pain patients undergoing intrathecal therapy. There have been four consensus statements since 2000[2,28-30]. The latest polyanalgesic consensus conference suggested different algorithms of care depending on whether the pain is nociceptive or neuropathic. Additionally, Deer and colleagues recently published separate consensus statements on cancer[9] and non-cancer pain[10]. These are welcome amendments to the less specific older consensus guidelines. Nonetheless, the current treatment algorithms still list the lines of care based solely on the intrathecal agents to be used. A patient-centered algorithm of care is needed. Additional algorithms may be developed that take into consideration the pain location and distribution and consequently makes evidence-based suggestions regarding best medication options and optimal catheter localization. More importantly, prospective studies should be performed to validate these treatment recommendations. These may have to involve multi-center collaborations. However, regulatory concerns over FDA approval of some agents and financial concerns over support of such studies will prove to be formidable obstacles. On the bright side, the advent of a few new companies onto the IDDS market may open up novel possibilities for moving the field forward.

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ROLE OF REGIONAL ANALGESIA TECHNIQUES CURRENT EVIDENCE

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Purpose/Objective: To evaluate regional anesthesia techniques widely used to manage acute postoperative pain, especially ultrasound-guided procedures, local infiltration analgesia and adjuvants, most studied innovations in latest literature.

Materials and Methods: Article is based on non-systematic literature searches in PubMed databases in last three years.

Results: We found nine randomized clinical trials involving 631 patients comparing US with peripheral nerve stimulators (PNS) performing different kinds of regional analgesia. US-assisted placement of stimulating catheter seems to improve success rate of peripheral blocks and patient satisfaction, allowing shorter procedural times and fewer complications. Results are not univocal in terms of postoperative pain control. We found 11 randomized clinical trials involving 577 patients evaluating LIA. Compared to epidural analgesia, LIA seems to provide better pain relief and reduce patient-controlled opioids consumption. When compared to FNB, LIA shows equivalent analgesia. Studies comparing LIA with placebo show non univocal results. Finally, we went through use of adjuvants in association with local anesthetics: we found 18 randomized clinical trials involving 1515 patients. In most of cases, adjuvants showed more rapid onset of sensory and motor block, prolonged duration of sensory block, reduced postoperative analgesic consumption and pain scores.

Conclusions: US are extensively used and may help in performing peripheral blocks with not yet clear efficacy in terms of decreasing postoperative pain. Further studies are necessary to define indication for local infiltration analgesia. New adjuvants showed good results when compared with placebo or intravenous administration. Further studies are necessary to make these

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techniques more standardized, with special attention to side effects and anaesthetic toxicity .

PHARMACOLOGICAL REDUCTION OF POST-OPERATIVE CHRONIC PAIN

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Since several years, the anesthesiologists are questioning the longterm effects of perioperative management and seriously considering their role in preventive medicine (De Kock 2009). The persistence of pain after surgical procedure, trauma or ICU stay has become a major focus of interest and its prevention now represents a challenge as an indice of the quality of health cares.

In Europe, the prevalence of chronic pain reaches 20% (Breivik et al. 2006) with trauma and surgery accounting for 15% of the cases. The definition of **Persistent Post-Surgical Pain (PPSP)** involves pain that develops after surgical intervention and lasts at least 2 months, other causes for the pain having been excluded (e.g. infection, recurrence of malignancy) as well as pain from a condition preceeding the surgery (Macrae 2008). The time frame of 2 months has been strongly debated because the exact duration of postoperative inflammatory process still remains undetermined. Actually, one may consider PPSP as pain lasting more than 3 to 6 months (often beyond 6 months) after surgery (Schug and Pogatzki-Zahn 2011). The first largest study aimed to assess the prevalence of PPSP in a general population reports a prevalence of 6.2 to 18.3% moderate to severe pain in the area of surgery 3 to 36 months after the procedure (Johansen et al. 2012). In this survey, 62% of patients had local pain in the area of surgery before surgery. The existence of PPSP in the pediatric population is also a recent concern. The first studies reveal an incidence of 13 to 22% at one year after surgery (Fortier et al. 2012; Page et al. 2013).

Chronic pain is a complex problem, with a multifactorial etiology. Several studies have analysed the risk factors involved in the development of PPSP after various surgical procedures (Kehlet et al. 2006; Schug and Pogatzki-Zahn 2011; Clarke et al. 2012). Among the risk factors, the severity of acute postoperative pain and both the severity and the duration of pre-operative pain at surgical site or elsewhere (co-existing chronic pain condition) are the most cited predictive factors. Recently, the role of psycho-social factors has also been highlithted e.g. anxiety, hypervigilance, catastrophizing. However, some patients presenting with severe acute pain will never develop persistent pain what supports the fact that individuals are not equal facing pain and that endogenous pain modulation may place peoples at less or more risk for severe acute and chronic pain. The mechanisms underlying the persistence of pain in some patients are not fully understood although a better understanding of the transition period would certainly help to better prevent PPSP (Katz and Seltzer 2009; Lavand'homme 2011).

Central nervous system sensitization participates to the acute pain experienced by the patient and is one of mechanisms underlying the maintenance of pain. For these reasons, the control of central sensitization has been and still remains a major target in the prevention of PPSP. Accordingly, the concept of **preventive analgesia**, a broader definition of preemptive analgesia, has been developed which involves any perioperative analgesic and antihyperalgesic treatments aimed to control central nervous system sensitization and to reduce the development of PPSP. In preventive analgesia, both the duration and the efficacy of the treatment are more important than the timing of administration of the drugs. Recent clinical studies have highlighted the fact that an optimal control of pre-operative, per-operative and post-operative pain is mandatory to ensure the success of preventive analgesia. Furthermore, progresses made in the assessment of endogenous mechanisms of pain processing should allow to improve even more preventive analgesia by an individualization of analgesic and antihyperalgesic perioperative treatments.

Peri-operative pharmacological strategies: Modern perioperative anesthesia and analgesia relies on the use of multimodal or balanced techniques which are aimed to reduce the intraoperative administration of opioids. The concept of **opioid-sparing anesthesia and analgesia** (even more, opioid-free anesthesia) is a major step in the prevention of PPSP. Opioids induce endogenous pro-nociceptive systems mainly through central NMDA receptors activation, a phenomenon well known as opioid-induced hyperalgesia (OIH) (Lee et al. 2011). They are also able to enhance the glial inflammation resulting from the incision, a state which contributes to central nervous system sensitization. OIH is dependent on the dose and the duration of opioid administration, exacerbates postoperative pain (acute hyperalgesia and tolerance) and as recently demonstrated by van Gulik (van Gulik et al. 2013) contributes to chronic thoracic pain in a dependent manner after cardiac surgery. Several pharmacological strategies besides their own effectiveness in reducing central sensitization process also reduce the development of PPSP by decreasing perioperative use of high doses of opioid, hence OIH, i.e. antihyperalgesic drugs like ketamine and gabapentinoids, nitrous oxide, locoregional analgesic techniques (Richebe et al. 2013).

Some meta-analysis and reviews support the view that perioperative administration of **ketamine and gabapentinoids** are effective in reducing PPSP (Clarke et al. 2012). **Epidural anesthesia**, and specifically its intraoperative use, may reduce the risk of developing PPSP after thoracotomy in 1 out every 4 patients (Andreae and Andreae 2012). **Paravertebral block** may reduce the risk of chronic pain after breast cancer surgery in one woman out of every 5 women (Andreae and Andreae 2012). In contrast, the use of peripheral nerve blocks has shown deceiving results after major joint arthroplasty. The choice of **anesthetics** also might not be innocent as propofol anesthesia seems to be associated with less PPSP after breast cancer surgery than sevoflurane anesthesia. Recently, outcome analysis in patients who received **nitrous oxide** during their surgical procedure seems to show both a lower incidence and reduced severity of PPSP (Chan et al. 2011). It is worth noting that the quality of published meta-analysis relies on the studies included and to date, very few studies are available regarding the effect of perioperative treatments on PPSP.

The failure of perioperative actual strategies: a clue for improvement: Inconstant clinical results in preventive analgesia should question the validity of our current practice. Without doubt, the extent and the duration of central sensitization, thereby its importance in pain chronicisation process, may highly differ among individuals even after similar injury. Recent preliminary results show that, after limb amputation, prolonged and individualized (from 4 to 83 days) perineural infusion of local anesthetic allows to significantly reduce the incidence of phantom pain (16% instead of the 67% usually reported with shorter-lasting therapeutic interventions) (Borghi et al. 2010). Further, the mechanisms involved in central sensitization, which result from the balance between endogenous inhibitory and excitatory processes, may also differ among patients. The aforementioned concepts argue for the application of tailored treatments, i.e. individualization of perioperative management to prevent PPSP. Preoperative chronic pain is not unusual (around 50 to 62% of the patients suffer such pain) and favors a state of preoperative central sensitization. It seems that those patients will have less favorable outcome after surgery and will be more prone to develop PPSP. A clinical trial concerning limb amputation has recently highlighted the impact of an effective preoperative pain control on PPSP development (Karanikolas et al. 2011).

The subacute pain period: a major role in the prevention of PPSP: It is now clear that subacute pain which can last for several weeks after surgery represents a neglected area of clinical investigation (White and Kehlet 2010). A few prospective studies have demonstrated the predictive value of 30-day or 6-week postoperative pain intensity as a risk factor for PPSP after inguinal hernia repair (Aasvang et al. 2010) and cosmetic breast surgery (Romundstad et al. 2006). The nature of PPSP remains unclear because inflammatory mechanisms play an important role even in the development of neuropathic pain (Schug and Pogatzki-Zahn 2011). However, recent arguments are in favor of a predominant **neuropathic origin** as there is a strong association between sensory disturbances like hypoesthesia and hyperesthesia and the presence and the intensity of PPSP (Johansen et al. 2012), some procedures carrying higher risk. Pain intensity and incidence (14% at day-30 vs 7% at day-7) may increase during the subacute pain period as shown postherniotomy, perhaps revealing a neuropathic pain process (Aasvang et al. 2010). Similarly after thoracotomy, neuropathic pain may develop (from 8% in the immediate postoperative period increasing up to 22% at 3 months) (Searle et al. 2009). Although data are scarce, neuropathic pain characteristics may appear very early after surgery. A prospective study reported 3% postoperative patients managed by an Acute Pain Service diagnosed with neuropathic pain (Hayes et al. 2002). During their follow up, 78% of these patients suffered persistent pain at 6 months and 56% at 12 months. Using adequate questionnaires aimed to diagnose neuropathic pain, an other study revealed an incidence of 8% for neuropathic pain immediately after thoracotomy (Searle et al. 2009). A recent study, using the iliac crest bone harvest model, has suggested that both nerve lesion and central sensitization are involved in persistent neuropathic pain (Martinez et al. 2012). Patients who developed PPSP of neuropathic origin displayed acute (48 h) postoperative pain with cutaneous hyperalgesia, higher pain intensity and neuropathic pain characteristics on DN4 questionnaire. Consequently, the anesthesiologists

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should pay a particular attention to patients'evolution during the early recovery period. Accurate evaluation of the patient (e.g; neuropathic pain diagnosis) and rapid adaptation of analgesic treatment should be possible from the immediate postoperative period (during hospital stay) until weeks later (follow up in "transitional pain units") (De Kock 2009).

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RISK FACTORS (ANAESTHETIC TECHNIQUE, SURGERY) AND GENETICS (GENETIC POLYMORPHISM)

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Introduction: Surgical incision invariably causes some measure of nerve damage and inflammatory response that, in the majority of cases, heals quickly without long – term negative consequences. Such, most patients who undergo surgery recover uneventfully and resume their normal daily activities within few weeks. Nevertheless, chronic post – surgical (postoperative) pain seems to develop in an alarming proportion of patients, with a significant subset of them presenting with lasting, difficult to treat, post – surgical neuropathic pain. Unlike other injuries, surgery presents a unique set of circumstances in which the precise timing of the physical insult and ensuing pain are known in advance. This provides an opportunity, before surgery, to identify the risk factors as well as potential protective measures that could predict or improve the course of recovery. Surgical patients can be studied before injury is inflicted, and thus, post – surgical pain provides a special opportunity to understand pathogenic mechanisms for developing a chronic pain state or the transition from an acute to a chronic pain state.

However, the transition of acute postoperative pain to chronic post – surgical pain still remains a complex and poorly understood developmental process, involving a variety of perioperative, neurophysiological, biological, genetic, psychological and social – environmental factors that demand further and more careful elucidation. In this context, it remains unknown why two patients undergoing identical surgical interventions and receiving similar perioperative – anaesthetic management may go on to develop completely divergent pain phenotypes or even no pain at all. In the following paragraphs, basic causative – risk factors of chronic post – surgical pain will be analyzed, focusing on the involvement of surgical and anaesthetic techniques that are applied, as well as on the role of genetic polymorphism.

Definition and Epidemiology of Persistent Post – Surgical Pain (PPSP): Persistent Post – Surgical Pain (PPSP) is a well – known and common clinical entity with a reported incidence between 5 and 50% of patients after various types of operations. Not all studies are consistent about PPSP incidence, with wide variations between different surgical procedures, probably due to the lack of clarity in its description and the absence of a universally agreed definition. According to classical literature, PPSP involves pain that develops after a surgical intervention and has a duration of at least two months after surgery, excluding pain due to other causes (malignancy, infection), or pre – existing pain problems continuing post – surgery. Yet, PPSP has received increased interest during the past 10 – 15 years and can be characterized as one of the commonest and most serious complications post – surgery, also posing a significant economic and health – care burden, since millions of patients undergo surgery at the European or International level annually.

Aetiology of Persistent Post – Surgical Pain (PPSP): Nerve injury during surgery has been implicated in the development of PPSP. Some patients with PPSP, but not all, present with neuropathic pain characteristics. Inflammatory and neuroimmune reactions after damage to axons result in neurotransmitters release that act both locally and in the spinal cord to produce hypersensitivity and ectopic neural activity. This contributes to central sensitization. Central sensitization and sequential neuroplasticity may occur when repetitive nociceptive stimuli result in altered dorsal horn activity and amplification of sensory flow, leading to persistent nervous system changes, for example, death of inhibitory neurones, their replacement with excitatory afferent neurones, and microglial activation. These changes lead to evoked

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and spontaneous symptoms associated with neuropathic pain, for example, allodynia and hyperalgesia. PPSP is reported in more than 50% of patients who have surgery associated with nerve and tissue damage, for example, mastectomy, thoracotomy, and amputation. Despite this, there is no simple relationship between nerve injury during surgery and the development of CPSP, suggesting that mechanisms other than nerve injury are responsible for ongoing pain in these patients and that any link between nerve damage during surgery and PPSP development is complicated. Not all patients with nerve damage develop PPSP, and those who do develop PPSP do not necessarily have neuropathic pain. Indeed, some operations not associated with nerve damage can result in CPSP.

Nowadays, the importance of central sensitization in the production of chronic post – injury pain has been proven. Furthermore, the fact that surgical incision results in inappropriate nerve firing, leading to sensitization, is a consolidated neuropathophysiological phenomenon. In addition to simple repetitive nociceptor firing, recent studies reveal that the source of central sensitization can include perioperative noxious stimuli, surgical stimuli and inflammatory mediators. Important work during the past decade has identified inflammation and glial cell activation as generators of neuronal sensitization, greatly expanding the possibilities for future therapeutics beyond simple and traditional prevention of nociceptive signaling.

The Immune Response to Nerve Injury in the Perioperative Period: Peripheral nerve injury is immediately followed by a robust inflammatory response. Macrophages localize to damaged nerve fibers. Macrophages and lymphocytes gather upstream in the dorsal root ganglion (DRG), and activate microglia and, eventually, astrocytes in the central nervous system (CNS). Growth factors released by Schwann cells at the site of injury sensitize nociceptors directly. Distal nerve injury recruits macrophages proximally to the DRG wherein, in humans, the immune response continues months after the distal inflammation has been resolved. In the dorsal horn of the spinal cord, large numbers of microglia, which share a common myeloid lineage with peripheral macrophages, and circulating monocytes surround the terminals of the injured nerve fibers in response to chemokines, such as fractalkine and CCL2, and toll – like receptor signaling. These activated microglia lead to increases in levels of the proinflammatory cytokines IL – 1b, IL – 6, and TNFa. These cytokines contribute to neuropathic pain symptoms, such as mechanical allodynia, by directly sensitizing dorsal horn neurons. This series of discoveries describes a completely different paradigm for chronic nociceptor sensitization and, potentially, an important new therapeutic target.

Risk Factors for Developing Persistent Post – Surgery Pain (PPSP): Although the mechanisms behind the development of PPSP have yet to be fully elucidated, a number of pre-, intra-, and postoperative risk factors have been identified. As our understanding of the pathophysiology, risk factors, and prevention of PPSP expands, the traditional focus of the anaesthesiologist on managing acute perioperative pain should primarily include identification and effective management of patients at risk for developing such a pain entity. PPSP risk factors identification is indeed crucial, since it may provide a possibility for PPSP prevention. Risk factors may be classified as patient – related and medical factors. Each patient developing PPSP has a specific genotype, medical history, experiences, beliefs and psychosocial conditions related to this problem. The most important PPSP risk factors will be emphasized in the following paragraphs.

Surgical Risk Factors involved in PPSP

Among multiple intraoperative circumstances, surgery itself may substantially contribute to PPSP development, with the following surgical factors being associated with an increased likelihood of PPSP: increased duration of surgery, low (versus high) volume surgical unit, open (versus laparoscopic) approach, pericostal (versus intercostal) stitches, incision site and type, surgeons experience, center where the operation is taking place, conventional surgical methods (eg for hernia repair) and degree of intraoperative damage.

In this context, longer (duration $>$ 3 hours) and by implication more complicated operations are associated with higher percentages of chronic post – surgery pain. This is not surprising as these patients probably have more serious pathologies, complications or other health issues affecting both the complexity of the operation and the outcome.

A relation affecting the incidence between different operation techniques and chronic pain following breast surgery has been put forth. The incidence varied from 53% for mastectomy with reconstruction by implant, to 31% for mastectomy only and to 22% for breast reduction. However, a relation between different open techniques and PPSP following hernia operations cannot be found, while less pain was observed by laparoscopic procedures. In the same way, it has been reported that PPSP is seen more frequently in patients undergoing open cholecystectomy compared to laparoscopic technique. Furthermore, repeat surgery for hernia repair has a higher incidence of moderate to severe pain intensity at 12 months compared to primary repair.

Moreover, according to basic science research, intraoperative technical – methodology factors may contribute to PPSP appearance and intensity. The type of knife used when cutting tissues may play an important role, whereas electrocautery is associated with significantly more chronic PPSP compared to laser or ultrasition use.

In addition, it has been suggested that chronic post – surgery pain following hysterectomy is partially lower in procedures performed through a Pfannenstiel incision. Similarly, protection of the nerve in the operation site or the neighborhood in the preoperative period may decrease the incidence of PPSP development. For example, preservation of intercostal brachial nerve in mastectomy operations and the intercostal nerve in thoracotomy may decrease the incidence of postoperative chronic pain. Thus, it is a fact that the experience of the surgical team affects the morbidity and mortality. It has been stated that PPSP following breast surgery was observed more commonly in surgical units with a lower number of cases and limited experience, with some studies underlying that perioperative radiotherapy or chemotherapy may also increase the risk of chronic pain, especially in breast cancer patients.

Continuous Preoperative and Acute Postoperative Pain involved in PPSP as Risk Factors

It is commonly admitted that the presence and intensity of preoperative pain in patients undergoing surgery may be related to PPSP, especially following hernia repair, thoracotomy, mastectomy, and limb amputation. Its existence for more than 1 month before surgery might predict PPSP. Hernia operations probably represent the leading type of surgical procedures among these operations. In a study on patients undergoing hernia repair operation, it was found that about a quarter of patients did not have pain at rest before their hernia repair, that half of them had mild pain, with the remainder describing mild to moderate pain at rest. As expected, a higher number of patients suffered from pain on movement. While 25% of the patients did not complain from pain in the follow – up during the first year, 22% complained of pain on movement. Some of the patients who had no pain preoperatively, developed pain after the repair operation and 5% of patients stated that the quality of their daily life was lower a year after surgery.

It has also been suggested that pre – amputation pain increased the risk of stump and phantom pain, whereas 48% of patients in whom narcotics had been given prior to thoracotomy, developed chronic post – thoracotomy pain, compared to a mere 5% of those who received no opioids preoperatively. While a similar relation has been underlined regarding mastalgia and phantom breast pain, this correlation was not established in total hip arthroplasty operations.

Apart from preoperative pain, the severity of postoperative pain significantly predicts PPSP development as well, supporting the hypothesis that repetitive nociceptive stimulation during the perioperative period results in nervous system alterations such as central sensitization. Many studies on PPSP development have been published, underlying the importance of sufficient treatment of acute postoperative pain. Among a variety of surgical procedures, hernia surgery, breast cancer surgery and total hip arthroplasty operations should be noted as the most common types of procedures where adequate postoperative analgesia influences PPSP incidence. The most important dilemmas are probably related to the medications and methods used. In previous studies, ketamine was reported to have a limited acute postoperative analgesic efficacy, nevertheless holding long term antihyperalgiesic efficacy. It has also been suggested that epidural anaesthesia at first is effective in preventing central sensitization during surgery. However, different opinions on this subject were also put forth later on. Whatever the case, the association between severe perioperative pain and PPSP development, however, does provide at least one important avenue for PPSP prevention and has been the foundation for using regional anaesthetic techniques in the perioperative period, in order to block nociception and subsequent sensitization.

No other patient factor is as consistently related to the development of future pain problems as is pain itself. Female gender and younger age predict chronic postsurgical pain, but not with the consistency or magnitude with which pain predicts pain.

What must be determined, however, is the aspect(s) of pain that is predictive. There are several possibilities for why pain predicts pain, including those that propose a causal or associative role. The following factors are not mutually exclusive:

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- Intraoperative nerve damage and the injury discharge that it causes
- Sensitization of nociceptors in the surgical field
- Early postoperative ectopic activity in the regenerating sprouts of injured primary afferents and in somata of these fibers in dorsal root ganglia associated with the injured nerves, and even in somata of intact neurons in dorsal root ganglia neighboring those associated with injured nerves
- Collateral sprouting from intact nociceptive Ad afferents that neighbor the field innervated by injured afferents
- Central sensitization induced by the surgery and maintained by peripheral input
- Structural changes in the CNS induced by perioperative nociceptive activity (e.g., disappearance of antinociceptive inhibitory interneurons in the spinal dorsal horn centralization of pain and somatosensory pain 'memories'
- Heretofore unidentified pain genes that confer increased risk of developing intense acute pain and chronic postsurgical pain
- Consistent response bias over time. Some individuals have a tendency to report more intense pain than other individuals. Thus, they would report intense pain immediately after surgery as well as in the long term. Excluding this possibility is important for establishing other plausible mechanisms for the pain.
- Psychological and emotional factors, including catastrophizing
- Social - environmental factors, such as solicitous responding from significant others and social support
- Publication bias in which findings of a significant relationship between pain before and after surgery are published whereas negative findings do not make it into print.

Anaesthetic Risk Factors involved in PPSP Development

Is there a relation between PPSP and anaesthetic medications or selected techniques and methods? Unfortunately, yet, there is no definite answer to this important question. In a study recently published by the group of Fassoulaki A et al, a positive relation was not found between anaesthetic agents used (Sevoflurane, Desflurane, Propofol) and acute postoperative pain. However, other investigators suggest that the choice of anaesthetics used might not be innocent, since propofol results in less PPSP compared to sevoflurane anaesthesia in breast cancer surgical patients. Recently, outcome analysis, in patients receiving nitrous oxide during surgery, concluded that this agent's application resulted in lower percentages and decreased severity of PPSP.

Furthermore, in another study on chronic pain one year after hysterectomy, it was found that PPSP appeared in 14.5% of patients receiving spinal anaesthesia, compared to a percentage of 33.6% of patients being treated under general anaesthesia. Additionally, a lower frequency of chronic post – surgery pain was observed in patients receiving subarachnoid anaesthesia, although not in those treated under epidural, a fact that was explained by the stronger blockade of "*central impulse traffic*". Similarly, in cesarean section operations the incidence of PPSP was higher in parturients undergoing CS under GA compared to those under RA, at the end of the first year after CS took place. Results and conclusions regarding regional techniques might be contradictory, since, according to other authors, intraoperative epidural instrumentation may result in PPSP risk reduction following thoracotomy, in 1 out every 4 patients. Finally, the role of peripheral nerve blocks in relation to PPSP development still needs further elucidation, since few existing studies have shown ambiguous results, especially following orthopaedic operations.

Genetics and Genetic Polymorphism associated with Persistent Post – Surgical Pain (PPSP): In the general population, sensitivity to physiological nociceptive and clinical pain may vary between individuals. This variation with regard to generation and pain experience may also reflect different responses. Increasing age is inversely related to PPSP development, whereas genetic susceptibility is likely to play a role in such a postoperative consequence. The dorsal horn is the site at which altered activity and gene expression occur, finally producing central sensitization, microglial activation and sensory flow amplification.

The genetics of pain is a very young research field and therefore, it should come as no surprise that, as of yet, no published reports exist on genes predisposing humans for the transition of acute pain after surgery to chronic postsurgical pain. There are only limited reports that have identified polymorphisms in human genes associated with chronic pain in general.

These include polymorphism in the following genes: *5-HTTLPR* (the gene encoding the serotonin transporter) that was found to associate significantly with levels of migraine, burning mouth syndrome, irritable bowel syndrome and fibromyalgia; *IL1B* (encoding IL-1b) playing a role in burning mouth syndrome; *IL1RN* (encoding IL-1 receptor antagonist) and *MC1R* (encoding the melanocortin-1 receptor) involved in vulvodynia; *IL23R* (which encodes a subunit of the receptor for IL-23) involved in Crohn's disease; *GCH1* (encoding GTP cyclohydrolase, an enzyme catalyzing tetrahydrobiopterin, BH4, an essential co – factor for catecholamine, serotonin and nitric oxide production) that has been implicated in persistent radiculopathic pain following surgical diskectomy; *COMT* (encoding catechol-*O*-methyl transferase, the enzyme that inactivates dopamine, epinephrine and norepinephrine in the nervous system) that has been implicated in a number of chronic pain entities (eg temporomandibular joint disorder); and polymorphisms in *CACNA1*, *ATP1A2*, *MTHFR*, *SCN1A* and the female hormone genes *ESR1*, *ESR2* and *FSHR* that have been implicated in migraine. However, it is of note that in many of these studies it has not been established whether the identified genetic determinants were associated with chronic pain indirectly, by producing a disease that carries a morbidity for chronic pain, or directly, by producing and maintaining chronic pain once having the disease.

It has been hypothesized that certain people are predisposed to pain development following nerve injury. Pain genetic studies that are relevant to chronic postsurgical pain in rodent models have yielded some initial (premature) results, suggesting that susceptibility to develop PPSP might have a strong heritable component, although the exact genes related to this inheritance still need to be identified. These experimental models were not explicitly developed to model chronic postsurgical pain *per se*, despite the use of surgical approaches to injure peripheral nerves, spinal nerves, dorsal roots and the spinal cord.

Some of these models were used to determine the level of heritability for spontaneous and stimulus-induced neuropathic pain in evaluating genetic differences across lines and strains of mice and rats in traits relevant to chronic postsurgical pain in humans, and the effect of genetic and environmental interactions on chronic postsurgical pain-related behaviors in these models. These models were also used to map chromosomal regions (termed quantitative trait loci) that harbor chronic postsurgical pain-related genes. These intervals were mapped using sets of recombinant inbred lines that were produced by repeatedly breeding two inbred parental lines, or by genotyping F2 offspring of inbred lines that contrast on the chronic postsurgical pain strain under study.

Using gene-expression and proteomic methods, hundreds of genes and proteins were identified in dorsal root ganglia and spinal cord (but none in supraspinal structures as of yet) of mice and rats in chronic postsurgical pain-related models. Furthermore, manipulations of individual genes by overexpression or deletion (in transgenic 'knockout' experiments), or by shutting off expression using siRNA or antisense oligodeoxynucleotide injections, have identified over 240 rodent genes that have some demonstrated role in various acute and chronic pain models, some of which are relevant to chronic postsurgical pain.

The information about these genes and the models in which they were studied is accessible on the internet, with multiple investigators suggesting that specific clinical disorders such as migraine, fibromyalgia, irritable bowel syndrome and Raynaud's syndrome, controlled by identified genes may act as markers of PPSP.

Conclusion: PSPS is a common and important problem after surgery. Although research remains limited, it is likely that anaesthetic agents – techniques selection and surgical methods modification may have a role in reducing its prevalence. CPSP should be seen as the inevitable consequence of surgery in a proportion of patients, like wound infection. It is not a sign that something has definitely gone wrong and the surgeon is seldom to be blamed. What is becoming increasingly clear is the importance of the role that more fundamental predispositions in a patient's genetic and psychological make-up have to play in the persistence of post-surgical pain. Future developments in genetic research will hopefully identify specific genes that increase a patient's susceptibility to pain. This, along with more targeted psychological approaches may give us a way forward in better management of this condition. Although it is not possible to predict who will develop chronic pain after surgery, there are some strategies we can use to prevent or minimize the risks. First, we should strive to minimize unnecessary and inappropriate operations. Raised awareness amongst surgeons and clear information for patients about chronic pain after surgery may help dissuade patients from unnecessary operations. Secondly, great efforts must be made to provide effective post-operative pain relief for a long enough period to prevent sensitization occurring. Finally, we must be aware of the problem and actively look

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for patients showing signs of neuropathic pain post-operatively. This would allow for early and aggressive intervention to minimize the chances of developing chronic pain.

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ESRA: HOW IS COMPETENCE DEFINED WHEN LEARNING REGIONAL ANAESTHESIA?

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Introduction: Ultrasound-guided regional anaesthesia (UGRA) has been in general usage for approximately 10 years. This has coincided with a renaissance in regional anaesthesia. This may be partly attributable to the increased efficiency (reduced doses of local anaesthestic, rapid block onset, improved block quality) and the ability to place blocks without dependence on landmarks that may be seen when using ultrasound compared with other nerve localisation methods.

There is very little evidence regarding the relative safety of UGRA compared to traditional nerve location techniques, nor is there likely to be; as the rates of complications due to the performance of regional anaesthesia are so low that demonstrating statistical differences between techniques is extremely problematic. However, this does not mean that we should be complacent when considering the safety of practitioners learning to perform techniques under ultrasound-guidance.

Training: In 2009, the American Society of Regional Anesthesia and Pain Medicine (ASRA) and the European Society of Regional Anaesthesia and Pain therapy (ESRA) produced their joint guidelines for education and training in ultrasound-guided regional anaesthesia[1]. This timely publication was drawn-up following a consultative process by a group of experts in the field from both societies that formed the Joint Committee. The guidelines contain a suggested curriculum, training pathways and suggestions for demonstrating competency.

The document begins by describing indications and the scope of practice for using ultrasound, and describing ten tasks that are undertaken when performing an ultrasound-guided nerve block. The document then describes four major skill categories: (1) understanding device operations; (2) image optimization; (3) image interpretation; and (4) visualisation of needle insertion and injection of the local anaesthetic solution. Within each of these categories, the Joint Committee defined a number of skills.

Two training pathways were then described; a practice pathway (for physicians who have completed anaesthesia training) and a residency-based pathway (for anaesthetists in-training). The practice-based pathway describes initially gaining the skill sets already mentioned, through an accredited CME event, followed by practice scanning techniques and needling in phantoms. Ideally, time would be spent with experienced individuals before finally incorporating UGRA into pre-existing regional anaesthetic practice. The residency-based pathway would fit flexibly into the training programme with an initial didactic component addressing the four skill categories described above. Then enough experience should be attained performing a variety of blocks to attain competency in these skill categories. Residents would be encouraged to record video clips and still images for review with trainers to gain feedback on procedures performed.

The guidelines also recommend the appointment of an UGRA coordinator, whose purpose is to implement, oversee and quality control both pathways of UGRA training. The coordinator should use direct supervision, recorded image review, logbook review and other information to help them improve quality of their training programmes.

In the UK, a guidance document has now been produced entitled; 'Ultrasound in Anaesthesia and Intensive Care: A Guide to Training', by a joint working party of the Association of Anaesthetists of Great Britain and Ireland (AAGBI), the Royal College of Anaesthetists (RCA) and the Intensive Care Society (ICS). This document covers all areas of anaesthesia ultrasound practice including UGRA for trainees in the UK working towards their completion of specialist training. The document describes a curriculum, lists basic ultrasound competencies and also lists competencies associated with level 1 and 2 practice in regional anaesthesia. The challenge is how to robustly and consistently assess these competencies. The document was published as a guideline in July 2011 and is available for download from the AAGBI and RCA websites.

One of the challenges in education of UGRA is the fact that the curriculum to be covered is actually very large. Consider the skill categories mentioned above: (1) understanding device operation (physics of US, individual machine operation); (2) image optimization (scanning technique); (3) image interpretation (sonoanatomy of the many areas of interest); and (4) visualisation of needle insertion and injection of the local anaesthetic solution (needling technique). Clearly, there is a large amount of information to be learned, anatomy to apply and hand-eye skills to master. In my experience, I think this has presented individual schools of anaesthesia (including my own) with a big challenge. How do we find the time to teach all these aspects to all our trainees and senior colleagues new to the practice?

In the UK, we have been running nationally advertised courses for nearly 10 years. These courses are now run through our national society: Regional Anaesthesia UK, and typically teach 24 delegates over two days. This serves as an introduction to UGRA and gives delegates an overview of the curriculum. However, these types of courses do not address the issue of reaching *all* UGRA novices. I believe we can go some way to achieving this major undertaking by developing computer-based remote learning packages, allowing trainees to undergo self-directed learning, with supervisor input at specific points during the process. This type of approach will allow trainees to cover (with assistance), all aspects of the curriculum.

Competency: The implementation of a curriculum and training programme, as described by the joint societies, is possible and many schools of anaesthesia

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and hospitals are already putting these recommendations in place. However, assessing competency in a consistent and reproducible manner is probably the most difficult part of the training process.

The ASRA/ESRA and UK guidelines did not make specific recommendations for assessing competency as they recognised that there exists a large spectrum of practice internationally, and individual institutions must develop their own processes for ensuring individuals' level of competency before providing them with practising privileges in UGRA.

So how should we assess competency in those who have undergone training and are wishing to perform the technique in their practice? Large teaching hospitals may well find this process simpler as they may have a teaching structure already in place. Smaller hospitals without trainees may find it more difficult.

There are a number of summative methods by which competency can be assessed. Cumulative sum analysis (CUSUM) is a sequential analysis technique and has been used to assess task competency in various surgical specialities[2-4] and anaesthesia[5-8]. CUSUM has been popularised for the assessment of regional anaesthetic tasks[9, 10], I will therefore mention it here.

CUSUM may be described as

$$S_n = \sum(X_0\text{-}X_i)$$

where X_0 is the set success rate for a procedure
and X_i is either 0 (failure) or 1 (success)

Let us consider a regional anaesthetic task and set an acceptable success rate for the task of 90%. Applying CUSUM to the task will present a value for S_n that will decrease by -0.1 or increase by 0.9 for a success or failure of the task respectively. If the operator has one failure in ten procedures, he or she will maintain an overall horizontal plot. If the operator is more successful (than 90%) the plot will have an overall negative gradient and equally, if the operator becomes less successful (than 90%), the plot will develop a positive gradient. CUSUM is therefore a potentially useful way for practitioners to monitor their own practice, but when applied to UGRA, there are some disadvantages. A CUSUM plot of an individual's UGRA practice may provide information about the success rates of their blocks. However, as inferred by the training guidelines described above, UGRA involves a number of integrating skill sets to be performed competently. The success or failure of a block does not necessarily show that the practitioner's technique was competent; for example, they may well have inadequate needle visualisation risking needle overshoot and nerve injury, even though the outcome is block success. For this reason, CUSUM can only form part of the assessment of an individual's competency to perform a complex task such as UGRA, and therefore has been termed a 'square peg in a round hole'[11]. The actual measured score used in the CUSUM plot may be made more sensitive by using a scoring system rather than a simple 'success or failure' result (see below)[12].

The other issue is that an individual's CUSUM score will be affected severely by early failures and therefore may only declare very late the novice who has actually become competent. In other words, CUSUM cannot define when an individual has become competent. This reflects the fact that CUSUM was designed to reveal system stability and has led to various manipulations of CUSUM analysis to improve its performance, and tries to provide the user with an answer to when the individual has achieved competency[13]. The advantage of a CUSUM analysis is that it can form part of an individual's self-assessment of their practice.

Direct assessment of competency is probably required to satisfactorily judge an individual's ability to perform UGRA due to the multiple skills sets that are involved. The Royal College of Anaesthetists (RCA) in the United Kingdom have produced a number of Workplace Based Assessments (WpBA), including the Direct Observation of Procedural Skills (DOPS) form that covers assessment of all practical skills required by anaesthesia trainees during their training. This is an example of a non-specific tool, and would need local adaptation to properly assess UGRA. Of course, competency is not just about being able to perform a practical skill, it also encompasses the ability to apply those practical skills in a clinical setting in an appropriate and timely manner. Again, this can be judged in part using the Anaesthetic List Management Tool (ALMAT), which is another RCA WpBA. In turn, this will rely on the assessors ability to adequately judge the trainees performance, and will therefore be subjective. The ability to assess non-technical skills in the workplace is not quickly learned by anaesthetists[14], and so there exists a need to specifically define how the knowledge, skills and attitudes should be assessed when considering regional anaesthesia, and how we do this consistently across all institutions.

Quantitative and qualitative assessments of UGRA performance and skill sets can be made. Cheung used the Delphi method to produce an assessment checklist and global rating scale for UGRA[15]. Sites described a composite accuracy score which scored the time to perform, the number of attempts and the number of errors (e.g. needle not visualised during advancement, unintentional probe movement and poor target positioning) image quality, number of attempts, block failure and intravascular puncture[16]. They also made qualitative assessments of 'quality-compromising' behavior. They found that errors rates did not 'flatten out' until approximately 80 blocks had been performed by novice residents; these errors were primarily advancing the needle without properly visualising it and unintentional probe movement (which of course go hand-in-hand).

De Oliveira's group used an animal phantom, and examined performance times, number of needle passes and actual task success[17]. They used CUSUM curves to define when subjects achieved proficiency (this was when subjects had succeeded enough times to pass a predesignated threshold on the CUSUM graph). They did not provide subjects with feedback (they argued that many individuals use 'discovery learning' for UGRA) and found that only a minority of their subjects reached the competence threshold on their CUSUM curves for needle alignment and successfully reaching the target within the phantom. More recently Barrington and colleagues performed a similar assessment of competency using cadaver sciatic nerves. They assessed needle visualisation and probe steadiness during the simulated block and used a derived score from this to define success or failure on CUSUM curves. They found that competence was achieved (again by passing a threshold on their CUSUM graph) after approximately 28 attempts in their ultrasound needle visualisation test. The difference from the previous study is that they provided feedback to the subjects during the study.

These studies found that subjects learned and achieved proficiency or competence at different rates. This will be due in part to the amount of feedback they received (quality of training), the subjects inherent ability and the fact that the assessment tool used was different in each case. I believe this summarizes the difficulty with assessing competence, i.e. what are we actually trying to assess? Ultrasound-guided regional anaesthesia (like any another skill) is a complex interaction of hand-eye coordination, understanding of anatomy, familiarity and knowledge of the machinery and finally an understanding of how the anaesthetic should be adapted to patients' medical and psychological condition. We may be able to test parts of this process, and make comments about basic ability, but overall competence will be an ongoing process of lifelong learning, combining all these skills, in the pursuit of excellence.

Summary: The use of ultrasound has, I believe quite rightly, become widespread in regional anaesthesia. The 2009 publication of the joint ASRA and ESRA guidelines and the 2011 AAGBI guidelines in the UK have laid out a curriculum for training and recommended that a structure be put in place in individual institutions for delivering that training. The challenge is how to demonstrate competency in those who have undertaken training in ultrasound-guided regional anaesthesia in a consistent and timely manner.

While specific assessment tools can provide a detailed assessment of the individual skill sets involved in UGRA, they will be time consuming in their delivery, and if applied to a large training programme will require training of assessors to ensure consistency in assessment standards.

The role of the ultrasound-guided regional anaesthesia coordinators will be paramount, not only in the local delivery of the training, but also in the more challenging role of ensuring that this important technique is delivered effectively and safely to the benefit of our patients. I believe that national leaders will be able to play a role in developing the training pathways that are 'deliverable' in local schools of anaesthesia.

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ESRA: HOW TO ACQUIRE THE NECESSARY EXPERIENCE IN RA

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The learning curve is a multidimensional function with a wide intra- and interindividual scattering. Regional anesthesia learning process has been shown to be more difficult than general anesthesia. This fact emphasizes the need to find the best strategies to teach regional anesthesia. Individual and institutional learning processes are complex and depend on a wide variety of factors. These include experience, manual skills and institutional environment. The 85 ± 5 % success rate has been shown to be reached by the majority of residents by experience only. Experience being the reflection of the number of cases performed. To go beyond the 90 % success rate other factors should be considered. Institutional environment is one of the most important to get over the magic limit of 90%. Optimal environment should comprise a group of dedicated and experienced mentor, a sufficient clinical volume and a well standardized method for each block. Each step during block performance should not only be explained but also documented in order to move from implicit to explicit learning. Access to other means of teaching should also be available. Individual characteristics, is another factor which need to be recognized. This issue is crucial in order to correct specific individual deficits. The application of all these principles is mandatory to reach the 90 % success rate barrier and to provide well trained anesthesiologists for the regional anesthesia health market.

ASRA: WHO SHOULD PROVIDE ACCREDITATION?

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Accreditation and certification are terms that are often used interchangeably and it is important to define these meanings more precisely. Certification can be defined as the attestation by a third-party (the certifying body) that a certain product, process, system, or person has met particular standards or criteria. These standards are usually determined by the certifying body. Accreditation in turn, refers to third-party attestation that the certifying body has formally demonstrated its competence in carrying out the certification process in a reliable and credible manner.

The place of ultrasound-guided regional anesthesia is now well-established. ASRA and ESRA have recognized that it is important to develop training standards and guidelines for this skill. The issue of whether there should be formal certification of competency in ultrasound-guided regional anesthesia is much more controversial. In the United States, the American Board of Anesthesiology is the primary certifying body for the specialty. ASRA and the American Society of Anesthesiologists (ASA) have taken the stand that certification is outside their scope of responsibility. Instead the mission of ASRA is to meet the educational needs of its members with regard to ultrasound-guided regional anesthesia. ASRA and ASA have therefore jointly undertaken to provide members with an educational framework that allows them to demonstrate that they have completed a certain amount of training in the field of ultrasound-guided regional anesthesia. This initiative is called the ASA / ASRA Ultrasound-guided Regional Anesthesia Education and Clinical Training Portfolio. A certificate is issued upon completion of the elements of the portfolio, and serves as documentation of completion of the educational process. It is not however certification of competency. The lecture will outline the portfolio in more detail and touch on the considerations in Canada and the United States that underlie the issues of training and formal determination of competency.

ASRA: HOW IS COMPETENCE DEFINED WHEN LEARNING RA

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The following discussion regarding competence in regional anesthesia is excerpted from:

Neal JM. Education in regional anesthesia: Caseloads, simulation, journals, and politics: 2011 Carl Koller Lecture. Reg Anesth Pain Med 2012;37:467-451

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"Although the American Council of Graduate Medical Education (ACGME) defines competence much more formally than when I began my academic career a quarter century ago, at the heart of every training program is how to produce competent anesthesiologists. Despite voluminous definitions couched in "PhD educator-speak," I still find it much easier to define what competence is not, than what it is. Confidence does not equate to competence, as was amusingly described some years ago in a survey of residents who reported that they felt 'very confident' of their skills after having performed a median 9.5 sciatic nerve blocks.[1] Yet early attempts by faculty to define competence were equally wanting and likely more harmful. By requiring programs to report how many spinals or peripheral nerve blocks a resident has performed, the ACGME's Anesthesiology Residency Review Committee (RRC) and others unwittingly focus attention on the technical aspects of regional anesthesia, ie, where to place the needle. I was just as guilty of this misplaced focus on numbers, having partnered with Dan Kopacz

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to construct "regional anesthesia learning curves" to ascertain how many spinal and epidural blocks (about 45 and 60, respectively) a resident had to perform to attain 90% success without faculty assistance.[2] As if to further emphasize this obsession with numbers, Dan and I have continued Don Bridenbaugh's tradition of scouring the RRC's database to track residents' regional anesthesia experiences and compare them to the previous decade's numbers.[3] Not surprisingly, the tradition of constructing learning curves has continued into the ultrasound era.[4] Yet when we surveyed graduates of regional anesthesiology and acute pain medicine fellowship programs, these former fellows were more likely to lament the paucity of research opportunities and teaching regarding the non-technical aspects of regional anesthesia than to decry a dearth of technical experience.[5] Indeed, the 2010 guidelines for fellowship training categorize techniques by their degree of complexity, and remain silent regarding the number of blocks required for competence.[6]

Recording caseloads is not inherently bad, but how many peripheral nerve blocks a resident performs says little regarding whether the technique was successful or safe. Focusing on technical success says nothing regarding the resident's overall competence as a physician. For instance, did the resident understand the indications and contraindications for the block, the underlying anatomy, or why mepivacaine was chosen rather than bupivacaine? Did the resident know the outcome literature related to that block? Could he or she predict the possible complications, know how to prevent them, or diagnose and manage them should they occur? And would that resident be competent to develop the systems to enhance patient safety, operating room efficiency, and billing codes? Being technically adept is but a single measure of competence, so why is it the primary regulatory reporting measure? Granted, the In-Training exam can test the resident's knowledge of the physicochemical properties of local anesthetics, and the ABA oral examination can tease out a sense of the candidate's knowledge regarding anticoagulation and neuraxial blockade, as well as their judgment in applying this knowledge during the artificiality of the exam; but these are all merely point-in-time evaluations. Beyond these traditional assessment paradigms, how do we best train not only our residents but also our practicing anesthesiologist colleagues to adopt new technology, to diagnose and treat a rare complication that they may never experience in a lifetime of clinical practice, or as Don Bridenbaugh was fond of saying, "To take a less than perfect block and get the patient through the surgery in a manner such that only you knew the block wasn't perfect"?"

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ASRA: HOW TO ACQUIRE THE NECESSARY EXPERIENCE IN RA

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Recent improvements in technology have made it possible for any anesthesiologist willing to put in the time and effort to gain experience in and improve their regional technique. As with any discipline, expertise in regional anesthesia comes only after many hours of practice. Paradoxically, the experience needed to administer a successful regional block is, for the most part, based on learning done away from the patient.

The foundation of successful regional anesthesia technique is equal parts knowledge and practical experience. A thorough knowledge of anatomy remains the basis for administering successful regional blocks; this knowledge can be gained from textbooks, conferences and workshops, and keeping abreast of the current literature for novel methods that use anatomy to improve regional technique. An example of this is the "traceback" method,[1] whereby a nerve can be located based on its anatomical relationship to surrounding blood vessel.

Practical experience itself is based on two components: ultrasound scanning and needling. Sound anatomical knowledge underlies scanning proficiency, as does time spent using the ultrasound machine. Practicing scanning one's self or patients can provide valuable experience in both recognizing anatomical structures and use of the ultrasound machine. Another benefit of self-scanning is that one can focus on an area of interest and learn the optimal angulation and pressure needed to obtain good images. Cadaver models also provide useful tools to improve scanning technique and increase knowledge of the underlying anatomy.[2-5] Needling experience can similarly be gained from practice with inanimate models, such as ex vivo animal tissue or artificial phantoms. Practice on a phantom model with a needle and ultrasound machine can aid in the development of techniques to better visualize the needle.[6;7]

As the old adage goes, "Practice makes perfect," and, while no regional block may ever be "perfect," extensive practice can provide the knowledge and practical experience needed to perform effective blocks. It is acknowledged that regional anesthesia technique, be it ultrasound-aided[8;9] or not,[10] is associated with a steep learning curve. Nevertheless, education with simulators (e.g., self-scanning and phantom needling) can provide trainees with the practical experience needed to be successful when administering regional blocks later to the patient.[11] Simulators have the added benefit of enabling the user to train and practice without time constraints. Simulation exercises and self-guided learning, together with good anatomical knowledge and an appropriate investment of time and effort, can provide the experience required to be proficient in regional anesthesia.

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ESRA: SHOULD WE CONTINUE TO TEACH NON US GUIDED TECHNIQUES IN RA AND PAIN MANAGEMENT?

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Introduction: Numerous articles have been published with regards to the advantages of the use of ultrasound as a guidance technique for regional procedure. Many now consider UGRA the Holy Grail of safe regional anaesthesia and the only way to a safer RA. However, what is the evidence for this ? Has convincing evidence been produced to indicate that UGRA is safer and at least as effective as RA without ultrasound? What is the role of nerve stimulation nowadays?

Which guidance tool should be used for our regional techniques ?: For a long time people believed that nerve injury was caused by intraneural injections. Therefore, a lot of effort was put in the search for a method that could give some information on the needle- to-nerve proximity. It is clear that response to nerve stimulation was not always a reliable parameter. Nowadays we know that an intraneural injection does not necessary mean nerve injury. For a while some authors even encouraged intraneural injections. Ultrasound gave the anaesthesiologist an extra pair of eyes to prevent intraneural injections. But according to recent literature, ultrasound alone is not sufficient to prevent long-term postoperative neurological symptoms.

Controversy exists on the role or need of nerve stimulation. Especially since some authors stated that there is an increase in performance time and number of needle passes, and a possible decrease in success rate when the combination of ultrasound and nerve stimulation is used compared to when ultrasound is used alone. Recent studies describe many advantages when blocks are performed with ultrasound as guidance technique in comparison with nerve stimulation varying from higher success rate, faster onset time, fewer vascular punctures, dose reduction of local anesthetic mixture and progression of sensory-motor block.

Therefore, in theory, ultrasound will already lower complications. However, Sites et al concluded recently that evidence exists that ultrasound may reduce the incidence of LAST but a reduction on nerve injury has not yet been substantiated in the literature: ultrasound alone is not protective enough against neurological complications.

So what is wrong with the ultrasound guided technique that the risk of complications are still as high as without ultrasound? Is it still a factor of learning curves of the ultrasound guidance technique itself? Initial articles on UGRA focused mainly on different approaches, but little was published with regard to complications. How these new developments needed to be taught was poorly investigated. So no conclusions can yet be drawn regarding the influence of teaching on complication rate. Nerve stimulation however is a guidance tool which has been used for decades. Most of the actual anesthesiologists were thought by colleagues with already years of experience. This is in contrast with the current generation who is learning the new ultrasound guided technique from relatively low experienced colleagues. In the learning process nerve stimulation can be a guiding tool in the ultrasound guided learning process.

Many people were blinded by the articles that showed that there is a bad correlation between stimulating current and response. Gadsden et al suggested that although nerve stimulation techniques may not be a highly sensitive method of detecting intraneural injections, nerve stimulation has a high specificity for intraneural needle tip placement when a motor response is obtained at a current of 0,2mA or less. So although nerve stimulation is not very sensitive, it is specific in the prevention of intraneural injections. And intraneural injections are, even it not always results in nerve damage, a risk for nerve injury.

Conclusions: The key requirement for successful regional anesthesia is to ensure optimal dose and distribution of local anesthetic around the nerves. In the quest for a safer regional anaesthesia one has to investigate all different steps involved in regional anaesthesia procedures. Looking back at the history of regional techniques, nerve blocks evolved from entirely blind procedures to technical guided procedures. The introduction of nerve stimulation and especially ultrasound, transformed regional anaesthesia from an "art" to a "science". Finding this optimal location has always been a big challenge. The "Golden Standard" to achieve this goal has been nerve stimulation. During the last 2 decades, the success of ultrasound as a guidance technique for regional anesthesia has been overwhelming. In a review article of Gadsden et al the author explained that these different monitors are available but that they are complementary and that best practice may involve combining these monitoring. Recent review articles however revealed that still a potentially risk of nerve injury. The advantages of nerve stimulation by means of nerve detection, the high specificity of intraneural needle placement with stimulating currents of 0,2mA or less and the role in the learning process of ultrasound guided procedures makes that nerve stimulation still has an important place in performing regional anesthesia. And rather than omitting a guidance tool one should consider adding injection pressure monitoring to make regional anesthesia blocks safer.

EDUCATION FOR BUILDING KNOWLEDGE AND SAFETY IN DELIVERING REGIONAL ANAESTHESIA: ESRA - WHO SHOULD PROVIDE ACCREDITATION?

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The use of regional anaesthesia (RA) techniques is progressively increasing due to accumulating evidence of their benefits and rapid technological developments (nerve stimulation and ultrasound). In particular the later method is rapidly becoming a standard of care. Ultrasound (US) allows real-time visualization of anatomical structures, facilitates choice of approach, control of needle advancement and observation of injected solution. It also simplifies RA and creates an overenthusiastic attitude to this invasive procedure. Therefore it is prudent to provide a structured training and a method of accreditation in RA.

In Europe a basic training of younger colleagues in RA is normally conducted during their specialist training in anaesthesiology. Scientific societies in many European countries also organize post-graduate courses in RA techniques, both basic and advanced. In some countries, f.ex. Denmark a structured approach to training in the use of ultrasound has already been implemented by the University of Aarhus, where CECLUS (Center of Clinical Ultrasound) has been established. Training in regional anaesthesia is a part of this programme, which starts at the pre-graduate level and continues through the all stages of post-graduate training from basic to expert levels. Each stage of training consists of four modules: e-learning, hands-on, supervision and testing. Accreditation is provided after completion of each level.

ESRA is an organization, which both educates and certifies European doctors in RA. The European Diploma in Regional Anaesthesia & Pain Therapy (EDRA) was created in 2005 with the goal of establishing standards in regional anaesthesia in Europe. It is a 2-level examination conducted by the leading european experts in RA.

The Diploma is intended to widen the activity spectrum of those anaesthesiologists, who are already in clinical practice and wish to expand their knowledge in the entire field of regional anaesthesia.

The ESRA or CME/CDP approved courses and workshops, take into account that participants are reasonably experienced clinicians. The salient points of different techniques, the overall strategies for their use, as well as their advantages and risks, are emphasized during the courses and workshops attended by all candidates for EDRA.

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NEUROMODULATION PROCEDURES FOR DISCOGENIC PAIN TREATMENT

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Introduction: Low back pain (LBP) is very prevalent in the general population The diagnosis and treatment of painful degenerative disc disease remains one of the most controversial topics in the literature The debate continues as to whether surgical treatment should be attempted, and if so, which surgical approach is optimal However, the second controversy begins when pain persists and no surgical target exists, or the patient had been scheduled for surgery (failed back Surgery syndrome).

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Management of back pain that is persistent and disabling despite the use of recommended conservative treatment is challenging Numerous diagnostic and therapeutic injections and other interventional and surgical treatments have therefore been proposed for the treatment back pain.

The most painful component in failed back Surgery syndrome (FBSS) is the radiculopathy, as shown by the characteristics of a FBSS population compared to other chronic pain condition[1] Patients were severely disabled, as indicated by several validated scores Owwestry Disability Score (ODI) , Short Form Health Survey SF-36, EuroQol EQ-5D, and their health-related quality of life was very poor[1] All patients had tried at least one class of drug or non-drug treatment prior to underwent a trial of neuromodulation, and 87% had tried 4 or more types of drug and non-drug treatments.

Patients with FBSS typically have failed to respond to multiple therapies. Few options remain; these most prominently include a new surgical procedure, multidisciplinary rehabilitation or neuromodulation Neuromodulation, the reversible and adjustable blockade or manipulation of pain pathways to modify physiological function, may be applied to spinal cord, deep brain structures, motor cortex and peripheral nerves. Among all the available neuromodulation techniques, spinal cord stimulation (SCS) and intrathecal drug infusion are the most common and efficacious.

NEUROSTIMULATION TECHNIQUES: Advances in our knowledge of the physiology of pain transmission and modulation have created new options for the control of chronic pain using electrical neuromodulation.[2] Likewise, there have been increasing reports of utilization of stimulation peripherally in the form of Selective nerve root stimulation (SNRS), Peripheral Nerve Stimulation (PNS) and Peripheral Nerve Field Stimulation (PNFS). Interestingly, Slavin[3] has noted that, although implanted spinal cord stimulator devices have more "approved" indications, the first articles reporting implanted devices for Peripheral Nerve Stimulation predated those of spinal cord stimulation.

Spinal cord stimulation is the most common mode of neuromodulation used in managing chronic low back pain. The basic scientific background of the initial spinal cord stimulation trials was based on the gate control theory of Melzack and Wall Various other mechanisms, which may play a significant role in the mechanism of action of spinal cord stimulation, include the suppressive effect of spinal cord stimulation on tactile allodynia, increased dorsal horn inhibitory action of gamma-aminobutyric acid (GABA), prevention or abolition of peripheral ischemia, and effects on human brain activity. In man, SCS may effectively abolish both continuous and evoked pain (tactile/thermal allodynia) whereas induced, acute nociceptive pain is unaffected. Recent SCS studies performed on rat models of mononeuropathy have demonstrated a preferential effect on A beta fiber mediated functions, and the hyperexcitability of wide-dynamic-range dorsal horn neurons was attenuated. These effects were coupled to increased release of GABA and reduced glutamate and aspartate release in the dorsal horn Intrathecal administration of GABA, baclofen and adenosine enhanced the SCS effect on tactile allodynia even in previously non-responsive rats. Preliminary results indicate that gabapentin may have a similar effect GABAergic and adenosine-related mechanisms conceivably represent only examples of a number of putative receptor systems involved in SCS.[4,5]

Spinal segmental inhibition still seems to be crucial, but supra-spinal activity via the posterior columns of the spinal cord is also involved In humans suffering from several types of neuropathic pain, electrical stimulation of the dorsal columns in the thoracic spinal cord generated antidromic action potentials activating large myelinated fibers in pure sensory peripheral nerves[6], and late cellular activation in the dorsal horn after SCS has been also hypothesized, as suggested by an increase in c-Fos immuno-reactive cells in the dorsal horn after SCS.[7] Recent results in an animal model of neuropathic pain showed that the spinal serotonergic system plays a crucial role in the pain relieving effect of SCS, suggesting an activation of serotonergic descending pathways that may inhibit spinal nociceptive transmission.[8] Moreover, evidences of SCS-induced activation of specific areas of the brain (primary and secondary sensorimotor cortex, cingulate cortex, insula, thalamus, and premotor cortex) have been recently published[9], and regional cerebral blood flow measured by PET in patients undergoing SCS therapy for intractable pain was increased in the right thalamus, superior parietal lobule and left inferior parietal lobule after application of SCS Hence SCS controls pain cognition by modulating the thalamus and parietal association area, and it also controls the emotional aspects of pain by modulating the prefrontal region.

As outlined in some reviews[10,11], the use of SCS in patients suffering from FBSS has been shown to provide 1) a sustained, long-term pain relief, with a reduction in concomitant pain medication 2) an improvement in quality of life and functional status 3) an increased ability to return to work 4) an increased patient satisfaction 5) minimal side effects 6) a cost-effective alternative to conventional therapies 7) the opportunity for maximized combination therapy with oral and intrathecal.

According to the last published systematic review[12] and based on Guyatt criteria[13], the recommendation for SCS in FBSS patient should be rated as 1B/1C (strong recommendation with moderate to low quality of evidence), with a caveat that it may change when higher quality evidence becomes available. The American Pain Society found fair evidence that spinal cord stimulation is moderately effective for failed back surgery syndrome with persistent radiculopathy, though device-related complications are common[14], and both European Federation of Neurological Society and NICE (National – UK – Institute for Health and Clinical Excellence) guidelines support the effect of SCS in patients with FBSS[15,16].

Two randomized controlled trials investigated the effect of SCS on the treatment of FBSS One trial (PROCESS) compared SCS in combination with conventional medical management (CMM) with CMM alone[17]; interestingly, most of the patients recruited had persistent radicular pain following anatomically successful surgery for herniated disc. The other trial compared SCS in combination with CMM with repeat operation in combination with CMM.[18] Follow-up in the PROCESS trial was at 6 and 12 months, with a further analysis published 24 months later[19], and in the other trial at 6 months and after a mean of 2.9 years. The primary outcome in both studies was the proportion of people who had 50% or greater pain relief. The PROCESS trial reported that SCS had a greater effect than CMM in terms of the proportion of people experiencing 50% pain relief at 6 months (48% and 9% in the SCS and CMM groups, respectively), 12 months (34% and 7% in the SCS and CMM groups, respectively) and 24 months (37% vs 2%). The other trial also reported a statistically significant benefit in terms of those experiencing 50% pain relief, favoring SCS in comparison with repeat operation (39% and 12% in the SCS and repeat operation groups, respectively). In the PROCESS trial, opioid use did not differ significantly between the two groups (56% and 70% using opioids in the SCS and CMM groups, respectively). However, the other trial reported that SCS resulted in a significantly greater number of people reducing or maintaining the same dose of opioids when compared with repeat operation (87% and 58% in the SCS and repeat operation groups, respectively). In the PROCESS trial the SCS group showed a significantly greater improvement in function compared with the CMM group for mean change in functional ability (Oswestry Disability Index) and significant benefits in health-related quality of life (SF-36). The other trial reported no statistically significant differences between SCS and repeat operation for pain related to daily activities or neurological function.

Patient selection is the key to having good outcomes[2]. Despite a proper patient selection however, some patients do not benefit adequately from SCS, in spite of the fact that stimulation-induced paresthesiae cover the painful area[20]. In a recent retrospective analysis of a single-centre experience with SCS over the past 22 years, Kumar et al reported a 84% of early SCS trial success in FBSS patients, that dropped to 60% in the long term follow-up (mean 98 months)[21]. Interestingly, authors reported a lower failure rates (16%) in FBSS patients with a clear pain etiology and radicular distribution, compared to an higher rate (33%) found in FBSS patients who did not experience obvious neuropathic pain but have nonspecific pain on their arms of legs that were not in the distribution of any particular nerve root or roots and were not associated with radicular neurologic deficits.

The delay between the first back surgery and the trial of SCS seems to be significant prognostic factor. In a study of 235 patients treated over 15 years, the success rate of SCS dropped from 93% in patients who had a 3-year delay. between surgery and implantation to 9% for those who had a 12-year delay[11]

Selective nerve root stimulation (SNRS)[22,23] is a neuromodulation modality that places stimulator electrode array(s) along the spinal nerve roots, creating stimulation paresthesias within the distribution of the target nerve root(s), thereby treating pain in that same distribution. There are several different forms of spinal nerve root stimulation, depending upon the exact electrode positioning along the nerve roots SNRS combines the minimally invasive nature, central location, and ease of placement of spinal cord stimulation with the focal targeting of stimulation paresthesias of peripheral nerve stimulation. This hybrid technique may be an effective alternative for patients in whom other forms of neurostimulation are either ineffective or inappropriate.

Peripheral Nerve Stimulation (PNS) generally implies implantation of a stimulating electrode either directly on a particular nerve via surgical visualization4 or perhaps more commonly percutaneous placement of a stimulating electrode in close proximity to a particular peripheral nerve[24,25]. In the

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latter, stimulating electrodes are percutaneously placed in the painful areas themselves without respect to a particular named nerve's location. In both, the underlying concept remains the same: using electrical stimulation peripherally (as opposed to centrally in the case of dorsal column stimulation) to provide paresthesias in painful areas leading to pain relief. The exact mechanism(s) by which these approaches render pain relief is incompletely understood. A widely held hypothesis is that pain relief may be (at least in part) explained by the "gate-control" theory originally described by Melzack and Wall in their landmark paper published in 1965. The gate of pain transmission is opened by activation of nociceptive specific neurons, while stimulation of large myelinated fibers closes the gate. Putative inhibitory neurotransmitters thought to be released during large myelinated nerve fiber stimulation include gamma-aminobutyric acid (GABA) and adenosine[20,26,27]. An advantage of using **Peripheral Nerve Stimulation and Peripheral Nerve Field Stimulation** as a modality for treating pain includes the fact the devices are nearly always trialed before a permanent implantation allowing for a "try before you buy" clinical situation.

With regards to indications, it is generally accepted that Peripheral Nerve Stimulation and Peripheral Nerve Field Stimulation are modalities reserved for neuropathic pain that is refractory to conventional treatment methods[28-31] Neuropathic pain in this context would include discogenic pain patients. The exact mechanism of the pain relief remains unclear but literature is providing evidence of adequate pain relief both in axial neck pain and lumbar back pain[32-37]. Actual selection criteria vary to a degree amongst practitioners, but converge on the fact that, the painful condition must be consistently well localized.

As a conclusion neurostimulation procedures resulted in adequate paresthesia coverage and effective pain relief patients with neuropathic patient of discogenic origin. Further clinical trials to evaluate long-term success rates and safety are indicated Detailed mapping studies are needed to evaluate the relationship between electrode placement and paresthesia patterns as well as the optimal stimulation parameters.

INTRATHECAL DRUG DELIVERY THERAPY: Intrathecal Drug Delivery (IDD) therapy was initially used only in the treatment of cancer-related pain, today the majority of patients treated with spinally administered medication have non-cancer types of pain.

IDD has been accepted as limited to moderate recommendation therapy for non-cancer-related pain[38], as few small studies suggest that intrathecal drug infusion could decrease pain scores and increase quality of life in patients with residual low-back pain and radiculopathy. While SCS has been extensively studied in patients suffering from FBSS, no specific data regarding the use of intrathecal infusion in complex chronic pain of spinal origin have been published.

However, most of the non-cancer pain studies included in the available systematic reviews recruited FBSS patients as a population suitable to represent mixed (neuropathic and nociceptive) pain, and the same general level of evidence (limited evidence) could be applied to this specific subset of patients In a recent survey of experienced neuromodulation centers (more than 10 implants a year), failed back surgery syndrome (FBSS) was identified as the top indication for intrathecal drug infusion device implantation[39].

A long-term evaluation (mean follow-up 27 months) of a treatment regimen consisting of intrathecal morphine mixed with bupivacaine, clonidine, or midazolam in 26 patients with chronic nonmalignant back and leg pain due to FBSS showed excellent or good long-term results in 19 patients, sufficient results in 6 while only 1 patient complained of poor therapeutic efficacy[40]. In a review of the efficacy of IDD in 136 patients with chronic low back pain identified from the U S National Outcomes Registry for Low Back Pain, numeric pain ratings had fallen by more than 47% for back pain and 31% for leg pain at the 12-month follow-up. A total of 65% of patients had reduced their Oswestry scores by at least one level after 12 months, 80% were satisfied with their therapy, and 87% said they would undergo the procedure again.[41]

However, FBSS is an heterogeneous chronic pain condition, and patients could have different degree of nociceptive and neuropathic pain at the same time According to authors' experience and to the results of a multicenter, retrospective study that surveyed pain physicians in the United States, patients with somatic pain seem to have greater analgesic benefit by intrathecal infusion compared to the ones suffering from pure neuropathic pain[42] Numerous preclinical[43] and clinical[44] studies confirmed the hypothesis that neuropathic pain could be less responsive to opioids than nociceptive pain.

Considering that chronic non-malignant pain is complicated by physical, psychological, and behavioral factors, we should remind that, to be successful, a treatment must include a multidimensional approach that takes into account each of the elements of the biopsychosocial model.[45]

Opioids are the most commonly used agents for long- term spinal drug therapy for pain control[46] Since the publication of the third Polyanalgesic Consensus Conference (PACC) report in 2007[47], the published literature on IT therapy has expanded, and the 2011 updated version of the PACC[48] treatment algorithm is based on the best available evidence from published reports and on panel discussions, for single-drug treatments and drug combinations in a rational and prioritized order First-line medications/combinations are supported by extensive clinical experience and published clinical and preclinical literature and are typically used to initiate IT therapy For neuropathic pain, line 1 contains morphine, alone or in combination with the local anesthetic, bupivacaine

Patients with a neuropathic pain component should be considered initially for mono-therapy with morphine or its derivative hydromorphone[49], both of which are supported by extensive clinical experience and published preclinical and clinical data.[50] Selected patients with pure or predominant neuropathic pain should be considered for initial treatment with opioid plus adjuvant medication such as the local anesthetic bupivacaine or the α-2-agonist clonidine. In case of failure of intrathecal morphine, the combination with non-opioid drugs such as the anticonvulsant baclofen or the local anesthetic bupivacaine[51,52] also is possible and has been shown to be effective in patients with central pain and in patients with peripheral, nociceptive, or neuropathic pain mechanisms.

Consistent with the recommendations from the PACC 2007, ziconotide, a nonopioid that is approved by the US FDA for IT analgesia, is also recommended as a first-line drug for nociceptive pain. The Polyanalgesic Conference 2007, a panel of experts known for their expertise in intrathecal therapy, felt, based on relevant new literature and clinical experience, that ziconotide should be upgraded to a first- line intrathecal agent and currently, ziconotide and morphine are the only drugs approved by the United States Food and Drug administration for intrathecal pain therapy.

Evidence from double-blinded controlled trials, open-label studies[53], case series, and case studies suggests that ziconotide, as either mono-therapy or in combination with other intrathecal drugs, is a potential therapeutic option for patients with refractory neuropathic pain[54]. In the preclinical studies, ziconotide demonstrated antiallodynic effects on neuropathic pain and clinical data indicated that patients with neuropathic pain reported a mean percent improvement in pain score with ziconotide mono-therapy that ranged from 15 7% to 31 6%. The main adverse effects of ziconotide in clinical trials were cerebello-vestibular disorders such as ataxia, dizziness, and gait disorders, as well as confusion, hallucinations (increased in cases of overdose), nausea, vomiting, postural hypotension, and urine retention. About 40% of patients had an elevation in muscle creatine-kinase activity, through an unknown mechanism. A low starting dose and slow titration of ziconotide resulted in an improved safety profile and a better side-effects profile.[55]

For neuropathic pain, line 2 of PACC[48] treatment algorithm contains hydromorphone, either as monotherapy or in combination with bupivacaine, and the combination of morphine and clonidine Line 3 of PACC48 treatment algorithm contains Fentanyl, either alone or in combination with bupivacaine, is considered a third-line approach to neuropathic pain. Additionally, clonidine and the combination of ziconotide and an opioid are third-line therapies. As fourth-line treatment of neuropathic pain, the combination of bupivacaine and clonidine, with or without an opioid, is recommended. As fifth-line treatment of neuropathic pain, the panel recommends the use of baclofen.

The use of other agents are common among pain practitioners who manage IT pumps; however, physicians should use their own best clinical judgment in making treatment decisions for their patients.

Ongoing research is in process for finding new alternatives for IDD therapy. A very recent study[56] suggest that intrathecal delivery spironolactone has therapeutic effects on radicular pain in rats. Decreasing the activation of glial cells, the production of proinflammatory cytokines and down-regulating the expression and phosphorylation of NMDA receptors in the spinal dorsal horn and dorsal root ganglia are the main mechanisms contributing to its beneficial effects.

In a very recent report on behalf of the International Association for the Study of Pain Neuropathic Pain Special Interest Group[57], the authors evaluated systematic reviews, clinical trials, and existing guidelines for the interventional management of Neuropathic pain Evidence supported intrathecal medication, in patients with radiculopathy and failed back surgery syndrome (FBSS).

As conclusion intrathecal drug delivery (IDD) is primarily effective for nociceptive or mixed pain, and its usage is generally limited to conditions within that realm.

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ESTABLISHING THE DIAGNOSIS OF DISCOGENIC BACK PAIN: AN EVIDENCE-BASED ALGORITHMIC APPROACH

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An estimated 40% of chronic lumbosacral spinal pain is attributed to the discus intervertebralis.[1, 2] Degenerative changes following loss of hydration of the nucleus pulposus lead to circumferential or radial tears within the annulus fibrosus. Annular tears within the outer annulus stimulate the ingrowth of blood vessels and accompanying nociceptors into the outer and occasionally inner annulus. Sensitization of these nociceptors by various inflammatory repair mechanisms may lead to chronic discogenic pain.

The intervertebral disc degenerates earlier than other musculoskeletal tissues. It starts as early as the teens and gradually increases. At the age of 70 and older 60% are of the persons have severely degenerated discs. [3]

In the normal disc, sensory nerves innervate the outermost third of the annulus. The nerves seem, however, to penetrate deeper and reach even the nucleus pulposus in degenerated discs. With an increased age and progressive degeneration the disc can become weaker and fissures and tears can arise. These tears can cause chronic pain, when it extends in the outermost third of the annulus. [4] The diagnosis of discogenic pain should preferentially be done according to a stepwise approach.

Medical imaging can show the level of disc degeneration.

The current criterion standard for diagnosing discogenic pain is pressure-controlled provocative discography using strict criteria and at least one negative control level. The strictness of criteria and the adherence to technical detail will allow an acceptable low false positive response rate.

It should be kept in mind that this is an invasive and painful procedure that, as any other interventional procedure has a risk for infection.[5] Moreover, the added value of a discography should be carefully balanced against the risks. It was demonstrated that discography causes accelerated progression of degeneration.[6] The need for increased precision of the diagnosis will depend on the degree of invasiveness of the planned intervention.

There is little evidence for the different interventional treatment options. Surgical stabilization of the lumbar spine was compared with intensive rehabilitation and superiority of surgery could not be demonstrated.[7]

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TAP BLOCKS – DO THEY HELP?

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The transversus abdominis plane (TAP) is a neurovascular plane in the abdominal musculature. Local anaesthesia deposited within this plane may block lower thoracic intercostal nerves (T7-T11), the subcostal nerve (T12), and the iliohypogastric and ilioinguinal nerves (L1). The aim of the TAP block is sensory anaesthesia or analgesia of the lower abdominal wall.

Classically the TAP is accessed via the Triangle of Petit using a landmark technique. The triangle is bordered anteriorly by the posterior border of the external oblique muscle, posteriorly by the lower border of latissimus dorsi and inferiorly by the iliac crest. A blunt-tipped needle (peripheral nerve

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block or Tuohy needle) is inserted within the triangle and after piercing the skin two pops are elicited as the fascial planes of the external and internal oblique muscles are pierced. Subsequent injection of local anaesthetic agent should proceed in the plane between the internal oblique and transversus abdominis muscles. Alternatively ultrasound (USS) can be used and described approaches include subcostal, mid-axillary and posterior.

Subcostal and mid-axillary approaches are likely to result in sparing of the lower thoracic and ilioinguinal/iliohypogastric nerves. Contrast studies with magnetic resonance imaging have found that the USS-guided posterior approach is most likely to mimic the spread of that seen with landmark approach. Using landmark and posterior USS techniques the contrast studies demonstrate pooling of contrast posteriorly in paravertebral and interforaminal epidural spaces. In addition to landmark or USS-guided approaches, a further option includes surgical placement under direct vision – either single shot or a catheter with subsequent local anaesthetic infusion. Small observational studies have found surgical placement to be superior to landmark techniques.

Randomised controlled trials studying pain relief after cesarean section have compared the efficacy of TAP blocks with intravenous and intrathecal opiates (morphine, diamorphine). If no intrathecal opiate is used, for instance after general anaesthesia, then a TAP block can significantly reduce intravenous morphine consumption within the first 24 hours post-operatively and increase patient satisfaction. In comparison, if intrathecal opiate is used, then a TAP block offers no additional benefit in reducing pain at rest, pain during movement or reducing the time until additional intravenous or oral opiate analgesia is required. Patients after cesarean section with a TAP block and no intrathecal opiate have higher pain scores and require earlier and increased analgesic supplementation than those with intrathecal opiate.

The optimum volume and concentration of local anaesthetic agent to be used in a TAP block are not yet determined. Typical doses include 20-30 mL 0.25-0.5% bupivacaine or 0.375-0.5% ropivacaine bilaterally. Neurotoxic levels have been reported up to 90 minutes post injection. Complications are rare, however femoral nerve palsy and peritoneal and visceral perforation have been reported.

A survey of obstetric anaesthetists in the United Kingdom (UK) indicated that the use of TAP blocks after cesarean section is not common practice and limited to providing analgesia after general anaesthesia. Lack of equipment and training are cited as reasons for infrequent usage.

Current UK guidelines by NICE for the provision of care during cesarean section recommend the use of intrathecal diamorphine during regional anaesthesia. Given the lack of evidence demonstrating benefits of TAP blocks in these patients the primary use of this block after cesarean section remains for patients who cannot or did not receive intrathecal opiates. Other uses for the TAP block in obstetric anaesthesia have been described. TAP blocks have been used successfully in patients following regional anaesthesia with post-operative breakthrough pain and wishing to avoid further opiate analgesia. Also, TAP blocks in combination with local anaesthetic infiltration and sedation have been used as a method of anaesthesia for cesarean section when regional or general anaesthesia were not possible.

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EPIDURAL BLOCKS: STILL THE BEST OPTION VS TAP BLOCK VS INFILTRATION?

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Effective pain management is a critical component of postoperative care and contributes to fewer postoperative complications, shortened hospital stays, better quality of life, and a decreased incidence of chronic pain postoperatively. Studies indicate that continuous epidural analgesia can be used effectively to manage acute postoperative pain, particularly in children. Indeed, continuous epidural analgesia for children has enjoyed considerable popularity. Futhermore, 2,717 catheters were placed in 2006 during the survey of ADARPEF to ensure continuous postoperative analgesia mainly epidural (56% out of all catheters) (1).

1.Advantages: The continuous epidural analgesia is associated with improved postoperative outcomes, such as less incisional pain, decreased muscle spasms (2), and decreased atelectasis and respiratory complications (3) and may increase gastrointestinal motility (4). Newborn infants who have been managed with continuous epidural analgesia may be intubated for shorter periods, recover more quickly, and experience less pain (5). The combination of a local anesthetic such as ropivacaine or levobupivacaine and an opioid such as fentanyl or sufentanil can optimize pain relief while minimizing side effects (6). However, despite the plethora of published literature on paediatric epidural analgesia, prospective outcome studies demonstrating the clinical benefits and cost effectiveness of continuous epidural analgesia over the simple intravenous opioid infusion in children are lacking.

2. Potential drawbacks: Many pediatric anesthetists who were strong and early advocates of the technique, are more reticent in their support today. Indeed, audits of epidural infusions in children have shown that 17–22% of infusions are terminated prematurely (7, 8) and that side-effects or complications occur in 67% of patients (7). Adverse effects of epidurally administered narcotics include respiratory depression, pruritus, urinary retention, nausea and vomiting, and sedation. Adverse effects of epidurally administered local anesthetics include urinary retention, hypotension, numbness, motor weakness and, rarely, systemic toxicity. Epidural analgesia

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exposes also patients to rare additional risks, at the time of insertion and during the course of the postoperative infusion, as recently reported in a large 5-yr prospective audit of 10 000 paediatric epidural catheter techniques currently taking place in the UK to try to establish the relative risk of these problems in modern practice (9). Complications may be venous air embolism, postdural puncture headache, inadvertent iv administration of local anesthetic, nerve trauma, back pain, epidural hematoma or infection (including osteomyelitis, epidural space infection).

In addition, the commonest problems with pediatric regional anesthesia are technical: either failure to establish a block or failure of maintenance of the block. The ultrasonography is helping to perform the puncture introduce the catheter (10). Epidural analgesia is reliant upon optimal positioning of the catheter tip within the epidural space at the appropriate level for the surgery performed. Even with optimal positioning, analgesia may be inadequate (because of pain or discomfort remote to the surgical site from intravenous cannulae, wound or chest drains, urethral or suprapubic catheters, bladder or skeletal muscle spasm), unilateral (e.g. epidural septa) or patchy (e.g. air in epidural space). Futhermore, the epidural catheter tip may be misplaced, in which case the likelihood of achieving satisfactory analgesia is diminished. The tip may be located distant to the nerves supplying the dermatomes that need to be blocked, or the catheter may have been inserted into the subdural space.

Finally, epidural infusions are more costly to maintain than intravenous opioid infusions postoperatively. Drugs for epidural infusion are often prepared in a sterile pharmacy environment, increasing the base cost of drugs, which are usually higher than intravenous opioids. In addition, routine pain service consultations take longer in patients receiving epidural analgesia because, in addition to checking for adequate analgesia, attention must also be paid to pressure care, the state of the epidural insertion site and dressing, degree of motor blockade and dermatome cover.

3. Alternative procedure: TAP blocks have gained a new place in the therapeutic arsenal of pediatric analgesia, following the principle of bene?ts/risks analysis. Indeed, ultrasound- guided TAP block as a single shot block has been suggested for laparotomy, appendectomy, pyloromyotomy, Nissen fundoplication, major abdominal wall surgery, colostomy placement, and closures, whereas ultrasound-guided rectus sheath block has become popular to provide analgesia for umbilical and epigastric hernia repair, laparoscopic surgery, and other small midline incisions (11). But it is still unclear whether both techniques really result in equivalent results. Catheter techniques are used by some experts (12). TAP block can be a valuable alternative to central neuraxial blocks, when these techniques are not applicable, for example, in case of spinal dysraphism or other anomalies of the spinal canal (13). With the exception of high systemic concentrations, up to now, no complication has been attributed to the pediatric TAP block. The technique has undoubtedly the potential to provide analgesia for some hours, allowing a smooth transition from general anesthesia to the postoperative awake period.

Infiltration is limited to the skin incision and the indication is different than contiuous epidural analgesia.

Paravertebral block is also an alternative technique, but this technique is close an epidural technique (14).

In conclusion, the risks of epidural catheter insertion and continuous infusion postoperatively are justified in some groups: those with cognitive impairment (especially self-mutilating behaviour), patients with cerebral palsy predisposed to painful muscle spasms postoperatively, neonates undergoing major laparotomy or tracheo-oesophageal fistula repair where epidural analgesia may reduce the likelihood of postoperative mechanical ventilation (in both) and the potential for barotrauma jeopardizing surgical repair (in the latter), in older children and adolescents where chest physiotherapy is critical (e.g. cystic fibrosis or chest trauma) and in those undergoing extensive laparotomy, painful thoracic surgical procedures such as pectus excavatum repair. The new fashion block, i.e. TAP block, can help sometimes but randomized studies are needed to evaluate the place of each technique.

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LIPID RESCUE: WHAT ABOUT KIDS? SAFETY RULES IN CHILDREN

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Local Anesthetic Systemic Toxicity (LAST) is described during the performance of a block both in adults and in children and it is, a drug-related toxicity due to to many factors such as a large amount of administered drug or an inadvertant intravenous injection. In any case the result can lead to neurological and cardiac signs, from convulsions to a cardiac arrest; immediate usual basic life support like O2 administration, ventilation, cardiac massage, epinephrine etc are very often not sufficient to save the patient.

In 1998 Guy Weinberg et al published a paper describing the effect of intralipid administration to rescue local anesthetic toxicity and subsequent articles of the same author underlined the validity of this method.(1-7)

Recently the potential benefits of a lipid rescue were described in a long series of case-reports bringing enough data to convince about the efficacy of this rescue drug.

Today there is a website- www.lipidrescue.org where both case reports and an intralipid protocol in different languages can be found.

Moreover two lipid rescue dose recommendations were published by two national and international associations.- the British Association of Anesthesists and the American Society of Regional Anesthesia (8,9)

The suggested doses are 20% Lipid emulsion 1.5 ml/kg over 1 min followed by a continuous infusion of 0.25 ml/kg/min(or 15 ml/kg/h) for 10 min; these doses are proposed for adults but can be used also in children

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The problem of LAST aquires more importance in children where the therapeutic window is narrow due to metabolic and physiologic differences compared to adults.

So far few case reports describe the value of lipid rescue in kids; out of 14 cases 7 were ascribed to local anesthetic infusion and 7 to other non-anethetic drugs.(10-17)

In 6 cases bupivacaine was the local anesthetetic used and in one case a mixture of lidocaine/ropivacaine was injected: in all cases a lipid rescue was administered even if with different dosages,single shot or continuous infusionsand; all cases were successfully resuscitated. The patients' age were 2 days, 40 days, 6 years 13 years 17, 17 and 18 respectively.

Even if in 2011 a paper published on Pediatric Anesthesia suggested that epinephrine gives better results than intralipid to rescue a LAST it seems that the piglets used for this study were not appropriate and so far no other criticissm was addressed to the use of lipid rescue(18,19).

Besides the efficacy of lipid rescue ,safety rules must be applied to prevent LAST and other errors.

Some controversies of the past are nowadays solved.

Slow administration of local anesthetic and frequent aspiration tests are mandatory, the use of ultrasound while performing the block increases the efficacy /safety in children (20).

A study based on Pediatric Regional Anesthesia Network (PRAN) data showed that general anesthesia and/or heavy sedation to perform the block are safe and the two big data-base from ADARPEF and PRAN itself confirmed that performance is safer under sedation/general anesthesia without any risk of "double anesthesia techniques"and spontaneous ventilation during the block is safer than in a paralyzed child underlying what written in the recent monography on pediatric regional anesthesia of Pediatric Anesthesia.(21-25)

In conclusion every anesthetic technique can have risks and also pediatric regional anesthesia though considered a safe method is not without risks so to have in our armamentarium the suggested lipid rescue can give as a bigger safety margin in performimg our work.

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ULTRASOUND: RISKS/BENEFITS UPDATE

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The use of ultrasound-guided peripheral nerve blocks has increased in popularity over the past decade and it has been reported for peripheral and central blocks in both adults and children. Although the superior visualization and localization for injection of local anesthetic, provided by ultrasound guidance, theoretically would result in a reduction of complication rates (eg, neurologic injuries and neurologic or cardiovascular toxicity), this has not been definitively proven. Nevertheless, ultrasound-guided regional anesthesia (UGRA) is universally accepted.

Three kinds of outcomes are analyzed to evaluate the UGRA: 1) block-related outcomes such as improvements in onset, duration, and patient satisfaction;

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2) process-related outcomes such as block performance times, and 3) safety-related outcomes such as reduction in local anesthetics toxicity. Among these, patient safety remains the most controversial when discussing the benefits of UGRA.

Different reviews and metanalysis indicate that ultrasound (US) may offer many benefits including a higher block success rate, decreased time to onset of blocks, improved quality of sensory block, decreased local anesthetic requirements and decreased time to perform peripheral nerve blocks (1). The movement of the needle tip in real-time permits to obtain a circumferential distribution around the target nerves and it could explain the observed advantages in block onset, block quality, reduction in local anesthetic requirements, and block procedure time (2,3,4). Nevertheless, authors are not yet unanimous to consider a superiority of UGRA versus most of the other techniques improving success of regional anesthesia (5, 6). Concerning pediatric blocks, UGRA showed to reduce the volume of local anesthetic required, but some doubts persist if reduced volumes can maintain or improve block quality and duration (7, 8).

US are used both for the central blocks and peripheral blocks with specific benefits. In regards to the neuraxial anesthesia, ultrasound imaging can show the dura mater and ligamentum flavum, the depth to loss of resistance, the epidural needle in neonates, catheter position either directly or indirectly after injection of fluid or air (9). With regard to specific peripheral blocks, there was a significant increase in block success and a faster sensory block onset with ultrasound-guided techniques compared with non-ultrasound techniques for brachial plexus blocks overall, showing improved outcomes (10). With UGRA when both infraclavicular nerve block axillary nerve block are compared to supraclavicular nerve block, the supraclavicular doesn't show significant differences in terms of efficacy (10). Furthermore, a significantly greater incidence of complications were found with supraclavicular nerve block (10). In regards to pediatric UGRA, randomized controlled trials showed that the onset of a infraclavicular sensory block with UGRA is faster than peripheral nerve stimulation, but the success of surgical anesthesia was not different (11). Lower-extremity nerves are more difficult to anesthetize because of typically larger size such as the sciatic nerve, and thus, advantages of US seem more understandable than upper-extremity blocks (3). In regards to femoral nerve blocks and popliteal sciatic nerve blocks there is an increase in success of sensory block, reduction in local anesthestic volume. In particular with femoral nerve block the onset time of complete sensory block is decreased, while with popliteal sciatic nerve block there is a decreased procedural time (2). In pediatric randomized clinical trials, UGRA modestly prolonged neural blockade in infraclavicular, sciatic and femoral block model (11,12).

It is probably not surprising that ultrasound-guided peripheral nerve blocks are associated with an increased overall success rate and shorter performance times versus controls as a whole. US allows direct visualization of various peripheral nerves, resulting in precise localization of local anesthetic administration, which may increase success rates and be particularly useful in difficult patients, such as children. If upper extremity blocks are analyzed by "block quality" indicators, about 20% of randomized clinical trials reported less need for rescue block, and ~10% found less need for supplemental analgesia in the UGRA (13). Duration of the block was infrequently measured and only one randomized controlled trial reported prolonged duration for UGRA (3). Furthermore, US was never inferior to control groups for upper- and lower-extremity blocks (3).

The ability to directly visualize the target nerve may be associated with shorter procedure times versus traditional techniques. Concerning US for brachial plexus block the highest-quality studies have demonstrated a clinically and statistically significant reduction in performance time even when scan time was included as compared with peripheral nerve stimulation (10).

The visualization of the target nerve is also related to the reduction in complications, presumably to visualization of needle contact with nerves. UGRA's advantage about increased security is obvious, above all in pediatric patients with their smaller body mass in either central or peripheral blocks. The direct visualization of the ligamentum flavum and particularly of the dura mater in neonates, infants and children up to 12 years of age are examples of UGRA's important contribution (9). Therefore the reduction of the number of bone contacts and a faster placement of the epidural catheter is possible, even if it doesn't affect analgesia or complications (14). Fortunately, serious complications of regional anesthesia, such as local anesthetic systemic toxicity (LAST) and permanent nerve damage for intravascular or intraneural injections are extremely rare (15). Consequently, statistical proof that using US reduces their occurrence may never be achieved. US decrease the minimum effective local anesthetic volume and the risk of vascular puncture but these have not been shown to affect the rate of LAST as seizures are still reported with UGRA (16). US have also been proven to decrease the number of needle passes required to perform a block, but this reduction has not been associated with a decreased incidence in block-related nerve injury. Furthermore, postoperative neurologic symptoms still occur with UGRA at the same rate as with peripheral nerve stimulator-guided blocks. However, US become essential because the use of subjective warning signs is not possible in the anesthetized patients as children and the currently relied on technique of nerve stimulation is showing to have less than optimal sensitivity (17). Pneumothorax and hemidiaphragmatic paresis (HDP) also continue to occur with UGRA. Pneumothorax occurrence may be related to operator experience. Some skilled physicians perform phrenic nerve-sparing brachial plexus techniques; however, HDP occurs unpredictably, even with low-volume blocks and one must still exercise caution performing proximal upper extremity US-guided blocks in patients with poor pulmonary reserve (16). Nevertheless a safe regional anesthesia practice, based on good training, knowledge of anatomy, and a careful technique with continuous aspiration and slow injection, has been considered fundamental by all authors (10).

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MONITORING SEDATION DURING RA – WHO, WHAT, WHY?

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Background: The use of regional anaesthesia is increasing for a variety of surgical procedures as it provides not only satisfactory operating conditions with excellent intraoperative and postoperative analgesia but also has advantages regarding health economics. Moreover, some surgical procedures, which in the past have required general anaesthesia and open surgery, can now be carried out percutaneously under regional anaesthesia. In order to improve patient acceptability and comfort and to reduce stress, it is common practice to provide sedation during such procedures. Ideally, during sedation, the patient should be relaxed, comfortable and cooperative throughout the procedure. In practice, achieving this goal may be the most challenging aspect of regional anaesthesia. In order to improve safety, the practice of conscious sedation is recommended. The world of sedation has exploded and expanded well beyond the operating room, and is now performed in many different settings within and outside the hospital. (1,2)

Techniques of Sedation: Different techniques have been traditionally applied. Single or repeated bolus techniques lead to unstable blood and effect-site concentration, causing collateral effects. This problem has been overcome by the use of target-controlled infusion (TCI) in which the administration is driven by microprocessor-controlled algorithms based on pharmacokinetic models. As different models exist, Barakat et al. (3) compared the Marsh and Schnider models to find out which one correlates better with the clinically observed effect of propofol as assessed by the observer assessment of alertness/sedation (OAA/S) Score and the bispectral index (BIS). Forty unpremedicated patients undergoing surgery under spinal anaesthesia received propofol sedation of a target concentration of 2mg/ml with either the Marsh or the Schnider model. The authors found first that the BIS correlated better with the Marsh than with the Schnider propofol effectsite predictions, and, second, that the achievement of a precise level of sedation was slower in patients sedated with the Schnider model. One of the new trends in performing sedation is to use both a hypnotic and an analgesic (analgosedation). However, this combination in spontaneously breathing patients is characterized by the occurrence of side effects, such as respiratory depression. Moerman et al. (4) analyzed whether the administration of remifentanil via TCI decreases the incidence of side effects and propofol requirements compared with manually controlled infusion (MCI). Patients undergoing elective colonoscopy were prospectively randomized to receive either remifentanil (MCI), TCI remifentanil or a placebo. All patients had TCI propofol adjusted to a target concentration level that provided deep sedation. The results showed that significantly more patients in the placebo group showed spontaneous movements, cough and hiccup. Additionally, TCI remifentanil resulted in a decrease in propofol requirements and was associated with a lower incidence of respiratory depression compared with MCI remifentanil administration. This study highlights the fact that even drugs with a short onset/offset time of action, such as remifentanil, can benefit from the TCI technique. However, the choice of remifentanil, propofol or the combination of both should be tailored to each specific procedure. Lallo et al. (5) compared the efficacy and ease of titration of propofol and remifentanil TCIs during fiberoptic intubation. The results showed that both drugs using TCI could be rapidly titrated to achieve good intubating conditions and patient comfort. However, remifentanil allows for more patient cooperation, improving safety when spontaneous ventilation is mandatory. This study clearly highlights the pivotal importance of the choices of the drug and the technique of administration to successfully achieve the sedation primary endpoint required for the surgical procedure. The application of new ways to perform sedation-like patient-controlled or patient-maintained sedation are still under investigation, and their development has been slowed down by limitations in the technology to implement the control in order to ensure patient safety. (1)

Assessment of Sedation: The reliability of how to assess sedation is controversially discussed, as most of the devices used for this purpose are influenced by external factors such as noise, light intensity and so on. (2) The interpatient variability in response to sedating drugs highlights the importance of clinical endpoints. Sedation scales were designed to standardize assessment and minimize interobserver variation in a reliable way. (2) The disadvantage of these instruments is the repeated verbal and tactile stimulation of the patient that is required to administer the drugs. Mahon et al. (6) investigated the effects of low-dose propofol on different parameters. In this study, the spectral parameters, including relative α and β power, spectral edge frequency 90% and spectral entropy, were assessed during moderate propofol-induced sedation (0.5–2.0 mg/ml). The results demonstrated a significant relative β power and spectral entropy increase correlated with increasing propofol effect-site concentration. On the contrary, increasing effect-site concentration has no effect on relative power in the α band. The best performing indicator to predict 'sedated/not sedated' based on OAA/S score was spectral entropy in the frontal channel. The unidirectional increase in both relative β power and spectral entropy when considered over the frequency and the propofol effect-site ranges investigated in this study may offer potential as a monitor of moderate or 'conscious' propofol-induced sedation. However, more studies are needed before wide spread clinical use of this device needs. Since its introduction in 1994, BIS monitoring has been considered a potential alternative to current standards of sedation monitoring. However, its utility for monitoring conscious sedation is unclear due to divergent study results. (7) This point is of highest importance as it has been demonstrated that deep sedation has implications for patients' safety and healthcare resources. (8) Seventysix patients scheduled to undergo elective colonoscopy were monitored simultaneously with the modified observer's assessment of alertness and sedation (MOAAS/S) and BIS. (9) Sedation was performed with a combination of narcotic (meperidine) and benzodiazepine (midazolam). The results demonstrated that deep sedation defined by MOAAS/S and BIS was seen in 26 and 12% of the patients, respectively. In this investigation, BIS correlated poorly with deep sedation. These results confirm previous observations demonstrating the limitation of BIS to discriminate between different levels of light sedation. (10) The electroencephalographic Narcotrend index was evaluated as a measure of sedation in intensive care settings. (11) Sedation was performed with either propofol or placebo, and clinical assessment was performed by means of the Richmond agitation– sedation scale. These results showed that the Narcotrend index performed better than other conventional electroencephalographic parameter values; being able to differentiate between the extremes of sedation (very light and deep sedation) but was not able to distinguish between light and moderate or moderate and deep sedation. These recent studies have shown that to date no devices can reliably substitute clincal scoring scales to assess depth sedation.

Factors influencing the Level of Sedation: Several studies have shown that spinal and epidural anaesthesia can reduce anaesthetic requirements and induce sedation. (12,13) A positive correlation between the depth of sedation and the extent of the block has been shown, and sedation to be dose related for epidural anaesthesia with procaine, as assessed by VAS, BIS, and brain steam evoked potentials. (14) The peak sedation effect is normally detected 30–45 min after block start. The hypothesis explaining this effect is a decrease in afferent sensory input with consecutive inhibition of the reticulothalamo-cortical mechanisms. Systemic levels of lidocaine or bupivacaine seem not to explain sedation. A second peak of sedation was seen in one study, with delayed rostral spread of anaesthetic proposed as a mechanism. (12) This second peak was not seen in following studies. (15) Moreover, the sedative effect can be enhanced by the addition of adrenaline. (16) Two mechanisms have been suggested: augmentation of the local concentration of the anaesthetic through vasoconstriction and direct stimulation of central α2- adrenoceptors by rostral spread of adrenaline. Listening to music is known to relax patients undergoing regional anaesthesia and has been described to reduce the consumption of sedatives and to decrease perioperative pain scores, but not have any anxiolytic effect. (17) Patients' satisfaction was significantly higher when listening to music and almost all the patients would choose music again in future for similar surgery. In the setting of regional anaesthesia, hypnosis has been used to provide light sedation and amnesia. However, success of this technique had the limitation of supplementary analgesics. (18) In expert hands, hypnosis may be useful in suitable patients, and when sedatives are contraindiced.

Nurse-driven Sedation: The sedative techniques used for regional anaesthesia ave been exported outside the operating room to improve the quality of many different procedures. This evolution has revised first the problem of anaesthesiologist vailability to cover this increasing number of procedures and second to delegate the practice of sedation in certain settings to well trained nurses. An earlier study (19) has shown that a nurse-implemented sedation protocol in an ICU resulted in less mechanical ventilation, fewer ICU and hospital days, and a lower number of patients requiring tracheostomy. A

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more recent investigation (20) in the same context demonstrated that nurse-driven sedation was associated with an increase in ventilator-free days and successful extubation. Although not reaching statistical significance, a trend toward fewer days of intubation was noted. Nurse-administered propofol sedation (NAPS) was compared with midazolam and meperidine for upper endoscopic ultrasonography (EUS). The results showed that NAPS for upper EUS was well tolerated and may be performed without major complications. Nurse experience was a major factor, as sedation-related complication rates for advanced experience-level (≥ 100 NAPS procedures) nurses were significantly lower than for the least-experienced (≤ 30 NAPS procedures) nurses. (21) In a similar setting, DeWitt et al. (22) demonstrated that NAPS offered a faster sedation induction and full recovery time, similar adverse event profile, higher procedure patient satisfaction and quicker return to baseline function compared with sedation with midazolam and meperidine. The question whether BIS would improve NAPS was investigated by DeWitt. (23) Fifty consecutive patients scheduled for an upper endoscopic ultrasound procedure were randomized to BIS-guided (BIS score < 65–75) or standard propofol sedation (MOAAS/S scale score ≤3). No difference was found between the groups concerning mean procedure duration, total propofol dose and recovery time. This study confirms previous results raising serious doubts regarding BIS utility during sedation.

Conclusion: The application of sedation is growing not only for regional anesthesia but also in many different settings outside the operating room. The use of the TCI technique with propofol and remifentanil has shown some distinct advantages for this purpose. Dexmedetomidine, still not widely available in Europe, may have some targeted indications. Sedation is and will be more and more used for an increasing number of indications at different locations. Thus, the availability of anesthesiologists to cover all these procedures will be insufficient, and this trend will inevitably lead to the evidence that nurse-driven sedation will become a necessity, implying that we, anesthesiologists, should be ready to build up efficient and reliable teaching programs to cover this new challenge.

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PROPOFOL AND REMIFENTANIL TCI

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Most anaesthetic drugs including propofol and remifentanil obey 3 compartment pharmacokinetics. We can administer these drugs by bolus for a short defined clinical effect, or for a more prolonged clinical effect by intermittent bolus, manual infusion or a combination of the two. Target controlled infusions became popular in the 90s with the introduction of the "Diprifusor" system for administering propofol. These original pumps were only able to use propofol from one manufacturer owing to safety features of the tagged prefilled syringes being the only propofol being recognised by the Diprifusor pump. More recently there are a multitude of TCI pump manufacturers which allow the user to customise drug concentration, pharmacokinetic model for the drug being used, as well as enter desired plasma or effect site concentrations. It is the intention of this article to help the user choose appropriate settings to provide sedation safely for the placement of a regional block, or sedation after the block.

Pharmacokinetic Models & The Difficulty of Manual Infusions[1]: It is well established that intermittent boluses provide oscillating plasma concentrations (Cp) and predicted brain concentrations or effect-site concentrations (Ce), and thus alternating overdose and underdose (figure 1). A combination of bolus and continuous infusions are much more desirable as they provide more steady Cp, Ce and clinical effects. It is relatively easy to calculate a loading dose if we know the desired plasma concentration ($C_{desired}$) and the volume of distribution (Vd). Adding in maintenance

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infusions requires knowledge of clearance and the rate constant values between the compartments of the appropriate pharmacokinetic model. The concept of context-sensitive half-time (the principle that observed half-life is dependant on the duration of the infusion); and its relationship to published redistribution half-life ($t_{1/2}$ α) and elimination half-life ($t^{1/2}$ β) are not straightforward. In short, the pharmacokinetics involved are complicated and difficult to do accurately for the clinician. Remifentanil is unique in that its context-sensitive half time doesn't change with prolonged infusion, so its offset is very predictable regardless of the duration of the infusion.

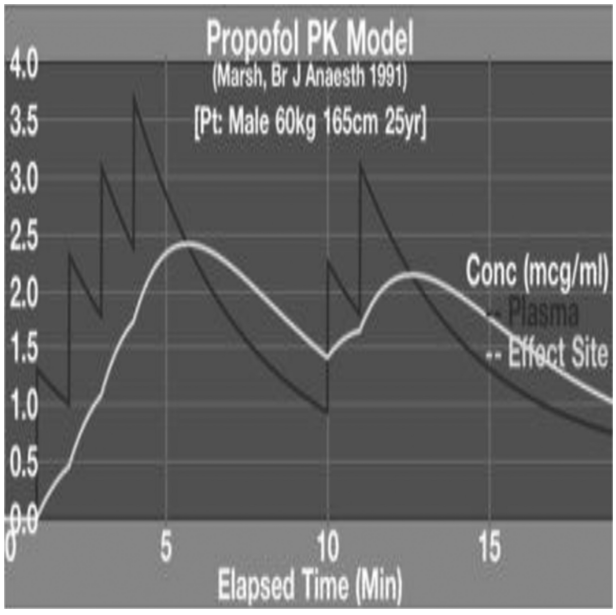

FIGURE 1. Intermittent boluses of propofol for sedation showing oscillating predicted plasma concentrations and the effect-site concentration (y-axis) lagging behind. These are calculated using a pharmacokinetic simulator using the Marsh model.

Target Controlled Infusions [2]: These use a pharmacokinetic model and a microprocessor to control delivery of the sedative or anaesthetic drug via a syringe pump. The anaesthetist enters some patient factors such as weight, age, sex, height; some drug factors such as drug concentration; and the desired plasma (Cp) or effect-site (Ce) concentration the "target concentration". The microprocessor calculates the amount of drug required to achieve that concentration. The actual plasma concentration may not be the same as the calculated concentration, however it is generally more stable than with manual infusion regimens. The anaesthetist observes the patient and alters the desired concentration up or down depending on the clinical response of that patient. There is little evidence for anaesthesia that outcomes are better with TCI, [3] however anaesthetists have to make fewer adjustments and seem to prefer it [4]. TCI pumps can also calculate predicted brain concentration or "effect-site concentration". To do this it uses a rate constant ke0 that describes equilibration of plasma concentration and clinical effect (usually measured by a depth of anaesthesia monitor). It can also calculate time to reach a pre-determined "decrement time" at which most patients will have woken up e.g. this is usually in the 1.5 mg.ml $^{-1}$ range for propofol.

There are many TCI delivery systems now available. It is wise if the anaesthetist understands fully the features of the system they use. It is also advisable to know (and standardise) the pharmacokinetic model they use, as switching PK models can alter the amount of drug administered quite markedly. Finally to provide anaesthesia or sedation it is useful to know what range of plasma or effect-site concentrations are associated with sedation and anaesthesia.

Propofol TCI for Sedation: Propofol especially delivered by TCI is an excellent sedative. It has a rapid onset and rapid offset, produces excellent anxiolysis, patient cooperation, rapid recovery and is very titratable.[5] At lower sedative doses it provides less amnesia than midazolam.

There is some dispute over what the best pharmacokinetic model for propofol is, the main choices that TCI machines offer are the Marsh (Diprifusor) or Schneider models, an in-depth comparison of these is beyond the scope of this article. However, the Marsh model seems to reproduce measured plasma concentrations more closely [6], and also correlate with depth of sedation better [7]. Personally I use the Marsh model as that is what we used for the majority of our sedation research, the suggested settings to follow relate to this model. However, the important thing is not to switch between models, as they will deliver quite different amounts of drug, potentially giving quite different levels of sedation for the target propofol settings.

There is a wide variety in the plasma concentration (Cp) that patients feel optimally sedated (1-3.0 mg.ml $^{-1}$)[5], and also similar effect-site concentration (1-2.5mg.ml $^{-1}$)[8]. Similarly if trying to avoid oversedation, there is wide variation in where patients lose verbal contact effect site concentration (1.2-4mg.ml^{-1})[9] [figure 2]. Obviously what provides optimal sedation for one patient will be excessive for another. It makes sense to start at the low end and titrate upwards depending on patient response. There appears to be about 0.6mg.ml $^{-1}$ difference in the Ce between performing tasks requiring coordination and cooperation (responding to a vibrating handset) and over-sedation.

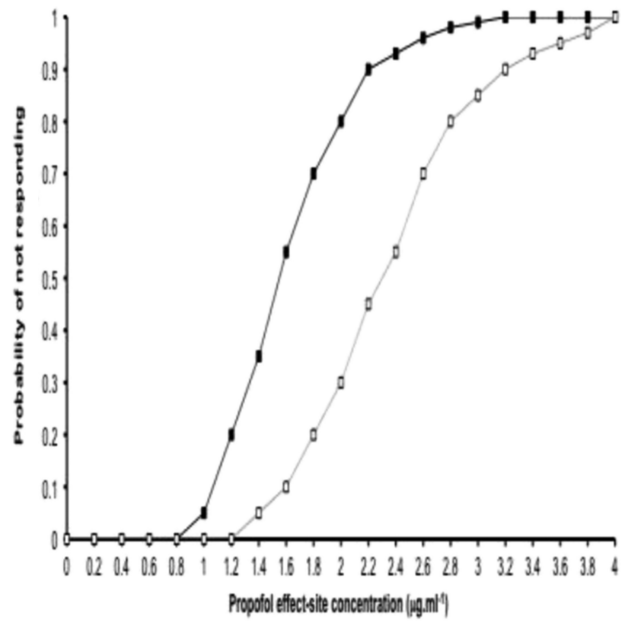

FIGURE 2. Dose–response curves, constructed by probit analysis, of the probability of patients not responding to a vibrating handset buzzer (black box) and verbal contact (white box) as the calculated effect-site concentration of propofol is increased. From Anaesthesia. 2013;68:148-53 with permission.

Remifentanil TCI

Remifentanil is an ultra short acting opioid analgesic with a half-life of 3-5minutes [10]. It offers good analgesia, but less anxiolysis and amnesia than alternative sedatives such as propofol [11,12]. Despite this remifentanil has become popular for sedation in specific scenarios in recent years. Many of the publications describe standard infusions at a specific μg.kg^{-1}.min^{-1} rate. The newer generation of TCI syringe pumps offer TCI with various drugs other than propofol, including remifentanil. TCI remifentanil seems particularly suited to awake fibreoptic intubation after local anaesthesia topicalisation of the airway, this may be because suppression of cough is more important than anxiolysis [13].

Remifentanil causes measurable effects on respiratory rate, end-tidal CO_2, and ventilatory variability at relatively low Ce levels 1.5 ng.ml $^{-1}$/ml [14]. It causes more frequent respiratory events than propofol [15]. However, it may be well suited for supplementing an incomplete block [15], or in a situation where complete regional anaesthesia is difficult and rapid recovery from sedation is necessary. A great example is the dissection phase during

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cervical plexus block for awake carotid endarterectomy followed by carotid cross clamping necessitating neurological and cognitive assessment [16].

There is little argument about the best pharmacokinetic model to use for remifentanil, most use the Minto model [17]. The main co-variates that are asked in programming a TCI system are height, weight (calculating lean body mass), age and sex. There are recently comparisons of TCI vs manual infusion remifentanil published [18,19]. It appears there is less variation in plasma concentration, easier titration and fewer respiratory events with TCI [19].

Reasonable Dose Regimens for Remifentanil.: It seems that hypoventilation and apnoea are unlikely under TCI remifentanil target of 2.0 $ng.ml^{-1}$ and more likely above 3.0 $ng.ml^{-1}$ [20]. Many AFOI studies use it in the dose range 3-6 $ng.ml^{-1}$. High doses are required if it is used in isolation, lower doses if used in conjunction with a hypnotic such as midazolam or propofol, where it may be useful to start at a lower level e.g. 1 $ng.ml^{-1}$ then titrate up.

If using manual infusions, you must be aware the variation in Cp/Ce is greater [18] and titration should be cautious. However a bolus dose of 0.25 $\mu g.kg^{-1}$ followed by an infusion of 0.05 $\mu g.kg^{-1}.min^{-1}$ will yield a final Cp & Ce of approximately 1-1.2 $ng.ml^{-1}$ at steady state. Whereas higher rates such as 0.5 $\mu g.kg^{-1}$ bolus followed by 0.1 $\mu g.kg^{-1}.min^{-1}$ will yield Cp/Ce in the 2-2.5 $ng.ml^{-1}$ range.

Many still feel that because its offset is so predictable regardless of the infusion rate that there is little to be gained from TCI remifentanil. This might well be true for its use in general anaesthesia, but inadvertent overdose during sedation without a secured airway is more of an issue. However, if one is to use a manual infusion regimen, there are a few tips to do this successfully.

1. Ideal Body Weight: we should really use the patient's ideal body weight not actual body weight. This can be done with a rough calculation (height in cm -100 for men or -105 in women) e.g. a 40 year old 165cm, 80kg female at steady state after 0.1 $\mu g.kg^{-1}.min^{-1}$ remifentanil will have a Cp of 3.2 $ng.ml^{-1}$ If we use her actual body weight. But would only have a Cp of 2.5 $ng.ml^{-1}$ if we used her ideal body weight (165cm-105=60kg).
2. Age: be aware that elderly will have a much higher plasma concentration than a young person for the same infusion rate. e.g. if we compare a 20 year old 178 cm 80kg male, and an 80 year old 178cm 80kg male. At steady state after 0.1 $\mu g.kg^{-1}.min^{-1}$ remifentanil the 21 year old will have a Cp of 2.8 $ng.ml^{-1}$, and the 80 year old a Cp of 4.0$ng.ml^{-1}$.
3. Also beware that when changing infusion rates it will take 5-6 half-lives i.e 15-30 minutes to reach steady state. The use of boluses (0.25-0.5 $\mu g.kg^{-1}$) can speed this up, but make inadvertent apnoea more likely.

Which drug or both?: Propofol is probably a better choice just for anxiolysis but remifentanil may be a better choice for an imperfect block or in specific situations like AFOI [13]. It seems reasonable to make individual choices based on the patient and procedure factors [19]. All the while bearing in mind that remifentanil and propofol behave synergictically not additive manner [20], hence careful incremental titration would be prudent. TCI may make this easier for the average clinician with no specific expertise in the pharmacodynamics or pharmacokinetics of these extremely useful agents.

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KETAMINE – SHOULD EVERYONE HAVE A LITTLE?!

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Since its introduction in clinical practice in the early 1960s as an intravenous anesthetic agent, the interest in ketamine has continued to grow, specifically with the use of low doses as antihyperalgesic agent [1]. The recent developments regarding the anti-inflammatory properties of ketamine have also contributed to a renewed interest in acute pain medicine. However, because of well known psychomimetic side effects, the administration of

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ketamine in awake patients remains unusual. Under those conditions, ketamine is generally used in case of block failure to supplement intraoperative anesthesia. As a matter of fact, publications assessing the potential benefits of the addition of a low dose (i.e. antihyperalgesic dose) of systemic ketamine to an effective locoregional technique are scarce, if not inexistant, although such utilization deserves some interest.

The main mechanism of action of ketamine relies on a noncompetitive antagonism of excitatory neurotransmission (NMDA receptors). However, ketamine mechanisms of action are complex and the drug may interact with opioid, monoaminergic, cholinergic, purinergic and adenosine receptor systems [1]. These multiple interactions account for the the various clinical effects such as anesthesia, analgesia, antihyperalgesia, induction of psychiatric symptoms « schizophrenia like » or positive effect on depression mood.

Preemptive or preventive analgesic effect: Various meta-analysis have demonstrated that the intraoperative administration of a low dose of ketamine (median dose 0.4 mg/kg ; range 0.1 to 1.6 mg/kg), even a single bolus dose, in patients under general anesthesia receiving opioids may reduce 24h- postoperative opioid requirements [2,3]. Postoperative pain was also reduced in patients who receive ketamine what implies an improved quality of pain control in addition to the decrease in opioid consumption [4]. Particular benefit of ketamine administration was observed in painful procedures, including upper abdominal, thoracic and major orthopedic surgeries. The analgesic effect of ketamine was independent of both timing and dose of ketamine administration. « Preemptive », « preventive » and also « protective » analgesia are current concepts used in perioperative analgesia . The goal of preemptive analgesia is to prevent nociceptive inputs from lesioned tissues to reach and to sensitize the central nervous system, thereby to reduce the expression of post-injury pain. Although extremely attractive, the concept of preemptive analgesia has only brought deceiving results in the perioperative setting [5]. In a meta-analysis analysing the postoperative analgesic efficacy of a preemptive application of various analgesic regimens versus the administration of the same analgesic regimens initiated after the surgical incision, systemic NMDA antagonists including ketamine were ineffective by comparison to epidural analgesia, intrawound local anesthetics or NSAIDs [6]. In the light of experimental models of incisional pain, the concept of preemptive analgesia has evolved to the concept of preventive analgesia, a broader definition, which involves any perioperative analgesic and antihyperalgesic treatments aimed to control central nervous system sensitization. An other qualitative systematic review focusing on the role of NMDA antagonists found 58% of included clinical studies in favour of a preventive analgesic effect [7]. The authors have defined "preventive drug" as a drug able to reduce central sensitization caused by surgical injury, thereby able to decrease postoperative pain beyond its clinical activity i.e. therapeutic half life. However, the real definition of preventive analgesia also involves longterm consequences of the modulation of central nervous system sensitization as the development of persistent post-surgical pain [8]. Unfortunately, very few studies have assessed the impact of intraoperative ketamine administration of chronic postsurgical pain. The combination of intravenous ketamine with epidural analgesia has demonstrated some efficacy in the context of major abdominal and thoracic procedures [9,10].

In preventive analgesia, both the duration and the efficacy of the treatment are more important than the timing of administration of the drugs [5]. Recent progresses made in the assessment of endogenous mechanisms of pain processing should allow to improve preventive analgesia by an individualization of analgesic and antihyperalgesic perioperative treatments. Effectively, individual differences in pain sensitivity place people at reduced or elevated risk for the development of acute and chronic pain [11]. Recent interesting developments have focused on dynamic test paradigms –in contrast with static tests like pain threshold- designed to measure endogenous pain processing and to depict individual's pain modulation capacity. Early promising results show that patients with poor inhibitory systems (i.e. bad conditioned pain modulation) are more susceptible to develop chronic postsurgical pain [11]. Moreover, patients with enhanced excitatory processes (i.e. positive temporal summation, the clinical correlate of experiment wind up phenomenon in animal) have higher postoperative pain and are more prone to persistent post-surgical pain [11]. Interestingly, low doses of ketamine reduce temporal summation both in animal experimental models, in volunteers and in humans [12]. Further, very recent data also suggest a role of endogenous inhibitory systems in the analgesic efficacy of ketamine [13].

Ketamine and peripheral inflammation: The inflammatory response to surgery appears to play a prominent role in the patient's outcome. Ketamine influences the immune system and is able to regulate very early the local inflammatory processes as it reduces the release of pro-inflammatory cytokines without affecting the production of anti-inflammatory ones [14]. Although the interactions of ketamine with the inflammatory processes are complex, to summarize, one can say that ketamine helps to avoid exacerbated pro-inflammatory reaction [14,15]. Once again, whether several studies have linked the administration of ketamine to lower levels of pro-inflammatory cytokines, the impact on clinical outcome has not been assessed. Nevertheless, the anti-inflammatory effects of ketamine might account for the benefits observed in both early and delayed rehabilitation processes (i.e. improved mobilization) after orthopaedic procedures like knee surgery (arthroscopy and arthroplasty) or hip replacement [16-18]. Currently, there seems to exist a potent link between clinical hyperalgesia, the expression of central sensitization, and a perioperative exaggerated pro-inflammatory reaction as central sensitization not only relies on NMDA receptors activation but also on extended glial pro-inflammatory reaction [15]. Some recent data even support the involvement of inflammatory mechanisms in opioid-induced hyperalgesia as glia exhibits pro-inflammatory responses to opioid administration. These findings reinforce the use of ketamine in patients who are already treated by opioids analgesics e.g. chronic pain patients and opioid-dependant patients [19].

Depression and postoperative cognitive dysfunction: As part of the anti-inflammatory effects of ketamine, the administration of the drug seems to reduce the risk for postoperative major cognitive dysfunction as observed after cardiac surgery [14]. An other interesting effect is the rapid action of the drug on depressive states which has been recently highlighted. The mechanisms are still unknown. It is worthing to note that an old study from Kudoh [20,21] already pointed out the improvement of postoperative state of depressed patients who received a small dose of intravenous ketamine.

Conclusion: Ketamine is a promizing drug which should be part of the perioperative strategies to improve patient's outcome, specifically outcome related to pathological pain i.e. rehabilitation and prevention of persistent post-surgical pain. Regarding the potential side effects (psychomimetic side effects) of the drug, the selection of patients is mandatory. Patients who have impaired endogenous analgesic systems including patients who suffer chronic pain and are under chronic opioid treatment should be targeted. The postoperative benefits (short-term and long-term) of the combination of low doses of ketamine with a loco-regional technique deserve further studies.

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CONTINUOUS SPINAL ANAESTHESIA-RECENT DEVELOPMENT AND ITS APPLICATION IN MAJOR ABDOMINAL SURGERY

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General anaesthesia is routine for major abdominal surgery but there is an increased incidence of morbidity and mortality in ASA classification patients and is much higher especially in elderly patients suffering from severe systemic diseases.

Epidural anaesthesia is an option but the catheter must inserted in the mid to low thoracic level requiring frequent change of patient's posture to achieve satisfactory anaesthesia. It Repeated doses of local anaesthetic agent may be associated with significant haemodynamic changes.

Single shot spinal anaesthesia is suitable for short surgical procedures of the lower abdomen and lower limb in both elective and emergency situations. However, the duration of anaesthesia is short-lived does not permit longer duration surgery.

The duration of anaesthesia can be extended by placing a micro-catheter in the subarachnoid space for continuous spinal anaesthesia (CSA). CSA is a well-established technique for many surgical procedures which allows greater control over surgical anaesthesia, with a more predictable effect and less haemodynamic instabilities and respiratory difficulties than epidural anaesthesia[1-4]. However, the technique is surrounded with controversy due both to technical and serious neurological complications and the use of spinal micro-catheter was banned by the Federal Drug Administration in the USA. But the proof that the spinal micro-catheter itself was the cause of the neurological complications was never proven.

Currently there are varieties of catheter including standard epidural catheter are available they all have their own advantages and disadvantages [5, 6].

Extended spinal anaesthesia using a spinal micro-catheter was used by the author as a primary method of anaesthesia for elective colorectal cancer surgery as well as emergency surgery (87 high risk patients) [5]. An example case will be described during the presentation. All patients suffered from severe chronic obstructive airway disease requiring multiple inhalers and drugs (ASA III). Some of these patients also suffered from angina, myocardial infarction, diabetes and other systemic diseases (ASA IV). Surgery included right hemicolectomy, left hemicolectomy, total colectomy, sigmoid colectomy, anterior resection of rectum, abdominoperineal resection, cholecystectomy (open and laparoscopic) and obstructed inguinal hernia requiring laparotomy.

Spinal anaesthesia is performed under strict aseptic conditions with a 22 gauge spinal needle with a mixture consisting of 2.75 ml of 0.5% heavy bupivacaine and 0.25 ml of fentanyl (25 microgram). This is followed by placement of a spinal micro-catheter and the duration of anaesthesia is extended by intermittent injection of 0.5% isobaric bupivacaine. Brief, mild, hypotension occurs in approximately 7% of patients during the establishment of block height to T6-7 which can be duly treated with intravenous administration of intravenous fluid and ephedrine hydrochloride. Good anaesthesia results in most patients except for brief discomfort in some patients during hemicolectomy surgery possibly due to the dissection and traction on the peritoneum causing irritation to the diaphragm. The use of sedation is avoided. The spinal micro-catheter is removed at the end of surgery.

Postoperative pain relief is obtained by administering intravenous morphine through a patient controlled analgesia machine in the critical care ward area (High Dependency Unit). Minor postoperative side effects such as nausea (13%), vomiting (7%) and pruritus (5%) may occur.

Spinal anaesthesia with a micro-catheter may be used as a primary method of anaesthesia for colorectal cancer surgery and other major abdominal surgery in high-risk patients for whom general anaesthesia would be associated with higher morbidity and mortality.

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IMAGE FUSION OF ULTRASOUND AND MRI

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The elderly population (over 65) is the fastest growing segment of the worlds population, and older age is associated with the prevalence of chronic pain, critical cardiac comorbidity and complications of perioperative analgesia. The impact of complicated cases of chronic pain, perioperative pain and surgical anesthesia of elderly patients on health care services is increasing exponentially and so is the demand for safe and effective surgical anesthesia and interventional pain care in selected subgroups of patients.

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In recent years medical ultrasound (US) has shifted from radiology to new point-of-care clinical applications driven by improved image quality, application-specific technology and the flexibility of modern mobile US systems. It has triggered a paradigm shift: US is rapidly becoming a bedside tool pervasively integrated in the diagnostic and interventional procedures in all clinical specialties. This is called Point-of-Care (POC) US.

The most basic POC US is the physical examination of the patient based on inspection, palpation and US. US replaces the traditional use of non-converted sound (percussion and auscultation). At the other end of the spectrum is advanced real-time image fusion of US with MRI, CT or PET. Image fusion of US with the 3D imaging modalities is defined as synchronization of real-time US with pre-procedure recorded MRI, CT or PET scans (1).

The scientific exploration of real-time image fusion of US with MRI, CT or PET is very sparse and mainly limited to interventional radiology and oncology.

In anesthesiology basic POC US has improved the quality of the diagnostic, monitoring and interventional procedures in the management of the airway, respiration, hemodynamics, regional anesthesia and pain therapy. The clinical efficacy of US Guided Regional Anesthesia (UGRA) and US guided (USG) pain therapy is limited by the inherent impediments of US: reduced transmission of US in human tissue due to bony structures or airfilled cavities, various artefacts and decreased image quality due to image depth or edema and other pathologies. The interventional UGRA techniques for deep plexus blocks and pain therapy are also challenged by the risk of complications such as bleeding and epidural spread of local anesthetics that can increase morbidity, mortality, and health care expenditures.

Presumedly real-time image fusion of US with other imaging modalities has a large potential to improve the safety, clinical efficacy and cost-effectiveness in selected cases of UGRA and USG interventional pain therapy.

Our first research project is to answer a specific scientific question: Is it feasible to apply guidance technique based on real-time image fusion of US and MR imaging to produce lumbosacral plexus anesthesia for surgery and perioperative pain relief in elective hip surgery patients?

Every year almost 10.000 danish citizens are admitted for elective hip surgery. The majority of the patients are over 65 years of age. A subgroup of fragile, elderly patients have severe cardiac comorbidity that makes traditional general or spinal anesthesia relatively unsuitable due to an increased risk of perioperative morbidity and mortality. The hip surgery patients suffer moderate to severe pain. However, opioids are associated with many serious side effects and complications. A solution would be regional anesthesia of the lumbosacral plexus. However, the challenges until now have been that no US guidance techniques have been described that visualize the lumbosacral plexus and its topography. A very high success rate for UGRA without complications and opioid-free pain therapy requires new techniques, and the efficacy and safety of such new techniques has to be validated.

New techniques for US guided visualization and blockade of the lumbosacral plexus have been developed recently (2-4). Our research group has also developed a MRI technique visualizing the lumbosacral plexus, and a real-time ultrasound/MR image fusion technique for imaging of the lumbosacral plexus. These techniques have not yet been published.

Previously acquired supine MRI datasets of healthy volunteers were uploaded in an advanced ultrasound system (Logiq E9, GE, USA). We applied an electromagnetic field across the prone lumbosacral region bedside with a transmitter and sensors mounted on the ultrasound probe, allowing dynamic real time tracking of the position and the orientation of the ultrasound probe and merging of the ultrasound images with the MRI datasets by lock of coinciding anatomical planes and points. We used advanced electronic needle tip tracking. We successfully imaged the lumbosacral plexus with US/MR image fusion and applied needle tip tracking in US/MR image fusion guided lumbosacral plexus blockade in the volunteers.

In conclusion, application of real time US/MR image fusion is feasible allowing accurate nerve targeting in UGRA. In perspective, US/MR image fusion guided lumbosacral plexus blockade may provide a safe and effective alternative to general and spinal anaesthesia and opioid-free analgesia in selected subgroups of fragile hip surgery patients.

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SONOPATHOLOGY AND WHAT TO DO WITH ABNORMAL FINDINGS

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When an anaesthetist scans a patient with ultrasound (US) during the performance of a peripheral nerve block, there is a distinct possibility that a textbook image will not be present. Nerves and key reference structures may be hard to distinguish from surrounding soft tissues. There are many potential reasons for this including the laws of physics (e.g. artefacts), incorrect machine settings, nuances of patient anatomy, incorrect scanning techniques and pathological conditions. Many of the educational objectives and training efforts focus on image optimisation through 'knobology' issues and scanning techniques. However, little information exists in the literature describing abnormal findings that may be encountered during the conduct of ultrasound-guided regional anaesthesia (UGRA). Such pathology or atypical anatomy as seen with ultrasound may be referred to as sonopathology. The identification of sonopathology during pre-procedural scanning presents an opportunity for anaesthetists to potentially avoid certain complications, alter the anaesthetic plan or perhaps even influence medical management. A collection of pathological conditions affecting vessels, nerves, the musculoskeletal system and viscera are discussed briefly below with regard to their significance in UGRA.

Vessels: Blood vessels are commonly used as landmarks for UGRA and both intravascular and perivascular pathology may be encountered. Target nerves often lie in close proximity but vascular lesions can create difficulties either by impeding the intended needle trajectory to the nerve or by displacing the nerve. Pre-puncture colour Doppler imaging complements 2-dimensional findings and can detect either *typical or aberrant vessels* as well as help determine patency, vessel narrowing and perturbations in blood flow. *Atherosclerosis* may be visible as hyperechoic (less commonly hypoechoic) lesions with a drop out shadow, most frequently in the carotid or femoral vessels in relation to UGRA. Such pathology is better imaged in the long axis however and may therefore not be noticed during short axis imaging commonly used in UGRA. Incidental detection of carotid plaque in some reports has resulted in delaying a case and also avoiding the head up position for shoulder surgery. *Deep venous thrombosis* may be detected in the short axis as a non-compressible, sometimes dilated circle of varying echogenicity with poor or obstructed flow. This may be noted in femoral or popliteal blocks. *Aneurysms* may also be detected.

Nerves: A variety of relatively common pathologies such as *hereditary neuropathies, nerve compression, nerve entrapment, nerve tumours, intraneural ganglia or anatomic variants* may be encountered during UGRA. Detection of intrinsic or extrinsic nerve abnormalities may require consideration of alternative anaesthetic management because neural pathology is a relative contraindication to nerve blockade. Perioperative nerve injury is a complex and multifactorial process. US guidance however does not necessarily prevent or reduce incidence of nerve injury.

Musculoskeletal system

A *cervical rib* and accompanying drop out shadow may be detected incidentally during an interscalene or supraclavicular block. Conversely, an *absent first rib* may be dangerous if a supraclavicular block is planned because the first rib is no longer present to act as a "back stop" to prevent unintentional pleural puncture. US can also be used to detect *fractures* but it is almost certain the anaesthetist will not be the first clinician to detect a new fracture. A variety of *tendon related pathologies* may be encountered including *tears, degenerative changes, tenosynovitis* (often circumferential hypoechoic fluid), *ganglia* (eccentric hypoechoic fluid), and *inflammatory conditions*. These may be most likely to be visualised when undertaking wrist or ankle blocks.

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Viscera: *Thyroid nodules* occur in up to 50% of the population and US remains the diagnostic imaging modality of choice. Diffuse conditions such as Hashimoto's thyroiditis or Graves' disease are more subtle and would be challenging to detect, particularly as an incidental finding. *Pneumothorax* is a potential complication of brachial plexus, paraverterbral and intercostal nerve blocks. The pleura is a linear, hyperechoic structure that slides during respiration. Importantly, this sliding sign is lost if a pneumothorax occurs and it is also visible in M-mode US as the hallmark 'stratosphere sign'. The 'seashore sign' conversely confirms pleural sliding and no pneumothorax, assuming the lung is imaged at the highest point. It is useful therefore to image the lung during supra- and infraclavicular, intercostal and paravertebral blocks to note the distance of the pleura relative to the proposed needle trajectory as well as to avoid pleural puncture in real-time. Lung sliding may be absent in patients without a pneumothorax but who have lung fibrosis, scarring or adult respiratory distress syndrome. *Hernias* may be encountered during a variety of abdominal wall or femoral blocks. US allows the operator to check for peritoneum and (peristalsing) bowel before inserting a needle near the location of a hernia.

Miscellaneous: Fluid collections such as hypoechoic abscesses and oedema, as well as lymphadenopathy may all be evident during scanning. A variety of hardware has also been detected during UGRA including ventriculoperitoneal shunts, pacemaker wires and spinal hardware, sometimes necessitating a change of approach. US is an excellent tool for detecting and evaluating foreign bodies. Unlike plain radiography, it can accurately determine the relationship of the foreign body to surrounding soft tissue structures.

Summary: Incidental findings during UGRA may increase as experience grows but these create a management dilemma for the anesthetist which is beyond the scope of this talk. This however includes the assumption of responsibility for timely referral and comprehensive investigation, as well as ensuring definitive diagnosis by a radiologist or appropriate specialist. Possible relevant analogies with traditional anaesthetic practice include the discovery of a vocal cord lesion during direct laryngoscopy, an unexpected lesion on chest x-ray or the identification of a complex cardiac rhythm. An understanding and appreciation of sonopathology will help support the adjustment of anaesthetic technique as indicated by the particular clinical scenario and initiate an early and appropriate consultation after surgery. The images and descriptions in this talk will hopefully add to the background knowledge and educational resources available to anesthesiologists.

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SONOELASTOGRAPHY IN REGIONAL ANESTHESIA

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Ultrasound guided regional anaesthesia is practiced widely and has gained immense popularity. There is a significant learning curve associated with this skill1. Inadequate needle tip and shaft visualization can lead to serious complications such as intravascular and intra-neural injection of local anaesthetic. In order to overcome these limitations of ultrasound several new developments in technology have been explored.

Tissues exhibit various properties, i.e., compressibility, density, porosity, membrane permeability etc. Ultrasound image generation is based on the principle of reflection of ultrasound waves due to density & variable tissue composition. Strain, the change in tissue dimensions during compression by sound waves, is analysed using a cross-correlation algorithm from data acquired during consecutive frames, based on the work of Ophir2. Changes in tissue strain are represented on the screen as a colour map3.

Sonoelastography with the compression method is a non-invasive, qualitative method of demonstrating tissue strain; with the shear wave method, it can also be used quantitatively to measure tissue stiffness. This has been recently used in the diagnosis of soft tissue tumours, for example, breast cancers.

We hypothesised that the use of sonoelastography alongside B-mode ultrasound for regional anaesthesia would offer extra information to the anaesthetist such as displaying patterns of tissue strain for a range of blocks and providing a real-time evaluation of the relationship between tissue strain and peripheral nerve anatomy

Methods: Our primary objective in this exploratory study was to measure the size of the elastography strain pattern after injection of different volumes of embalming fluid(0.25, 0.5, 1, 2.5, 5 and 7.5 ml) for simulated interscalene and femoral blocks in Thiel embalmed cadavers. Our secondary objectives were to compare B-mode ultrasound and sonoelastography changes and then translate our experience in Thiel cadavers to patients and, in doing so, describe the patterns of sonoelastography for interscalene and femoral nerve block in a clinical setting

Cadaver nerve blocks: The cadaver study was carried out on a Thiel embalmed cadaver in the Centre for Anatomy and Human Identification at the University of Dundee covered by Human Anatomy Act of Scotland. After computer generated randomization, a single operator randomly performed 10 interscalene and 10 femoral blocks using volumes of 0.25, 0.5, 1, 2.5, 5 and 7.5 ml on five occasions, 1–2 weeks apart and divided equally between left and right sides. Previous observations of 1–5 ml injections on Thiel cadavers indicated that perineural distension secondary to injection regresses within 2–3 min, allowing repeated injections without disruption of anatomy. Videos of each injection lasting up to 30 s were recorded according to the Digital Imaging and Communications in Medicine (DICOM) standard for handling storing, printing, and transmitting information. Measurement of spread and brightness in each image was calculated in two stages. First, an enhanced elastography image matrix was developed using computer software (Image J, National Institutes of Health, Washington, DC, USA http://rsb.info.nih.gov/ij/ and MATLAB, Mathworks, Cambridge, UK) by conversion to an 8-bit image with 256 shades of grey, then automatically to a binary black and white image using a greyscale cut-off point. We then superimposed the elastography image onto the B-Mode image and a standardised area of 25 by 25 pixels selected in each video frame. From this, we calculated for each frame the hydrolocalisation index.

Two independent raters (SM and GAM) retrospectively analysed the 30-s video clips and scored them using Likert and Vienna scores. Likert scores consisted of a 7-point scale: 1 – extremely poor; 2 – very poor; 3 – poor; 4 – fair; 5 – good; 6 – very good; and 7 – excellent visibility. Vienna scores consisted of a 4-point scale: 1 – internal structure of nerve seen; 2 – nerve seen as circular or oval-shaped bright halo (epineurium); 3 – nerve seen as reflections determined by the anatomy of the surrounding tissue and 4 – anatomical position of nerve shows no response to ultrasound beam (isoechoic behaviour).

We examined the data for normality using the Shapiro–Wilk test and normality plots. We used ANOVA and post-hoc Bonferroni tests, with volume injected and block performed as fixed covariates, to analyse the AUC. Our pilot work suggested that greater variation in spread occurred between volumes rather than between blocks. Therefore, for our power calculation, we assumed the log time-weighted AUC to be 5 and 6 U.s-1 for femoral and interscalene blocks and 2, 4, 6, 6, 8 and 8 U.s-1 for 0.25, 0.5, 1, 2.5, 5 and 7.5 ml volumes, respectively, with a common SD of 1.2 U.s-1

Sonoelastography in patients: The clinical blocks were performed in the main operating suite, Ninewells Hospital and Medical School, after obtaining written patient consent and Caldicott Guardian approval for use of data.

Interscalene and femoral nerve blocks were performed in two separate adult patients (59 & 70 years of age respectively), of ASA physical status 2, scheduled for right shoulder rotator cuff repair and elective knee replacement surgery. Standard monitoring (ECG, pulse oximetry and non-invasive blood pressure) were applied to the patient and we then administered sedation with intravenous midazolam 2 mg and fentanyl 50 micrograms. Both blocks were performed under aseptic conditions and ultrasound guidance using a 5–10 MHz linear probe (Zonare Ultra; Zonare) with B-Mode and sonoelastography split imaging. For the interscalene block we used a 5-cm short bevelled regional block needle (Stimuplex A; B.Braun) in the plane of the ultrasound beam and passed it anteromedially through the scalenus medius muscle. With the needle tip placed within the fascial sheath and seen underneath the C5 nerve root, we injected a test dose of 1 ml levobupivacaine 0.375% followed by a further three 5-ml increments. A continuous femoral block was performed using a 5-cm Tuohy-tipped needle (Pajunk, Newcastle-upon-Tyne, UK) inserted out-of-plane with respect to the probe and advanced it under direct vision through both fascia lata and illiaca layers to the medial aspect of the femoral nerve. We threaded a 19-G catheter

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through the needle and fixed it to the skin for a postoperative continuous perineural infusion. We administered a test dose of 1 ml levobupivacaine 0.024% followed by four further increments of 5 ml.

Results: The data from cadaver experiment was analysed quantitatively and qualitatively. The data we obtained from human patients were used to qualitatively describe the spread of LA injection. We successfully recorded 60 videos of 0.25, 0.5 and 1 ml injections, divided equally between interscalene and femoral blocks. For interscalene block, injections of 2.5, 5 and 7.5 ml volumes were restricted to seven, three and two occasions; and for femoral block, restricted to five, four and two episodes, respectively to protect the cadavers from being damaged.18 interscalene and 19 femoral large volume blocks were not performed due to high injection pressures.

Concordance of visibility ratings was present between raters; linear weighted Kappa (95% CI) was 0.66(0.61–0.71). The characteristics of spread were similar with both interscalene and femoral blocks; spread increased with injectate volume up to 1 ml. Within-subject SDs was similar for both blocks (Table 1).

TABLE 1. Comparison of volume dose response of Mean Log time weighted AUC of sono-elastography spread (H) between interscalene and femoral block in Thiel cadaver

Volume Injected(ml)	Interscalene block	Femoral block
0.25	2.69 (1.34)	2.10 (1.40)
0.5	3.59 (1.34)	4.10 (1.82)
1.0	5.90 (1.13)	5.20 (1.58)
2.5	5.87 (2.51)	3.35 (1.20)
5.0	4.20 (1.58)	2.83 (1.97)
7.5	5.40 (0.46)	3.80 (0.60)

Analysis of variance showed differences in measured spread between injection volumes ($p = 0.009$), but not between regional blocks ($p = 0.05$). There was no interaction between injection volume and regional blocks ($p = 0.56$). Posthoc

Bonferroni analysis showed greater spread with1 and 2.5 ml volumes compared with 0.25 ml within the blocks (Table 1). Secondary outcomes showed a non-parametric distribution. Spearman's correlation (rho) between Likert and Vienna score was 0.78. Visibility of nerves (Likert and Vienna scales) and muscles before injection was better ($p = 0.04$ and $p = 0.02$, respectively) using B-mode ultrasound compared with sonoelastography (Table 2, Fig 1).

TABLE 2. Visibility scores of nerves (Likert and Vienna scores) and muscles (Likert) in Theil cadaver. B-mode ultrasound compared to sono-elastography

	B-Mode	Sono-elastography	W	p
Nerve (Likert)	5 [2 – 7]	2 [1 – 3]	28	0.04
Nerve (Vienna)	1 [1 – 2]	4 [3 – 4]	36	0.02
Muscle	4 [2 – 6]	2.5 [2 – 4]	23	0.03
Needle insertion	4.5 [4 – 5]	2 [1 – 3]	36	0.02
Spread	5 [4 – 6]	6.5 [6 – 7]	28	0.04

During injection, needle visibility was better ($p = 0.02$) with B-mode ultrasound, but spread of solution was better ($p = 0.04$) with sono-elastography (Fig 2).

Patient: Interscalene block: The scalenus anterior, scalenus medius and sternocleidomastoid muscles and C5, C6 and C7 nerve roots were readily seen on the B-mode image. Muscles were indistinct using sonoelastography and appeared as a light blue colour with the colour scale we used. Using sonoelastography, we viewed the initial 1-ml test dose as an orange hue spreading medially between and over the outer aspect of the nerve roots of C5 and C6 (Fig 3), along the lateral border of C6 and infero-laterally at C7 away from the interscalene sheath. Colour changes settled after 5 s as the tissue distension resolved. After 30s, and no obvious sign of intraneural or intravascular injection, injection of 5 ml local anaesthetic generated a dramatic colour flare with accentuation of spread between and medial to C5 and C6, and infero-laterally flow along the interscalene sheath on the lateral border

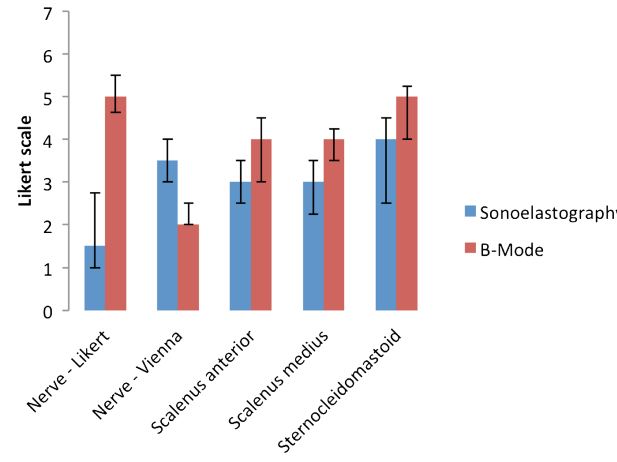

FIGURE 1. Visibility of interscalene anatomy in cadavers pre-injection. Visibility of nerves (Likert and Vienna scales) and muscles better using B-Mode ultrasound compared to sono-elastography. Wilcoxon signed-ranks test for matched pairs Likert scale W 351, Z 4.5, $p<0.001$; Vienna scale W 320, Z 4.3, $p<0.001$; Scalenus anterior W 230, Z 3.7, $p<0.001$; Scalenus medius W 288, Z 3.9, $p<0.001$; Sternocleidomastoid W 343, Z 4.4 $p<0.001$.

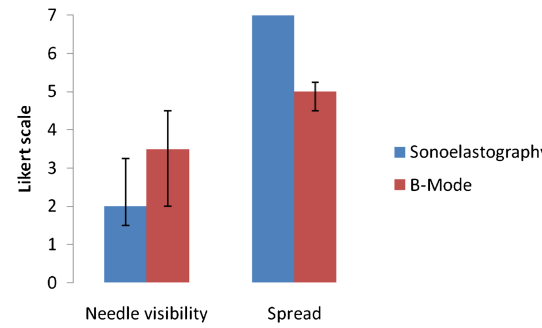

FIGURE 2. Visibility of needle and spread of solution during perineural injection in cadavers using sono-elastography and B-Mode ultrasound. Needle visibility better with B-mode ultrasound using Wilcoxon signed-ranks test for matched pair, W 182, Z 2.8, $p = 0.006$, and visibility of spread of solution better with sono-elastography W 378, Z 4.5, $p < 0.001$.

of the nerve roots. Although we saw spread between C5 and C6 and down the interscalene sheath on the B-mode image, it was more difficult to see and less distinct. The patient had a successful interscalene block without the need for intra-operative or postoperative opioids.

Patient: femoral block: With B-mode imaging, we could clearly see the left femoral artery, femoral vein, fascia lata and fascia iliaca using B-mode ultrasound. The initial 1-ml local anaesthetic injection showed up as an orange hue above the incompressible blue nerve with sonoelastography that disappeared, as expected, after 10 s. Subsequent injection of 5-ml aliquots showed good spread of local anaesthetic above, medial and lateral to the nerve and substantial spread underneath the fascia iliaca in both medial and lateral directions. We saw the local anaesthetic compressing the femoral nerve with each bolus and separating it into its component divisions. This single-shot bolus and subsequent continuous low-dose local anaesthetic infusion provided good postoperative pain relief to the patient, with minimal motor block.

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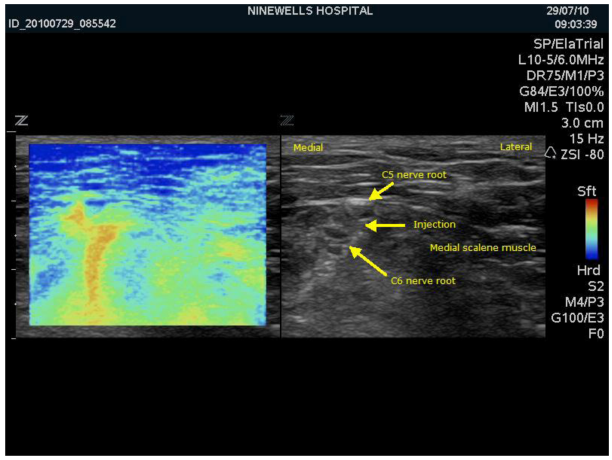

FIGURE 3. Interscalene block in patient – 1ml test volume. Spread of local anaesthetic along lateral border and between C5 and C6 nerve roots.

Discussion: Sonoelastography showed similar spread for interscalene and femoral blocks in the Thiel cadaver with a maximal response using 1 and 2.5 ml of solution. When translated to patients, we saw a dose-dependent strain pattern using 1 and 5 ml of local anaesthetic with high and low strain being shown as red and blue, respectively. Furthermore, we found sono-elastography on the Thiel cadaver model to be reliable for repeated blocks for both interscalene and femoral regional blocks without evidence of perineural fluid accumulation. Sono-elastography recognised rapid increases in tissue strain secondary to volume expansion of interstitial tissue and thus potentially offers three important signs to the clinician during regional anaesthesia: (i) accidental interstitial spread of local anaesthetic; (ii) accidental intra-arterial and intra-neural injection; and (iii) real-time identification of strain with volumes as low as 0.25 ml. We have previously described unexpected interstitial spread and arterial and intra-neural injection within the Thiel cadaver model5. Injection of 1 ml of solution into the sciatic nerve of a cadaver resulted in intraneural expansion, similar to the swelling seen in experimental pig nerves6,7.

Our study demonstrated the detection of strain at test volumes less than those routinely used in clinical practice. For example, a test volume of 1 ml is often used in clinical practice to determine needle tip placement, yet injection into a nerve fascicle of a small volume of local anaesthetic may result in long-term damage. A recent review of neurological complications of regional anaesthesia reported that the incidence of nerve injury secondary to interscalene nerve block is 2.84 in 1008; this suggests that a clinical means of early detection or even avoidance of intra-neural needle placement and injection should be developed.

Our study has shown that detection of strain with low test doses is entirely possible with sonoelastography. For example, only 1 ml of local anaesthetic injected into our patient between C5 and C6 opened up the space between both nerve roots and expanded the space medially before resolving over 10 s. Tissue strain was detected as a distinct circumneural yellow–orange spread around a relatively incompressible blue nerve.

Our results suggest that B-mode imaging is of value when scanning anatomy such as nerves and muscles, but that sono-elastography offers additional information during interstitial fluid injection and dynamic tissue changes. Reliance on the B-mode greyscale may not clearly show local anaesthetic spread at low volumes, especially when merged with a dark background and a colour scale has shown improved pattern recognition.

A failing of sono-elastography as well as B-mode ultrasound is that spread within a three-dimensional (3-D) anatomical area is visualised on a two-dimensional (2-D) monitor. The 3-D anatomy of perineural spread is not well described nor is any correlation between 2-D and 3-D strain and spread. Our group has developed enhanced sono-elastography software, which allows visual recognition of both the strain pattern and injected volume in real-time and pilot studies are ongoing. Within the relative confines of an enclosed space such as the interscalene sheath or below the fascia iliaca, our results suggest that spread is more easily seen using sono-elastography compared to greyscale ultrasound.

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THERMAL QUANTITATIVE SENSORY TESTING FOR TESTING PERIPHERAL NERVE BLOCKS

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In many publications aiming to determine the optimal solution mixture for single shot peripheral nerve block, quality and duration of anesthesia in different dermatomes has often been assessed using absence of pinprick or cold sensation. But are pinprick and cold the correct way to test a block? In fact, pinprick tests high threshold mechanoreceptors (also activated by pain, pressure and stretch) and cold sensation tests A-δ fibers. These techniques for testing the extent of a PNB have two clear advantages viz. they are easy and quick to perform. However, they have important disadvantages too viz. measurement variability, subjectivity and non-selectivity, as they do not test all of those fibers involved in pain impulse transmission. Both A-δ and unmyelinated C fibers are the most important small afferent fibers in the transmission of pain signals.[1] The lack of a quantitative method for the assessment of a peripheral nerve block, as well as the aforementioned problems associated with traditional testing directed our attention to Quantitative Sensory Testing (QST) as applied in chronic pain diagnostics. QST is a psychophysical testing method already applied for many decades in multiple domains in medicine. In the last 10 years specific QST protocols have been developed for application in a variety of acute and chronic pain syndromes, in order to provide a more objective way of measuring abnormalities in the functioning of cutaneous afferent small fibers. This evaluation method can also be used to test the neurotoxicity of drugs.[2]

QST involving the application of thermal stimuli such as cold (CS) and warm sensation (WS), cold-induced pain (CP) and heat induced pain (HP)

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provides reproducible and semi-objective investigation of the small A-δ and C polymodal nociceptors responsible for pain transmission to the spinal cord. QST also allows us to adequately compare the effects of differing substances on peripheral nerve conduction. Its implementation in daily anesthetic practice has, however, been tempered by rather complicated methodological protocols and by the fact that the technique is inherently time-consuming.[3, 4]

The increasing use of ultrasound in regional anesthesia has demanded greater objectivity in testing peripheral nerve blocks. Many studies emphasize the multiple advantages of ultrasound in regional anesthesia: shorter block onset, better control of anesthetic solution spread, use of smaller volumes obtaining more selective blocks and minimal effective volumes for specific surgical procedures. [5] But practically speaking, how small a volume of local anesthetic can be effectively used? Do we have to use adjuvants to compensate for the dose reduction? Lower volumes means lower doses of local anesthetics, but how should adjuvants be administered? Clearly, QST seems a method for evaluating the quality of a peripheral nerve block as well as the neurotoxicity of the local anesthetic solutions.

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IMMEDIATE MANAGEMENT OF ADP AND PDPH IN OBSTETRIC ANESTHESIA

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Although a meticulous technique and prevention of an accidental tap may be the first steps to prevent PDPH, the present abstract will mainly focus on the best attitude once such a tap has occurred and what to do in the first place when nevertheless PDPH occurs with or without recognized dural puncture or accidental tap .

After a tap : prevention of PDPH: When an unintentional tap has been performed with an epidural needle, the incidence of PDPH may increase to more than 50%, particularly in the more vulnerable parturient. To prevent the occurrence of headache several suggestions have been proposed. Whereas the supine position may exacerbate the complaints, some recommended to resume this position as soon as possible (provided PDPH is not present yet) to allow the dura to fit better against the bony structures of the spinal canal thus reducing CSF leakage.

Regarding a **prophylactic blood patch** a randomized study demonstrated that the headache lasted shorter but that it was not effective in reducing PDPH or the need for EBP (1). Although recently it has been shown that a prophylactic patch may be better than conservative or no treatment (2.3), these studies had flawed methodology. In addition, performing them via the epidural catheter located above the dural hole (the epidural will mostly be resited at a more cephalad interspace) is not a good idea while not all orifices will remain open.

Placing the catheter intrathecally and leaving it in place for at least 24 hours has been considered for quite some time to be the best option to prevent the later occurrence of PDPH or at least to lessen the need for an Epidural Blood Patch EBP (4). However some recent similar studies were unable to confirm the initially published fabulous results when proceeding to continuous spinal anesthesia (CSA) (5-7). The major flaw of most similar studies performed actually is the lack of defining or scoring the severity of PDPH but also of presetting criteria when to perform such an EBP. Others were reviewing data going back more than 20 years which is not meaningful due to the change of practice (8).To provide final evidence larger sample sizes or meta-analyses are mandatory. Such a meta-analysis of 9 reports has been performed recently (9) demonstrating that proceeding to CSA is indeed beneficial in reducing the need for EBP but not significantly the occurrence of PDPH. However it is unclear whether in all these studies the epidural catheter was left in situ for at least 24 hours and whether this catheter was used during this period for administration of analgesics or saline. A Belgian University Hospital has reviewed their data at regular time intervals going back to 1997. Whereas no differences could be found after reviewing the first period of 10 years further record reviewing, actually and this after 16 years, they were able to demonstrate a lower incidence of PDPH and EBP need (7,10). During the last decade several nationwide surveys (11-17) have been published to examine the incidences of accidental taps and PDPH and which strategies are followed subsequent on these events. Despite some increase still a majority of colleagues prefers to place the epidural ad an adjacent interspace. In the most recent German survey less than 3% proceeded with continuous spinal anesthesia (17). Anesthetists should take into consideration that a new tap may be performed while epidurally injected substances may tend to spread more cephalad either by subarachnoid migration or dilution by leaking CSF. So, even if the incidence of PDPH may not decrease with conversion to a CSA technique, this is no reason to reject the latter option. Some concern has been raised with respect to the possible damage caused by introducing epidural catheters intrathecally.

While two options are commonly mentioned i.e. placing the epidural at another interspace or placing an intrathecal catheter, a third reported option is to draw back the epidural needle into the epidural space and place the catheter at the intended level. Why this would reduce the incidence of PDPH (the reported incidence was20%) is unclear (18).

Finally it is unclear whether **medication** such as gabapentin, corticosteroids, neuraxial opioids, epidural postoperative analgesia or intrathecal saline are really useful as prophylactic measures against the development of PDPH or decreasing its severity. A recent systematic review and meta-analysis found that, unfortunately based on single reports, epidural morphine and cosyntrophin seem to be the most promising but that this needs to be confirmed by larger studies (19). Another Cochrane Database Review confirmed the benefit of morphine and cosyntrophin, found dexamethasone to even worsen PDPH, aminophylline worth to try while it was inconclusive for the commonly accepted use of caffeine and NSAIDs (20) .

Avoiding to mother to push during the second stage of labor (in favor of forceps or vacuum extraction) or reducing the duration of this stage has been shown to be less successful in reducing PDPH than previously suggested (12).

When PDPH occurs despite the above....: Some patients are more at risk than others to develop PDPH. At higher risk are parturients, those suffering headache or migraine, females, caffeine abusers and when the dura was punctured with larger needles or multiple times. Obese patients are less likely to develop PDPH. Although most handbooks recommend to start with hydration, caffeine, symptomatic drugs (opioids, NSAIDs, weak muscle relaxants, aminophylline…) some cases, in particular parturients or/and those at risk for DVT may not allow a rather long interval of conservative treatment. Whereas conservative treatment may treat PDPH induced with small spinal needles, it may be less realistic to believe that taps made with Tuohy needles in an obstetric population might be able to cure PDPH. Especially midwives insist on quite rapid performance of an EBP to allow mothers to remain mobile to take care of their neonate and allow discharge no later than uncomplicated cases. As a consequence the interval between the initial complaints (with subsequent conservative treatment) and an EBP is mostly 24-48 hour, even less in the US while in the UK the interval may be extended to 3-4 days. The EBP remains the most successful treatment option with a higher success rate than epidural injection of saline, dextran or tissue glue. When reviewing EBPs performed during a seven-year period it appeared that parturients required more repeating of the EBP because lack of success after a first patch (21). This raises the question whether anesthetists are not jumping to fast into an EBP.

Other treatments with variable success consists of hydrocortisone, ACTH, triptans, cosyntropin, gabapentin, mirtazapine, acupuncture, stellate-, sphenopalatine - and occipital nerve blocks (22-24).

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AMBULATORY PERINEURAL CATHETERS

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Ambulatory Catheters: The benefits of regional anaesthesia for day case surgery include superior analgesia compared to opioid based techniques, earlier discharge, fewer analgesia related side effects and, for surgery amenable to be undertaken under regional anaesthesia techniques alone, avoidance of GA related side effects which in turn improves time to discharge. The introduction of day surgical stay pathways in particular for upper and lower limb surgery in combination with the benefits of procedures undertaken under regional anaesthesia techniques have allowed patients to enter this pathway who would in the past not have been seen as suitable for day case surgery.

However, patient care has to go beyond the immediate day case stay and plans have to be in place to provide a safe and effective postoperative pain treatment once the patient is back home.

The duration of regional anaesthesia requires several considerations:
- Balancing effective analgesia against undesired motor blockade when a single block approach is used (eg blocks proximal to the axilla for upper limb, proximal to popliteal fossa for lower limb). Many patients find the lack of sensation and motor function of a complete limb block distressing. Using short acting local anaesthetic will allow earlier mobilisation of the limb, but pain relief will also be short lasting. Long acting local anaesthetic may help with analgesia but encumber the use of the limb and, for lower limb, cause potential falls and injury.

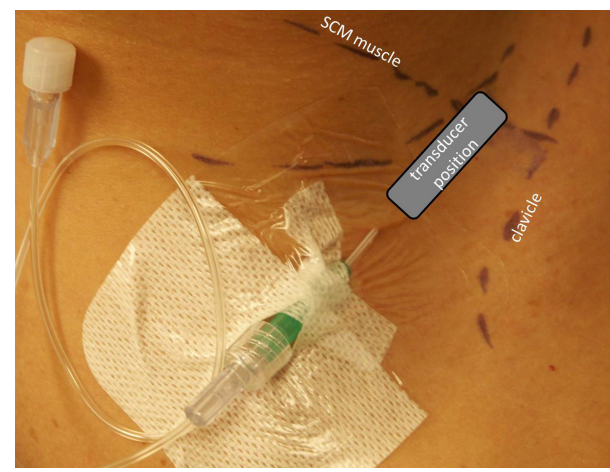

FIGURE 1. Simplest catheter set, Contiplex D needle in supraclavicular plexus approach.

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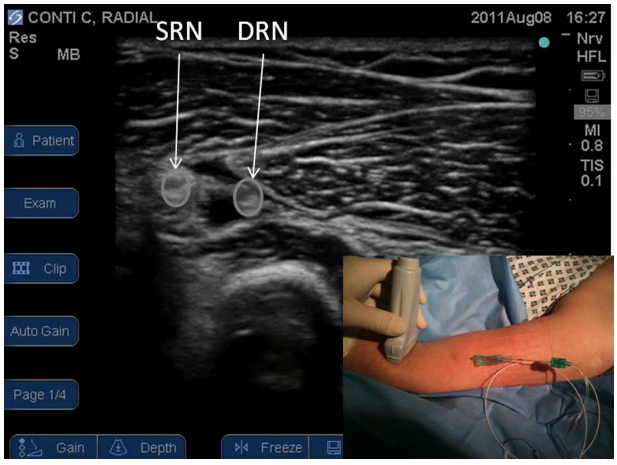

FIGURE 2. Contiplex C catheter placed to deep radial nerve for trapezectomy with LA bolus.

- A single injection block versus multi injection block. To avoid ongoing motor block whilst allowing lasting analgesia a combined technique of a short acting tourniquet block with more distal anaesthetic block using long acting local anaesthetic may be required. For ankle surgery up to 5 separate injections may be required, equally for upper limb blocks depending on the type of surgery. This not only demands a sound knowledge of anatomy and nerve territories, but also a proficient block technique to ensure patient comfort and avoidance of nerve damage.
- The severity of pain depending on surgery undertaken. For shoulder rotator cuff repairs, major elbow forearm or wrist surgery many of which were traditionally performed as an inpatient procedure, pain may be severe once the initial block has worn off and oral analgesia treatment may be inadequate. Long lasting local anaesthetic may delay the recurrence of pain, but realistically not beyond the first 24 hours. Many patients experience the '3 am' pain storm even when large doses of local anaesthetic have been used.

The duration of even long acting local anaesthetic blocks is limited and ensuing pain once the block has worn off may be severe. Adjuvants so far have not been shown to prolong the effects significantly for peripheral blocks. For selected surgery, consideration should therefore be given to using continuous infusion techniques:

Considerations for ambulatory catheters:

1. Catheter kit: Many different catheters have been available in regional anaesthesia: non stimulating, stimulating, catheter over needle, catheter through needle, multi hole or single hole catheters.

Catheters placed through needle and advanced into nerve sheeths or fascial planes pose a separate problem. The site of placement is usually decided on anatomical considerations, i.e which block approach is best suited to cover the surgical site. The initial bolus may be placed via the first needle pass to expand the space. Catheter advancement past the needle tip may however then lead to a situation where the infusion site is further distal to the optimum bolus placement. This will then require a higher infusion rate to compensate or lead to secondary failure. Catheter through needle may cause leakage of LA.

Catheters over needle such as the Contiplex D and C (BBraun, Melsungen, Germany) may allow a more precise and quick placement. The intial bolus site is also the infusion site and the catheters 'plugs' the skin puncture to avoid leakage, but postoperative movements of the limb may potentially move the catheter from it's optimum position.

2. Insertion procedure: The practicalities of catheter insertion may deter many practitioners from using them. Distal placed catheters may interfere with surgical preparation, if placed preoperatively, whilst postoperative insertion adds to the organisational difficulties of keeping a list going.

3. Post insertion pathways and protocols: Time required for insertion, skill for safe and accurate placement, fear of catheter related side effects or secondary failure are immediate concerns. In the ambulatory setting in particular, the setting up of protocols to cover every eventuality no matter how rare and the need to involve a large number of health care professionals in secondary and primary care in the development process have proven detrimental in many places. In the USA ambulatory catheters are used regularly and successfully, a development primarily driven by cost considerations. With the increasing financial constrictions in the UK ambulatory catheters would also be beneficial by allowing more, and more complex surgery to be undertaken as a day surgical procedure provided the safety net in the primary care setting is sufficient.

This talk will primarily focus on the practicalities of catheter insertion, looking at different approaches and techniques and showing examples of practice to the benefit of selected patients.

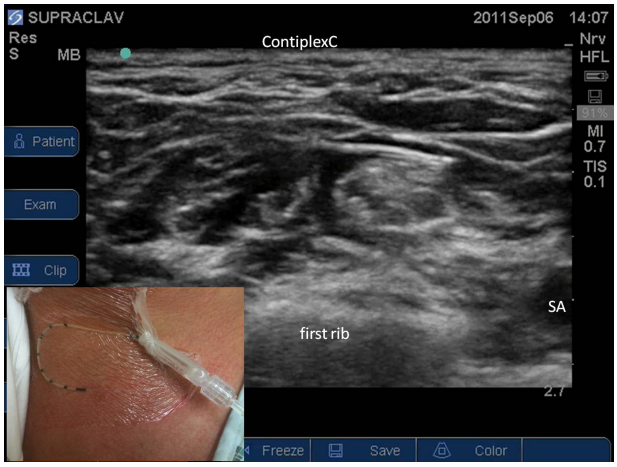

FIG 3. Contiplex C catheter supraclavicular placed over upper trunk for shoulder surgery

NON RA ANALGESIC OPTIONS FOR DAY SURGERY

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More and more complex and painful 'major' operations are performed on a minimally invasive (i.e. key-hole surgery) outpatient (short-stay) basis (e.g. renal, adrenal, prostate laparoscopic interventions; laminectomy; orthopaedic reconstructions; total knee and total hip replacements; hysterectomy). Quite often regional anaesthesia techniques would have been applied if the patient would undergo the operation as part of their clinical in-hospital procedure. However, outside the hospital environment, the usual opioid-based intravenous patient-controlled analgesia and central neuraxial analgesia (e.g. subarchnoid, epidural, combined spinal-epidural blocks) are impractical pain relief techniques to use. Nevertheless ambulatory-operated patients often experience moderate to severe pain, which causes a prolonged hospital stay (recovery room).

Recovery variables after ambulatory surgery (e.g. resumption of normal activities including food intake, bowel function, return to work) can be used to validate recovery and control of factors that can influence postoperative morbidity (e.g. postoperative nausea and vomiting, adequacy of pain control and hydration status). A simple, safe and low-cost analgesic

Optimal multimodal postoperative pain control plays therefore an important role in ambulatory surgery, especially in the post-discharge period to reduce pain scores, enhance patient satisfaction and facilitate early mobilization and rehabilitation. The anaesthesiologist can choose among opioid, partial opioid and non-opioid analgesics and non-analgesics. Opioids are known for their postoperative side-effects (nausea, vomiting, ileus, pruritus, urinary retention, constipation, ventilatory depression, sedation, drowsiness, sleep disturbances) while nausea, vomiting and ileus are also seen frequently

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after the administration of partial opioid agonists (e.g. tramadol). The latter is the reason why many patients dislike partial opioid agonists.

Therefore non-opioid analgesics should assume a greater and more specific role in post-operative pain therapy, including the use of infiltration with local anesthetics at the surgical site, acetaminophen, NSAIDS, COXIBS, ketamine, alpha-2 agonists, gabapentanoids, other non-analgesics (e.g. droperidol, corticosteroids) and non-pharmacological approaches (e.g. TENS). However, it is clear the non-opioid analgesics have unique side-effects as well, including hepato/renal toxicity, confusion sedation, dizziness and effects on coagulation.

Twenty years ago, Professor Henrik Kehlet from Copenhagen, introduced the concept of multimodal "opioid-sparing" analgesia technique or "balanced analgesia" aiming to improve analgesia by combining analgesics - from different pharmacologic drug classes - with additive or synergistic effects. Meta-analyses demonstrated that single-modality, non-opioid analgesics have shown clinically significant reductions (range: 20-40%) in the incidence of postoperative nausea, vomiting and sedation.

Most anesthesiologists inherently expect that better postoperative pain relief will result in an improved clinical outcome (e.g. shorter hospital stay and therefore lower perioperative care costs, decreased morbidity and reduced organ dysfunction). Review of the literature fails to consistently support the claim that multimodal therapy has beneficial effects to common side effects, such as bladder and bowel dysfunction and ventilatory depression. Probably the reason for this failure can be found in the fact that many analgesic outcome studies showed major deficiencies in protocol design as they focused on surrogate endpoints (e.g. length of recovery room/hospital stay, change in pain score at rest, quantitative opioid sparing), rather than the more clinically meaningful endpoints (e.g. resumption of dietary intake, resumption of normal daily physical activities or work, recovery of bowel/bladder function and change in pain score during mobilisation). Moreover, most clinical trials have applied multimodal pain relief for a short period of time following the surgical intervention, in stead of continuing the multimodal treatment for as long as the surgical stimulus (inflammation process) continues after the operation. Furthermore, effective analgesia in the early postoperative period may lead to clinically effective long-term benefits as it avoids the development of chronic pain.

Modern fast-track surgery includes an optimal procedure-specific analgesia regimen that has been integrated into an enhanced recovery care program with early oral feeding, mobilization, and adjustments of surgical care (e.g. drains, tubes, catheters, monitoring). We as anesthesiologists should adjust our postoperative pain regimen into the total care a patient has to be given following ambulatory surgery. This regimen should be procedure-specific. If after major abdominal surgery, optimal pain relief will be obtained with the insertion of a thoracic epidural catheter in reducing dynamic pain, postoperative bowel dysfunction (ileus, nausea, vomiting) then it is appropriate to use an epidural catheter. However, steps have to be taken to make sure that enough information and help is offered so that epidural analgesia can be effective for the patient. On the other hand, many abdominal operations (e.g. laparatomy for hysterectomy, laparoscopic colon resection, adrenalectomy or nephrectomy) can perfectly be performed without the need of an epidural catheter as simply the resulting pain is less intense and responds well to oral pain killers. The anaesthesiologist should also take into account the different side-effects of both surgical type of operation and side-effects of the postoperative medication given to the patient. NSAIDS are preferably avoided in patients with an enhanced probability of bleeding (e.g. ear-nose-throat surgery, hip and plastic surgery), postoperative ileus (e.g. following colon resection operations whereby opioids are administered as pain killers). Ventilation can also be depressed following the administration of opioids in thoracotomies. The latter may be better treated with regional analgesia blocks.

In order to improve long-term functional outcome after major surgery, prolonged multimodal opioid-sparing analgesia is essential. Patients should be categorized according the risk of developing clinically significant pain after surgery. The most important predictors of postoperative pain after surger are: 1) presence of PRE-operative pain; 2) patient's and physicians' expectations regarding the level of postoperative pain; 3) the patient's age; and 4) the patient's fear regarding the outcome of the operation. Procedure-specific evidenced-based analgesia care maps are needed to be combined with a fast-track recovery strategy. A more thoroughly integrated collaboration and communication between different departments (anesthesia, surgery, nursing, acute pain team) is an absolute prerequisite in order to be successful. Hospital administrators, governmental and regulatory bodies, and insurance companies need to agree on a solid foundation of the organisation of health care and help in the establishment of total quality care for the ambulatory patient. The general public' awareness of the existing possibilities for improved pain care, better education of patients and their families, shall result in a higher demand of better pain control. Patient with a high pain threshold (low pain responders), should be treated differently (less aggressive and simple approaches) from patients with a low pain threshold.

More studies are needed to discover all factors involved in pain development. Genetic research to detect specific genotypes (pain may genetically vary between patients), research on pharmacokinetics of opioid receptors (and their genes) and other non-opioid analgesics, research on patient responses to various analgesic medications, newer and longer acting local anesthetics (e.g. extended-release local anesthetics such as depo-bupivacaine), and research on the effect of gender and ageing on the response of opioid/non-opioid medication are welcome, to come to the optimal pain control for ambulatory-operated patients with the least amount of side-effects. The number of ambulatory surgery procedures continues to grown in an aging global society (1% per year in < 65 years of age; 2% in 65-79 years; 3% per year for the 80 years and older, making the later group the most rapidly growing age group.

Pain after surgical procedures remains a challenge for anesthesiologists, as it is a highly personal experience by the patient, communicated to healthcare workers, family members and friends by verbal signs, body and facial expressions (Loeser circles). Pain is the fifth vital sign to assess the most basic body functions besides body temperature, heart rate, blood pressure and respiratory rate. Both undertreatment and overtreatment of pain with analgesics have a negative impact on recovery after ambulatory surgery. Still, too many patients experience unacceptable pain, despite receiving 'standard' analgesic regimens.

Understanding the pathophysiologic basis of acute pain remains a need to implement evidence-based procedure-specific (individually-adjusted) aggressive pain management, as part of a multimodal analgesic treatment regimen in the postoperative period of a patient, who underwent surgery on a day-case surgery basis, with the care of all involved (anesthetists, surgeons, nurses and other supportive bodies), underlining the importance of effective communication and organisation of 'total' care for a patient, including adequate pain relief administered for 3 to 5 days (not 1-2 days!). Non-opioid analgesia techniques are the first choice of pain treatment, with opioid analgesics taking more and more the role of 'rescue medication' for acute pain relief after ambulatory surgery.

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CHRONIC PELVIC AND PERINEAL PAIN. TARGETS FOR ELECTRICAL NEUROMODULATION

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INTRODUCTION: The International Association for the Study of Pain defines chronic pelvic pain without obvious pathology as chronic or recurrent pelvic pain that apparently has a gynecologic origin but for which no definitive lesion or cause is found1. This definition has not been widely used in the literature2. Pelvic pain syndrome (CPPS) is the occurrence of persistent

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or recurrent episodic pelvic pain associated with symptoms suggestive of lower urinary tract, sexual, bowel or gynaecological dysfunction. There is no proven infection or other obvious pathology (adopted from ICS 2002)3.

Chronic pelvic pain is a common problem among women. Overall, a women has about a 5% risk of having chronic pelvic pain in her lifetime. In patients with a previous diagnosis of pelvic inflammatory disease this risk is increased fourfold (approximately 20%)4. Recent epidemiologic data from the United States showed that 14.7% of women in their reproductive ages reported chronic pelvic pain5.

Although complete cures are uncommon, chronic pelvic pain is truly a multidisciplinary problem whose diagnosis and management require the concerted effort of a multidisciplinary team.

ROLE OF SACRAL NERVE ROOT STIMULATION (SNS): The use of an implanted sacral neuromodulator on the sacral nerve roots6,has become an acceptable and promising modality for controlling various forms of voiding dysfunction7. Sacral nerve stimulation has already been shown in studies to reduce pain related to voiding and other forms of pelvic pain8-12, patients with urinary symptoms due to detrussor instability, interstitial cystitis , to alleviate voiding symptoms, urinary symptoms due to detrussor instability, an also can obviate the need for more invasive surgery11.

Mechanism of action of neuroaugmentation, have been recently reviewed by Calvillo et al13, and pelvic Conditions amenable to sacral neuromodulation. Previously, in their excellent article, Chancellor et al7, proposed that SNS depends on electrical stimulation of afferent axons in the spinal roots which in turn modulate voiding and continence reflex pathways in the central nervous system. The afferent system is the most likely target because beneficial effects can be elicited at intensities of stimulation that do not activate movements of striated muscles. To understand how sacral somatic afferents alter lower urinary tract reflexes to promote voiding, it should be recognized that in adults brain pathways are necessary to turn off sphincter and urethral guarding reflexes to allow efficient bladder emptying. Before the development of brain control of micturition, at least in animals, stimulation of somatic afferent pathways can initiate efficient voiding. The somatic afferent can activate bladder efferent pathways and turn off the excitatory pathways to the urethral outlet. Different reflex mechanisms are involved in the SNS suppression of bladder hyperactivity. It is known that various afferent pathways projecting to the sacral cord can inhibit bladder reflexes in animals and humans. The list includes afferents from the pelvic floor and sphincter muscles, afferents from the distal colon, rectum, and anal canal, afferents from the vagina and uterine cervix, and cutaneous afferents from the perineum. Two mechanisms have been identified in animals for somatic and visceral afferent inhibition of bladder reflexes. The most common mechanism is suppression of interneuroneal transmission in the bladder reflex pathway. It is assumed that this inhibition occurs in part on the ascending limb of the micturition reflex and therefore blocks the transfer of information from the bladder to the pontine micturition center. This action would prevent involuntary (reflex) micturition but not necessarily suppress voluntary voiding that would be mediated by descending excitatory efferent pathways from the brain to the sacral parasympathetic preganglionic neurons. A second inhibitory mechanism is mediated by a direct inhibitory input to the bladder preganglionic neurons. This can be induced by electrical stimulation of the pudendal nerve or by mechanical stimulation of the anal canal and distal bowel. It is not elicited by tactile stimulation of penile or perineal afferents. The later mechanism would be much more effective in turning off bladder reflexes because it would directly suppress firing in the motor outflow from the spinal cord. It would also be expected to block nonselectively both voluntary and involuntary voiding. Thus this inhibitory response may be less important in clinical studies than responses to SNS because patients usually retain normal voiding mechanisms.The principles behind SNS can be summarized as somatic afferent inhibition of sensory processes. Pudendal afferent input to the sacral spinal cord can turn off supraspinally mediated hyperactive voiding, blocking the ascending system. Pudendal afferent input can also turn on voiding reflexes by turning off the guarding pathways.

In relation to these stimulation techniques applied to the treatment of coccygodynia, Poggi14 has published a clinical case corresponding to a woman with lower back pain and coccygodynia who following failure of other therapeutic measures received a posterior column stimulator (SCS) with the electrode tip at L2 level, with good results. On the other hand, Alo et al15-17 has published various cases involving NRS at different levels, in patients who failed to improve with SCS. These patients included two cases of sacral root NRS with a diagnosis of vulvar pain and interstitial cystitis, with satisfactory results. In the same publication, Alo enumerated a series of causes of perineal pain that could benefit from this technique, including coccygodynia. Although the literature presents no studies designed to evaluate the efficacy of this treatment option, we believe it may constitute an important option in the management of neuropathic coccygodynia18.

S3 sacral foraminal procedure: The electrodes were inserted in the operating theatre with the patient under a combination of local anaesthesia and sedation. Foramen needles were placed in both the right and left S3 foramina and a ground electrode over the lateral chest wall. The exact location was determined by evaluating the appropriate motor and sensory responses to electrical stimulation19 . When placed correctly the electrode leads were passed down the foramen needles. The new lead was inserted on the side which had the best motor and sensory response. The typical S3 responses recorded were a tingling sensation in the vagina, with contraction of the external anal sphincter and flexion of the ipsilateral great toe. The foramen needles were then removed and the position of the electrode leads re-assessed by observing the functional response to stimulation. The electrode leads were then secured into place using transparent adhesive tape and coupled to a hand-held pulse generator. The patient remained prone in the theatre until a lateral sacral X-ray was taken, for measuring the distance between the lead tip and the ventral surface of the S3 foramen as control of lead migration. The stimulator frequency is set at 20 Hz, a pulse duration of 210 μs and an amplitude limit of 10 V. Currents were set at the maximum comfort level for each patient (0.5–20 mA).

Occasionally, patients may complain of discomfort at the insertion site but inflammation or infection is rare20-22. However, lead migration is a commonly reported technical problem. In a study by Vaizey et al23, 12 women underwent trial stimulation and lead migration was identified in four.

Percutaneous, "retrograde", epidural approach: For this procedure the patient is placed prone with two pillows under the abdomen to straighten the lordotic lumbar curve. A parallax-less image over the L3/4 interspace is assessed with a 20-degree cephalocaudal fluoroscopic projection. Two paramedian epidural Touhy needle tips are then directed into the midline L3/4 interlaminar space. The electrodes are then directed caudad within the median raphe until they traversed the L5/S1 interspace. At that point they need to be rotated off the midline toward the proximal S2/3 foramina. Stimulation paresthesia must be felt in the parasacral/paracoccygeal, vulval, and distal lower extremity regions. This is best achieved with multiple cathodes in a bipolar configuration.

In comparison to the standard SCS approach, cephalocaudal "retrograde" insertion methods were developed to improve paresthesia overlap and facilitate lumbosacral nerve afferent targeting, as many of the T12-S5 dermatomes cannot be effectively (or individually) stimulated over the spinal cord. Although this can be improved with newer dual electrode SCS programming approaches, modeling has suggested that this difficulty may be due in part to the specific anatomic and/or geometric variations of the cord DC or DRG afferents (in relation to the electrode size and position), as well as the depth of the dorsal cerebrospinal fluid layer(dCSF)24. Most sacral sensory and motor conditions (pudendal neuralgia, coccygodynia, urge incontinence, etc.) cannot be effectively stimulated above T12. To date, the cephalocaudal "retrograde" approach has been applied successfully in long-term follow-up for the combined sensorimotor dysfunction of interstitial cystitis25,26.

As a result, the following potential clinical advantages have been identified18 for cephalocaudal vs. transsacral nerve/root applications: the ability to physiologically map the cauda equina from T12 through S5 in the awake patient; the ability to anatomically "stabilize" the electrode within the epidural space and/or sacral root sleeve; the ability to maintain "parallel" electrode symmetry and contact with the respective sacral roots; the ability to minimize the morbidity of open posterior sacral root dissections; the ability to use current "off the shelf" technology without the need for new, specialized hardware; the ability to apply electrodes more readily over multiple neural segments; the ability to work within an interdisciplinary team (urologist/anesthesiologist/neurosurgeon) in optimally evaluating, implanting, and managing the patient and system perioperatively; and the ability to more readily expand this effective application to more patients through appropriate training and education of the primary implanting pain practitioner group.

Potential disadvantages of this approach include: the inability to successfully cannulate the cephalocaudal intralaminar epidural space; the inability to traverse abnormal intraspinal anatomy (eg, spondylolisthesis, scar, sensitive dura, steep lumbosacral angulations, etc.); the inability to achieve a lateral or selective electrode placement within the sacral canal; and the initial learning curve associated with developing a new technique.

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FINAL REMARKS AND CONCLUSION: Consideration of the advances in understanding of the neurobiology of CPP syndromes forces us to consider novel treatment options. The role of central sensitization and viscerosomatic and somatovisceral reflexes in the maintenance of CPP needs to be recognized: treatments aimed primarily at central and peripheral nervous-system neuromodulation are likely to play a larger role in the treatment of CPP.

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NEUROSTIMULATION IN HEADACHE DISORDERS. ONLY PERIPHERAL OR CENTRAL MECHANISMS INVOLVED?

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Primary headaches affect about 45% of the general population and have considerable socioeconomic impact. About 1.4-2.2% of the population suffer from chronic headaches, where patients experience daily or almost daily headache attacks and are highly disabled. Chronic headaches cause significant impairment and put more strain on public health systems. In chronic cluster headache annual expenses is about €9000 per patient while it is €1800 for the episodic form. In the majority of chronic headache patients effective treatments are available, but a proportion of these patients are poor responders or develop intolerable side effects to drugs. Chronic drug resistant headache patients need therapeutic armamentarium to be enhanced and are the reasonable target of invasive and non-invasive neurostimulation procedures. Neurostimulation procedures in primary headaches started in the late 1990s for peripheral neurostimulation and in early 2000s for central neurostimulation. First reports on occipital nerve stimulation efficacy in presumed occipital neuralgia was in the late 1990s and deep brain stimulation of the posterior hypothalamic area in cluster headache in 2001. Introduction of these neurostimulation procedures has changed the life of many headache patients and today they are preferred to many irreversible ablative interventions on the peripheral and central nervous system carried out before. Neurostimulation procedures are reversible even if permanent lesions can occur mainly.

CLUSTER HEADACHE: Hypothalamic stimulation: In 1998 imaging studies showed activation in the posterior hypothalamic area during cluster headache attacks and subsequently it was hypothesized that high frequency stimulation of that area could counterbalance neuronal activation

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there, thus aborting cluster headache. Following this idea, hypothalamic implantation of stimulating electrodes for intractable chronic cluster headache was first performed in 2000: the results were excellent. Subsequently, data on 61 patients implanted for chronic cluster headache have been published from different headache centre both in Europe and US. More than 60% of the hypothalamic implanted cluster headache patients were rendered pain-free or had ≥50% improvement. In the largest series including 19 chronic drug resistant cluster headache patients, after a median follow up of 9 years it has been recently showed that one third of patients are still improved and the improvement is maintained notwithstanding the stimulator is off, while in first years or so after implantation, these patients experienced headache recurrence a short time after the stimulator was switched off. In another one third of patients, chronic cluster headache was reverted to episodic cluster headache but the stimulator has to be on. Non responders often suffers from bilateral cluster headache; and tolerance can appear after one-two years of improvement. The approach has also been extended to patients with other types of trigeminal autonomic cephalalgia, namely short-lasting unilateral nevralgiform headache attacks with conjunctival injection and tearing (SUNCT) and paroxysmal hemicrania.

Occipital nerve stimulation: Today, occipital nerve stimulation is considered the first choice neurostimulation procedure for drug resistant chronic cluster headache because it is less invasive compared to hypothalamic stimulation. Its success rate is rather similar to that for hypothalamic stimulation; however patients selected for occipital nerve stimulation seem to suffer from a less severe chronic cluster headache compared to than those selected for posterior hypothalamic stimulation. Length of follow up is longer for hypothalamic stimulation maybe because it was started before occipital nerve stimulation. As for hypothalamic stimulation, time to obtain improvement may vary from days to months.

Sphenopalatine ganglion stimulation: Efficacy of an implantable on-demand sphenopalatine ganglion neurostimulator was tested as a treatment for acute cluster headache attacks in a multicentre study in drug refractory chronic cluster headache patients. Duration of the experimental period was for 30 attacks or 8 weeks maximum. CH attacks were randomly treated with either full, sub-perception, or sham stimulation. Pain relief at 15 minutes was evaluated. Tirthy-two patients were enrolled and 28 completed the experimental period. Pain relief was achieved in 67.1% of full stimulation-treated attacks while only 7.4% of sham-treated and 7.3% of sub-perception treated attacks improved. Pain-free condition was obtained in 34.1% of attacks with full stimulation and 1.5% with sham stimulation. Over the experimental period mean cluster headache attack frequency reduced from 17.4 per week (range 4 to 70) to 12.5 (range: 0–96). Eighty-one per cent experienced transient, mild/moderate loss of sensation within distinct maxillary nerve regions; 65% of events resolved within three months.

MIGRAINE: Occipital nerve stimulation: A number of studies have investigated occipital nerve stimulation efficacy in patients with chronic drug refractory migraine but results are conflicting maybe because of non homogenous selection criteria, brief duration of follow up, small series, different definitions used for chronic migraine. In a recent randomized controlled study chronic migraine patients refractory to treatment of acute migraine attacks and having failed at least two different classes of prophylactic medication were included. One-hundred and fifty-seven patients received occipital nerve stimulation of whom 105 were randomised to active and 52 to sham stimulation. The primary endpoint was a ≥ 50% reduction in mean daily visual analogue scale score after 12 weeks: the study failed to reach it but a number of secondary endpoints showed some benefit including 30% reduction in mean daily visual analogue scale scores, number of headache days, and migraine related disability. Seventy-three patients in the active group (69%) and 34 in the sham group (65%) had adverse events. More studies are needed to better understand efficacy in specific forms of chronic migraine; for instance it seems that chronic migraine complicated by medication overuse does not benefit from the procedure.

Supraorbital transcutaneous stimulator in episodic migraine: Efficacy and safety of trigeminal neurostimulation with a supraorbital transcutaneous stimulator has been recently test as prophylactic treatment in episodic migraine in a double-blinded, randomized, sham-controlled multicenter study. Three months after treatment, the mean number of migraine days decreased in the verum from 6.94 to 4.88 (p=0.023). No change was observed in the sham group (6.54 vs 6.22). Accordingly migraine attacks per month as well as headache days and acute antimigraine drug consumption per month were significantly reduced. There were no adverse events in either group.

TAP BLOCK VERSUS RECTUS SHEATH FOR MIDLINE ABDOMINAL SURGERY

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Purpose/Objective: Traditionally analgesia for abdominal surgery is provided either by systemic drugs such as opioids, ketamine, nonsteroidal anti-inflammatories (NSAIDs), α_2 agonists and paracetamol or by epidural anaesthesia. A major contributor to the pain experienced after abdominal surgery is pain from the incision made in the abdominal wall. Therefore, peripheral nerve blockade is an alternative means of providing analgesia, by anaesthetising the sensory nerves conveying pain impulses from the incision site to the spinal cord and brain, and for midline abdominal surgery which block would be better to perform, a TAP or a rectus sheath block?

Materials and Methods: Anatomy

The sensory innervation of the anterolateral abdominal wall arises from the anterior rami of the six lower thoracic and upper two lumbar nerves. Branches arising from the anterior rami comprise the lower six thoracic nerves, intercostal nerves (T7–T11), the subcostal nerve (T12) and the iliohypogastric and ilioinguinal nerves (L1), which give rise to lateral and anterior cutaneous branches as they become more superficial. And these are the therapeutic target of local anaesthetic to provide analgesia for the abdominal surgical incision[1]. The intercostal nerves exit the intercostal spaces and traverse a course between the internal oblique and transversus abdominis muscles. The subcostal, ilioinguinal and iliohypogastric nerves also travel in this plane, innervating both the transversus abdominis and internal oblique muscles. The thoracic nerves continue anteriorly from the TAP to pierce the rectus sheath and finally end as anterior cutaneous nerves[2].

TAP and rectus sheath blocks

The transversus abdominis plane (TAP) block is an analgesic technique that has become increasingly popular over the last decade and involves the infiltration of local anaesthetic in the plane between the internal oblique and transversus abdominis muscles. Local anaesthetic can be injected into the plane either unilaterally or bilaterally, and there is some evidence that the site of injection influences the resulting area of abdominal wall anaesthesia[3]. Therefore the site of injection can potentially be modified according to the anticipated site of surgical incision.

Transversus abdominis plane block was first described in 2001 by Rafi[4] as a landmark-based technique withinthe ilio-lumbar triangle of Petit. It provides a dermatomal sensory block of the lower six thoracic and first lumbar afferents. Since then, a number of variations of delivering local anaesthetic into this anatomical plane have been described, the most popular the use of ultrasound to identify the correct place where to inject the local anaesthetic[5]. Different studies suggest that TAP blocks provide analgesia mainly to the lower abdominal wall, approximately between the dermatomes of T10 and L1[6,7]. The subcostal approach used for upper abdominal operations, which involves percutaneous needle puncture below the costal margin to access the TAP plane, to specifically target upper abdominal dermatomes reference[6]. To replicate the duration of analgesia described with the landmark approach, we described an ultrasound-guided approach as far posterior as the lateral border of the quadratus lumborum muscle[8].

Its proponents suggest that analgesia provided by the TAP block is equal or superior to that provided by systemic opioids such as morphine. It is also claimed that postoperative opioid consumption and opioid-derived adverse effects can be reduced[9]. Furthermore, the TAP block may have a lower risk of complications and greater acceptability to patients than epidural analgesia.

The rectus sheath block, a regional anaesthetic technique first described in 1899 by Schleich[10] to provide relaxation of the anterior abdominal wall for intra-abdominal surgery. This block can also provide postoperative analgesia for procedures using a midline incision by acting on the terminal branches of the 7th to 11th intercostal nerves within the rectus sheath. The rectus sheath block can also be considered a variant of the TAP block and it has been proposed that it may provide reliable analgesia above the umbilicus[6]. Interest in the block has been renewed following reports of its analgesic efficacy in adults undergoing laparoscopy and in children undergoing paraumbilical and umbilical hernia repair[11-13]. In adults, the rectus sheath block has been shown to improve patient comfort after laparoscopic surgery, suggesting that it might be an alternative to epidural anesthesia for some surgical procedures[11].

Two techniques for the rectus sheath block have been described. In the two-injection technique, as described by Ferguson et al[12], the needle is

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inserted 0.5–1.0 cm medial to the linea semilunaris, just above the level of the umbilicus. The anterior aspect of the rectus sheath is identified by moving the needle back and forth until a scratching sensation is noted. The needle is then advanced through the sheath, and a second scratching sensation is elicited, indicating the posterior aspect of the rectus sheath. Local anesthetic is injected anterior to the posterior sheath on either side. Courreges et al[13] referred to their technique of rectus sheath block as the paraumbilical block. The injection site is the midpoint of a horizontal line joining the umbilicus and the linea alba. A short-bevel needle is inserted at an angle of 45° and one quarter of the dose is injected in a subcutaneous fan-shaped pattern; the needle is then advanced posteriorly until a 'click' is felt as the anterior rectus sheath is pierced. Nevertheless, the rectus sheath block is suited to ultrasound-guided techniques because the layers of the rectus sheath are readily identified. Ultrasound-guided regional anaesthesia and analgesia have improved the placement of local anaesthetics and reduced inadvertent vessel or peritoneal puncture in paediatric and adults patients.

Charlton et al[14] published in 2010 a review analizing TAP block and rectus sheath block in abdominal surgery. They included eight studies examining the effects of TAP or rectus sheath blocks on pain relief after abdominal surgery (five studies of TAP blocks, and three studies of rectus sheath blocks). TAP block versus no TAP block (placebo block or no block): two studies comparing TAP blocks injecting local anaesthetic agents with a placebo TAP block using saline; other three TAP block studies compared TAP blocks with standard general anaesthetic and analgesic care (enteral and parenteral). And analizing rectus sheath block versus no rectus sheath block (placebo block or no block) there are different studies comparing rectus sheath block with local wound infiltration, rectus sheath block with standard care, and rectus sheath block with a placebo saline infusion.

Measures of TAP block efficacy comprised the morphine dose required postoperatively, the time until first request for morphine, and pain scores. While not all the included studies used each measure, combining the results of the five studies suggested that TAP blocks provide effective analgesia after abdominal surgery compared with standard postoperative opioid-based regimens. TAP blocks also prolonged the time until first request for additional analgesia in the first several hours postoperatively, in studies where this was measured. In all five TAP block studies, pain scores were lower in participants who received TAP blocks at most time points where pain was assessed, up to 24 hours.

Results: About rectus sheath block efficacy, only one of the three included studies of rectus sheath blocks found a reduction in postoperative systemic analgesic requirements in participants receiving blocks. The same study also noted a reduction in pain scores. As with TAP blocks, rectus sheath blocks made no apparent impact on nausea and vomiting or sedation scores. It must to say no studies employed ultrasound guidance.

Conclusions: As studies suggest that TAP blocks provide analgesia mainly to the lower abdominal wall, approximately between the dermatomes of T10 and L1 (umbilicus and top of the leg), but that they provide less reliable analgesia above the umbilicus; we should consider the rectus sheath block for the operations involving midline abdominal surgery.

There was considerable heterogeneity among studies, likely due to differences in study protocols, types of surgery, and scales used to assess postoperative pain, sedation or nausea and vomiting. Given this heterogeneity and the small numbers of studies and participants, conclusions about TAP and rectus sheath block efficacy are inconclusive.

FAILURE TO EXTEND LABOR EPIDURAL ANALGESIA FOR C-SECTION: RISK FACTORS, PREVENTION AND MANAGEMENT

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Epidural analgesia is commonly used for labour. Many authors advocate the use of epidural analgesia in parturients who are at high risk for emergency Caesarean Section (CS) because the time to effective surgical anaesthesia may be shortened (1). Conversion of labour epidural analgesia to CS is an important strategy in limiting the use of general anaesthesia in obstetrics. In some cases epidural catheters placed for labour may not be reliable for use in surgical anaesthesia. Failed conversion may result in unpredictable hazards associated with managing the obstetric airway, performing a spinal technique in the presence of partial epidural blockade or titration of appropriate analgesic medications. The Royal College of Anaesthetists has published best practice guidelines for providing anaesthesia for CS (2). These state that the incidence of general anaesthesia (GA) in a parturient with a labour epidural in situ should not be more than 3%. However epidural catheter failure occurs in a significant number of patients. An understanding of the risk factors for failed conversion creates an opportunity to identify and replace an at risk epidural catheter. Strategies designed to increase the success rate of conversion of labour analgesia to anaesthesia may improve safety and quality. Bauer M.E. and colleagues (3) evaluated the risk factors in a systematic review and metanalysis of the literature and concluded that the risk factors may include:

- An increased number of top-ups or breakthrough pain during labour

If labour analgesia is maintained with a continuous epidural infusion of local anaesthetic and patient-controlled boluses and is not able to give a satisfactory analgesia, in this setting, more than one clinician-initiated bolus may be an early sign that the epidural catheter may be misplaced. This factor has been shown by all the authors to be consistently important (4,5,6,7).

- Increased urgency for Caesarean delivery

In a prospective study conducted by S. H. Halpern and colleagues,(8) only three patients with epidural analgesia required a GA for CS because of the emergency nature of the surgery. All were for foetal reasons. While almost all patients received epidural lidocaine with epinephrine, the mean time to achieve a sufficient level was at least 10 min. This may be too long if there is severe sustained foetal bradycardia or a prolapsed umbilical cord.

- Higher BMI

Most authors (8,9) could not demonstrate a difference in failure rate between patients with a BMI >35 compared with those with a BMI <35. This may be due to a low tolerance for an imperfectly working labour epidural in obese parturients because of the high incidence of operative delivery. These are usually replaced as soon as they are identified in an attempt to prevent the need for repeating a regional technique or changing to GA.

- Care being provided by a non-obstetric anaesthesiologist

Clinicians with special training in obstetric anaesthesia may have a lower rate of failure than clinicians without this training (5-6). The reason for this is unclear but may be related to confidence that the block will work if allowed sufficient time. In addition, in the event of failure, non-specialists were less likely to attempt a spinal anaesthetic instead of converting to GA.

- Increased duration of epidural analgesia

Analgesia was significantly longer in the failure cases. Epidural catheters in situ for prolonged periods of time were at higher risk of migration and dislodgement, possibly accounting for higher failure rate.

- Use of an epidural versus combined spinal-epidural (CSE) technique for analgesia.

Whether or not initiation of labour analgesia with a CSE technique might be a factor is controversial. Catheters inserted using a CSE technique were less likely to require replacement compared to an epidural technique (10–12) The attainment of freely flowing cerebrospinal fluid during the spinal component of CSE analgesia strongly suggests optimal midline placement of the epidural Tuohy needle. This might explain the increased incidence of successful epidural blockade with CSE analgesia. The role of dural rent in enhancing the effect of local anaesthetics deposited epidurally, might also be a contributory factor. An increased failure rate in parturients who received a standard labour epidural compared with a CSE has been described (8). However, a retrospective review of 366 patients was unable to demonstrate this effect (13).

When it becomes apparent that the epidural will not provide sufficient anaesthesia, the anaesthetist must choose how to proceed. The best course of action will depend on the urgency of the surgery, whether or not the surgery has commenced, and maternal preference. Strategies designed to increase the success rate for conversion of labour analgesia to anaesthesia may improve safety and quality.

Survey data from the UK (14) showed a high rate (89%) of intraoperative conversions being to GA. This may be due to poor reliability of tests of block height used in routine clinical practice. Standardized testing of block height with cold, touch, and pinprick may improve reliability.

The early recognition of failure might allow the anaesthetist to reposition an epidural catheter for subsequent epidural top ups or to perform a low dosage CSE technique for CS. In case of urgent CS the administration of a full dose subarachnoid block after prior epidural anaesthesia is not safe. This is

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because the appropriate dose for spinal anaesthesia is not predictable and cannot be titrated readily (15).

In a retrospective cohort analysis, Visser and colleagues (16) reviewed their practice to perform SA as an alternative to epidural top-up in women who have received epidural analgesia and present for intrapartum CS. They did not find an increased incidence of serious side effects with this technique compared with a group of women receiving only spinal anaesthesia for CS.

GA may be the only option if the patient experiences extreme pain or emotional distress. Data from the closed claims database suggest that intraoperative pain during Caesarean section results in litigation more often than in non-obstetric surgery (17).

The local anaesthetic and dose used for conversion of labour analgesia to surgical anaesthesia may play a role in determining success. In a retrospective review (18), a mean volume of 18.6 (5.6 SD) ml of lidocaine 2% with 1:200 000 epinephrine was used. They reported a 2.6% incidence of GA. There was no difference in failure rate whether or not the block was supplemented with epidural sufentanil. Using bupivacaine 0.5%, 10 ml, Dickson and colleagues (19) observed that ~30 min were necessary to extend the block height to T4. This delay is incompatible with emergency CS. Moreover, rapid injection of high doses of bupivacaine exposes the patient to the risks of cardiotoxicity A sensory block is achieved more rapidly with chloroprocaine, but the difference is clinically small and this agent is not available in Europe for obstetric surgery (18). Recently, 112 patients were randomized to receive levobupivacaine 0.5% with and without fentanyl 75 mg after labour epidural analgesia (20). The mean volume was similar between the groups (22.9 vs 23.9 ml). A block to T4 developed rapidly in both groups (median 10 min with fentanyl, 11 min without). The incidence of GA was 4% in each group. Additionally, two patients (4%) required supplemental spinal anaesthesia for an inadequate block.

Regional anaesthesia for Caesarean section has many advantages when compared with GA. These include superior postoperative analgesia, positive influence on breast-feeding, and the psychological advantages of being awake during delivery. For some patients, particularly those who are obese, regional anaesthesia may be safer than GA because of difficulties in airway management.

The incidence of unpredictable airway management problems in the obese patient may be up to 15.8 times that of the normal weight patient (21). For these reasons, the incidence of conversion to GA should be low. Low rates of conversion of labour epidural analgesia to Caesarean section GA can be achieved as suggested by the Royal College of Anaesthetists. Although conversion to GA does not necessarily imply poor practice for individual cases, intraoperative conversion may increase both maternal and foetal risks because of stress, time pressure, and physical constraints (drapes and instruments in the way). Strategies to reduce the incidence may include early recognition of inadequate labour analgesia and reliable assessment of adequacy of surgical anaesthesia

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OPTIMAL ANAESTHESIA/ANALGESIA FOR SHOULDER SURGERY, AND WHICH BLOCKS?

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Introduction: Advanced regional anaesthesia techniques are an important part of the peri-operative management of patients undergoing shoulder surgery. Regional anaesthesia provides patients with more choice, gold standard analgesia post-operatively and improved patient satisfaction. Regional anaesthesia has a part to play in the development of early discharge pathways and the provision of efficient services.

Surgery: The development of arthroscopic techniques and equipment has facilitated a growth in the popularity of shoulder surgery. Common elective operations include sub-acromial decompression (acromioplasty), frozen shoulder release, stabilisation, rotator cuff repair, replacement arthroplasty

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and resurfacing. Trauma to this area is also common with operations including shoulder hemiarthroplasty and humeral fracture fixation.

Patients: Patients presenting for this type of surgery are varied. Younger patients present for treatment of sporting injuries such as fractures and instability. Diabetic patients have a higher incidence (36% if insulin dependent) of frozen shoulder requiring release[1]. Older patients with multiple co-morbidities including generalised arthritis present for investigation and arthroplasty.

Post-operative Pain: Pain may be a significant problem after shoulder procedures[2]. Some of the more painful operations include replacement arthroplasty and rotator cuff repair, but severe pain can also occur following 'minor' orthopaedic procedures[3]. This will be influenced by the patient's response to pain, the surgical insult and poor compliance in taking post-operative analgesia.

Nerve Supply: Alon Winnie correctly pointed out that regional anaesthesia is an exercise in applied anatomy, and before considering regional anaesthesia of the shoulder, one must have a sound grasp of the anatomy of the brachial plexus. The sensory innervation of the shoulder joint is primarily provided by the suprascapular and axillary nerves (C5-6). The suprascapular nerve is a branch of the superior trunk of the brachial plexus, and supplies posterior, medial and superior portions of the joint. It also has muscular supply to supraspinatus, infraspinatus and part of teres minor. The axillary nerve is a branch of the posterior cord of the brachial plexus and supplies inferior, lateral and anterior portions of the joint. It also has muscular supply to deltoid and some of teres minor. There are also sensory contributions to the joint from the lateral pectoral, musculocutaneous and subscapular nerves.

The periarticular structures must also be considered; the suprascapular, lateral pectoral and supraclavicular nerves are involved in supplying sensation to the acromioclavicular joint, subacromial bursa, and coracoclavicular ligament[4].

The primary dermatomes around the shoulder are C4 & 5, but thoracic dermatomes will supply anterior and posterior skin involved in open incisions and the posterior arthroscopic port sites respectively.

Relevant Brachial Plexus Anatomy: The C5-T1 ventral spinal nerve roots emerge from the intervertebral foramina, course laterally and inferiorly between the anterior and middle scalene muscles at the level of the cricoid cartilage in the neck. The pre-vertebral fascia invests the scalene muscles and surrounds the nerve roots to form the sheath of the brachial plexus. These two scalene muscles are accessory muscles of respiration and insert onto first rib inferiorly. The subclavian artery loops over the first rib posterior to the anterior scalene muscle within the plexus sheath. The C5 & 6 roots form the upper, C7 the middle and C8 & T1 the inferior trunks of the plexus. The trunks pass postero-laterally to the artery. The subclavian vein passes anterior to the anterior scalene muscle and is therefore outside of the plexus sheath.

The suprascapular nerve is mainly derived from the ventral rami of the fifth and sixth cervical nerve roots. After leaving the upper trunk, it courses laterally and posteriorly through the posterior triangle of the neck, deep to the trapezius and omohyoid muscles, before entering the supraspinous fossa via the suprascapular notch underneath the superior transverse scapular ligament. In the supraspinous fossa, the nerve emits a motor nerve to supraspinatus muscle and a superior articular branch which supplies the coracoclavicular & coracohumeral ligaments, the acromioclavicular joint, glenohumeral joint (posterior and superior aspects) and the subacromial bursa[5].

The supraclavicular nerve arises from C4, then penetrates the deep cervical fascia and emerges from the posterior border of sternocleidomastoid. It is the only descending branch of the superficial cervical plexus, derived primarily from C4[6]. It descends caudally in the neck, deep to platysma beneath the superficial cervical fascia and divides into medial, intermediate and lateral terminal branches. The lateral branch supplies the skin over the lateral aspect of the clavicle and shoulder and, along with the lateral pectoral and suprascapular nerves, innervates the acromioclavicular joint.

The axillary nerve departs the posterior cord at the lateral border of subscapularis and travels posteriorly just below the inferior capsule. After passing posteriorly with the posterior circumflex humeral artery through the quadrilateral space the nerve immediately forms an anterior and a posterior branch[7].

The phrenic nerve arises from C3, 4 & 5, and passes inferiorly and medially over the anterior scalene muscle. The dorsal scapular (C5) and long thoracic (C5-7) nerves are also closely related to the interscalene brachial plexus as they both pass through the middle scalene muscle.

Regional anaesthesia: Interscalene Brachial Plexus Block: Interscalene blockade of the upper roots of the brachial plexus provides effective shoulder anaesthesia, as part of a balanced anaesthetic to reduce surgical stimulus or as a sole anaesthetic; and in both cases to provide excellent analgesia post-operatively. I currently perform over 250 interscalene blocks per year for patients undergoing arthroscopic shoulder procedures either awake or under sedation. Various approaches have been described[8-10] including the cervical paravertebral approach by Boezaart[11]. The interscalene approach to the plexus is proximal enough to ensure blockade of the suprascapular nerve (see above); a branch of the superior trunk and the only sensory nerve to leave the plexus proximal to the clavicle. A local anaesthetic volume of 20 ml is sufficient to block the shoulder; larger doses will variably block the lower roots of the plexus (C8-T1) to affect the ulnar surface of the arm[8] . Side effects include ipsilateral phrenic nerve blockade (in approaching 100% of blocks, with reduction in functional residual capacity and cough strength), cervical sympathetic blockade producing Horner's syndrome and recurrent laryngeal nerve blockade (hoarse voice, swallowing difficulty). Serious complications include cervical spinal cord damage, pneumothorax and vascular injection (including vertebral artery injection).

Ultrasound-guidance can be used for interscalene brachial plexus blockade, giving the operator the advantage of confirming spread of local anaesthetic around the nerve roots[12]. Ultrasound-guidance also potentially allows use of lower local anaesthetic volumes[13, 14] and may increase success rates[15]. Ultrasound may also have benefits in difficult patients; such as in obesity, anatomical variants/abnormality or paediatrics[16]. Ultrasound-guidance also allows successful block placement despite high minimum motor thresholds with nerve stimulation. This variability in nerve stimulation thresholds in the interscalene region may be due to the relatively nonhomogenous distribution of motor, sensory and connective tissue in the nerve roots[17]. Another interesting potential advantage of ultrasound is in early recognition of intraneural injection[18]. As with other blocks, the use of ultrasound has encouraged modifications of needle approach. Many operators use a posterior approach to the interscalene groove through the middle scalene muscle. Care must be taken not to transgress the dorsal scapula nerve and/or the long thoracic nerve; which pass through the middle scalene muscle, and are seen as hyperechoic structures within the hypoechoic muscle tissue[19].

Economic benefits of interscalene blocks in shoulder surgery have been demonstrated; including reductions in theatre time, earlier discharge from or bypassing of recovery and reducing postoperative complications (pain, sedation, nausea & vomiting and need for overnight stay)[20, 21]. Continuous infusion of dilute solutions of local anaesthetic into the interscalene groove to prolong post-operative analgesia provides superior analgesia, causes less nausea and vomiting and leads to greater patient satisfaction than patient controlled opioid analgesia following single shot plexus block[22, 23]. Historically, the development of catheter sets with Tuohy needle tips, stimulating insulated needles and stimulating catheter tips increased ease of insertion and success rates[24], many types of catheters are now produced along with fixation devices. Ultrasound-guided catheter insertion may be more comfortable for patients, when compared with neurostimulation, and improve accuracy, resulting in improved pain relief[25]. Continuous blocks provide superior pain relief to single shot blocks after moderate to painful[26] or even minor shoulder surgery[27] and can also reduce discharge time following shoulder arthroplasty, with reduced opioid requirement, better quality pain relief and superior mobilisation[28].

The excellent quality of post-operative recovery with continuous regional techniques after major surgery of the shoulder has led to the development of domiciliary services to allow for earlier discharge. Rawal demonstrated that patient controlled local anaesthetic administration at home after surgery can be both effective and safe for a variety of orthopaedic procedures[29]. Ilfeld showed an improved quality of recovery following moderately painful shoulder surgery using continuous interscalene brachial plexus blocks at home[30].

Suprascapular and or axillary nerve block: An alternative approach to interscalene block is blockade of the peripheral nerves supplying the shoulder. Suprascapular block is a commonly performed block in the chronic pain clinic[5]. The block can be performed using landmarks, nerve stimulation, fluroscopy or ultrasound. A suprascapular nerve block performed in the lateral supraspinatus fossa, will block its articular supply to the shoulder joint and surrounding structures. Singelyn found that suprascapular block reduced pain scores following shoulder surgery compared to controls, but less so than interscalene block (which also reduced morphine consumption and improved satisfaction)[31]. This is not surprising when one considers that the shoulder

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joint and surrounding structures are also innervated by the axillary, lateral pectoral and subscapular nerves. Price has subsequently described combining suprascapular block with a block of the axillary nerve. The axillary block is performed on the posterior surface of the humerus either by a landmark[32] or ultrasound approach[33]. The articular fibres to the shoulder are blocked by retrograde spread of local anaesthetic through the quadrilateral space, which Price nicely demonstrated in subjects using radio-opaque dye[7]. Price also described a case series of dual blocks in 40 patients with encouraging results following shoulder surgery, and Rothe described a small case series (4 patients) suggesting efficacy of axillary block performed as a sole technique[34]. Peripheral blockade of these two nerves will not produce complete surgical anaesthesia of the shoulder, but may become an effective technique for post-operative pain relief after a general anaesthetic, while avoiding side-effects and complications of an interscalene block, particularly phrenic nerve block and ipsilateral diaphragmatic paralysis (and therefore be useful in patients with significant respiratory disease). Effective placement of two catheters for extended post-operative analgesia may be problematic than single (proven) interscalene perineural catheter placement. We await further evidence of efficacy and use of this block combination.

Supraclavicular nerve block: The supraclavicular nerve may not be blocked following an interscalene approach, particularly with the lower volumes that may be used during ultrasound-guided approaches. As mentioned above, this nerve supplies skin over the shoulder and partially innervates the acromioclavicular joint. I routinely block this nerve in patients undergoing awake surgery. The nerve can be blocked after performing an interscalene block, without need for a second needle insertion. Ultrasound can be used to identify the nerve as it passes and divides within the superficial cervical fascia and then assist placement of local anaesthetic, after the needle is withdrawn from the roots[6].

Conclusions: Interscalene brachial plexus blockade produces anaesthesia and analgesia for shoulder surgery. Post operative analgesia can be extended by placement of perineural interscalene catheters and infusion of dilute local anaesthetic. Peripheral blockade of the suprascapular and axillary nerves may be a useful alternative when trying to avoid an interscalene block. The use of ultrasound-guidance has become a successful method of placing nerve blocks around the shoulder.

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PULSED RADIO FREQUENCY TREATMENT FOR MYOFASCIAL PAIN

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Myofascial pain syndrome is a complex of sensory, motor and autonomic symptoms caused by myofascial trigger points. Trigger points are spots of exquisite tenderness and hyperirritability in the muscles. It is a primary cause of health care visits, absenteeism and invalidity pensions. There is a paucity of published information on the prevalence of myofascial pain in the United Kingdom. A recent nationwide survey of over 300 pain physicians, rheumatologists and physiotherapists in Germany found that the estimated overall mean incidence of myofascial pain among chronic pain patients was 45%. The underlying pathophysiology of a trigger point is unclear. Stress and micro trauma to muscle can cause motor endplate dysfunction with resultant abnormal excessive firing. This causes shortening of the muscle with resultant taut band formation. Sustained stress to the muscle can result in an increase in the size of taut bands, microvascular disturbance and release of pro-inflammatory mediators.

We audited a relatively new technique called pulsed radiofrequency (PRF) to treat myofascial pain. In PRF, a high frequency alternating current is used to heat tissues to 42 degrees Celsius for a period of 5 minutes. The precise mechanism of action of PRF is undergoing extensive research. Presently, most studies point towards an alteration in the synaptic transmission, in a neuromodulatory type effect. The efficacy of PRF in trigger point treatment may support the motor endplate dysfunction theory of myofascial trigger point pain. PRF has been successfully used for the treatment of myriad chronic pain conditions (19) and has demonstrated a remarkable margin of safety.

25 patients underwent pulsed radiofrequency treatment for regional myofascial pain syndrome. 17 patients had abdominal triggers while 8 patients had cervicothoracic triggers. Patients were followed up over telephone at three and six months following treatment. Numerical rating scale pain sores as well as Euro Qol 5D questionnaires were completed at 3 and 6 months.

Twenty patients (80%) had durable analgesia lasting 4-6 months following treatment. Five patients (20%) did not have any response to treatment. There were no complications reported. The ultrasound-guided procedure was performed under sedation with intravenous propofol. Post procedure pain lasted 1-3 weeks in all cases. Patients were warned of a flare up in pain and were prescribed supplemental analgesia for 1 week to take home.

In conclusion, pulsed radio frequency (PRF) treatment appears to be a safe technique in the management of myofascial pain syndrome.

PULSED RADIOFREQUENCY: WHAT EVIDENCE BASED MEDICINE TELL US

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Introduction: Radiofrequency (RF) has been used to treat multiple pain conditions. In conventional RF (i.e. thermal RF), high-frequency voltage fluctuations cause ionic agitation which results in frictional heating with the desired goal being the lesioning of a targeted nerve. The power output of the generators is typically maintained to generate a temperature of 80° C.[1,2] Tissue coagulation occurs at temperatures greater than 45°C.

Recently, there has been substantial interest in pulsed RF. Pulsed RF uses brief bursts of RF energy separated by longer time periods when RF energy is not applied. The pauses between bursts allow for heat to dissipate within the surrounding tissue. Since the tip temperature does not rise above 42°C, neurodestructive temperatures are not achieved.[3–6] Although, ex-vivo work has suggested that pulsed RF can produce "heat spikes" which may have thermal effects.[7] Furthermore, an egg white in vitro study demonstrated the coagulation of egg white at temperatures above 60°C with pulsed RF.[8] The theoretical appeal of pulsed RF is the ability to modulate pain without causing extensive tissue injury as seen with thermal RFA.[9] The first pulsed RF unit was developed and designed in 1995 by Raymond Fredericks and Jack Thomasian.[10] Although there has been substantial interest in pulsed RF, there are persistent questions regarding its clinical efficacy and underlying mechanism of action.[11] Herein and in lecture, we will provide a current update on the understanding of the mechanism of action of pulsed RF and level of evidence.

Mechanism of Action: In order to further evaluate the efficacy of pulsed RF it is important to understand the histopathological effects of the treatment and the proposed antinociceptive mechanisms; animal studies have provided some insight.

Histopathological Effects – Animal Models: Both Erdine et al.[12] and Podhajsky et al.[9] have provided further insight into the histopathological effects of pulsed RF. Erdine et al.[12] compared the effects of conventional RF at 67°C for 60 seconds and pulsed RF at 42°C for 2 minutes on the rabbit dorsal root ganglion (DRG). Two weeks following treatment the DRG specimens were evaluated with electron and light microscopy. Sham and control groups were also included. When analyzed under light microscopy no differences were found between groups. The electron microscopic evaluation demonstrated changes in the conventional and pulsed RF groups but not the sham and control groups. At the electron microscopic level conventional RF was found to be substantially more destructive with evidence of loss in the integrity of the nuclear membrane and mitochondrial degradation.

Podhajsky et al.[9] studied the histological effects of pulsed and continuous radiofrequency at 42°C on the rat DRG and sciatic nerve. Five groups were examined: 1) pulsed RF of the DRG at 42°C, 2) continuous RF at 42°C of the DRG, 3) conductive heating at 42°C of the DRG, 4) continuous RF of the sciatic nerve at 80°C, and 5) sham. Animals were histologically studied at 2, 7 or 21 days posttreatment. In the pulsed and continuous RF and conductive heating at 42°C groups, no neurological deficits were detected. Light microscopy demonstrated reversible subclinical changes including endoneurial edema and collagen deposition in lesions performed at 42°C with pulsed RF, continuous RF or conductive heating. In the continuous RF at 80° C there was consistent thermal injury demonstrated by Wallerian degeneration of nerve fibers. The results of this study suggested that pulsed RF treatment at 42°C does not rely on thermal energy for its antinociceptive effects.

Antinociceptive Mechanism – Animal Models: Although the exact mechanism of pulsed RF is unknown, multiple mechanisms have been proposed. Pulsed RF seems to preferentially target small diameter C and Ad fibers. In addition, pulsed RF has been shown to alter gene expression in the dorsal horn of the spinal cord, suppress the release of excitatory amino acids in the DRG, and attenuate microglial activation in the dorsal horn.[13–16] Hagiwara et al.[17] suggested that the analgesic effects of pulsed RF may involve the enhancement of the noradrenergic and serotonergic descending pain inhibitory pathways.

As the exact mechanism of pulsed RF continues to be investigated, in vivo neuropathic pain models have demonstrated antinociceptive effects.[16,18–21] Aksu et al.[19] in a rabbit model demonstrated the ability of pulsed RF at the DRG to reduce hyperalgesia caused by ligation of the sciatic nerve. Pulsed RF has also been shown to be effective in reducing mechanical allodynia when applied in the periphery.[18]

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Pulsed Radiofrequency – Clinical Studies: Clinical studies to date on pulsed RF have been limited with a majority of studies being case reports with small patient numbers and retrospective in nature.[3,5,11,22] Studies have examined both neuropathic and nociceptive pain states. Examined conditions have included axial spine pain, radicular pain, facial pain, occipital neuralgia, joint pain (e.g. shoulder and knee), and inguinal pain.[23–27]

For neuropathic pain, the highest quality study has examined pulsed RF for chronic cervical radicular pain. Van Zundert et al.[28] in a double-blind, sham controlled, randomized clinical trial examine the effects of pulsed RF on the cervical dorsal root ganglion in 23 patients. Two hundred and fifty six patients were screened in order to enroll 23 patients. Compared to sham at three months, the pulsed RF group experienced significant improvement in the visual analog scale and global perceived effect. In addition the need for pain medications, although not significantly reduced at three months, was significantly reduced with pulsed RF in comparison to sham at six months. No complications were observed.

Pulsed RF has also been studied for the treatment of axial low back pain originating from the lumbar facets.[29,30] For the treatment of lumbar facet pain, thermal RF has been shown to be superior to pulsed RF. Tekin et al.[29] in a randomized double-blind, sham lesion study examining the efficacy of pulsed RF at 42°C versus thermal radiofrequency at 80°C, demonstrated that thermal RF was associated with a longer duration of pain relief. The decrease in pain scores was maintained at six months and one year postprocedure in the thermal RF group. Kroll et al.[30] also demonstrated greater improvement with thermal RF overtime.

Pulsed RF has also been used for peripheral neuropathic pain. The research to date is limited. A systematic review examined pulsed RF in the treatment of persistent pain after inguinal herniotomy.[23] During the literature search, only four case reports including a total of 8 patients existed. Pain relief did occur with treatment and it varied between 63% and 100% for a follow-up window ranging from 3 to 9 months. Suggestions were made by the authors for study requirements for future studies examining pulsed RF in patients with persistent pain after inguinal herniotomy. Recommendations included such suggestions as image guidance to confirm appropriate needle placement, sham controlled double-blind pulsed RF treatment, and long-term follow-up for both pain ratings and functional impairment scales.

Conclusion: To date, basic science research and a controlled clinical trial suggest that pulsed RF may be effective for neuropathic pain. In addition, pulsed RF seems to be associated with a high level of safety and to date no complications have been reported.[31] Future studies are clearly needed to demonstrate the efficacy of pulsed RF in both neuropathic and nociceptive pain states. In addition, further insight is needed on the technical issues of pulsed RF and on appropriate patient selection. The idea of treating neuropathic pain states with limited tissue destruction is appealing. Hopefully in the future further research will help define the role of pulsed RF in the treatment of specific chronic pain states.

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PRE-EXISTING NEUROLOGICAL DISEASE – BLOCK OR NOT?

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In 2005, ASRA convened its first Practice Advisory on the Neurologic Complications of Regional Anesthesia and Pain Medicine. The proceedings from this initiative were published in 2008 in *Regional Anesthesia and Pain Medicine.* At the spring 2012 ASRA meeting, the 2nd practice advisory panel was convened. This lecture will summarize unchanged information and recommendations from the 2005 advisory, and emphasize those new areas of concern and/or emerging clinical data and experience.

The 2012 Practice Advisory: New Areas for Concern:

1. Performing Regional Anesthesia in Patients with Pre-existing Neurologic Disease. Over the past 8 years, large retrospective reviews of at risk populations have been published. Most of these studies are reassuring in their recommendation that performing neuraxial anesthesia in the setting of chronic central nervous system disease does not appear to appreciably increase the patient's risk for worsening of existing injury or appearance of new deficits. However, there are two areas of concern. First is what appears to be a slightly increased risk of new or worsening deficit as compared to historic norms in patients with sensorimotor neuropathies. Second, spinal stenosis is emerging as an area of concern.
2. Pre-Existing Neurologic Disease. Because regional anesthesia in the course of rare neurologic conditions is so limited, it is impossible to ever answer these questions using randomized clinical trials. Instead, our knowledge largely relies on retrospective reviews or prospective registries. What exists in this realm suggests that performing regional anesthesia in the setting of pre-existing central nervous system disease (eg, multiple sclerosis, Guilliane-Barre, postpolio syndrome, etc) does not substantially increase the risk for new lesions or exacerbation of existing disease. In the peripheral nervous system, the same can be said for surgery in the same distribution as the block (eg, ulnar transposition). There is evidence to suggest that the "double-crush theory" may be applicable in patients with pre-existing peripheral neuropathy from chemotherapeutic agents.
3. Sensorimotor Neuropathies. An exception to the above may be neuraxial block in patients with pre-existing sensorimotor neuropathies (primarily diabetes mellitus), wherein there is association with a slightly increased risk of worsening symptoms or new lesions over and above the historic controls for neuraxial anesthesia.
4. Spinal Stenosis. Several large studies and case reports note an association between epidural hematoma, epidural abscess, cauda equina syndrome, and other neurologic deficits in patients with known (but most often unknown) spinal stenosis. This is interpreted as a worrisome signal, but cause-and-effect has not been established.
5. Cauda Equina Syndrome. Large population studies from Denmark and France point to a rare, but present baseline number of patients that develop cauda equina syndrome in the setting of an otherwise normal neuraxial block. Although some of these cases may be worsened by or linked to the presence of spinal stenosis, maldistribution of local anesthetic, or excess local anesthetic dose, a significant number of CES cases occur in settings where nothing untoward or unusual has occurred.
6. Performing Regional or Pain Techniques in Anesthetized or Deeply Sedated Patients. The advisory will update emerging closed claims and pediatric data on this topic. The panel continues to recommend that regional and pain techniques not be performed on anesthetized or deeply sedated adult patients on a routine basis.
7. Blood Pressure Targets During Neuraxial Block. As anesthesiologists rethink the lower limits of autoregulation in their neurosurgical patients, so too are the previously accepted LLA norms being challenged with regard to blood pressure control during neuraxial techniques.

References

Complete discussion of this topic and accompanying references will be part of the 2nd ASRA Practice Advisory on Neurological Complications of Regional Anesthesia and Pain Medicine, which should be published in *Regional Anesthesia and Pain Medicine* in late 2013 or early 2014.

SPINALS IN PATIENTS WITH BACK CONDITIONS

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Many colleagues, because of litigation issues, are reluctant to consider a neuraxial block when there is spinal compromise. As randomized trials are not feasible only case or serial reports and few reviews have been published[1]

Spinal cord injury / Para- and quadriplegia: Initially, muscle weakness will predominate while later on they will become spastic. Although lower extremity or abdominal surgery and also delivery may not be painful, a proper anaesthetic is advisable to prevent autonomic hyperreflexia which is at risk with lesions above T7. It can be triggered by skin incision, shock waves and examination or distension of hollow viscus (bladder, bowel or uterus).. Unopposed catecholamine release will cause a hypertensive crisis accompanied by headache, flushing, pupillary dilatation, dysrhythmias and bradycardia as well as tachycardia. Convulsions and intracranial bleeding may exceptionally occur A deep plane of anaesthesia will be required but may cause hypotension, dysrhythmia, and uterine atony. Succinylcholine is contraindicated because of an increased risk of hyperkalemia. A neuraxial technique may avoid haemodynamic distress subsequent to intubation and the administration of hypnotics. A low-dose combined spinal-epidural (CSE), continuous spinal (CSA) or epidural anaesthesia technique should be preferred rather than a single dose spinal anaesthetic (SDS). The use of neuraxial anaesthesia has been reported mostly in obstetrics.[2-6] Epidural anaesthesia potentially blocks autonomic hyperreflexia during labour but its success may be variable. Determination of the sensory block level may be difficult. Some recommend to administer epidural local anaesthetics already a few weeks before the expected day of delivery and to proceed the infusion one to two days after delivery or surgery. Previous back surgery may impair the performance of neuraxial blockade. The desired upper sensory level cannot always be achieved due to obliteration of local anaesthetic spread by persisting compression of the neural structures or previous surgery. A restricted spread may bear the risk of local toxicity.

Spinal congenital anomalies: The approach with respect to neuraxial blocks should be one of individuality. Successful labor analgesia has been reported in patients with neural tube defects more particularly spina bifida.[7] A Klippel-Trenaunay and Von Hippel-Lindau syndrome are vascular malformations being possibly located in the spinal cord, subdural and epidural space. Pregnancy and uterine contractions may enhance the bleeding risk due to engorgement of the vessel malformations. In addition, Klippel-Trenaunay syndrome may be complicated by Kasabach-Merritt coagulopathy. MRI may allow to verify the safety of a neuraxial block but should be performed as closely as possible to the day of planned intervention. Neuraxial anaesthesia should be avoided if MRI is not accessible. Uneventful neuraxial blocks have been reported although the disease was not always present at the puncturing level.[8-13]

Chronic back problems, herniated disc and spinal stenosis: Several cases raise concerns about performing neuraxial techniques in patients with spinal stenosis.[14-17] Motor weakness, sensory deficit, and cauda equina syndrome have been reported following neuraxial anaesthesia in patients in

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whom a symptomless spinal stenosis was diagnosed postoperatively. It is unclear whether this is caused by the choice of drugs or volume of bolus or infusion. Pregnant patients may suffer more back and radicular pain than a non-pregnant population. A comparison between labor epidurals with non-epidurals revealed that except for the first day(s), no differences can be found later on.[18] Neural damage caused during delivery and gynecological positional changes of uterus and adnexes may be a more plausible explanation for back pain after delivery. Altered orthostatics, enhanced elasticity of perispinal structures or direct compression of the lumbar plexus may result in back pain or a herniated disc. At the present time, more than 10 cases have been reported with cauda equina symptomatology due to posterior disc displacement, necessitating urgent surgery.[19-22]

Previous back surgery: Most handbooks still consider previous back surgery, regardless of its extent, as a contra-indication to the use of regional anaesthesia. Even in parturients with anterior spinal surgery only 2 out of 19 patients received epidural analgesia for delivery.[45] Neuraxial blocks may be a challenge due to mutilated landmarks, scar formation or the presence of instrumentation and bone-grafts. These patients are also at a higher risk for false loss of resistance, dural tap, traumatic needle placement, unsuccessful catheter insertion and incomplete or patchy blocks. When the spine fusion terminates above L3-L4, needle insertion at the lower free interspaces may be attempted. A recent review of the literature on 24 uncorrected and 93 corrected scoliotic parturients revealed neuraxial success rates of 79% and 69% respectively while problems were encountered especially with epidurals.[24] Similarly a 9% technical and 9% analgesic failure rate of epidurals in 31 parturients with previous spine surgery confirms that epidurals may be expected to create more difficulties.[25]

Successful single dose spinal anaesthesia has been described, even to save a failed epidural after letting recede this incomplete block below the lumbar level.[26-28] CSE anesthesia, despite similar technical problems than epidurals, may offer good intra-operative anesthesia while the epidural catheter may be helpful (or not) in extending or prolonging anaesthesia and analgesia. CSA may be an interesting alternative but paresthesias may occur more frequently than after a SDS. In a study of 41 parturients with either lumbosacral fusion, untreated or corrected scoliosis, 19 patients received CSA with only one case of post dural puncture headache (PDPH).[29]

A recent report has evaluated the feasibility and complication rates of neuraxial anaesthesia in 937 patients with spinal stenosis, lumbar disc disease, or prior spine surgery in 22% of them.[30] The success-rate of the blocks was high (>97%) and not different between operated and non-operated patients while accidental dural and bloody taps occurred in 3% and 4%, respectively. Ten patients (1.1%) experienced new deficit or worsening of pre-existing symptoms. With only 3 operated patients out of these 10, this demonstrates that previous spinal surgery 'per se' does not imply a higher risk for neurological deficit following a central nerve block.Ultrasound may be of additional help to determine the best interspace, midline and epidural space depth.

Implantable pumps and stimulators: Patients with implanted pumps or spinal cord stimulators have been subject of concern for neuraxial anaesthetic techniques due to the risk of damaging the implant, infection, and unknown effects of the injected drugs. Nevertheless neuraxial blockade has been reported to be uneventful.[64-67]

Previous tap and blood patch: Although some fear existed in the past, previous wet taps with or without blood patch do not affect subsequent success of epidurals but there is a risk of a second wet tap.

Conclusion: Most decisions should be made on an individual basis. In many constellations the risk:benefit ratio may even be in favour of the neuraxial technique. The recent development of ultrasound technology may be of additional help to the anaesthetist Nevertheless certain precautions should be considered: a careful preoperative examination remains mandatory while patients should be informed about technical difficulties , block failure and the normal sensory and motor effects of a neuraxial block.High concentrations and volumes of local anaesthetics should be avoided at all times in order to prevent additional local toxicity, ischemia or mechanical compromise.

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ASLEEP VERSUS AWAKE

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Performing blocks on asleep patients clearly is a matter of debate. Traditional believes determine recommendations not to do blocks on anesthetized patients [1]. Risks associated with regional anesthesia that may differ if patients are asleep may relate to nerve injury or local anesthetic intoxication. Current estimates indicate that both risks are extremely low [2, 3].

Risks of regional anesthesia in anesthetized patients: The fact that important early warning signs which may potentially prevent systemic toxicity and nerve injury are absent assuming that stopping an injection may prevent further intoxication and that pain perception during needle advancement may prevent nerve damage if the needle is withdrawn. Both reasonings are unproven. Case reports suggested that interscalene blocks should not be performed in anesthetized patients when the classical Winnie approach without ultrasound is used [1]. Personal experience in lumbar epidural catheter placement in anesthetized patients have been published [4,5].

Benefits of regional anesthesia in asleep patients: Proponents argue that safety is increased because the chance that patients will move suddenly and cause the needle to impale vital structures is decreased. This arguing typically is used for regional blocks in the pediatric population. Patient acceptance also may be increased and potential benefits [6,7,8] will reach more patients.

In 2008 the German Society of Anaesthesiology and Intensive Care Medicine (DGAI) and the Association of German Anaesthesiologists (BDA) founded a network for safety in regional anesthesia (NRA) [9]. The NRA registry currently contains 218,230 data sets from 68,274 patients. After exclusion of children <14years 2,570 were performed in general anesthesia, 15.213 on sedated patients and 25,363 blocks were documented in fully awake unsedated patients. Differences have no impact on important outcome parameters and support the notion that anesthesiologists are free to follow personal preferences in this matter without posing a legal threat onto themselves [10]. The risk of systemic toxicity of local anesthetic agents is not higher in patients who receive regional anesthesia under general anesthesia or deep sedation. Finally, in children and uncooperative adults the administration of peripheral nerve blocks under general anesthesia or deep sedation is widely accepted.

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HOW TO START REGIONAL ANESTHESIA WITH ULTRASOUND

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This lecture will provide the necessary information for the beginning ultrasound (US) user in regional anesthesia (RA), but will also be a refresher course for those who are using US regularly. This abstract is based on the recommendations for education and training in US-guided RA, published by a joint committee of ASRA and ESRA. [1, 2]

The basis for performing regional anesthesia is a thorough knowledge of anatomy. Without essential knowledge of anatomy, it is impossible to perform high quality and safe RA.

Besides anatomy, basic knowledge of US physics and machine settings are mandatory for understanding the image and optimizing image quality.

Part of this lecture will focus on scanning technique for identification of the structures and on artifacts and pitfalls when interpreting images.

Last part will cope with needle technique and injection, with the possible complications.

With the knowledge of anatomy, basic physics and image interpretation together with the core competencies associated with the necessary skills for performing ultrasound guided regional anesthesia (USGRA) the beginner can start his training in USGRA keeping a list of 10 tasks helpful in performing an US guided nerve block [2]

1. Visualize key landmark structures including blood vessels, muscles, fascia, and bone.
2. Identify the nerves or plexus on short-axis imaging.
3. Confirm normal anatomy and recognize anatomic variation(s).
4. Plan for a needle approach that avoids unnecessary tissue trauma.
5. Maintain an aseptic technique with respect to the ultrasound equipment.
6. Follow the needle under real-time visualization as it advances toward the target.
7. Consider a secondary confirmation technique, such as nerve stimulation.
8. When the needle tip is presumed to be in the correct position, inject a small volume of a test solution. If solution is not visualized during this test injection, presume that the needle tip is intravascular or out of the imaging plane.
9. Make necessary needle adjustments if an undesired pattern of local anesthetic spread is visualized. The visualization of local anesthetic should occur through the entirety of the injection to avoid an intravascular injection.
10. Maintain traditional safety guidelines including the presence of resuscitation equipment, frequent aspiration, intravascular test dosing, standard monitoring, patient response, and assessment of injection characteristics.

Because image interpretation is not possible without images, this abstract will explain the most important terms and definitions for USGRA.

Terminology.: US-wave: It is a sound wave with a frequency much higher (2MHz-18MHz) than an audible sound wave (20Hz-20KHz). This longitudinal wave is dependent of the medium in which it is travelling.

Wavelength: Wavelength and frequency are inversely proportional at any given speed, meaning the higher the frequency, the shorter the wavelength, the better the axial resolution.

Frequency: The frequency determines the number of cycles of the wave in 1 second (unit is Hertz (Hz)). The higher the frequency, the higher the axial resolution, the lower the penetration (superficial target). The lower the frequency, the lower the resolution, the higher the penetration (deep target). Choose the right frequency in relation to the depth of the target.

Amplitude: The amplitude of the ultrasound wave can be regarded as the amount of acoustic pressure.

Velocity: This is dependent of the medium in which the US is traveling. In air the speed of US, like audible sound, is 330m per second, in fat 1460m/

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s, in water 1480m/s, in bone 4080m/s. In US-machine speed is determined as an average speed in of soft tissue, 1540m/s.

Piezoelectric effect: When an electric current is sent trough a piezoelectric crystal it will vibrate and create an US. Reversely, when an US reaches a crystal, this latter will generate a current and with the necessary algorithm it will generate an image on the screen.

Reflection: This phenomenon occurs when the US wave hits a structure with different acoustic resistance. The US then reflects in the direction of the US probe, which emitted the primary US beam. Not all US waves sent are reflected to the probe.

Doppler effect: A wave sent to a moving target will change in frequency when reflected. When the target is moving away from the probe the frequency of the reflected wave will be lower. Reversely, when the target is moving towards the probe the reflected wave will have a higher frequency. Color Doppler is based on this principle, a higher frequency has a red color code and a lower frequency has a blue color code. Power-Doppler doesn't differentiate in the direction of flow, but is more sensitive than Color-Doppler.

Machine and machine settings: US-probe: Basically there are 2 types of probes, the linear probe, a high frequency probe and the convex probe, merely a low frequency probe. All US transducers contain multiple piezoelectric crystals. The US probe emits a pulsed beam, meaning it emits for 1% of the time and receives for 99% of the time. The US transducer generates a 1mm thick beam, for a length almost equal to the probe. Modern probes use spatial compound imaging for optimizing the reflection.

Spatial compound imaging: US waves are sent in 3 different angles trough the tissue for optimizing reflection on structures not parallel to the probe.

Gain: This knob enhances the reflected beam for optimizing the image quality.

Time gain compensation (TGC): The deeper the ultrasound beam travels into the tissue, the more it gets attenuated. To compensate for this, depth selective gain adjustment is provided by TGC on the US machine.

Focus: Like optical lenses can focus light beams, electronic focusing through beam steering is used to get better "vision" at a defined focus zone- which is a certain depth at the image set by the operator.

Depth: The depth is operator dependent and will be set in function of the target. Increasing depth will narrow the image to keep proportions, reduce lateral resolution and by lowering frequency for more penetration, reduce axial resolution.

Artifacts [3, 4]: Anisotropy: Phenomenon created by the angle at which the US beam reaches the nerve (or tendon). When the US beam reaches the nerve perpendicularly the reflection is maximal and the nerve will be more visible. When not perpendicular, the nerve is less visible. By tilting, the angle changes and the nerve will switch-on or switch-off on the screen.

Acoustic shadowing: reduced reflection of echoes caused by intervening structures with high attenuation, like bone, such that sound passing through is weaker and echoes from tissue behind the bone are attenuated.

Posterior acoustic enhancement: Some structures such as vessels and cysts can increase the speed of sound causing an area of increased signal distal to the lesion. The tissues immediately beyond the decreased-attenuation structure appear brighter than they should.

Reverberation: When the sound beam is oscillating between two strong reflectors, reverberations can occur. Strong reflectors are bone, the needle, calcifications, …

The beam can bounce back and forth between the structures causing multiple bands of noise to show up on the image.

Bayonet artifact: The needle passing true the different tissue layers seems to be broken and forms a bayonet. This artifact is due to different US beam velocities in the multiple layers.

Comet-tail: When an US beam oscillates between 2 strong reflecting layers, close together and moving upon each other, a special form of reverberation will occur. This reverberation will appear and disappear like a comet-tail. This phenomenon has a special signification in the 2 layers of the pleura.

Mirror image: Highly reflective interfaces perpendicular to the beam can cause double or mirror images to be created. Exact duplicates will be created at equal distances from the probe.

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DIAGNOSIS OF THE VERTEBRAL LEVEL FROM WHICH LOW BACK OR LEG PAIN ORIGINATES

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Problems identifying the spinal segment(s) of significant pathology in patients with post lumbar spine surgery syndrome or common low back pain by clinical evaluation are familiar to the pain physician. Pure segmental distribution of pain is frequently not found.[1,2,3,4,5,6,7] Therapeutic intervention at the correct spinal segment(s), even surgically, relies on accurate clinical examination and imaging such as with CT scan or MRI. Diagnosis of the correct vertebral level through *clinical evaluation* often depends on dermatomal, myotomal and sclerotomal distributions of the nervous system. Identification of these patterns in clinical practice is often ambiguous.[1,2,3,4] MRI is considered by many to be the gold standard for localization of common spinal pathology, but the accuracy of MRI has been questioned. [5,6,7,8,9,10,11]

Inspection of the epidural cavity with a flexible endoscope (epiduroscopy) is being used with increasing frequency to localize pathology. Epiduroscopy can be used to evaluate the contents and visualize pathology of the lumbar spinal canal as well as locate tissue which when pressed elicits pain.[12,13] All segments in the lumbar canal can be examined bilaterally via a single entry through the sacral hiatus. Epiduroscopy is mostly performed under monitored anaesthesia care allowing direct communication with patients. This permits evaluation of the patient's response to manipulation of epidural structures in distinct regions of the epidural cavity. If pain produced by contact with epidural structures is similar in nature and distribution to the pain for which the patient is seeking treatment (concordant pain), it can be assumed that this region of the spinal canal is directly or indirectly related to spinal pathology of interest.[2,4] In this presentation, I will describe, along with relevant literature, a study Dr. Hemmo Bosscher and I did to compare the clinical significant vertebral level identified through endoscopic evaluation with the level determined through clinical evaluation (history and physical examination) and with the level determined with MRI. and to obtain the frequency distribution of the vertebral levels at which a concordant pain response could be evoked through epiduroscopy.[14]

Methods: *MRI Reports.* Routine MRI evaluation of the lumbar spine reported by qualified radiologists was used to determine the vertebral level of pathology (e.g. spinal stenosis, degenerative disc disease, etc) from which the pain was thought to originate. The vertebral level was defined as the region between the mid points of two subsequent pedicles as identified by MRI. Only pathology reported as moderate or severe was considered to be

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significant. If moderate or severe pathology was identified at more than one level, more than one level was considered to be of clinical significance.

Clinical evaluation. Since in most instances, back pain and accompanying pain that radiates down the leg does not follow a precise dermatomal distribution, referred pain patterns and associated spinal segments as described by Feinstein, Inman and Kellgren were used in the clinical evaluation.[15,16,17] Thus, the vertebral level was defined as the region between the mid points of two subsequent pedicles at which the pathology was *presumed* to be present based on the following radiating patterns: Pain at the lateral posterior thigh, lateral calf and dorsum of the foot was considered to be associated with the segment of L5 and pathology located in the region of the L4-5 vertebral level. Pain radiating over the anterior lateral thigh, anterior medial shin was considered to be associated with the segment of L4 and pathology located at the region of the L3-L4 vertebral level. Pain at the anterior thigh or the groin was considered to represent pathology above the pedicle of L3, while pain referring down the posterior thigh, calf or heel was associated with pathology at the region of L5-S1 or below.

Epiduroscopy. Routine epiduroscopy assisted by fluoroscopy was performed under monitored anaesthesia care as described previously.[12]

Concordancy. Patients were asked if the pain generated by pressing upon discrete areas in the epidural space with the tip of the epiduroscope was similar in distribution and character to the pain for which the patient was seeking treatment. This was compared to the non-painful response to touch when an anatomical structure such as a nerve root, in a different region of the epidural cavity was touched.

Level definition. The vertebral level was defined as the region between the mid points of two subsequent pedicles, e.g. L5 equals the midpoint between L4 and L5 pedicles, as observed through fluoroscopy or MRI where the concordant pain could be generated. The following 5 regions were included in the study: The region corresponding to the level of L3 to L4, L4 to L5 or L5 to S1 and the region above L3 or below the pedicle equivalent of S1. If more than one level was identified where the response was concordant to a component of the pain, more than one level was considered to contain clinical significant pathology.

Comparison. The vertebral level as identified by each method was compared as follows: 1) If two methods identified the same levels as clinically significant, the findings were considered to be in agreement. 2) If methods identified different single or multiple levels, the findings were considered to be in disagreement.

Results: In 125 of 143 patients, pain could be reproduced in a discrete area of the spine using epiduroscopy. The most frequent levels of pain reproduction were L4-5 (87 patients followed by L3-4 (14 patients), combined accounting for 93 % of patient in whom pain could be reproduced and 81 % of all patients in the study. The levels of clinically significant pathology from which pain was thought to originate as determined by clinical examination were most frequently L3-4 and L4-5 (54 patients). In contrast, when evaluated with MRI, no clinically significant lesions were reported in the majority of patients (87).

Radiating pain corresponding to pathology at a level below S1 was not diagnosed in any patient through clinical evaluation, lumbar MRI or epiduroscopy.

Clinical evaluation diagnosed a different region at which spinal pathology was thought to be present than through touch with epiduroscopy in 103 of 143 (72 %) patients. This difference was statistically significant ($p<0.01$). MRI diagnosed a different vertebral level compared to epiduroscopy in 115 of 143 (80%) patients. This difference was also statistically different ($p< 0.01$) In only 5 patients (3.5 %),did epiduroscopy, MRI and clinical evaluation, agree on the same vertebral level(s).

Discussion: The most significant finding of the study is that there is poor correlation between the spinal segments at which clinically significant pathology is determined to be present by epiduroscopy vs the level determined by clinical evaluation and by MRI. We believe the levels differ because the three assessment techniques assess different indicators and that levels determined by epiduroscopy are the best for guiding targeted treatment.

To explain the inconsistent results from clinical evaluation, MRI findings and epiduroscopy, three possible pathophysiological mechanisms should be considered. 1.) The nerve root and dorsal root ganglion is directly involved in local pathology of the spine (e.g. disc protrusion with compression of DRG) and causes dermatomatal distribution of pain, loss of sensation and loss of motor strength in the associated muscle groups. 2.) The nerve root and dorsal root ganglion are directly involved but cause a mixture of dermatomal, sclerotomal and myotomal components in the distribution of pain, loss of sensation and motor weakness and 3.) The nerve root and dorsal root ganglion are not directly involved. In this case, back pain and radiating pain down the leg are caused by an alternative pathophysiological mechanism.

MRI and epiduroscopy clearly are different diagnostic tools. MRI describes *observable* spinal pathology often associated with compression of a nerve root or dorsal root ganglion. MRI is therefore more likely to diagnose the precise location of the pathology in patients with true radicular symptoms. Response to touch during epiduroscopy is *functional* and can identify painful areas more diffuse in nature and too small for the discriminative power of MRI. Epiduroscopy is more likely to diagnose disease that is not directly associated with compression of the nerve root or dorsal root ganglion. This may explain why MRI is a weak indicator of the vertebral level diagnosed through epiduroscopy in this study but not in studies of patients who presents with classic radiculopathy.[18]

The absence of significant spinal pathology at level of L5 – S1 in patient population we studied is remarkable considering the frequency of abnormalities diagnosed at this level based on MRI and the relative frequent spine surgery performed at this level in general.[19,20]

In conclusion, the pathophysiology of a "posterior protruding disc" and "sciatica" as described by Barr and Mixter may fit the patient with intractable pain and a strict dermatomal pain pattern, but must be an oversimplification in patients with moderate to severe back pain and non-dermatomal leg pain commonly seen in pain management institutions.[21]

The majority of clinically significant epidural pathology found by epiduroscopy in patients with low back pain and or radiating pain down the leg in this study was located at the L4 - L5 vertebral level, followed by L3 - 4. Pathology at other levels was far less common. As compared to the pain response to direct touch using epiduroscopy, clinical evaluation and MRI were of low specificity in the diagnosis of the correct vertebral level of clinical significant spinal pathology.

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CAUDAL EPIDURAL STEROID INJECTIONS: STILL A PLACE? ALTERNATIVES?

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Introduction: With an annual prevalence ranging from 15-45%, chronic low back pain is associated with significant health and socioeconomic costs to the individuals suffering from the condition and to our healthcare system.[1] Of the individuals suffering from chronic low back pain, it has been estimated that only approximately 4% experience a neuropathic component (i.e. radicular pain).[2] Low back pain is the number one cause in the world for occupational disability and ranks fifth among the most common medical condition that leads individuals to seek medical care. From 1997 to 2006, the United States national expenditures for spine problems have increased to 82% (average of 7% per year).[3] Although a large percent of the increase was related to inpatient, prescription, and emergency services, outpatient services, including interventional therapies, also contributed to the drastic increase in healthcare costs. Unfortunately, even though expenditures for spine treatments increased during this period of time, measures of self-reported mental and physical health, and activity limitations declined. In addition, the number of individuals suffering from spine conditions that reported work, social and physical functioning limitations also substantially increased.

Furthermore, the number of spine surgeries has significantly grown and has been associated with significant costs. In the United States, this is evident by the substantial increase in Medicare spending for inpatient back surgery which has doubled over the last decade.[4,5] Unfortunately, a significant number of individuals who undergo back surgery still have persistent or recurrent pain. These individuals are often labeled as having failed back surgery syndrome and treatment can be challenging. It is important for pain practitioners to understand the level of efficacy, safety, and medical costs associated with specific treatments in order to make medical decisions when treating individuals with failed back surgery syndrome.

In an attempt to treat persistent pain following back surgery, multiple interventional and non-interventional treatments have been developed and utilized. Prior to defining treatment, it is critical to attempt to determine the pain generator. Pain generators may include: recurrent herniation, herniation at another level, lateral and central stenosis, sacroiliac joint dysfunction, facet joint pain, vertebral instability, arachnoiditis, epidural fibrosis, and acute and chronic radicular pain. Currently, two mechanisms are believed to cause radicular symptoms associated with a HNP: mechanical compression (i.e. stimulation of nerve cells and vascular impairment) and chemical inflammatory cascade initiated by the released nucleus pulposus.[6] Caudal epidural steroid injections have been one of the interventional techniques utilized for treating failed back surgery syndrome. Herein and in this lecture, we will provide an overview on the effectiveness of caudal epidural steroid injections for failed back surgery syndrome as well as discuss the alternative forms of treatment.

Efficacy and Cost-Effectiveness: Multiple studies have examined the efficacy of caudal epidural steroid injections in the management of chronic pain following surgical intervention.[7-11] A systematic review indicated that the evidence (Level II-1 or II-2) was fair for the treatment of failed back surgery syndrome and that stronger evidence existed for the use of caudal epidural steroid injections in the treatment of pain secondary to disc herniations.[8]

When examining the effectiveness of caudal epidural steroid injections, it is also essential to compare this approach to other approaches used to enter the epidural space, including the transforaminal and interlaminar techniques. Advantages for the caudal approach include the ability to target the lower lumbar levels and the ventrolateral epidural space. In addition, the procedure may offer an enhanced safety profile for individuals who have had previous back surgery, including the ability to perform the procedure on individuals with hardware, and possibly associated with a lower risk for a dural puncture.[8] When the interlaminar approach is utilized, medication may not reach the anterior epidural space, which is the logical target to place medications to treat radicular pain. In order to overcome this limitation, the parasagittal and transforaminal approaches have been advocated.[12] Caudal epidural steroid injections have been shown to have a higher occurrence of ventrolateral spread in comparison to the interlaminar approach. Manchikanti et al.[13] demonstrated ventral spread in 69% of caudal epidural steroid injections performed with 10 mL volumes. This is in contrast to a ventral spread of only 36% for interlaminar epidural steroid injections.[14] For the caudal approach, limited epidural spread occurs above the L3 level.[13,15] Attempts have been made to improve epidural spread to upper lumbar spine pathology by using a trendelenburg tilt and further removing lumbar lordosis. Unfortunately, these maneuvers have not significantly improved epidural spread and therefore, if pathology exists above L3, alternative approaches to the epidural space should be considered.

When compared to the transforaminal approach, Ackerman and Ahmad[16] demonstrated in 90 patients with disc herniations at L5 – S1, the transforaminal approach provided significantly better improvement in pain scores. Patients were evaluated at two, twelve, and twenty-four weeks post injection for pain relief, disability, and activity levels. In a retrospective study, Lee et al.[17] compared the effectiveness of different approaches for epidural steroid injections in the treatment of lumbosacral herniated discs and spinal stenosis, demonstrating that the transforaminal approach was more effective.

When examining economic data associated with epidural steroid injections, studies have suggested that epidural steroid injections are a cost-effective treatment for managing chronic pain.[18,19] A cost utility analysis, with actual reimbursement data in United States dollars, showed the cost utility for one year of quality adjusted life was $2,191 in failed back surgery syndrome patients treated with caudal epidural steroid injections.[19]

Alternative Treatments: Unfortunately, many individuals with failed back surgery syndrome have chronic radiculopathy. A multicenter blinded randomized controlled trial demonstrated that caudal epidural steroid injections were not effective in the treatment of chronic lumbar radiculopathy.[20] In these individuals, pharmacotherapy and/or spinal cord stimulation may be considered as alternative therapies.[5,21] In patients with persistent symptoms after lumbosacral spine surgery, spinal cord stimulation has been shown to be an effective treatment.[5]

Conclusion: Failed back surgery syndrome is often challenging to treat and resistant to many forms of interventional and non-interventional forms of care. Caudal epidural steroid injections in appropriately selected individuals may assist with short-term pain relief. Data has suggested that approaches (e.g. transforaminal approach) that target the ventrolateral aspect of the epidural space may have improved efficacy in comparison to the caudal approach. In patients who have not responded to more conservative options, spinal cord stimulation may assist in reducing chronic neuropathic pain symptoms.

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METHODOLOGY, PUBLICATION AND RETROSPECTIVE BIAS

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Bias is a systematic error, or deviation from the truth, in results or inferences, possibly leading to underestimation or overestimation of the true intervention effect. [i]

Particular flaws in the design, conduct and analysis of randomized clinical trials can lead to risk of bias, although it is usually impossible to know to what extent biases have affected the results of a particular study. Risk of bias is increased by methodological study characteristics that can introduce systematic error into the results. These characteristics include unreliable methods for generating the allocation sequence, poor allocation concealment, and failure to blind participants, personnel, and outcome assessors. Methodological flaws can lead to overestimation of medical interventions, or produce larger treatment effect sizes, thus falsely inflating the efficacy of the drugs, compared to studies that have these design features. [ii]

Systematic reviews (SRs) are becoming increasingly popular in evidence-based health care and have as their strength, methodological features designed to minimize bias. However, evidence suggests that a large proportion of SRs are poorly reported and susceptible to bias[iii].

Pharmaceutical industry-sponsored studies overestimate the efficacy and underestimate the harm of their treatments, even when controlling for methodological biases as shown by a recent Cochrane review.[iv] Thus, study funding sources and financial ties of investigators should be considered as risks of bias. Consequently, scientific articles that overstate benefits and applicability or understate harms of medical interventions may lead evidence-minded practitioners and patients to make suboptimal treatment decisions. This can result in overutilization of medical services with increased wasteful spending and harm to patients.[v]

Also very important is **Outcome reporting bias,** occurring when authors selectively report outcomes based on factors such as the statistical significance of the outcome. In a review of 102 trials approved by a Danish Ethics Committee in 1994-95, it was found that the odds of a particular outcome being fully reported was more than twice as high if that outcome was statistically significant. [vi]

Furthermore since the 1950s, it has been recognized that research with statistically significant or positive findings is more likely to be published than research with non statistically significant or negative findings (publication bias). [vii] In a recent Cochrane systematic review, it was found that the odds of trials with positive findings being published were nearly four times the odds of trials with negative or null findings. [viii]

Clinical trial registration was an initiative aiming at protecting public access to information about ongoing clinical trials, and encourage timely and accurate publication of completed trial results'. From 2005 the International Committee of Medical Journal Editors (ICMJE) has required investigators to register trials before patient enrolment in order to be considered for

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publication.[ix] Since then, the registration of clinical trials has increased dramatically. However, according to recent studies, some aspects of this process remain far from ideal, including the poor quality of trial reporting in online registries (that is, specifying primary outcomes at registration), selection of promising or positive outcomes for publication regardless of what was set down in the study protocol, and, finally, the 'disappearance' of many trials that are registered but never find their way to publication[x].

Various groups and bodies have developed and published initiatives and guidelines to guide qualitative research and minimise sources of bias such as the following, and many more:

- Reporting randomised trials : CONSORT 2010 Statement: Updated Guidelines for Reporting Parallel Group Randomized Trials[xi]
- Improving the quality of reporting meta-analyses of randomised controlled trials: the QUOROM statement[xii]
- Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies**[xiii]**
- Guidelines for data collection from medical records for use in retrospective analyses[xiv]
- The ISPOR Good Research Practices for Retrospective Database Analysis Task Force Report[xv]
- Rating the quality of evidence publication bias[xvi]

Thus recognizing bias in health research is crucial for evidence-based decision making. In order to do so readers of a published report need complete, clear, and transparent information on its methodology and findings. Transparent reporting reveals deficiencies research if they exist.

Publication of medical research is the cornerstone for the propagation and dissemination of medical knowledge, culminating in significant effects on the health of the world's population. However, instances of individuals and institutions subverting the ethos of honesty and integrity on which medical research is built in order to advance personal ambitions have been well documented. Many definitions to describe this unethical behavior have been postulated, although the most descriptive is the "FFP" (fabrication, falsification, and plagiarism) model put forward by the United States' Office of Research Integrity. It is sometimes difficult to differentiate fraud from incompetence, errors, bias, and misunderstanding. Critical audit and alertness on all parts are required to diagnose it. This relies on research institutions, editors of journals, citing authors, and, most of all the researchers who must adhere strictly to medical professionalism, which is solely based on honesty and ethics to self-regulate and conduct only ethical and genuine research. Educating potential researchers at an early stage (e.g. at medical school) on the mechanics of research ethics is essential to finding a solution to this problem and ensuring careers are constructed on honesty and integrity. [xvii]

[i] Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 [updated March 2011]
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MAINTAINING DATA

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To demonstrate that findings are justifiable and valuable, qualitative researchers must be able to demonstrate the rigor of the whole research process. The results of RCT would be impossible to interpret without data that is valid, sufficient and high-quality. To achieve these aims it is necessary to have a whole process including data collection, data collection training and data monitoring. The goal of this session is to give a clear understanding of this process.

LOGISTICS AND TROUBLESHOOTING OF AMBULATORY CONTINUOUS REGIONAL ANALGESIA

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Introduction: The goal of ambulatory continuous regional analgesia (ACRA) is to provide postoperative pain control lasting for 48-72 hours and to discharge home patients who would otherwise have to be admitted to the hospital for pain control. ACRA is useful for especially painful procedures and allows shortening patients' length of stay, limiting sleep disturbances and the side effects of opioids, and improving patient satisfaction. In a study of postoperative pain among ambulatory patients, "The orthopedic patients had the highest incidence of severe pain" and "Shoulder surgery was the most painful orthopedic procedure" (Chung et al. Anesth Analg 1997). Those patients will especially benefit from ACRA.

Single-injection blocks have a long track record and their postoperative management is well codified. CRA is a relatively new technique and is still evolving. CRA, when successful, allows avoiding the analgesic gap, the onset of severe pain when the block wears off. However, it is not free of concerns such as failure, toxicity, excessive motor block, possible falls for lower extremity blocks, and excessive sensory block leading to unrecognized surgical complications such as compartment syndrome. Cost and time are also a concern. A minority of patients complains of the resulting insensate ("dead") extremity, and occasionally comments that they prefer having pain to the unpleasant paresthesias caused by the continuous block, but these are a minority.

Neurologic injury does not seem to be more common with continuous than with single-injection techniques. Bergman BD et al. (Anesth Analg 2003): 405 axillary catheters, 2 anesthesia-related neurologic deficits (0.5%); Borgeat A. et al. (Anesth Analg 2006): 1001 popliteal catheters, no neuropathy or infection; Compère V et al. (Acta Anaesthesiol Scand 2009): 400 popliteal catheters, 2 neuropathies (0.5%).

Catheter colonization is common, but infection is rare. Cuvillon P et al. (Anesth Analg 2001): 208 CFNB for 48 hours, 57% colonization, no cellulitis/abscess, 3 bacteremias.

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However, infection can be catastrophic: Maheshwari A et al. (Anesthesiology 2013) describe a multiloculated abscess of the thigh following a popliteal catheter left in place 4 days after a trimalleolar fracture ORIF.

In practice: One published example of practical experience is Swanson's article (Anesth Analg 2006), describing 620 ambulatory patients who received ultrasound (US)-guided catheters. Exclusion criteria included morbid obesity, obstructive sleep apnea (OSA), chronic opioid use, and severe cardiopulmonary disease.

Among the blocks, 190 were interscalene (ISB), 206 femoral, and 224 popliteal blocks. The author reports 2 complications (popliteal) with one case of weakness and sensory loss that resolved within 6 weeks, and one case of CRPS that resolved after 3 sympathetic blocks within 6 weeks.

The intervention rate for troubleshooting was 26/620 = 4.2%. Out of these, 9 were patient education issues, 4 were due to equipment malfunction, and 13 to inadequate pain control.

Patients with inadequate pain control wee treated with a LA bolus in 7 cases. Fluid was accumulating around the catheter site in 3 patients, leading to a dressing change in 1 patient. One patient was unable to remove the catheter. There were 5 cases of the catheter being dislodged; 3 returned for a repeat block, while 1 was readmitted and started on an IV PCA.

Commonly used ambulatory perineural/plexus blocks are as follows:
- ISB for e.g. total shoulder arthroplasty, arthroscopy with acromioplasty, rotator cuff repair.
- Supraclavicular block, infraclavicular block for e.g. elbow replacement, elbow release, wrist fusion, or carpectomy.
- Axillary block for e.g. wrist fusion, first row carpectomy
- Psoas compartment block for hip surgery (e.g. arthroscopy) [rarely used block for ambulatory patients]
- Femoral block / FICB / adductor canal block for e.g. ACL/PCL reconstruction.
- Sciatic block at the buttock/thigh (multiple techniques), popliteal block for e.g. major foot/ankle surgery.

Patient selection is paramount for success. Typically, only ASA 1, 2, and carefully selected 3 patients are candidates. Patients should live close enough to return in case of a problem. Patients with cognitive dysfunction, drug abuse, or psychiatric disorder should be excluded. A language barrier is also an exclusion criterion, as troubleshooting would be impossible over the phone. Significant hepatic/renal impairment (possibly increasing the risk of local anesthetic (LA) systemic toxicity), and respiratory impairment for ISB, must lead to carefully weighing risks and benefits.

A caretaker should be available at home at least for the first night, and if possible for the full duration of the infusion, to monitor the patient, and to remove the catheter if needed.

One major difference with inpatient catheters is that, in case of secondary catheter failure, the patient will not be easily accessible for troubleshooting or to repeat the block. It is therefore extremely important to ensure correct catheter placement to avoid secondary failure, and there are three main options.

1. One can inject the loading dose of LA through the catheter instead of through the needle. This will ensure, in case of successful block, that the catheter is in correct position. However, there is a risk that no block will result if the catheter is misplaced.
2. A stimulating catheter can be used. This will allow verifying positioning near the nerve or plexus initially, but also later on once the block has subsided. My experience with stimulating catheters has been somewhat mixed, however.
3. The best option is to use ultrasound (US) to confirm catheter position. This can be done by injecting local anesthetic and visualizing the spread, or using color Doppler to visualize the turbulence caused by the injection. A few mL of air can also be injected and will be clearly seen as a hyperechoic image.

Of note, US-guided single-injection blocks appear to be similar to neurostimulation (NS) in terms of failure rates (Liu S et al. Anesth Analg 2009). However, perineural catheters placed with US-guidance are more effective than NS, and necessitate fewer needle passes with less patient discomfort (Fredrickson M et al. Reg Anesth Pain Med 2009).

A test dose (3 mL of LA with epinephrine) to exclude epidural, intrathecal, or intravascular placement should always be used.

The catheter should be well secured to prevent dislodgment with patient motion; however, tunneling/glue may make removal more difficult.

Catheters are typically removed at home by the patient or the caretaker, or in some cases (very anxious patients) by a healthcare provider in the hospital.

The local anesthetics commonly used are bupivacaine and ropivacaine. No adjuvant has been shown to be useful. Concentration, rate and dose are still being worked out. The ideal medication, concentration and administration rate are probably different according to the catheter location, the patient, and the time after surgery (pain decreases as time goes by, thus decreasing the LA requirements.) Several studies suggest that administering a basal rate with patient-controlled boluses is better than a plain continuous infusion, allowing better pain control with less motor block and a lower amount of LA. Intermittent LA boluses have been investigated, but there is no commercially available pump at this time that can deliver them.

A variety of portable pumps can be used; they can be elastomeric or computerized, disposable vs. reusable. Their accuracy can be variable (Ilfeld et al. RAPM 2003). Some offer a patient-controlled bolus capability. The volume of the pump reservoir will determine the maximum duration of the infusion. Some pumps are reprogrammable, and troubleshooting can be done over the phone by having the patient adjust settings.

Most patients will be followed over the phone. Occasionally, a visiting nurse service will be able to do home calls. All patient contact should be documented.

The catheter can be removed by the patient or the caretaker (using written or phone instructions) or by a healthcare provider: document "blue tip" intact.

Patients should also be educated regarding the need for limb protection (brace, splint) and the risk of falls for lower extremity blocks.

Written instructions should be given to the patient upon discharge, including the expected duration of infusion, instructions in case of signs of toxicity/infection, and instructions for removal (if applicable).

Troubleshooting: The main question is: Who will answer the calls? Depending on the institution (large academic center vs. small private structure and/or surgicenter), staffing might be very different. There can be a full-fledged pain service that can take calls and address patient concerns by day as well as night and weekends, or there might be no one else than nurses and anesthesiologists who are already caring for patients full-time. In any case, a clear plan must be in place as to who will be the first line respondent (MD vs. RN; resident, fellow, attending/consultant), and who will be available as second line if the first-line respondent is unable to solve the patient's concern.

All patients should receive at the very least a prescription of oral opioids to take in case of breakthrough pain or technical issue. Multimodal analgesia (NSAIDs, acetaminophen, newer analgesics) should be systematically used for these painful procedures. Prepare the patient for the time the block will wear off, which will happen even with continuous blocks. Take PO analgesics before the pain starts!

The most common problems are inadequate analgesia, catheter dislodgement, leakage at the insertion site, blood in or around the catheter, and excessive numbness

1. I am still in pain - what should I do?
- Is the catheter disconnected?
No: Bolus catheter (if available), increase rate (if doable), take po meds
Yes: Pull catheter, take po meds
- Extreme pain unresponsive to meds; 5 Ps: Pain, Pallor, Pulselessness, Paralysis, Paresthesia: possible compartment syndrome; that is an EMERGENCY. Have the patient return to the hospital ASAP for evaluation
2. The catheter is leaking - what to do?
- Are you comfortable?
Yes: Reinforce dressing
No: If catheter out of skin, pull catheter and change to po meds
Check for disconnection
Reinforce dressing
Bolus catheter (if available), increase rate (if doable)
Take po meds
Still leaking? Pain relief?
If improved, keep catheter
If still leaking and no relief, pull catheter and take po meds
3. There is blood in my catheter!
- Is it blood AROUND the catheter or IN the catheter?
Blood in the catheter: Pull catheter, take po meds
Blood around the catheter: Are you comfortable?
Yes: clean area, redo dressing
No: bolus, increase rate, take po meds
Ask about hematoma formation: Blood just under dressing, or is the area enlarging / swelling?

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If hematoma, pull catheter and apply pressure for 20 minutes
If no improvement, come to the hospital
4. Toxicity questions
- Toxicity symptoms: Dizziness, tinnitus, blurred vision, metallic taste in mouth
Clamp catheter
Come to the hospital ASAP
5. My extremity is very numb and/or weak
- Can you tolerate the numbness/weakness?
Yes: Avoid pushing bolus button unless pain is worse than numbness. If doable, decrease infusion rate
No: Clamp catheter until sensation/movement return
- Can you tolerate the pain without the catheter?
Yes: remove catheter, take po meds
No: unclamp catheter, decrease rate if doable, avoid pushing bolus button unless pain is worse than numbness
6. Normal side effects of ISB
- Eyelid drooping on side of the surgery: Normal, will go away after the catheter comes out (Horner's syndrome)
- Hoarse voice: Normal, will go away after the catheter comes out
- Shortness of Breath
Chest pain? If yes, come to the hospital emergently
If no chest pain, and able to speak in full sentences, this is normal & will go away. The block is numbing half of the diaphragm

Multidisciplinary approach: Involve at least surgeon and physical therapist.

Also the acute pain service, or whoever will get the calls.

Admitting: fast-track admission of patients getting CPNB.

PACU RNs: they can discharge patients while still blocked.

Business manager, billing service, hospital administration should also be involved and facilitate.

Conclusion: Patient selection and education are paramount to avoid issues. Prior to discharging the patient, ensure correct catheter placement, at best by using US. There has to be a well-established pathway as to who will get the patient calls as a first-line, and who will be available as a backup. Troubleshooting algorithms should be available. For success, it is important to involve all stakeholders (patients, surgeons, physical therapists, nurses, administrators, etc.)

If done right, ambulatory perineural catheters work. They can lead to a shorter patient length of stay, increased patient and surgeon satisfaction, and possibly to added income.

NOVEL SPEDI BLOCK (SINGLE PENETRATION DUAL INJECTION) BLOCK FOR BELOW THE KNEE SURGERY

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Background and Objectives:: We describe a novel ultrasound-guided approach blocking the sciatic and saphenous nerves in the proximal thigh (at level of the lesser trochanter or immediately below) utilizing a single-penetration dual-injection (SPEDI) technique. The popliteal-sciatic approach necessitates re-positioning of the leg exposing the popliteal fossa and an extra injection for the saphenous nerve block at the mid-thigh level. We aimed to introduce an alternative, equally effective and faster method.

Methods:: A prospective, randomized, double-blind study. Sixty patients undergoing leg and foot surgery under general anesthesia were included. Using ropivacaine 0.75%, fifteen mL was deposited around the sciatic nerve and five mL at the saphenous nerve. Patients were randomized to the popliteal-sciatic/saphenous technique or the SPEDI technique. Primary outcome measure was performance time. Positioning time, pain assessment and nausea in the post-anesthesia care unit, sufentanil demand, dermatome anesthesia and degree of motor blockade were also recorded.

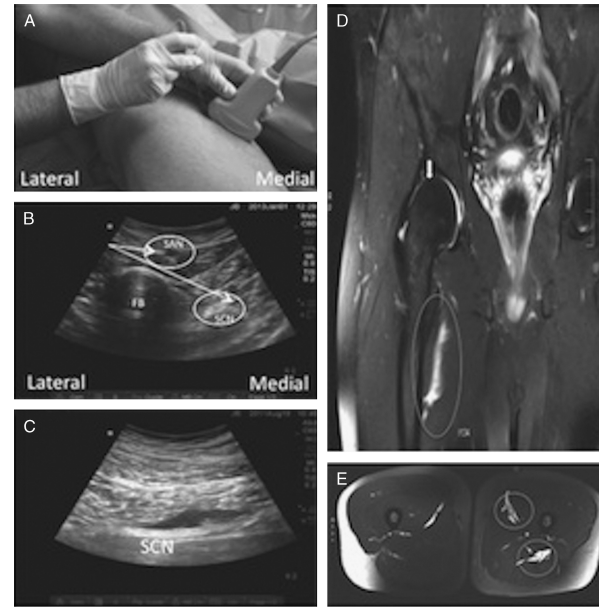

FIGURE 1.

The SPEDI technique (Fig 1):

The low frequency curved array transducer is placed in the transverse scanning position on the medial proximal thigh (at the level of the lesser trochanter) 8-10 cm caudad to the inguinal ligament (Fig. 1A) giving a cross sectional view of the femur (FB) laterally and the hyperechoic sciatic nerve (SCN) medially sandwiched between the adductor magnus muscle and the gluteus maximus muscle (Fig. 1B). More superficial the pulsating femoral artery is visualized with the hyperechoic saphenous nerve (SAN) lateral to the artery (Fig. 1B). The needle is inserted from the lateral end of the transducer at a very steep angle and going deep aiming for the medial border of the SCN beneath the deep fascia of the adductor magnus muscle (Fig. 1B).

TABLE 1.

	Popliteal-sciatic/ saphenous	SPEDI	P
Procedure time (median, range) [seconds]	246 (163-472)	110 (57-315)	<0.0001
Positioning time (median, range) [seconds]	87 (17-253)	0 (0-0)	<0.0001
Total time (median, range) [seconds]	358 (216-660)	110 (57-315)	<0.0001
Sciatic Visibility Score (easy/moderate/difficult) [numbers]	20/7/3	17/8/5	0.76
Saphenous Visibility Score (easy/moderate/difficult) [numbers]	18/10/2	16/8/6	0.41
PONV at PACU entry [number]	2	3	1.00
Pain Assessment - NRS >3 at PACU entry [number of patients]	2	4	0.67
Pain Assessment - NRS at PACU discharge (median, range) [NRS 0-10]	0 (0-4)	0 (0-3)	0.21
Sufentanil demand in PACU (median, range) [microgr]	0 (0-15)	0 (0-24)	0.39
Failed blocks [number]	1	4	0.35
L3 dermatome block failure [number]	4	6	0.73
L4 dermatome block failure [number]	1	5	0.19
L5 dermatome block failure [number]	1	4	0.35
S1 dermatome block failure [number]	1	4	0.35
S2 dermatome block failure [number]	6	7	1.00
Ankle flexion possible [yes]	3	2	0.67
Foot inversion and eversion possible [yes]	1	2	1.00

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As an additional control of the correct distribution of local anesthetic the transducer is rotated 90 degrees to scan the SCN in the longitudinal axis (Fig. 1C). The needle is subsequently retracted and re-directed at a more shallow angle to the transducer and advanced towards the SAN lateral to the artery (Fig. 1B). Magnetic resonance (MR) imaging in the coronal plane (Fig. 1D) depicts the distribution of the injectate spreading high in the proximal thigh surrounding the SCN. The injectate distribution for the SPEDI block combination is also visualized in the axial plane (left thigh) clearly showing the correct distribution of the two injectates (Fig. 1E).

Results: Performance time was significantly faster with the SPEDI technique, i.e. median time 110 seconds (range 57-315 seconds) vs. 246 seconds (range 163-472 seconds) ($P<0.0001$). Positioning time was significantly shorter with the SPEDI technique ($P<0.0001$). Remaining secondary outcomes were similar in the two groups (Table 1).

Conclusions: The SPEDI block resulted in significantly faster performance time and reduced positioning time with equal efficacy in relation to pain assessment, nausea, sufentanil demand, dermatomal anesthesia and motor blockade. The SPEDI block is an equally effective alternative to the traditionally popliteal-sciatic/saphenous block combination for leg and foot surgery, but it is faster, requires only one skin penetration and is without a repositioning of the leg.

REGIONAL ANAESTHESIA FOR LOWER LIMB SURGERY - HOW TO SELECT PERIPHERAL BLOCK TECHNIQUES

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General considerations:

Peripheral nerve blocks (PNB) provide important benefits in the peri- and postoperative treatment of patients with lower limb surgery. Compared to the use of general, spinal, or epidural anaesthesia, improved hemodynamic stability can be maintained with PNB. Continuous nerve blocks with catheter placement are suitable for prolonged postoperative analgesia in many orthopaedic patients. This is particularly useful because the use of epidural catheters is no longer recommended for routine pain treatment after major orthopaedic surgery (1). At the present time, quick recovery and a short hospital stay are priorities after surgical procedures. Hence, anaesthesia techniques and postoperative pain treatment should not delay early mobilisation of the patients. Choosing appropriate PNB techniques, while avoiding unnecessary and long lasting motor blocks, is one of the challenges of modern regional anaesthesia. Ultrasound can be used to visualise block needles, nerves and local anaesthetic distribution. Ultrasound guidance reduces time consumption and local anaesthetic doses (2); it might also contribute to the use of more selective block techniques. Profound anatomical knowledge is still mandatory, even though nerve structures can now be visualised

Anatomical background: Nerve supply of the lower extremity comes from two major neural pathways formed by the lumbar and sacral plexus (3). The *lumbar plexus* is formed by the ventral rami of the nerve roots L1 to L4, with a contribution from T12. The plexus is situated within the psoas mayor muscle, ventrally to the transverse processes. The *femoral nerve* (L2-L4) is the largest and longest nerve from the lumbar plexus. After passing posterior to the inguinal ligament, the nerve divides into numerous branches. The *saphenous nerve* is a sensory branch of the femoral nerve. It proceeds below the sartorius muscle and continues down to the medial side of the foot. Another sensory nerve from the lumbar plexus is *the lateral femoral cutaneous* (L2-L3) nerve. It passes behind the inguinal ligament, medial to the anterior superior iliac spine, and below the fascia lata. The *obturator nerve* (L2-L4) leaves the pelvis through the obturator foramen, and divides into an anterior and posterior branch separated by the adductor brevis muscle. Figure 1 shows the skin innervation of these nerves from the lumbar plexus.

The *sacral plexus* is formed by the lumbosacral trunk (L4 – L5), the ventral rami of the nerve roots S1 to S3, and a part of the ventral ramus of S4. The plexus passes between the piriformis muscle and pelvic fascia. The *sciatic nerve (L4-S3)* is the largest and longest peripheral nerve in the human body. After passing through the greater foramen, it runs posterior to the femur. The nerve is surrounded by a solid extraneural layer of connective tissue (4). In the upper part of the popliteal fossa the sciatic nerve divides into the *tibial nerve* (L4-S3) and the *common fibular nerve* (L4-S2). The sciatic nerve and its branches innervate the posterior compartment of the thigh, and all compartments of the leg and foot. Figure 2 shows the skin innervation from the sacral plexus.

Commonly used blocks for the lower extremity: *Femoral nerve block:* The block is relatively simple to perform with the aid of a nerve stimulator or ultrasound. The femoral nerve is situated lateral to the femoral artery on the anterior surface of iliopsoas muscle, and bellow the iliac fascia. The block needle is inserted distal to the inguinal crease. Puncturing the iliac fascia is essential to provide local aesthetics to the nerve.

Saphenous nerve block: The sensory nerve can easily be accessed in the adductor canal, bellow the sartorius muscle, using ultrasound. Several landmark-based techniques are also described to block the nerve at different anatomical locations.

Lateral femoral cutaneous nerve block: Using the landmark-based technique, a needle is inserted medial and caudal to the anterior superior iliac spine. A loss of resistance is felt as the needle passes the fascia lata. Alternatively, a high frequency ultrasound probe can show the nerve as it crosses the sartorious muscle.

Obturator nerve block: Many nerve stimulator-guided techniques may be associated with the risk of entering the pelvic cavity. For ultrasound-guided techniques, the adductor brevis muscle is a valuable landmark. The branches of the obturator nerve proceed on the anterior and posterior side of the muscle.

Plexus lumbalis block: The block includes the femoral, obturator, and lateral femoral cutaneous nerves. Electrical nerve stimulation has traditionally been used to perform this block. Ultrasound-guided techniques have been described (5). The block can be associated with serious (and potentially life threatening) complications due to an unintentional epidural, spinal or intravascular injection (6). It is not uncommon to combine ultrasound-guidance and nerve stimulation for this block.

Sciatic nerve blocks: The nerve can be blocked on numerous levels (transgluteal, subgluteal, popliteal, among others) by the use of nerve stimulation or ultrasound. The local anaesthetic should be injected bellow the extraneural connective tissue layer to ensure a successful block. The tibial nerve or common fibular nerve can be blocked further distally, after the division of sciatic nerve in the popliteal fossa.

Sacral plexus block: The sciatic nerve and other branches of the sacral plexus can be acsessed with a parasacral block by nerve stimulation or ultrasound.

Ankle blocks: The terminal branches of the tibial nerve (posterior tibial nerve and sural nerve) and the common fibular nerve (deep and superficial peroneal nerve) and saphenous nerve can be blocked at the level of the ankle.

Choice of blocks for lower limb surgery: PNB for hip surgery: The hip joint is supplied from the lumbar plexus by the femoral nerve and obturator nerves, and from the sacral plexus by the nerve to the quadratus femoris and the superior gluteal nerve. A lumbar plexus block will give sufficient postoperative analgesia after most types of hip surgery. It will also involve skin innervation from the lateral femoral cutaneous nerve. A sacral plexus block must additionally be performed to obtain complete anesthesia of the hip. However, sciatic nerve damage can be related to surgical procedures (f.e. total hip replacement) and a sacral plexus blocks may inadvertently be

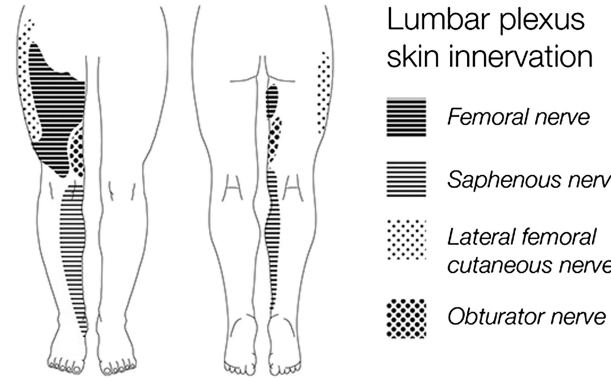

FIGURE 1.

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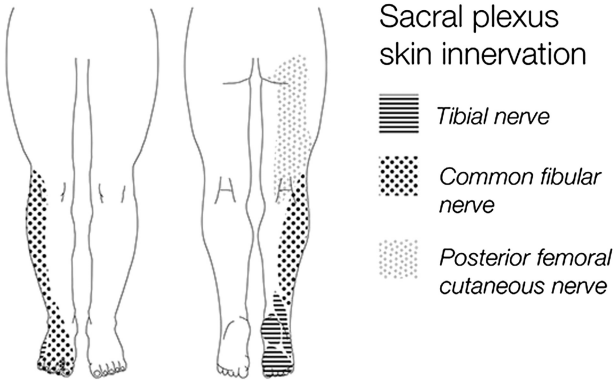

FIGURE 2.

held responsible for the nerve injury. Femoral nerve blocks are also advocated for pain relief after total hip replacement (1). Though a lumbar plexus block will give a more efficient analgesia, especially when the surgery involves joint link pan.

PNB for surgery of the thigh: Branches of the femoral nerve supply the periostium of the anterior part of the femoral bone. Periostal innervation of the posterior part of the femur comes from the obturator nerve. Hence, a lumbar plexus block (including femoral, obturator and lateral cutaneous femoral nerve) provides excellent anaesthesia for femur surgery. A femoral nerve block alone may also give sufficient analgesia.

PNB for knee surgery: The knee joint is supplied by branches from the femoral (anterior part of the joint), tibial, common fibular (posterior aspect) and obturator nerves (medial aspect). Femoral nerve blocks are often used for postoperative pain treatment after knee surgery. For total knee replacement, continuous nerve blocks with catheters have been shown to provide satisfactory analgesia and improved mobilisation of the joint (7). The sciatic nerve and obturator nerves must also be blocked when knee surgery is performed under PNB alone, or if postoperative pain treatment with only a femoral nerve block is insufficient. Selective blocks of the terminal sensory nerve branches are now increasingly performed, in order to avoid compromising motor function (8).

Leg and ankle surgery: The tibial and common fibular nerves innervate the tibia, fibula, the ankle joint, and the foot. The saphenous nerve supplies the skin on the medial side of the leg and foot, as well as the medial side of the ankle joint. A sciatic nerve block is suitable for surgery of bellow the knee. However, to obtain complete anaesthesia of the skin and the ankle joint, the saphenous nerve must also be anesthetised. For prolonged postoperative pain treatment, a catheter can be placed adjacent to the sciatic nerve, and combined with a single injection of a long lasting local anaesthetic to the saphenous nerve. One should be aware that an acute compartment syndrome can be more difficult to diagnose when peripheral blocks are performed for leg surgery.

Foot surgery: Surgery on the foot can also be carried out with an ankle block. However, compared to a (popliteal) sciatic and a saphenous nerve block, multiple injections are required for the ankle block, giving more discomfort to the patient, and increasing the chance of partial block failure.

Conclusion: PNB techniques are suitable for lower limb surgery. Knowledge of the anatomy is essential in choosing the right techniques.

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PRESSURE MONITORING – SHOULD THIS BECOME WIDESPREAD?

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The risk of death and major complications associated with anaesthesia in otherwise healthy patients (ASA 1) is approximately 4: 1 000 000. (1) Such a risk increases with patient age, comorbidities, complexity and emergency of the surgical procedure. Safety in anaesthesia has improved significantly in the last 30-40 years due to high quality training of medical professionals but also thanks to introducing standard monitoring which includes: electrocardiography- ECG, non-invasive blood pressure (NIBP), pulsoximetry (SpO2), capnometry (EtCO2) and other gases analysis, airway pressure, nerve stimulator, body temperature monitoring and maintaining (2). More invasive monitoring including urine output, arterial blood pressure, central venous pressure, cardiac output are to be introduced once need arises both from the nature of surgery or patient preconditioning.

Regional anaesthesia and specifically peripheral nerve blocks has been part of anaesthesia armamentarium equally to general anaesthesia. Its benefit and risk has to be tailored individually to patient need and potential complications such as systemic toxicity of local anaesthetics, malposition of needle with penetration of body cavities, organs, vessels causing pneumothorax, hematoma and other complications has to be considered.

Peripheral nerve injury after regional anaesthesia (RA) is a very rare event - more than 1:10 000 but less than 1:1000. Most reviews regardless of way of nerve identification claim incidents of 1:2500-5000 (3, 4, 5). For many years peripheral nerve blocks "always" worked in expert hands and failed in others and all the effort has been concentrated to localize the nerve structure using anatomical landmarks, paraesthesia, nerve stimulator and most recently ultrasound. Nerve injury are not life – threatening but may have debilitating consequences for the patients involved. Recent systematic review by Spencer et al. did not show that the numbers have changed in the era of ultrasound (6) and it has been further calculated that 70 000 patients per group would be required to show 50% reduction in such an incident. (7) Peripheral nerve stimulator available in every anaesthetic department has low sensitivity in identifying needle-to-nerve proximity yet it appears highly specific to detect intraneural placement at motor response of 0,2mA and less(8,9).

Pressure injection monitoring although in a contrary to a nerve stimulator lacks specificity has been shown to be very sensitive in detection of intraneural injection at the pressure $>$ 25psi.

In collaboration with Anatomy Department of SGUL (St George's University of London) we designed and conducted cadaver study which are soon to be published. We performed 30 intraneural and 30 extraneural injection in embalmed human cadavers hypothesising significant difference in pressure

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injection. We used 6 human cadavers donated for anatomical and medical investigation in accordance with the 2004 Human Tissue Act to Anatomy Department SGUL. All specimens were preserved with a mixture of phenol, glycerol, and ethanol. Such preservation allows tissues to remain close to an in vivo state. 10 median, 10 radial and 10 ulnar nerves were identified with ultrasound (M-Turbo system Sonosite - Fuji, Bothell, Washington, USA). Using in plane technique and 80 mm echogenic needle (80 mm 22 G Sonoplex, Pajunk, Melsungen, Germany) 1ml of 0,9% NaCl in 10 seconds (0,1ml/s) was injected and injection pressure in psi was recorded using CDS device (Controlled Disc Stimulation, Neurotherm, Middleton, MA, USA). Subsequently chosen cadavers were dissected to confirm intra or extraneural needle placement. For intraneural position macroscopic assessment did not allow differentiate needle placement in epineurium, perineurium, endoneurium or intrafascicular.

Our preliminary results confirm statistically important pressure difference between extra and intraneural injection. (Fig1)

Authors note – 1psi=51,7mmHg: All extraneural injections showed pressure lower than 10 psi and intraneural more than 25 psi for radial and median nerve but interestingly not for ulnar nerve where values were lower but difference still statistically significant.

Our findings are consistent with previous animal studies by Hadzic et.al (10) and more recently by Orebaugh et. al (11) on human unembalmed cadavers although in the latter not injection pressure but spread of dye after intraneural injection was primary aim of investigation and cervical root was the subject of investigation.

If we accept the evidence that pressure monitoring is valuable parameter to be used the question remain how it can be introduce in daily practice? Routine combination of all monitoring modalities if possible including **1. awake patient 2. ultrasound 3. nerve stimulator 4.injection pressure** has been suggested but not all can be always available or practical to use. (12) As 1,2,3 are relatively achievable in various combinations, 4 is not. It has been shown that operator subjective hand feeling is not reliable to determine injection pressure in artificial models. Moreover injection pressure at the same rate of injection, needle size and length has been different for different manufactures. (13,14) Siegmueller and Ramessur from our institution suggested to use intravenous infusion pump but it has never been tested in lab or clinically. (15)

An in-line manometer (Bsmart, Concert Medical LLC, Norwell, MA, USA) is commercially available in the USA but not in Europe (16). Connected between syringe and needle extension tube provides a visual reading of pressure throughout the injection (White= 1-15 psi, Yellow= 15-20 psi, Orange > 20 psi.) This or similar device should be available at low cost perhaps purchased together with needles. At present the cost is £7 (8.1Euro) which is comparable to the price of single needle.

Nerve injury after trauma might be as common as 30%, surgery up to 5%, general anaesthesia 0,1% and regional anaesthesia 0,04% respectively. (17) Would incidental episode of the latter in the sake of individual wellbeing justify implementing additional cost associated with routine use of pressure monitoring? Now when we know?

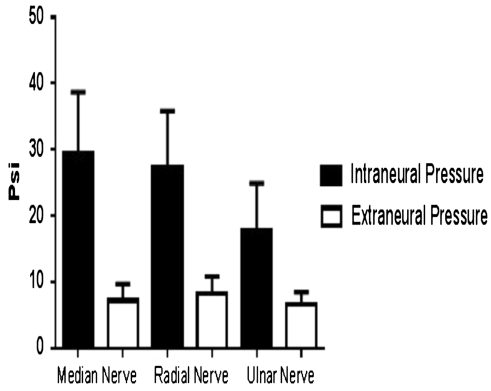

FIGURE 1. Bar graph showing the intraneural and extraneural pressure of the median, radial and ulnar nerves following injections of 1.0ml saline with a flow rate of 0.1ml/s using a 22G 80mm needle. The Data is statistically significant across all three nerves. The P values are median <0.01, Radial <0.002, Ulnar 0.16. (Paired t-test was used n=10).

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NERVE STIMULATORS AND NEEDLE TO NERVE PROXIMITY

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Abstract: Background: The introduction of ultrasound for nerve localization in peripheral regional anaesthesia led to important insights in our anatomical understanding of nerve structures, anatomical variations and nerve localization techniques we applied before the implementation of ultrasound.

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In particular, electrical nerve stimulation got "re-evaluated" when it was combined with sonography (1-4). Some authors observed that threshold currents for electrical nerve stimulation -which had been considered as safe so far- resulted in intraneural needle tip placement (1-4). Hence, our understanding of nerve stimulation got modified. Therefore, needle nerve proximity during needle placement got an important issue for experimental and clinical studies. On one hand it can be challenged whether the nerve stimulation technique, ultrasound or their combination may avoid needle nerve trauma. On the other hand it can be questioned whether conditions like needle nerve contact, nerve puncturing or intraneural injection of local anaesthetics – which should be commonly avoided- are really reflecting a nerve trauma resulting in nerve injury.

Correspondingly, we applied experimental studies in a pig model for regional anaesthesia to challenge several hypotheses regarding neede nerve proximity and potential outcome due to intraneural needle placement.

Study A, The current intensity does reliably discern needle-nerve contact from intraneural needle placement. Study B challenged the occurrence of motor response failure in a current threshold range of 0.1m A up to 2 mA. In Study C we hypothesized, that volutrauma due to intraneural injection results in nerve injury.

Methods: Study A, in six anaesthetized pigs, axillary brachial plexus and sciatic nerves were exposed surgically. An insulated stimulation needle connected to a nerve stimulator was placed either adjacent to nerve epineurium or intraneurally. As a control, further measurements were performed approx. 1mm distant to the nerve. Three arbitrary pulse duration settings were applied in a random fashion (0.1ms, 0.3ms or 1.0ms). With all stimulations, the initial current was 0.0mA. Subsequently, the current was increased until a minimal specific motor response was observed.

Study B, in five pigs the brachial plexus was exposed surgically during general anaesthesia. Selecting a predefined current intensity from 0.0 mA up to 2.0 mA in intervals of 0.1 mA, the needle tip was placed in steps of 1 mm close to a target nerve until an evoked motor response (EMR) was observed. Correspondingly, the minimal threshold current was noted. A total of 2100 needle placements was performed. Primary endpoint was the occurrence of failed motor response during nerve stimulation at each current interval. Secondary endpoints were the needle nerve distance at the minimal current threshold eliciting an EMR and the occurrence of needle nerve contact due to a predefined threshold intensity.

Study C, intraneural injection was applied in six anaesthesized pigs to a total of 36 plexus nerves in the axillary region. Either bupivacaine 0.5% (n=18) or Ringer solution (n=18) was applied. After 48 hours the nerves underwent histological examination (HE-, Kluver-Barrera-, Anti-CD68-staining). Signs of neuroinflammation, intraneural haematoma and myelin damage were evaluated using a histological score ranging from 0 (no lesion) to 4 (severe lesion).

Results: Study A, the minimal stimulating current (STC) required to elicit a motor response was recorded in a total of 900 needle position/current duration settings. There were no significant differences in the current intensity to elicit a motor response between extraneural [i.e. brachial plexus; median (25^{th} -75^{th} IQR); 0.1ms, 0.12 mA (0.08-0.18); 0.3ms, 0.10 mA (0.06-0.12); 1.0ms, 0.06 mA (0.04-0.10)] and intraneural needle placement [median (25^{th} -75^{th} IQR); 0.1 ms, 0.12mA (0.10-0.16); 0.3ms, 0.08mA (0.06-0.10); 1.0ms, 0.06mA (0.06-0.08)] or tested current durations. Control groups (1mm distant needle placement) needed significantly higher STCs than needle placement adjacent to nerve epineurium [i. e. brachial plexus; median (25^{th} -75^{th} IQR); 0.1ms: 0.28mA (0.26-0.32); 0.3ms: 0.20mA (0.16-0.22); 1.0ms: 0.12mA (0.10-0.14)].

Study B, a failure of EMR was observed in 82% of needle placements with a current intensity of 0.1 mA and 54% at 0.2 mA. In the range of 0.3 up to 1.0 mA the failure rate decreased to nearly 0%. In the range from 0.1 to 0.2mA a direct needle-tip to nerve contact (NNC) occurred in 92.5% (185/200) of needle placements. In this range NNC with EMR was noted in 60.5% whereas no motor response during NNC was observed in 32%. In the range between 0.3 mA and 0.5mA NNC was found in 64% (192/300). In three of 300 cases no EMR (1%) occurred. With current intensities of 0.6 mA up to 0.8mA the incidence of nerve contacts decreased to 30% (90/300). No EMR failures were observed with currents> 0.8 mA. The mean needle-tip to nerve distances ranged from 0.028±0.151mm for 0.1mA to 3.25 ±0.903mm for 2mA.

Study C, global statistical analysis showed significant nerve lesions in the interventional groups (bupivacaine 0.5%, Ringer solution) compared to the negative controls (p=0.022). Median score values of intraneural injection groups showed similar score values (median [25. -75. IQR]: Ringer solution 1 [0-2]; bupivacaine 0.5% 1 [1-1]; p=0.585). Myelin damage (Score value 4) occurred in 11.1% following intraneural injection.

Conclusion: We have demonstrated that electrical nerve stimulation is not able to distinguish extraneural direct needle-nerve contact from intraneural needle placement. However, motor response with STC < 0.2 mA was present only with needle-nerve contact or intraneural needle placement, and therefore may have a role as a sensitive monitor of needle position. Furthermore, we noted a failure of motor responses despite the application of electrical current during contact to the target nerve. Additionally we observed that stimulation failure depends on the applied current intensity. However, we assume that this technical phenomenon could result in further needle advancement despite existing needle nerve contact in a clinical setting. Considering our observations, we conclude that higher threshold currents ≥ 0.6 mA could reduce the likelihood of stimulation failure during nerve localization. Regarding histological assessment, intraneural injection may result in fascicular injury, reflected by myelin degeneration. Histological impairment occurred independently of the injected substance in the intraneural space. Hence, we conclude that rather the volutrauma than the local toxicity of a common local anesthetic like bupivacaine triggers nerve injury in case of intraneural placement. According to our results, we suggest that intraneural injection may be of crucial importance for the occurrence of nerve injury in clinical routine.

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CAN ULTRASOUND RELIABLY DETECT INTRANEURAL INJECTION

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Despite technological advancements in needle placement methods, including nerve stimulation and ultrasound, intraneural injection remains a concern for regional anesthesiologists. Intraneural injection has, in the past, been thought to be associated with peripheral nerve damage,[1] although recent studies challenge this idea.[2-4] The advent of ultrasound was thought to introduce a new level of safety to regional blocks: both the nerve and the needle could be visualized in real-time, and so, the needle could be guided into the perineural space without risking nerve injury. Of course, this has proven easier said than done.

Ability to avoid intraneural needle tip placement is influenced by both the ultrasound machine and the operator. The resolution of the image created by the ultrasound machine must be sufficient enough to allow visualization of the nerve and the needle tip. Ultrasound resolution is dependent on frequency and wavelength. The speed of sound through water is approximately 1540 m/s; therefore, at a frequency of 2.5 mHz, the wavelength will be about 0.3 mm, which should be enough resolution to differentiate perineural from intraneural needle tip placement but not enough to determine extrafascicular versus intrafascicular placement. Visibility of the needle tip is affected by several factors, including the alignment of the needle with respect to the ultrasound probe, whether the approach is in plane or out of plane, the angle of needle insertion, and whether the needle tip is in the viewing plane or not.

Operator experience also affects accuracy of needle insertion. More experienced operators will, on average, be more accurate when placing the needle

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tip compared to inexperienced users or trainees. Ultrasound can obviously assist in identifying needle-nerve position compared to blind or 'syringe-feel' insertion methods;[5] however, several studies have documented unintentional intraneural injection during a variety of ultrasound-guided blocks.[2;6-8] Although none of these studies revealed any incidence of peripheral nerve injury, they were likely underpowered to detect such a rare event. At least one case report documents a severe but transient neurologic sequela following ultrasound-guided interscalene block.[9]

Ultrasound can help visualize the needle and nerve and can assist in guiding the needle tip to the optimal location for injection of local anesthetic. In most cases, however, ultrasound cannot prevent intraneural injection. Indeed, when one can visualize nerve expansion upon injection, it is already too late. Careful observation of the ultrasound image combined with good needling technique should minimize the risks of intraneural injection and neurologic injury.

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URINARY RETENTION AFTER SPINAL ANESTHESIA

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Urinary retention after spinal anesthesia: There is a high incidence of micturition difficulties postoperatively and acute urinary retention can follow all types of anesthesia and operations. Many factors are associated with the etiology of postoperative urinary retention. In most cases a combination of many factors, including surgical trauma to the pelvic nerves or to the bladder, overdistention of the bladder by large quantities of fluids given intravenously, postoperative edema around the bladder neck, and pain- or anxiety-induced reflex spasm of the internal and external urethral sphincters may be involved. (Pertek and Haberer 1995, Tammela 1986). Urinary retention is more common after major surgery and with elderly male patients. After surgery opiates and confinement to bed may also be explanations for the development of urinary retention. The type of anesthetic and the management of postoperative pain may have little effect on the occurrence of postoperative urinary dysfunction (Pertek and Haberer 1995).

Even a single episode of bladder overdistention may result in significant morbidity. Overfilling of the bladder can stretch and damage the detrusor muscle, leading to atony of the bladder wall, so that recovery of micturition may not occur when the bladder is emptied. To avoid protracted postoperative bladder symptoms, careful supervision of bladder function is of great importance in patients receiving spinal anesthesia with long-acting anesthetics (Axelsson et al. 1985). Disturbances of micturition are common in the first 24 hours after spinal anesthesia. There is a higher frequency of these disturbances after longer acting local anesthetics like bupivacaine than lidocaine spinal anesthesia (Lanz and Grab 1992). The micturition reflex is very rapidly eliminated after administration of spinal anesthesia with bupivacaine. Detrusor muscle contraction is restored to normal 7 to 8 hours after the spinal injection. On average, patients recover enough motor function to be mobilized 1-2 h before the micturition reflex returns. Full skin sensibility is restored at the same time or slightly before patients are able to micturate. Patients at risk for urinary retention should be stimulated to void and provided a calm environment in which to do so. They should be encouraged to sit, stand or ambulate as soon as possible (Pertek and Haberer 1995). Ultrasound bladder volume calculation is an easy method for estimation of bladder volume (Dicuio et al. 2005). Ultrasound is cost effective and fast way to detect possible urinary retention non-invasively. However, the staff needs to be educated to the use of ultrasound. Expedient catheterization when needed and the prophylactic placement of indwelling catheters in patients with previous disturbances has been recommended (Lanz and Grab 1992, Pertek and Haberer 1995).

Outpatient surgery and urinary retention after spinal anesthesia: Small dose or unilateral spinal anesthesia is associated with smaller risk for urinary retention than conventional methods. In day case surgery, opioids are usually added to the spinal anesthetic. The reported frequency of urinary retention after intrathecal administration of opioids varies considerably. The risk for urinary retention is increased with higher doses of local anesthetics or opioids. Many high-risk patients undergoing major surgery who receive opioids intrathecally are usually catheterized prophylactically. On the other hand, 10-20μg fentanyl administered with small dose bupivacaine for day case surgery does not seem to increase the risk for urinary retention or prolong the discharge times (Kuusniemi et al 2000, Korhonen et al 2003, Jankowski et al 2003).

During the past few years, the home discharge criteria have been changed. All the patients must receive oral and written instructions before discharge when and where to contact in the case of inability to void. The routine requirement of voiding before discharge can be considered mandatory only for high-risk patients. These high-risk patients include those with preoperative difficulties in urinating, operation in the perineal area, older men etc. A follow-up phone call, where ability to void is specifically asked, is recommended for all the patients that are discharged before they have voided.

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PREVENTION AND MANAGEMENT OF BREAKTHROUGH PAIN

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Neuraxial anesthesia (epidural, spinal and combined spinal-epidural) is the most popular modality of anesthesia for cesarean delivery. It is preferred over general anesthesia primarily due to the lower incidence of potential hypoxic injury in mothers with difficult airway and avoidance of depressant actions of inhalational anesthetics via the fetus and uterus. Neuraxial techniques for C-Section can also be utilized for postoperative analgesia. However, one of the frequent complications of regional anesthesia (use of preexisting labor epidural or single shot spinal) in C-Section is the possibility of recurrent episodes of breakthrough pain during surgery. Pain during cesarean delivery under regional anesthesia may be distressing to the mother and also, as reported in American Society of Anesthesiologists' closed claims report, has been one of the most frequent causes for litigation.(2)

A meta-analysis on failed conversion of labor epidural analgesia to anesthesia for cesarean section found the incidence of use of general anesthesia in case of non-functioning neuraxial anesthesia to be approximately 7.7%, and successful use of inhalation and intravenous anesthesia during these cases is reported to be around 10.7%. (1) According to Royal College of Anesthesia, the failure rate of conversion should not be more than 3%. (3)

Several factors are responsible for the failure of conversion of labor epidural;

a). Number of top-ups of epidural catheter: higher number of top ups are associated with the failure of conversion. Several studies have reported that more than one (5) or two (4) clinician top ups are important risk factors.

b). Obesity: young obese patients are reported to be at higher risk for conversion of epidural analgesia for anesthesia. (6) Although high BMI was not found to be a significant factor in other studies. (4, 7) Maternal height was reported to be a risk factor; taller patients had increased incidence of failed conversion. (4)

c). The failure rate was reported to be high when the attending anesthesiologist for the cesarean section was not trained in obstetric anesthesia. The expertise and confidence of an obstetric anesthesiologist is thought to be a possible reason for low rate of conversion. (8)

d). Urgency of cesarean delivery: It was reported that failed conversion was higher in patients scheduled for emergency cesarean delivery. (10) However, during urgent cesarean section, the primary reason for failed conversion might be inadequate time to obtain adequate level after dosing the preexisting labor epidural catheter for surgical anesthesia.

e). Use of combined spinal-epidural analgesia: The use of combined spinal-epidural analgesia, instead of traditional epidural analgesia, has been reported to have more successful conversion (11). Also reported was that compared to CSE, epidural techniques had higher incidence of catheter replacement for poor analgesia (9). However, in a retrospective review, no significant difference was noted between these two groups (12). The successful use of CSE in cesarean delivery is often complicated by the fact that the efficacy of epidural catheter is difficult to test at the beginning of placement.

f). Duration of epidural analgesia: An increased chance of catheter displacement in patients with longer duration of epidural analgesia is thought to be one of the reasons of failed conversion. (8, 13).

Among all of these risk factors, increasing number of unintended boluses for epidural analgesia during labor, anesthesia for cesarean delivery provided by a non-obstetric anesthesiologist, and urgent cesarean delivery for fetal distress were noted to be the most important causes for failed conversion of labor analgesia to successful anesthesia for cesarean section. (1)

Several factors could be helpful in preventing or mitigating breakthrough pain during cesarean delivery. An informed discussion with the patient prior to placement of epidural, better communication with the obstetrician and nurses, frequent evaluation of the efficacy of the epidural catheter, prompt replacement of catheter in cases of repeated top ups, placement of prophylactic epidural catheter, use of anesthesiologists with experience in obstetric anesthesia, and use of proper local anesthetic solutions are all important factors to reduce the risk of failed conversion. (14)

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LOW DOSE CSE: TIPS AND TRICKS

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Advantages of using low-dose combined spinal-epidural (CSE) anaesthesia for cesarean section (CS) include improved haemodynamic stability, reduced nausea and vomiting and faster recovery from motor blockade when compared to using conventional intrathecal doses. [1,2] Despite these obvious benefits which have repeatedly been demonstrated in clinical trials the technique remains underused. The view being that the low-dose CSE is an anaesthetic of suboptimal quality and shorter duration. Consequently there is a fear of increased maternal discomfort and potential for litigation (in particular in the U.S. and UK).

A 2009 survey of obstetric anaesthetists in the U.S. found that only 11% were using a CSE technique for elective cesarean delivery, with the majority

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(85%) preferring the single shot spinal method. [3] The same year an editorial in Anesthesia and Analgesia expressed the view that low-dose CSE anaesthesia may not be optimal for all patients and institutions and is too unpredictable to be used routinely. [4] Instead the use of CSE or low-dose CSE has typically been reserved for patients with cardiovascular morbidity in which a haemodynamically stable anaesthetic is desirable. [5]

The most important criteria for choosing the optimal anaesthetic technique and drug dose are efficacy of the anaesthetic (onset, duration, spread) and occurrence (incidence and severity) of hypotension. [4] Opponents of low-dose CSE techniques will argue that the increased hypotension from conventional (and more efficacious) doses of intrathecal local anaesthetic can be counteracted with appropriate use of fluids and boluses or infusions of phenylephrine. However in the light of recent publications regarding the detrimental effects of phenylephrine on maternal cardiac output [6,7] it would seem prudent to avoid hypotension in the first instance if safely possible.

Low-dose CSE is the preferred method of anaesthesia for cesarean section at the University Hospital Gasthuisberg in Leuven, Belgium and the following pointers below have arisen from the institution's 15 years of practical experience and a prospective case series investigating outcomes in low-dose CSE in routine daily practice in over 200 patients in 2010/2011. [8,9,10] When used correctly, the incidence of intraoperative discomfort is comparable to that of conventional-dose methods.

Crucial to a successful low-dose CSE is accepting that using the epidural catheter is integral to the technique, be it for epidural volume expansion, perioperative supplementation to prevent block regression or for treating intraoperative discomfort via a top-up. [11]

Adequate training of the anaesthetist and preparation of the patient about expected sensations are key to success.

After the CSE procedure a steep trendelenburg position should be initiated until a complete bilateral sensory block to cold is achieved to at least dermatome T3. Epidural volume expansion (in trendelenburg position) may be required to extend the block to the T3 dermatome.

Note that the patient is unlikely to have a sensory block to light touch.

Hypotension can still occur and the blood pressure should be measured frequently and treated promptly. Co-loading with crystalloid or colloid is recommended.

Due to the shorter duration of a low-dose CSE the obstetricians should be available to start the cesarean section as soon as the patient is anaesthetised.

The obstetricians must be aware of the potential limitations of a low-dose CSE and appropriate communication with the anaesthetist and patient will be necessary in certain instances, e.g. when exteriorizing the uterus.

A low-dose CSE is shorter acting and the epidural should be topped up pre-emptively at 45 minutes post-CSE if the uterus is not yet closed.

Discomfort requires prompt treatment with epidural top-up (+/-; other agent e.g. opioid as per local protocol).

Preterm mothers may have a higher incidence of discomfort and an increase in the intrathecal dose may be necessary.

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PHANTOMS FOR USGRA

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Introduction: Ultrasound guidance has revolutionized the practice of peripheral nerve block for anaesthetists. Once the preserve of a few dedicated enthusiasts, referred to dismissively as 'the green needle brigade', peripheral nerve block has become a truly viable alliterative to general or neuraxial anaesthesia in the 21st century. In Ireland, the College of Anaesthetists has defined peripheral nerve block as a core clinical skill and has appointed a task force to advise on the creation of a curriculum to integrate ultrasound guided peripheral nerve block into the established specialist training programme. In principal this might seem like a fairly straight forward process: decide what the trainees need to know and teach it. In reality the design of a learner centered, proficiency based curriculum for peripheral nerve block is a complex high-stakes process which creates more questions than it delivers answers.

At the beginning: What is a peripheral nerve block? What is an ultrasound-guided peripheral nerve block? If you can answer these two questions, then please read no further. However think a little more carefully as to each of the components of an ultrasound-guided peripheral nerve block and you will then begin to grasp the complexity of this procedure that you may perform intuitively and instinctively several times each day. This is akin to asking: How did you drive to work today? There are a number of domains from basic knowledge, cognitive processing of received information, decision-making processes, procedural skills and technical execution of all of the above that is required to drive a motorcar on any journey from A to B safely. This is also true of USGPNB. Therefore the definition of the procedure 'Ultrasound-Guided Peripheral Nerve Block (USGPNB)' is the initial starting point in curriculum design.

At Cork University Hospital and University College Cork, Ireland, we have been busy asking that question and examining ways in which the complex procedure that is USGPNB can be broken down into component parts.

Competence based Knowledge Space Theory [1]: The challenge in developing such a procedure lies in defining each skill while taking account of the many factors which influence doctors' learning and performance. These include cognitive, motor, communication, and human (e.g. fatigue, anxiety and fear) factors. In other areas (including digital gaming and human resource management), an innovative theory, 'competence based knowledge space theory' (CbKST), has been successfully applied to enhance learning, assess competence and facilitate personalised learning. This theory is applied by developing a "problem set" designed to test all aspects of the practitioner's proficiency. The manner in which an individual practitioner copes with the various problems provides a profile of his/her competence at a point in time. This profile (described using mathematical formulae) can be used to judge / monitor a trainee's progress over time, to compare practitioner's performance with a standard and, importantly, provide detailed feedback to the clinician to facilitate "personalised" learning.

Hierarchical Task Analysis (HTA) [2]: HTA is a technique borrowed from industry which defines the end goal of a process in terms of a hierarchy

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of tasks and subtasks required to achieve the desired goal. To answer 'What is an ultrasound-guided axillary brachial plexus block (USgABPB)', HTA may be employed. HTA methodology facilitates task decomposition, including cognitive tasks, which would be carried out by an anaesthetist in performing USgABPB. Utilising this methodology USgABPB can be broken down into 257 discrete operations and sub-operations.

Errors and criticality [2]: It is obvious that novice/trainee anaesthetists do not behave or perform in a manner comparable with experienced or expert anaesthetists in the context of USGPNB. Again to use the driving analogy, learner driver behaviour differs significantly from that of experienced drivers and as such learners are more likely to make errors that lead to adverse consequences. Novice anaesthetists in the sphere of USGPNB are no different [2]. By identifying the common errors in novice behaviour observed during USgPNB, matching the HTA operation and ranking the error based upon their detectability and criticality, the curriculum design can be better informed as to what portion of the 257 discrete outputs from the HTA to focus upon. Systematic Human Error Reduction and Prediction Approach (SHERPA) and Failure Modes Effects and Criticality Analysis (FMECA) are two such error identification tools that we successfully applied to HTA outputs to identify the 'top 20' novice errors in USgABPB. (Table 1)

Metrics Assessment and Tracking: Once the error has been identified, it is now possible to define precisely how that error might be identified and appropriate metrics applied. For example the error with the highest criticality index in table 1 involves the forward advancement of the block needle without adequate visualisation of the needle using the needle in plane approach. This could be a simple yes/no with a pass/fail outcome: Did the trainee advance the needle when the needle tip and shaft were not visualised? Alternatively, with the design of needle tracking or video analysis it may be possible to determine the proportion of time during forward needle advancement the needle was actually visualised. This could then be matched to an expert derived proficiency score for direct comparison.

Definitions of Proficiency/Competency: Clinical competence might be defined as: 'The mastery of relevant knowledge and the acquisition of a range of relevant skills at a satisfactory level including interpersonal, clinical and technical components at a certain point of education…' [4]. Proficiency might be thought of as an extension of competency measured and determined over time. Therefore proficiency might be defined as: 'mastery of a specific behaviour or skill demonstrated by consistently superior performance, measured against established or popular standards.' [5] It is beyond the scope of this abstract to discuss the merits of a proficiency versus competency based model of medical training. It is however desirable, in designing a curriculum, to acknowledge that skill and knowledge decay over time may occur. This may then be addressed and remediated within the curricular structure.

Simulation and Clinical Training: Simulation has become an integral part of most postgraduate anaesthesia curriculae. Training in a simulated environment, novices can acquire skills in a setting whereby errors and critical events may occur in a consequence free fashion. This enables trainees to acquire the necessary experiential knowledge, cognitive processes, communication skills and procedural skills to deal with real life procedures and critical incidents. Procedural skills training in surgery and interventional radiology has evolved in the sphere of simulation. High fidelity virtual reality simulators are available to train high stakes procedural skills without patient contact. In many instances real-time assessment of trainee performance is possible in the simulated environment, thereby potentially offering a component of credentialling or performance certification.

USGPNB is ideally suited to teaching in a simulated environment. It has been demonstrated that novices learn best when removed from the pressures and time constraints of a busy operating list and when they have dedicated time and space for learning procedural skills. A simulator (currently available gel-based models, meat phantoms or future virtual reality high fidelity models) may fill the gap between initial skills acquisition, repetitive deliberate practice and skills mastery prior to engaging with patients.

The department of health and the national health service (UK) have recognised the need to modernise the manner in which healthcare professionals are trained. It is likely that simulation and simulated environments within the clinical arena will become commonplace in the near future [6].

Integrated Learning Management Systems: Learning management systems (LMS) have been integrated into simulators, and add to the versatility and individualised nature of the simulated training environment. Using a unique user log-in it is possible to track individual performance over time and across many domains of competence. The LMS can assimilate procedural performance derived metrics and provide user feedback. The use of integrated virtual patient environments enables the LMS to track trainee performance in any number of circumstances and allows a comprehensive assessment of overall clinical performance, not simply procedural proficiency, in the simulated environment.

Assessment methods: In the absence of sophisticated tools to track and score decision making processes, needle trajectory, visualisation and

TABLE 1. Top 20 Errors in Novice USgABPB

HTA Operation NUMBER	Error Description	Criticality Index
2.5.4.3.3.1.4	In the event that the needle is poorly or not visualised while advancing it towards the target, the anaesthetist continues the advance the needle	490
2.5.4.3.3.1.1	In advancing the needle under ultrasound guidance, the anaesthetist believes the needle tip is visible when in fact it is not	461
2.5.4.3.3.2.4.2	In using a small bolus of local anaesthetic to confirm the needle tip is in an appropriate location, the anaesthetist incorrectly identifies visual cues as appropriate when they are not	437
2.5.4.3.3.2.2	Prior to depositing a bolus of local anaesthetic, the anaesthetist believes the needle tip is visible when in fact it is not	432
2.1.6.2.2	In finding the best needle trajectory to perform the block, the anaesthetist fails to check the risk of the possible trajectory to cause neural/other injury or vascular puncture	404
2.5.4.3.3.2.4.3	In using a small bolus of local anaesthetic to confirm the needle tip is in an appropriate location, the anaesthetist checks for the presence of inappropriate visual cues but fails to recognise them when they occur	403
2.5.4.3.3.1.6	In attempting to optimize the image of a needle which is poor/lost, the anaesthetist moves needle rather than the probe	394
2.5.4.3.3.1.5	In attempting to manipulate the ultrasound probe to optimize the image of a needle which is poor/lost, the anaesthetist fails to note the cues provided by examining the orientation of probe and needle at the skin surface	382
2.5.4.3.3.2.2	Prior to depositing a bolus of local anaesthetic, the anaesthetist fails to confirm the needle tip is visualized	374
2.1.5.1.3	In confirming the anatomy of the vessels in the axilla, the anaesthetist fails identify all veins	336
2.5.5.1	Having deposited what is believed to be sufficient local anaesthetic, the anaesthetist fails to be vigilant of signs of CNS toxicity	269
2.5.4.3.3.1.1	In advancing the needle under ultrasound guidance, the anaesthetist fails to check that entire length of the needle (including the tip) is visible	269
2.5.4.3.4.1	Prior to depositing subsequent doses of local anaesthetic, the anaesthetist fails to aspirate the syringe at appropriate intervals	246
2.5.4.3.3.2.4.1	Prior to depositing local anaesthetic around the target nerve, the anaesthetist fails to administer a small test bolus to confirm the needle tip is in an appropriate location	234
2.1.6.1.3	In finding the best location to perform the block, the anaesthetist checks for the ability to visualise the blood vessels in the area but fails to identify all of the significant vessels	227
2.5.4.2.6.1	In attempting to advance the needle towards the target nerve, the anaesthetist is markedly inaccurate	222
2.1.6.3	In finding the best needle trajectory to perform the block, the anaesthetist fails to scan proposed needle trajectory with colour Doppler to identify unsuspected blood vessels	187
2.5.4.2.5	Prior to advancing the block needle the needle, the anaesthetist misaligns the needle trajectory and the scanning plane of the ultrasound probe	180
2.1.5.1.3	In confirming the anatomy of the vessels in the axilla, the anaesthetist fails to identify any veins	163
2.5.4.3.3.2.1	Prior to depositing a bolus of local anaesthetic, the anaesthetist fails to aspirate the syringe	112

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ultimately the site of local anaesthetic deposition, how might trainee performance be assessed? Traditionally, unstructured mentor-style observation has been employed. In this model the trainee will have intensive supervision for a period of time, until such time as they begin to display attributes and skills that please the mentor. Gradually the mentor withdraws from a supervisory role toward an advisory role and finally a consultative role. The process is usually unstructured, user dependent and open to very significant inter-rater observational bias.

Formative assessment models provide a more structured approach to trainee performance. Regular structured feedback sessions are planned along a predefined training period which allows the trainee to develop a sense of how they are performing. This 'metacognitive awareness' allows trainees develop reflective practice. Training outcomes and performance can be tracked over time. There are rating scales which have been used for research purposes to track individual performance over time, however their reliability is questionable given problems such as poor initial validation and limited inter-rated reliability [7].

Summative assessment or the end of term examination may be a convenient way to assess learning and provide a snapshot as to whether a trainee has attained a preordained standard. This may take the form of a OSCE-type scenario where the trainee, having completed the modular training in USGPNB, undertakes a multifaceted examination to determine adequacy of learning. The advantage of this approach is that a single assessment intervention will determine the quality of learning. However such high stakes examinations are seldom accurately reflective of real-world performance and therefore of limited external validity.

Recently, groups have focussed on PNB outcome data tracked using CUSUM scoring. CUSUM tracks successes and failures in processes over time and alerts to inappropriately high process failure rates. Unfortunately when applied to USGPNB the process outcome measured is block success or failure. Is there an appropriate or acceptable block failure rate? If so why are individual practitioners blocks failing where others don't? Within CUSUM there is no way to determine whether individual performance was 'satisfactory' or in adherence with best accepted standards. Therefore tracking performance with a blunt instrument such as CUSUM moves away from competency/proficiency based models. The danger in adopting such a tool is that performance metrics which may be used to improve the training environment, for both the individual and the collective, is lost.

The Curriculum Design and Delivery: The curriculum design for USGPNB might therefore incorporate the following elements:

- Cognitive, knowledge based elements
- Ultrasonography, physics, image interpretation/optimisation
- Clinical Anatomy
- Sonoanatomy
- Clinical Pharmacology
- Equipment
- Procedural/technical skills
- Ultrasonographic skills, manipulating the ultrasound machine
- Needle/ultrasound interaction
- Block performance
- Block assessment
- Communication skills
- Patient selection
- Pre-block interview/anxiolysis
- Staff/assistance interactions
- Patient interaction during and following block
- Human factors
- Managing personal stress
- avoidance of anxiety transfer from healthcare professional to patient
- Intra-operative OR environment management
- Provision of anxiolysis (non-pharmacological/pharmacological)

In Ireland it is planned to deliver this curriculum on a phased basis to trainees over the course of their 7 year specialist training programme in four distinct phases:

1. Foundation level

a). Core blocks to include Axillary Brachial Plexus, Femoral and Popliteal Sciatic
b). Delivered in a one day small group problem based setting outside of the teaching hospital.
c). Key cognitive and procedural elements covered

1. Intermediate Level 1

a). Core blocks as in the foundation course, practiced in the clinical arena under direct specialist supervision over a 2-4 week intensive module.
b). Formative structured assessment process to incorporate matched modular goals with proficiency as measured by modified global rating scale.

1. Intermediate Level 2

a). Extension of core blocks to incorporate more advanced techniques: interscalene/supraclavicular brachial plexus, thoracic paravertebral block, transversus abdominis plane block (non-exhaustive list)
b). Formative structured assessment process to incorporate matched modular goals with proficiency as measured by modified global rating scale.

1. Masters Level

a). designed for those who wish to pursue USGPNB as a sub-specialist interest. A fellowship level programme designed to allow the experienced practitioner opportunity to develop additional USGPNB skills and participate in clinical and educational/translational research.

Summary: The design and delivery of a comprehensive training process for USGPNB is tantalizingly close. New technology will play an increasingly important role in both training delivery and assessment of learning. Assembling the building blocks of an integrated USGPNB curriculum will facilitate the widespread use of PNB safely throughout the world.

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EPIDURAL SIMULATORS

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Epidural anesthesia is frequently used for pain relief during childbirth, for the treatment of acute and chronic pain or as a means to provide intra- and post-operative pain relief and is considered one of the best recognized and ubiquitous of regional anesthesia techniques. The incidence of complications associated with neuraxial blocks is low but persistent. Accidental dural puncture with an epidural needle introduced at lumbar spinal levels occurs in obstetric and non-obstetric patients (between 1.5% - 2.8%), which is more than the incidence of primary dural puncture (0.85%) seen after accidental dural punctures following thoracic epidural attempts.[1-5] Other complications

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include post-dural puncture headache, trauma to epidural blood vessels and neural tissue and incorrect delivery site of the anesthetic, with subsequently toxic reactions (following intravascular injections) or unexpected high upper sensory levels of neural blockade, and finally neurological complications. An increasingly popular technique in neuraxial anesthesia is the combined spinal-epidural technique. Incorrect catheter placement accounts for half of the failures leading to inadequate epidural anesthesia, while others experience suboptimal analgesia through a correctly positioned epidural catheter.

Failure rate of 27% for lumbar epidurals and 32% for thoracic epidurals have been reported,[5] while problems encountered during epidural anesthesia in obstetrics, ultimately resulted in a success rate of only 76%. Reasons for inadequate or failed epidural blockade include: 1) insufficient training/skills and lack of knowledge (anatomy, landmarks); 2) technical failures due to incorrect primary placement of epidural (preparation, equipment problems, identification technique, wrong puncture site, midline vs paramedian approach, depth of catheter insertion, catheter fixation); 3) management failure (incorrect position of patient, monitoring and follow-up); 4) incorrect local anesthetic solution (dose, volume, concentration of local anesthetics and adjuvants e.g. opioids, epinephrine); 5) secondary migration of epidural catheter after initial successful placement.

Traditionally, training in anesthesia, similar to other operating room specializations, has followed the apprenticeship model whereby residents in anesthesia are trained on actual patients, carefully watched by the supervision of an experienced anesthesiologist. Changing in the training structure and compliance with European Working Time Directive have created fewer opportunities for trainees to learn technical skills in work time. A novice trainee in anesthesia may require as many as 75 epidural insertion attempts to become fully proficient although to reach a success rate of 80% probably 100 epidurals seems to be the minimum. Such numbers could potentially be difficult to achieve within a defined training period. The costs and ethical questionability of current training has resulted in a groundswell for improvement through simulation and a shift away from practicing on patients due to reduced tolerance for medical error, increasing accountability of the medical profession and an increased emphasis on patient safety. Drawing parallels with the airline industry with its reputation for safety and lifetime learning, virtual reality simulation for anesthesia has gained increasing popularity. In the past epidural simulators have been described, using fruits and vegetables, to simple mechanical devices, to virtual reality models on a computer screen.

Actually, the medical industry provides us with more than 30 central neural blockade simulators, 16 of which are solely for epidurals, claiming to provide the trainee with a similar feel to the one encountered in theatre. The simulators are categorised into computer-based (more technologically advanced) and manikin-based (on physical models without any electrical or mechanical control) simulators.

Epidural needle insertion is essentially a blind procedure, based on the "loss-of-resistance techniques", first introduced by Dogliotti in 1933 or the less frequently used hanging-drop technique. The operator needs to visualise in their mind a three-dimensional anatomical image of bony structures, various tissue layers (skin, subcutaneous fat, supraspinous and interspinous ligaments, ligamentum flavum, epidural space and dura mater) using an epidural identification technique based on compression of either air or fluid. During this manoeuvre, the anesthesiologist tries to perceive which tissue layer the needle tip is passing through by feeling the resistance on the needle, a process known as 'haptic feedback'.

The insertion of an epidural needle consists of a complicated interaction of several forces: 1) each tissue has his unique viscosity, elasticity, density and frictional properties; 2) insertion method (needle inclination angle, paramedian or median approach speed of insertion and torque of the needle); 3) equipment properties (needle tip design, needle width, material, wall strength, and plunger resistance); and 4) obstruction of needle orifice with tissue. During the insertion of the epidural needle, the operator's thumb applies force onto the plunger of the syringe whilst concurrently the other hand applies limited guiding force onto the Tuohy hub, stabilizing the epidural needle at the same time.

The manikin-based epidural simulators or dummy models are made from plastic or rubber, are portable, easy to set up and use and have physically palpable anatomical landmarks. The 'Greengrocer Model' proposed by Leighton in 1980, is a simple simulator that consists of a foam block, representing the skin, subcutaneous tissue and ligamentum flavum. A hidden balloon represents the dural layers and its rupture is used to indicate a dural tap. As there is no bone, the needle will penetrate through at any angle or position. More recently, solid structures to represent the lumbar vertebrae and often a rubber spinal canal, filled with a liquid to mimic CSF, have been added. Some may use an audible "pop", followed by CSF leak if the Tuohy needle punctures the artificial dura mater. One of the most difficult aspects of epidural insertion is to teach the idea of the loss-of-resistance. Most advanced simulator users find this 'feel' disappointing and judge the ligamentum flavum as less thick. They also find that threading the epidural catheter was more challenging than usual. Recently, some unique features were incorporated, such as those that are amenable to ultrasound scanning, so that the internal structures can be viewed pre-puncture and an estimation can be made of the depth and location of the epidural space, in an attempt to achieve correct placement. Some newer manikin simulators provide the option of radiological X-ray screening to confirm needle placement, which can be useful for pain management.

The computer-based epidural simulators contain mechanical, electronic or computer properties, including haptic devices, computer control or virtual reality. The first mechanical simulator 'the epidural injection stimulator' was created by Daykin and Bacon in 1990 and is based on inserting a Tuohy needle through a spring-loaded device, creating frictional resistance forces, similar to those of tissues on a needle. At a certain depth, the needle triggers a solenoid valve to open, while saline escapes to mimic loss-of-resistance. It was even possible to measure the pressures exerted during insertion of the epidural. Later computer-controlled haptic epidural simulators were developed, displaying a 3D patient model with a vertebral column and a polygon model of the needle. The 3D patient model came from MRI scans of actual patients, while the haptic forces are based on data obtained during epidural insertions on canine and porcine cadavers. More recent several simulators were introduced featuring several more realistic options. Users of the latter rate the models as realistic in 50% regarding tactile feel, needle grip and loss-of-resistance, but were less satisfied with the quality of the model's skin.[6-8]

An ideal simulator should aim to recreate as far as possible the in vivo procedure. However, the difficulty is combining manikin and computer-based simulators. The following features seem to be essential: 1) a human-shaped physical form (containing palpable vertebrae with spinous processes); 2) ultrasound compatibility (visualisation of the inter-vertebral gap, ligamentum flavum and epidural space, especially useful in obese patients); 3) a real Tuohy needle; 4) a force feedback haptic device (automatically adjusted forces to give patient variation on weight, height and shape); 5) the availability of 3D virtual spine displayed on the monitor (showing the moving needle's position in real time); and 6) loss-of-resistance technique and solenoid valve with internal reservoir. Currently most simulators provide models for normal, elderly and obese patients. Ideal simulators should offer variations in patient body shape, height, weight, age and other patient measurements. BMI should be incorporated into the model. Manikins should be able to bend forward (to mimic spinal flexion to increase spacing between vertebrae) to give a greater level of realism than static epidural simulators. At least four common positions should be modelled (sitting, sitting with lumbar flexion, lateral decubitus and lateral decubitus with lumbar flexion). Recording the ideal insertion and playback option, voice input/output for interaction and control certainly would add to the high-end simulators. Finally, the real advantage of an ideal epidural simulator would be the structured assessment of the trainee's skill level and objective performance feedback. Incorporating a stressful environment (moving pregnant patient, the sound of a cardiotocograph, foetal heart beats, painful contractions, presence of partner and midwife) imitates the clinical reality employed in a similar way by the aviation industry, whereby the simulated flight cockpit gives a real sense of flying an actual plane in difficult weather conditions.

Additionally, there are limitations to the use of manikin-based and computer-based models, the haptic devices (precision scientific instruments that can exert forces and torques in three dimensions), the material used to mimic skin and other tissues, all of them having implications on costs (models and replacement parts), especially the high fidelity epidural simulator.

The insertion of an epidural needle is a complex procedure which relies almost entirely upon feeling the forces on the needle, while navigating from skin to epidural space through different ligaments (supraspinous, interspinous and ligamentum flavum), whereby the feel of the tissue layers (e.g. elasticity, toughness, texture), depth of the needle, and the ability of the tissue to support needle and syringe are evaluated constantly. Epidural simulators can benefit greatly from stereo-technology. Haptic devices are an ideal tool to help to reproduce needle forces and to identify the different

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layers during an epidural attempt. The application of engineering technology into biomedical procedures, such as epidural simulators, should help in making the epiduralist to stop before actually reaching the dura mater and as such avoiding accidental perforation of the dura mater. Ideal epidural simulators require features such as a palpable spine, the ability to accommodate for patient variation (scoliosis, morbid obesity), 3D graphics variation and an adjustable needle insertion point. Adequate training on a regular basis on a modern advanced epidural simulator using an adequate manikin models, is essential and will help alleviating the risks of epidural failures from inaccurate placement, thereby improving the safety of the epidural procedure. If applying medical engineering techniques to the epidural simulators, a higher degree of accuracy will be achieved, which in turn will improve patient safety, and maximize patient success.

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HAVE ADVANCES IN ULTRASOUND TECHNOLOGY IMPROVED OUR UNDERSTANDING AND DELIVERY OF RA FOR SHOULDER SURGERY?

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Introduction: In this lecture, I would like to consider the development of 'handheld' ultrasound technology and its effect on the delivery of regional anaesthesia for shoulder surgery.

Since handheld ultrasound imaging was introduced into mainstream clinical practice over ten years ago, we have witnessed worldwide a new 'golden age' of enthusiasm for regional anaesthesia using these techniques. This has manifested both clinically and in research output.

The first handheld devices delivered inferior image quality when compared to the mainstream larger ultrasound machines, and this meant that we could only visualise the larger nerves with confidence. Researchers soon demonstrated that the brachial plexus could be easily visualised using ultrasound[1].

Interscalene brachial plexus blocks provide effective analgesia following shoulder surgery[2], when applied as a single shot or continuous infusion[3]. Indeed, continuous infusions may improve outcome and shorten discharge times following major shoulder surgery[4-7]. The question researchers started to investigate was whether the use of ultrasound could improve the delivery of these successful techniques.

Descriptions were soon published describing imaging of the brachial plexus in the interscalene groove and subsequent placement of effective blocks under ultrasound-guidance. This was achieved by direct visualisation of the neural structures, needle insertion and subsequent local anaesthetic spread in real-time, when placing blocks for shoulder surgery[8]. Anaesthetists also soon recognised the utility of ultrasound in situations where nerve stimulation may not be suitable or provide the feedback required on nerve proximity[9-11].

Success: The question of whether ultrasound makes us more successful when placing local anaesthetic blocks is controversial[12]. Kapral, who was one of the early pioneers of ultrasound-guided techniques, suggested that it does. He recruited 160 patients scheduled for trauma-related upper limb surgery. He then assessed the success rates of surgical anaesthesia following interscalene brachial plexus blockade. He found significantly improved rates of 99% and 91% respectively, using ultrasound-guidance and peripheral nerve stimulation for placement[13]; although the motor response end-point used in this study was subsequently questioned as too distal[14]. Other workers have also demonstrated high success rates for ultrasound-guided interscalene block, for example Davies et al. reported 99% in a series of 200 blocks[15]. We must interpret these types of findings (usually reported by experts in using ultrasound) in the knowledge that interscalene blocks placed using anatomical landmarks and nerve stimulation as an end-point can reach success rates of 97% in expert hands[16].

We also have indirect evidence for improved accuracy when using ultrasound-guidance. There is little argument that ultrasound improves accuracy of needle tip placement when compared to a landmark technique[17, 18]. When placing interscalene blocks, Sinha noted that accurate placement of a stimulating needle into the interscalene groove using ultrasound-guidance in 61 patients scheduled for ambulatory shoulder surgery resulting in complete sensorimotor block in all patients, resulted in a stimulating threshold range of 0.14 - 1.7 mA, with a current ≤ 0.5 mA in only 42% of patients.

Success is operator dependent; and other workers using ultrasound-guidance have shown reduced needle passes but no differences in success rates or complications when placing interscalene blocks[19]. However, I believe Liu's findings actually demonstrate an important difference between the nerve stimulation and ultrasound-guided techniques. The number of needle passes was significantly lower using ultrasound. This demonstrates that we can now directly visualise target structures and are usually able to relatively painlessly (i.e. without stimulation) approach those structures efficiently and accurately (using less needle passes) in order to place our local anaesthetic. We can also do this in patients with difficult anatomy or in whom we may not be able to elicit a motor response either due to disease, age of the patient, trauma or because they already have had local anaesthetic deposited around their nerves[9-11].

Volume: Ultrasound-guidance has allowed regional anaesthetists to use lower volumes of local anaesthetic. There is evidence that we can successfully use lower volumes compared to other techniques during peripheral nerve blockade[20-24, 25]. This evidence is a reflection of the improved accuracy available to regional anaesthetists when using ultrasound-guidance. This provides real advantages in terms of safety (reduced volume) and efficacy (improved accuracy).

Safety: There is very little evidence regarding the relative safety of ultrasound-guidance compared to traditional nerve location techniques, nor is there likely to be; as the rates of complications due to the performance of regional anaesthesia are so low that demonstrating statistical differences between techniques is extremely problematic.

One would assume that ultrasound should make the delivery of regional anaesthesia safer, as we are guiding the needle to the target and injecting local anaesthetic under direct vision. Indeed, ultrasound is extremely sensitive for detecting intraneural injection[26, 27] and can also detect intravascular injection of local anaesthetic[28, 29]. With this in mind, one may conclude that ultrasound is the safest technique and indeed the gold standard for regional anaesthesia[30]. However there are a number of reports of inadvertent intraneural injection and/or complications occurring following needle-guidance with ultrasound[31-33], and studies looking at post-block complications may show little difference between nerve stimulator and ultrasound-guided nerve blocks[19].

Complications may occur due to operator error when performing ultrasound-guided blocks. If the needle tip and nerve are not observed at all times during block placement, then needle misplacement may occur, often leading to over-insertion of the needle. These errors will occur more frequently when learning ultrasound-guided regional anaesthesia[34]. A thorough knowledge of the anatomy of individual nerves and nerve plexuses and the ultrasound appearance of those structures (sonoanatomy) is also required before undertaking ultrasound-guidance; without this, the risk of needle malposition into a nerve or vessel may actually be greater than when using nerve stimulation[35].

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Nerves to avoid: Phrenic nerve blockade and resulting ipsilateral hemidiaphragmatic paralysis is a common side-effect following interscalene block. This may cause dyspnoea in a proportion of patients. The phrenic nerve can be visualised using ultrasound[36]. Workers have examined a lower (C7) injection point and lower injection volumes for interscalene block[37, 38]. They showed an encouraging reduction in the volumes required for successful analgesia following shoulder surgery and a reduced incidence of phrenic nerve paralysis. However, these studies were carried out in patients undergoing shoulder surgery under general anaesthesia; and it will be interesting to see if the results can be replicated in patients undergoing surgery under regional anaesthesia as a sole technique.

We may also identify the dorsal scapular and the long thoracic nerves passing through the substance of scalenus medius[39]. These nerves are under potential threat when performing an in-plane posterolateral to anteromedial interscalene approach through the middle scalene muscle (this is a popular example of an 'in-plane' ultrasound-guided needle approach[40]). Careful pre-scanning can be used to avoid contacting these structures. I scan for these nerves directly, prior to needle insertion, and always insert my needle cautiously through the muscle. Occasional contact with the nerves usually produces a parasthesia. I am not aware of any reports of damage to these nerves using this technique. One might argue that this ultrasound-guided approach creates this potential problem of contacting/damaging these nerves (by differing from the traditional Winnie approach), but I am more comfortable with the superficial nature of the needle trajectory across the neck, which is well away from the deeper, sensitive structures, which have been transgressed with occasional devastating consequences following 'traditional' interscalene brachial plexus blockade[41-43]. The approach is also posterior and inferior to the phrenic nerve (passing over the anterior scalene muscle), which has also been damaged with approaches using nerve stimulator-guidance[44].

Supraclavicular nerve block: Traditionally, interscalene brachial plexus blockade might have been achieved with 20-30 ml of local anaesthetic. The onset of ultrasound-guidance has allowed us to progressively reduce our volumes and still produce effective blockade of the upper roots of the brachial plexus[20], this may reduce the side effects and complications associated with the block. However, using these smaller volumes also probably reduces the incidence of blockade of the branches of the cervical plexus, and specifically for shoulder surgery, the supraclavicular nerve. This is the most inferior branch of the cervical plexus and supplies sensation to the skin over the cape of the shoulder and also some sensation to the clavicle and acromioclavicular joint. Identification and selective blockade of the supraclavicular nerve within the superficial cervical fascia using ultrasound is possible using small volumes of local anaesthetic[45]. Following identification of the nerve and its branches, I perform this block following interscalene blockade prior to arthroscopic shoulder procedures under regional anaesthesia alone. The block does not require a separate needle insertion (it is performed after withdrawal of the needle from the interscalene groove into the superficial cervical fascia), and in my experience, usually avoids blockade of the other more superior branches of the cervical plexus. In addition to producing anaesthesia to the cape of the shoulder, this block seems extremely effective in patients undergoing arthroscopic excision of the distal and of the clavicle under regional anaesthesia as the supraclavicular nerve supplies some sensation to the acromioclavicular joint.

Peripheral blocks for shoulder surgery: Suprascapular nerve block reduces morphine requirement, pain and nausea following arthroscopic shouder surgery[46]. It also provides better analgesia than intra-articular infiltration but is inferior to interscalene brachial plexus block[2]. Darcy described a combined blockade of the suprascapular and axillary nerves using landmarks and nerve stimulation in 2007. He recommended this as an alternative to interscalene block for post-operative analgesia following shoulder surgery[47].

Ultrasound-guidance can be used to block the suprascapular nerve[48 49]. The nerve can be traced using ultrasound as it exits the plexus and followed as it progresses distally, inferior to omohyoid. The nerve may also be seen running with the suprascapular artery as it enters the supraspinatus fossa via the suprascapular notch, deep to the suprascapular ligament.

Blockade of the axillary nerve using ultrasound has also recently been described and this may well prove to be a useful addition to suprascapular nerve block in patients undergoing shoulder surgery in whom an interscalene block is relatively contraindicated[50, 51].

Continuous interscalene blockade: The efficacy of continuous interscalene blockade has been demonstrated following shoulder surgery[4]. Perineural catheter insertion is often a difficult technique for regional anaesthetists to master and achieve a high degree of success. Ultrasound imaging enables us to place the catheter needle under direct vision[52], and then develop new needle approaches[53] and techniques to either detect the catheter position or to visualise it directly[54-56].

I find a convenient method is to first place local anaesthetic in the interscalene space around the nerve roots using a standard small block needle. I then place the catheter within its needle either underneath the C6 root or C5 root (depending on the fluid dilated space available) and then withdraw the needle over the catheter. I can usually visualise the catheter position (wiggling the catheter helps) and then optimally position the catheter by injecting fluid/agitated fluid/a small aliquot of air under direct vision (with or without Doppler).

Summary: I believe ultrasound has given us the opportunity to advance our knowledge of the anatomy of the interscalene brachial plexus. We have developed new superficial needle approaches to the plexus, as well as delivering regional anaesthesia for shoulder surgery that is safe, reliable and comfortable for our patients.

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HIP SURGERY – NEW LUMBOSACRAL TECHNIQUES

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Old and fragile patients suffering from cardiac comorbidity are often admitted for emergency hip surgery. Blockade of the lumbosacral plexus (LSP) is considered an alternative to general or spinal anesthesia due to presumed better hemodynamic stability and effective perioperative pain management without opioids.

The lumbar plexus (LP, L2-L4) innervates the hip via the femoral nerve and the obturator nerve. Another LP branch - the lateral femoral cutaneous nerve – sometimes has to be blocked separately for the surgical skin incision on the upper lateral thigh, when the nerve descends too proximal to be anesthetized by a LP block. The hip is also innervated by the sacral plexus (SP) via the lumbosacral trunk (LST) (L4-L5) and S1 supplying the superior gluteal nerve, the sciatic nerve, and sometimes the inferior gluteal nerve (1-3).

The LP is sandwiched between the anterior and posterior layers of the psoas major muscle (PMM) – the socalled psoas compartment (PC). The PMM is adherent to the vertebral bodies, intervertebral discs and transverse processes (TP) from T12 down to the TP L5. Below TP L5 the PMM deviates anterolaterally and creates an anatomical space between the ala sacrum posteriorly, the promontory medially, the iliac vessels anteriorly and the PMM anterolaterally. This space is enlarged by the lumbar lordosis and it contains the obturator nerve and the femoral nerve - after their exit from the PC - and the LST. The femoral nerve emerges at the lateral border of the PMM at the level of the TP L5. The obturator nerve descends between the PMM and the L5 vertebra. The LST descends medial to the obturator nerve and runs across the ala sacrum to join the rest of the SP in the pelvis between the piriformis muscle fascia and the presacral pelvic fascia (4).

The LP can be approached inside the PC using paresthesia, loss-of- resistance, electrical nerve stimulation (ENS), or ultrasound (US) guidance (5-14).

A new technique to block the LP guided by US alone was presented recently in a letter-to-the-editor (14). A curved array transducer is placed horisontally in the flank visualizing a characteristic pattern of a shamrock with three leaves (the TP L4 surrounded by the PMM, the quadratus lumborum muscle and the erector spinae muscle). In this position the hyperechoic branches of the LP are visible medially and posteriorly in the PMM allowing an in-plane US guided approach of the needle tip towards the target LP. The US technique may be combined with ENS.

Another new technique for blockade of the LP also produces blockade of the LST. This is the socalled SupraSacral Parallel Shift (SSPS) technique, which was also presented recently in a letter-to-the-editor (15). With this technique the block needle is inserted into the anatomical space behind the PMM and below the TP L5. A curved array probe (6-2 MHz) is parallel shifted medially along the iliac crest until the sacral bone comes into view. In this position the probe is rotated until both the upper margin of the sacral bone and the TP of the L5 vertebral body and the interspace between the two bony structures comes into view. This interspace contains the lumbosacral osteofibrotic tunnel bounded by the ala sacrum inferiorly, the TP L5 cranially, the fifth lumbar neural foramen medially, the lumbosacral ligament anteriorly, and the intertransverse ligament posteriorly. The lumbosacral ligament typically extends obliquely inferolateral from the TP L5 to the ala sacrum (16). The needle is inserted with a steep out of plane ultrasound guided approach perpendicular to the skin surface and advanced until it penetrates the lumbosacral ligament and a loss-of-resistance is obtained. 20 mL of ropivacaine 0.5% is injected with intermittent aspiration.

A third new technique can be used to block the SP with a parasacral approach guided by US alone or by US combined with ENS. This technique is called the ParaSacral Parallel Shift (PSPS) (17). The patient is placed in the lateral decubitus position with the side to be blocked facing upwards. The US transducer is aligned between the midpoint of the line connecting the posterior superior iliac spine with greater trochanter (GT) and the GT visualizing the characteristic sonographic hyperechoic iliac bone line. Then the transducer is parallel shifted inferomedially until it intersects the upper margin of the sciatic notch breaking the continuity of the iliac bone line. This is exactly where the SP exits the pelvis through the greater sciatic foramen. At this point the transducer is tilted in a slight caudad angle, allowing clear visualization of the flattened, hyperechoic sacral plexus that is located immediately beneath the triangular piriformis muscle. The needle is inserted with in-plane technique from the lateral end of the US transducer until the needle tip is in close proximity to the SP avoiding the medially located inferior gluteal vessels. It is possible to combine US with ENS for needle guidance.

The efficacy, safety and feasibility of providing anesthesia for hip surgery and postoperative analgesia with ultrasound-guided lumbosacral plexus blocks requires further studies.

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KNEE SURGERY - SAPHENOUS, ADDUCTOR CANAL, INFRAPATELLAR

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In relation to various types of knee surgery, it would be relatively easy to provide for sustained and effective post-operative pain management (PPM) using traditional regional anaesthetic techniques. Spinal or epidural catheters would be very effective indeed, but it would certainly not be seen as minimal invasive for many relative simple surgical procedures of the knee joint. It would also be possible and rather easy to perform ultrasound-guided (USG) nerve blocks of the sciatic nerve (SCN), the femoral nerve (FN) and the obturator nerve (ON) to provide for effective PPM, i.e. this would be true both for insertion of perineural catheters and for single shot nerve blocks. However, for many surgical procedures of the knee joint the degree of motor block resulting from such regional anaesthetic techniques would probably not be seen as a positive contributor even if the patients were without pain for a prolonged period of time. Early mobilization and accelerated patient programs would probably not benefit from a high degree of motor blockade, even if the patients were without pain. However, we have previously published results concerning the quadruple and quintuple nerve block combinations providing for surgical awake anaesthesia for elective knee arthroscopy (KA) and anterior cruciate ligament (ACL) reconstruction, where the femoral and the femoral+sciatic nerves are included in the block combinations, respectively (1). We were able to document that these ASA I-II patients were actually not significantly hindered in their ability to ambulate for the first 24-hours postoperatively. Having said that, it is the current trend to avoid or at least minimize the degree of motor block for many surgical procedures in the knee joint in relation to PPM.

Thus, there has been a general trend during the last 3-5 years to explore the possibilities for sensory nerve blocks in relation to knee surgery. This is highly understandable, since it would seem that the combination of sensory nerve blocks and early mobilization – hopefully with a significant reduction in the consumption of long lasting opioids – would be highly beneficial for the patients.

Local infiltration analgesia (LIA) techniques have also been much studied by many scientific groups in the last decade. It would probably be safe to say that the verdict is still out regarding the efficacy of these techniques – and also regarding which surgical procedures could possible benefit from such treatment.

This manuscript will concentrate on recent advances relative to regional anaesthetic techniques utilizing USG nerve blocks relative to surgical procedures such as elective knee arthroscopy (KA), total knee arthroplasty (TKA), and anterior cruciate ligament (ACL) reconstruction. We will also include current scientific investigations from our own scientific group.

Blockade of the saphenous nerve has attracted much attention in relation to effective PPM for various types of knee surgery, and this is not surprising since the saphenous nerve is the largest sensory branch from the femoral nerve. It runs in the adductor canal. In the proximal canal the saphenous nerve is lateral to the femoral artery. In the mid-adductor canal the saphenous nerve contributes to the subsartorial plexus that innervates the femoral artery. At the midcanal level it crosses anterior to the artery to become medial. In the distal canal it leaves the canal accompanied by the saphenous branch of the descending genicular artery. At the exit of the canal it delivers an infrapatellar branch crossing anterior to the knee from the medial side and contributing to the peripatellar plexus together with branches from the medial and intermediate femoral cutaneous nerves and the lateral cutaneous femoral nerve. The saphenous nerve penetrates the fascia lata and becomes subcutaneous between the tendons of the sartorius and gracilis muscles. It innervates the prepatellar skin. It accompanies the long saphenous vein along the medial border of the tibia. It splits in two branches. One runs anterior to the ankle and innervates the skin on the medial side of the foot with a variable endpoint. Sometimes all the way down to the metatarsophalangeal joint. The other branch continues along the medial border of the tibia to the medial ankle joint. The saphenous nerve innervates the periosteum of the tibia in the lower leg and that of the medial malleolus and the medial and ventral areas of the capsule of the ankle and sometimes also the medial part of the capsule of the talocalcaneonavicular joint.

The use of the adductor canal block (sometimes called the continuous saphenous nerve block) has been much investigated to provide for effective PPM particularly in relation to TKA (2-7). This brilliant technique requires for the insertion of a perineural catheter close to the saphenous nerve in the adductor canal. It is believed that in addition to a saphenous nerve block this technique may also result in a blockade of the genicular branch from the ON, posterior branch since MRI revealed spread of local anaesthetic to the distal part of the adductor canal (6). The positive results from these recent publications bodes well for the possible use of the adductor canal block for other surgical procedures such as elective KA and ACL reconstruction.

Another purely sensory nerve block has recently been described in relation to arthroscopy-assisted ACL reconstruction (8). In this study a selective USG block of the infrapatellar nerve (IPN) was performed. It was found that the proportion of patients with a pain score of higher than 3 (NRS 0-10) at rest was significantly lower postoperatively in patients receiving an IPN block.

At our department we are currently conducting three different prospective, randomized double-blind studies. In two of the three studies we investigate the efficacy of sensory nerve blockade (or at least with minimal motor block). In one study we compare a nerve block combination with a high degree of motor block with a nerve block combination that results in nearly purely sensory nerve blockade.

The first study includes 60 patients undergoing elective KA under general anaesthesia with propofol, remifentanil and a laryngeal mask airway. All patients are administered the standard 0.15 microg/kg sufentanil for postoperative PPM at the end of surgery. The patients are randomized to receive USG blocks of the saphenous nerve and the obturator nerve, posterior branch just after induction of the anaesthesia. These USG blocks are both single shot

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blocks selectively placed exactly at each nerve and do not rely on gradual spread of the local anaesthetic. Group 1 receive active USG blocks with ropivacaine 0.75% with 7.5 ml at the saphenous nerve and 7.5 mL at the obturator nerve, posterior branch. Group 2 receive placebo (saline) USG blocks at the same nerves. The blinding is ensured since the active blocks in Group 1 will only result in minimal motor blockade (part of the adductor magnus muscle). The primary outcome measure is pain assessment (NRS 0-10) at regular intervals postoperatively for the first 24 hours with the knee flexed 45 degrees (area under the curve). Pain assessment at rest, opioid consumption for 24 hours and LOS in the PACU are amongst the secondary outcome measures.

The second study includes 81 patients undergoing elective arthroscopic ACL reconstruction (using the hamstring tendon) under general anaesthesia with propofol, remifentanil and a laryngeal mask airway. All patients are administered the standard 0.2 microg/kg sufentanil for postoperative PPM at the end of surgery and 30 mg ketorolac. In addition, all patients are post-operatively connected to an electronic Patient Controlled Analgesia (PCA)–pump containing morphine 1 mg/mL. The patients are randomized to receive USG block combinations of the femoral nerve, the saphenous nerve and the obturator nerve, posterior branch just after induction of the anaesthesia. These USG blocks are all single shot blocks selectively placed exactly at each nerve and do not rely on gradual spread of the local anaesthetic. Group 1 receive active USG blocks with ropivacaine 0.75% with 10 ml at the femoral nerve and 10 mL at the obturator nerve, posterior branch. In this group the saphenous nerve receive a placebo block with 5 mL saline. Group 2 receive active USG blocks with ropivacaine 0.75% with 5 mL at the saphenous nerve and 10 mL at the obturator nerve, posterior branch. In this group the femoral nerve receive a placebo block with 10 mL saline. Group 3 receive only placebo (saline) USG blocks at all three nerves. The primary outcome measure is pain assessment (NRS 0-10) at rest at regular intervals postoperatively for the first 6 hours (area under the curve). Opioid consumption for 6 hours, opioid side effects, degree of quadriceps motor block and LOS in the PACU are amongst the secondary outcome measures.

The third and final study includes 75 patients undergoing elective and unilateral primary TKA under general anaesthesia with propofol, remifentanil and a laryngeal mask airway. All patients receive the standard oral premedication 2 hours prior to anaesthesia: 1 g paracetamol, 500 mg naproxen and 300 mg gabapentin. All patients are administered the standard 0.2 mg/kg morphine for postoperative PPM at the end of surgery. In addition, all patients are post-operatively connected to an electronic Patient Controlled Analgesia (PCA)–pump containing morphine 1 mg/mL. These patients do not receive LIA. The patients are randomized to receive USG block combinations of the saphenous nerve and the obturator nerve, posterior branch just after induction of the anaesthesia. These USG blocks are both single shot blocks selectively placed exactly at each nerve and do not rely on gradual spread of the local anaesthetic. Group 1 receive active USG blocks with ropivacaine 0.75% with 10 mL at the obturator nerve, posterior branch and 5 mL at the saphenous nerve. Group 2 receive an active USG block with ropivacaine 0.75% with 5 mL at the saphenous nerve but a placebo (saline) USG block with 10 mL at the obturator nerve, posterior branch. Group 3 receive only placebo (saline) USG blocks at both nerves. The primary outcome measure is pain assessment (NRS 0-10 at regular intervals postoperatively for the first 24 hours with the knee flexed 45 degrees (area under the curve). Pain assessment at rest, opioid consumption for 24 hours, opioid side effects, and LOS in the PACU are amongst the secondary outcome measures.

Some final and some preliminary result will be presented at the congress.

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Abstracts and Highlight Papers of the 32nd Annual European Society of Regional Anaesthesia & Pain Therapy (ESRA) Congress 2013

Best Free Papers

DOES DEXAMETHASONE AS ADJUVANT TO A POPLITEAL NERVE BLOCK ALLOW LOWERING THE CONCENTRATION OF ROPIVACAINE WITHOUT AFFECTING ONSET AND DURATION OF ANALGESIA: A DOUBLE-BLINDED RANDOMIZED TRIAL

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Purpose/Objective: Single shot sciatic nerve blockade (SSSNB) reduces pain after foot surgery, but the duration of analgesia is still limited. Previously, we demonstrated that adding dexamethasone (DXM) to ropivacaine significantly prolonged the postoperative pain-free interval of a SSSNB. This prospective, double-blinded, randomized trial (EudraCT n° 2012-005705-49) evaluates whether adding DXM to a SSSNB allows lowering the dose of localanesthetic without affecting quality of analgesia.

Materials and Methods: Fifty one patients were included. They were randomly allocated to one of two study groups: I) 30ml of ropivacaine 0.75% with DXM 5mg and II) 30ml of ropivacaine 0.50% with DXM 5mg. Time to first postoperative pain sensation was the primary endpoint. Secondary endpoints were: block onset time, time to first motor and sensory recuperation, time to full motor and sensory block regression. Kaplan-Meier survival analysis and Cox proportional hazard regression were used to compare both study groups.

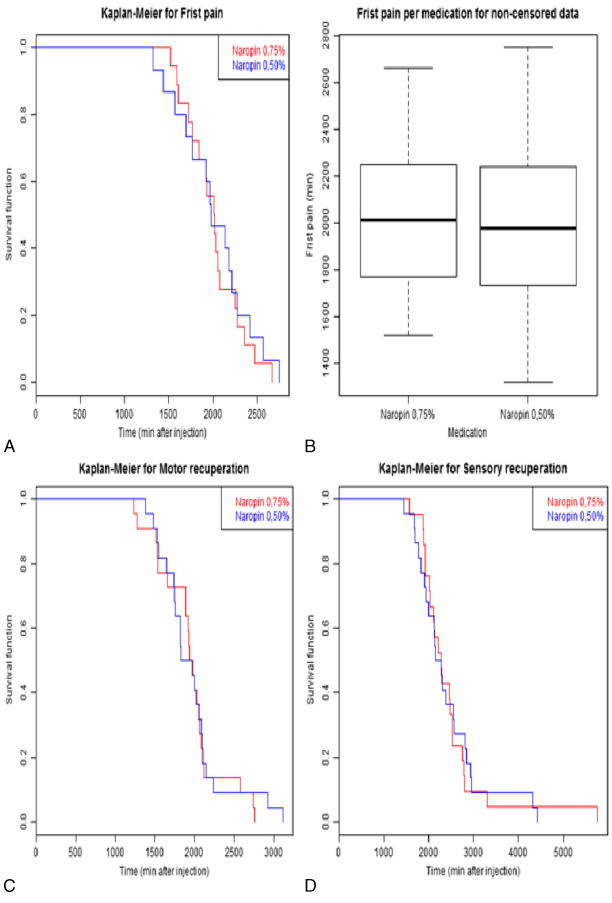

FIGURE 1.

Results: Two patients were excluded from analysis because of missing data. No differences in demographics or sensory block onset time were noted. Three patients had a failed block, but were analyzed based on intention-to-treat principles. Eleven patients (5 in group I and 6 in group II) reported never to have had postoperative pain. There was no significant difference in time to first pain, first motor and sensory recuperation, or time to complete resolution of motor and sensory blockade between the two groups (Figure 1, Table 1).

Conclusions: Adding DXM to a SSSNB allows lowering the concentration of local anesthetic without affecting quality of analgesia. No differences in motor block were observed.

TABLE 1.

	No pain (Total)	Time to first pain (min)	First sensory regression (min)	First motor regression (min)	Full motor regression (min)	Full sensory regression (min)
Ropi 0,75% + DXM	5 (25)	2012 (1840-2270)	1560 (1380-1755)	1558 (1475-1835)	1958 (1890-2090	2270 (2030-2745)
Ropi 0,50% + DXM	6 (24)	1980 (1770-2420)	1415 (1295-1575)	1565 (1415-1775)	1902 (1755-2100	2212 (2000-2820)
All groups	11(49)	2010 (1920-2215)	1500 (1380-1575)	1565 (1475-1710)	1955 (1830-2060	2270 (2105-2520)
P-value	0,936	0,66	0,13	0,40	0,78	0,92

KEEPING THE ENDOTHELIAL BARRIER TIGHT: ROPIVACAINE BLOCKS TNF-ALPHA-INDUCED ENDOTHELIAL CELL SRC ACTIVATION VIA INHIBITION OF PI3-KINASE/AKT/ENOS SIGNALLING

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Purpose/Objective: Amide-linked local anesthetics, such as ropivacaine, have been shown to attenuate lung inflammation. We hypothesized ropivacaine may attenuate inflammatory Src signalling and subsequent ICAM-1 and caveolin-1 phosphorylation via a disruption of the PI3K/Akt/NO pathway, thus blocking endothelial hyperpermeability.

Materials and Methods: Human lung microvascular endodthelial cells (HLMVEC) were incubated with TNFα for 20min in absence/presence of different concentrations of ropivacaine and analyzed by Western blot, probing for phosphorylation/activation of Src, ICAM-1, caveolin-1, Akt and endothelial NO synthase (eNOS). To evaluate recruitment of p85 subunit of PI3K to TNFR1, co-immunoprecipitation (co-IP) of TNFR1 with p85 from cell lysates was assessed after stimulation with TNFα in absence/presence of ropivacaine.

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NO production was measured in HLMVEC cell culture media after treating the cells with TNFa with/without ropivacaine for 1h. Transendothelial resistance (TER) of HLMVEC monolayers grown on gold-plated microelectrodes was measured over 6h following treatment with TNFα in absence/presence of ropivacaine.

Results: Ropivacaine (1nM-1μM) attenuated TNFα-induced Src activation by 54% (p=0.02) as well as subsequent ICAM-1 (45%, p=0.045) and caveolin-1 phosphorylation (38%, p=0.018). TNFα induced a 4-fold increase in co-IP of TNFR1 and PI3K-p85 which was decreased by 70% in presence of 1nM ropivacaine (p=0.005) resulting in diminished Akt 71%, p=0.008). TNFa-induced NO production was completely abolished by 1nM ropivacaine (p<0.001). TER measurements indicated TNFα-induced disruption of endothelial monolayers was reduced by 1μM ropivacaine (p=0.004).

Conclusions: Ropivacaine at clinically relevant concentrations blocked inflammatory Src signalling in endothelial cells by attenuating p85 recruitment to TNFR1, thus disrupting PI3K/Akt/eNOS signalling and attenuating endothelial hyperpermeability.

INJECTION PRESSURE MONITORING RELIABLY DETECTS NEEDLE-NERVE CONTACT DURING ULTRASOUND-GUIDED INTERSCALENE BRACHIAL PLEXUS BLOCK

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Purpose/Objective: Needle-nerve contact during peripheral nerve blockade (PNB) may lead to neurological injury.

This study evaluated the utility of injection pressure monitoring as a useful adjunct for detecting needle-nerve contact.

Materials and Methods: Sixteen adults scheduled for shoulder surgery under interscalene block (ISB) were recruited. A 22 G stimulating needle was sequentially placed under US at three locations from the nerve root: 1 mm away (Figure 1A), contacting with gentle displacement (Figure 1B), and disengagement to 1 mm away. The current (0.1 msec, 2 Hz) required to maintain motor response (MR) and the opening injection pressure (OIP) required to initiate an injection of 1 mL D5W were recorded using an electronic in-line manometer coupled to a computer and disposable injection pressure monitor. Injectate was administered via an automated infusion pump at 10 mL/min and aborted when OIP was ≥ 15 psi.

Results: Minimum current to maintain MR was significantly lower during needle-nerve contact compared to 1 mm away (0.29 ± 0.23 v. 0.61 ± 0.29, p<0.0001, 95% CI 0.17-0.47). A current of < 0.5 mA detected needle-nerve contact in 27 of the 36 (75%) needle-nerve contact instances while paresthesia only detected 10 (28%). OIP were < 15 psi in all but two injections 1 mm away (6%) (Figure 2A). In contrast, OIP ≥ 15 psi detected needle-nerve contact in all but one (97%) (Figure 2B, 3).

Conclusions: Sensitivity of electro-stimulation and paresthesia were 75% and 28% respectively, whereas the presence of OIP ≥ 15 psi reliably detected > 97% of the needle-nerve contact events.

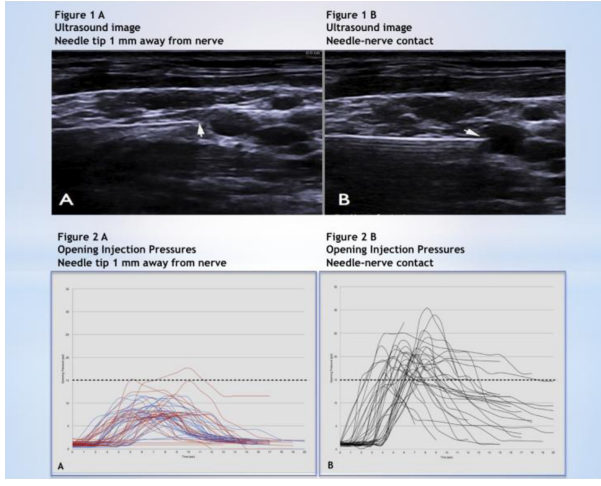

FIGURE 1.

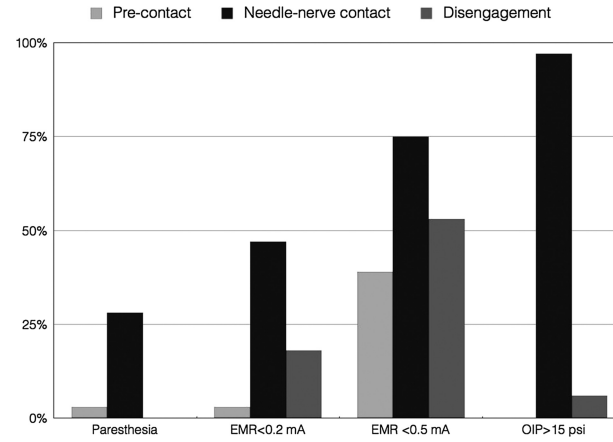

FIGURE 2.

USE OF COLOUR DOPPLER ULTRASOUND TO CONFIRM SACROILIAC JOINT INTRA-ARTICULAR INJECTION

S. Mishra[1], D. Harmon[1]. [1]*Anaesthesia Critical Care and Pain Medicine, Mid Western Regional Hospital, Limerick, Ireland.*

Purpose/Objective: Fluoroscopic guidance for intraarticular sacroiliac joint injection is considered the gold standard. Ultrasound guidance for sacroiliac joint has been reported. Ultasound guidence has advantages as it is cheaper and not associated with ionising radiation. We tried to prove the ablility of ultrasound to detect intra-articular injection, which never has been studied.

Materials and Methods: In a prospective study, 10 adult patients undergoing sacroiliac injection were studied. Needle placement was established in all patients using ultrasound or fluoroscopy guidance. Intra-articular injection was initally confirmed with fluoroscopy with 0.5ml non ionising contrast (Iohexol). Ultrasound colour doppler was then used to detect injection of 1.5ml of injectate(Triamcinalone 40mgs and 0.5 ml 0.25% L-Bupivacaine) intra-articularly. Colour doppler settings were optimised and standradised. Intra-articular injection was evident by colour doppler flow deep to hyperechoic bony cortex of sacrum,sacroiliac joint and ilium. Flow was also evident along the needle(22 G 10 cm Quincke needle) and absence of flow out side hyperechoic bony cortex. Fluoroscopy was used in all patient at end of injection to confirm placement remained intra-articular.

Results: In all the 10 patients, we were able to demostrate colour doppler flow deep to hyperechoic bony cotex of sacrum, sacroiliac joint and ilium.

Conclusions: Ultrasound colour doppler can be used to detect intra-articular sacroiliac joint injection.

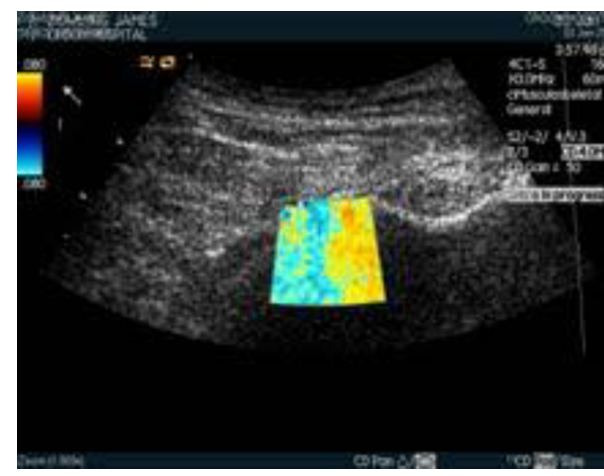

FIGURE 1.

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LEVEL OF INSERTION OF 22,150 SUBARACHNOID BLOCKS (SAB) IN OBSTETRICS AND NEUROLOGICAL SEQUELAE: EXPERIENCE FROM FOUR UK HOSPITALS OVER A SIX YEAR PERIOD

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Purpose/Objective: The UK 3rd National Audit Project(NAP3) in 2009 reported incidence of major complications from neuraxial blocks.[1] However the incidence of temporary neurologic deficits following obstetric intrathecal blocks was not evaluated. Furthermore, it is a concern that higher level spinal insertion risks conus damage.[2] We aimed to audit the incidence of higher spinal insertions and temporary neurologic sequelae in obstetric anaesthesia.

Materials and Methods: Data collected retrospectively between 2006–2012 from obstetric database and standardized follow up forms used in 1 tertiary centre and 3 District Hospitals. Obstetric procedures, number of spinals, CSEs, level of insertion, difficulty, experience of anaesthetists, neurological sequelae-permanent/reversible neuropathies, transient neurologic symptoms (TNS),cauda equine syndrome(CES); prolonged sensory/motor deficits; prolonged bladder/bowel disturbances were evaluated. Accidental dural punctures,PDPH and obstetric palsies were excluded from this study.

Results: The total number of SAB performed during this period was 22,150. Of these spinals: 85% and CSE: 15%.Trainees performed 10% of these insertions and consultant/staff anaesthetists 90%. 3,544 blocks were placed at or above $L_{2/3.}$ There were no permanent neurological injury (lasting more than 6 months) or spinal haematomas or infective complications in this audit.Temporary sequelae are as follows:

Level:	$L_{3/4}$	$L_{2/3}$	$L_{1/2}$
Sensory symptoms lasting 1-3wks	1	6	1
Sensory lasting 3wks-3months	0	2	0
Motor deficit lasting 1-3wks	0	3	0
TNS	0	3	1
Bladder dysfunction<1wk	0	2	0

Conclusions: Significant number of insertions were performed at higher levels.The incidence of temporary neurological dysfunction in this study (8.6:10,000) is comparable to previous published reports. However, most of these symptoms are in blocks performed higher than $L_{3/4}$ giving an incidence of 50.8:10,000 for blocks inserted at $L_{2/3}$ or higher.

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ULTRASOUND-GUIDED BILATERAL DUAL TAP BLOCK FOR LAPAROSCOPIC SURGERY DUE TO ACUTE APPENDICITIS – THE FIRST PROSPECTIVE RANDOMIZED AND DOUBLE-BLIND STUDY

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Purpose/Objective: Transversus abdominis plane (TAP) blockade for laparoscopic surgery due to acute appendicitis is not part of standard postoperative pain management (PPM). However, data extracted from the Danish Anaesthesia Database showed that a third of these patients needed opioids for PPM. The bilateral dual (BD) - TAP blockade combines the classical TAP block (lower abdomen) and the upper intercostal TAP block (epigastric area). We hypothesized that anaesthesia of the entire anterior abdominal wall (Th6-Th12) resulting from the BD-TAP block would benefit patients undergoing laparoscopic surgery with several port holes and CO_2-distention of the abdominal wall.

Materials and Methods: Following IRB approval 56 patients undergoing laparoscopic surgery due to acute appendicitis were randomized to receive either a BD-TAP blockade with ropivacaine 0.375% or isotonic saline. Blocks were performed after induction of general anaesthesia. Patients were all administered 0.2 mg/kg morphine intravenously and 15 ml carbocaine 2% in the surgical incisions as PPM. Primary outcome measure was pain assessment during mobilization using the numerical rating scale (NRS 0-10). Secondary outcome measures were pain assessment at rest, overall opioid consumption (patient controlled analgesia with morphine), length of stay in recovery and time to first mobilization.

Results: A pilot study of ten cases showed a significant reduction in postoperative pain score even in patients with a ruptured appendix. Additional outcome measures will be presented at ESRA.

Conclusions: The BD-TAP blockade could be a supplement to standard PPM after laparoscopic surgery thus minimizing pain and opioid consumption.

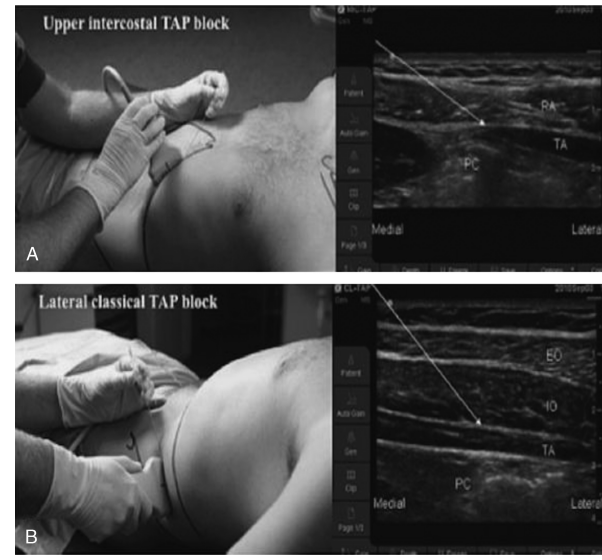

FIGURE 1.

DOES SPINAL CATHETERIZATION REDUCE THE INCIDENCE OF PDPH AFTER ADP IN OBSTETRIC PATIENTS? AN ANALYSIS OF 16 YEARS' EXPERIENCE

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Purpose/Objective: Accidental dural puncture (ADP) and post-dural puncture headache (PDPH) are important complications of obstetric regional anesthesia. Inserting the catheter intrathecally after ADP to prevent PDPH has gained popularity. Nonetheless, data on the effect of an intrathecal catheter on PDPH and epidural blood patch (EBP) rates are mixed.

Materials and Methods: Prospectively gathered anesthetic records of 28945 regional blocks performed between January 1997 and January 2013, were analyzed retrospectively. All patients who experienced a witnessed ADP or PDPH without ADP were identified. Different data were compared, including data from patients with or without a prolonged spinal catheter.

Results: There were 203 events of either witnessed ADP (n=126; 0.44%) or PDPH without recognized dural puncture (n=77; 0.26%). Following known ADP, 36 women had epidural catheter re-sited and 90 had an intrathecal catheter for at least 24 h. Sixty patients developed PDPH after observed ADP (48%).

No differences were seen in the incidence of PDPH after puncture with Tuohy needle and catheter, after epidural and CSE techniques and after 27- and 29-gauge pencil-point spinal needles.

Prolonged intrathecal catheter placement significantly reduced the risk of PDPH after ADP to 41% compared with 64% in those who have the catheter re-sited epidurally (χ^2=5.35: P=0.02).

Moreover, the need for epidural blood patch is also reduced in our series, from 56% to 36% (χ^2=4.24: P=0.0395).

Conclusions: The incidence of ADP, PDPH and blood patching is in line with previously published studies. After witnessed ADP, inserting the

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epidural catheter intrathecally significantly reduced the incidence of PDPH and blood patching.

ROPIVACAINE PLASMA LEVELS FOLLOWING LOCAL INFILTRATION ANALGESIA FOR TOTAL KNEE ARTHROPLASTY: A SUBSET ANALYSIS

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Purpose/Objective: Local infiltration analgesia is effective in early postoperative pain management following total knee arthroplasty (TKA), however safety concerns exist regarding high volumes (and correspondingly high doses) of local anaesthetic used. Aim was to analyse total and free plasma concentrations of ropivacaine and record toxicity following local infiltration analgesia in patients undergoing TKA.

Materials and Methods: Twenty patients over 65years undergoing elective TKA were recruited. During surgery 180ml of 2mg/ml ropivacaine was infiltrated into the operative site. A further 20ml of ropivacaine was injected into the knee via a catheter after wound closure. Venous blood samples were taken for total and free ropivacaine levels at baseline, 5, 10, 15, 20, 25, 30, 60 and 240 minutes following tourniquet release. Symptoms and signs of local anaesthetic toxicity were recorded in addition to continuous ECG monitoring. All patients gave written informed consent and ethical approval was granted.

Results: Cohort demographics: 65% female; mean age 72.5years; mean weight 76.6kg; mean BMI 28.9kg/m^2; ASA1 10%, ASA2 70%, ASA3 20%. From 179 samples free ropivacaine levels varied from 0.003–0.072μg/ml (mean 0.029μg/ml). Total levels varied from 0.141–2.896μg/ml (mean 1.187μg/ml). 15% of patients experienced blurred/double vision although all had plasma ropivacaine levels below those reported for toxicity. ECG monitoring showed sinus rhythm (except one patient with pre-existing atrial fibrillation).

Conclusions: Maximum tolerated venous plasma concentrations of total and free ropivacaine are 2.2μg/ml and 0.15μg/ml respectively. Free ropivacaine levels following local infiltration analgesia during TKA were below toxic levels. The local infiltration analgesia technique described is safe in elderly patients undergoing TKA.

POPLITEAL FOSSA SCIATIC NERVE BLOCK: EFFECTS OF SYSTEMIC OR LOCAL DEXAMETHASONE AS ADJUVANT TO ROPIVACAINE ON BLOCK DURATION

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Purpose/Objective: Sciatic nerve block (SNB) reduces postoperative pain after major foot and ankle surgery with minimal side ef-fects, but analgesia is limited to 24 hours. Hence perineural catheters or local anesthetics (LA) combined with adjuvants are used to extend block duration. Dexamethasone (DXM) used as adjuvant in brachial plexus blocks resulted in prolonged analgesia. Since IV steroids have been shown to produce analgesia, it was hypothesized that the analgesic effects of DXM in peripheral nerve blocks might be due to a systemic effect. This prospective, double-blinded, randomized trial compares the effect of IV or local DXM on duration of analgesia of a SNB.

Materials and Methods: After ethical Committee approval and written informed consent 41 patients were randomized to one of the two study groups. Group 1 received a single shot SNB with 30ml plain ropivacaine 0.75% and received DXM 10mg intravenous, group 2 received a single shot SNB with 30 ml ropivacaine 0.75% and DXM 5 mg. Time to first pain sensation (VAS > 3) was the primary study endpoint. Using Kaplan-Meier (K-M) survival analysis, block 'survival' times were evaluated.

Results: Demographics were comparable between the two groups. 3 patients were excluded because of missing data or protocol violation. The addition of DXM to a single shot SNB with plain ropivacaine significantly prolonged the duration of post-operative analgesia (time to first pain sensation) (p=0.012) compared to the IV-group.

Conclusions: The addition of DXM significantly prolonged the mean post-operative pain-free interval of a single shot SNB with ropivacaine as compared to a SNB in which IV DXM was given.

TABLE 1. Mean block time. Proportional increase with respect to systemic group in red.

Mean block Time (in minutes)	Time to first pain sensation	First sensory regression	First motor regression	Complete sensory regression	Complete motor regression
DXM systemic (n = 18)	1690	1154	1397	1897	1564
DXM local (n = 20)	2138 +27%	1435 +24%	1705 +22%	2052 +8%	1999 +28%
P-value*	0,012	0,024	0,007	0,759	0,007

*Kolmogorov-Smirnov analysis.

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Abstracts and Highlight Papers of the 32nd Annual European Society of Regional Anaesthesia & Pain Therapy (ESRA) Congress 2013

Free Communications

A PROSPECTIVE STUDY TO EVALUATE EFFICACY OF CELIAC PLEXUS NEUROLYSIS UNDER SONOGRAPHIC GUIDANCE FOR PAIN MANAGEMENT IN UPPER ABDOMINAL MALIGNANCY

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Purpose/Objective: Celiac plexus neurolysis(CPN) is adjunct modality to relieve intractable pain in upper abdominal malignancy. An anterior approach offers several advantages over posterior approach including shorter procedure time, less discomfort and lesser neurological complications. The use of CT and ultrasound allow accurate needle placement but CT guidance is expensive and time consuming. We report our experience with sonographic guided anterior approach in patients with upper abdominal malignancy in whom systemic analgesics were ineffective.

Materials and Methods: Fifteen patients with upper abdominal malignancy pain (VAS≥3) not responding to opioids were included. CPN was performed under sonographic guidance using Chiba needle advanced to preaortic zone above takeoff of celiac artery using thirty ml, 50% alcohol. The VAS scores, analgesic consumption, duration of complete (VAS 0) and partial (VAS 1–3) pain relief and complications were assessed at one hour, 24 hours, one week, one month, two month and three month intervals. Patients assessed quality of block as excellent, good, satisfactory or unsatisfactory.

Results: Mean VAS decreased from baseline 8.1±1 to 0.53±0.99 and 1±2.22 at first week and first month respectively. There was statistically significant decrease in mean pre-block VAS at 1st hour, 24th hour, 1st week, 1st, 2nd and 3rd month. Analgesic consumption was statistically significant at all time intervals. Eleven patients had complete pain relief for 71.6 days and four patients had partial relief for 35.5 days. Quality of block was excellent in eleven patients.

Conclusions: Sonographic CPN is safe, effective and quick. Use of doppler helps in real -time needle positioning in relation to celiac trunk.

OUTCOME AND COST-EFFECTIVENESS OF EPIDUROSCOPY IN THE TREATMENT OF FAILED BACK SURGERY SYNDROME

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Purpose/Objective: Spinal cord stimulation (SCS) is accepted as symptomatic treatment for failed back surgery (FBSS) with predominant radicular pain. The cost is, however, high. Epiduroscopy alleviates symptoms by removing epidural fibrosis, involved in the pathophysiology of FBSS. We calculated the cost-benefit ratio of performing epiduroscopy before SCS in a treatment algorithm for FBSS.

Materials and Methods: After obtaining written informed consent, patients suffering of FBSS with predominant radicular pain and eligible for SCS were first treated with epiduroscopy. Six months after the intervention, we determined global perceived effect (GPE) and the number of patients needing SCS.

Results: 38 patients were included over a 15 month period. 6 months after epiduroscopy 13 (34%), 3 (8%) and 22 (58%) patients had a GPE of >50%, 30-50% and 0% respectively. 18 patients (47%) required SCS after epiduroscopy. The calculated hospital, medical and hardware costs of SCS and epiduroscopy totaled 14.195€ and 990€ per patient respectively. The total cost of all epiduroscopies amounted to 37.620€ whil the total cost for SCS was 255.510€. If every patient received SCS immediately, instead of first having epiduroscopy, the cost of SCS would have totaled 539.419€. Therefore, the overall cost reduction is 246.280€.

Conclusions: Epiduroscopy resulted in favorable outcomes in 34% of patients afflicted with FBSS thereby reducing the use of SCS in this population and cutting the cost by almost 50%. These preliminary data suggest that epiduroscopy can be cost-effective in the treatment of FBSS. Further trials with long-term follow-up are needed to confirm these data.

MENSTRUAL CYCLE PHASE MODULATES PAIN-RELATED BRAIN'S FUNCTIONAL NETWORKS

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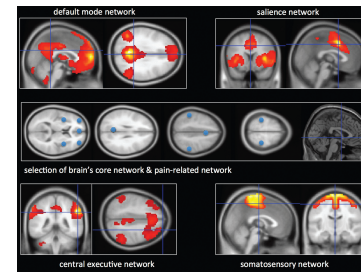
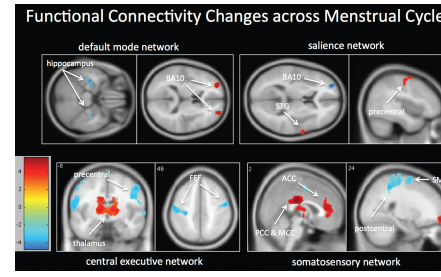
Purpose/Objective: The menstrual cycle or the levels of sex hormones have been reported to alter pain perception and the symptoms of chronic pain. Pathophysiologic mechanisms behind these influences are still unexplained. Recent studies have showed that aberrant functioning of brain core networks or somatosensory network might contribute to chronic pain. Hereby we used resting-state fMRI (rsfMRI) approach and observed the changes in functional connectivity for these pain-related networks across menstrual cycle.

Materials and Methods: Forty-eight healthy young female subjects with normal menstrual cycle were recruited. All subjects received rsfMRI scanning both in their menstrual phase and peri-ovulatory phase. Inter-regional correlations of MRI signal fluctuation were used to assess default-mode network(DMN), central executive network(CEN), salience network(SN), and sensori-motor network(SMN). The alterations of functional connectivity for these networks were elucidated by the comparison of the different menstrual phases.

Results: Functional connectivity of these pain-related networks was indeed influenced by different phases of the menstrual cycle. Functional connectivity changes of these networks involved both the intra-network and inter-network regions, especially the somatosensory cortex. Correlational analyses indicated that functional connectivity changes for these pain-related networks might be explained by varying estrogen levels.





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Conclusions: This study is the first report of dynamic changes of functional connectivity for pain-related networks during the menstrual cycle. The involved brain regions suggest that pain perception or general bodily awareness systems are most susceptible to menstrual cycle effects. These findings provide understanding sensory and emotional processing for pain in the brain across menstrual cycle.

CHRONIC PAIN AFTER THORACOTOMY: EVALUATION OF THREE TECHNIQUES OF ANALGESIA

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Purpose/Objective: Thoracotomy has the highest risk of severe chronic post-operative pain (incidence of 44–67%)(1). We evaluated the impact of three different analgesics techniques on the post-thoracotomy chronic pain.

Materials and Methods: 46 patients undergoing thoracotomy were included. Inclusion criteria were: ability to provide valid informed consent, absence of contraindications to epidural catheter placement. Epidural catheter was positioned between T6-T7. Patients were divided into three groups: Group A received a ropivacaine 0.3% 10 ml epidural bolus at least 20 minutes before surgical incision + paracetamol 1 gr iv (Multimodal-preempitive-analgesia), Group B was managed with ropivacaine 0.3% 10 ml epidural bolus at least 20 minutes before surgical incision (Preemptive-epidural-analgesia). Group C has not receive preemptive analgesia (Postoperative-analgesia). All patients received continuous epidural infusion of ropivacaine 1 mg/ml + morphine 12.5 µcg/ml via elastomeric pump for 48 hr, and only Group A paracetamol 1 gr iv every 8 hours. Patients were then contacted at 6 and 12 months to assess chronic pain by telephonic questionnaire (2). Chronic pain incidence at 6 and 12 months was evaluated with $\chi 2$ test. A $p < 0,05$ was considered statistically significant.

Results: Preoperative variables and type of surgical procedures were homogeneous among the three groups. The table shows the most important results:

	GROUP A (n = 16)	GROUP B (n= 15)	GRUPPO C (n= 15)
Chronic pain incidence at 6 months	25%*	26,6%*	66,6%*
Chronic pain incidence at 12 months	20%**	26,6%**	66,6%**
*A vs B p = 0,91; A vs C p= 0,019; B vs C p= 0,028			
**A vs B p= 0,66; A vs C p = 0,009; B vs C p= 0,028			

Conclusions: There is no clear indication (3–4) about the type of perioperative analgesia more effective to control chronic post-thoracotomy pain. Our study showed a lower incidence of chronic post-toracotomy pain in patients treated with preemptive-epidural-analgesia and the multimodal-preempitive-analgesia compared with patients that receveid postoperative-analgesia.

ACUPUNCTURE FOR TREATING LOW BACK PAIN: A MULTICENTRE, RANDOMIZED, SINGLE-BLIND, CONTROLLED CLINICAL TRIAL

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Purpose/Objective: The purpose of this study is to evaluate the effectiveness and safety of acupuncture for low back pain.

Materials and Methods: This study is a four-armed, randomized, patient-assessor blinded (to the type of acupuncture), controlled trial conducted from May 2011 to July 2012 in Kyung Hee Korean medical hospital and Kyung Won Korean medical hospital. Two hundred seventy-six participants with low back pain were assigned to 4 groups; IA (Individualized acupuncture group; according to pattern identification), SA (standard acupuncture group), Sham A (sham acupuncture group; using park sham needle), WG (waiting group). IA, SA and Sham A was treated twice per week for 6 weeks (a total of 12 sessions). The follow-up was in after the 6 and 12 times treatments with Visual Analogue Scale (VAS), Low back pain rating scale, 36-item short form health survey (SF-36).

Results: VAS score for the acupuncture groups (IA+SA) were significantly improved after 6 and 12 times treatments ($p<.05$) compared to the other groups. Low back pain rating scale and SF-36 total score for the acupuncture groups was significantly improved after 12 times treatments ($p<.05$) compared to the other groups. This tendency was also appeared when analysed IA and SA groups separately. Between IA and SA, all measurements for IA showed a greater effect after 12 times treatments than SA, but there is no statistical significance.

Conclusions: This study suggests that acupuncture can be applicable to improve symptoms in patients with low back pain. But further study is required to investigate whether and how much there are specific effect of individualization for acupuncture treatment.

INCIDENCE OF PERSISTENT PAIN AND OPIOID USE FOLLOWING TRAUMATIC MUSCULOSKELETAL INJURY: A PILOT STUDY

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Purpose/Objective: Traumatic musculoskeletal injury (TMsI) is a leading cause of morbidity worldwide. Many patients go on to have persistent pain after; however, the incidence of this pain or the types of pain management strategies are unknown. Thus, the aim of this ongoing pilot study is to examine the incidence of persistent pain and pain management over the course of rehabilitation following TMsI.

Materials and Methods: A prospective, longitudinal design was used to follow participants during hospitalization (T1) and at 3-months (T2) post TMsI. Participants provided demographic information, as well as measures of pain, pain management, disability, and psychological distress.

Results: A sample of 53 patients (67.9% male) with a mean age of 46.6 years (SD=19.22) and mean Injury Severity Score of 17.6 (SD=8.02) was collected. Attrition rate was 46% with n=34 completing T2 follow-up.

67.9% (n=36) and 33.3% (n=8) of patients reported pain scores 4≤ on the Brief Pain Inventory (BPI) at T1 and at T2, respectively. 98.1% (n=52) of patients required pharmacological pain management at TI; 90.6% (n=48) were managed with opioids and a multimodal pain regimen. At T2, 52.9% (n=18) of patients reported using some type of pain management. 26.4% (n=9) of all patients report using opioids at T2.

Conclusions: Preliminary results indicate a high incidence of pain following TMsI as well as a large proportion of patients who continue to use opioids chronically for pain control. There is a need for further research into the mechanisms for persistent pain within this patient population and the use of interventions targeting a reduction in pain severity.

ANALGESIC EFFICACY OF TRANSVERSUS ABDOMINIS PLANE BLOCK FOR LAPAROSCOPIC INGUINAL HERNIA REPAIR IN ADULT PATIENTS: A RANDOMIZED CONTROLLED TRIAL

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Purpose/Objective: Transversus abdominis plane (TAP) block anaesthetizes nerves of the anterior abdominal wall (T10 to L1), hence is used for lower abdominal surgeries, such as inguinal herniorrhaphy which can lead to acute as well as chronic pain. This study aimed to assess the efficacy of TAP block for relieving acute and chronic pain following laparoscopic hernia repair.

Materials and Methods: 70 ASA 1 and 2 patients undergoing laparoscopic hernia repair were included in the study. They were randomized into port site infiltration (control) and TAP block groups. Intra-operative analgesia was maintained with IV fentanyl boluses0.5mcg/kg and post operatively by PCA

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fentanyl (bolus 25mcg, lock out interval 10 mins) for the first 6 hrs. Pain was assessed using VAS (100mm) scale at 1, 2, 4, 6 and 24 hours and telephonically at 1 week and 3 months.

Results: The control and case groups were comparable with regard to demographic and surgical details. The VAS scores were significantly lower in the TAP group as compared to the control group at 1,2,6, 24 hours (P=0.0193, 0.0219, 0.0045, 0.0075 respectively) postoperatively together with a significant decrease in the postoperative fentanyl consumption. (P=0.046). There was however no significant difference observed in pain scores at 1 week (P=0.1150) or at 3 months (P=0.1065).

Conclusions: TAP block is effective in reducing the immediate post operative pain of hernia surgery, however the study is underpowered to conclude if it is effective in reducing the chronic pain due to the same.

VALIDATION OF AN IN-LINE INJECTION PRESSURE MONITOR USING A REFERENCE DIGITAL PRESSURE RECORDER

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Purpose/Objective: Injection pressure monitoring (IPM) has been suggested as a means to detect needle-nerve contact and/or intrafascicular injection. A disposable in-line IPM has been gaining acceptance as a clinical tool for injection monitoring. However, no study has validated its performance against a digital reference standard (DRS). In this study, we tested the accuracy of BSmart to detect needle-nerve contact using a DRS as a control in fresh human cadavers.

Materials and Methods: This study was approved by the IRB of KU Leuven, Belgium. Needles were inserted using US to contact and slightly displace the C5, C6, and C7 nerve roots in fresh frozen cadavers. Pressure was slowly applied manually to the syringe (20 mL) until spread of injectate was observed by a blinded investigator. Pressure data was recorded simultaneously with an in-line IPM (BSmart) and a digital pressure transducer (PendoTECH, Princeton, NJ) through a 150 cm low-compliance conduit (Lectro-Cath, Vygon, Ecouen, France) and 22 gauge blunt-tipped stimulating needle (Stimuplex-A, B Braun, Inc). Figure 1.

Results: Pressures reported by BSmart correlated well with recordings by the electronic transducer. The BSmart monitor displayed pressures through color-coded indicators (White: 1 to 15 psi; Yellow: 15 to 20 psi; and Red: >20 psi). BSmart detected all instances (100%) of opening injection pressure >20 psi recorded by the digital pressure transducer with needle-nerve contact. Table 1.

Conclusions: Under the conditions of our study, all attempted injections with needle-nerve contact in cadavers generated opening injection pressures >20 psi. BSmart accurately detected injection pressures > 20 psi in all instances.

INFORMED CONSENT FOR REGIONAL ANAESTHESIA- THE GREY AREA

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Purpose/Objective: Patients have a right to informed consent. Considerable confusion exists among anaesthetists regarding the requirements to achieve this, leading to wide interdepartmental and interpersonal variations in practice. When undertaking invasive techniques or those that carry significant risk, the AAGBI recommends that we record the consent process, noting what risks, benefits and alternatives are explained (1). We audited local practice in documentation of consent for peripheral and neuraxial blocks with the aim of improving and clarifying the consent process.

Materials and Methods: We reviewed 120 anaesthetic charts, looking at consent for peripheral upper limb, lower limb and subarachnoid blocks over a 2-week period in two audit cycles (2009, 2013). Consent stickers with pre-printed risks were introduced in 2009 to guide and unify the consent process. These were used as the audit standard.

Conclusions: Though more charts documented the consent process in 2013, we still fall short of the standard with many charts lacking any documentation of consent, and omission of certain risks from those that did. Introduction of consent stickers improved consistency, but were rarely used. Clear documentation formalizes the consent process, demonstrates respect for patients' right to informed consent, and may afford some protection in post hoc claims of lack of informed consent. Is it time to introduce a regional anaesthesia consent form to make this grey area crystal clear?

EFFECT OF SYRINGE SIZE ON INJECTION PRESSURES

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Purpose/Objective: High opening injection pressure (the pressure at which injectate is detected by US) has been consistently shown with intraneural injections, and may also be associated with needle-nerve contact. However, the reliability of opening injection pressure (OIP) monitoring to detect needle-nerve impingement may be affected by syringe size. We hypothesized that OIP is affected by the size of the syringe used for injection.

Materials and Methods: After Ethics Committee approval (KU Leuven, BE), 22 gauge 50 mm needles (Stimuplex-A, B Braun, Inc) were inserted under US to contact the C5, C6 and C7 nerve roots in fresh frozen human cadavers. Hand-held injections were performed bilaterally at each nerve root using 3 different syringe sizes (5, 10, 20 mL) at a rate commensurate with clinical practice. OIP data were acquired with an in-line digital pressure recorder using a 60 ml syringe (10 ml/min), and injection halted when spread was detected.

Results: A total of 48 injections were made. Pressures at which injection commenced are displayed in Table 1. OIP were similar regardless of syringe size ($p>0.05$) and method of injection (hand-held versus automated pump) ($p>0.05$).

Conclusions: Syringe sizes commonly used in clinical practice did not significantly affect monitoring of OIP. All injections with needle-nerve contact resulted in OIP > 20 psi, regardless of syringe size or method of injection. Our findings are thus consistent with the fluid mechanics described by Pascal's Law, where pressure exerted anywhere in a confined incompressible fluid system is transmitted equally throughout until the opening pressure is reached and injection begins.

THE INFLUENCE OF OBESITY AND/OR DIABETES ON AXILLARY BRACHIAL PLEXUS BLOCKS

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Purpose/Objective: The aim of this audit is to investigate the influence of diabetes (type I and type II) and/or obesity on the onset of axillary brachial plexus blocks.

Materials and Methods: All blocks would be performed by Samantha McColl using ultrasound and nerve stimulator. Drug mix of LA would always be a 50:50 mix of 0.75% Ropivacaine and 2% Xylocaine inc Adrenaline (1:200,000).

The volume of drug was up to a maximum of 30 mls.

Insertion time was measured from the initial insertion of the block needle, until the needle was removed at the end of the regional procedure. Immediately after, the stop clock was restarted to calculate the time for onset of a block suitable for hand surgery. The block was then tested at 5 minute intervals and measured as 'no block, partial block or fully blocked'.

The results from each patient would be recorded into a Microsoft excel spreadsheet.

Results: A total of 70 patients were included in this study, 48 patients were used as the control group, 12 patients were obese and 10 had diabetes.

Mean Block Insertion	Mean block insertion time (minutes)
Control	6.26
Obese	7.23
Diabetic	6.24

Time taken for onset	Mean block onset time (minutes)
Control	10.09
Obese	17.50
Diabetic	23

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Conclusions: Patients with diabetes and/or obesity take a longer time for the brachial plexus to become surgically blocked. The diabetic population on average took more than double the time than the non-diabetic population. Obese patients also took an average of 8 minutes longer than the control group to become surgically blocked.

AWAKE CRANIOTOMY: A CASE SERIES OF SCALP BLOCK COMBINATION WITH DEXMEDETOMIDIN IN DEEP BRAIN STIMULATION (DBS) PATIENTS

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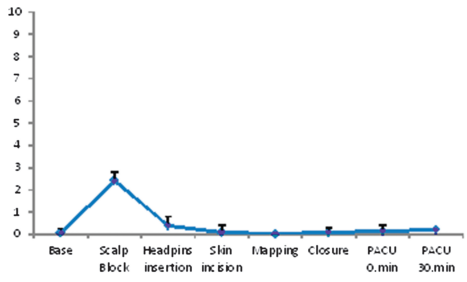
Purpose/Objective: In awake craniotomy, the anesthesists goal is to maintain hemodynamic stability, allow patients cortical mapping and maintain optimal analgesia and reduce physicophysical distress of the patients The objective of this case series are to show the feasibility of scalp block with dexmedetomidine in Deep Brain Stimulation (DBS) surgery.

Materials and Methods: After obtaining institutional ethical approval, the 32 DBS procedures between 1 May 2012 and 1 April 2013 in our center were reviewed. Intraoperative conscious sedation was achieved with a continuous infusion of dexmedetomidine (1 mcg /kg/ h) over 10 min before scalp block and maintained 0.2-0.7 mcg/kg/h if necessary. Scalp block was performed bilaterally (supratrochlear, supraorbital, zygomaticotemporal, auriculotemporal, great auricular, lesser occipital and greater occipital nerves) using marcaine 0.05% plus 1:200000 epinephrine. The DBS electrodes were placed through the burr hole under the guidance of cortical mapping (microelectrode stimulation test and macrostimulation test bilaterally). After the target nucleus was localized the patients underwent internalization of the DBS wires and pulse generator under general anesthesia. Intraoperative VAS scores of the patients and the patients' satisfaction of the procedure, was interviewed postoperatively.

Results: Patients data were summarized on Table1. The patients reported that the experience was entirely satisfactory without any intraoperative discomfort or pain.

Table 1:Patient's perioperative details.

	Mean ± SD
Age (yr)	57 ± 6
Sex (female/male)	17/32
Body mass index (kg/m^2)	24 ± 2
Duration of procedure (min)	212 ± 17
Total Dex Consumption (mcg)	55 ± 10
Patient Satisfaction Score	2.8 ± 0.6



Conclusions: Combination of scalp block with dexmedetomidine sedation provides safe, effective and a good patient tolerance for Parkinson surgery.

IN VITRO EXPOSURE TO LOCAL ANESTHETICS IMPAIRS HUMAN OSTEOBLASTS CELL GROWTH

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Purpose/Objective: It is an ongoing debate if local anesthetics (LA) impact on healing. Therefore we performed an in vitro study determining the growth of osteoblasts in the presence of LA.

Materials and Methods: Growing human fetal osteoblasts were exposed to lidocaine, bupivacaine or ropivacaine solutions at 0.3125 mg/ml or 1.25 mg/ml with continuous exposure (group 1) or exposure limited to 48 hrs, followed by incubation with medium only (group 2). The following assays were performed after 3, 6, 9 days: cell count (DNA quantification), viability (mitochondrial activity, MTT; mitochondrial permeability transition pore opening), proliferation (bromodeoxyuridine, BrdU,) and apoptosis (caspase-3) rate. Additionally, wound healing was visualized.

Results: Bupivacaine showed the largest negative effect when compared to others ($p<0.05$). In group 1 there was a significant dose- and time-dependent decrease in cell number, viability, proliferation and apoptosis rates for all three LA ($p<0.001$). In group 2 lidocaine and ropivacaine showed significantly less decrease in cell number and proliferation when compared to group 1 ($p < 0.05$), for bupivacaine only at low concentrations. Preliminary data reveal that mitochondrial permeability transition pore opening also relates to time/dosage exposure. Wound healing was significantly impaired with high concentrations of all LA ($p<0.001$).

Conclusions: These data suggest that application of LA may negatively affect osteoblast's growth by interfering with calcium and mitochondrial homeostasis. Limiting exposure to shorter periods and lower concentrations could weaken this side effect.

IMPACT OF PRO-INFLAMMATORY STATES ON CHRONIC POST-SURGICAL PAIN AFTER FAST-TRACK LAPAROSCOPIC COLECTOMY

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Purpose/Objective: The role of proinflammatory states in pain and chronic post-surgical pain (CPSP) is debated (Steyaert A, Curr Opin Anesthesiol 2012). We questioned the role of obesity and inflammatory bowel disease on the development of CPSP after fast-track laparoscopic colectomy.

Materials and Methods: After IRC approval, CPSP directly related to surgery was questioned by mailed questionnaire in patients who underwent surgery under standardized protocole (April 2007-December 2011). Pro-inflammatory parameters were recorded from patient's files: BMI, waist to hip ratio, presence of central obesity, neutrophil-lymphocyte ratio (NLR) which correlates with organ dysfunction (Cook E, Int J Surg 2007). Statistical analysis used unpaired t-test, Pearson's or Spearman rank order correlations, a P value < 0.05 was significant.

Results: 16 patients (11.5%) reported CPSP, median duration 18 months, average pain score 3.4 ± 3.6. CPSP was negatively correlated with BMI and waist to hip ratio (−0.39; $P<0.001$) and was weakly correlated with preoperative NLR (0.229; P=0.023). Inflammatory bowel disease did not correlate with the risk of CPSP (0.04; P=0.679).

	No CPSP(n=123)	CPSP (=16)	Pvalue
Inflammatory disease /tumor disease (n)	40 / 83	6 / 10	NS
BMI (kg/m^2)	25 (23 – 28)	22 (20 – 24)	0.001
Waist to hip ratio	0.98 (0.89 –1.05)	0.87 (0.81 –0.93)	0.005
Central obesity (n)	51 (41%)	5 (31%)	NS
Preoperative NLR	2.29 (1.70–3.35)	3.29 (2.28–5.64)	0.016
NLR at day 3	4.91 (3.31–7.23)	6.62 (4.44–13.88)	NS

Conclusions: Incidence of CPSP after fast-track laparoscopic colectomy is similar to that found after open surgery. Pro-inflammatory states including obesity do not seem to be a significant risk factor for CPSP after colectomy.

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POST-OPERATIVE PAIN AFTER TOTAL KNEE REPLACEMENT: A COMPARATIVE STUDY BETWEEN THREE ANALGESIC TECHNIQUES

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Purpose/Objective: Pain after total knee replacement (TKR) is a major concern, since it influences rehabilitation and patient satisfaction. Continuous Lumbar Epidural Analgesia and Peripheral Nerve Blocks are the most used analgesic techniques, however it remains unclear which one is the most effective.

The aim of our study was to compare the efficacy of three analgesic techniques after TKR: Continuous Epidural Analgesia (CEA), Continuous Femoral nerve block (CF) and Continuous Femoral nerve block combined with single shot Sciatic nerve block (CF + S).

Materials and Methods: 131 patients, ASA II and III, fulfilling the study criteria were randomized into three groups: CEA, CF and CF + S. All peripheral nerve blocks were executed under ultrasound guidance.

Mean VAS scores at rest and during movement were assessed at 24 and 48 hours after surgery and compared between groups, as well as side-effects and the need for rescue analgesia.

Results: We found no statistical differences in VAS scores between groups. The CF + S group needed less rescue analgesia than the other two, however this difference was not statistically significant.

Sensitive block was more common in the CF + S group, with no statistical significance. Side-effects as PONV and itching only occurred in the CEA group.

Conclusions: There were no statistical differences in post-operative pain between the three analgesic techniques. This means that ultrasound guided peripheral nerve blocks are a good alternative to epidural block, as they represent less invasive techniques with less potential side-effects and similar analgesic results after TKR surgery.

PROSPECTIVE OBSERVATIONAL STUDY OF PERINEURAL DEXAMETHASONE ADJUVANT FOR INTERSCALENE NERVE BLOCK

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Purpose/Objective: Interscalene block is a gold standard for analgesia following shoulder surgery. Concerns regarding continuous nerve catheter use in ambulatory setting make it impractical for current UK practice. Aim of our study was to assess patient experience on use of perineural dexamethasone as an alternative to nerve catheter for shoulder surgery of moderate to severe postoperative pain.

Materials and Methods: Prospective observational study comparing group 1 (n-21 levobupivacaine and dexamethasone) and group 2 (n-18 levobupivacaine alone). Follow-up telephone calls were made 48 hours after surgery to assess duration of analgesia, pain severity, patient acceptability and satisfaction. Groups were compared using t test, Mann Whitney U test and Chi square test.

Results: Overall there was high patient satisfaction and acceptability of the outcome in both the groups. Median duration of block in dexamethasone group was 30 hours (IQR 12) compared to 14 hours (IQR 12) for group 2 ($p<0.0001$). Duration of block correlated with the concentration of local anaesthetic used. Only 28% of patients had moderate to severe pain on first postoperative day in dexamethasone group compared to 67% for group 2 ($p=0.001$). Patients were not bothered by duration of motor block.

Conclusions: Our study results are similar to published results on perineural use of dexamethasone to prolong the duration of analgesia following nerve block. With good postoperative backup analgesia, overall patient satisfaction and acceptance were generally high. This strategy is a cost effective alternative to nerve catheters in clinical practice.

A NOVEL ADDUCTOR CANAL CATHETER INSERTION TECHNIQUE

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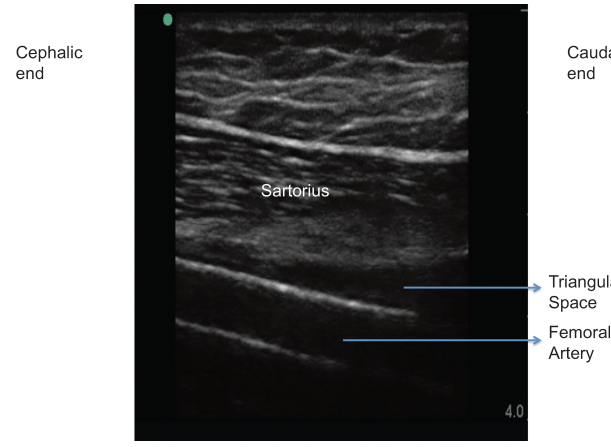
Purpose/Objective: The saphenous nerve blockade at adductor canal can provide analgesia for knee surgery with sparing of quadriceps strength. Pre-operative continuous catheter is not practical at lower third of thigh due to its close proximity to the surgical field. We describe a technique of performing continuous saphenous nerve block wherein the catheter insertion site is higher in thigh.

Materials and Methods: The ultrasound probe is placed in long axis to femoral artery. The probe is moved caudally until the artery is seen to dive deeper. At this location there is a triangular space between the sartorius and the artery. A long needle is inserted in-plane hydrodissecting the artery from the overlying connective tissue until the needle tip reaches the triangular space. A catheter can be inserted in this area for extended block.



Results: We have tried this technique of catheter insertion in three patients undergoing Anterior Cruciate Ligament repair with good success rate. Two patients had excellent analgesia with continuous peripheral nerve block catheter and were discharged home with an ambulatory pump with minimal motor blockade.

Conclusions: We have described a promising technique of providing continuous saphenous nerve blockage that produces minimal weakness of the quadriceps muscle. The catheter insertion site is away from the surgical field and can be performed preoperatively. The technique needs further evaluation to determine success rate, incidence and degree of motor weakness and complications.

SAFETY AND TOLERABILITY OF PATIENT-CONTROLLED FENTANYL IONTOPHORETIC TRANSDERMAL SYSTEM COMPARED TO MORPHINE IV PCA FOR POST-OPERATIVE PAIN MANAGEMENT: POOLED ANALYSIS OF 7 RANDOMIZED, CONTROLLED TRIALS

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Purpose/Objective: Moderate to severe postoperative pain often is managed using intravenous patient-controlled analgesia (IV PCA). In this analysis of pooled data, the safety and tolerability of the fentanyl iontophoretic transdermal system (ITS) was compared to morphine IV PCA.

Materials and Methods: Data were obtained from seven multicenter, randomized, controlled trials (N=3392), of which four studies compared fentanyl ITS to morphine IV PCA and three studies compared fentanyl ITS to placebo. These 7 pooled study comprised a total of 3392 patients who received fentanyl ITS (n=1763) or IV PCA morphine (n=1313) or placebo (n=316).

Results: The most common adverse events experienced by patients in either the fentanyl ITS group or the morphine IV PCA group frequently occur during postoperative opioid therapy. No patient in the fentanyl ITS group experienced clinically relevant respiratory depression, whereas five such incidents occurred in the morphine IV PCA group. Events that occurred significantly less frequently in the fentanyl ITS group compared to the morphine IV PCA group were hypotension (4.2% vs 6.6%; $p=0.022$), tachycardia (1.4% vs 2.8%, $p=0.042$), hypoventilation (0.9% vs 2.1%, $p=0.042$), pruritus (4.6% vs 8.5%, $p<0.001$), and urinary retention (1.6% vs 3.4%).

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Events that occurred less frequently in the morphine IV PCA group were back pain (p=0.039), headache (p=0.015), and application site reactions (p<0.001).
Conclusions: These pooled data represent the largest head-to-head comparison of safety of fentanyl versus morphine in the post-operative acute pain setting. Results suggest that fentanyl delivered by ITS has safety and tolerability advantages over IV PCA morphine.

SONOANATOMY OF THE "CERVICAL NERVES PATHWAY" RECOMMENDATIONS FOR ULTRASOUND-GUIDED REGIONAL ANAESTHESIA FOR CAROTID ENDARTERECTOMY

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Purpose/Objective: Cervical plexus block interventions with ultrasound technology can be divided into superficial, intermediate and profound. There is no recommendation for a puncture site with minimal risk, reduced local anaesthetic volume, optimal effectiveness and easy sonographic identification.
Materials and Methods: Cadaver axial cross-sectional images were analysed within 1mm slices. The track of the anterior nerve roots of the cervical nerves from the spinal cord to the Erb´s Point was followed. Nerves were coloured in each slice with a graphics-editing program and worked out as a consecutive sequence of image movies. The results of the cross sectional method were compared with special T2-weighted MRI sequences on a volunteer and our clinically established ultrasound regional anaesthesia technique on 350 cases.
Results: The anterior cervical nerve roots emerge laterally to longus colli and longus capitis muscles and medially to the medial scalene and levator scapulae muscles. After consecutive passage of root C2-C4 medially and dorsally of the sternocleidomastoid muscle, they run in a 5 mm thick layer of connective tissue. This layer is limited by the profound cervical fascia, by the carotid sheath and by the superficial cervical fascia.
Conclusions: There is an anatomically clearly defined limited space of connective tissue, where the cervical spinal nerves C2-C4 lie closely together: Our so-called 'Cervical Nerves Pathway'. A volume of approximately 20 ml at the level of C4 leads to a reliable 'C2-C4 Compartment Block' for carotid endarterectomy. A deep cervical blockade with an increased risk profile, should no longer be recommended as primary approach.

DIRECT PERCUTANEOUS GASTROSTOMY UNDER ULTRASOUND-GUIDED BILATERAL OBLIQUE SUBCOSTAL TRANSVERSUS ABDOMINIS PLANE BLOCK: A CASE SERIES

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Purpose/Objective: Monitored anaesthesia care or deep sedation are mandatory during endoscopic gastrostomy performed by the direct percutaneous technique. We tested the possibility that such procedure could be performed under ultrasound-guided bilateral oblique subcostal transversus abdominis plane (TAP) block and conscious sedation.
Materials and Methods: Study population was ten informed consent patient. Exclusion criteria were: age <18 years, BMI >30 and previous abdominal surgery. Peripheral intravenous access and routine monitoring was applied. An ultrasound-guided TAP block was performed injecting 20 ml of 0,5% ropivacaine each side according to multiple-injections technique described by Barringtone. Skin sensory block was evaluated 20 minutes after block placement. During the procedure, patients were given oxygen supplementation and, as discomfort-related by stomach manipulation, remifentanil 0.03 µg/kg/min was infused. If discomfort persisted, sedation with propofol was started.
Results: The most commonly dermatomal affected by the sensory block was T9 (10 out of 10), than T8 (8/10) T10 (4/10) and T7 (1/10). In all patients, sensory block extent fully overlapped the surgical incision site that was at T8 and T9 dermatomal level in 4 and 6 patients respectively. Oxygen saturation, blood pressure and pulse rate remained stable. No propofol sedation was needed, no complications were referred.
Conclusions: According to previous studies, oblique subcostal transversus abdominis plane block by multiple injection technique is confirm to be the technique of choice when the intercostal nerves above the umbilicus are the target. Our initial experience have demonstrated that the block could also play a role as an option in anaesthesia management of direct percutaneous gastrostomy.

NEEDLE TIP TRACKING USING FIBER OPTIC ULTRASOUND SENSORS

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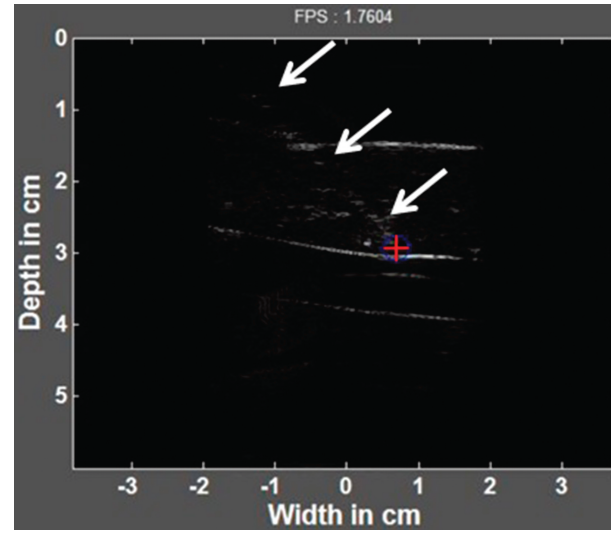
Purpose/Objective: Accurately and efficiently guiding a medical device (e.g. a needle or catheter) to a target in the human body is of critical importance during peripheral nerve blocks. With ultrasound imaging, determination of the position of the needle tip remains challenging in many contexts, even for experienced practitioners. Several methods for improving medical device guidance have been proposed, including mechanical needle guides, electromagnetic tracking, echogenic needles, and 3D ultrasound imaging, but challenges with needle tip identification remain. In this study, we present a new needle tip tracking method using fiber optic ultrasound sensors.
Materials and Methods: With the ultrasonic needle tip localization method, ultrasound pulses from an imaging probe at the surface of the patient are received with a miniature, fiber optic ultrasound sensor integrated into the needle. The needle tip position is calculated from the sensor signals and superimposed on the ultrasound image display in real-time. Tests of this method were conducted in water and in an anatomically-realistic ultrasound phantom.
Results: During in-plane needle insertions in the phantom, there was excellent agreement between the position of the needle tip as visualized on the image and that which was calculated using our method. The needle tip position could be calculated even with insertion angles greater than 70 degrees. The positional accuracy was greater than 1 mm.



Conclusions: The method presented in this study has strong potential to increase procedural efficiency and safety in a manner that is compatible with current clinical practice.

ULTRASOUND-GUIDED BLOCK OF THE SUPRASCAPULAR NERVE: A VOLUNTEER STUDY OF A NEW APPROACH

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Purpose/Objective: Current approaches for a suprascapular nerve (SSN) block are all anatomical landmark based techniques aiming at positioning the

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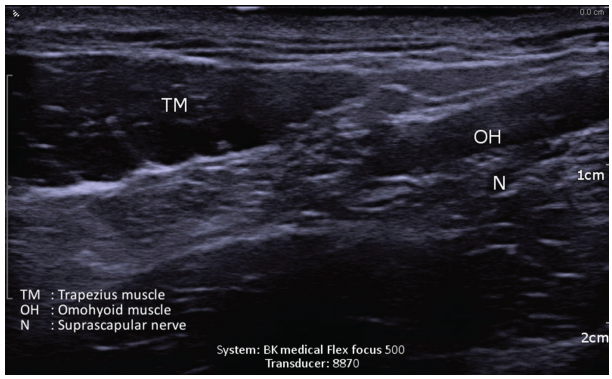
needle tip posterior to the suprascapular notch. However, a common characteristic for all methods is none or poor nerve visualization. Therefore, the aim of the present study was to perform an ultrasound-guided specific SSN block using a supraclavicular approach as described in a recent anatomical study.
Materials and Methods: The study was approved by the Danish ethical committees. Ten healthy volunteers were included. Using ultrasound, the SSN was visualized departing the superior trunk of the brachial plexus and followed as distal as possible. We placed the tip of a nerve stimulation needle in close proximity to the SSN using in-plane technique and injected 1ml of lidocaine 20mg/ml. Needle placement was aided by nerve stimulation. We assessed motor block of the SSN before, 15 and 30 minutes after performing the block.



Results: Seven volunteers demonstrated selective SSN block. One volunteer had block failure, and in two volunteers the procedure was aborted due to vaso-vagal episodes before injection. In all subjects the SSN was visualized in cross-section by ultrasound. There was no measurable affection of other branches from the brachial plexus in any of the volunteers.
Conclusions: We successfully visualized and selectively blocked the SSN proximal to the suprascapular notch. The omohyoid muscle with its distinct ultrasonographic appearance was a valuable landmark. The potential clinical role of this new approach remains to be determined.

SAPHENUS NERVE BLOCK AND SCIATIC NERVE BLOCK IN THE PERIOPERATIVE PAIN MANAGEMENT FOR ARTHROSCOPIC ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

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Purpose/Objective: Anterior cruciate ligament reconstruction is one of the most frequent arthroscopic procedures and also one of the most painful. Majority of patients are young and healthy, expecting rapid recovery and early mobilization. Optimizing pain control in such patients is quite challenging. We aimed to provide an optimal pain control with focus on procedural anatomy by blocking two relevant nerves using low dose local anesthetic.
Materials and Methods: We included 100 patients (ASA I) undergoing arthroscopic anterior cruciate ligament reconstruction. Ethical committee approval was obtained. Patients were randomized in two groups: group A (n=50) received preoperative blockade (ultrasound-guided) of saphenous and sciatic nerve with the same dose of local anesthetic mixture : 0.375% levobupivacaine and 4 mg dexamethasone, combined with unilateral spinal anesthesia. Group B received only unilateral spinal anesthesia (our standard approach for this procedure), followed by tramadol and metamizole intravenously for postoperative analgesia. We measured intraoperative and postoperative pain control using visual analogue scale (VAS), as well as postoperative nausea, iv fluid intake, early mobilization and patient satisfaction.
Results: Intraoperative VAS was similar in both groups. Postoperative VAS was significantly lower in A group compared to group B. Early mobilization was found to be worse in group B as well as nausea and patient satisfaction scores. Greater iv fluid intake was found in group B, while group A could take fluid orally.
Conclusions: The use of peripheral nerve blocks in orthopedic surgery should be a mainstay of perioperative pain control. We found this technique and dosage optimal for this and similar procedures.

MAGNETIC RESONANCE IMAGE FUSION IN ULTRASOUND GUIDED REGIONAL ANAESTHESIA

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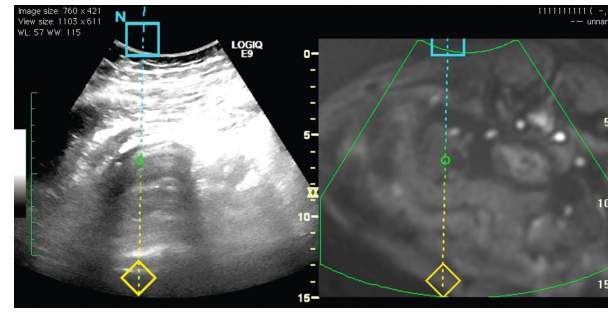
Purpose/Objective: Real time dynamic image fusion of ultrasound and magnetic resonance imaging (MRI) has never been applied in ultrasound guided regional anaesthesia (UGRA).[1] We aim to explore the feasibility of ultrasound/MR image fusion guided lumbosacral plexus blockade.[2]
Materials and Methods: Previously acquired supine MRI datasets of a healthy volunteer were uploaded in an advanced ultrasound system (Logiq E9, GE, USA). We applied an electromagnetic field across the prone lumbosacral region bedside with a transmitter and sensors mounted on the ultrasound probe, allowing dynamic real time tracking of the position and the orientation of the ultrasound probe and merging of the ultrasound images with the MRI datasets by lock of coinciding anatomical planes and points. We used advanced electronic needle tip tracking.
Results: We successfully imaged the lumbosacral plexus with ultrasound/MR image fusion and applied needle tip tracking in ultrasound/MR image fusion guided lumbosacral plexus blockade in one volunteer.



Conclusions: We conclude that application of real time ultrasound/MR image fusion, allowing accurate nerve targeting, in UGRA is feasible. In perspective, ultrasound/MR image fusion guided lumbosacral plexus blockade may provide a safe and effective alternative to general and spinal anaesthesia and opioid-free analgesia in fragile hip surgery patients.

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AUDIT OF PAEDIATRIC EPIDURAL ANALGESIA OVER A TEN YEAR PERIOD

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Purpose/Objective: The purpose of this audit is to document the various indications, effectiveness (including the patients and parents satisfaction survey) and finally to review the incidence of complications following the Epidural insertion.
Materials and Methods: This is a retrospective Single-center audit conducted over a 10-yr period (2002-2012).The children university hospital, temple street is a tertiary center at which various surgical operations are performed.

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The center has two dedicated pain nurses, an acute pain medicine and a chronic pain specialist. The data were stored electronically over this period.

Results: Over the 10-year period three hundred and twenty six epidurals were performed in our center. Children between the ages of over 6 months to 15 years were given epidural analgesia for procedures ranging from corrective osteotomies, limb amputations, pyeloplasty, thoracotomy, and few general surgical procedures. Most of the epidurals were performed by skilled clinician in the field. The epidural provided excellent analgesia as revealed by the pain score as documented by the nurses at the receiving wards.

We found no infective complications at the site of insertion or the epidural space. Going by the pain score,the incidence of moderate-severe pain was 15% and 3% for severe pain 24 hours after surgery. Less than 1% were converted to systemic opioid due to continuing pain. Ninety-four percent of the parents questioned were satisfied with the excellent analgesia received by their children.

Conclusions: Epidural analgesia provides excellent pain relief as found from this 10-year audit at our center,with low complication rate.Despite the lack of controlled studies in children, the combination of excellent pain relief associated with minimal side-effects provides high patient and parent satisfaction when compared with other methods of analgesia.

OCULOCARDIAC REFLEX AS A PREDICTIVE SIGN OF POST-OPERATIVE NAUSEA AND VOMITING FOLLOWING STRABISMUS SURGERY IN CHILDREN

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Purpose/Objective: The quoted incidence of postoperative nausea and vomiting (PONV) following strabismus surgery in children can be as high as 88%[1] with up to 30% admission rate[2]. In our prospective, non-randomised study we tested a hypothesis if oculo-cardiac reflex (OCR) can be used to predict PONV following strabismus surgery in children.

Materials and Methods: After the approval of the regional research and ethics committee (Ref: 08/H1203/84) and parents/guardians informed written consent, we conducted this study. Using data from a previous study by Allen el al[3] a 65% incidence OCR is assumed. With a power of 80% and a significance level alpha = 0.05, a total of 88 patients would be needed to detect a difference between 47.1% of OCR patients with POV and 17.9% of non-OCR patients with POV, using a chi-square.

Eighty eight ASA I, II patients were included while patients with known allergy to any of the agents used or those for re-do procedure were excluded.

Anaesthetic and monitoring technique were standard.

Data regarding PONV during the hospital stay were collected from the nursing documentation and postoperative visit.

TABLE (1). Demographic data.

Gender (N/%)	Male	39 (44%)
	Female	46 (56%)
Age (years)	Median	6
	Range	2–16
Weight (Kg)	Mean	23.5
	SD	10.3

TABLE (2). Relation between OCR and PONV (number of patients):

OCR	No PONV	PONV	Total
No	9	3	12
Yes	70	6	76
Total	79	9	88

Conclusions: Our results showed that with the use of standard antiemetic prophylaxis, the incidence of PONV after strabismus surgery was low. OCR cannot be used to predict PONV in children and hence the use of more than one antiemetic is not justified.

ANALGESIC EFFICACY OF CAUDAL DEXAMETHASONE ADDED TO ROPIVACAINE IN CHILDREN UNDERGOING ORCHIOPEXY

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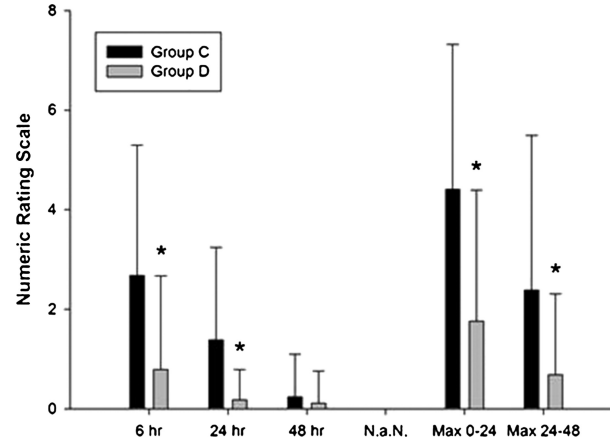
Purpose/Objective: Animal and preliminary human studies have shown the analgesic efficacy of dexamethasone added to local anesthetics. The aim of the study was to demonstrate the analgesic efficacy of caudal dexamethasone added to ropivacaine in children undergoing orchiopexy.

Materials and Methods: After approval of Institutional Review Board of Severance hospital, total 80 children aged between 6 months and 5 years undergoing orchiopexy were randomly allocated to either group C or group D. For caudal block, group C received 1.5 mL/kg of 0.15% ropivacaine and group D received 0.1 mg/kg of dexamethasone diluted in 1.5 mL/kg of 0.15% ropivacaine. For postoperative 48 hrs, pain scores and consumption of oral analgesics (ibuprofen) were assessed.

Results: Demographic data and profiles related to anesthesia and surgery were comparable between the two groups. Pain scores at various time points were significantly lower in group D than in group C (Figure). Consumption of oral analgesics during 48 hrs after surgery was also significantly lesser in group D than in group C (Table).



	Group C	Group D	P value
Number of patients who required oral analgesics	20 (54.1%)	11 (28.9%)	0.027
Time to 1st oral analgesic administration (min)	439 (354–689)	617 (500–825)	0.072
Number of oral analgesic administrations during postoperative 48 hrs			0.013
0	17 (46%)	27 (71.1%)	
1	11 (29.7%)	10 (26.3%)	
2	3 (8,1%)	1 (2.63%)	
3 and more	6 (16.2%)	0 (0%)	

Conclusions: Caudal analgesia with dexamethasone added to ropivacaine could provide superior analgesia compared to ropivacaine alone in children undergoing orchiopexy.

MINIMUM ALVEOLAR CONCENTRATION OF DESFLURANE WITH CAUDAL ANALGESIA FOR LARYNGEAL MASK AIRWAY REMOVAL IN ANESTHETIZED CHILDREN

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Purpose/Objective: Regional blocks have been shown to decrease the requirement of anesthetic agents. This study was conducted to determine the optimal end-tidal concentrations of desflurane for removal of LMA in children in presence of caudal block.

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Materials and Methods: Ethics clearance number (MS/1251/Deptt/2102) under the chairmanship of Dr SK Jindal 22 children of ASA status I between the age group of 2–10 year undergoing infraumbilical surgery were recruited. General anesthesia was induced with sevoflurane and oxygen given via mask and LMA inserted. Caudal injection of bupivacaine 0.25%, 1mL·kg-1 was administered according to Armitage regimen. Desflurane was used for maintenance of anesthesia. Pre decided end tidal concentration of desflurane was maintained for 10minutes at the end of surgery and LMA removed. Target concentration in the next patient was thereafter determined by the Dixon up-down method (with 0.5% as a step size). 5% end-tidal concentration was kept as the starting concentration. If removal of LMA was not associated with any coughing, teeth clenching, gross purposeful movement, breath holding or laryngospasm, during or within 1 min after removal, it was considered as successful.
Results: In the presence of caudal analgesia, end tidal concentration of desflurane required for successful LMA removal in 50% (ED50) children was 3.39±0.38 by Dixon's method.
Conclusions: LMA can be safely removed in 50% of anesthetized children without coughing, moving, or any other airway complications at an end tidal desflurane concentration of 3.4% in the presence of caudal analgesia.

SURVEY OF OBSTETRIC EPIDURAL ANAESTHETIC DRUGS AND DOSES IN SCOTLAND

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Purpose/Objective: Epidural services are widely available in maternity units across Scotland. However, choice of drugs for obstetric epidurals vary widely among anaesthetists. We have explored these variations through an online survey.
Materials and Methods: An online survey was sent to all anaesthetists practising obstetrics in all hospitals across Scotland. Questions included years of Obstetric anaesthetic experience, the local anaesthetic drug, concentration, volume and any additive used for establishing epidural anaesthesia in the labour ward.
Results: Out of total 148 completed responses, 109 (74.4%), 33 (22.3%) and 6 (4%) had more than 7 years, 3–7 years and 2 years or less of anaesthetic experience respectively.

The most preferred drugs used for epidural test dose was 0.25% L-Bupivacaine 2.5 -3 ml used by 58 (39%), 0.5% L-Bupivacaine 2.5-3ml used by 30 (20.3%), 0.25% L- Bupivacaine 4-5ml used by 21 (14.2%), 2% Lignocaine 2.5 -4 ml used by 16 (10.8%) and 0.1% L-Bupivacaine 10ml used by 7 (4.7%) anaesthetists.

The most frequently used drugs for establishing labour analgesia was 0.1% L-Bupivacaine 15mls used by 30 (20.3%), 0.25% L-Bupivacaine 10 ml by 28 (19%), 0.1% L-Bupivacaine 20 ml by 19 (12.9%), 0.25% L-Bupivacaine 7 ml by 19 (12.9%), 0.125% L-Bupivacaine 10 ml by 14 (9.6%) and 0.125% L-Bupivacaine 15 ml by 12 (8%) of anaesthetists. 114 (77%) used fentanyl as an additive for the same.
Conclusions: This survey shows considerable variation and a lack of consensus in the use drugs in obstetric epidurals in Scotland. It may be useful to have a guideline on epidural drugs and doses in obstetric practice.

PAIN-RELATED PATIENT REPORTED OUTCOMES IN WOMEN UNDERGOING CAESAREAN DELIVERY: FINDINGS FROM TWO ACUTE PAIN REGISTRIES, THE INTERNATIONAL, PAIN OUT AND NATIONAL (GERMAN), QUIPS

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Purpose/Objective: Caesarean delivery (CD) is the most frequently carried out surgical procedure worldwide. We analysed pain-related patient-reported outcomes (PROs) after CD.
Materials and Methods: Women provided PROs by filling in the validated International Pain Outcomes questionnaire on the first day after surgery as part of PAIN OUT (www.pain-out.eu). Similar assessments were made by patients participating in the German acute pain registry, QUIPS (www.quips-projekt.de).
Results: A total of 4347 women (339 in 6 institutions in Europe; 4008 in 35 institutions in Germany) filled in the questionnaire.

In PAIN OUT, 52% of women reported worst pain since surgery of ≥6. 21% were in severe pain 50–100% of the time. Pain interfered severely with coughing or deep breathing in 57% of women, it interfered with sleep and with activities out of bed in 37% and 35% of women, respectively. 17% would have liked more analgesics than they received.

In QUIPS, 66% of women reported worst pain since surgery of ≥6. Pain interfered with coughing or taking a deep breath in 71% of women. It interfered with movement in 80% of women and interference was severe in 47% of cases. 46% were woken from sleep by the pain. 14 % would have liked more analgesics than they received.
Conclusions: A large sample of women, in multiple medical centers, undergoing CD, experienced significant pain on the first postoperative day, interfering with coughing and taking a deep breath, sleep and activities out of bed. Current practices in these institutions seem to be insufficient to manage pain adequately.

A PROSPECTIVE AUDIT OF A BLIND TAP-BLOCK BASED POST-CESAREAN SECTION ANALGESIC REGIMEN

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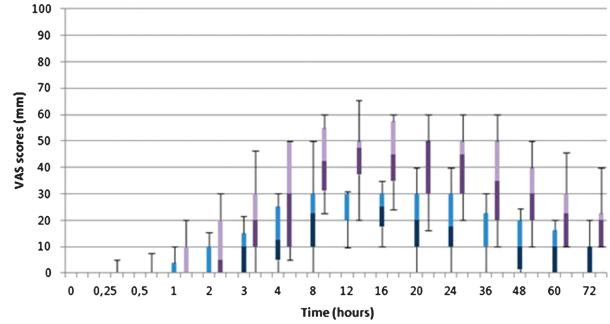
Purpose/Objective: The use of transversus abdominis plane (TAP) blocks have gained popularity in providing post-cesarean section analgesia. To evaluate pain scores, adverse effects and patient satisfaction of our current TAP-block based multimodal analgesic regimen, we performed a prospective audit.
Materials and Methods: Fifty-one parturients undergoing cesarean delivery were included. They all received standard intra-operative spinal anesthesia consisting of hyperbaric marcaine and sufentanil. At the end of surgery, a landmark-based bilateral TAP block was performed using 20 ml ropivacaine 0.375% on each side. Postoperative analgesia for the first 24 hours consisted of scheduled IV ketorolac and paracetamol; breakthrough pain was treated with IV tramadol. For the next 48 hours, scheduled oral ibuprofen and paracetamol were given; oral tramadol was administered upon patient request. PCEA was only connected when the aforementioned analgesic regimen appeared to be insufficient. Several parameters were recorded on fixed time intervals during the first 72 postoperative hours.
Results: VAS scores, especially with movement, were suboptimal in a substantial number of patients **(Figure 1)**. Patient satisfaction however, was high (mean±SD: 83.3±12.9%). Five patients requested PCEA. The incidence of adverse effects was marginal. Sedation and pruritus was absent and only 4 patients complained of some nausea. In 3 of them, nausea started after receiving PCEA.



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Conclusions: Despite improvable pain scores, patient satisfaction is excellent, suggesting the mothers' reluctance to feel nauseous, sleepy, or restricted by equipment. A switch from landmark-based TAP blocks to an ultrasound-guided technique should be considered.

WHAT TYPE OF PERIPHERAL NERVE BLOCKS SHOULD BE COVERED BY RESIDENCY TRAINING PROGRAMS? AN ONLINE SURVEY

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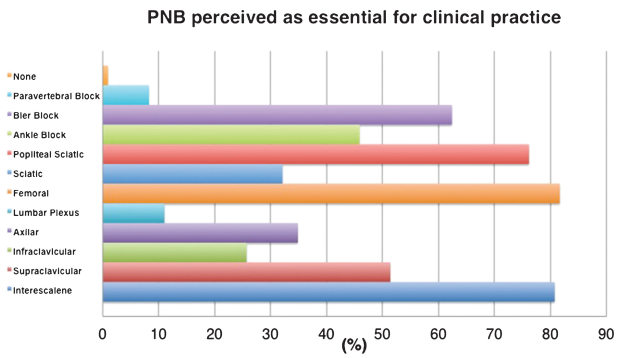
Purpose/Objective: Despite the increasing use of regional anaesthesia, specific recommendations regarding the type of procedures to be covered by residency training programs are not currently available.

We aimed to determine the type of blocks perceived as essential to be mastered by Chilean anaesthesiologists based upon their clinical practice.

Materials and Methods: After institutional ethics committee approval, an online survey was sent to anaesthesiologists graduated between 2005–2012 from the two biggest university residency programs in our country. Multiple-choice items elicited responses concerning the use of regional anaesthesia.

Results: A total of 109 completed questionnaires were received, corresponding to a response rate of 70.8%. The 98.2% of the anaesthesiologists surveyed use regional anaesthesia in their clinical practice, 86.7% of them do peripheral nerve blocks (PNB) regularly, and 51% use continuous PNB techniques. Their primary source of training was residency programs.

Regarding PNB, the most common techniques performed were interscalene (75%), femoral (73%) popliteal sciatic (70%) and Bier block (68%). Responders felt the highest degree of confidence performing femoral (73%), Bier block (68%), interscalene (67%), and popliteal sciatic (64%). Figure 1 shows the frequency of blocks perceived as essential to assure an optimal performance in their current job.



Conclusions: There is coincidence between the techniques perceived as essential for clinical practice, the most commonly ones used and the degree of confidence performing them. Considering that the primary source of training is residency programs, real needs for clinical practice should orient their requirements, aiming to fulfil the reality of each region.

A CADAVERIC STUDY OF ULTRASOUND GUIDED PARAVERTEBRAL COILED CATHETER PLACEMENT

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Purpose/Objective: Thoracic paravertebral blockade provides effective analgesia for chest wall and upper abdominal surgery. Ultrasound guidance has improved accuracy of paravertebral needle placement but results for catheter placement remain variable. We attempted to place a novel coiled paravertebral catheter in cadavers using a paramedian, oblique sagittal in-plane ultrasound guided approach. We assessed spread of dye with fluoroscopy and final catheter position by subsequent dissection.

Materials and Methods: With consent as per the Human Tissue Act 2004. An upper and contralateral lower paravertebral space were identified in 10 prone cadavers using ultrasound in a parasagittal, oblique orientation. With an in-plane approach, a coiled catheter was inserted into the space via a Tuohy needle. If insertion was difficult, the needle was manipulated and the paravertebral space flushed before reattempting catheter insertion. Contrast dye was injected and fluoroscopic images taken to assess spread. Lastly, the cadavers were dissected to assess final catheter location.

Results: Median IQR [range] of craniocaudal spread of dye assessed by fluoroscopy was 4 (3-5[1-8]) thoracic segments. Final catheter location on dissection was paravertebral in 2/19 cases (11%), intrapleural 13/19 (68%), intercostal 2/19 (11%) and extrapleural 2/19 (11%).

Conclusions: Only 11% of catheters were correctly placed in the paravertebral space using this novel technique and catheter. Reasons for malpositioning include poor image quality causing too lateral needle placement and technical difficulties threading the catheter. Whilst intrapleural catheter placement is a valid analgesic technique, it was not the primary aim and the high chance of misplacement contraindicates using this technique in practice.

COSMOPOLITAN CHOICES. GEOGRAPHICAL LOYALTY IN THE PUBLICATION RECORD OF ULTRASOUND-GUIDED PERIPHERAL NERVE BLOCK LITERATURE

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Purpose/Objective: The scientific literature on ultrasound-guided (USG) peripheral nerve blocks is extensive. While reputation and impact factor of a scientific journal may be important determinants for the researcher in the choice of publication, there seems to be an equally strong tendency to publish in journals close to home. We wanted to quantify these ideas, if possible, and identify potential trends in publishing choices.

Materials and Methods: An extensive Medline search was undertaken to identify publications containing USG peripheral nerve blocks. Author's country of residence, editorial office or scientific affiliation of the journal, and type of publication, were registered. 1382 studies were included for review [231 RCTs, 198 cohort studies, 255 case studies, 238 technology reports, and 456 commentaries/reviews].

Results: Studies on USG peripheral nerve blocks are predominantly being published by American journals (Figure 1).

	Authors	Journals			
		European	American	Asian	*Loyalty*
RTCs, cohorts (n=406)	European	96	67	6	57%
	American	26	113	2	80%
	Asian	19	26	51	53%
	Loyalty	68%	55%	86%	
Tech reports, cases (n=475)	European	111	73	6	58%
	American	43	150	5	76%
	Asian	12	23	52	60%
	Loyalty	67%	61%	83%	
Commentaries (n=443)	European	123	73	5	61%
	American	37	149	2	79%
	Asian	8	19	27	50%
	Loyalty	73%	62%	79%	

While a preponderance of American authors (76–80%) publish in American journals, Europeans and Asians are less inclined to publish in their own native country (50–61%). From the perspective of the publicists, American journals only publish articles by Americans in 55–62% of the time, while European journals contain articles by Europeans in 67–73% of the time. Asian journals are primarily hosted by Asian authors (79–86%).

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Conclusions: Most American researchers publish in their native country, while Europeans and Asians do not. Type of publication does not influence these geographical loyalties, suggesting that the author's choice of journal does not depend on impact factor or journal profile in itself, but perhaps more likely on tradition, culture, language and implicit personal preferences.

SYSTEMATIC REVIEW AND META-ANALYSIS OF ULTRASOUND GUIDED REGIONAL ANAESTHESIA VERSUS NERVE STIMULATION, PARAESTHESIA OR LANDMARK TECHNIQUES

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Purpose/Objective: Controversy still occurs regarding the quality, block characteristics and side effects of ultrasound guided regional anaesthesia (UGRA) compared to alternative techniques. Therefore our objective was to peform a systematic review and meta-analysis of randomized controlled trials comparing the use of ultrasound against techniques such as paraesthesia or anatomical landmarks.

Materials and Methods: We searched study database and trial registers. Our primary objective was block efficacy, defined as regional anaesthesia without needing supplementation or general anaesthesia. Secondary objectives were block characteristics, block performance, patient discomfort and incidence of vascular injection. A meta-analysis was performed.

Results: Forty nine studies, incorporating 3505 patients met our criteria. Forty three studies were conducted in adults (27 upper limb blocks, 15 lower limb blocks and 1 hybrid study) and 6 were performed in children (1 upper limb and 5 lower limb blocks). Block efficacy was better in patients receiving UGRA, [Risk Ratio 1.13 (95% 1.10 to 1.17)] and more patients were ready for surgery within 30 minutes, [Risk Ratio 1.35(95%CI: 1.15 to 1.58)]. UGRA took less time to perform, had faster onset [mean diff. -4 min (95% CI: -10.0 to 1.2)]and had a longer duration of action [mean diff. 136 min (95%CI: 45 to 227)]. UGRA was better with infraclavicular block [Risk Ratio 2.01(95% 1.33 to 3.03)] and sciatic block [Risk Ratio 1.55(95% 1.13 to 2.13)].

Conclusions: UGRA improves the efficacy, time to surgical readiness, block procedure time, onset and duration of peripheral nerve block compared with nerve stimulation or landmark techniques.

PATIENT SATISFACTION WITH LOW DOSE INTERSCALENE BLOCK FOR SHOULDER SURGERY

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Purpose/Objective: We perform over 250 shoulder surgeries annually. We report on how the introduction of ultrasound has changed our total volume of local anaesthetics required for interscalene block.

Previously with nerve stimulation technique our minimum local anaesthetic volume was 20ml.

Materials and Methods: After hospital audit committee approval, data was collected from 20 prospective patients undergoing shoulder surgeries in 2012–13.

Patients were given questionnaires which they posted after discharge from hospital.

Data collected included type of surgery, sedation, volume of local anaesthetic, level of discomfort during block, intraoperative & post operative analgesia and overall satisfaction with block.

Results: All patients were sedated with midazolam and all blocks were done under ultrasound guidance.

33% of patients had no discomfort during the block; the remaining 66% had mild to bearable discomfort.

All patients received fentanyl at induction . Intraoperatively, all patients received paracetamol; 13% of patients received diclofenac (75mg).

Postoperatively, 47% of patients had no pain or discomfort in recovery; the remaining 53% had mild discomfort with only one patient requiring fentanyl for pain relief.

Mean duration of analgesia was 18hrs, (range 10–24 hours).

The mean volume of local anaesthetic used was 5.6 ml, (range 4–10 ml) of 0.5% bupivicaine.

Patient satisfaction with block was 100%.

There was no intraoperative or postoperative complications reported.

Conclusions: The evolving experience & expertise with ultrasound has increased the interscalene block safety by reduction of local anaesthetic volumes (1)without compromising duration & quality of analgesia.

We encourage others to use low volumes of local anaesthetics for interscalene block for shoulder surgery.

References:

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COMBINED ULTRASOUND IMAGING AND HYDROLOCALIZATION TECHNIQUE FOR ACCURATE PLACEMENT OF PERINEURAL CATHETERS

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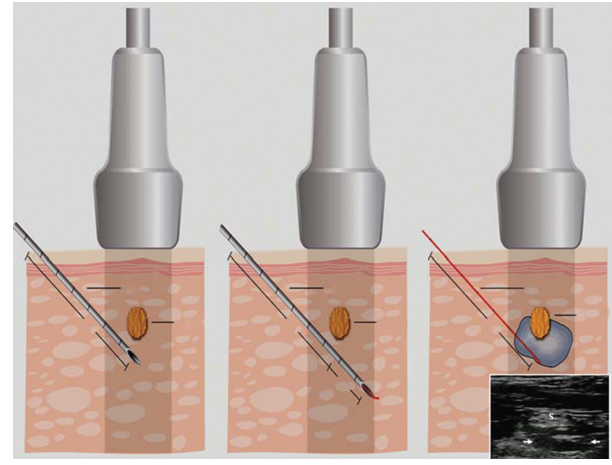
Purpose/Objective: Although continuous peripheral nerve blocks have become increasingly popular, a major concern is the accurate placement of perineural catheters in proximity to the nerves. Therefore, we developed a simple method for the accurate perineural catheter placement based on combined ultrasound guidance and hydrolocalization technique.

Materials and Methods: After Ethics Committee approval and written consent eighteen patients [7/11 (F/M), 42 (27) yr, 71 (13) kg] scheduled for surgery of the foot, ankle, or both underwent a popliteal sciatic continuous block. Three simple maneuvers were performed (i) needle positioning under the sciatic nerve 'D', (ii) needle advancement beyond the targeted nerve, and (iii) catheter retraction back to 'D', (Fig 1A,B,C). Hydrolocalization with normal saline being injected exactly underneath the targeted nerve confirmed the precise placement of the catheter tip. We evaluated quality of sensory block from 10–40' and rated as: 0, 1, and 2 for normal, partial, and complete sensory nerve block, VAS score at rest the degree of pain at rest and on movement at 12, 24, and 36 h.



Results: In all cases, the catheter tip was accurately placed under the sciatic nerve (saline injection was always seen exactly posterior to the targeted nerve). After operation, in two of 18 patients, one with hallux vagus repair and one with tibial fracture fixation, pain management was inadequate and was treated with additional bolus and increase of the infusion rate.

Conclusions: Combined ultrasound imaging and hydrolocalization technique can lead to the very accurate placement of perineural catheters.

STIMULATING CATHETERS DO NOT IMPROVE THE EFFECTIVENESS OF LUMBAR PLEXUS BLOCK COMPARED WITH TRADITIONAL NONSTIMULATING CATHETERS. A PROSPECTIVE, RANDOMIZED, DOUBLE BLINDED STUDY

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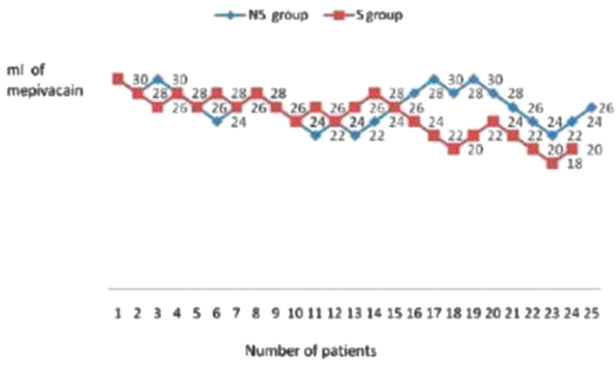
Purpose/Objective: No volume-response study has still compared the success rates of stimulating catheters over nonstimulating catheters. The preliminary data of this prospective, randomized, blinded study are to detect if stimulating catheters decrease the minimal effective volume (MEAV50) of 1.5% mepivacaine for successful lumbar plexus block (LPB) in 50% of patients compared with traditional non-stimulating catheters.
Materials and Methods: After local ethics committee approval and written informed consent, 50 ASA physical status I-III patients scheduled for total knee arthroplasty (TKA) were enrolled in the study. The first group received a continuous LPB with a stimulating catheter (group S = 25 pz), while the second group received a continuous LPB with a non-stimulating catheter (group NS = 25 pz). The MAEV50 of 1.5% mepivacaine was evaluated for consecutive patients applying the up-and-down Dixon's staircase method; a p value ≤ 0.05 was considered significant.
Results: The MAEV50 of 1.5% mepivacaine for continuous LPB was 27.40 ml (95% CI, 24.1–30.6) in group S and 26 ml (95% CI, 24.2–27.7) in group NS (p = 0.145). Catheter placement was faster in group NS (P=0,030). (Fig 1)
Conclusions: This preliminary data show that stimulating catheters do not decrease the MEAV of 1.5% mepivacaine in patients undergoing continuous lumbar plexus block. Kirchmair, recently, evidenced that lumbar plexus is located within the psoas muscle in 98% of cases (1). This location could allows the spread of local anesthetic close to the target nerve even in case of blind insertion of the catheter.



1- Kirchmair L, et al. *RAPM* 2008;33:109-14

THE ANALGESIC EFFICACY OF ULTRASOUND GUIDED TRANSVERSUS ABDOMINALIS PLANE BLOCK (TAP BLOCK): A META-ANALYSIS

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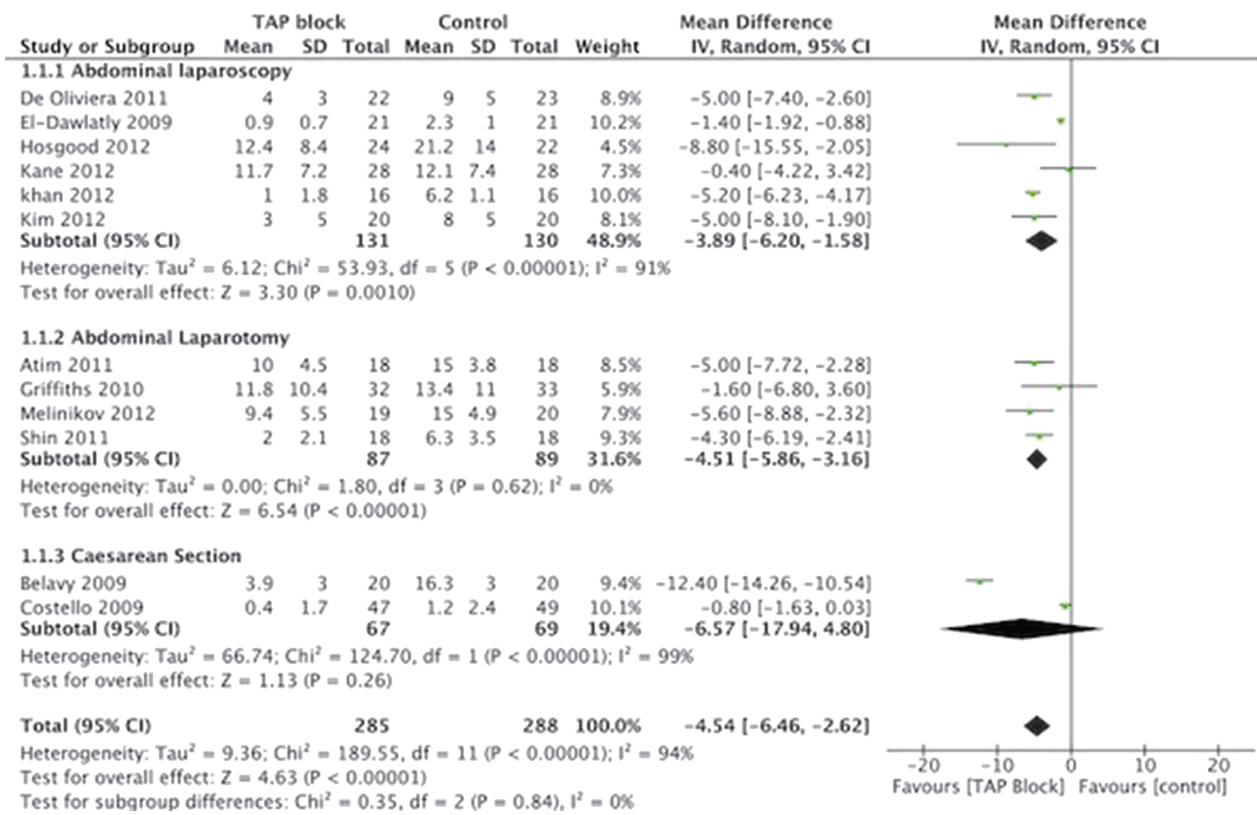
Purpose/Objective: Meta-analyses on the TAP block have reported to improve postoperative pain, but they included enthusiastic trials using anatomical landmarks. Thereafter, prospective studies based on ultrasound-guided techniques described conflicting results. This meta-analysis aimed to evaluate the postoperative analgesic efficacy of ultrasound-guided TAP block.
Materials and Methods: The authors searched the electronic databases MEDLINE and EMBASE among others. The primary endpoint was IV morphine consumption at 6h postoperatively, analysed according to the type of surgery. Secondary endpoints were IV morphine consumption at 24h postoperatively, pain scores at rest and on movement at 6 and 24h postoperatively, rates of PONV and pruritus at 24h postoperatively, and complications. Meta-analyses were performed with Review Manager software (RevMan_version_5.1.6).
Results: Twenty trials were identified. Ultrasound-guided TAP block reduced cumulative IV morphine consumption at 6h postoperatively by 43% (mean difference:-4.5mg,95%CI:-6.5,-2.6mg;p<0.00001)(Figure 1). Other endpoints are summarized in table 1. No complications were reported.
Conclusions: Ultrasound-guided TAP block reduces morphine consumption and pain scores at 6h postoperatively.



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Endpoint	Number of studies	References	Total number of patients or number of patients with outcome/total number of patients (%) TAP group	Control group	RR (95% CI)	Mean difference (95% IC)	I^2 (%)	Test for heterogeneity (p)	Test for overall effect (p)
IV morphine consumption (mg) at 24h postoperatively	7	Baaj 2010, Belavy 2009, Costello 2009, El-Dawlatly 2009, Kane 2012, Niraj 2009, Siriramka 2012	257	238	-	-11.7 (-20.2, -3.1)	98	<0.00001	0.008*
Pain scores (VAS, VRS or NRS, 0-100) at rest at 6h postoperatively	12	Atim 2011, Baaj 2010, Bollag 2012, Costello 2009, Griffiths 2010, Melinikov 2012, Kane 2012, Khan 2012, Kim 2012, Ra 2010, Shin 2011, Tsuchiya 2012	294	305	-	-12.2 (-19.6, -4.77)	89	<0.00001	0.001*
Pain scores (VAS, VRS or NRS, 0-100) on movement at 6h postoperatively	7	Atim 2011, Bollag 2012, Costello 2009, Griffiths 2010, Kim 2012, Melinikov 2012, Shin 2011	179	188	-	-12.4 (-19.4, -5.4)	63	0.01	0.0005*
Pain scores (VAS, VRS or NRS, 0-100) at rest at 24h postoperatively	12	Atim 2011, Baaj 2010, Belavy 2009, Bollag 2012, Costello 2009, Griffiths 2010, Hosgood 2012, Melinikov 2012, Kane 2012, Kim 2012, Ra 2010, Shin 2011	292	300	-	-4.5 (-12.4, 3.49)	93	<0.00001	0.27
Pain scores (VAS, VRS or NRS, 0-100) on movement at 24h postoperatively	9	Atim 2011, Baaj 2010, Belavy 2009, Bollag 2012, Costello 2009, Griffiths 2010, Melinikov 2012, Kim 2012, Shin 2011	222	232	-	-8.3 (-20.7, 4.03)	95	<0.00001	0.19
PONV at 24h postoperatively	4	Baaj 2010, Belavy 2009, Bollag 2012, Hosgood 2012	11/92 (12%)	11/96 (11%)	0.97 (0.46, 2.01)	-	-	0.70	0.93
Pruritus at 24h postoperatively	2	Belavy 2009, Bollag 2012	16/48 (33%)	17/54 (31%)	1.0 (0.61, 1.63)	-	-	0.86	0.30

ULTRASOUND-GUIDED (USG) TRANSMUSCULAR QUADRATUS LUMBORUM (TQL) BLOCK FOR ELECTIVE LAPAROSCOPIC CHOLECYSTECTOMY. A PROSPECTIVE, RANDOMIZED DOUBLE-BLIND STUDY

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Purpose/Objective: Laparoscopic cholecystectomy (LC) is a common surgical procedure. 40% of our patients need supplementary postoperative opioids. The USG TQL block is a novel approach to treat postoperative pain after abdominal surgery. Local anaesthetic (LA) is injected ventral to the quadratus lumborum (QL) muscle and posterior to the psoas major muscle (PMM) and thus posteriorly to the transversalis fascia (TF). Thus, LA injected in the lumbar region between the PMM and QL can potentially spread cranially reaching the thoracic paravertebral space, because both muscles have their embryonic origin and insertion within the thoracic cage, respectively.

The aim of this study is to investigate the effect of a right-sided USG TQL block with 30 ml ropivacaine 0.75% compared with placebo block (isotonic NaCl) after elective laparoscopic cholecystectomy in patients presenting with moderate to severe postoperative pain (Numerical-Rating-Scale (NRS) > 3).

Materials and Methods: Following IRB approval, a prospective, randomized, double-blind study will include 30 patients. Primary outcome measure is pain assessment (NRS 0-10) in the sitting position one hour after the administration of a TQL block.

Results: A pilot study including 6 patients has shown a significant reduction in pain score (P<0.01) following block administration. Magnetic Resonance Imaging (Fig. 1CD) has shown the intended cephalad distribution from the lumbar application to the arcuate ligaments and beyond.

Conclusions: The novel USG TQL block may have a supplementary role in providing effective postoperative pain management in patients undergoing elective laparoscopic cholecystectomy.

EVALUATION OF THE FEASIBILITY OF THORACIC SURGERY WITHOUT GENERAL ANESTHESIA AND TRACHEAL INTUBATION

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Purpose/Objective: This study evaluated the safety and feasibility of awake thoracic surgery under thoracic epidural anesthesia (TEA) vs. a traditional thoracic surgery under general aneasthesia (GA).

Materials and Methods: Thirty patients scheduled for thoracic surgery were randomly assigned to receive either sole TEA at any level between T4–T6 with sedation (awake group [AG], n=15) or receive GA with one lung ventilation (OLV) and thoracic epidural analgesia (control group [CG], n=15). Evaluated variables included the technical feasibility, patient satisfaction, perioperative arterial oxygen tension to fraction of inspired oxygen (PaO_2/FiO_2), arterial carbon dioxide tension ($PaCO_2$), heart rate (HR) and mean arterial pressure (MAP). Anesthesia, surgery, recovery, and total operating room times were recorded as well as all anesthesia-related costs for both techniques.

Results: The study groups were comparable as regards technical feasibility, anesthesia satisfaction, PaO_2/FiO_2 and $PaCO_2$.The operating room workflow was better in the AG group when compared with the CG [anesthesia time, 14 (3) vs. 33 (6) min, P <0.001; global operating room time 59 (15) vs 89 (21) min, P<0.001, respectively; time to Aldrete score > 8, 21 (13) min in CG]. The ICU stay was 18 (5.3) h in the AG vs 29 (11) h in the CG, P=0.002).The anesthetic costs were significantly reduced in the AG (L.E. 213 (33) vs. L.E. 709 (25) in CG, P<0.001).

Conclusions: Awake thoracic surgery under TEA in highly selected patients and procedures is safe, satisfactory, and technically feasible, with less cost, shorter global operating room time than the same procedures performed under GA.

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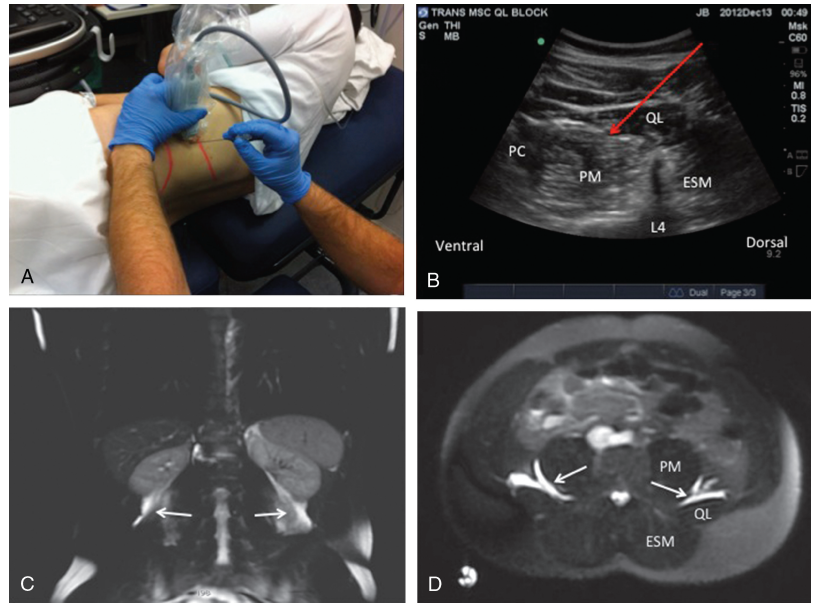

LOW SPECIFITY AND ACCURACY IN DETERMINING THE NEEDLE NERVE PROXIMITY USING ELECTRICAL STIMULATION FOR NERVE LOCALIZATION-AN ULTRASOUND-IMAGED ASSESSMENT OF THE FINAL NEEDLE POSITION

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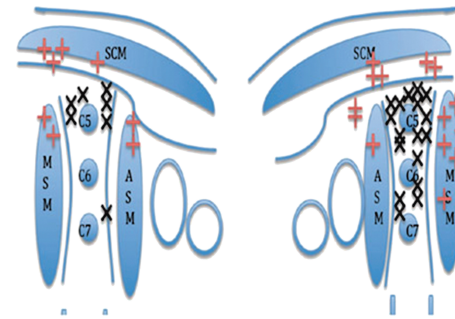
Purpose/Objective: The sensitivity of detecting the needle nerve proximity by electrostimulation has been questioned by recent studies, this trial investigates the specifity and accuracy of electrostimulation.

Materials and Methods: After IRB approval (BB90/12) and written consent in 42 patients undergoing elective shoulder surgery the brachial plexus was localized at the interscalene level using electrostimulation. Elicting motor responses in biceps or deltoid muscle at a threshold of 0.3 mA/ 0.1 ms as commonly accepted to signal a close proximity, the actual distance between needle tip position and the neural target was assessed as was the spread of a waterdissection regarding the contact to neural structures.

needle-nerve-distance	pts
direct needle-nerve contact	7
1- 4mm	21
>5 mm	16
topographic position	**pts**
interscalene space	22
superficial to deep cervical fascia	9
intramuscular ant scalene muscle	3
intramuscular ant scalene muscle	8
anterior to the ant scalene muscle	2

Results: The **specifity** of nerve stimulation was assessed with **63%**, the rate of **false positive** results with **36%**. The **overall effectivness** including the water dissection would have been **52%**.

Conclusions: Sensitivity and specifity of electric nerve stimulation of the brachial plexus at the interscalene level is lower than determined in former trials. The predictability of needle nerve proximity based on the concept of current intensity-distance-relation is inconsistent and not reliable. Further investigations, monitoring the stearing and deflection of electric impulses and the influence of connective tissue impedances on currentflow could clarify the observations made in this study.



OPTIMAL PLACEMENT OF A SURGICAL SITE CATHETER FOR POSTOPERATIVE ANALGESIA IN TOTAL KNEE ARTHROPLASTY: A HUMAN CADAVERIC STUDY

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Purpose/Objective: Surgical Site Catheter Analgesia (SSCA) is a technique that has been used successfully for Total Knee Arthroplasty (TKA). Currently no reliable evidence exists for the optimal catheter position. The purpose of this study was to determine the position of the catheter, which provided the maximum amount of volume dispersion within a total knee arthroplasty.

Materials and Methods: Six cadaveric knees underwent total knee arthroplasties using standard techniques with catheters placed in one of three locations: Supra-patellar, Medial gutter, and Lateral gutter. The catheters were infused with radio-opaque dye and the cadaveric knees were placed on a continuous passive motion (CPM) machine for one hour. Fluoroscopic images were obtained at regular time intervals (0, 1, 5, 60 minutes) to identify diffusion patterns within the joint. Areas of the knee were considered infiltrated when dye was visible at pre-determined anatomic landmarks.

Results: Superior global diffusion rates were achieved with the catheter placed in the supra-patellar pouch over both the medial or lateral gutters. Posterior capsular diffusion was achieved in all catheter positions and found to be similar. Anterior capsular diffusion was found only to take place in the supra-patellar position.

Conclusions: When placing a SSCA within the knee, the supra-patellar space achieved superior diffusion within the joint compared to both medial and lateral gutters This anatomic position may also confer additional benefits to early rehabilitation by limiting the risk of entrapment of the catheter. By defining a catheter placement technique, we may help standardize a location for optimal pain control.

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Abstracts and Highlight Papers of the 32nd Annual European Society of Regional Anaesthesia & Pain Therapy (ESRA) Congress 2013

Posters

ANALGESIC EFFECT OF COMBINATION THERAPY OF SAMARIUM153-EDTMP AND CAPECITABINE IN PATIENTS WITH SKELETAL METASTASIS

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Purpose/Objective: Bone-seeking radio-isotope Samarium153-EDTMP is routinely used for pain palliation in skeletal metastasis, however most patient report partial response. Capecitabine a chemotherapeutic drugs is routinely combined with external beam radiation to make the target more radiosensitive. Aim of the study was to evaluate whether combining capecitabine in radiosensitizing dose with Samarium153-EDTMP produce superior analgesia in patients with skeletal metastasis compared to samarium alone.

Materials and Methods: Patients with multiple skeletal metastases were randomized into 2 arms of 22 patients each. In the study arm patients received I mili-curie/Kg Samarium153-EDTMP intravenously and capecitabine orally at a dose of 1650mg/square meter of BSA for 8 days. In control arm patients received only one mili-curie /Kg Samarium153-EDTMP intravenously. Pain evaluation and complete hematological evaluation was done at baseline and at 6 week post-therapy.

Results: At baseline there was no significant difference in VAS pain score (8.3 ± 1.8 vs. 8.2 ± 1.4, p = 0.87), hemoglobin level (11.16 ± 1.47 vs. 11.19 ± 1.28 g/dl, p= 0.94) and leukocyte count (9921 ± 2643 vs. 9172 ± 2187/ml, p of 0.81) between study and control group.

Patients of study arm reported significantly lower post-therapy VAS score of 1.29 ± 1.05 compared to 3.59 ± 2.77 in control arm (p = 0.001). No significant difference in hemoglobin level (10.2 ± 1.47 vs. 10.16 ± 1.28 g/dl, p = 0.92 and leukocyte count (7220 ± 1865 vs. 7681 ± 2013/ml, p = 0.23) was noted between study and control group.

Conclusions: Samarium153-EDTMP and capecitabine combination produce superior analgesia in patients with skeletal metastasis compared to Samarium153-EDTMP alone with no additional toxicity.

HIGH-FREQUENCY SPINAL CORD STIMULATION: NOT ONLY FOR TREATMENT OF CHRONIC BACK PAIN PATIENTS

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Purpose/Objective: To describe the efficacy and safety of a spinal cord stimulation (SCS) system that utilizes high-frequency waveforms for treatment of chronic, intractable pain, cerebrovascular ischemic pain of the back and/or limbs.

Materials and Methods: Five patients were recruited for a trial of high-frequency stimulation. Patients' pain ratings, disability, sleep disturbances, and satisfaction, as well as complication rates, were assessed for up to four months. Two patients suffered of chronic post-ischemic pain, with spasticity and haemiplegia; one of them developed a Complex Pain Regional Syndrome Type I on the upper left limb. The third patient suffered of post-laminectomy FBSS, with neurologic disorders; the fourth was affected by a non-demyelinating polyneuropathy associated to a lumbar radiculopathy, the fifth undergone a post-traumatic vertebral stabilization.

Results: After a trial period all patients reported a significant improvement in VAS scores and underwent permanent implantation of the high-frequency SCS system. Back pain VAS 8.4 was reduced to 3.2 at four months, leg pain VAS 5.4 was reduced to 2.4 at four months. All patients showed greater than 50% back pain relief at six months, with significant improvements in NPSI (Neuropathic Pain Symptom Inventory) and sleep, and reductions in pain medication use. No adverse events were observed.

Conclusions: HFSCS provided significant low back and leg pain relief, improvement in disability and sleep. The results confirm a favorable safety and efficacy profile of the high-frequency SCS system. Further work should be done to understand HFSCS mechanism of action and clinical effectiveness.

SPINAL CORD STIMULATION – OUTCOMES FROM NOTTINGHAM UNIVERSITY HOSPITALS NHS TRUST

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Purpose/Objective: According to The National Institute of Clinical Excellence in the UK (NICE) spinal cord stimulation (SCS) is recommended as a treatment option for adults with chronic pain of neuropathic origin who continue to experience significant chronic pain for at least 6 months despite optimal standard management. The aim of our study was to evaluate the outcome of SCS treatment at the Nottingham University Hospitals in the UK.

Materials and Methods: Patients with SCS had a telephone interview using a uniform questionnaire which included assessment of reduction in pain scores, reduction in opioid usage, improvement of quality of life (QOL) and return to work. QOL was assessed using a Patients' Global Impression of Change (PGIC) Scale.

Results: Of the total of 96 patients who underwent insertion of SCS, 73 responded to the questionnaire. 70% of patients had more than 50 % reduction in pain, 63 % were able to reduce the dose of opioid based medications, 75% scored more than 4 out of 7 on PGIC scale. 17 patients managed to return to work post SCS insertion.

Conclusions: Control of pain with SCS in our institution was associated with significant reduction of pain scores and improvement of quality of life.

STABILITY EVALUATION OF ZICONOTIDE-MORPHINE HYDROCHLORIDE AND ZICONOTIDE-BACLOFEN ADMIXTURES UNDER EXPERIMENTAL CONDITIONS

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Purpose/Objective: Stability of drug combination in intrathecal pump is a necessary consideration due to its influences on analgesic efficacy and frequency of refills. We evaluated the stability of ziconotide - morphine HCl - baclofen (not previously studied) during simulated intrathecal infusion under laboratory conditions at 37° C.

Materials and Methods: Admixtures were prepared and 20 ml of each was transferred into preconditioned Medtronic Synchromed® II pumps, and kept at 37° C under gentle shaking. The analysis was performed on a Jasco® system equipped with PU-2080 pumps and UV-2070 and UV-2075 detectors. Samples were collected by syringe from pumps and injected in HPLC system. The stability of the admixtures containing ziconotide and morphine HCl was assessed through a 30-days period, while data for baclofen admixtures were collected also after 45 and 60 days.

Results: After 30 days ziconotide concentration (alone) 20 mcg/ml did not decrease significantly (87.5%), in line with the data previously reported. After 30 days concentration of ziconotide added to morphine HCl 1 mg/ml decreased about 25%, for the most part in the first few days after pump filling, while added to morphine HCl 2 mg/ml decreased about 13%. Concentration of ziconotide added to baclofen 0.1 mg/ml decreased 33% after 30 days, 50% after 45 and 64% after 60 days respectively.

Conclusions: Morphine HCl, particularly 2 mg/ml, had slight effect on ziconotide stability over a 30 days period was added. Baclofen had a stronger effect in reducing ziconotide stability in solution over time in conditions

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similar to that employed in clinic and these results are lower than the one previously obtained.

ULTRASOUND-ASSISTED VERSUS FLUOROSCOPIC-CONTROLLED EPIDURAL STEROID INJECTIONS IN PATIENTS WITH DEGENERATIVE DISEASES OF THE SPINE: A PROSPECTIVE, RANDOMIZED, SINGLE BLIND CLINICAL STUDY

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Purpose/Objective: Epidural steroid injections have been used for treatment of lower back pain and irradiate pain in the legs for many years. Imaging-guided techniques increase the precision of these procedures. Epidural steroid injections are routinely performed under fluoroscopic guidance, but technically could also be completed using pre-procedure ultrasound examination. The aim of the present study is to compare ultrasound-assisted with fluoroscopy-controlled epidural steroid injections accuracy, average procedure time, pain relief, and the degree of disability score.

Materials and Methods: One-hundred-and-twelve patients with axial chronic low-back pain, who were diagnosed with degenerative diseases of the spine, receiving three lumbar interlaminar epidural steroid injections, were randomly assigned between two groups. In the fluoroscopic group (n=56), injections were performed under fluoroscopic guidance; in the ultrasound group (n=56), ultrasound scanning of the lumbar spine was performed before injection to determine the future puncture site, epidural space depth, and needle trajectory. Outcome measures included numbers of needle insertion attempts and needle passes, procedure time, visual analogue scale, and Oswestry disability index at baseline, and one- and three-months post-treatment.

Results: There was no statistically significant difference between the two groups in mean number of needle insertions attempts (p=0.338), needle passes (p=0.097), or procedure time (p=0.644). Mean visual analogue scale and degree of disability scores before the procedure, and at one- and three-months post-procedure, were similar in both groups. Neither group had serious complications.

Conclusions: Ultrasound may not replace fluoroscopic-controlled epidural steroid injections, but could be an acceptable method when fluoroscopy is not an option.

EFFICACY OF 5% LIDOCAINE PATCH IN PERIPHERAL NEUROPATHIC PAIN SYNDROMES-A PROSPECTIVE STUDY

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Purpose/Objective: Background: 5% Lidocaine medicated plaster is licensed for the treatment of Post Herpetic neuralgia (PHN). Nevertheless, there is evidence in the literature of its efficacy in other peripheral neuropathic pain syndromes [1,2]. It is included in the guidelines for the management of neuropathic pain by various societies[3].

Aim: To assess efficacy of 5% Lidocaine patch in peripheral neuropathic pain syndromes of various aetiologies.

Materials and Methods: A prospective study was undertaken over a period of 6 months. All patients who received 5% Lidocaine plaster according to local protocol were reviewed by telephone after 4 weeks based on a structured questionnaire to assess the efficacy of treatment.

Results: A Total of 36 patients were prescribed 5% Lidocaine patch-31 patients with Focal allodynia, 3 with Scar tissue pain, 1 with PHN and 1 with myo-fascial pain.

There was pain relief in 23 patients (64%). The percentage of pain relief was less than 30% in 9 patients, 30–50% in 6 patients and > 50% in 5 patients. There was improvement in quality of life in 19 patients (53%).

Conclusions: We have observed that 5% Lidocaine patch provides pain relief in more than 50% of cases of Neuropathic pain. It is effective in many neuropathic pain conditions in addition to PHN. But larger trial is required to validate our result.

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EVOLVING PRACTICE: PERIPHERAL NERVE BLOCKADE IN THE DAY CASE UNIT OF A UK TEACHING HOSPITAL: THE COMPLETED AUDIT CYCLE 4 YEARS ON

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Purpose/Objective: Ultrasound guided regional anaesthesia (RA) started in Preston a decade ago and has since become the gold standard. >90% of adults undergoing upper limb surgery in our day case unit receive a peripheral nerve block.

In light of the ongoing expansion in our practice of day case RA we performed this review to complete the audit cycle, evaluate local trends and assess the quality of our outcomes as compared to 2008/9.

Materials and Methods: Approved by Lancashire Teaching Hospitals NHS Foundation Trust.

Prospective audit and patient satisfaction survey. Patients consented to postoperative telephone followup at 24–48 hours. Data collection over 2 months in 2013 and 4 months in 2008/9 utilising a standardised proforma designed to evaluate the patient experience; technical details; effectiveness and safety of RA practice.

Analysis: Fisher's Exact Test.

Results: 2013: 43-patients; 2008/9: 84-patients.

Nerve localisation techniques have not changed ($p = 0.19$), anaesthetists currently utilise a combination of ultrasound and nerve-stimulation. A greater proportion of patients undergo RA awake without sedation 95%-*vs*-64% ($p=0.00004$) and surgery with RA as the sole anaesthetic 58%-*vs*-30% ($p=0.00007$).

We identified a lower incidence of early complications 11%-*vs*-19% ($p=0.43$), excellent success rates and high levels of patient satisfaction.

Conclusions: Our audit demonstrates improved service provision and patient safety. A significant amount of work goes on preoperatively to educate patients about awake RA. Results suggest that locally, there's an ongoing cultural change in the practice and public perception of day case RA. Patients appear better informed and are highly accepting of RA as a sole anaesthetic.

PATIENT REPORTED OUTCOME MEASURES (PROMS) AFTER SHOULDER SURGERY WITH INTERSCALENE NERVE BLOCK.

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Purpose/Objective: In recent years, single shot interscalene block has become standard analgesia for arthroscopic and open shoulder surgery, with a wide range of surgery performed under the block. In this study we use patient reported outcome measures to determine patients block experience.

Materials and Methods: After an institutional ethics waiver, we studied 25 consecutive patients over a 3 month period. All patients had shoulder surgery under general anaesthesia and interscalene nerve block using 100mg bupivicaine, with the same single anaesthetist and surgeon. Patients were consented to postoperative follow-up by telephone questionnaire.

Questions included: pain scores after the block, experience of numbness, quality of sleep, analgesia timing and satisfaction.

Surgery types were classified by expected pain into mildly, moderately or severely painful.

Results: Out of the 25 operations that took place 6 were deemed as mildly painful, 14 as moderately painful and 5 as painful. 3/5 patients undergoing painful operations wanted longer duration of block, compared to 1/6 in the mildly painful procedures. 52% of patients found numbness uncomfortable, with no difference between the groups. 4/5 patients undergoing painful surgeries had

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sleeping difficulties the night after surgery. Despite this 96% of patients would have a block again.
Conclusions: Single shot nerve block may not provide sufficient analgesia for patients undergoing painful shoulder surgeries, and this may be affecting their sleep and post-operative recovery. In painful operations perineural catheters may be appropriate, whereas in mildly painful operation patients may prefer to avoid nerve blocks or have a lower dose of short acting local anaesthetic to avoid discomfort of numbness and paralysis.

RETROSPECTIVE ANALYSIS OF INCIDENCE OF UPPER LIMB NERVE BLOCK FAILURE: ULTRASOUND VERSUS NERVE STIMULATOR TECHNIQUE

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Purpose/Objective: In literature incidence of upper limb block failure is 5−25% depending on technique and experience of anaesthetist.There are only few small studies published comparing the difference in success rate of two techniques. Wrightington is one of the major orthopaedic centers in UK performing around a 1000 upper limb blocks per year.Ultrasound guidance is rapidly becoming the gold standard for regional anaesthesia. We compared the incidence of upper limb block failure performed with nerve stimulator versus ultrasound guidance.
Materials and Methods: Recovery book was retrospectively analysed for the period of 3 years April 2008−April 2011 giving a total of 3215 upper limb blocks including inerscalene, supraclavicular , vertical infraclavicular and axillary blocks. The data collected: the grade of anaesthetist, technique used (US versus NS) and requirement for additional opioids and block efficacy. Excluded patients: patients undergoing simultaneous bone grafting, unless the efficacy of the block was clearly stated; patients undergoing procedure under block only; blocks performed in lower limb theatre. Block was considered unsuccesful if patient required opioids in recovery.
Results: 3215 cases were analysed and following results obtained:

TABLE 1. No caption available.

	Substantive consultants US failure rate	Substantive consultants NS failure rate	Locum consultants NS failure rate	Staff grades US failure rate	Staff grades NS failure rate	Trainee Us failure rate
ISB	7%	13.7%	23.1%	0% small n	20.7%	11.4%
SC	8.6% (11.3%*)	NA	NA	0% small n	8.3%	12.5%
VIB	NA	6.8%	20.2%	NA	9.3%	14.2%
Axillary	3.8%	18.3%	24.1%	0% small n	24.4%	6.3%

*consultants learning US guided blocks

Conclusions: 30.5 % (982/3215) of all upper limb blocks were performed with US guidance. Overall incidence of failure in US guided group was 7.3% (72/982) compared to nerve stimulator guided group where incidence of block failure was 15.1% (338/2233).

Ultrasound guided blocks have lower incidence of failure compared to nerve stimulator technique in experienced operator.Ultrasound guided failure rate in middle grade/trainee group was lower compared to nerve stimulator guided blocks.

A PROSPECTIVE TWO CENTRE TELEPHONE SURVEY OF INTER-SCALENE BRACHIAL PLEXUS BLOCK FOR ARTHROSCOPIC SHOULDER SURGERY. A COMPARISON BETWEEN 50MG AND 112.5MG OF L-BUPIVICAINE.

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Purpose/Objective: Arthroscopic Shoulder surgery is associated with severe post-operative pain that can be difficult to manage without large dose opioids. Inter-scalene Brachial Plexus nerve block (ISB) improves the quality of post-operative pain.

AIM: To obtain patient reported outcome measures using a prospective telephone questionnaire in arthroscopic shoulder surgery. A two centre survey of single shot ISB comparing 20ml of 0.25% (50mg) and 30ml of 0.375% (112.5mg) L-bupivicaine, each centre using their standard dose.
Materials and Methods: Institutional approval and informed verbal consent was gained. 50 ASA 1–3 (25 in each group) patients having ultrasound guided ISB for elective shoulder arthroscopies were contacted by telephone at 24 and 48 hours post-operatively. Successful ISB was documented in recovery by sensory loss in the shoulder. Data collected included duration and complications of ISB, worst pain scores (none, mild, moderate, severe), analgesia usage and patient satisfaction. Results were analysed using a Mann–Whitney U test.
Results: All patients had a sensory block in the shoulder post-operatively. In the 112.5mg group duration of action was increased (p=0.02) and day 1 pain scores reduced (p=0.0015). By day 2 there was no difference (p=0.49). On Day 2, 32 patients (64%) had moderate to severe pain. 7 patients (14%) would have liked further analgesia with 2 (4%) actively seeking extra analgesia. 96% would have ISB again if they required shoulder surgery.
Conclusions: Increasing the dose and volume of local anaesthetic increased the duration of ISB and thus reduced pain scores on day 1 with no increase in complications.

DOES SAPHENOUS NERVE BLOCK IMPROVE ANALGESIA AFTER TOTAL KNEE REPLACEMENT WHEN USED IN COMBINATION WITH LOCAL INFILTRATION ANALGESIA A PROSPECTIVE RANDOMISED DOUBLE BLINDED CONTROLLED TRIAL.

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Purpose/Objective: Local infilteration analgesia (LIA) is considered acceptable after total knee replacements (TKR) in terms of analgesia, ease of performance, early mobilisation and early hospital discharge. We hypothesise that preoperative saphenous nerve block (SNB) in combination with periarticular local infiltration provides better analgesia profile as compared to local infilteration alone.
Materials and Methods: With institutional ethics approval and having obtained written informed consent 20 ASA 1 – 3 scheduled to undergo TKR under spinal anaesthesia +/− sedation patients were randomly allocated to either Group (SNB): patients receiving SNB or Group (NSNB): patients not receiving SNB. All patients received LIA perioperatively. Post operatively patients were assessed for pain at rest and movement and degree of ambulation 0, 6, 12 and 24 hour. Cumulative opiod consumption and time to discharge were recorded.
Results: 20 patients were assessed for the study. Our primary outcome was pain on movement at 24 hours. There was no significant difference between the two groups 5.5 +/− 1.7 (SNB) vs 2.2 +/−5.9 (NSNB). Our study also showed no significant difference in pain at rest at all four time points with a minimum p value of 0.08, cumulative opioid consumption in 24 hours 24 +/− 9.6 (SNB) vs 18 +/− 10 (NSNB) and till discharge 38 +/− 18 (SNB) vs 32 +/− 18 (NSNB), and time to discharge 4 +/− 1.4 (SNB) vs 5 +/− 1.4 (NSNB).
Conclusions: We conclude that SNB does not improve analgesia after TKR when combined with LIA.

THE IMPACT OF A BLOCK ROOM REGIONAL ANAESTHESIA SERVICE ON THE POST OPERATIVE PAIN SCORES OF PATIENTS UNDERGOING ARTHROSCOPIC SHOULDER SURGERY

S. Robb[1], L. Roberts[1]. [1]*Anaesthetics, Sunderland Royal Hospital, Sunderland, United Kingdom.*
Purpose/Objective: Despite published evidence to the contrary [1,2] there remains a perception that *arthroscopic* shoulder surgery does not merit a regional technique for post operative analgesia. The establishment of a block

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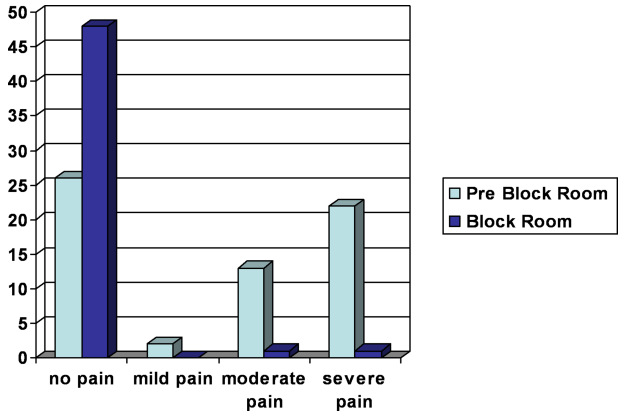
room regional anaesthesia service at Sunderland Royal Hospital provided the opportunity to audit the post operative pain scores in a cohort of patients undergoing arthroscopic shoulder surgery with an interscalene block compared to a otherwise similar cohort pre block room service.

Materials and Methods: Comparison of the two cohorts allowed assessment of the impact of a block room, and the consequent consistent provision of peripheral nerve blockade, on the post operative pain scores of patients undergoing arthroscopic shoulder surgery. The two groups had a similar range of surgical procedures. Pain score in recovery data was collected retrospectively from the Hospital Integrated Software System. The project was logged with the trust clinical governance department who deemed formal ethical approval unnecessary.

Results: 55% of patients pre block room had moderate to severe pain in recovery. (67%, if the 11 patients out of 63 who had an interscalene block are discounted) compared to only 4% in the block room cohort.



Conclusions: As demonstrated in the figure above the institution of a block room and the consequent consistent provision of interscalene brachial plexus blocks had a dramatic impact on patients' post operative pain scores. A block room provides the facility to consistently offer all patients undergoing arthroscopic shoulder surgery optimum analgesia with a regional technique.

ASSESSING THE VARIABILITY IN THE PREPARATION OF SYRINGES WITH MORPHINE

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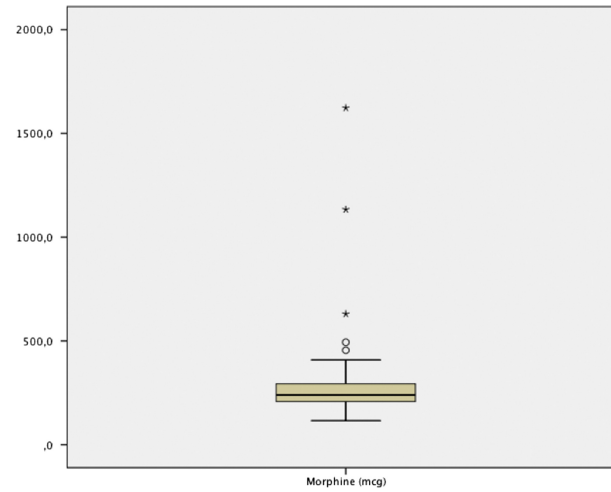
Purpose/Objective: Opioids are commonly chosen for subarachnoid administration because they provide good quality analgesia. Occasional intrathecal morphine overdoses have been reported with a variety of adverse outcomes, includind death from respiratory depression. The preparation of 100µg of morphine from the formulations available on the market (10000 µg/ml) is capable of variations.

The aim of our work was to assess the variability in the preparation of syringes with morphine for intrathecal administration.

Materials and Methods: A group of fifteen anesthesiologists/residents of anesthesia voluntary agreed to participate in this work. Each participant was asked to prepare three samples with 200µg of morphine in 2ml of saline. Participants were free to choose the material and the method of preparation. An observer recorded the preparation method. An independent laboratory analyzed the samples by HPLC.

Results: Forty-five samples were analyzed. The average morphine in samples was 308.4µg ± 257.6µg, the minimum was 115.2µg and the maximum was 1622.0µg (figure 1). Fifteen percent of the samples were out of ± 10% of the targeted concentration; 35% were out of ± 20% and 20% were out of ± 50%. It was recorded six different methods of sample preparation.



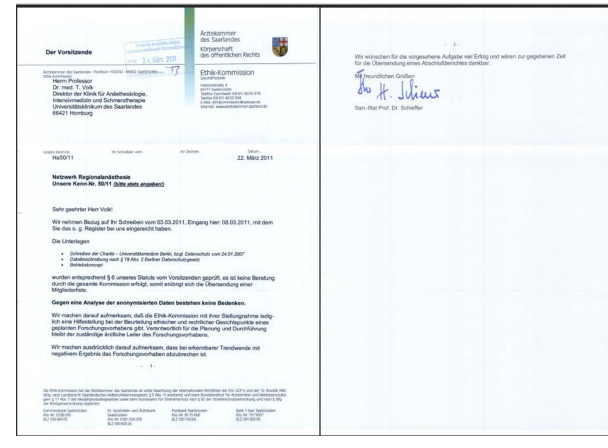
Conclusions: The results show a great variability, suggesting not only an imprecision but also an error during sample preparation. This supports the importance of the existence of standard preparation procedures and the need of vials with different concentrations on the market.

DOES THE INCIDENCE OF BLOODY TAP DEPEND ON THE STATE OF CONSCIOUSNESS?

K. Schmitt[1], N. Albert[1], C. Kubulus[1], H. Bomberg[1], S. Gräber[2], F. List[1], T. Volk[1]. [1]*Department of Anesthesiology Intensive Care Medicine and Pain Medicine, University of Saarland, Homburg/Saar, Germany,* [2]*Department of Medical Biometry Epidemiology and Medical Informatics, University of Saarland, Homburg/Saar, Germany.*

Purpose/Objective: The influence of the state of consciousness during the block procedure for the risk of bloody tap is unknown. The study is aimed at comparing the incidences of bloody taps in different states of consciousness.

Materials and Methods: The German network for regional anesthesia database was analysed between 2007 and 2012. 43,146 patients ≥ 14 years were subdivided into the following groups: I. awake (n=25,363), II. sedated (n=15,213) and III. during general anesthesia (n=2,570). Differences between groups were tested with ANOVA and Chi-Square (p=0.05). Odds Ratios OR [95% confidence interval] for group III. were calculated.


Der Vorsitzende

Ärztekammer des Saarlandes
Körperschaft des öffentlichen Rechts

Ethik-Kommission

Herrn Professor
Hr. Prof. T. Volk
Direktor der Klinik für Anästhesiologie, Intensivmedizin und Schmerztherapie
Universitätsklinikum des Saarlandes
66421 Homburg

Ha50/11

22. März 2011

Netzwerk Regionalanästhesie
Unsere Komm-Nr. 50/11 (bitte stets angeben!)

Sehr geehrter Herr Volk!

Wir nehmen Bezug auf Ihr Schreiben vom 03.03.2011, Eingang hier: 08.03.2011, mit dem Sie das o. g. Register bei uns eingereicht haben.

Die Unterlagen

- *Schreiben der Charité – Universitätsmedizin Berlin, bzgl. Datenschutz vom 24.01.2007*
- *Datiebeschreibung nach § 19 Abs. 2 Berliner Datenschutzgesetz*
- *Behördenscript*

wurden entsprechend § 6 unseres Statuts vom Vorsitzenden geprüft, es ist keine Beratung durch die gesamte Kommission erfolgt, somit erübrigt sich die Übersendung einer Mitgliederliste.

Gegen eine Analyse der anonymisierten Daten bestehen keine Bedenken.

Wir machen darauf aufmerksam, daß die Ethik-Kommission mit ihrer Stellungnahme lediglich eine Hilfestellung bei der Beurteilung ethischer und rechtlicher Gesichtspunkte eines geplanten Forschungsvorhabens gibt. Verantwortlich für die Planung und Durchführung bedürfen der zuständige ärztliche Leiter des Forschungsvorhabens.

Wir machen ausdrücklich darauf aufmerksam, dass bei erkennbarer Trendwende mit negativem Ergebnis das Forschungsvorhaben abzubrechen ist.

Wir wünschen für die vorgesehene Aufgabe viel Erfolg und wären zur gegebenen Zeit für die Übersendung eines Abschlußberichtes dankbar.

Mit freundlichen Grüßen

Dr. H. Schaefer

San.-Rat Prof. Dr. Schieffer

Results: Gender, age, BMI and ASA score were equally distributed among the groups, whereas the numbers of peripheral procedures (28.9%; 78.6%;

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87.9% in group I., II., III., respectively), anticoagulation (33.4%; 39.1%, 51.6%), multiple skin punctures (23.5%; 17.3%; 23.5%), bloody taps (1.8%; 3.6%; 5.2% – OR: 2.19 [1.82–2.64]) and use of ultrasound (11.2%; 34.4%; 20.3%) were significantly different between the groups. Incidences of bloody taps were comparable in neuraxial procedures, whereas significantly different when considering peripheral procedures (2.6%; 4.3%; 6.0% – OR: 1.70 [1.41–2.06]). The risk of bloody tap increases during combination of general anesthesia with multiple skin puncture (OR: 3.70 [2.94–4.67]), anticoagulation (OR: 2.90 [2.34–3.59]) and without use of ultrasound (OR: 2.29 [1.88–2.78]).

Conclusions: The risk of bloody tap increases when blocks are performed in general anesthesia. However, anticoagulation and multiple skin puncture are risk factors. Interestingly, in neuraxial procedures the incidences of bloody taps were comparable. Use of ultrasound seems to be protective for bloody taps in anesthetized patients.

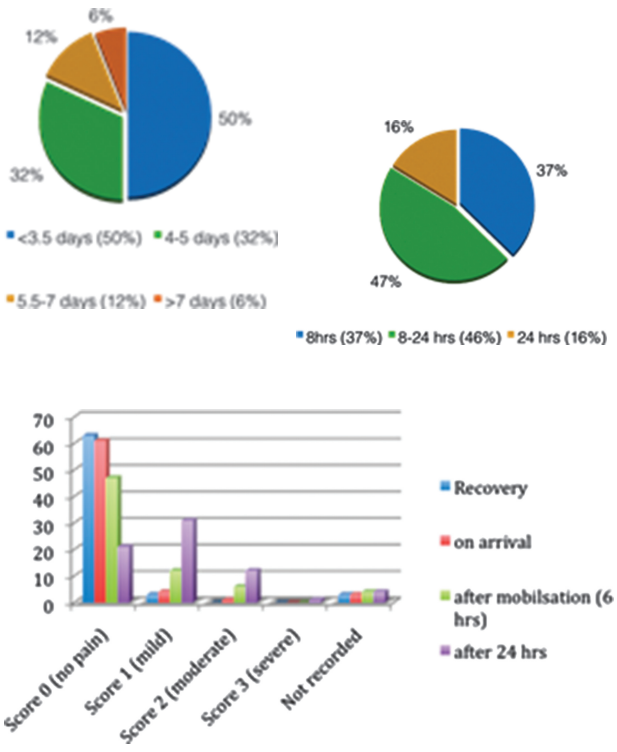
INTRODUCTION OF ENHANCED RECOVERY PROGRAMME FOR PRIMARY KNEE ARTHROPLASTY IN SANDWELL AND WEST BIRMINGHAM HOSPITALS NHS TRUST- OUR JOURNEY SO FAR!

S. Sivasubramaniam[1], S. Marri[1], A. Rayen[1]. [1]*Anaesthetics, City Hospital Birmingham B18 7QH, Sutton Coldfield, United Kingdom.*

Purpose/Objective: Multimodal enhanced recovery protocols for primary knee arthroplasty has shown improvement in clinical outcomes and also reduction in hospital stay.

Materials and Methods: The enhanced recovery protocol was introduced to City Hospital in May 2012. 78 patients between may –July 2012 for total knee replacement were assigned to enhanced recovery programme. Revision knee replacements were excluded from the programme.

The primary measured outcomes were length of stay and time to mobilisation. Secondary outcomes were pain scores at 0, 6, 12 and 24 hours postoperatively.



Conclusion: A decrease in length of stay was observed (from 6.4 to 4.5), most of the patients were mobilised with in first 24 hrs leading to quicker recovery and early discharge, post op analgesia scores were better compared to previous analgesic techniques.

DEVELOPMENT OF A PHANTOM FOR ULTRASOUND GUIDED SPINAL AND EPIDURAL ANAESTHESIA WITH THREE-DIMENSIONAL POLYMER PRINTING.

S. West[1], I. Koutsakos[2], J.M. Mari[2], D. Kamming[1], A.E. Desjardins[2]. [1]*Anaesthesia, University College London Hospitals NHS Foundation Trust, London, United Kingdom,* [2]*Medical Physics and Bioengineering, University College London, London, United Kingdom.*

Purpose/Objective: Ultrasound guidance for spinal/epidural procedures has a steep learning curve, and simulation can be helpful (1). Current phantoms are limited in realism and expensive. In this study, we investigate the use of 3D polymer printing to develop anatomically realistic phantoms for spinal and epidural anaesthesia.

Materials and Methods: A section of the lumbar spine (L2–L5) was segmented from a computed tomography (CT) image volume and converted to a 3D polymer printing file using commercially available software (Mimics Innovation Suite). This file was printed using Nylon 6. Additional components were added to the Nylon 6 structure after printing, to represent the dura and the ligamentum flavum. The phantom was completed using agarose to represent soft tissue structures. Ultrasound images of the phantom were compared with corresponding *in vivo* images using qualitative and quantitative criteria.

Results: The ultrasound images of the phantom bore a strong resemblance to images of the lumbar spine obtained from patients *in vivo* (Fig.1). The resistance encountered during needle insertions was acceptable for training purposes, and needles were visualized in the same range of angles as those encountered in clinical practice.

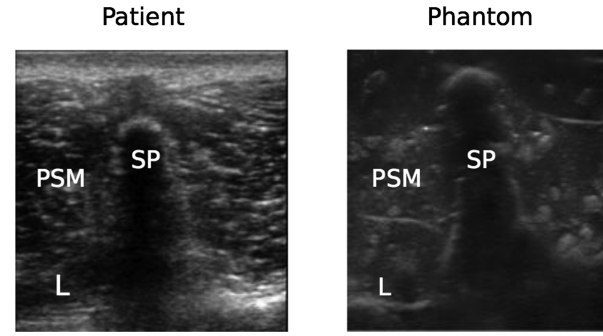


Figure 1. Transverse ultrasound images of the lumbar vertebrate acquired from a patient during clinical examination (left) and from the phantom (right). SP: Spinous process; PSM: Paraspinous Muscle; L: Lamina.

Conclusions: Three-dimensional printing has a high potential for efficiently producing realistic, cost-effective ultrasound phantoms. There is strong potential to generate patient-specific phantoms to provide training for abnormal geometries.

1. Sites BD, Gallagher JD, Cravero J et al. The learning curve associated with a simulated ultrasound-guided interventional task by inexperienced anesthesia residents. *Regional Anesthesia and Pain Medicine.* 2004;29:544–548.

COMPARISON OF TWO DOSES OF IV PARACETAMOL AS ADJUNCT TO CAUDAL ROPIVACAINE IN CHILDREN UNDERGOING LOWER ABDOMINAL SURGERY: A PROSPECTIVE, RANDOMIZED, CONTROLLED, DOUBLE BLIND TRIAL

M. Arora1, A. Malik[1], G. Prasad[1], A. Chhabra[1], R. Subramanium[1]. [1]*Anaesthesiology, All India Institute of Medical Sciences, New Delhi, India.*

Purpose/Objective: The prospective , randomized , double blind study was done to evaluate the efficacy of an initial dose of 15mg/kg IV as compared to 30 mg/kg IV paracetamol to caudal ropivacaine (0.2% , 1ml/kg) for providing perioperative analgesia in children 1–8 year, undergoing lower abdominal and genitourinary surgeries.

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Materials and Methods: Institute ethical committee approval was obtained. A total of 75 patients were included and divided randomly into three groups of 25 each.
Group A : 15 mg/kg IV paracetamol
Group B : 30mg/kg IV paracetamol
Group C : Normal Saline IV

After administration of general anaesthesia caudal block was performed with 0.2% ropivacaine , 1ml/kg body weight. Any increase in HR or Blood pressure by 20% was treated with boluses of 0.5µg/kg IV fentanyl. Pain in Post operative period was assessed using CHEOPS score. The time to first analgesic requirement was noted . Fentanyl boluses were administered when CHEOPS was > 6 . Oral paracetamol 15mg /kg dose was given to all patients every 6hrly for first 24 hrs.

Results: Intraoperative analgesic requirement between the three groups were not statistical significant. Post operative pain scores were similar in the three groups during 24 hrs and number of patients requiring rescue analgesia and time time to first analgesia requirement was not different between the three groups.

Conclusions: This randomized controlled double blind trial demonstrated that an initial dose of 15mg/kg or 30mg/kg paracetamol as an adjuant to caudal ropivacaine provided no advantage as compared to normal saline.

REAL-TIME ULTRASOUND EVALUATION OF CAUDAL ANESTHESIA SPREAD FOR PILORIC STENOSIS SURGERY WITHOUT TRACHEAL INTUBATION

B. Dottore[1], I. Toretti[1], A. Vilardi[1], M. Brazzoni[1], A. Iacobucci[1], R. Muzzi[1], A. De Monte[1]. [1]*Anesthesia, Udine Hospital, Udine, Italy.*

Purpose/Objective: The classically recommended local anaesthetic (LA) volume of 1.25 mL·Kg for caudal anaesthesia during hypertrophic pylorus stenosis (HPS) correction, often it isn't adequate to reach the required T6 level of anaesthesia.

We report our preliminary experience with 1.6 $mL \cdot kg^{-1}$ of LA volume administered under ultrasound guidance to check its intraspinal spread.

Materials and Methods: After canulation of a peripheral vein, seven neonates were sedated with i.v. ketamine 1mg/kg. Monitoring included ECG, SpO_2, T°. With the neonate placed in lateral decubitus, ultrasound identification of T12 spinous process was obtained by tracking medially the ultrasound scanning of 12th rib. Subsequently, the transducer was moved cranially to localize the T6 spinous process. A Pajunk 24 G Crawford needle was inserted through the sacral hiatus and its proper placement was confirmed by ultrasound view. A LA volume of 1.6 $mL \cdot kg^{-1}$ of plain saline containing 4 $mg \cdot kg^{-1}$ of bupivacaine was administered in less than 60". The spread of LA bulk flow at T6 level was observed during the injection by longitudinal paramedian ultrasound view. All neonates were allowed breathing spontaneously throughout surgery without tracheal intubation. A successful block was defined as the absence of movement or tachycardia during skin incision 20' after LA administration.

Results: Needle position and LA bulk flow spread were confirmed by ultrasound examination and surgery was performed safely.

Conclusions: In our experience real-time ultrasound spread evaluation of LA during caudal block suggests that a volume of 1.6 $mL \cdot kg^{-1}$ of LA is required to reach the adequate anaesthesia level for HPS correction.

ULTRA LOW-DOSE LEVOBUPIVACAINE-SUFENTANYL SPINAL ANESTHESIA FOR CESAREAN SECTION

D. Rucco[1], C. Del Coco[1], I.G. Strafella[1], G. Fiorita[1], M. Miggano[1], F. La Viola[1]. [1]*Anesthesia, Copertino Hospital, Lecce, Italy.*

Purpose/Objective: The state of turmoil due the immobilization of the lower limbs and the hypotension following spinal anesthesia remains commonplace in cesarean delivery. Intrathecal opioids are synergistic with local anesthetics and intensify sensory block without increasing sympathetic block.

Materials and Methods: Since January 2009 to June 2012, 743 women scheduled for cesarean delivery received a spinal injection of 6 mg of levobupivacaine 0.25% with 2,5 µg sufentanyl added. Each decrease in systolic pressure of greater than 25% from baseline was considered as hypotension and treated with a bolus of 5 of intravenous ephedrine.

Results: Spinal block provided surgical anesthesia in all patients. at the end of surgery, 73% of women had Bromage 0 and 27% Bromage 1 12% of the patients experienced a drop in blood pressure that required the administration of ephedrine 5 mg IV. nausea had occurred in 7% of women, while 26% complained of itching at the end of caesarean section, regressed in less than 20 minutes.

Conclusions: Levobupivacaine 6 mg + sufentanyl 2,5 µg provided spinal anesthesia for cesarean delivery with less hypotension, vasopressor requirements, nausea and prolonged motor blockade in the lower limbs.

A COMPARISON OF LOCAL ANAESTHETIC INFILTRATION AND RECTUS SHEATH BLOCK FOR PAIN RELIEF FOLLOWING PYLOROMYOTOMY IN INFANTS

S.D. Singaravelu[1], C. Moores[1]. [1]*Dept of Anaesthesia, Alder Hey Children's Hospital, Liverpool, United Kingdom.*

Purpose/Objective: Hypertrophic pyloric stenosis is a common condition in infants, needing emergency pyloromyotomy. Pain has a detrimental effect, hence it is important to provide adequate analgesia. We intended to review our current practice on post operative pain management after pyloromyotomy.

Materials and Methods: We conducted a retrospective audit in a large paediatric hospital collected the post operative analgesic requirements in those who had rectus sheath block and those who had infiltration of local anaesthetic into the wound, in infants undergoing pyloromyotomy.

Results: There were 61 patients who underwent open pyloromyotomy over a 7 month period between January and July 2011. The patient characteristics are given in the following table. We found no difference in the analgesic requirements between both groups.

Details	Rectus sheath block	Local infiltration	P value
No of patients	43 (70%)	18 (30%)	
Age [weeks]	5.0 +/− 1.3	4.4 +/−1.4	
Weight [kg]	3.7 +/− 0.6	3.9 +/− 0.6	
Time to first dose of analgesia [hours]	8.2 +/− 5.1	8.2 +/−5.4	0.94
Total paracetamol [no of doses]	1.6 +/−1.7	2.3 +/− 1.5	0.51
Total Codeine [no of doses]	0.5 +/− 0.7	0.5 +/− 0.9	0.86

Conclusions: We found that local infiltration is at least as effective as rectus sheath block in pain relief after pyloromyotomy. We suggest that local infiltration could be routinely practiced for all patients who need pyloromyotomy in the place of rectus sheath block.

DO NEEDLES HAVE TO HURT? USE OF A PODCAST TO RAISE PARENTAL AWARENESS OF ANALGESIA FOR PAINFUL PROCEDURES IN CHILDREN.

D. Son[1], N. Chaudhry[2], S. Govindaraj[2], K. Hassan[2], M. Kube-Clare[2], J. Machta[2], I. Gunaratnam[3], S. Cheung[3], J. Nicholson[4]. [1]*Paediatrics, Queen Mary's Hospital for Children St Helier Hospital, Surrey, United Kingdom,* [2]*Medical School, St George's Medical School University of London, London, United Kingdom,* [3]*Medical School, King's College London School of Medicine, London, United Kingdom* [4]*Medical School, Medical School The University of Birmingham, Birmingham, United Kingdom.*

Purpose/Objective: Provision of analgesia for painful procedures in children is often inadequate. Parental anxiety regarding procedural pain experienced by their children and the need for more information is well documented. Our video podcast was inspired by the UK healthcare campaign Clean Your Hands, which successfully improved patient care by educating and involving patients.

We aim to investigate the effectiveness of the podcast in terms of educating parents about pain relief options for their children and attitudes towards asking health professionals about analgesia when it is omitted.

Materials and Methods: Randomly selected parents were shown a video podcast on pain relief options for needle procedures and then asked to complete questionnaires. The podcast was shown on mobile devices or sent as emails.

Results: 89 questionnaires were completed. Only 12% of parents asked for analgesia for their children, when it was not offered, which happened in about 80%. 88% felt podcasts to be a good method to learn about pain relief. The level of knowledge increased significantly in almost all cases after

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watching the podcast. The attitude towards asking for pain relief had changed in 83% and 84% felt confident asking for it, if not offered.

Conclusions: We demonstrated, that a video podcast can be an effective method of educating parents about analgesia options for painful procedures. Providing parents with information also positively changed their attitudes towards the need for adequate analgesia and encouraged many to ask for it in the future.

This will hopefully contribute to improving analgesia management in children.

INTRODUCTION OF TAP BLOCK FOR POST CESAREAN ANALGESIA REDUCES POSTOPERATIVE OPIOID NEED

P. Van Houwe[1], M. Vertommen[1], A. Vandebroek[2]. [1]*Anesthesiology, GZA St Augustinus, Wilrijk, Belgium,* [2]*Anesthesiology, UZ Leuven, Leuven, Belgium.*

Purpose/Objective:

- improving postoperative analgesia after Cesarean Section (CS)
- obtaining rapid mobilization, early autonomy for the mother
- optimize breastfeeding

Materials and Methods: - introduction of tranversus abdominis plane block (TAP block) in the multimodal approach for postoperative analgesia, using the blind technique. Ropivacaine 0.5% 20 cc was injected bilaterally postoperative CS under spinal anesthesia

- in combination with paracetamol 1 gram IV/PO 4xday and diclofenac 50 mg PO 3xday for two days, escape analgesia with piritramide maximum 15mg IM/5h.
- monitoring of 71 patients during their hospitalization
- comparison of quality of analgesia with the control group before the introduction of the TAP block

Results: As primary variable the total piritramide use was analyzed. A score on a visual analog pain scale at rest and during movement, patient satisfaction and patient's preference for analgesia technique for future cesarean were included as a secondary outcomes (All variables were compared with a student t-test, equal variances assumed (Levene's test: $p > 0.05$).

There was no significant difference in VAS-scores (in rest and in motion), neither in patient satisfaction or in patient's preference for analgesia technique for future cesarean. However, as shown in figure 1, patients receiving a TAP block required approximately 50% less piritramide than patients without a TAP block (2,6 mg vs 5,5 mg, $p < 0,01$).

Conclusions: We can conclude that, although we didn't assess a difference in patient's comfort, the introduction of the TAP-block post cesarean section, has an opioid sparing effect.

DEVELOPMENT OF THE ROLE OF THE BLOCK ROOM AND ASSOCIATED COST SAVINGS

E. Chuter[1], R. Palugniok[1], N. Haslam[1], S. Robb[1], S. Cope[1]. [1]*Anaesthesia, Sunderland Royal Hospital, Sunderland, United Kingdom.*

Purpose/Objective: The introduction of a dedicated block room and parallel processing of orthopaedic patients leads to time saving and increased income in the form of additional cases. By providing a 5-day service and allowing the role of the block room consultant to develop we aimed to determine where further cost savings and improvements in efficiency within the theatre suite could be identified.

Materials and Methods: Over a 12-day period each block room consultant kept a diary. The diary exercise was logged with our local clinical governance committee and deemed not requiring of ethical approval.

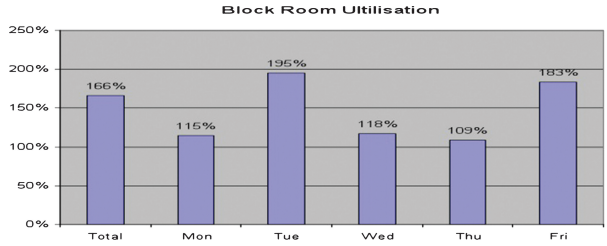


FIGURE 1. On average we have shown a daily 66% surplus of utilisation which equates to 1.3 of an anaesthetic session saving per day.

All work done was categorised and broken up into 15min slots. If the block room was the sole provider of anaesthesia for a hand surgery list it was deemed 100% utilised prior to the addition of other work.

TABLE 2. Extra activity not associated with block room direct clinical care.

Extra activity per week	Pre-op assessment	Theatre efficiency tasks	Direct trainee supervision	Trainee education
Minutes	54	274	38	120

Conclusions: Development of the role of the block room has further proven its cost effectiveness by covering an average of 2 dedicated anaesthetic sessions from hand surgery lists per day as well as providing parallel processing in other theatres. We have also highlighted additional roles vital to the improved running of the theatre suite.

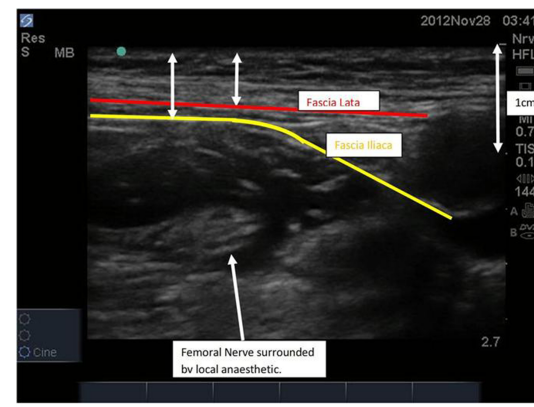
USING SONOANATOMY TO IMPROVE EFFECTIVENESS OF LANDMARK-TECHNIQUE FASCIA ILIACA BLOCKS FOR FRACTURED NECK OF FEMUR ANALGESIA

N. Courtenay-Evans1, F. Arif[1], F. Sage[1]. [1]*Anaesthesia, East Surrey Hospital, Redhill, United Kingdom.*

Purpose/Objective: Our Department teaches a landmark fascia iliaca compartment block (FICB) technique for pre-operative fractured neck of femur analgesia. Following an audit revealing a succession of ineffective FICBs, we assessed whether using ultrasound imaging and teaching the sonoanatomy would improve our service.

Materials and Methods: Auditing pain scores and morphine consumption after FICB showed 4/11 (36%) of patients still required morphine and that numeric pain scores were only reduced by a median of 2 points. Investigating this, we believed the FICB were being inserted too deep to be effective. We asked the anaesthetists to record the depth at which they injected their blocks (we use cm-marked Tuohy needles) and then later used ultrasound imaging to assess the true depth of the fascia iliaca in the patient.

We used the following annotated ultrasound image to educate our department that the fascia iliaca is usually a very superficial structure when performing FICB and to encourage that the endpoint of the block should normally be felt by 2.5cm, as indicated by our ultrasound study. We then reaudited the depth and effectiveness of FICBs following this intervention.



Results:

	Observed FICB Depth Before AnatomyTeaching	Observed FICB Depth After Teaching	Depth of Fascia Iliaca on Ultrasound
Number of Patients	16	13	19
Median (cm)	3.5	2.0	1.5
Range (cm)	2.5–5	1.5–3.5	1.2–2.5
		Before Teaching	**After Teaching**
Number of Patients Requiring Morphine		4/11 (36%)	3/15 (20%)
Morphine Used (median)		17.5mg	5mg
Median Numeric Pain Score Reduction		2 Points	4.5 points

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Conclusions: Understanding the anatomy of the FICB, as taught using ultrasound imaging, has greatly improved the effectiveness of these blocks in our hospital.

A SURVEY OF ANAESTHETISTS' ATTITUDES AND KNOWLEDGE REGARDING REGIONAL ANESTHESIA

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Purpose/Objective: Regional anaesthesia (RA) offers many advantages. This survey reports anaesthetists' exposure,attitudes and preferences toward regional anaesthesia.

Materials and Methods: A survey was emailed to Anaesthetic Consultants in a teaching hospital. Exposure to RA was found out in terms of the no and type of blocks performed over 6 months. Anaesthetic preferences were determined. Reasons for favouring or not favouring RA were determined.

Results: 50% of the anaesthetist always offer RA in their pre-operative visit while 16.7% never offer RA.

Principle reasons for favouring RA.

No of blocks in last 6 months	
<10	54.5%
10–20	9.1%
> 20	36.4%
Types of block	
Interscalene	50%
Supraclavicular	20%
Infraclavicular	10%
Axillary block	70%
Fascia Illiaca	30%
Femoral	30%
Sciatic	0%
Popliteal	20%
TAP	50%

Principle reasons for favouring RA.	
Improves analgesia	66.7%
Reduces PONV	44.4%
Increases patient satisfaction	55.6%
Decreases blood loss	22.2%
Decrease thrombosis risk	33.3%
Use in high risk patients	77.8%

Principle reasons for non-favouring block	
Increase anaesthetic time	50%
Increase patient anxiety	0%
Unpredictable success	25%
Delay in assessment of neurological status	25%
Less effective than GA	0%
More side effect	25%
Additional GA still required	0%

41% of Anaesthetic Consultant would like training session on RA.

Conclusions: Most of the Anaesthetic Consultants are supportive of RA. Direction toward RA or general anesthesia may be significantly influenced by subspecialty. The main reasons for not favouring block is it increases anaesthetic time(50%).These issues can be resolved with physician education, improvements in training, and organization of the RA facility.

ULTRASOUND GUIDED CONTINUOUS PHRENIC NERVE BLOCK FOR THE TREATMENT OF PERSISTENT POSTOPERATIVE HICCUPS

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Purpose/Objective: To present a case report of a 45 y/o female who underwent laparoscopic Nissen fundoplication and developed chronic postoperative hiccupping with no response to medical treatment during one year. Phrenic nerve blockade was performed.

Materials and Methods: A single ultrasound guided injection of the left phrenic nerve was performed, injecting 60mg of 1% Lidocaine and 40mg of Triamcinolone depot. The patient's symptoms showed a mild decrease in intensity, without resolution. The same procedure was performed on the right phrenic nerve with no response. A second blockade was performed using 50mg of 0.5% Levobupivacaine, with a reduction in the frequency of hiccupping, but with recurrence 24 hrs after the procedure. An ultrasound guided neurostimulable catheter was placed in the left phrenic nerve. A 3ml bolus of 0.75% Levobupivacaine was administered, followed by two infusions of 0.375% Levobupivacaine at a rate of 1ml/hr for 24 hrs.

Results: Complete response was obtained after 30 minutes of the 0.375% Levobupivacaine infusion. The patient was discharged from the hospital with the catheter in place, and a 48 hr follow-up check was performed, with satisfactory results. Four days after the patient's discharge, the catheter was discontinued, and the patient presented total remission of her symptoms. One month after discharge, the patient continues to be asymptomatic without respiratory symptoms.

Conclusions: Phrenic nerve blockade is described in the literature as a reliable treatment for persistent postoperative hiccupping. In our case hiccups disappeared completely after 4 days continuous infusion.

ANTERIOR SCIATIC NERVE BLOCK: EVIDENCE SUPPORTING A NOVEL APPROACH USING BONY LANDMARKS ON ULTRASOUND

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Purpose/Objective: A new anterior sciatic nerve block technique using bony landmarks on ultrasound with confirmatory nerve stimulation has been developed at our department. To further validate this technique, a small volunteer MRI study was set up to investigate the relationship of the sciatic nerve to the flat medial border of the femur when the leg is held in a relaxed position with a natural amount of external rotation.

Materials and Methods: Volunteers (comprising 5 males and 5 females) were recruited to undergo T1 weighted MRI scanning from pelvis to knees. Subsequent analysis of the scans was carried out by a Consultant Radiologist. A line drawn overlying the flat medial aspect of femur on the cross sectional images was used to simulate the path of a block needle. This analysis was repeated at three different levels (subtrochanteric, mid femoral and junction of the mid/distal third of femur).

Results: The needle path described directly contacted the sciatic nerve in 60% and 40% of the cross sectional images at the subtrochanteric and mid – femoral levels respectively. Where the nerve did not directly contact this line, it was found medial to it in 95% and 80% of images at the subtrochanteric and midfemoral levels with a mean medial distance to the nerve of 3.25 and 2.1 mm respectively.

Conclusions: At the subtrochanteric and mid-femoral levels the sciatic nerve lies on or just medial to a line following the flat medial border of femur as seen on ultrasound. A block needle passed along this line will contact the sciatic nevre in the majority of patients.

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FEMORAL NERVE BLOCK WITH PROPOFOL/ALFENTANIL SEDATION USING TARGET CONTROLLED INFUSION FOR HIP FRACTURE SURGERY: A SERVICE EVALUATION OF THREE YEARS IN USE.

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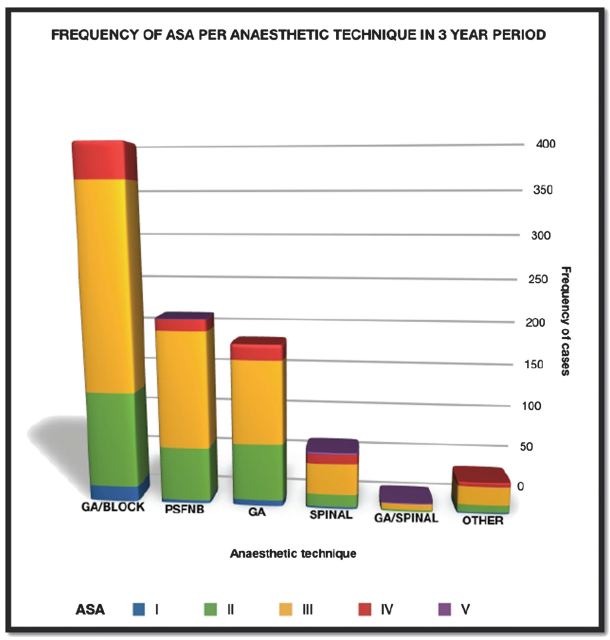
Purpose/Objective: In our hospital, hip fracture patients can undergo a combination of sedation using target controlled infusion of propofol/alfentanil with femoral nerve block (PSFNB). This technique provides cardiovascular stability, reduction in post-operative confusion and suitability for patients if central neuraxial blockade (CNB) is contraindicated. A service evaluation was performed to calculate frequency and demonstrate the safety of this technique.

Materials and Methods: We reviewed the hospital hip fracture database and measured frequency of PSFNB being chosen as the anaesthetic technique over a 3-year period (October 2009 – September 2012). We determined the demographic data, ASA and calculated the length of stay and 30-day mortality for our unit while this technique is in use.

Results: A total of 922 patients received hip fracture fixation. The male to female ratio was 1:3 with median age of 84. PSFNB was used for 25% of all cases (GA/block in 42%, GA alone in 21% and CNB in 7%). The distribution of ASA among the PSFNB and GA/block group was similar (fig.1). The 30-day mortality rate was 6% with a median length of stay of 11 days.



Conclusions: PSFNB for hip fracture surgery is safe and versatile. We have shown that it can be used safely as an alternative to CNB or GA. In our centre it is used commonly without adversely affecting hip fracture outcomes. Both 30 day mortality and length of stay is better than national average over this period (6% versus 10% and 11 versus 20 days respectively).[i]

[i] NHFD Annual Report, 2012. http://www.nhfd.co.uk/003/hipfractureR.nsf/0/da44e3a946a14e4180257a6f001eb4db/$FILE/NHFD %20National%20Report%202012.pdf (Accessed : 17/04/13)

PAIN MANAGEMENT OF PATIENTS WITH RIB FRACTURES AFTER BLUNT THORACIC TRAUMA.

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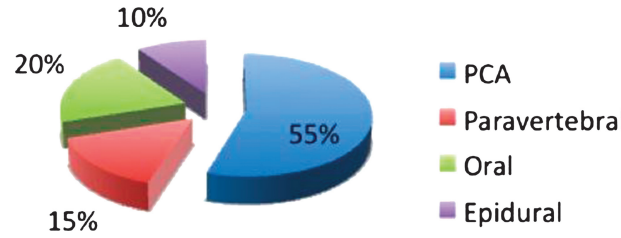
Purpose/Objective: Analgesia provided for chest trauma patients is variable in UK. Patients may have thoracic epidural, paravertebral catheter, patient controlled analgesia (PCA), or oral analgesia. There is increased number of chest trauma patient admissions in our hospital since we became a multi-trauma centre. This led to an increased workload on regional anaesthetists and intensive care.

Materials and Methods: We identified 20 patients with 4 or more fractured ribs. Our standards were: 1- More than 90 % of all patients aged ≥ 65 years offered a regional technique within 24 hours 2- A mean pain score of ≤ 6 in the first 3 days 3-An incidence of vomiting ≤ 10% 4-An incidence of respiratory complications ≤ 40%. Graph:Initial analgesia given to patients.



Results: 83% of patients aged ≥ 65 years had regional technique within 24 hours. The initial mode of analgesia was a regional technique in 42 % of patients aged ≥ 65 years . Such patients had a 50% reduction in respiratory complications. Mean pain scores were higher in PCA and oral analgesia groups. Nausea and vomiting were a problem in PCA group. There was Surprisingly a high rate of respiratory complications in paravertebral group (older population).

Conclusions: Analgesia for patients with multiple rib fractures is suboptimal with high rate of respiratory complications. Paravertebral catheters are likely to be of benefit only if they are inserted early. Thoracic epidural provides excellent analgesia but there are so many contraindications for putting them in trauma patients.

ROPIVACAINE BLOCKADE OF PRESSURE-INDUCED PULMONARY EDEMA IN VIVO AND IN VITRO VIA INHIBITION OF ENOS AND SRC – A NEW TARGET FOR AN OLD DRUG?

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Purpose/Objective: Elevated pulmonary vascular pressures occur during acute heart failure, fluid overload, and mechanical ventilation. Pressure-induced mechanotransduction leading to vascular hyperpermeability and pulmonary edema is mediated in part by nitric oxide (NO) generation, Src kinase activation, and caveolin-1 phosphorylation. Ropivacaine has previously been shown to attenuate experimental lung injury and Src activation. Thus, we hypothesized ropivacaine may attenuate mechanotransduction during elevated pulmonary pressures by blocking NO-induced Src activation and caveolin-1 phosphorylation.

Materials and Methods: All animal experiments were approved by the Institutional Animal Care and Use Committee. Capillary filtration coefficient (K_{fc}) was measured in the isolated perfused rat lung (IPL). The IPL was subjected to two 20-minute-periods of left atrial pressure (P_{LA}) elevation to 7.5 cmH_2O or 15 cmH_2O (2nd period only). K_{fc} was calculated for both individual pressure steps ($K_{fc}1$, $K_{fc}2$). Treatment groups were control vs. ropivacaine (1 μM). Additionally, rat pulmonary artery endothelial cells (RPAEC) subjected to a vertical pressure of 30 cmH_2O for 1 hour +/− ropivacaine (1 μM) *in vitro* were analyzed by Western Blot.

Results: The 4.5-fold increase in the IPL $K_{fc}2/K_{fc}1$ ratio induced by P_{LA} elevation to 15 cm H_2O was completely abolished by 1 μM ropivacaine. *In vitro,* vertical pressure increased eNOS and Src activation and promoted caveolin-1 phosphorylation in RPAECs, which was attenuated by 1 μM ropivacaine.

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Conclusions: Ropivacaine at a clinically relevant concentration completely blocked pressure-induced increase in pulmonary capillary leakage, possibly due to the inhibition of eNOS-mediated Src activation. This novel property of ropivacaine may have significant therapeutic potential in patients with acutely elevated pulmonary pressures.

INTRAVENOUS LIPID EMULSION IS INEFFECTIVE IN ACUTE LIDOCAINE-INDUCED CNS TOXICITY IN HEALTHY VOLUNTEERS

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Purpose/Objective: The proposed antidotal action of intravenous lipid emulsion (ILE) in drug-induced toxicity is thought to be based on a "lipid sink" mechanism. However, modern local anaesthetics (LAs) are probably not lipophilic enough for significant entrapment, suggesting that ILE would be ineffective in LA-induced CNS toxicity.

Materials and Methods: In randomized, subject blinded and cross-over fashion, an i.v.-bolus of 20% Intralipid® 1.5 ml/kg or Ringer-acetate was given to eight volunteers, followed by a rapid i.v. bolus of lidocaine 1.0 mg/kg. Then, Intralipid® or Ringer was given at a rate of 0.25 ml/kg/min for 30 min. EEG (24 electrodes) was registered. Five min after lidocaine administration subjective sensations were scored. Venous blood was sampled for lidocaine concentration measurements (HPLC).

Results: All volunteers experienced CNS toxic symptoms from lidocaine which were similar during ILE and Ringer treatment. Toxic EEG changes (e.g. increased spectral power of delta in the frontal and reduced alpha power in the occipital region) during the first 2 minutes after lidocaine were similar during both treatments. Total lidocaine plasma concentrations in Ringer group were slightly higher than those in ILE group. In ILE group there was no difference between unentrapped and total lidocaine plasma concentrations.

Conclusions: Our study shows that CNS toxicity from i.v. lidocaine is unaffected by ILE. Lidocaine was not entrapped in plasma by ILE, in accordance with our earlier results with mepivacaine.[1] Thus, ILE may not be useful for the treatment of lidocaine-induced CNS toxicity.

Reference:

1) Litonius E et al. Anesth Analg 2012;114:901–6.

VISUO-SPATIAL ABILITY AS A PREDICTOR OF NOVICE PERFORMANCE IN ULTRASOUND-GUIDED REGIONAL ANAESTHESIA (UGRA)

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Purpose/Objective: Service efficiencies, patient safety agenda and the European Working Time Regulations have all reduced clinical learning opportunities in Anaesthesia, which could compromise patient safety. One solution in regional anaesthesia, would be to permit early, targeted training for anaesthetists who are predicted to perform poorly. The aim of the study is to identify which assessment of visuo-spatial ability best predicts novice performance of ultrasound-guided regional anaesthesia (UGRA).

Materials and Methods: Sixty medical students with no prior experience of ultrasound scanning were enrolled voluntarily in this observational study. They were assessed on mental rotation (MRT), spatial reasoning (AH4), numerical reasoning (NRT) and field independence (GEFT). They completed an ultrasound-guided needling task on a turkey breast model and were assessed independently by 2 assessors using the validated composite error score (CES).

Results: Interrater reliability was excellent for the CES (Intra-class correlation ICC = 0.98, p<0.0001). Mental rotation negatively correlated with CES (ρ, −0.48; $p < 0.001$) such that, better mental rotation skills were associated with fewer errors. None of the remaining assessments (AH4, NRT and GEFT) correlated with CES.

Poisson regression model for CES showed significant effect for MRT (Coefficient, -0.082; $p < 0.001$) with AH4 and GEFT in the model. There was also a significant effect for GEFT, with AH4 and MRT in the model (Coefficient, -0.042; p= 0.003). Thus better mental rotation and field independence were associated with fewer errors.

Conclusions: This study shows that better mental rotation and field independence predict fewer errors in novice performance in UGRA.

THEATRE SIMULATION TRAINING FOR MANAGEMENT OF LOCAL ANAESTHETIC TOXICITY

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Purpose/Objective: It is important that all members of staff are able to respond appropriately to critical incidents in the operating theatre to reduce morbidity and mortality. In spite of this a survey of trust theatre staff showed that multi disciplinary training opportunities in theatre emergencies were limited & staff felt unprepared to help manage emergencies in theatre such as local anaesthetic toxicity following peripheral nerve blockade.

Materials and Methods: Live simulation and SimMan 3G scenarios were integrated within theatre Clinical Governance Meetings. The theatre simulation training exposed multi-disciplinary staff to adverse anaesthetic incidents. Staff were familiarised with SimMan 3G equipment before a simulated operating list commenced. A local anaesthetic toxicity scenario was performed followed by a local anaesthetic anaphylaxis scenario. Staff were expected to react in real time and use all necessary resources within the department, thus testing clinical, non clinical skills and highlighting latent threats within these processes.

Results: Survey results showed that no attending staff had had any formal teaching within the last two years and only 21% felt they had the appropriate training to assist with management of emergencies in theatre. Post training feedback was excellent. 90% felt it was relevant and 82% felt more aware of how to deal with emergencies and more confident in managing them as a team.

Conclusions: Integrating the use of simulation within theatre Clinical Governance Meetings provides a highly effective educational and training opportunity. Increased exposure to infrequent emergencies through simulation enables the rehearsal of delivery of high quality care and improves patient safety.

PRACTICE OF REGIONAL ANAESTHESIA IN CRITICAL CARE UNITS IN THE NORTH WEST ENGLAND

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Purpose/Objective: Practice of Regional Anaesthesia (RA) in the perioperative setting has gained huge popularity. It seems natural to except similar trends in the non-surgical setting too. However, the use of the RA in the critical care is less well studied. RA in critical care poses unique challenges, which are uncommon in the perioperative milieu.

Our aim was to audit the practice of RA in the critical care units (CCU) across the North-West England.

Materials and Methods: An online survey to probe different aspects of the practice of RA and was sent to 17 CCUs in the region. Questions included frequency and type of regional blocks performed, common indications and contraindications and use of catheter techniques.

Results: 11 CCUs (64.7%) responded to our survey. 77% of the respondents practiced RA in their CCU. However, the frequency RA use varied widely between hospitals and 35% replied that they performed blocks only less than once a month. Epidural and TAP blocks were most commonly performed blocks and catheter techniques were used by 88%. Post-surgical and trauma were the commonest indications for RA, whilst coagulopathy and sepsis were the commonest contraindications. All but

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one respondent replied that they were not aware of any complications arising from RA in their CCU.
Conclusions: Practice of RA in CCU seems to follow the general trend of increasing utilisation as seen elsewhere. Despite this, the take up of RA varies widely with some centres performing RA very infrequently. In spite of the challenges posed by the CCU environment, RA appears to be safe.

ILIOHYPOGASTRIC/ILIOINGUINAL NERVE BLOCK IN THE INGUINAL HERNIA REPAIR FOR POSTOPERATIVE PAIN MANAGEMENT: COMPARISON OF THE ANATOMICAL LANDMARK AND ULTRASOUND GUIDED TECHNIQUES

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Purpose/Objective: The purpose of this study is to compare the efficacy of Iliohypogastric/Ilioinguinal (IH/II) nerve blocks performed with ultrasound (US) guided and anatomical landmark techniques for postoperative pain management in cases of adult inguinal herniorrhaphy.
Materials and Methods: 40 patients who underwent elective unilateral inguinal herniorrhaphy were enrolled in this study and were randomized into two groups equally: in Group AN (anatomical landmark technique) and in Group US (ultrasound guided technique), IH/II nevre block was performed with levobupivacaine prior to surgery with specified techniques. Postoperative pain scores were assessed and recorded by VAS. In addition, first mobilization time, length of hospital stay, score of postoperative analgesia satisfaction, opioid induced side effects and complications related to block were assessed for 24h postoperatively.
Results: VAS scores at rest and movement were found significantly less in Group US. While length of hospital stay and first mobilization time were being found significantly shorter, analgesia satisfaction scores were found significantly higher in Group US ($p<0.05$, $p<0.001$, $p<0.001$ respectively).
Conclusions: According to our study, US guided IH/II nerve block in adult inguinal herniorrhaphies provides a more effective analgesia and higher satisfaction of analgesia. It may be suggested that the observation of anatomical structures with the US may increase the success of the block, and minimize the block-related complications.

COMPARISON OF INTRA-ARTICULAR LEVOBUPIVACAINE WITH FEMORAL BLOCK AFTER KNEE ARTHROSCOPY FOR POSTOPERATIVE ANALGESIA

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Purpose/Objective: Arthroscopic surgery of knee is a painful procedure requiring postoperative pain management. This prospective study investigates analgesic quality after femoral block using ultrasound guide as compared with intra-articular injection of local anaesthetic.
Materials and Methods: After Institutional Ethic Committee approval was obtained, sixty patients scheduled for elective arthroscopic knee surgery under general anaesthesia were randomly assigned into 1 of 2 groups. After completion of surgery, femoral group (n:30) received a femoral block using ultrasound guide with 20 ml of 0.5% levobupivacaine and intra-articular group (n:30) received 20 ml of 0.5% levobupivacaine injected intra-articularly. Primary end point was 24 hours supplemental analgesic (diclofenac sodium) consumption postoperatively. Analgesia duration and Visual Analogue Scale (VAS) scores at 1, 2, 4, 8, 12, 24 hours postoperatively were recorded.
Results: Demographic data and surgical characteristics were comparable in both groups. After femoral block, supplemental analgesic consumption was lower than intra-articular group for 24 hours postoperative period ($p=0.01$). VAS scores at 8 and 12 hours postoperatively were higher in the intra-articular group than those of femoral group. Analgesia duration of femoral group was longer than in intra-articular group.
Conclusions: Femoral block provides better analgesia and allows a significant supplemental analgesic sparing effect after arthroscopic knee surgery for postoperative analgesia.

COMPARISON OF ANTI HYPERALGESIC EFFECT OF KETAMINE AND TRAMADOL DURING PERIOPERATIVE PERIOD FOR VISCERAL SURGICAL LAPAROTOMY

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Purpose/Objective: Recently an anti-hyperalgesic activity of tramadol has been reported. The aim of our study is to compare it with ketamine (anti hyperalgesic of reference).
Materials and Methods: Prospective double blind study .Patients scheduled for visceral surgical laparotomy were eligible for recruitment into the study. The anesthetic protocol is similar for all patients: *Premedication*: hydroxizine 1mg/Kg 2H before the surgery. *Induction*: Fentanyl 2Ω/Kg, propofol 2,5mg/Kg and cisatracrium 0,15mg/Kg. *Maintenance*: Isoflurane 0,7 à 1,5% or propofol 10mg/Kg/H, fentanyl bolus 50 Ω /20 or 30 min and cisatracrium bolus.

The patients were randomized in two groups:

Ketamin group (K): induction bolus 0,2mg/kg, maintenance and 48H post operative 2δ/kg/min infusion.

Tramadol group (T): induction 100mg, end of surgery 0,5mg/kg and 48H post operative 0,1mg/kg/h infusion.

Both groups enjoy the same post operative analgesia: morphine titration then relay with patient-controlled analgesia and paracetamol 1g/6H.
Results: The two groups were comparable in demographic terms. The dose of morphine titration was similar in both groups [7.67 mg for G (T) and 9.40 mg for G (K)]. Total consumption of morphine during the postoperative 48 hours was statistically higher in the group (T) (67.17 mg vs. 39.40 mg). The VAS at rest and in motion 24H and 48H post op is similar in both groups. In the ketamine group, two cases of nausea and one case of dry mouth were reported.
Conclusions: The anti hyperalgesic tramadol activity remains unproven. Morphine-sparing effect is less than ketamine.

TRANSVERSUS ABDOMINIS PLANE BLOCK: IS THERE MORE THAN ONE WAY TO SKIN A TAP?

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Purpose/Objective: Transversus abdominis plane blocks are a fairly recent arrival within anaesthetic practice. Despite evidence of efficacy a recent systematic review has suggested that our understanding of them, and their role in our practice, is limited. This may be because there is no consensus on the indications and optimal technique for the procedure.
Materials and Methods: A survey was sent to all anaesthetists within NHS Lanarkshire to ascertain what TAP block techniques they used and for what indications.
Results: 49 completed surveys were returned, 75% of respondents use TAP blocks in their daily practice.

Ultrasound	83% (31/37)	**Landmarks Alone**	17% (6/37)
Awake	8% (3/37)	**Asleep**	92% (34/37)
Standing on same side	78% (29/37)	**Standing on opposite side**	22% (8/37)
Surgical Site		**% Respondents = TAP Block indicated**	
Below Umbilicus		100% (37/37)	
Above Umbilicus		38% (14/37)	
Midline		86% (14/37)	
Laparoscopic		22% (8/37)	

An 18 gauge Tuohy needle was most commonly used but there was a great variety of others including regional block, blunt filter and spinal needles. All respondents used levobupivicaine but volume and concentration varied significantly.
Conclusions: The results confirm that there is no clear consensus within our region on how to perform a TAP block. Different techniques, both landmark and ultrasound, are described in the literature but their efficacy is not compared. Therefore investigation into the most effective TAP block technique is required. This could then inform a more unified approach to executing and teaching this frequently performed but poorly understood block.

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THE EFFECT OF THE ADMINISTRATION OF DIFFERENT SINGLE DOSES OF INTRAARTICULAR LEVOBUPIVACAINE ON THE CARTILAGE IN THE RABBIT SHOULDER JOINT MODEL

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Purpose/Objective: The administration of local anaesthetics as single injection or continuous infusion into the joint is an analgesia technique which is well defined for the postoperative control of pain in the patients who underwent arthroscopic surgery. However, many studies have been published in the recent years stating that the local anaesthetics damage the joint cartilage. Our aim was to investigate the effects of intraarticular administration of levobupivacaine (into the shoulder joint), which is accepted to have less side effects compared to other local anaesthetics and whose effects are not completely known, on the cartilage structure, histologically and morphometrically.

Materials and Methods: In our study, 35 shoulder joints of 20 male New Zealand rabbits were classified into 7 groups of 5 replicates, 2 and 15 days after the intraarticular (glenohumeral joint) administration of levobupivacaine (0.25% and 0.5%) and saline. The samples which were obtained from the control, day-2 and day-15 trial groups were evaluated histomorphometrically using Mankin's score.

Results: Macroscopically, no changes were observed on the joint surfaces of any of the groups. It was only observed that the synovial fluid decreased in the groups after 15 days. Microscopically, the highest Mankin's score (average: 3,14 ± 2,1 / 14) belonged to group of day 15, 0.5% Levobupivacain and it was statistically significant ($p<0.05$).

Conclusions: In our study, the effect of levobupivacaine on the cartilage was limited with superficial changes. The single administration of intraarticular levobupivacaine in low concentrations is considered safe. Despite this fact, care should be taken considering the side effects.

EFFICACY OF CONTINUOUS RECTUS SHEATH BLOCK AFTER MAJOR ABDOMINAL SURGERY

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Purpose/Objective: Single shot rectus sheath block provides adequate analgesia after low abdominal and umbilical surgery [1, 2]. But the role of this technique in major abdominal surgery still unknown and debatable.

Materials and Methods: After approval by ethical commettee we enrolled 78 adult patients after open gastric and colonic resection in a prospective, randomized study. All patients were randomized in to two groups. In the RSA (Rectus Sheath Analgesia) group (n=44), we used bilateral rectus sheath epidural catheter technique with infusion of 0.25% ropivacaine 5 ml/h through the elastomeric pump. In the SSA (Standard Systemic Analgesia) group (n=34) we used 20 mg of the trimeperidine every 4–6 h after surgery. Pain scores were assessed by 100-point visual analog scale (VAS) at 3, 6, 12, 24, 48 and 72 h after surgery. In addition, the consumption of opioids and the incidence of opioid-related adverse effects and the recovery of bowel function were recorded. Data were compared using Students t-test.

Results: VAS in coughing was lower in the RSA group comparing with the SSA group at 3, 6, 12, 24 and 48 h after surgery ($p< 0.05$). The consumption of the trimeperidine at 24 h was significantly smaller in the RSA group (18.3±1.3) than in the SSA group (66.6±1.4mg, $p< 0.05$). In the SSA group, the incidence of nausea was 55.9%. An opioid-induced pruritis was mostly observed in SSA group (29.4%).

Conclusions: After major abdominal surgery, rectus sheath analgesia with LA provides better postoperative analgesia comparing with the systemic analgesia. In addition, rectus sheath block after laparotomy reduces the consumption of opioids.

EFFECTS OF ANAESTHETIC TECHNIQUE FOR CLAVICLE FRACTURE FIXATION ON POST-OPERATIVE RECOVERY

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Purpose/Objective: Clavicle fracture fixation is controversial, reserved mainly for patients with neurovascular injury or fracture non-union, however there is evidence that early fixation may result in improved function and satisfaction.

The patient group is usually young, fit, ASA 1–2 and suitable for day case surgery.

An understanding of the options available for the peri-operative management of these cases is useful in order to provide excellent analgesia and achieve timely discharge from hospital.

Materials and Methods: We conducted a retrospective review of the case notes of all patients who had had clavicle fixation during the past two years.

Primary aim: to compare perioperative opiate use between the two groups

Secondary aims: to compare length of stay & post-operative pain scores between the two groups.

Results: 30 patients were identified.

Group 1 (n= 8): received SCPB+ ISB prior to general anaesthetic

Group 2 (n=22): received general anaesthetic and local anaesthetic infiltration by surgeon

Group 1 required significantly less post-operative morphine ($p=0.00075$). Other results were not statistically significant, but mean hospital length of stay was 5.75 hours in group 1 compared to 10.5 hours in group 2.

Conclusions: General anaesthesia with a combination of cervical plexus and interscalene brachial plexus blocks is an appropriate technique for fixation of clavicle fractures. In our patient cohort, this technique had the benefit of reducing opioid requirements and hospital length of stay compared to general anaesthetic with local anaesthetic infiltration by the surgeon.

EFFECTS OF SINGLE-SHOT AND CONTINUOUS TWO-LEVEL EPIDURAL ANESTHESIA ON PAIN MANAGEMENT AND STRESS RESPONSE IN PATIENTS UNDERGOING SCOLIOSIS CORRECTION

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Purpose/Objective: Study Design: A prospective, randomized, study was used to compare two anesthesia methods for scoliosis surgery. Objective: To assess the efficacy and influence of two methods on clinical outcome, systemic haemodynamics, stress response and the haemostatic system during surgical corrections of scoliosis.

Materials and Methods: The study included 135 patients, aged from 12 to 25 years with spinal deformities of grade III-IV. All patients were randomly allocated to 2 groups. Two-level (Th4-5 and Th10–11) thoracic epidural anesthesia (EA) with 0.75% ropivacaine (15–25 ml) and 200 mcg of fentanil and general endotracheal anesthesia with sevoflurane (0.8–1.5% vol.) were used in the Group E (n = 70) and only general anesthesia with sevoflurane and fentanil was used in the Group G (n = 65) during the surgery. After surgery analgesia was performed by prolonged EA by setting two-level epidural catheters with ropivacaine, fentanil and epinephrine using infusion pump in both groups.

Results: Noninvasive hemodynamic monitoring has shown EA not to lead to life-threatening disorders in cardiac output, systemic vascular resistance and critical increase of extravascular lung water. In Group E, there was significantly less pain, earlier mobility and higher satisfaction compared to Group G. Group E has also experienced significantly less blood loss on 50% (568 ml, $p=0.0013$). Group E demonstrated lower levels of glucose, cortisol, interleukin IL-1β, IL-6 and IL-10 and haemostasis desorders during the postoperative period.

Conclusions: Single-shot and then continuous epidural anesthesia can be successfully used to provide better pain control, less blood loss, and modulation of the endocrine and haemostatic stress response.

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ONE MAN CAN MAKE A DIFFERENCE. HOW SINGLE RESEARCH CENTRES HAVE SHAPED THE DEVELOPMENT OF ULTRASOUND-GUIDED PERIPHERAL NERVE BLOCKS

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Purpose/Objective: The literature on ultrasound-guided (USG) peripheral nerve blocks is expanding rapidly these years. What began as scanty reports on clinical applications of sonar technology 35 years ago has assimilated into scientific literature and everyday clinical use. We wanted to investigate how prime movers determined that development and who are currently active in the field.

Materials and Methods: An extensive PubMed search was undertaken to identify publications on USG peripheral nerve blocks. Publications were classified according to type and year of publication, and author's country of residence. A total of 1382 studies were included for review [231 RCTs, 198 cohort studies, 255 case studies, 238 technology reports, and 456 commentaries].

Results: Central European centres were responsible for the first wave of randomized studies in USG peripheral nerve blocks. This sparked an interest among about 50 prolific researchers ("champions, with >10 publications each) located in other parts of central Europe, USA, Canada, Australia and New Zealand, accounting for almost half the world literature (Figure 1A). Since 2010, hundreds of authors worldwide are doing research. A ranking of countries by author's country of residence and population size is displayed in Figure 1B. USA continues to dominate numerically because of its large population, while Canada, New Zealand, Switzerland and Austria continue their remarkable publishing record.

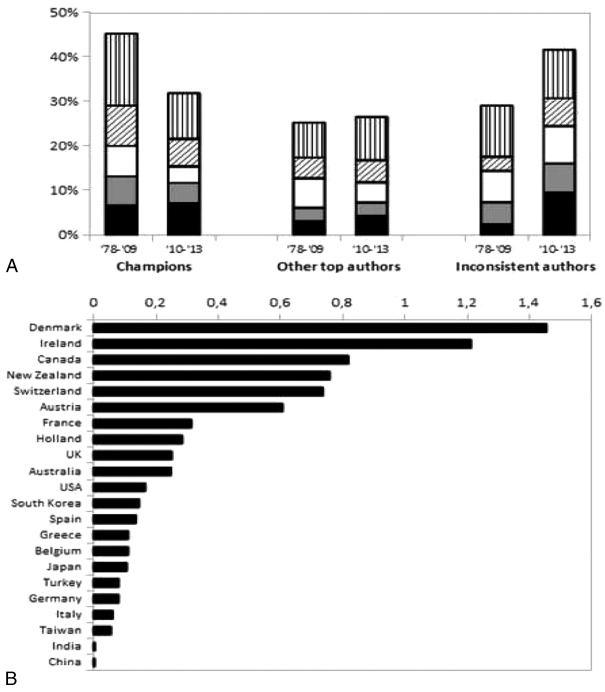

FIGURE 1. A proportion of studies by groups of authors, according to study type. Black: randomized studies; grey: cohort studies; white: case studies; diagonal shading: technical reports; vertical shading: commontaries. X-axis, time intervals and author groups. B, publications per million inhabitants per year [averaged 2010–2013]

Conclusions: USG nerve block literature has reached a critical junction. Studies were initiated by dedicated champions, but a new wave of research centres among smaller countries such as Denmark and Ireland are being recruited. More quality studies than previously are now being published.

ULTRASOUND-GUIDED RECTUS SHEATH BLOCK: THE SPREAD OF LOCAL ANESTHETIC SOLUTION IN THE LONGITUDINAL DIRECTION

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Purpose/Objective: Rectus sheath block is the most popular peripheral nerve block for abdominal surgery. We reported a correlation between the spreading area of local anesthetics and its injected volume for rectus sheath blocks (of 10 and 20 ml) at the 31st annual ESRA congress last year. In this study, we added data for 10 and 20 ml doses, but also investigated the results of 30 ml doses.

Materials and Methods: After Hospital Ethics Committee approval, this study included 60 adult patients (ASA-1 or 2) scheduled for operations requiring a midline skin incision. After the induction of general anesthesia, we performed rectus sheath block with one of 10, 20 or 30 ml 0.25% levobupivacaine at the umbilical level using a 15–6 MHz linear probe. We measured the spreading area of the local anesthetic in longitudinal direction within 3 minutes after the injection. We also measured the thickness of the rectus abdominis muscle at the umbilical level.

Results: The mean spreading area of levobupivacaine in the longitudinal direction depended on the volume injected. In addition, the caudal extent of levobupivacaine was much greater than the rostral extent for each volume. The extent of spreading area in the longitudinal direction had a correlation with the thickness of the rectus abdominis muscle in both 20 ml and 30 ml.

Conclusions: The volume of injected local anesthetic solution affects the extent of the spreading area during ultrasound-guided rectus sheath blocks. Furthermore, the local anesthetic spreads much more easily in a caudal rather than a rostral direction.

TO STUDY THE ANALGESIC EFFICACY OF TWO DIFFERENT DOSES OF CLONIDINE AS AN ADJUVANT TO BUPIVACAINE IN ILIOINGUINAL NERVE BLOCK IN CHILDREN

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Purpose/Objective: Clonidine has been found to have varying effect as adjuvant to local anaesthetics in nerve blocks. We study the effect of 1μg/kg and 4 μg/kg clonidine as adjuvant to local anaesthetic in paediatric ilioinguinal nerve block.

Materials and Methods: 60 ASA 1 and 2 children undergoing elective inguinal hernia repair were randomized into 3 groups – A : 0.5% Bupivacaine; B: 0.5% bupivacaine with 1μg/kg clonidine; C: 0.5 % bupivacaine with 4μg/kg clonidine, (0.25 ml/kg, max 5 ml) for IINB . After premedication and general anaesthesia, IINB was given by 'double loss of resistance'. Postoperative pain was assessed by VAS/OPS.

Results: Data were analysed by STATA 9.0. There was no significant difference in duration of analgesia between the groups (A : 279±101.22; B: 285 ±98.7; C: 265.5±120 min). There was a significant delay in discharge time in group C (156 min) compared to the other groups (A:120 min; B:123 min). No side effects were noted in any of the groups. Success rate of the block was 93.3%.

Conclusions: Addition of clonidine in doses of 1μg/kg or 4μg/kg to bupivacaine in IINB in children does not improve the duration or quality of analgesia. The 4μg/kg dose causes sedation and delay in day care discharge time.

EFFECT OF ELECTRONIC BEAM STEERING ON VISIBILITY OF ECHOGENIC AND NON-ECHOGENIC NEEDLES DURING ULTRASOUND-GUIDED REGIONAL ANESTHESIA

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Purpose/Objective: Several techniques are available now to improve needle visibility among which echogenic needle design and steering the ultrasound beam perpendicular to the angle of needle insertion are popularized for regional anesthesia. We wanted to compare the impact of each of the needle visualization tools and the combination of them on needle visibility.

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Materials and Methods: Pajunk SonoPlex Stim (echogenic) and Pajunk UniPlex NanoLine (non-echogenic) needles were inserted into a pork roast at shallow (20^0), medium (40^0), steep (60^0) and very steep (70^0) angles. An experienced clinician (SG) aligned the probe to obtain the best needle images. The images were recorded with and without beam steering. Experienced anesthetists were asked to score the needle visibility in recorded images (0= no needle visible, 10=excellent needle visibility).
Results: Eleven blinded anesthetists scored the images obtained. The results are shown in the table below. Numbers denote median (IQR) scores.

Needle insertion angle	Non-echogenic needle, No beam-steering	Non-echogenic needle, Beam-steering used	Echogenic needle, No beam-steering	Echogenic needle, Beam-steering used	P-Value
20^0	6 (3–8)	8 (7–10)	8 (6–10)	9 (8–10)	0.01
40^0	3 (2–4)	8 (7–9)	5 (2–6)	8 (6–9)	<0.01
60^0	1 (0–1)	2 (1–3)	6 (5–8)	7 (6–8)	<0.01
70^0	0 (0–1)	2 (1–2)	3 (2–5)	4 (4–6)	<0.01

Conclusions: While performing ultrasound-guided nerve blocks at shallow and medium angles non-echogenic needles are adequate with use of beam steering technology. Echogenic needles can be reserved for steep angle of needle insertion. This information can be used for obtaining best results during ultrasound-guided nerve blocks in most cost effective manner.

COMPARISON OF A NEW AUTOMATIC RECTUS SHEATH CATHETER LOCAL ANAESTHETIC INFUSION REGIME WITH THE CURRENT STANDARD PROTOCOL

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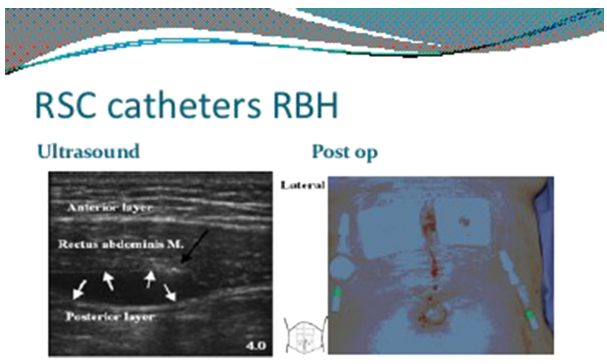
Purpose/Objective: Rectus sheath catheters (RSC) benefit enhanced recovery protocols via safe, effective analgesia, improved mobility and reduced nursing burden. However, there is no consensus on optimal infusion regimes. In our institution, the ambIT® pump (Sorenson Medical) was set at 2mls/hr bupivacaine 0.15% with a nurse-delivered 40mls bolus five hourly. CADD® SOLIS (Smiths Medical) was later introduced with a regime 2mls/hr bupivacaine 0.15%, 35mls bolus four hourly. We attempted to compare regimes, assess overall effectiveness and complications.
Materials and Methods: Between January and December 2012, 39 patients received RSC for urological and general surgical operations. Anaesthetists sited 33 catheters. 18% (n=7) had converted laparoscopic procedures, with RSC used as rescue analgesia. Data were analysed retrospectively and prospectively via implementation of a data collection sheet. Ethics approval was sought but not required.
Results: There were 25 patients in the ambIT group and 14 in CADD group. Analgesia was equivalent with similar opiate consumption and no length of stay difference. No safety issues arose from automatic bolusing but two cases of wound dehiscence were reported.
Conclusions: No difference was demonstrated between regimes but the data is non-randomised and numbers small. One concern was the inherent safety with loss of nursing vigilance with the delivered bolus. We report no adverse safety incidents. The wound dehiscence in two cases needs extra vigilance. Overall, low pain scores, low opiate requirement and encouraging mobility data reinforces the benefit this strategy offers.

Ultrasonographic view RSC insertion and location once secured.



INTRAVENOUS DEXAMETHASONE COMBINED WITH SINGLE SHOT INTERSCALENE BLOCK WITH ROPIVACAINE FOR SHOULDER SURGERY: HOW LOW CAN YOU GO?

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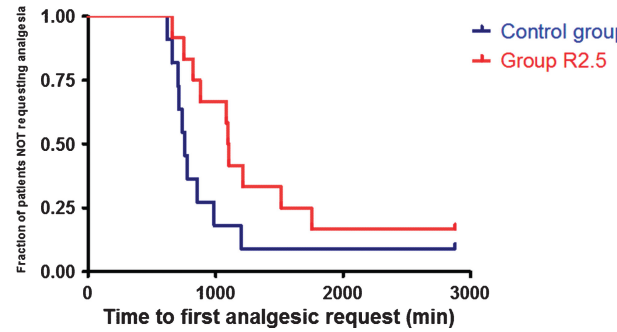
Purpose/Objective: Interscalene brachial plexus block (ISB) provides excellent, but time-limited analgesia. Intravenous (IV) and perineural dexamethasone (10mg) equally increase analgesic duration of an ISB with ropivacaine. However, a lower dose of IV dexamethasone might have a similar effect.

In this study we tested the hypothesis that 2.5mg IV dexamethasone (DXM) leads to a clinically relevant increase in analgesic duration after an ISB with ropivacaine.
Materials and Methods: Following EC approval and written informed consent, patients presenting for arthroscopic shoulder surgery were randomized to receive either 0 or 2.5mg of IV DXM (Control group and Group R2.5, respectively) in addition to a standard US-guided ISB with ropivacaine 0.5% (30ml). The primary outcome was analgesic duration, defined as the time between block performance and first analgesic request.

Continuous variables are presented as medians with interquartile range (IQR). A Kaplan-Meier curve for analgesic duration (figure 1) was constructed. Mann Whitney U testing was used to compare between groups.
Results: 23 patients were included in this analysis. The median analgesic duration was significantly prolonged in group R2.5 (1103 min; IQR 838–1695) compared to the control group (760 min; IQR 705–990) (p=0.04).



Conclusions: These preliminary results suggest that even a dose as low as 2.5 mg IV DXM results in a clinically relevant increase of analgesic duration of 6 hours. As this low dose of DXM might have a lower potential for side effects clinicians should consider the use of 2.5 mg IV DXM in patients having regional analgesia for postoperative pain management.

THE INFLUENCE OF REGIONAL ANAESTHESIA AFTER TOTAL HIP AND TOTAL KNEE REPLACEMENT SURGERY ON PAIN AND TREATMENT RELATED SIDE-EFFECTS USING THE PAIN-OUT DATABASE

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Purpose/Objective: The EU funded PAIN-OUT project systematically collected data on postoperative pain in institutions across Europe and contains over 30,000 patients. We analysed the influence of regional anesthesia (RA) on postoperative pain and treatment related side effects after total hip and knee replacement surgery(THR/TKR).

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Materials and Methods: Within the registry ICD-9 codes were used to identify THR and TKR. Data on least and worst pain, time in severe pain, persistent pain, interference with sleep, breathing and coughing, relief and satisfaction were analysed. For each item the risk ratio was calculated.
Results: After checking for plausibility 1289 THR and 1327 TKR cases could be identified. THR patients with a RA catheter had no significant difference regarding worst pain (1.1 CI 0.66–1.83), least pain (0.64 CI 0.38–1.07), time in severe pain (0.65 CI 0.39–1.09), interference with sleep (0.96 CI 0.57–1.59) and persistent pain (1.12 CI 0.64–1.97). TKR patients with a RA catheter had better pain levels regarding worst pain (0.54 CI 0.36–0.80), least pain (0.62 CI 0.413–0.944) and intensity of persistent pain (0.393 CI 0.247–0.627), less itching (0.641 CI 0.413-0.997) and a lower risk of helplessness (0.640 CI 0.426–0.961). RA catheter use was not associated with differences for interference with breathing (0.826 CI 0.542–1.259), interference with sleep (0.76 CI 0.511–1.120), satisfaction (0.839 CI 0.568–1.239), nausea (1.187 CI 0.807–1.747), drowsiness (0.767 CI 0.513–1.146) or relief (1.276 CI 0.851–1.914).
Conclusions: Real life registry data revealed that THR patients with RA catheter use had no benefit in pain related outcome parameters whereas pain related parameters in TKR patients were better when continuous RA catheters were used.

AN EXAMINATION OF THE EFFECTS ON FIBROBLASTS OF PERIARTICULAR INJECTION SOLUTION USED AS ANALGESIA IN ARTHROPLASTY A CELL CULTURE LABORATORY AND ELECTRON MICROSCOPY STUDY

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Purpose/Objective: Periarticular injection is a component of mutimodal analgesia in arthroplasty.The effects of this solution on fibroblasts was examined.
Materials and Methods: 3T3 rat fibroblast cells and F12 raw nutritional mixture medium as nutrition were used. In the first stage, by counting the 3T3 cells produced, 2,500,000 100% live 3T3 cells with 5ml DMEM-F12 medium were placed in each hollow. After 1 hour, a maximum of 100 µlt of the prepared solution was added to each hollow. Nothing was added to the control group. Trypan Blue staining was performed to determine the ratio of live cells. The morphological structures of the cells were evaluated by Transmission Electron Microscopy (TEM).
Results: Although the number of cells in the solution group(SG) was the same at the end of 48 and 72 hours as the number obtained in the first 24 hours, the number of cells in the control group(CG) showed an increase of 47% at the 48th hour from the number in the first 24 hours, and at the end of 72hours there was a 7% increase on the number from 48 hours.

In the SG, the ratio of live cells was found to be 96% at 24hours, 98.2% at 48hours and 96.7% at 72hours, and similary in the CG.

In the TEM examination, no pathology was determined between in both group.
Conclusions: Periarticular injection has no negative effects on cells and structure, so that it can be applied as a safe component of multimodal analgesia.

A RANDOMIZED, DOUBLE-BLIND, PLACEBO-CONTROLLED TRIAL OF PREEMPTIVE ANALGESIA WITH BUPIVACAINE IN PATIENTS UNDERGOING MASTECTOMY FOR CARCINOMA OF THE BREAST.

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Purpose/Objective: In this prospective, randomized, placebo-controlled, double-blinded clinical trial we have tested a hypothesis that preemptive analgesia with bupivacaine applied in the area of surgical incision in patients undergoing mastectomy for breast cancer would reduce post-operative acute pain and would reduce the amount of analgesics used during surgery and in post-operative period.
Materials and Methods: Participants were assigned into two groups: with bupivacaine applied in the area of surgical incision or with placebo. We assessed the intraoperative consumption of fentanyl, the postoperative consumption of morphine delivered using a PCA method and the subjective pain intensity according to VAS score reported by patients in the early postoperative period.
Results: 112 women out of 121 consecutive cases qualified for mastectomy were allocated randomly to two groups: group A (bupivacaine) and group B (placebo). The final study group comprised 106 breast cancer cases. Between the groups statistically significant difference was observed with respect to: lower fentanyl consumption during surgery (p=0.011), lower morphine (delivered by means of a PCA) consumption between 4^{th}–12^{th} postoperative hour (p=0.02) and significantly lower pain intensity assessed according to VAS score at 4^{th} and 12^{th} hour after surgery (p=0.004 and p=0.02 respectively) for the group A patients.
Conclusions: Preemptive analgesia application in the form of infiltration of the area of planned surgical incisions with bupivacaine in breast cancer patients undergoing mastectomy decreases post-operative pain sensation, limits the amount of fentanyl used during surgery and reduces the demand for opiates in early hours after surgery. ClinicalTrials.gov registration number: ISRCTN33898123.

EFFECTS OF MAGNESIUM SULPHATE ON SUGAMMADEX REVERSAL IN PATIENTS UNDERGOING GYNAECOLOGIC PROCEDURES

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Purpose/Objective: The aim of this study was to evaluate the effect of magnesium sulphate ($MgSO_4$) on reversal of rocuronium induced neuromuscular block by sugammadex.
Materials and Methods: Seventy three patients, aged 18–60 years, ASA I–II, udergoing elective gynaecological surgery were enrolled. Anaesthesia was induced with propofol and fentanyl and maintained with 60% N_2O and O_2 in 2% sevoflurane. The $MgSO_4$ group received 50 $mg.kg^{-1}$ iv $MgSO_4$ as a bolus and 15 $mg.kg^{-1}$ as continuous infusion untill the end of surgery. The placebo group recieved same amount of isotonic saline. Rocuronium 0.6 $mg.kg^{-1}$ was administered for intubation and 0.1 $mg.kg^{-1}$ added when TOF counts were 1 or more during the procedure. At the end of the surgery, at a TOF count of 1, sugammadex iv 4 $mg.kg^{-1}$ was administered. Patients were obsrved until a TOF ratio of 0.9 was achieved. Patient contolled analgesia with morphine was used postoperatively.
Results: The incidence of rocuronium-induced injection pain significantly less and rocuronium onset time was shorter in $MgSO_4$ group (p=0.005, p=0.000; respectively). Rocuronium requirement was similar among the two groups. The time to recovery of the TOF ratio to 0.9 were longer in $MgSO_4$ group (2.1±0.9 min) than the placebo group (1.6±0.6 min), (p=0.006). Postoperative morphine consumptions were not different between the groups.
Conclusions: A difference of about 0.5 min in times to recovery to a TOF ratio of ≥ 0.9 between the goups is clinically negligible. $MgSO_4$ has no clinically significant effect on reversal time after sugammadex administration.

SURVEY OF KNOWLEDGE OF LOCAL ANAESTHETIC TOXICITY AND MANAGEMENT IN A DISTRICT GENERAL HOSPITAL'S MATERNITY UNIT

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Purpose/Objective: Awareness of local anaesthetic (LA) toxicity should be commonplace in maternity units. We performed a survey across the obstetric multi-disciplinary team to assess awareness of LA toxicity.
Materials and Methods: A survey was circulated to midwives, anaesthetic and obstetric trainees, operating department practitioners (ODPs), nurses and health care assistants (HCAs) to provide a snapshot of the team's awareness

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of LA toxicity. Questions included knowledge of complications of local anaesthetics, toxicity, AAGBI guidelines, Intralipid and if they knew where Intralipid was stored.

Results: A total of 36 members of the obstetric team were surveyed with results listed in the table below. Variable awareness of LA toxicity, guidelines for its management and Intralipid were demonstrated.

	Midwives (n=14)	Nurses (n=4)	HCAs (n=3)	Obstetric Trainees (n=3)	Anaesthetic Trainees (n=6)	ODPs (n=6)
Can list (any) complication of a LA	100%	50%	67%	100%	100%	100%
Able to describe features of LA toxicity	57%	50%	0%	100%	100%	50%
Aware of AAGBI guidelines	21%	50%	0%	33%	100%	100%
Aware of Intralipid	14%	100%	33%	100%	100%	83%
Know Intralipid is stocked	0%	100%	33%	33%	100%	83%
Know where Intralipid is kept	0%	100%	33%	0%	83%	83%

Conclusions: These results highlight further training of the whole multidisciplinary team involved with obstetric care is needed. Measures being implemented include placing wall posters highlighting the AAGBI guidelines and location of Intralipid, attaching cards to the epidural pumps highlighting the initial management of LA toxicity, as well as implementing in-house simulation scenario training. A repeat survey will be conducted.

PRESCRIPTION AND DOCUMENTATION OF PRE-MEDICATION IN EMERGENCY CAESEREAN SECTIONS.

N. Parbat[1], K. Koothrajen[1], S. Verma[1]. [1]*Department of Anaesthesia, Medway Maritime Hospital, Gillingham, United Kingdom.*

Purpose/Objective: Patients for Emergency Caesarean section are at risk of vomiting and aspiration. To avoid this, patients are starved and premedication administered by midwives. Obstetricians routinely prescribe Ranitidine, Metoclopramide and Sodium citrate to enhance gastric emptying and to increase the pH of gastric contents. Our aim was to review this practice in our hospital. We also wanted to see if anaesthetists were documenting the period of starvation and premedication given, for good record keeping.

Materials and Methods: We analysed the case notes of 46 emergency caesarean sections over a 3-week period in January 2013.

Results: The period of starvation was not recorded by the anaesthetist in any of the cases. The premedication was only documented on the anaesthetic chart in one case, in which sodium citrate was administered on table.

TABLE 1. Prescription of pre-medication

Drugs prescribed	Number of cases (%)
Ranitidine, Metoclopramide, Sodium Citrate	3 (7 %)
Ranitidine, Metoclopramide	31 (67 %)
Metoclopramide	6 (13 %)
None	6 (13 %)

TABLE 2. Administration of pre-medication by Midwives

	Number of cases (%)
All given	34 (85%)
Part given	3 (7%)
None given	3 (7%)

Conclusions: Anaesthetic documentation of the period of starvation and premedication is very poor. Education of obstetricians and midwives is needed to emphasize the importance of premedication in emergency caesarean sections. To encourage better record keeping, the anaesthetic chart will be amended to include a set of tick boxes for duration of starvation and administration of premedication.

UNPLANNED CONVERSION OF REGIONAL ANAESTHESIA (RA) TO GENERAL ANAESTHESIA (GA) IN PATIENTS UNDERGOING CAESAREAN SECTION (CS)

N. Airey[1], S. Singaravelu[1], K. Wankhade[1]. [1]*Anaesthesia, Wirral university Teaching Hospital NHS Foundation Trust, Wirral, United Kingdom.*

Purpose/Objective: Aim: Establish the RA to GA conversion rate at our institution and identify risk factors for its occurrence.

There is unequivocal evidence that RA is safer than GA for patients undergoing CS and is also the preferred choice for patients. However, there are occasions when RA has to be converted to GA part way though the surgery.

Materials and Methods: After seeking institutional audit department approval we conducted a retrospective review to identify all cases of RA to GA conversion in patients undergoing a CS over a 5 year period. Having identified the patients we then conducted a case note review. Outcome measures included; category of CS, time of operation, age of patient and reasons given for conversion.

Results: 80 patients were identified as having had a RA to GA conversion. 30 patients having had a spinal initially (conversion rate of 1.08%) and 50 patients had an epidural top-up (9.38%). Of the 30 patients who received a spinal; 10 (0.69%) were elective and 20 (1.51%) had emergency CS.

The conversion rate increased out-of-hours (18:00–08:00) for both epidural top-ups (10.25%) and spinals (1.61%). For patients <25 years the rate of conversion for epidural top-ups was 24% compared to 6% for patients >25 years.

Conclusions: There is a significantly higher risk of RA to GA conversion in patients having an emergency CS, and those having a CS with an epidural top-up. Younger patients having an epidural top-up appear to be at very high risk of requiring a conversion to GA. These results question the wisdom of topping-up epidurals in patients <25 years.

COMPARISON FOR THREE TECHNIQUES FOR FEMORAL NERVE CATHETERS USING ULTRASOUND

E. Farag[1], D.I. Sessler[1], A. Kurz[1], J. Dalton[1], M. Kot[1], E.D. Mascha[1]. [1]*Anestheiology Institute, Cleveland Clinic, Cleveland, USA.*

Purpose/Objective: We tested the primary hypothesis that postoperative analgesia (as measured by pain scores and opioid consumption) differs significantly with ultrasound alone, ultrasound combined with stimulation of the needle, and ultrasound combined with stimulation of the needle and catheter.

Materials and Methods:

***Methods*:** After Cleveland Clinic IRB approval 453 patients presenting for total knee replacement under general or neuroaxial anesthesia at Cleveland Clinic received ultrasound guided femoral nerve blocks and were randomly assigned to one of the following:

- with a stimulation needle and stimulating catheter.
- with a stimulation needle only.
- ultrasound guided femoral nerve block alone.

A blinded observer assessed VRS pain scores every 30 minutes in the recovery area and every 4 hours thereafter up to 48 hours postoperatively. Opioid consumption within the first 48 hours postoperatively were converted to IV morphine equivalents and totaled for each patient.

Results: The stimulating needle/non-stimulating catheter was significantly noninferior to both the stimulating needle/stimulating catheter (noninferiority P<0.001 for mean VRS pain score and P=0.002 for mean IV morphine equivalent dose; both statistically significant after application of the Holm-Bonferroni testing procedure) and ultrasound only (P<0.001 and P=0.006, respectively; both significant after the Holm-Bonferroni procedure) on pain management (Figure 2).

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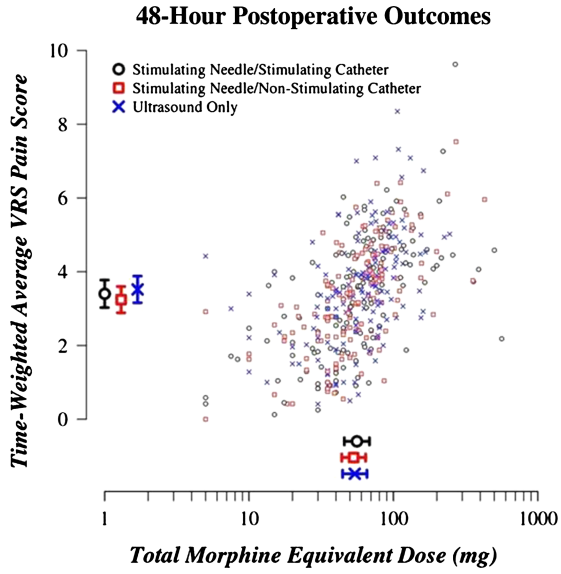

FIGURE 1. Scatterplot of primary outcomes for the enrolled patients. Estimated means for each outcome and corresponding simultaneous 95% confidence intervals are provided by group in the margins. Confidence intervals used a nominal significance criterion of 0.0023, reflecting the Bonferroni correction for the six simultaneous estimates and the adjustment for interim monitoring.

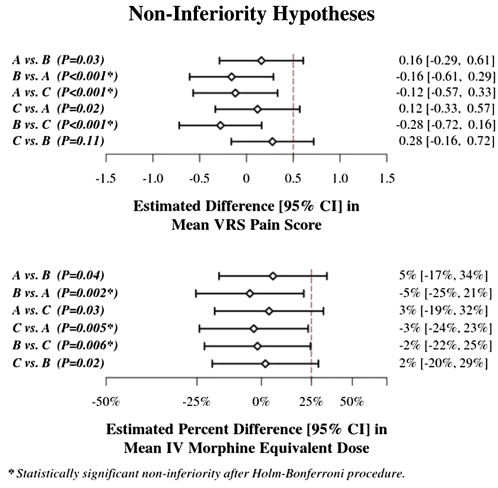

FIGURE 2. Results of simultaneous noninferiority hypothesis tests among randomized femoral nerve catheter insertion treatments (A = stimulating needle + stimulating catheter, B = stimulating needle + non-stimulating catheter, and C = ultrasound alone), given as estimates and 95% confidence intervals (confidence intervals adjusted for simultaneous inference and interim monitoring), One treatment (say, treatment A) was declared noninferior to another treatment (say, treatment B) on mean VRS pain score if the estimated difference in means was significantly less than the pre-specified noninferiority delta of 0.5 (given as the dashed vertical line). Likewise, A was declared noniferiority to B on mean total IV morphine equivalent dose if the mean for A was significantly not more than 25% greater than the mean for B. Significant noninferiority (as assessed by the Holm-Bonferroni step-down method) is given by asterisks next to the raw P-values.

Conclusions: Use of stimulating needle with non-stimulating catheter was noninferior (i.e., no worse) to both stimulating needle/stimulating catheter and ultrasound alone in regards to pain management. Therefore the use of ultrasound **alone** will be sufficient for successful femoral nerve block.

ULTRASOUND-GUIDED INTERMEDIATE CERVICAL PLEXUS BLOCK FOR EXTRACRANIAL CAROTID REVASCULARIZATION: A PROSPECTIVE OBSERVATIONAL STUDY.

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Purpose/Objective: The best anesthesia technique for carotid endarterectomy remains a subject of debate. Intermediate plexus block (IPB) using ultrasound guidance consists to inject local anesthetic at the C4 level in the cervical posterior space between the sterno cleido mastoidian muscle and the scalene muscle, where the superficial divisions of the cervical plexus cross. We conducted an observational prospective study about efficacy and outcomes of this IPB for carotid endarterectomy.

Materials and Methods: After ethic committee permission, 48 patients undergoing a carotid endarterectomy with IPB from April 2011 to April 2013 were prospectively included. Quality of anesthesia and surgical dissection, early complications, hemodynamic stability, neurologic and cardiac outcomes initially and one month later were recorded.

Results: Quality of anesthesia and dissection was good in 88 % of patients, hemodynamic stability in 85 %. No serious complication or conversion in general anesthesia occurred. Three patients required a shunt after carotidal clamping for lost of consciousness. We observed one elevation of Troponin Ic to 0.95 ng/ml without EKG change and 1 death occurred after a postoperative hemorrhagic stroke. No neurologic or cardiac outcome appears one month later.

Conclusions: Ultrasound IPB is easy and quick to perform with a good anesthesia and it doesn't hamper anatomic dissection. This ultrasound guided block is safe for visualization of vascular structures in patients requiring anti platelets aggregation medication. Easy neurologic evaluation during procedure, and hemodynamic stability are available.

PERSISTENT MEDIAN ARTERY AND VEINS IN PATIENTS UNDERGOING ELECTIVE DAY CASE HAND SURGERY

P. Milligan[1], J. Dolan[1]. [1]*Anaesthesia, Glasgow Royal Infirmary, Glasgow, United Kingdom.*

Purpose/Objective: Persistent median arteries (PMA) in the forearm, and more rarely persistent median veins (PMV) have been reported[1]. This study aimed to identify their prevelance in an orthopaedic population presenting for hand surgery.

Materials and Methods: A retrospective review of 223 patients who underwent ultrasound-guided (USG) median nerve (MN) block in the forearm for elective day-case unilateral hand surgery was performed. Images were obtained using a linear, high-frequency (5-10MHz) probe and S-nerve platform (SonoSite, Bothell, Washington).

Results: PMA was observed in 43 (19.2%) patients. PMA was observed laterally to the MN in 40 patients [93% cases], medially in 2 patients [4.6%], while in 1 patient PMA bisected the MN. The PMA was smaller than the radial and ulnar arteries except in 2 patients where it was the dominant vessel.

PMV was observed in 11 patients [25.5%] {Fig1}.

The nerve commonly hydrodissected from the PMA, although in 4 patients [13%] PMA adhered to the MN. PMA pulsation continued, showing no evidence of occlusion following LA injection. There were no reports of postoperative MN neuropathy.

Conclusions: Significant vasculature accompanying the MN should be actively sought. Color probe doppler {CPD} may determine their presence. Our results suggest the presence of PMA and PMV is not a risk factor for postoperative neuropathy following USG MN block.

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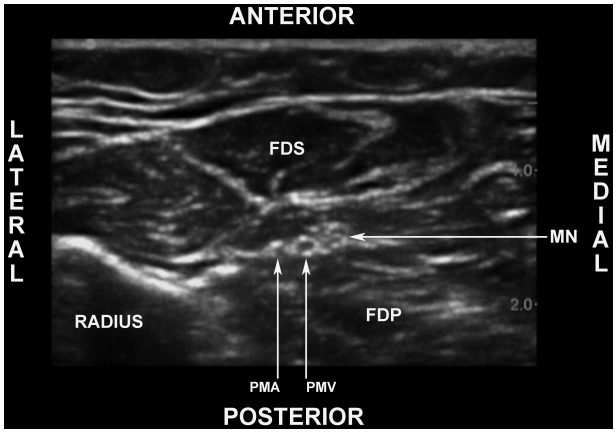


FIG1. PMA and PMV (FDS/FDP: Flexor Digitorum Superficialis/Profundus)

Reference:

1. Stimpson JA, Gupta A. Persistent median artery (Palmar Type) and median nerve block in the forearm. Observational study of prevalence. Reg Anaesth Pain Med 2012; 37: 558–560.

ULTRASOUND-GUIDED PERINEAL BLOCK

T. Parras[1], R. Blanco[2]. [1]*Anaesthetic, Lewisham University Hospital, London, United Kingdom,* [2]*Anaesthetic, King's College Hospital, London, United Kingdom.*

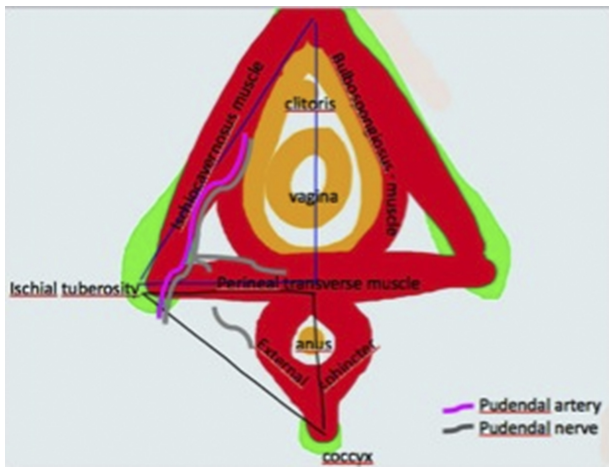
Purpose/Objective: Describe the technique of the anterior approach ultrasound-guided of pudendal nerve.

Materials and Methods: Cases report, 28 volunteers, scanning the perineal area.

Patient: sim position.

Probe: linear.

First, probe in longitudinal position, identify the lateral and medial borders of the urogenital triangle: bulbospongiosus (medial border) and ischiocavernosus (lateral) muscles.

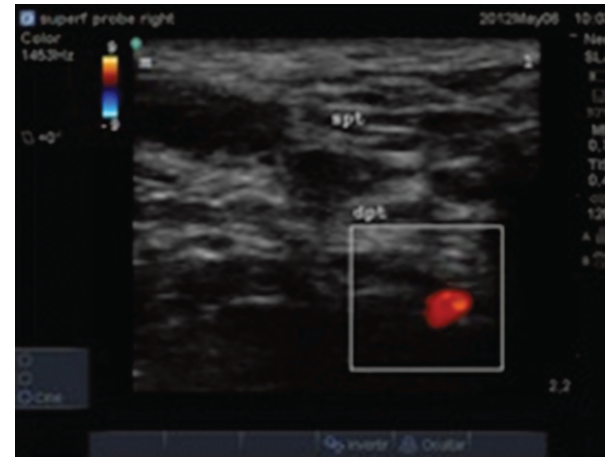


Second, probe in transverse view, identify its base, the perineal transverse muscle. Then identify the ischial tuberosity lateral aspect of the screen, and applying colour we visualize the pudendal artery.

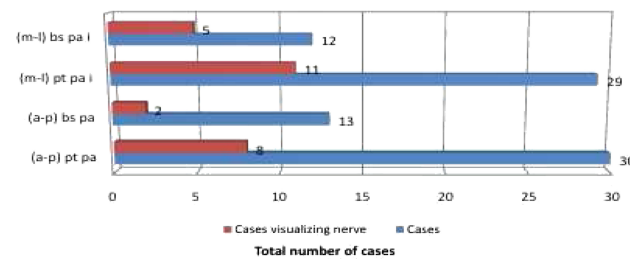
Pudendal artery in transverse view. Superficial perineal transverse (spt), deep perineal transverse (dpt). Medial (m), lateral (l).

Close to it we'll find the pudendal nerve.

If we follow the artery distally, when the pudendal nerve is divided in its three branches, we could identify the perineal nerve.



Results: We observed placing the probe in transverse position, we identify pudendal artery between perineal transverse muscle and ischion in 29 cases, and the nerve in 11. And if we place the probe in longitudinal, we identify the artery posterior to perineal transverse in 30 images and the nerve can be seen in 8.



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Anterior-posterior view (a–p) placing the probe in longitudinal way, medial lateral view (m-l) placing the probe in a transverse way. Perineal transverse muscle (pt), pudendal artery (pa), ischium (i), bulbospongiosus (bs) and pudendal nerve (pn).
Conclusions: The anterior approach of pudendal block is very easy localization, reliable and noninvasive technique, without the use of radioscopy or neuroestimulation with multiple indications in surgery and chronic pain in the perineal area.

A PROSPECTIVE, RANDOMIZED COMPARISON BETWEEN CIRCUMFERENTIAL AND NON-CIRCUMFERENTIAL INJECTIONS FOR ULTRASOUND-GUIDED SUBGLUTEAL SCIATIC NERVE BLOCK

A. Tomozawa[1], S. Sakura[1], H. Yamamoto[1], A. Shido[1], Y. Saito[1]. [1]*Department of Anesthesiology, Shimane University Hospital, Izumo city, Japan.*
Purpose/Objective: It is believed that local anesthetic (LA) injected to obtain circumferential spread around nerves produces a more rapid onset and successful blockade after ultrasound-guided peripheral nerve blocks. However, little evidence exists to demonstrate this point. We conducted the present study to examine whether multiple injection of LA to make circumferential spread results in a more rapid onset after ultrasound-guided subgluteal sciatic nerve block as compared with a single injection technique.
Materials and Methods: Patients undergoing knee surgery were randomly divided into two groups to receive the ultrasound-guided subgluteal approach to the sciatic nerve block. In group M, 20 mL of 1.5% mepivacaine with epinephrine was injected to create circumferential spread around the sciatic nerve. In group S, 20 mL of the LA solution was injected to create spread along the dorsal surface of the sciatic nerve. Sensory and motor blockade was assessed by double-blind fashion for 30 min after completion of the block.
Results: Data from 86 patients (43 in each group) were analyzed. Patients in group M developed sensory blockade significantly more rapidly than those in group S on posterolateral lower leg, inferior anterolateral lower leg, dorsal foot, and foot sole. The development of motor blockade was also significantly more rapid in group M than in the other.
Conclusions: When ultrasound-guided subgluteal sciatic nerve block is conducted, multiple injection of LA to make a circumferential spread around the sciatic nerve results in a more rapid onset of sensory and motor blockade as compared with a single injection technique.

INTERCOSTOBRACHIAL NERVE BLOCK USING HIGH RESOLUTION ULTRASOUND

A. Thallaj[1], S. Talawy[1], T. Alzahrani[1], A. alsaif[2]. [1]*Anesthesia, king khaled university hospital, Riyadh, Saudi Arabia,* [2]*Surgery, king khaled university hospital, Riyadh, Saudi Arabia*
Purpose/Objective: A prospective volunteer study was designed to describe a technique for ultrasound identification of the intercosotobrachial nerve (ICBN) with subsequent blockade of this nerve at the base of the axillary area.
Materials and Methods: 28 volunteered male were recruited for US guided identification and blockade of the ICBN. The volunteers were placed in supine position; with their arm abducted and elevated above head level. An US scan was performed 6 Cm proximal to the medial aspect of the humeral head, posterior to the lateral border of the Pectoralis Major muscle (PM), the area of interest was zoomed. Measurements included; horizontal nerve diameter and depth, nerve to axillary vein distance, nerve to lateral border of the PM distance and nerve to medial aspect of the humeral head distance. Subsequently, blockade of the ICBN was performed under US guidance with 1 ml lidocaine 2%. Finally, the area of sensory loss was assessed and a sensory map was drawn in relation to the medial aspect of the humeral head.
Results: Constant ultrasound visualization of the nerve superior and posterior to the axillary vein was possible, ICBN appears as hyper-echoic oval shaped structure surrounded by a fascial split. Blockade of the ICBN with 1 ml of local anesthetic through an "in plane technique" was successful in all cases.
Conclusions: The study describes the sonographic anatomical details of the ICBN and its sensory distribution that helps in successfully performing selective ultrasound guided blockade of the nerve.

IS THE LOCATION OF MAXIMUM LOW BACK PAIN AS DETERMINED BY ULTRASOUND IMAGING (SONOPALPATION) PREDICTIVE OF POSITIVE SACROILIAC JOINT INJECTION OUTCOME?

A. Biswas[1]. [1]*Anaesthesia Intensive Care and pain Medicine, Mid Western Regional Hospital, Limerick, Ireland.*
Purpose/Objective: Sacroiliac joint (SIJ) is the pain generator in 15 – 30 % of adult patients presenting with low back pain. There are no definitive clinical or radiological features to diagnose SIJ pain. Static and dynamic tests are available with variable sensitivity and specificity. Pain relief associated with SIJ local anaesthetic injection is still considered the gold standard in diagnosis. In this study we aimed to determine if the location of maximum tenderness as determined by ultrasound imaging (sonopalpation) is predictive of SIJ injection outcome.
Materials and Methods: After ethical approval, a prospective observational study including adult (n=40) patients was designed. Patients complaining of low back pain suggestive of SIJ pain were included in the study. If their location of maximum tenderness as determined by ultrasound scanning was over the SIJ, they were allocated group A and the rest into group B. All these patients recieved SIJ injection of local anaesthetic under fluoroscopy guidance which was repeated after two weeks. Pain scores before and after injection was recorded. Positive results were taken as reduction of pain by 90% with concordance to local anaesthetic duration of action. Sensitivity, specificity, positive and negative predictive values of sonopalpation was calculated along with significance using Chi square test.
Results: Data collection is on progress. So far twelve patients out of thirteen were positively diagnosed by sonopalpation as SIJ pain signifying 100% sensitivity.
Conclusions: Sonopalpation could prove to be superioir diagnostic tool for SIJ pain which is non invasve and easily performed in outpatient clicinc.

ELECTROACUPUNCTURE FOR TREATING PAINFUL DIABETIC NEUROPATHY: STUDY PROTOCOL FOR A RANDOMIZED, PATIENT-ASSESSOR BLINDED, CONTROLLED CLINICAL TRIAL

S. Lee[1], J.H. KIM[1], K.M. Shin[1], S.M. choi[1]. [1]*Division of Medical Research, Korea Institute of Oriental Medicine, Daejeon city, Korea.*
Purpose/Objective: The purpose of this study is to evaluate the feasibility of massive clinical research and to make a basic analysis on the effectiveness and safety of electroacupuncture on painful diabetic neuropathy (PDN) compared to placebo and usual care.
Materials and Methods: This study is a protocol for a randomized, patient-assessor blinded, controlled pilot trial (KCT0000466). The study was approved by the Ethic Committee of the oriental hospital of Daejeon University in Korea. Forty-five participants will be assigned to the electroacupuncture group (EA, n=15), sham electroacupuncture group (SEA, n=15), and usual care group (UC, n=15). Participants assigned to the EA will receive electroacupuncture at 12 standard acupuncture points (bilateral ST36, GB39, SP9, SP6, LR3, GB41) 2 times per week for 8 weeks (total of 16 sessions). Participants in the SEA will receive sham electroacupuncture at the non-acupuncture points. Participants in the UC will not receive electroacupuncture treatment during the study period. Follow-up will be made on the 5th, 9th, and 17th weeks.
Results: 11-point pain intensity numerical rating scale is the primary outcome measurement used in this study. The Short-Form McGill Pain Questionnaire, sleep disturbance score, The Short-Form 36 Health Survey, Beck Depression Inventory, and Patient Global Impression of Change will be used as outcome variables to evaluate the effectiveness of acupuncture. Safety will be assessed at every visit.
Conclusions: The result of this trial will provide a basis for the effectiveness and safety of electroacupuncture for PDN.

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AUDIT OF TRIGEMINAL NEURALGIA- ARE WE MANAGING IT APPROPRIATELY?

U. Paralkar[1], S. Vamadevan[2], J. Blackburn[1]. [1]*Department of Anaesthesiology and Pain Medicine, St Georges Hospital NHS Trust, London, United Kingdom.* [2]*Department of Anaesthesiology and Pain Medicine, Guys and St Thomas' HS Trust, London, United Kingdom.*

Purpose/Objective:

1.Assess whether trigeminal neuralgia was appropraitely managed.

2.Assess outcome of our interventional procedure.

Materials and Methods: Proforma was created.

Data was collected for 6 patients who underwent radiofrequency ablation at our tertiary centre were assessed post procedure.

Results:

1. Demographics-80% female; Age 41–85years; 50% had more than 1 divisions of trigeminal nerve involved.

2. Initial assessment-50% were idiopathic in nature, followed by MS. Carbemazipine and Pregabalin were the most commonly used drugs used by referring physician. Other drugs prescribed were Oxcarbemazipine, Duloxetine, Opioids, Amitriptyline, & Baclofen. 50% of patients were referred by GP. Half of the patient a recurrent episode with previous intervention done, with pain relief lasting between 2–5years. We performed radiofrequency gasserian gangliolysis on all patients.

3. Post Procedure-Radiofrequency gasserian gangliolysis under propofol conscious sedation with full monitoring and fluoroscopic guidance. Iv-line secured. In 83% of our patients we either stopped the medications completely or partially. 66% of our patients had the complication of dysaesthesia.

Conclusions:

1. Although patients were appropriately diagnosed with trigeminal neuralgia, not all the cases were managed with the first line medical treatment of the condition.

2. Thus we need to educate the primary care physicians about the appropriate first line management of these cases.

3. After radiofrequency gasserian gangliolysis all our patients had substantial pain relief, evident by the fact that we were able to stop drug treatment all our patients.

4. Dysaesthesia was the commonest complication observed in our practice, which also compares to already published data.

THERMAL RADIOFREQUENCY DENERVATION - THE WAY TO MANAGE TRIGEMINAL NEURALGIA

U. Paralkar[1], S. Vamadevan[2], J. Blackburn[1]. [1]*Department of Anaesthesiology and Pain Medicine, St Georges Hospital NHS Trust, London, United Kingdom,* [2]*Department of Anaesthesiology and Pain Medicine, Guys and St Thomas' HS Trust, London, United Kingdom.*

Purpose/Objective:

1. Assess whether trigeminal neuralgia are managed appropriately pre and post referral to tertiary pain services

2. Assess outcome of our patients post intervention

Materials and Methods:

1. patients referred to our tertiary pain unit were assessed, following failure of initial primary care treatment.
2. Data was collected prospectively of 6 patients who underwent the procedure between 2012-13.

Results:

1. Demographics-80% female; Age 41–85years; 50% had more than 1 divisions of trigeminal nerve involved.

2. Initial assessment-50% were idiopathic in nature, followed by MS. Carbemazipine and Pregabalin were the most commonly used drugs used by referring physician. Other drugs prescribed were Oxcarbemazipine, Duloxetine, Opioids, Amitriptyline, & Baclofen. 50% of patients were referred by GP. Half of the patient a recurrent episode with previous intervention done, with pain relief lasting between 2–5years. We performed radiofrequency gasserian gangliolysis on all patients.

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Conclusions:

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2. Thus we need to educate the primary care physicians about the appropriate first line management of these cases.

3. After radiofrequency gasserian gangliolysis all our patients had substantial pain relief, evident by the fact that we were able to stop drug treatment all our patients.

4. Dysaesthesia was the commonest complication observed in our practice, which also compares to already published data.

EFFECTIVENESS OF LUMBAR FACET JOINT RADIOFREQUENCY DENERVATION IN TREATMENT OF CHRONIC BACK PAIN - A RETROSPECTIVE AUDIT OF CLINICAL OUTCOMES

Y. Stefak[1], Y. Mehrez[2]. [1]*Anaesthesia, Oxford University Hospital, Oxford, United Kingdom,* [2]*Anaesthesia and Pain Management, Milton Keynes General Hospital, Milton Keynes, United Kingdom.*

Purpose/Objective: Lumbar facet joints have been suggested to be the source of lower back pain for a long time. One of the methods to treat facet joint pain is radiofrequency denervation of median branch of the primary dorsal rami of the spinal nerves.

Materials and Methods: The treatment was performed at a district general hospital between 2007 and 2011. Patients were selected on the basis of history of chronic lower back pain lasting for over a year not amenable to conservative treatment and confirmatory diagnostic injections with local anaesthetic and steroid to the median branch nerves.

Results: 146 patients, 43 females and 103 males, mean age 54.1 were included.

75 patients (51%) reported improvement at first follow up which occurred between 14 and 330 days after the procedure, average 89 days.

Average duration of pain relief was210 days. VAS score had improved from a mean of 7.86 (range 4–10) to a mean of 3.63 (range 0–10).

Functional improvement was reported by 40 patients. 24 patients reported complete pain relief. 38 patients were discharged.

Conclusions: Radiofrequency denervation of median branch blocks in treatment of chronic lower back pain is a useful management option.

Reference: 1. Boswell MV, Shah RV, Everett CR et al (2005) Interventional techniques in the management of chronic spinal pain: evidence-based practice guidelines. Pain Physician 8:1–47

Ethics: This is to confirm that Dr Y Stefak undertook an Audit of 'Radiofrequency ablation in management of Back Pain' Ref: 674 This audit did not require ethic approval. Barry Roberts Clinical Governance Administrator.

OPTICAL SENSING, A NEW TECHNIQUE FOR PROVIDING ADDITIONAL NEEDLE TIP INFORMATION

A. Balthasar[1], G.J. van Geffen[2], M. van der Voort[3], G.W. Lucassen[3], S. Roggeveen[4], M. van Kleef[1], M. Sommer[1]. [1]*Department of Anesthesiology and Pain Medicine, Maastricht University Medical Center, Maastricht, Netherlands,* [2]*Department of Anesthesiology, Radboud University Medical Center, Nijmegen, Netherlands,* [3]*Research, Philips Research, Eindhoven, Netherlands,* [4]*Healthcare, Philips Healthcare, Best, Netherlands.*

Purpose/Objective: A critical challenge encountered in interventional pain management and regional anesthesia is to accurately identify the needle and tissue at the tip of the needle, which may prevent complications. Current localization techniques, which include ultrasound guidance, angiography, aspiration and nerve stimulation are not ideal and do not present information on the tissue characteristics.

Materials and Methods: Diffuse reflectance spectroscopy (DRS) may provide this information. DRS is an optical sensing method based on the principle that when light is delivered to tissue, it is scattered and partially absorbed at certain wavelengths that depend on the composition of the tissue. The development of fiber optic technology has enabled DRS measurements directly from tissue at the tip of the needle. Needle stylets in standard needles allow for real-time tissue characterization. We present the typical diffuse reflectance spectra obtained from the tip of the needle when the needle is placed in subcutaneous fat, muscle, vessels, nerves and when pneumothorax occurs (see Figure 1).

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Results:

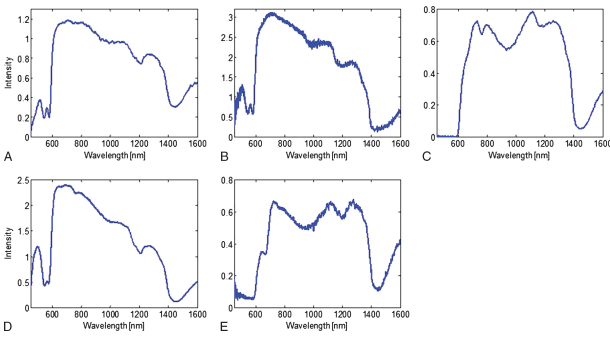

FIGURE 1. Optical spectra obtained during a) subcutaneous needle insertion, b) intramuscular needle placement, c) intravenous needle placement, d) subepineural needle placement and e) accidental pneumothorax.

Conclusions: In conclusion, DRS is a promising technique for providing additional information during needle insertions and may diminish complications.

ASEPSIS FOR CENTRAL NEURAXIAL BLOCKS.

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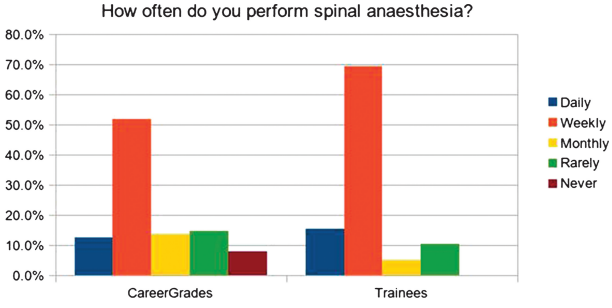
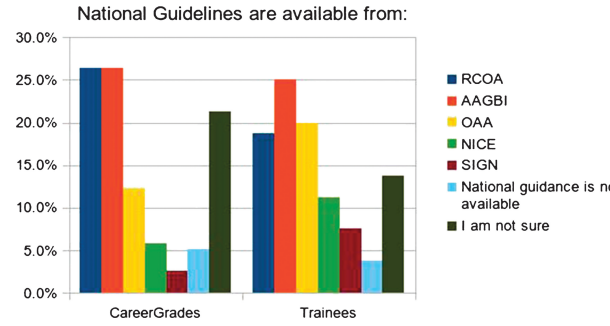
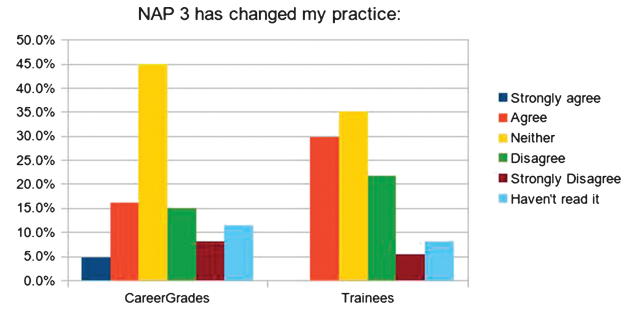
Purpose/Objective: The 3rd National Audit Project (NAP3) of the Royal College of Anaesthetists includes two chapters looking at infective complications of central neuraxial block (CNB) and contains recommendations on aseptic technique and method of skin preparation. We wanted to find out if 4 years after the publication of NAP3 anaesthetic practice reflects the learning points and recommendations it made.

Materials and Methods: We designed an electronic questionnaire, which was sent out to anaesthetists. It asked about frequency of performing CNB, awareness of national guidance on asepsis, details of their current practice regarding asepsis, agent of choice for skin preparation and whether the teachers perform the same techniques as they taught others and if NAP3 had changed their practice of CNB.

Results: We received 128 responses from 6 Scottish hospitals, 70% career grades (consultants and associate specialists) and 30% trainees. 70% and 44% of all respondents perform spinals and epidurals respectively weekly or more often. The most common specialties where CNB are carried out are Orthopaedics, General Surgery and Obstetrics. Less than 50% were aware of the AAGBI's guidance on asepsis. Less than a third of respondents felt that NAP3 had changed their practice. Less than 15% report using iodine for skin preparation and 90% claim to use full aseptic precautions when performing CNBs.







Conclusions: Overall compliance with asepsis for CNB is good. Whilst few felt that NAP3 had changed their practice the decline of iodine for skin preparation suggests that NAP3 had a bigger impact. Knowledge about national guidelines is relatively poor.

DETERMINATION OF THE ED 90 OF HYPERBARIC PRILOCAÏNE (HP) COMBINED WITH FIXED DOSE OF OPIOÏD TYPE SUFENTANIL, FOR INTRATHECAL ANAESTHESIA IN DAY CASE KNEE ARTHROSCOPY

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Purpose/Objective: ED90 of HB has been defined for intrathecal anaesthesia in knee arthroscopy (1). The aim of this prospective study is to define the ED90 of HP combined with sufentanil 1µg, in patients undergoing knee arthroscopy.

Materials and Methods: The local Medical Ethics Committee approved this study. First, ED50 of intrathecal HP with sufentanil 1µg is calculated based on modified Dixon's and Massey's up-and-down sequential allocation method (2). Sequences are analyzed by probit analysis, based on the logistic regression method to obtain ED50 and ED90. Second, an observational study is performed with this calculated ED90 on 30 patients. Sensory and motor onset times, sensory levels, duration of the blocks, and non-invasive arterial blood pressure are recorded. These results are expressed as percentage or mean±SD.

Results: Calculated ED50 is 19.56±4.17 mg, ED90 is 29.05±12.90 mg. 30 mg of HP combined with 1µg of sufentanil allowed surgery in 27 patients out of 30 after 18.9±4.8 min. Complete sensory block at level T12 is obtained before 10 min in 93% of the cases. Bromage IV is obtained in 43 % of the patients after 20 min. Duration of the sensory block is 169±57min. Maximal sensory block level is T4 whereas blood pressure and heart rate did not exhibit any variation (±20%). We recorded one case of pruritus and no urinary retention.

Conclusions: 30 mg of intrathecal HP combined with 1µg of sufentanil is able to achieve an adequate anesthesia for day case knee arthroscopy in term of timing, comfort and safety, with a low incidence of motor block.

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NEW ANTINOCICEPTIVE CURCUMINOID EFFECTS ON PAIN

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Purpose/Objective: Curcumin, the active ingredient of turmeric *(Curcuma longa)*, has a wide range of beneficial effects including anti-inflammation and analgesia. However, poor bioavailability of curcumin hinders its clinical application. To overcome this limitation, we modified the structure of curcumin and synthesized new derivatives having more favourable pharmacokinetic profiles than curcumin. Recently, curcumin shows the antagonizing effect on TRPV1 ion channels. We investigated the antinociceptive activity of KMS4034, which had the most favourable pharmacokinetics among the tested curcumin derivatives.

Materials and Methods: To evaluate the mechanism of the antinociceptive effects of KMS4034, capsaicin (I_{CAP})- and heat (I_{heat})-induced currents in TRPV1 expressing HEK293 cells were observed following application of KMS4034. Nociceptive behavioural measurement in hot plate test, formalin test and chronic constriction injury (CCI) model were evaluated in mice to observe various pain conditions. Also, calcitonin gene-related peptide (CGRP) was immunohistochemically stained in the L4/5 dorsal horns in neuropathic pain mice.

Results: $I_{CAP}$and I_{heat} of TRPV1 were significantly blocked by 10 μM KMS4034. Behaviourally, noticeable antinociceptive effects after 10 mg $kg^{-1}$of KMS4034 treatment were observed in the hot plate test and the formalin test. Mechanical threshold of 10 mg kg^{-1} KMS4034-treated group was significantly increased in the CCI model compared to the control group. Immunohistochemical CGRP expression was decreased in the lamina I–II of the lumbar dorsal horns in KMS4034-treated CCI mice compared to the control.

Conclusions: KMS4034 may be an effective analgesic for various pain conditions.

THE EFFECTS OF PROPOFOL SEDATION ON OXIDATIVE STRESS AND ISCHEMIA-REPERFUSION INJURY IN TOTAL KNEE REPLACEMENT

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Purpose/Objective: We aimed to show the effect of propofol sedation in addition to spinal anesthesia on oxidative stress and inflammation resulting from ischemia-reperfusion.

Materials and Methods: Thirty-six patients were randomly allocated to two groups as Group control and Group propofol after having obtained the written informed consents of the patients and ethics committee approval. Spinal anesthesia was administered to both groups with 15 mg of bupivacaine. While the propofol group received propofol infusion at a dose of 2 mg/kg/h, the control group received placebo infusion in an equal dose. Malondialdehyde (MDA), superoxide dismutase (SOD), and the total antioxidative capacity (TAC) levels were measured in blood samples preoperatively (T0), at the 30th min after inflating the tourniquet (T1) and at 2nd hour after deflating the tourniquet (T2). The hsCRP (High sensitive c-reactive protein) and the neutrophil levels were measured preoperatively (T0) and at the 12th hour after deflating the tourniquet (T3).

Results: While the serum MDA and SOD levels were significantly higher during the reperfusion period than the pre-ischemic period, the TAC level was found to be low in the control group. In the propofol group, there was no difference between the pre-ischemia-reperfusion periods with regard to the MDA, SOD and the TAC levels . The neutrophil and hsCRP levels were observed to be increased to a lower extent in the propofol group compared to the control group.

Conclusions: Propofol infusion in addition to spinal anesthesia may reduce oxidative damage and the inflammatory response developing due to the tourniquet in total knee replacement surgery.

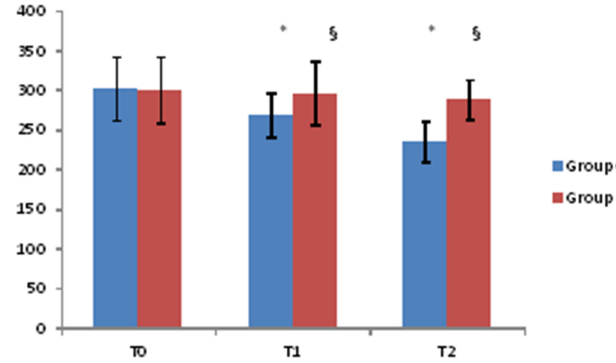

Fig. Total antioxidative Capacity (μmo/L) Levels of groups. *p < compared with preischemic values, *p0.05 for differences between groups. Data are meas n SD.

Table: The hCRP and neutrophil levels of groups.Data are Mean±SD.

	Group C			Group P			
	T0	T3	p	T0	T3	p	Between groups p
hCRP (mg/L)	2.3±0.8	4.9±1.3	<0.001	2.7±1.2	3.4±1.4	0.08	0.01
Neutrophil Count(n)	4558±508	10532±1226	<0.001	4646±710	7425±798	<0.001	<0.001

IN AND EX VIVO VALIDATION OF A NOVEL TECHNIQUE FOR RADIOFREQUENCY DENERVATION OF THE DORSAL SACROILIAC JOINT - INCLUDING A CASE STUDY

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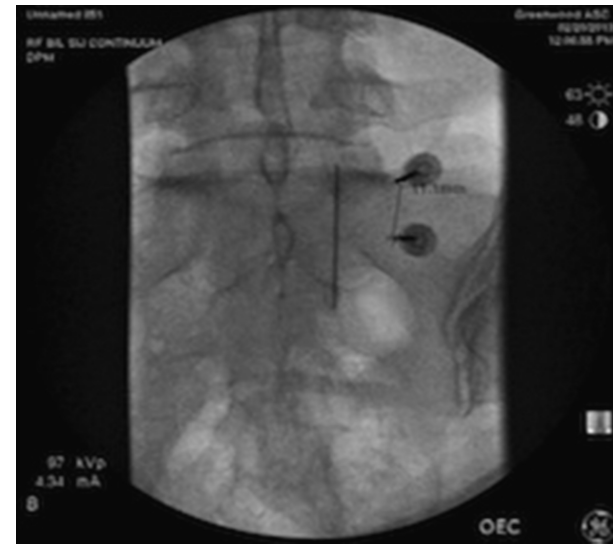
Purpose/Objective: A technique was developed for radiofrequency (RF) ablation of the L5 dorsal ramus (L5DR) and S1-3 lateral branches (LBs) making use of a novel (FDA approved Nimbus Multi-tined Expandable Electrode) RF electrode.

Materials and Methods: The typical distance between lateral walls of adjacent S1-3 foramina is 18–22mm. Tissue coagulation in chicken breast using Nimbus electrodes in bipolar configuration with 20mm gap (and in vivo simulation with 37 C water bath) was observed thermographically. A



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Baylis RF generator produced parameters of 80C for 120 seconds (30 sec ramp time). Tissue samples were sectioned and geometric measurements were made at 10mm from either electrode (lesions > 10mm in diameter). The experiment was replicated using the palisade bipolar strip lesion method, for comparison of data. Consented adults underwent the Nimbus Continuum strip lesion technique, and MRI assessment was obtained 13 days post-RF. Lesion (edema) size was scored with an axial fat suppressed proton density sequence (echo train 8, TR 3000ms, TE 26ms) and the tubular (diam 11.7mm) tissue change extended from L5-S1 through S4 segment inclusive, and overlapped the known dorsal sacroiliac joint (SIJ) innervation.
Results: Bench and in vivo findings thus far support the Nimbus Continuum technique as a method for the ablation of the L5DR and S1-3 lateral branches for dorsal SIJ denervation.
Conclusions: This new RF technique appears to be technically effective and time efficient as a method for successful dorsal SIJ denervation.

DOES INTRATHECAL CATHETER PLACEMENT MINIMIZES POSTDURAL PUNCTURE HEADACHES (PDPH)? A RESTROSPECTIVE OBSERVATIONAL STUDY IN THE OBSTETRICAL DEPARTMENT OF A TERTIARY REFERRAL HOSPITAL IN PORTUGAL

I. Tellechea[1], I. Taborda[1], J. Santos[1], F. Lança[1], F. Morais[1]. [1]*Anesthesiology, Centro Hospitalar Lisboa Norte Hospital de Santa Maria, Lisbon, Portugal.*
Purpose/Objective: In parturients receiving epidural analgesia, the incidence of accidental dural puncture is between 0,4 and 6%. This results in PDPH in 75 to 86% of subjects. The primary goal of this study is to assess the results of intrathecal catheter placement in prevention of PDPH.
Materials and Methods: This is a retrospective study including parturients who had dural puncture while performing epidural technique for labor analgesia in the last 2 years in the University Hospital of Santa Maria in Lisbon. Institutional protocol for PDPH prevention includes insertion of an epidural catheter in the subarachoid space immediately after dural puncture (with continuous spinal analgesia through the catheter), removal after 24 hours and conservative measures such as hydration, bed rest and endovenous paracetamol and cetorolac q8h.
Results: The incidence of accidental dural puncture was 0,9% (39/4175). Postdural puncture headaches occured in 25,6% (10/39). From those who had headaches 60% (6/10) patients were successfully managed with conservative treatment and in 40% (4/10) blood patch was performed in the first 72 hours. Spinal analgesia was always effective and didn't interfere with labor progression or fetal outcome.
Conclusions: PDPH rate in our study was 25,6%, much lower than the reported incidence higher than 75% without prophylaxis. Spinal analgesia was an acceptable choice for labor analgesia. Subarachnoid catheter placement for 24 hours after dural puncture is becoming common practice aparently reducing the PDPH rate despite conflicting data. Large randomized controlled studies are needed to prove unequivocal benefit.

A POSTPARTUM HEADACHE: SUBTLE SIGNS WITH A SERIOUS CAUSE

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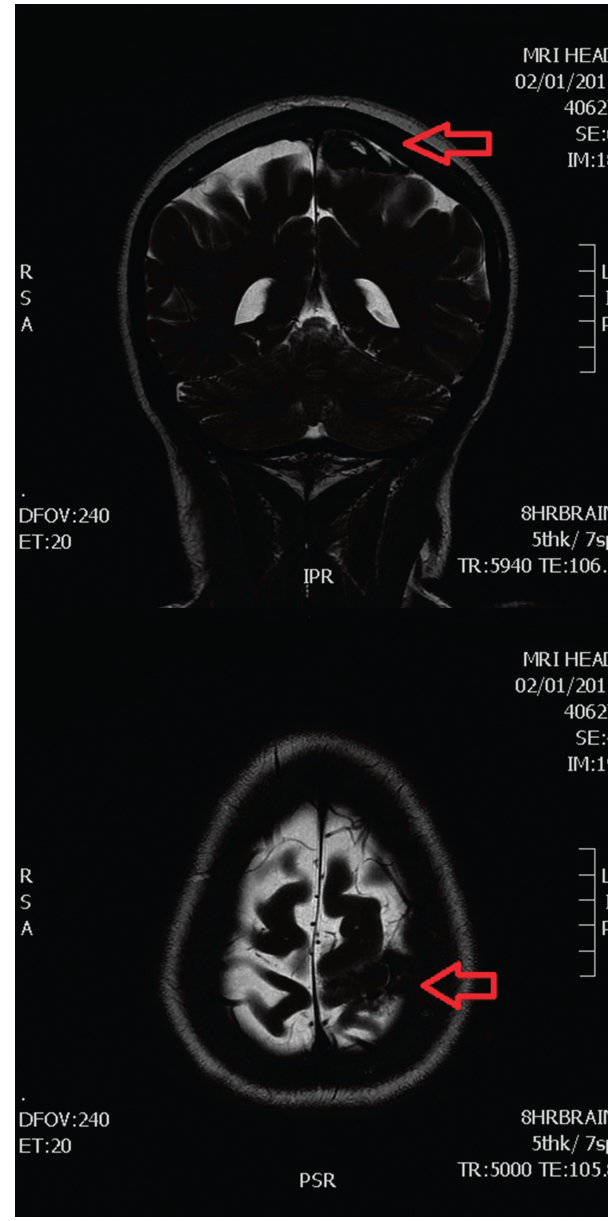
Purpose/Objective: Diagnosing the cause of a postpartum headache can be complex and unclear[1]. We report a case of isolated cortical vein thrombosis (ICVT) where the patient's subtle symptoms and signs were initially attributed to a post-dural puncture headache (PDPH). Clinical rigour and appropriate imaging helped elucidate the serious underlying pathology.
Materials and Methods: A multiparous 26 year old was admitted to delivery suite at full term in labour. Despite a history of three previous Caesarean sections she had declined elective Caesarean section. Slow progress led to a decision to perform a Caesarean section using a combined spinal and epidural anaesthetic technique. Surgery proceeded successfully and the patient was discharged two days later.
Results: Ten days post-delivery the patient presented with photophobia and an atypical postural headache. Computed tomography and cerebrospinal samples were unremarkable. Following the development of unilateral radiculopathy and then a seizure, magnetic resonance imagery (MRI) confirmed an ICVT.



Conclusions: ICVT is an extremely uncommon condition, with an incidence of 10 – 20 per 100,000 deliveries. It is an important cause of maternal mortality[1]. Predisposition to ICVT includes ongoing dural leak following central neuraxial anaesthetic techniques. Diagnosis is by MRI and MR venography which should be performed at the earliest opportunity to prevent the development of potentially life-threatening or life-changing injury[1]. If a PDPH is diagnosed but the patient displays additional symptomology, this approach should be undertaken.
1 – Macarthur A. Differential diagnosis of postpartum headaches. *Revista Mexicana de Anestesiologia* 2009; pp S16–S23.

COMPARISON OF GENERAL WITH SPINAL ANESTHESIA FOR CESAREAN DELIVERY IN PREECLAMPTIC PARTURIENTS: NEONATAL OUTCOME

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Purpose/Objective: To compare neonatal status following general with spinal anaesthesia in preeclamtic parturients.

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Materials and Methods: 50 preeclamptic parturient undergoing non-urgent cesarean section without fetal distress were studied. High blood preassure and proteinuria were presented in all these parturients. The first group (n=25) received GA and the second one spinal "low dose" anesthesia of 5–7 mg bupivacaine + 20 microgr fentanyl (n=25). HR and blood preassure at specific time points, efedrin requirement, neonatal UA blood gas samples and Apgar scores were evaluated.
Results: There was not a statistically significant fall in mean arterial pressure in spinal group (the decrease in MAP > 20% of baseline) although the mean lowest systolic blood pressure was lower in the spinal group compared wit general anaesthesia group (90.6 +/− 12.9 vs. 96 +/− 8.9 mmHg; p >0.05). Neonatal acid-base status following spinal anaesthesia (pH = 7,23±0.08) was not statistically significant compared with those delivered following general anaesthesia (7.24± 0,03, p> 0.05); BE (mEq/ml) was 5,04 ± 2.4 after spinal and 4,35 ± 1,91 after general anaesthesia (p>0.05). Spinal anesthesia patients required more ephedrine (5,2 vs. 1.7 mg, p>0.05). The percentage of neonates with a 1 min Apgar score > or = 7 was 96% after spinal anaesthesia and 75% after general anaesthesia (P < 0.05).
Conclusions: As a result of specific physiology mehanism enrolled to preeclamptic parturient, it seems that they are not so prone to spinal hypotension as healthy parturients. General anaesthesia cannot be considered safer than spinal low dose anaesthesia for the neonatal wellbeing regarded to maternal haemodinamics, acid-base and Apgar-scores.

EFFECT OF PELVIC TILT BY BIRTH BALL USAGE ON ACTIVE PHASE LABOR PAIN DURING PHYSIOLOGIC LABOR: A RANDOMIZED CONTROL TRIAL

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Purpose/Objective: Various safe Complementary therapies are available for labor pain management, but need to study more about their positive effect.

Aim: To evaluate the effectiveness of Pelvic tilt by birth ball usage on active phase labor pain of physiologic labor/ delivery process.

Materials and Methods: Method: This is randomized control trial study, which had done in delivery ward of one of the large general public hospi tals of Tehran University of Medical (TUMS) Sciences, in Tehran, Iran in 2009− 2010. After describing the aim of study, 60 volunteer 18−35 years old primiparas women after signing informed consent were involved. Samples were randomly divided into Birth ball users, whom did pelvic tilt by using it and control group, whom received routine care of Physiologic labor/delivery. The tools which was used had three main parts of personal characterizes, check list of labor control chart, and chart of pain score by using VAS. Descriptive and inferential statistical methods were used. All ethical points were considered and approved by Ethics committee of TUMS.
Results: Result: Pain score during active phase in the birth ball user group after 30, 60, 90 and 120 minutes, were significantly less than control group (P≤0.001). There were no significant differences between duration of active phase & uterine contraction in two groups during physiologic labour process.
Conclusions: Conclusion: Referring to the results, our research groups suggest that obstetrics and midwives incorporate safe method of the pelvic tilt exercises by using birth ball as part of labor pain management.
Acknowledgement: Received Grants from Research Department of TUMS, 2009–2010.

ARE DECREASING NUMBER OF GENERAL ANAESTHETICS THE ONLY ISSUE IN OBSTETRIC ANAESTHESIA?

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Purpose/Objective: Concerns have been voiced regarding the declining intubating skills due to reduced GA (1) numbers. Our GA rates over years have declined from 15.6% in 2001 to 8.5% in 2011. We have audited to identify the reasons for GAs for all obstetric operative cases and associated problems faced.
Materials and Methods: The data collected for this prospective audit for all GAs administered and associated problems from January 2010 to December 2011 was: reason for GA, grade of anaesthetist, consultant presence, timing, problems experienced.
Results: The overall GA rate was 9%, 10.8%, 8.5% for 2009, 2010 and 2011 respectively. A regional failure rate for operations was 2.7%.

	CS numbers (n)			
GA Indications (n)	elective	emergency	Other cases	Consultant presence(n)
Grade 1 CS	—	**140**	—	**16**
Failed regional	8	39	3	14
Sepsis	—	12	1	1
Patient refusal	8	5	8	5
Severe hypovolemia	—	2	28	10
Raised ICP	2	4	—	3
Spinal problems	10	5	—	11
Coagulopathy	2	2	—	3
Other	2	3	3	4

Conclusions: We identify reduction in training hours has an impact on the confidence of the trainees to provide adequate regional anaesthesia out of hours. Patient demographics and increasing case complexity puts additional stress on all involved disciplines. A repeat ongoing audit will demonstrate if the recently increased consultants working hours in obstetrics provided the opportunity of benefit of extending obstetric training beyond the working hours.

AN AUDIT OF IMPLEMENTATION OF ENHANCED RECOVERY AFTER SURGERY (ERAS) IN PATIENTS UNDERGOING PRIMARY ARTHROPLASTY AT A SCOTTISH HOSPITAL

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Purpose/Objective: ERAS protocols are being increasingly used in number of hospitals for total hip and knee arthroplasties (THA and TKA). ERAS was adopted by some but not all our surgeons. We aimed to audit the initial implementation process.
Materials and Methods: After getting hospital ethics approval, we used an 'anaesthetic data sheet', 'Patient diary' and '6 week follow-up' questionnaire to get the required information.
Results: 'Anaesthetic Data Sheets' were completed by 154 patients which detailed the perioperative period, with 67 of these patients completing voluntary diaries detailing their experience and 64 patients completing the 6 week questionnaire. Patients were divided into four cohorts according to procedure (THA or TKA) and pathway (ERAS or non-ERAS).

There were no significant differences in length of stay in recovery or hospital, blood loss, mobilisation, catheterisation, transfusion, readmission or mortality. Patients in ERAS pathway undergoing TKA had a lower incidence of nausea and vomiting (P= 0.044) at certain times.

Removal of femoral nerve block from TKA ERAS and routine post-operative intravenous opioids from ERAS patients did not lead to increased post-operative pain.

At 6 weeks post THA, 48.3% patients had pain of which 14% had S-LANSS ≥12. Following TKA, 68.6% had pain and 58% had S-LANSS ≥12 (40% of total TKA patients) at 6 weeks.
Conclusions: An absence of any difference between reported pain scores or other parameters may be an encouraging finding despite reduction in use of invasive nerve blocks and PCA. Substantial number of patients have pain at 6 weeks.

SURGICALLY PLACED WOUND CATHETERS FOR OPEN HEPATOBILIARY SURGERY

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Purpose/Objective: Post operative analgesia after open Hepatobiliary surgery can difficult. Large upper abdominal wounds are often extremely

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painful, limiting respiratory efforts. Epidural analgesia can be problematic, or contraindicated, and systemic analgesia may be affected by abnormal metabolism or excretion.

We have recently adopted a new procedure to improve our patient's post-operative analgesia. Intra-operative, surgical placement of two wound catheters allows infusion of Local Anaesthetic (LA). One catheter is inserted in to the muscle layers in on the right side of the abdomen, and the second catheter inserted into the Rectus Sheath on the Left side. Each catheter has a 10ml/hr infusion of 0.125% L-bupivicaine infused, with a PCA providing systemic analgesia.

We have noted initial success with this technique, so have retrospectively analysed our results.

Materials and Methods: After approval from the local Clinical Effectiveness department, we retrospectively reviewed the notes of identified patients. Data collected includes demographics PCA use, Pain scores, complications of analgesia regime and use of other analgesia techniques (eg intrathecal opiods).

Results: An initial group of 32 patients has been identified who have had surgically placed wound catheters, but this number is likely to increase slightly. The patients are subdivided into intrathecal opiod and no intrathecal opiod. PCA use, pain scores and complications (where found) of the most up to date patient set we have will be presented.

Conclusions: Out initial data suggests that post operative infusion of LA via two surgically placed wound catheters provide good, safe, analgesia after open Hepatobiliary surgery.

AN APPROACH TO INCREASE STANDARDS AND QUALITY OF DOCUMENTATION OF CHRONIC PAIN PROCEDURES

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Purpose/Objective: Ethics. Your clinical audit "Documentation of Pain Procedures in Chronic Pain Intervention Clinic" registered number 2943. Ethical approval is not required.

Documentation and record keeping is an important part of healthcare practice and there is a need for high quality information regarding patients and procedures performed. AAGBI specifies the following entries that must be absolutely completed during regional anaesthesia: entry site, needle used, aid to location, catheter, drug, concentration and dose. Other relevant elements pertinent to the regional anaesthesia include post op instructions, untoward events, personnel, place and time and patient positioning.

We found a great variability in documentation in our institution. We implemented a standard documentation for the recording of chronic pain procedures.

Materials and Methods: A total of 47 procedural charts made using new standard documentation were compared with 44 procedural charts recorded prior to the introduction of the standard. The charts were completed by 3 pain consultants and 3 trainee in pain management.

Results:

Parameter	Before standard introduced Mentioned %	With standard introduced Mentioned,%
Aspiration	20	93
Complications	20	100
Patient position	47	97
Visualisation	63	100
Needle for procedure, size	88	95
Asepsis	93	93
Level of procedure	93	97
Needle used	88	95
Drug used	95	100
Local Anaesthetic	86	100

Conclusions: The audit showed significant improvement in the quality of the recorded information following a pain procedure. We have found that using standard recording in the form of documentation stickers increases quality of the record.

RADIATION EXPOSURE IN PATIENTS UNDERGOING INTERVENTIONAL PROCEDURES FOR PAIN RELIEF

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Purpose/Objective: The aims of our audit were.

1) To evaluate the radiation exposure in patients undergoing lumbar medial branch blocks (MBB) and sacroiliac joint injections (SIJ)

2) Measuring the screening time and dose area product (DAP) values for these porcedures

3) To compare the varying practice between consultants and compare it with the published data

Materials and Methods: A retrospective data collection of the practice of four chronic pain consultants was assessed. The procedures included were Lumbar medial branch blocks (L4/5 and L5/S1) and unilateral saroiliac joint injections.

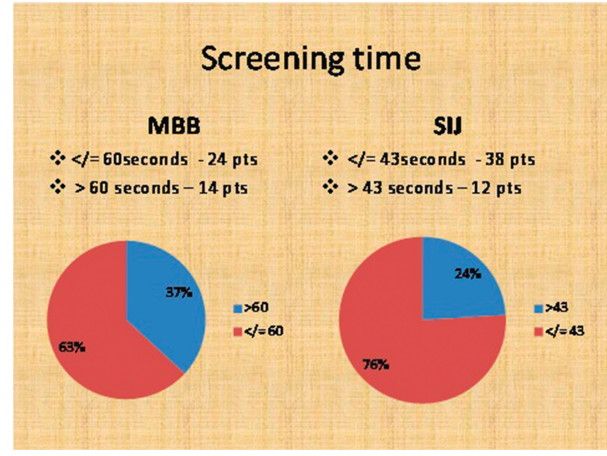
The reference for MBB was screening time - 60 seconds and DAP – 2.5 Gy.cm2

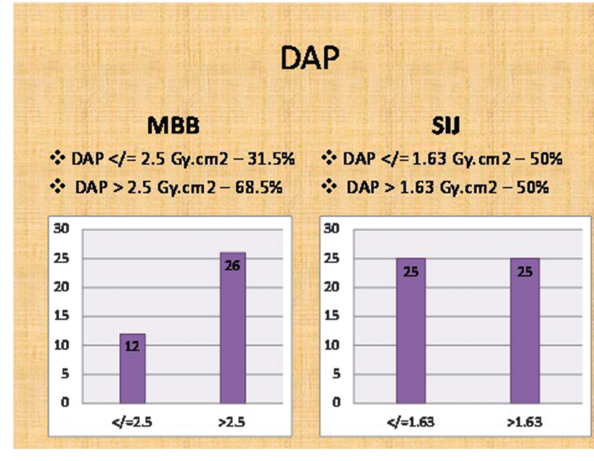
The reference for unilateral SIJ was screening time - 43 seconds and DAP – 1.63 Gy.cm2

Results: Data was gathered from 38 patients for MBB and 50 patients for SIJ injections:

MBB-Bilat n=38	A	B	C	D
Sreening time (sec)	27	47	83	93
Dose (Gy.cm2)	2.6	4.2	4.8	5.0

SIJ-unilateral n=50	A	B	C	D
Screening time (sec)	20	26	33	69
Dose (Gy.cm2)	1.18	1.28	2.28	5.8





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Conclusions: We have to weigh benefit to balance risk of radiation and aim to limit screening times and DAP levels to mentioned reference values until local/national guidelines available.

We propose a large prospective study where the values could be used as a baseline against which we can monitor effectiveness of dose reduction strategies as part of the optimisation process.

RETROSPECTIVE EVALUATION OF THE EFFICACY OF THE VERSATIS PATCH IN CHRONIC PAIN CONDITIONS OTHER THAN POST-HERPETIC NEURALGIA

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Purpose/Objective: Versatis is a topical, medicated plaster containing 700mg (5% w/w) lidocaine. It is only licensed for the symptomatic relief of neuropathic pain in post-herpetic neuralgia (PHN). However studies have indicated the efficacy of Versatis in the treatment of other neuropathic and mixed pain conditions.

Materials and Methods:

•177 patients reviewed by a consultant over a 3 year period from 20.04.2010 to 20.04.2013 and a trial of the patch requested.

•Patients were categorised into mixed nocieptive/neuropathic pain (lower back pain), neuropathic pain, widespread pain and other.

•Patients were retrospectively reviewed by telephone follow-up (with verbal consent) using the numerical rating score.

Results:

•177 patients: 2 were excluded as they had PHN, 31 patients were not contactable and 26 patients were not prescribed the patch by the GP (see figure 1).

•Out of the 118 remaining patients **26% found good pain relief from the patch.**

•Patients in the mixed pain group were most likely to find the patch helpful (32%)(see figure 2).

•Subgroup anaylsis of patients who found the patch helpful showed the average drop of pain score was **3.19** (see figure 3).

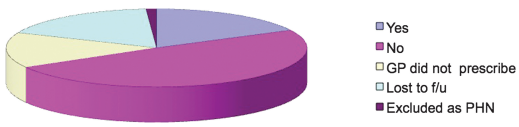

FIGURE 1. Pie chart to show the proportion of the patient population who found the Versatis patch effective.

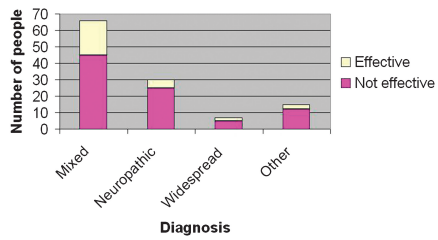

FIGURE 2. Bar chart to show which patients found the patch effective based on diagnosis.

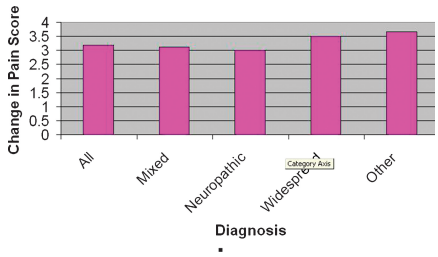

FIGURE 3. Bar chart to show the reduction in pain score for patients who found the Versatis patch helpful.

Conclusions:

•Overall the Versatis patch helped 26% of chronic pain patients to lower their pain score by over 30%.

•Of patients who suffered with mixed nocieptive/neuropathic pain (lower back pain) almost 1/3 found the Versatis patch effective.

•Further evaluation is required.

CAUDAL EPIDURAL STEROID OUTCOMES

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Purpose/Objective: Auditing caudal epidural steroid injections may inform both clinicians and patients of expected outcomes and demonstrate their utility to local healthcare commissioning services. We determined the efficacy and safety of this procedure in chronic lumbar radiculopathy in the 6 weeks post procedure.

Materials and Methods: Between October 2011 and Dec 2012, 30 patients were included in the audit (presenting with lumbar radiculopathy >12 weeks). Exclusion criteria included cauda equina syndrome, previous spinal injection or surgery and significant psychiatric comorbidity. Retrospective analysis of consent, theatre records, case notes and pain/function diaries informed our results. 80 mg triamcinolone acetonide in 20 ml 0.125% Laevobupivacaine caudally was given to all patients.

Results: All patients had radicular lower limb pain and had MRI scans showing concordant findings. Patients had injection in the prone position under fluoroscopic guidance. 73% of the patients reported improvement in pain and function. There were no major complications. Minor side effects noted were discomfort during the procedure. Only 3/30 patients received repeat injection and 1/30 underwent surgery.

Conclusions: Caudal epidural steroid injections still have a role for chronic lumbar radiculopathy in the short term. Limitations of our audit are that it is retrospective, short duration(only 6 weeks) and small numbers. More, controlled, studies are required to better assess the role of Caudal Epidural Injection in the treatment of radicular pain in middle and long term.

A MULTI-SPECIALITY TEACHING PROGRAMME TO IMPROVE UTILISATION OF THE FASCIA ILIACA BLOCK FOR PATIENT WITH FRACTURED NECK OF FEMUR IN THE EMERGENCY DEPARTMENT

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Purpose/Objective: The fascia iliaca block (FIB) has been identified as the optimal means to provide low risk, effective and definitive analgesia for patients who have sustained a fractured neck of femur (NOF).

An audit of practice in the emergency department (ED) at Salford Royal Foundation Trust (SRFT) in 2011 showed low utilisation of the FIB (4%).

Emergency Medicine and Anaesthesia worked together to initiate an education programme for the delivery of FIB in the ED, covering the theoretical, clinical, practical and safety aspects of the FIB.

Our aim is to assess the effectiveness of this teaching programme.

Materials and Methods:

1) Clinical staff in the ED were surveyed assessing: FIB training, USS usage and regularity of performing the FIB.

2) A retrospective audit reviewing analgesia for patients with a fractured NOF pre and post introduction of the training programme.

Results: Our survey demonstrated that through our training programme, 92.3% had undergone FIB training, 68.7% reported performing the FIB regularly. 78.5% are now confident with the use USS for FIB. Our audit highlighted a reduction in poly-pharmacy and opiates usage due to utilisation of the FIB. Through our education programme the audits demonstrated an increase in the use of FIB from 4% to 56%.

Conclusions: Through multi speciality teaching we have begun the process of changing the provision of analgesia is these high risk patients. Through a knowledge and skill based teaching programme, we have begun to replace poly pharmacy, with the safe and effective use of FIB in patients who sustain a fractured NOF.

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IMAGE AND VIDEO PROCESSING OF STRAIN AND SHEAR WAVE ELASTOGRAPHY DURING REGIONAL ANAESTHESIA

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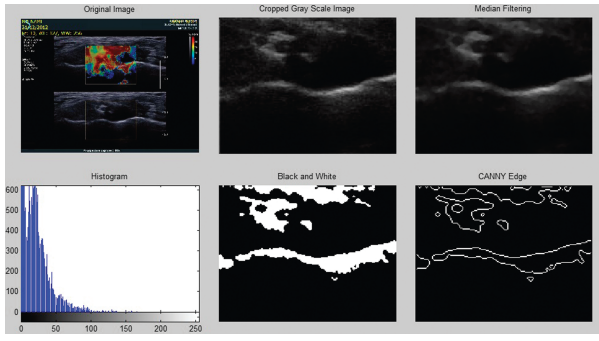
Purpose/Objective: Precise differentiation between nerve and surrounding tissue is difficult using B-Mode imaging. Colour representation of peripheral nerve location and local anaesthetic spread is possible during ultrasound guided regional anaesthesia using shear wave and strain elastography respectively. However, strain images represent change in relative tissue dimensions in both fluid and surrounding tissue. In contrast, shear waves do not pass through fluid. Therefore, the primary objective of this study was to differentiate nerves from surrounding local anesthetic using post-processing methods.

Materials and Methods: MATLAB (R2012b) software with the Image Processing Toolbox was used to process serial images or videos taken from a Zonare Z.one ultra (Mountain View, CA) or Supersonic Aixplorer (Aix-en-Provence, France), ultrasound machines. Images and videos were first converted into a gray scale and histogram whereby 0 = black and 255 = white then converted to binary images in order to detect tissue edges.

Results: Post processing was performed on all B-Mode, strain and shear wave images. An example of post processing is seen in Fig 1 illustrating a supraclavicular nerve block using shear wave elastography.



Conclusions: Edges of nerves, difficult to detect using B-Mode ultrasound imaging, may be visualized using software post processing methods. Our intention is now to develop software to allow real-time processing of B-Mode and elastography images in order to detect the edges of tissues during UGRA.

A MOTOR SPARING KNEE (MSK) BLOCK FOR TOTAL KNEE ARTHROPLASTY - AUDIT OF 26 CONSECUTIVE PATIENTS

C. Egeler[1], A. Jayakumar[1], S. Ford[1]. [1]*Anaesthetics, ABMU LHB, Swansea, United Kingdom.*

Purpose/Objective: We report the analgesic efficacy of the motor sparing knee (MSK) block on 26 consecutive patients undergoing primary total knee arthroplasty (TKA) and a comparison audit with patients receiving enhanced recovery protocol (ERAS) or conventional nerve blocks (NB).

Materials and Methods: Patients received routine MSK block following standard general or spinal anaesthetic. Lateral and Intermediate Cutaneous Nerves of Thigh, Infrapatellar and Genicular Nerves were blocked using Ultrasound using a total of 25 ml 0.75% Chirocaine. Routine intraoperative and postoperative analgesia was used. A rescue femoral block with low dose infusion was used in recovery if clinically indicated. 24 hours pain scores and analgesic consumption were collected, also for patients who underwent TKA under ERAS protocol and for patients receiving femoral +/− sciatic NB.

Results: 26 patients received MSK Block (22 GA, 4 spinal). 13 patients underwent ERAS protocol and 10 patients had NB. Average pain levels in recovery were 0.9 (scale 0–3) for MSK patients compared to 1.1 for ERAS and 1.3 for NB patients. Average pain scores in first 24 hours were 1, 1.25 and 1.5 respectively. No or mild pain was noted for 75%, 60% and 42% of patients respectively. 2 MSK Patients received femoral catheter.

Morphine consumption (oral equivalence) over 24 hours was 42.5, 45.8 and 80 mg, average intraoperative and recovery morphine iv usage was 8.1, 12.3 and 17.3 mg respectively. MSK Patients mobilised normally with no evidence for motor block.

Conclusions: This comparative audit data suggests that MSK block is a promising motor sparing analgesia technique for primary TKA.

A MOTOR SPARING KNEE BLOCK FOR KNEE SURGERY - PROPRIOCEPTION

C. Egeler[1], A. Jayakumar[1], S. Ford[1], J. Dingley[1]. [1]*Anaesthetics, ABMU LHB, Swansea, United Kingdom.*

Purpose/Objective: The anatomy of a new motor sparing knee (MSK) block was described before. We investigated the effects of the block sequence on motor function and proprioception.

Materials and Methods: The first author underwent MSK block using 5 ml 0.5 % Chirocaine twice in reverse sequence, mapping out sensory loss and performing a Romberg test after each block (1 minute standing with eyes open,1 minute with eyes closed). Detection of sway was performed using a force platform (AccuSway^{TM}, AMTI Inc, USA) which measures movement in all directions off the centre of gravity. First sequence was lateral cutaneous nerve thigh (LCNT), intermediate cutaneous nerve thigh (IMCNT), infrapatellar nerve (IPN), second seqence genicular nerves, IPN + cutaneous nerves.

Results: Clinically no motor block was evident on walking, standing and knee bending. Sway was measured as 95 % of overall movements (Area95) and movement of centre of gravity. Baseline test showed Area95 sway of 1.3 with eyes open and 3.5 with eyes closed. Following cutaneous blocks sway was 1.6 vs 4.1, after adding IPN block 1.8 vs 4.5. In the second sequence genicular nerve blocks showed a sway of 2.7 vs 7.2, after addition of IPN, LCNT and IMCNT 2.6 vs 6.7. Sway on the x and y axis showed movement of centre of pressure towards the blocked leg suggesting that no motor block was present.

Conclusions: Proprioception appeared mainly affected with genicular blocks, not with IPN or cutaneous blocks. No motor block was evident, although with individual variations weakness of vastus medialis muscle cannot be excluded.

COMPARISON OF THE COST IMPLICATIONS OF GENERAL ANAESTHESIA AND REGIONAL NERVE BLOCK ANAESTHESIA IN HAND SURGERY

H. Williamson[1], C. Egeler[2], D. Williams[2]. [1]*medical student, cardiff university, Cardiff, United Kingdom,* [2]*Anaesthetics, Morriston Hospital, Swansea, United Kingdom.*

Purpose/Objective:

- Literature review comparing regional anaesthesia (RA) with general anaesthesia (GA)
- Investigate cost implications of RA versus GA
- Compare the total numbers of patients who had GA as opposed to RA in a dedicated Day Surgery Unit over a set time period

Materials and Methods: Retrospective study looking at anaesthetic notes from a theatre database for patients who had hand surgery from January 2011 until November 2012 in Singleton Day Surgery Unit Swansea, and calculation of the total anaesthetic cost based on hospital acquisition costs.

Results: 287 patients had RA and 34 patients had GA. On average, RA cost £24.68 and GA cost £50.06. Another cost saving resulted from the ability to provide RA by one anaesthetist for 2 simultaneous hand lists, saving a further £180 per session.

Conclusions:

Discussion: RA is more cost effective than GA in terms of equipment used and staff time. The difference calculated is less than previously published and may reflect changes in acquisition costs. RA provides superior pain relief postoperatively and with Ultrasound, success rate is close to 100%. GA is associated with more side effects and less pain relief, therefore may result in higher admission rates and more additional treatments being required.

Conclusion: Although GA may be required on occasion, RA is more cost effective and should be used whenever possible. Largest savings occur when simultaneous lists can be run but covered by one highly skilled anaesthetist.

SCIATIC NERVE BLOCK FOLLOWING PIRIFORMIS INJECTION UNDER ULTRASOUND AND NERVE STIMULATOR GUIDANCE - A CASE REPORT

S. Clarke[1], S. Muthukrishnan[1], S. Kanakarajan[1]. [1]*Anaesthetic, Aberdeen Royal Infirmary, Aberdeen, United Kingdom.*

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Purpose/Objective: Piriformis syndrome is thought to cause of 6–8% of sciatica. Injection of local anaesthetic and steroid into piriformis muscle is an established treatment option. A combined technique of ultrasound with motor stimulation has been advocated for accurate confirmation of piriformis pain and avoidance of sciatic nerve block. We report a case of sciatic nerve block despite taking the above precautions.
Materials and Methods: The patient was positioned prone with intravenous access and standard monitoring in place. A pillow under the pelvis optimised piriformis visualization. A 2–5 Hz curvilinear probe placed horizontally over the posterior superior iliac spine was moved downwards and laterally to identify piriformis and the sciatic nerve. Under ultrasound guidance a 100mm insulated needle was passed into piriformis. A current of 2mA resulted in contraction of piriformis and pain. No muscle contractions corresponding to tibial or peroneal nerve stimulation were observed. 10ml of 0.25% levobupivacaine and 80mg of triamcinolone were injected.
Results: 30 minutes after injection, a sciatic nerve block became obvious. This resolved completely after 8 hours. The patient reported a 70% reduction in her presenting symptoms.
Conclusions: Nerve localisation studies have shown that an absence of muscle contraction at 1–2m. A stimulation indicates that the nerve is 0.5–1cm away from the needle tip. However, MRI studies report that a volume of 10mls is required for even spread within the muscle and in 10% of the population, the peroneal portion of the sciatic nerve traverses piriformis. In our case, injectate spread is likely to have caused the sciatic block.

RESPIRATORY ARREST AFTER LOSS OF RESISTANCE TO AIR TECHNIQUE DURING A COMBINED SPINAL-EPIDURAL FOR LABOR ANALGESIA

A. Marinho[1], J. Dias[1], L. Maria[1], N. Lages[1], C. Correia[1]. [1]*Anaesthesiology, Centro Hospitalar do Alto Ave, Guimarães, Portugal.*
Purpose/Objective: We present a case of iatrogenic pneumocephalus and subdural block after combined epidural-spinal analgesia. Two complications never recorded in literature in the same patient.
Materials and Methods: A pregnant 15-years old patient in labor was submitted to combined epidural-spinal analgesia. After several puncture attempts at L3–L4 interspace, through the technique of loss of resistance to air, 2.5ml de ropivacaine 0,2% + 10μg of fentanyl were injected in subarachnoid space. The patient presented pain relief, without the need for additional boluses of local anesthetic, until C-section was proposed. Five plus 9ml ropivacaine 0,75% + 50μg fentanyl were administered through the epidural catheter.
Results: After birth, the mother failed to respond to orders and pain, with the need for orotracheal intubation. Patient recovered consciousness and was extubated 60 minutes after surgery. Cerebral CT-scan showed an image compatible with pneumocephalus, and spine x-rays showed epidural catheter placement in spinal and subdural spaces. Further neurological evaluation was normal.
Conclusions: The air passage from epidural to spinal space during combined epidural-spinal analgesia can occur. Additionally, the trauma and tissue damage resulting from multiple attempts can create fissures in the meninges, favoring catheter entry in abnormal locations. The images obtained allowed to infer a subdural and spinal catheter located simultaneously. Probably the subdural injection of local anesthetic was the main cause of the clinical picture reported.

If multiple epidural attempts are anticipated, we may prefer the loss of resistance to saline solution technique and the use of incremental doses of local anesthetics.

ACCIDENTAL SPINAL POTASSIUM CHLORIDE INJECTION

J. Dias[1], L. Maria[1], A. Marinho[1], J. Ferreira[1], D. Vieira[1], N. Lages[1], C. Correia[1]. [1]*Anaesthesiology, Centro Hospitalar do Alto Ave, Guimarães, Portugal.*
Purpose/Objective: Inadvertent administration of non-spinal drugs in spinal spaces is a possible anesthetic complication and has been associated with serious morbidity and mortality. This report presents an incident where potassium chloride (KCl) was injected in the spinal space.
Materials and Methods: 62-years-old male patient, ASA II was scheduled to total hip replacement. Spinal anesthesia was performed in L3–L4 space with a local anesthetic and opioid association, 10 mg of 0.5% isobaric bupivacaine and 20μg fentanyl. As the patient had a history of spinal surgery and presented a patchy blockade without adequate sensory level for surgery, new spinal anesthesia was performed administering the same dose of drugs. Then the patient started to refer severe pain, cramps and weakness in both lower limbs and there was complete anesthesia below T4. A review of the spinal technique revealed that an ampoule of KCl concentration of 7.45% was mistaken for bupivacaine 0.5%. We perford 2 spinal lavage with lactate ringer solution (LRS). After the first lavage the patient presented tachycardia and severe hypertension and respiratory insufficiency requiring intubation and ventilation.
Results: The patient was admitted in the ICU and was extubated 8h after without evidence of any neurologic deficit.
Conclusions: A literature survey revealed no other cases of accidental spinal potassium succeeded treated with LRS lavage. In theory, cerebrospinal fluid lavage dilutes and removes the drug thus limiting neural damage and this principle was applied to potassium epidural administration. It is desirable to standardize vial colors and anesthesia trolley aiming at minimizing this type of accident.

THORACIC ENDOVASCULAR AORTIC ANEURISM REPAIR – ANESTHETIC IMPLICATIONS OF CEREBROSPINAL FLUID DRAINAGE

L. Dias[1], A. Pereira[1], C. Oliveira[1]. [1]*Anesthesiology and Intra-Hospitalar Emergency, CHVNG/E, Vila Nova de Gaia, Portugal.*
Purpose/Objective: Thoracic Endovascular Aortic Aneurism Repair (TEVAR) when compared to conventional surgery presents several advantages. This approach also has complications, including neurologic ones like spinal cord ischemia. To promote neurological protection, intra and post operative cerebrospinal fluid (CSF) drainage is an option to consider.

The aim of our study is to review all the cases of patients to whom CSF drainage catheter was placed during TEVAR procedures that took place in our hospital since 2010.
Materials and Methods: Descriptive and observational study: review of all cases of patients who underwent TEVAR in our hospital since 2010. The cases without CSF drainage catheter were excluded.
Results: From the total cases reviewed, none presented medullary ischemia. The extent of the thoracic aorta envolved was the determinant criteria for patients' selection: three had indication for a CSF drainage catheter placement. There were neurologic complications reported in the three cases: subarachnoid hemorrhage, severe paraplegia, headache and lumbar pain. The post operative neurologic complications were possibly linked to the lumbar catheter in one case and had no connection in the other.
Conclusions: The placement of CSF drainage catheter presents some complications. Therefore it has to be performed in selected patients and in experienced centers. Such decision must be discussed with both the surgical team and the patient. Our experience is very limited and the review of these cases lead to the need to create a protocol to promote patients' safety and standardized procedures to be applied by the anesthetic team.

BRADYCARDIA/HYPOTENSION DURING AWAKE ARTHROSCOPIC SHOULDER SURGERY IN THE SITTING POSITION AFTER INTERSCALENE BLOCK: CASE REPORT AND SERIES OF 19 CASES WITH LITERATURE REVIEW

S.M. Ghosh[1], A. Gupta[1]. [1]*Anaesthetics, Queen Elizabeth Hospital, Gateshead, United Kingdom.*
Purpose/Objective: Arthroscopic shoulder surgery has been widely performed in the sitting or beach chair position using interscalene brachial plexus block (ISB) as a primary technique.

We report a case of profound bradycardia and hypotension (BH) in a 42-year old gentleman undergoing arthroscopic shoulder surgery under ISB in the sitting position and discuss the possible mechanisms responsible for the occurrence of BH episodes under these conditions.
Materials and Methods: A 42 year-old gentleman with no significant past medical history presented for elective arthroscopic shoulder surgery. ISB was performed under ultrasound-guidance, with the patient awake. There were no immediate complications. Intra-operatively the patient developed a profound bradycardia (25 beats per minute) and hypotension (58/37mmHg). Immediate management involved the administration of ephedrine and atropine.

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Haemodynamic stability was restored within 5 minutes. The patient recovered without sequelae.

A further 19 cases of awake arthroscopic shoulder surgery under ISB were performed – each using a target-controlled infusion (TCI) Propofol sedation. Only 1 patient in this series developed bradycardia (50 beats per minute) requiring pharmacological management.

Results: ISB can be used as the primary anaesthetic technique for awake shoulder surgery. In this setting BH episodes have a reported incidence of between 13–29%. Propofol TCI sedation may potentially reduce the incidence.

Conclusions: The underlying mechanisms responsible for this phenomenon are poorly understood but may involve mechanisms responsible for vasovagal syncope, orthostatic hypotension and the Bezold-Jarisch reflex.

Careful planning including the use of anti-embolism stockings and/or intermittent pneumatic compression, intravenous fluid administration and intra-operative sedation may potentially reduce the risk of this complication.

INTERSCALENE BRACHIAL PLEXUS BLOCK FOR CLAVICLE SURGERY FACILITATES DAY-OF-SURGERY DISCHARGE: A CASE SERIES

M. Kelleher[1], H. Shanahan[1], N. Conlon[1]. [1]*Anaesthesia & Intensive Care Medicine, St Vincent's University Hospital, Dublin, Ireland.*

Purpose/Objective: Clavicle surgery is associated with severe post-operative pain, often requiring administration of high doses of opioid analgesics and in-patient admission. The innervation of the clavicle arises from the nerve roots C3–C6 via contributions from the brachial plexus, in addition to a contribution from the supraclavicular nerve arising from the cervical plexus. Interscalene brachial plexus block (ISB) has been used to provide analgesia following clavicle surgery, although it does not deliberately target the cervical plexus. We wished to examine the impact of ISB on pain and discharge following clavicle surgery.

Materials and Methods: This case series includes 12 consecutive patients who underwent surgery on the clavicle. All patients received ultrasound-guided ISB prior to the induction of general anaesthesia. Pain scores (verbal rating scale) were recorded in PACU, at 4 hours and at 24 hours. Supplemental analgesic use and incidence of complications were recorded for each patient.

Results: All patients were pain free throughout their PACU admission, and were discharged on the day of surgery. Mean time to first post-operative pain was 16 hours (range 12–21 hours). Mean maximum pain severity in the first 24 hours was 4.5/10 (range 0–8). One patient required admission for analgesia 16 hours after surgery (having been discharged pain-free). All other patients' pain was successfully managed with a combination of simple analgesics and tramadol.

Conclusions: This case series demonstrates that interscalene brachial plexus block can be successfully used to facilitate clavicle surgery with minimal post-operative opioid use and day-of-surgery discharge.

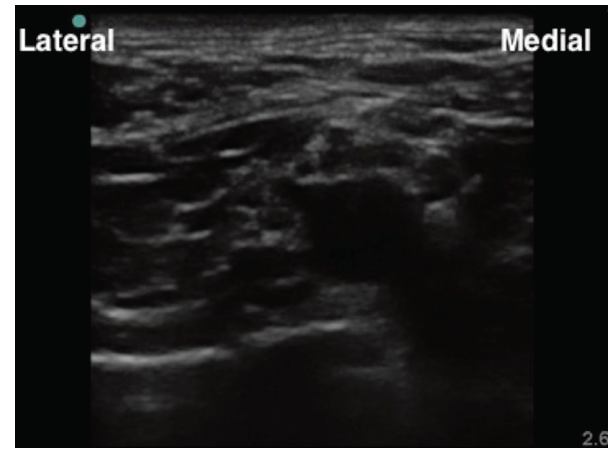
REGIONAL ANESTHESIA IN A PATIENT WITH CLEIDOCRANIAL DYSPLASIA

M. Liu[1], J. Stimpson[2]. [1]*Anaesthesia, Peterborough City Hospital, Peterborough, United Kingdom,* [2]*Anaesthesia, The Queen Elizabeth Hospital, King's Lynn, United Kingdom.*

Purpose/Objective: Cleidocranial dysplasia (CCD) is a rare hereditary congenital disorder associated with deformities of the clavicles and skull. Patients with CCD pose an anesthetic challenge with potential problems in: airway management, neuroaxial and regional anesthesia techniques, and intraoperative positioning. The estimated prevalence of CCD is one case per million and there is no sex predilection. We have found no articles published to date describing regional anesthesia techniques in this disorder. We present the anesthetic management of a 44-year-old male with CCD undergoing a day-case procedure for release of Dupuytren's contracture.

Materials and Methods: On physical examination, the patient was of short stature (157cm, BMI 24) with a large skull, a broad forehead with frontal bossing and obviously short clavicles bilaterally. Airway examination suggested a potentially difficult airway with limited mouth opening and a Mallampati score of III–IV. The patient was consented for undergoing the surgical procedure under regional anesthesia by supraclavicular blockade.

Results: We had anticipated potential loss of integrity of the brachial plexus behind a shortened clavicle, with or without variability in its location over the first rib. Indeed we found relevant structures in a more medial position over the first rib and the trunks of the brachial plexus positioned more superiorly over the subclavian artery with a vascular structure passing through the plexus.



Conclusions: We demonstrate the value of an ultrasound-guided regional anesthesia technique in this patient with CCD and a high potential for anatomical variation.

LEFT STELLATE GANGLION BLOCKADE UNDER ULTRASOUND GUIDANCE FOR REFRACTORY VENTRICULAR ARRHYTHMIAS

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Purpose/Objective: Stellate ganglion block(cervicothoracic sympathetic block) is a procedure for the diagnosis and treatment for chronic pain. Also it can be another option for treatment of refractory ventricular arrhythmias which is demonstrated in the following case report.

Materials and Methods: A 72-year-old blind female presented with chest pain and dyspnea and was diagnosed with non ST elevation myocardial infarction. She underwent cardiac catheterization: thrombectomy was performed at left anterior descending artery, and bare metallic stents were deployed in left circumflex coronary artery and right coronary artery.The patient then developed multiple episodes of pulseless ventricular arrhythmia. Multiple external direct current cardiac shocks, intra-aortic balloon pump was inserted, multiple doses of intravenous cordarone and lidocaine were all tried, however these measures failed to terminate the life-threatening ventricular arrhythmia.We performed two attempts of left stellate ganglion blocks. First attempt was done under blind technique with 10 ml of 2%lidocaine. The arrhythmias was terminated, however 2 hours later the patient had a brief period of partial seizure. On the following day, we tried our second attempt with 10 ml of 0.25%abupivaciane under ultrasound guidance.

Results: As a result the ECG was converted to sinus rhythm and from the ultrasound images showed her thyroid gland was enlarged. Refractory Ventricular arrhythmias has been reported to respose to Left stellate ganglion blockade.

Conclusions: We demonstrated that left stellate ganglion block under ultrasound guidance can improve the safety and efficacy of the block especially in a patient with a difficult anatomical landmark.

WOMEN WITH SEVERE PRE-ECLAMPSIA UNDERGOING CAESAREAN SECTION UNDER SPINAL ANESTHESIA – OUR EXPERIENCE

M. vukelic andic[1], M.K. Marko Kovacevic[2], I.S. Ira Skok[2], A.J. Aleksandra Jokic[2], I.S.K. Ivan ?klebar[2], A.M.P. Ana Marija Pavicic[2].

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Purpose/Objective: Ideal method of anesthesia during caesarean section in women with severe pre-eclampsia is difficult to decide. Regional anesthesia and general anesthesia are commonly used for caesarean section and both have advantages and disadvantages.

Materials and Methods: The aim and objective of this report is to present management in women with severe pre-eclampsia, undergoing caesarean section in spinal anesthesia in our institution.

Results: During year 2012 we had 3133 labours in our institution of which 596 pregnants undervent cesarian section. 387 was performed in spinal, 115 in epidural and 94 in general anesthesia. Total of 17 patients (0.54%) was presented with pre-eclampsia. 14 patients were delivered in spinal anesthesia, 2 in epidural anesthesia and one undervent cesarian section in general anesthesia. Standard scheme for spinal anesthesia, consisting of 0,5% Chirocaine 12,5 mg, 25 mcg of Fentanyl and 0,2 ml of 40% Glucose was used. Epidural anesthesia was achieved with 15 ml of 0,5 % Bupivacaine. In three cases we noticed need for intravenous use of Ephedrine due to hypotension. In the rest of the cases, no complication was noticed as far as mother or neonate morbidity is concerned. During anesthesia we used standard monitoring techniques.

Conclusions: Regional anesthesia is safe method for conducting cesarian section for pregnants with pre-eclampsia.

TRUS-GUIDED INTRA-PROSTATIC AND PERIPROSTATIC INJECTION OF METHYLPREDNISOLONE, AMIKACIN AND BUPIVACAINE IN ABACTERIAL CHRONIC PROSTATITIS/ CHRONIC PELVIC PAIN SYNDROME

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Purpose/Objective: Chronic prostatitis/chronic pelvic pain syndrome (CP/CPPS) is a common condition in men of wide age range & has detrimental effects on quality of life. The etiology of CP/CPPS is currently unknown, and there are no established treatments that consistently relieve patients of their symptoms. Current treatment options, including alpha-blockers, antibiotics, anti-inflammatory agents, antidepressants, and muscle relaxants, have limitations in their effectiveness and durability in relieving the symptoms.

Materials and Methods: Following institute's ethical committee for human studies approval, twenty consecutive patients of CP/CPPS for than one year and refractory to conventional treatment, were included. After written informed consent, intraprostatic and periprostatic injections of methyl prednisolone (60 mg in 1.5 ml), amikacin (60mg in 1.5 ml) in 0.25% bupivacaine (11ml) were given under the TRUS guidance. Pregabalin (75mg twice a day) and amitriptyline (10mg, once in the evening) were continued and gradually tapered off over a period of six to eight weeks. Indomethacine (25mg twice a day) was also given for one week. In a follow-up period of 18 months NIH chronic prostatitis symptoms index (CPSI) was recorded at various intervals.

Results: Post-procedure, there was no evidence of haematuria, haematospermia or local infection. The NIH chronic prostatitis symptoms index improved significantly. All patients showed significant reduction in symptoms of CP/CPPS along with marked improvement in quality of life & various other parameters.

Conclusions: Intra and periprostatic injection of methylprednisolone and amikacin in bupivacaine is effective in relieving symptoms of CP/CPPS in patients who are refractory to conventional management. However, larger, prospective, controlled trials are required before it is recommended as a definitive therapy.

PROSPECTIVE EVALUATION OF THE EFFECT OF THERMAL DISCOPLASTY IN PATIENTS OF CHRONIC LOW BACK PAIN WITH RADICULOPATHY

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Purpose/Objective: Thermal discoplasty or nucleoplasty is a minimally invasive procedure to decompress the contained herniated intervertebral disc that combines percutaneous disc removal and thermal coagulation using radiofrequency waves in the nucleus pulposus. We have evaluated the efficacy of thermal discoplasty in patients who had chronic low back pain with radiculopathy.

Materials and Methods: Following approval from the Institute's Ethics Committee for human studies, twenty consecutive patients of either sex aged between 20 to 60 years, suffering with chronic low back pain and radiculopathy with contained herniated disc who underwent thermal discoplasty, were evaluated. Patients who had either spinal stenosis, a loss of disc height of >50% or severe disc degeneration, were excluded. All the procedures were day-care and performed under local anaesthesia using fluoroscopy. Six channels were created per disc.

Results: Out of 20 patients, 4 patients dropped out. In 13 patients, single disc and in 3 patients two disc nucleoplasty were performed. The mean follow-up period was 12 months. Six patients had VAS reduced from 8 to 1, four patients reported a reduction in VAS from 8 to 3, three patients reported VAS from 8 to 4 and three reported no pain relief. MRI in the follow up could be done in 8 patients out of whom morphologic reduction of the disc could be appreciated in 3 patients.

Conclusions: Thermal discoplasty has good results in carefully selected patients resulting in minimal discomfort, invasiveness and complications. MRI correlates to clinical outcomes in about one-third of cases. The study has a limitation due to its small sample size.

APPLICATION OF EMPATHO-TECHNIQUE: A STUDY OF THE ROLE OF PHANTOM PAIN IN CHANGING OF EMOTIONAL CHARACTEROLOGICAL FEATURES OF PATIENTS AFTER AMPUTATION OF LOWER LIMBS

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Purpose/Objective: There is an increase in amputation of lower limbs over the last years resulting in increase in patients' complains about phantom pain (PP). PP responds to treatment poorly being accompanied by negative emotional state.

Objectives. To study changing of PP intensity in the process of application of empatho-technique (ET) and its possible impact on emotional characterological features in post amputation patients.

Materials and Methods: Material and Methods. There were surveyed 80 patients with PP (61 men and 19 women, mean age 55.01±6.3 yr). A psychological testing was conducted at the beginning and at the end of the course of ET that was used for PP removal. An accentuation of character was defined using Shmishek's questionnaire, an intensity of PP – using SF-36 questionnaire, and negative emotional states – using questionnaire SCL-90-R.

Results: Results. At the beginning of the course, PP intensity score was 40.09±1.95. It was accompanied by depression (0.76±0.06), anxiety (0.63 ±0.09) and interpersonal sensitivity (0.86±0.12). There were accentuations of emotive and cyclothymic types that evidenced emotional excitement and frequent emotional instability in the patients. At the end of the course, there was a decrease in anxiety (0.12±0.02), interpersonal sensitivity (0.33±0.04), depression (0.32±0.03) associated with the absence of PP ($p<0.001$).

Conclusions: Conclusion. The data obtained allow conclusion that PP exerts a strong negative effect on emotional characterological personalities of the patients, while removal of PP results in a significant decrease in level of depression, anxiety, and improvement of interpersonal relationships. Am employment of the empatho-technique may contribute to improvement of life quality of patients after amputation.

A FOLLOW-UP STUDY ON THE EFFICACY OF THE NEW NAVIGABLE PERCUTANEOUS DISC DECOMPRESSION DEVICE (L'DISQ) IN PATIENTS WITH LUMBAR DISCOGENIC PAIN

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Purpose/Objective: To assess the clinical outcomes of percutaneous disc decompression using the L'DISQ in patients with lumbar discogenic pain.

Materials and Methods: We ablated the torn annulus using L'DISQ for 13 patients(male : female = 9 : 4) had been diagnosed as lumbar discogenic pain through provocation discography. The target ablation site, torn annulus

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was identified through lumbosacral magnetic resonance image and computed tomographic discogram. Prospectively, we evaluated pain intensity, disability and quality of life for 1 year using visual analogue scale (VAS), Oswestry disability index (ODI) and Roland-Morris disability questionnaire (RM) and pain-related quality of life (Bodily Pain scale in Short Form-36 version 2, SF-36 BP). A successive outcome for the patient was defined as a reduction of VAS more than 50%.

Results: The mean VAS fell from 7.58 to 3.25 scores at 1 year post procedure. At 1 year the mean ODI had fallen from 43.26 to 23.30%, and the mean RM from 13.33 to 5.11 points. The mean SF-36 BP dropped significant improvement from 33.19 to 41.76 at 1 year. The success rates was a total of 58.3 % of patients after 1 week, 66.7 % after 4 weeks, 75.0 % after 12 weeks, 66.7 % after 24 weeks and 58.3% after 48 weeks. No major procedure-related complications were reported.

Conclusions: L'DISQ is relatively safe and expected to be a new percutaneous intradiscal procedure to treat patients diagnosed with lumbar discogenic back pain. The limitation of this study was that it was a pilot study, which will require a long term follow up and more subjects.

EFFECT OF MENS CYCLE IN PATIENTS WITH CHOLECYSTECTOMY, ON QUALITY LIFE, ANXIETY AND CHRONIC PAIN

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Purpose/Objective: Gonadal hormones have direct and indirect effects on pain mechanisms. In current study, we aimed to investigate the effects of menstrual cycle phase (follicular and luteal) in patients with cholecystectomy in regards to quality of life and anxiety and chronic pain.

Materials and Methods: Ethics committee approval and patient consent was obtained. Patients who underwent cholecystectomy divided into two groups based on their menstrual cycle phase at the time of the operation; Follicular group (n = 63), Luteal group (n = 64). HAD (Hospital anxiety depression scale), SF 12, pain catastrophizing scale and Visual Analog Scale Score (VAS), nausea and vomiting, postoperative analgesic consumption were measured prior to procedure and 1 and 3 months after.

Results: There was no difference between the groups in demographic data and the duration of the operation. A trend toward decreased postoperative nausea and vomiting, SF 12, VAS, and analgesic consumption have been found in the Luteal group. The Luteal group had significant decreases on VAS scores at 1-hour ($p = 0.038$), and 6 and 24-hour nausea and vomiting postoperatively compared to the Follicular group ($p = 0.002$ and $p = 0.025$, respectively).

Conclusions: In our study, we have determined although the patients who were at the luteal phase of their menstural cycle had lower, pain, nausea and vomiting at the early postoperative stage, we found no effect of the menstural cycle phase on chronic pain.

TECHNICAL CHALLENGES OF SPINAL CORD STIMULATION IN MORBIDLY OBESE PATIENTS

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Purpose/Objective: The world is becoming heavier. Performing permanent spinal cord stimulation in obese patients is medically and physically challenging. Morbidly obese patients have a much higher rate of postoperative complications than non-obese patients. The challenges in placing spinal cord stimulator (SCS) leads are numerous. The challenges are both physical and technical. Technical challenges involved in placement of SCS leads in morbidly obese patients are discussed. Tips for aiding in such placement are also provided.

Materials and Methods: The physical challenges are broken down into three areas. First, can the patient lie prone for one to two hours? Due to the obese abdomen, the tidal volume and functional residual capacity (FRC) are reduced in prone position. Prior to the date of procedure, encourage them to try to lie prone and supine daily to increase the duration prior to the surgery date. Encourage the patient to lie prone daily for 15 minutes and to increase duration daily. Second is the raw weight of the patient. Weight of the patient cannot exceed the maximum allowable limit of the procedure table. A third challenge in placement of the leads is infection. Technical challenges include level of required anesthesia, patient positioning due to size, epidural space access, and lead migration. Tips for aiding in placement of SCS leads in morbidly obese patients will be provided.

Results: None reported.

Conclusions: There is an increasing amount of patients who are morbidly obese requiring SCS along with commonly occurring challenges. Techniques will be identified to overcome these challenges in placement of SCS.

INFLUENCE OF DIFFERENT TYPES OF SURGERIES ON THE PANCREAS WITH CHRONIC PANCREATITIS ON ABDOMINAL PAIN IN THE LONG TERM

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Purpose/Objective: Abdominal pain is the main recurrent syndrome in chronic pancreatitis.

The aim of the study was to investigate the effect of different types of surgeries in pancreas to longstanding post-operative pain syndrome in chronic pancreatitis.

Materials and Methods: 268 patients (214 men and 54 women) with chronic pancreatitis were operated. The average age of patients was 43.1±4 years. The cause of the disease in 87% patients was alcoholism, and 13% - cholelithiasis. Depending on the type of surgery, all patients were divided into 4 groups. The first group included 172 patients with internal drainage pancreatic cyst. The second group included 32 patients with longitudinal pancreatojejunostomy. The third group included 22 patients with Frey's surgery. The fourth group consisted of 42 patients with pancreatoduodenal resection. The severity of pain was assessed by visual analog scale before and 2 years after surgery. Statistical comparisons were based on the t test.

Results: The intensity of abdominal pain before surgery in all groups was similar, average 5.6±1.5 points. In 90% of patients pain was recorded at 24 months after surgery . The intensity of abdominal pain after surgery in the first group was 0.6±0.3 points ($p<0.05$), in the 2nd group – 1.1±0.4, in the 3rd group – 1.5±0.4 and in the 4th group – 2.8±0.6.

Conclusions: In 2 years, 90% of patients after pancreatic surgery shows pain syndromes of various intensities. Low intensity of pain in the late postoperative period is recorded after an internal drainage of cysts of the pancreas, whereas the maximum pain has shown after pancreatoduodenectomy.

UNUSUAL FRACTURES OF SPINAL CORD STIMULATOR ELECTODES IN TWO PATIENTS: A CASE SERIES

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Purpose/Objective: We report 2 cases of patients with good initial outcome from spinal cord stimulation (SCS), followed by a sudden failure of the system within weeks of implantation, due to SCS lead fracture.

Materials and Methods: Case 1–35 yr lady with failed back surgery syndrome (FBSS) was treated with percutaneously inserted single SCS octopolar cylindrical electrode (St Jude Medical) for right leg L5–S1 radicular pain. She reported excellent analgesia from SCS, but had loss of stimulation 3 weeks after implantation. Xrays confirmed a SCS lead fracture proximal to the anchor in transit to the interlaminar space, confirmed on lead explantation (Fig 2).

Case 2–42 yr lady underwent percutaneous implantation of a single octopolar cylindrical SCS electrode (St Jude Medical) for right S1 radicular pain secondary to FBSS. She reported full paraesthesia coverage of her leg pain from SCS. However, she reported loss of stimulation 12 weeks after implantation. Xrays again demonstrated a lead fracture proximal to the anchor in transit to the interlaminar space (Fig 1) .

Results: Both patients underwent revision surgery, with removal of the respective fractured SCS lead and insertion of replacement octopolar lead. They both reported full coverage and excellent benefit from restoration of SCS therapy.

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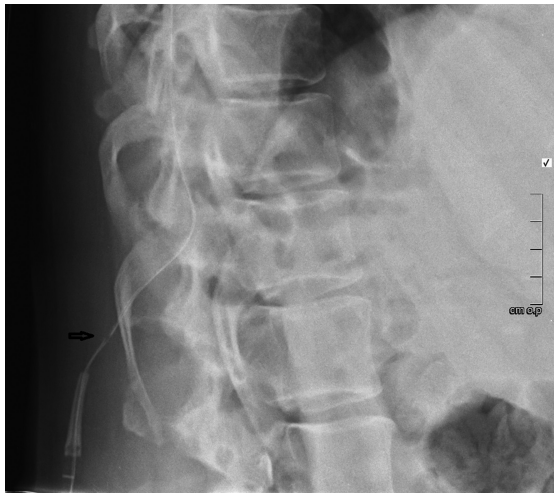

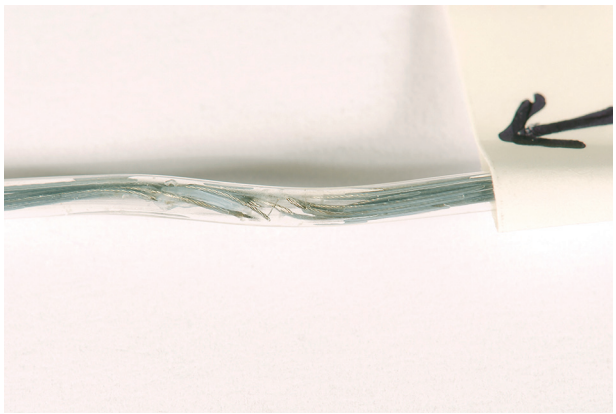

Conclusions: SCS lead fracture is seen in 6% cases (Mekhail et al Pain Pract 2011;11(2):148–53), but these occur commonly distal to the SCS anchor site. Lead fracture proximal to the anchor, as seen in our patients, is unusual and suggests structural integrity problems in the electrodes may be responsible.

IS DORSAL ROOT GANGLION STIMULATOR IMMUNE TO LEAD MIGRATION?

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Purpose/Objective: We present a case of dorsal root ganglion stimulator (DRGS) lead migration resulting in loss of therapy and re-emergence of post-surgical abdominal neuropathic pain.

Dorsal root Ganglion stimulation (DRGS), an emerging therapy in the field of neuromodulation, delivers targeted paraesthesia coverage in a dermatomal distribution. It is superior to conventional Spinal cord stimulation (SCS) in delivering satisfactory paraesthesia coverage in distal extremities at a low amplitude of current. Moreover, as the DRGS electrode is placed in the intervertebral foramen, the incidence of lead migration is thought to be quite low compared to SCS. Our report highlights a rare case of DRGS lead migration.

Materials and Methods: A 34 yr old female underwent implantation of left T12 DRGS with excellent efficacy for post-surgical left abdominal wall neuropathic pain following consistent reproducible transient benefit with DRG pulsed radiofrequency neurotomy.

However, 10 weeks following implantation, loss of paresthesia and hence effect was confirmed by minor (2 contact) lead migration on X ray. Therapy was transiently re-established by re-programming of DRGS. Repeat X ray confirmed complete migration of DRGS lead out of intervertebral foramen into the dorsal epidural space.

Results: Reprogramming attempts to re-establish therapy were unsuccessful, necessitating repositioning of the DRGS.

Conclusions: DRGS stimulation is a neuromodulatory technique with reliable paresthesia coverage into the distal extremities. Though the incidence of DRGS lead migration is considered to be quite low, our report highlights that this risk persists, albiet at low rate compared to conventional SCS techniques.

ULTRASOUND-GUIDED RADIOFREQUENCY OF PERIPHERAL NERVES FOR DIAGNOSIS AND TREATMENT OF CHRONIC PAIN

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Purpose/Objective: Radiofrequency is a well recognized treatment modality for chronic pain. We used ultrasound-guidance to accurately locate several peripheral nerves for diagnosis and subsequent radiofrequency treatment of chronic pain. The purpose of this case series was to review the accuracy of localization, qualitative benefit and longevity of pain relief following the use of radiofrequency.
Materials and Methods: Three patients with chronic pain were recruited following a successful ultrasound-guided diagnostic targeted peripheral nerve block using lidocaine. The patients were subsequently readmitted and consented for ultrasound-guided radiofrequency of their target nerve. All procedures were performed by an expert in regional anaesthesia. The radial, musculocutaneous and superficial peroneal nerves were localized respectively in the three patients using ultrasound-guidance. Pulsed radiofrequency ablation was performed (pulse duration 20ms, frequency 2–50 Hz, temperature 42°C) for 10 min. No local anaesthetic was injected prior to each radiofrequency ablation. The patients were followed-up after 6 weeks.
Results: None of the patients had evidence of muscle weakness following the procedure. All patients.
Conclusions: The use of ultrasound-guidance aided accurate localization and diagnostic blockade of the peripheral nerves involved in chronic pain and subsequent accurate application of radiofrequency. However, the patients did not experience any long-term analgesic benefit. More evidence is required on the effectiveness of radiofrequency in the treatment of chronic pain.

REGIONAL ANAESTHESIA DOCUMENTATION

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Purpose/Objective: Good anaesthetic record keeping promotes communication between healthcare teams and facilitates continuity of care, as well as allowing retrospective analysis for audit and medico-legal purposes. [1]

Consent is a process of interaction between people and documentation of the adequacy of this process is a challenge. [2]

The patient's agreement and the discussions which led to that agreement should be clearly documented in the patient's notes. [3]

We set out to establish the quality of documentation of consent and procedure in a London teaching hospital.
Materials and Methods: We conducted a retrospective audit of a random sample of anaesthetic charts. The primary aim of the audit was to assess the documentation of consent. The audit did not require ethical approval.
Results: We analysed a random sample of 46 sets of notes of patients who had undergone hand surgery. Of these, 36 had a peripheral nerve block performed (78%). Discussion of benefits was only recorded in 4 cases (8.7%), whilst risks were more frequently discussed with nerve damage and block failure documented in 21 (45.6%) of cases. The side blocked was only documented in 14 cases (30.4%) and the adequacy of block was assessed in 4 cases (8.7%).
Conclusions: Our audit showed that the quality of documentation of consent for regional anaesthetic procedures is poor.

The results highlighted a need for a more standardised form of documentation and we have since introduced a consent sticker which we hope will improve documentation of risks and benefits of regional anaesthesia in our trust.

SPINAL ANESTHESIA FOR AMBULATORY SURGERY- 24 HOURS POSTOPERATIVE FOLLOW-UP

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Purpose/Objective: The advantages of Regional Anesthesia make it a good anesthetic option in the ambulatory setting.

The aim of this work is to analyze the 24h postoperative (PO) evaluation of the patients who were operated under spinal anesthesia (SA) in the Ambulatory Surgery Unit (ASU).
Materials and Methods: Descriptive and observational study.

Reviewed patients who underwent surgery in our ASU under SA during 2012 and their 24h PO telephone contacts were analyzed.
Results: During 2012, 4055 patients underwent surgery in ASU, 15.4% (n=626) of them were operated under spinal anesthesia more frequently for inguinal hernia repair, knee arthroscopy and varicose vein surgery.

The 24h's PO telephone evaluation was obtained with success in 91.2% of those patients: 1.4% had PO complications like pain, headache, dizziness, nausea and fever. Six of those patients searched a hospital without subsequent need for hospitalization situations.

No one had drowsiness, vomiting or urinary retention.

The pre and PO information was considered good or excellent by 99.8% patients and 56.4% referred no functional activity limitation.

There was no readmission or re-intervention registration.
Conclusions: In selected patients, SA has advantages in day-case surgery. We verified a small incidence of PO complications and a reduced functional activity limitation in patients who were operated under SA.

Telephone contact at 24h PO makes possible the evaluation of our medical practice which is essential to improve the patient care.

EFFECT OF ORAL TRAMADOL ON GASTRIC SECRETIONS VOLUME AND PH IN PATIENTS SCHEDULED FOR ELECTIVE SURGICAL PROCEDURES.COMPARISON OF TRAMADOL AND FAMOTIDINE

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Purpose/Objective: Pulmonary aspiration of gastric fluid volume > 0.4 ml/kg and PH < 2.5 is a risk factor for aspiration pneumonitis. Preoperative single dose of intramuscular tramadol 1- hour before elective caesarean section is effective in lowering the risk of acid aspiration. The aim of our study was to evaluate and compare the effect of oral single dose of tramadol and famotidine as premedication on gastric secretion volume and PH in patients scheduled for elective surgical procedures.
Materials and Methods: The study was conducted after hospital IRB approval and informed patient consent. 90-patients were randomly divided into control (GC), famotidine (GF) and tramadol (GT) groups. Patients ASA I and 2, age 18–50 yrs of either sex planned for surgical procedure > 2- hr were included. Patients on tranquillizers, contraindications to studied drugs and history of acid peptic disease were excluded from the study. GC received placebo, GT received Tramadol 100 mg and GF received Famotidine 40 mg orally as premedication 2- hrs preoperatively. Anesthesia was standardized. Gastric fluid sample was taken through nasogastric tube 2-hrs after premedication. Aspirated fluid volume and PH was measured.
Results: Patients age, weight and sex and gastric fluid volume in all groups were comparable (p >.005). Mean PH values in GC 1.95, GF 6.21 and GT 1.95. PH values GC Vs GF (P.005) and GF Vs GT (P>.005).
Conclusions: Premedication of single dose oral Tramadol 100mg was unable to increase the gastric PH.

BURNOUT IN ANESTHESIA AND PAIN MEDICINE

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Purpose/Objective: Burnout is described as a prolonged response to chronic emotional and interpersonal stressors on the job, and is defined by the 3 dimensions of exhaustion, cynicism, and inefficacy (Maslach). Burnout can affect quality of care, job turnover, and negatively influence others in the group. It has been minimally studied in US Anesthesiologists(A) and not at all in Pain Medicine Physicians(PMP). We undertook this study to determine the prevalence in these specialties and to compare the incidence to the overall US physician(USP) population (as described by Shanafelt et al).
Materials and Methods: Anesthesiologists and Pain Medicine Physicians (APMP) were recruited via invitation to participate from of one of the authors (DT) on QuantiaMD, an online medical learning network. The participants completed the MBI-Human Services Survey (MBI-HSS), a validated 22-item questionnaire, which assesses the three core dimensions of burnout: Emotional Exhaustion(EE), Depersonalization(DP), and Personal Accomplishment(PA). Burnout is indicated by high levels of EE(≥27), DP (≥13), and low levels of PA(≤31). Results were also compared to the recent Shanafelt study of burnout in USP. One sample binomial probability tests were used to compare percentages.
Results: A total of 253 surveys were completed. 44.7% had high EE, 33.5% high DP, and 47.4% low PA. There was a statistically higher percentage of APMP with a high EE compared to USP(37.9%)(P=0.028). The APMP also

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had statistically higher percentage with low PA compared to USP(12.4%) (P≤0.001).

TABLE 1. Burnout in Anesthesia and Pain Medicine (Current Study) Compared to All US Physicians (Shanafelt et al.[1])

	Current Study	Shanafelt[1]	P value
Emotional Exhaustion (EE)			
Median Score	24	21	
Low	78 (30.8%)	42.2%	0.0002
Intermediate	62 (24.5%)	19.9%	0.07
High	113 (44.7%)	37.9%	0.028
Depersonalization (DP)			
Median Score	9	5	
Low	103 (39.6%)	50.1%	<0.001
Intermediate	70 (26.9%)	20.5%	0.013
High	87 (33.5%)	29.4%	0.15
Personal Accomplishment (PA)			
Median Score	38	42	
High	60 (23.7%)	66.6%	<0.001
Intermediate	73 (28.9%)	20.9%	0.002
Low	120 (47.4%)	12.4%	<0.001
Burnout (High EE or High DP)	131 (51.6%)	45.4%	0.055

1. Shanafelt TD et al.: Burnout and Satisfaction With Work-life Balance Among US Physicians Relative to the General US Population. Arch Intern Med 2012; 172 (No. 18); 1377–1385

Conclusions: Indicators of burnout are significantly higher in APMP compared to the overall USP. Direct comparison between A and PMP may show differences in burnout rate.

MULTIPLE SCLEROSIS AND PERIOPERATIVE PAIN MANAGEMENT

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Purpose/Objective: Background and aims - To identify the best possible managment of perioperative pain in patients with multiple sclerosis undergoing major surgery.

Materials and Methods: Methods: Literature search was done using using NHL search 2.0 (including EMBASE(ovid), Medline, HMIC, Oxford pain database, Cochrane pain palliative and supportive care group). Literature search was restricted to articles in english for the past 15 years.

Results: Results: Fentanyl, alfentanyl and remifentanyl were all been successfully used as a bolus during induction of anaesthesia with minimal side effects. Fentanyl and remifentanyl were both been used as an infusion during maintenence of anaesthesia. With regards to central neuraxial anaesthesia - spinal anaesthesia has been reported to worsen the symptoms of MS in 4 seperate occasions. Epidural anaesthesia (low dose concentration) has been used with relative safety during intraoperative and postoperative period. Peripheral nerve blockade has been reported to worsen the symptoms of peripheral neuropathy on atleast five seperate occassions(including report of severe brachial pexus neuropathy after usg guided interscalenii nerve block). Midazolam during induction and meticulous temperature control during peri and post operative period have been suggested to reduce the incidence of flaring of MS and subsequent pain symtomps. Fentanyl, remifentanyl and low dose epidural have all been used with success for post operative pain relief with minimal effects on MS.

Conclusions: Conclusion : Perioperative pain managment in patients with MS can pose a challenge but careful choice of analgesia can avoid complications. Spinal anaesthesia and peripheral nerve blockade are relatively contraindicated in these patient cohort.

A NOVEL MODIFIED COMBINATION CHEMICAL VTE PROPHYLAXIS TO AID ENHANCED RECOVERY FOR PRIMARY LOWER LIMB ARTROPLASTY

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Purpose/Objective: Enhanced recovery is compromised by excessive wound oozing and complications due to chemical thromboprophylaxis. We analysed the impact of the change in VTE prophylaxis in terms of lenght of stay (LOS), VTE episodes, deep infection and return to theatre (RTT).

Materials and Methods: Retrospective study of 458 THRs (235 in group I & 223 in group II) and 526 TKRs (250 in group I & 276 in group II).

Patients in group I received 10mg Rivaroxaban at 8 hours post op. Patients in group II received Clexane 40mg SC at 8 hours post op followed by Rivaroxaban 24 hours later. Both groups continued Rivaroxaban for 14 days for TKRs and 35 days for THRs.

Age was not an exclusion criteria. ASA 1 to ASA 3 patients were included. Aspirin 75mg was not stopped pre-operatively.

The anaesthetic, peri-operative management,surgical technique and prosthesis used were standardised.

Results: LOS in group I was 3.52 days for THRs and 3.57 days for TKRs. LOS in Group II was 2.37 days for THRs and 2.52 days for TKRs.

Return to theatre in group 1 was1.3% for THRs and 0% for TKRs. In Group II was 0.4% for THRs and 0% for TKRs.

Deep infection in group I was 0.4% for THRs and 0.8% for TKRs. In Group II was 0%.

VTE was similar in both groups.

Conclusions: The administration of LMWH followed by Rivaroxaban reduce the incidence of return to theatre and deep wound infections. This helped in our enhanced recovery programme by reducing the LOS by one day.

CROSS-SECTIONAL STUDY OF ANESTHESIA USED IN AMBULATORY INGUINAL HERNIA REPAIR. GENERAL ANESTHESIA VERSUS SUBARACHNOID ANESTHESIA. WHICH ONE IS ASSOCIATED WITH LESS COMPLICATIONS AND HOSPITAL ADMISSIONS?

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Purpose/Objective: Evaluate what kind of anesthesia the patients, who undertake a unilateral inguinal hernia repair, receive in our center. Furthermore to analyze the post-surgical morbidity associated with each kind of anesthesia.

Materials and Methods: Cross-sectional retrospective study. Patients included were those who have had unilateral inguinal hernia repair as an outpatient procedure between January and June 2012. The anesthesia technique (general versus intradural), surgical wound infiltration, TAP block, dose and type of local anesthetic used, immediate post-surgical complications and conversion ratio from outpatient attendance to inpatient admission were recorded.

Results: 57 patients were included; 52 men (91%), 5 women (9%), the mean age was 57.9 years (range 22-87 years). 63% of the patients received subarachnoid anesthesia (prilocaine or bupivacaine) and 27% general anaesthesia. In the case of the subarachnoid, 36% were complemented with TAP block, 5.5% suffer surgical wound infiltration. 81% of the general anesthesia received TAP block, 9.5% undergo local infiltration. There was 21% of admittance, the causes were: delayed output from the surgical area (50%), acute urinary retention (25%), persistence of motor blockade (25%). 17% of the intradural presented post-surgical complications (4 acute urinary retention, 2 hemodynamic complications).

Conclusions: The anesthesiologists can contribute to reduce the number of reconversion of outpatients by carrying out alternative anesthesia techniques to the intradural. But there is one variable upon which we cannot act alone: time. This is the cause of 50% of admissions; in order to improve this variable, other professionals such as surgeons, nurses and those in charge of the surgery schedules must be involved.

A MULTI-CENTER, RETROSPECTIVE, CROSS-SECTIONAL AUDIT TO DETERMINE THE APPROPRIATENESS OF HAEMOSTATIC PREOPERATIVE TESTING PRIOR TO ELECTIVE SURGERY

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Purpose/Objective: Unnecessary preoperative testing may cause increased patient anxiety, surgery delays and waste resources. The aim of this study

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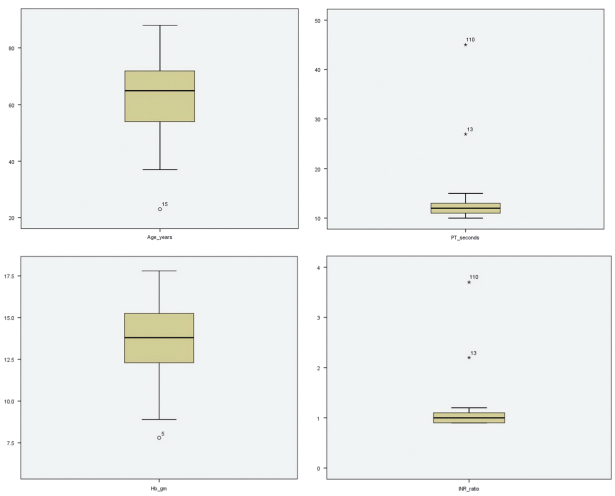
was to investigate the appropriateness of preoperative haemostasic testing prior to elective surgery.
Materials and Methods: A retrospective, cross-sectional audit was performed over a week across two sites with 24 operating theatres. The inclusion criteria were patients aged 16 or above undergoing elective surgery, including regional anaesthesia. Patients undergoing cardiovascular, neurological or urgent surgery were excluded. Patient demographics, ASA status, and preoperative haemostatic testing (full blood count (FBC) and clotting screen) were collected using a standadised proforma.
Results: 139 consecutive patients were recruited, median age 65.0 years, range 18–92 years. One patient had a preoperative haemoglobin of 8.0g dL^{-1} for which no intervention was performed. Two patients had abnormal international normalized ratio (INR >1.2), one patient had cardiovascular comorbidities and an INR of 2.2, another had a previous cadaveric kidney transplant and an INR of 3.7. A significant number of patients were over-investigated in comparison with NICE recommendations: 12.0% for FBC and 45.4% for clotting screen.

TABLE.

ASA grade	n=
1	43
2	64
3	29
4	3
Total	139



Conclusions: Unnecessary preoperative testing appears to be commonplace and rarely informs management. Unnecessary testing costs an estimated 90,480 annually across these two sites. There is a need for improved awareness among the preoperative clinical staff regarding appropriate haemostatic testing, as well as regular audit with individualised feedback.

INTRAVENOUS CLONIDINE AND KETAMINE COMBINATION ADMINISTRATION DURING SUBARACHNOID ANAESTHESIA

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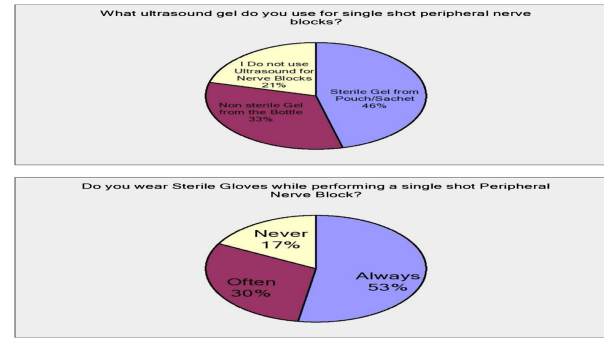
Purpose/Objective: Aim of this study was to evaluate the use of intravenous clonidine and ketamine combination during subarachnoid anaesthesia.
Materials and Methods: We studied 124 patients who expressed discomfort or mild to moderate pain (VAS score 1–5), intraoperatively, under subarachnoid anaesthesia, despite they were given midazolam (0.05–0.1mg/kg). In 60 of them (group A) we administered ketamine iv (0.3–0.5mg/kg) and in the other 64 (group B) we administered a combination of ketamine (0.3–0.5mg/kg) and clonidine (1–2μg/kg)iv. Vital signs (blood pressure, pulse rate, respiratory rate and pulse oxymetry), such as patients'overall satisfaction were recorded. Patients with arterial hypertension or coronary disease were excluded of the study.
Results: Among the 60 group A patients, 54 (90%) expressed tachycardia and hypertension, 15 (25%) discomfort, 6 (10%) anxiety and 1 (1.66%) delirium. Among the 64 group B patients, 6 (9.37%) expressed slight respiratory depression which was easily managed with jaw thrust and patient awakening and none presented hypo- or hypertension tachy- or bradycardia. All group B patients appeared to be mildly sedated and when asked after the operation were completely satisfied with the anaesthesia method without remembering the initial cause that led to ketamine – clonidine administration. None of both groups' patients remembered feeling pain intraoperatively when asked postoperatively.
Conclusions: Ketamine and clonidine combination administration to patients who expressed discomfort or mild to moderate pain during surgery under subarachnoid anaesthesia seems to be safe, effective and satisfactory to patients.

PRACTICE OF ANTISEPSIS FOR REGIONAL ANAESTHESIA: SURVEY IN WESSEX REGION

H. Singh[1]. [1]*Anaesthesia, QAH Portsmouth, Portsmouth, United Kingdom.*
Purpose/Objective: Infectious complications are exceedingly rare event but can cause severe and disabling injuries with long-term or even permanent adverse sequelae. Most hospitals have guidelines for antisepsis for central neuraxial blockade but those for peripheral neurexial blockade are lacking.
Materials and Methods: Online questionare sent to all the trainnes and permenant anaesthetists in the Wessex training region with about 120 responses.
Results:



1. 13% anaesthetists do not wear sterile gown and 29% do not wear face mask while performing central neurexial blocks
2. 23% anaesthetists still use 2% chlorhexidine for central neurexial blocks
3. Data submitted graphically

Conclusions:
1. we still need clear cut national guidelines for single shot peripheral nerve blocks.
2. a lot of hospitals need to formulate local guidelines for antisepsis

FOOT DROP AFTER SPINAL ANESTHESIA

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Purpose/Objective: Neurological complications, though rare, have been documented after spinal anesthesia. The exact etiological factor may not be detected in all patients. Traumatic injury to the spinal cord or nerve roots during spinal anesthesia is an infrequent cause.

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Materials and Methods: A 31 yr old female patient was sheduled for anal fissurectomy operation. Preoperative evaluation was insignificant for disease history. Complete blood count and coagualtion parameters were normal. In the operation room routine monitorization was made. Spinal anesthesia was administered with a 27g Quincke needle through L4–L5 interspace with 10 mg %0,5 hyperbaric bupivacain solution. In order to achive saddle block the patient was kept sitting position for 5 minutes and after patient was turned to prone position. The duration of operation was 30 minutes and the patient was sent to ward uneventfully. At postoperative 6th hour the patient noticed that she was unable to move her left food. On neurological examination weakness of left foot plantar flexion (0/5) and numbness were diagnosed while right foot was normal. Because MRI (cranial and lumbal) scans were normal; any surgical intervention was not planned.

Results: Methylprednisolone 250 mg and B complex treatment were started. Dexamethazone 16mg and B complex therapy was continued for 5 days. Physiotherapy planning was done and the patient was discharged. After a 21 days period of physiotherapy patients symptoms were markedly improved. An electromyography did not reveal a pathology.

Conclusions: We recommend that after a spinal anesthesia related foot drop situation, urgent diagnose making and treatment procedure is crucial for improved long term outcomes.

AN INTERESTING CASE REPORT ON ANAPHYLAXIS TO CHLOROHEXIDINE FOLLOWING NEURAXIAL BLOCK.

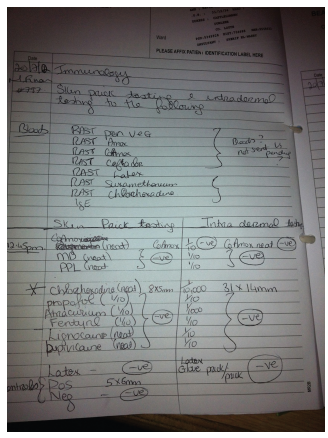
A. Bangalore Puttappa[1], B. Lamont[1]. [1]*Anaesthesia, Beaumont University Hospital, Dublin, Ireland.*

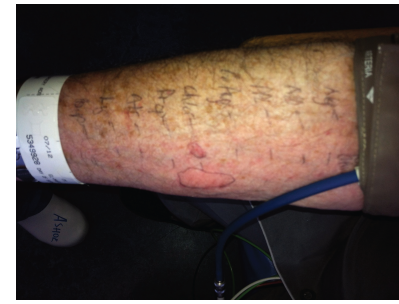
Purpose/Objective: Chlorhexidine is antiseptic and disinfectant agent used widely in surgical field. Hypersensitivity reactions to chlorhexidine have been reported including delayed and Immediate type In this case report, we describe anaphylaxis reaction to topical skin application of Chlorohexidine.

Materials and Methods: none

Results: 78 year old male posted for elective anterior resection with back grount history of Hypertentsion, hiatus hernia, Previous abdominal aneurysm repair. He was well prepared Preoperatively. No previous drug allergies. Epidural followed by General Anaesthesia was given. Prep done with **chlorohexidine**. Epidural by the senior staff was difficult, dural puncture first time. Test dose with 0.5% Levobupivacaine 3 ml given and uneventful. Anaesthesia induced with propofol, Atracurium and fentanyl. Easy intubation and hemodynamically stable. 5 ml each 0.25% injected epidurally with interval of 5 min. Urinary catheter inserted after **chlorexidine** disinfection. Patient transferred to theatre. Surgical site prepared with betadine. BP slowly dropped to 50/20 not respond to ephedrine, phenylephrine, fluids. Pulse droped to 45. Adrenaline 50mcg IV resulted in HR jumping to 160 and BP remained low. Face and chest of patient showed redness. Anaphylaxis is assumed and Adrenaline 100mcg im, leg elevation, fluid, and chloropheniramine maleate administered. BP slowly picked up over 30 to 45 min, sugery cancelled, Patient starts breathing spontaneously, and extubated . Transfere to CCU. Tryptase test and skin test was done and confirmed with chlorohexidine anaphylaxis.

Conclusions: Extensive use of chlorhexidine to reduce hospital-acquired infections has the potential to sensitize a small proportion of patients, leading to life-threatening anaphylaxis on subsequent exposure.





COMBINATION OF LUMBAR PLEXUS AND SCIATIC NERVE BLOCKS FOR FEMOROPOPLITEAL BYPASS SURGERY IN AN ELDERLY, HIGH-RISK PATIENT

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Purpose/Objective: Femoropopliteal bypass surgery is often performed under general anesthesia or central neuroaxial blocks. Peripheral regional anesthesia may be a better choice than these anesthesia techniques, especially in high risk patients. In this case, we report an elderly, high-risk patient who presented for femoropopliteal bypass surgery.

Materials and Methods: An 80–year-old man was admitted with ischemia due to by superficial femoral artery occlusion. His medical history revealed severe heart failure with aortic valve dysfunction, chronic obstructive lung disease, hypertension, and diabetes mellitus induced nephropathy. He was also under medical treatment for coronary artery disease. He was assessed as American Society of Anesthesiologists Physical Status of IV, and was scheduled for femoropopliteal bypass surgery of the left leg.

In the operating room, he was administered 1 mg midazolam, 5 minutes before the peripheral blocks under routine monitorization plus radial artery and central venous catheterization. Since he wasn't on anticoagulant therapy we decided to perform a combination of lumbar plexus and sciatic nevre block. We administered 30 ml of 0.25 % bupivacaine for lumbar plexus block (Winnie technique) followed by 20 ml of 0.25 % bupivacaine for sciatic nerve block (Labat technique) by peripheral nerve stimulator. The patient received 2–4 L/min of oxygen via nasal catheter.

Results: Surgery continued for 170 minutes and peroperative period was uneventful. There were no hemodynamic or respiratory complications.

Conclusions: We believe that combination of lumbar plexus and sciatic nerve block with 0.25 % bupivacaine provides suf-ficient and reliable anesthesia and adequate anal-gesia in elderly and high-risk patients.

EXACERBATION OF MYASTHENIA GRAVIS FOLLOWING LOWER LIMB SURGERY UNDER SPINAL ANAESTHESIA

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Purpose/Objective: Regional anaesthesia may reduce or eliminate the need for neuromuscular blocking agents in surgery allowing for safer care of patients with myasthenia gravis (MG). Having obtained patient's consent, we report a case of MG exacerbation following spinal anaesthesia.

Materials and Methods: A 79-year-old unthymectomised myasthenic female (Osserman class IIa) on pyridostigmine 30 mg q.i.d. and prednisolone 10 mg q.d presented for intertrochanteric fracture fixation. Her medical history included atrial fibrillation, hypothyroidism and osteoporosis under medical control. Physical examination and laboratory testing were unremarkable. All medications were received on the morning of surgery. A fascia iliaca compartment block was performed followed by spinal anaesthesia with fentanyl 10 mcg and ropivacaine 10.5 mg at the L3/4 interspace (maximum sensory block level at T10). Surgery and anaesthesia were uneventful and the patient was discharged from the postanaeshesia care unit (sensory and motor block fully reversed) with instructions for resumption of oral medications, acetaminophen and steroid supplementation for 24 hours. Four hours later, the patient complained of dyspnoea and fatigue.

Results: Physical examination revealed rapid/shallow breathing. Arterial blood gas analysis showed partial pressure of carbon dioxide of 35, of oxygen of

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78 (FiO_2 0.27) and pH of 7.43. She received edrophonium chloride 2 mg IV with remarkable improvement followed by her oral pyridostigmine dosage increased by 50%. Chest computed tomography and echocardiography were unremarkable. Her clinical course improved gradually as pyridostigmine and prednisolone dosages were adjusted and titrated.

Conclusions: The unpredictable disease course coupled with acute stressors such as surgery and anaesthesia warrants vigilance, irrespective of the anaesthetic technique.

LUMBAR SYMPATHETIC BLOCK WITH BOTULINUM TOXIN TYPE B IN A PATIENT WITH DYSTONIA OF LOWER EXTREMITIES. - A CASE REPORT-

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Purpose/Objective: Dystonia is a neurological movement disorder, in which involuntary muscle contractions cause repetitive movements, abnormal postures or pain. Muscle ischemia and depletion of energy in muscle fiber could be a reason of this pain. The lumbar sympathetic block (LSB) is an effective method for treating chronic pain of the lower extremity in several ways including raising the blood flow and washing the inflammatory substances. For longer therapeutic effect of LSB, botulinum toxin (BT) could be considered because it inhibits the release of acetylcholine at the cholinergic preganglionic sympathetic nerve terminals and its effect lasts longer than local anesthetics.

Materials and Methods: A 40-year-old woman, affected by bilateral lower extremity dystonia was referred to our department because of the pain associated with involuntary movements for 26 years. We performed bilateral LSBs using local anesthetics. After confirming the effect of LSBs, BT type B with local anesthetics mixture was injected.

Results: Both pain intensity and the frequency of involuntary muscle contraction were decreased at 6 months follow-up.

Conclusions: In case of lower extremities pain associated with dystonia, LSBs with BT type B may be an alternative treatment.

INVOLUNTARY MOVEMENTS OF THE UPPER LIMB FOLLOWING AN ULTRASOUND GUIDED AXILLARY BRACHIAL PLEXUS BLOCK: POSSIBLE MYOCLONUS

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Purpose/Objective: To discuss involuntary movements following ultrasound guided axillary block (Video available and will be presented at the meeting).

Materials and Methods: We perform more than 1500 axillary brachial plexus blocks annually at our tertiary regional trauma center. We had a 33/F, who underwent exploration of right hand under ultrasound guided axillary block. Few minutes after an uneventful block, patient developed involuntary jerky movements of the entire right arm. Stopped with propofol sedation but reappeared on waking-up. A sustained relief was obtained after Clonazepam and an overnight stay - no further treatment required. Incidentally, patient had previous uneventful exploration of the same hand under axillary block and another exploration after the above event, which presented the same diagnostic and management challenge.

Results: Although, we can not rule out the functional myoclonus, we believe that this could be a case of variable frequency myoclonus due to either direct mechanical irritation of the nerves or possibility of cranial spread of local anaesthetics with concomitant inhibition of descending inhibitory pathways: both may be due to temptation to go too close to the target nerve. The movement was suppressed by central nervous system depressant. This was completely reversible with no long- term effects.

Conclusions: We present a possible iatrogenic myoclonus after ultrasound guided axillary brachial plexus block. Its reassuring that the involuntary movements were transient and completely reversible with no long standing untoward side effect. Deep sedation or general anaesthesia may be required to accomplish the operation.

SPINAL EPIDURAL HAEMATOMA AFTER SPINAL ANAESTHESIA FAR FROM NEEDLE PUNCTURE SITE THAT RESOLVED SPONTANEOUSLY.

E. Gkliatis[1], A. Makris[1], G. Mazarakis[1], A. Spanomanoli[1], G. Tsakoumis[2], A. Mela[1]. [1]*Anaesthesiology, Asklepieion Hospital of Voula, Athens, Greece,* [2]*Orthopaedics, Asklepieion Hospital of Voula, Athens, Greece.*

Purpose/Objective: Incidence of spinal epidural haematoma (SEH) after spinal anaesthesia in patients without coagulopathy is 1:220000. Having obtained patient's consent, we report a case of SEH that was initially thought to be related to the anaesthetic technique.

Materials and Methods: A 64 year old female, underwent a total knee arthroplasty under spinal anaesthesia, performed atraumatically, using a 25 gauge pencil point needle in the L2-L3 interspace, injecting 3 ml bupivacaine 0.5%. The operation concluded uneventfully. Sensory and motor block fully reversed 3 hours later. One shot femoral nerve block was performed for postoperative pain control. Prophylactic anticoagulant therapy with bemiparin started the following day. On the third postoperative day the patient complained of bilateral acute shoulder pain followed a few minutes later by paraplegia with motor and sensory block of the lower extremities as well as muscle weakness of the upper extremities.

Results: An MRI was performed revealing a SEH extending from C2 to T3, caused by a vascular malformation rupture. Conservative treatment was decided since clinical status was gradually improving. Within 8 hours sensation was normal and in 14 hours motor activity returned. Two days later the patient was mobilized and nine days later she was discharged.

Conclusions: Our patient developed a SEH in the cervico-thoracic region 76 hours after spinal anaesthesia, caused by rupture of a vascular malformation. Vigilance is imperative after central nerve blockades and any new neurological symptom has to be immediately evaluated to exclude presence of a haematoma that may have several causes beside the anaesthetic technique.

INFECTIOUS COMPLICATION FOLLOWING A SINGLE SHOT INTERSCALENE BRACHIAL PLEXUS BLOCK

E. Gkliatis[1], A. Makris[1], P. Papadopoulos[1], C. Vlachos[1], I. Katrabasas[2], A. Mela[1]. [1]*Anaesthesiology, Asklepieion Hospital of Voula, Athens, Greece* [2]*Orthopaedics, Asklepieion Hospital of Voula, Athens, Greece.*

Purpose/Objective: Regional anaesthesia generally carries a very low risk for complications. Concerning infections, the risk is 0–3.2%. Although the importance of adherence to strict aseptic technique has been recognized in practice by anaesthetists, infective complications may still occur. For peripheral nerve blocks almost all reported cases involve continuous catheter techniques. After obtaining patient's consent, we report a case of a serious neck infection complicating a single-shot interscalene approach for brachial plexus block (IBPB).

Materials and Methods: A 32 year-old, ASA I male was scheduled for a subacromial decompression - acromioplasty operation to treat a chronic impingement syndrome. A single-shot IBPB was performed, using a nerve stimulation technique, injecting 40 ml ropivacaine 0.5% through a 50mm 22G atraumatic needle. Povidone iodine 10% disinfection was used. Teicoplanin was administered intraoperatively. A week later the patient complained of neck pain, heat, edema and erythema of the supernatant skin. He was prescribed oral antibiotics and analgesics but symptoms persisted.

Results: The patient was admitted to hospital with the addition of fever up to 40°C, as well as hypoesthesia and numbness in the distribution area of brachial and superficial cervical plexuses. Blood cultures were negative. Head and neck CT did not reveal an abscess. He received intravenous antibiotics. The infection subsided gradually and the patient was discharged eight days later.

Conclusions: The site of infection indicates that the infective agent probably entered skin through the needle track site, despite the strict aseptic technique, causing an expanding cellulitis and started invading deeper structures. Infectious complications though rare may still happen in regional anaesthesia.

ULTRASOUND GUIDANCE HELPS AVOID WRONG OPERATION AND IMPROVES PATIENT SAFETY

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Purpose/Objective: We present a case where ultrasonography changed the operation the patient had consented for and was critical in the patient's management.
Materials and Methods: A 61-year-old woman had been booked for a below knee amputation. We planned to perform a general anaesthetic, popliteal and saphenous nerve blocks for postoperative analgesia. A preliminary ultrasound scan revealed gas in the soft tissues and became obvious the disease had spread. Only the ultrasound displayed the real extent. A below knee amputation was the wrong operation to perform as the disease had already spread proximally. However, the patient had not been consented for an above knee amputation. She was therefore woken up and consented for the correct operation.
Results: Ultrasound is not a common mode of investigation for the extent of gas gangrene, despite it being a specific and sensitive modality to detect subcutaneous and intramuscular air. This is the first reported case of ultrasound aiding the diagnosis of lower limb gas gangrene. While evidence accumulates for increased efficacy and speed of regional anaesthesia under ultrasound guidance, an increased safety profile has yet to be confirmed. The classical technique for popliteal nerve block is relatively straightforward, and ultrasound may appear to add little to an already effective and low risk procedure.
Conclusions: The use of ultrasound in our case allowed us to alter management and avoid the wrong operation. In this instance it undoubtedly improved patient care but the ethical implications of incidental ultrasound findings are still a concern and hindrance for scanning all patients.

COMPLEX REGIONAL PAIN SYNDROME AFTER INJECTION OF ILLEGAL MATERIAL ON NOSE

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Purpose/Objective: Polyacrylamide hydrogel (PAAG) is popularly used for cosmetic injections. We reported on a 29 year-old female suffering from facial and limb pain after injection of an illegal product similar to PAAG on the nose.
Materials and Methods: The 29-year-old female patient received an injection of an illegal product, similar to PAAG, on her nose by an aesthetic clinician. After the injection, a nose deformity occurred. To correct the deformity, 50 mg or more of triamcinolon, and 1500 IU of hyalunidase were injected on her nose. Severe pain, visual analogue scale (VAS) 7–8, was felt from her nose to her forehead immediately after the injection. Allodynia and a reddish to pale discoloration occurred on the nose and forehead, combined with anhidrosis. The pain, VAS 7–8, spread to her four limbs and abdomen two months later. Pale to dark-red discoloration occurred on both hands and feet. The patient complained of edema on her wrist and ankle. Three-phase bone scintigraphy showed an increase in both wrists and small joints of both hands of the osseous phase. The patient was diagnosed with complex regional pain syndrome (CRPS) of face and extremities.
Results: CRPS in the head and neck is rare. The mechanism of the pain's spread from face to upper arm may be communication between the trigeminal nucleus caudalis and cervical innervations with the intermingling of second and third cervical roots.
Conclusions: We should be aware of the possibility of chronic pain if a clinician uses an illegal product for aesthetic procedures.

THE EFFECTIVENESS OF TRANEXAMIC ACID IN TOTAL KNEE REPLACEMENT

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Purpose/Objective: This is a perspective randomized study to estimate the effectiveness of tranexamic acid which is a fibrinolytic inhibitor in patients undergoing Total Knee Replacement.
Materials and Methods: We studied 40 patients ASA status II–III. In group A, 20 patients (19 female,1 male, mean age 70 years old), we administered one single dose of 1gr tranexamic acid intravenously 15 minutes before tourniquet deflation. In group B, 20 patients (19 female, 1 male, mean age 66 years old), we administered nothing and this is the control group. All patients had spinal anaesthesia for surgery and continuous femoral block for postoperative analgesia. We studied the number of blood transfusions, the blood loss 24h postoperative and the mean value of Hb and Ht 72h postoperative.
Results: In group A, 5 patients transfused by 2 units of blood while in group B, 1 patient transfused with 1 unit, 8 patients with 2 units and 2 patients with 4 units of blood. (p=0.09).The blood loss during the first 24 h postoperative is significantly less in group A (mean volume 179,5ml) than in group B (mean volume 459ml) p=0.0001. The mean value of Hb and Ht 72h postoperative is significantly less in group A($p<0.05$).
Conclusions: According to our results the use of tranexamic acid intravenously reduces significantly the blood loss and the blood transfusion in patients undergoing TKR.

POST DURAL PUNCTURE TINNITUS – NEED FOR PATIENT FOLLOW UP

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Purpose/Objective: Tinnitus and other auditory symptoms are known complications after spinal anaesthesia with an incidence of 0.3–8% (1). We present three cases of severe tinnitus in our obstetric unit to highlight the need for early management, along with an audit undertaken to estimate the incidence of tinnitus in our practice.
Materials and Methods: Case 1:

Presented 6 weeks post spinal with tinnitus and was a late presentation as she did not attribute her symptoms to the Spinal anaesthetic. After undergoing audiometry and MRI scan an epidural blood patch was performed, which was ineffective.

Case 2:

Presented early after spinal. Two consecutive blood patches were performed with symptoms resolving for a variable length of time.

Case3:

Presented early after receiving an epidural and a spinal. Early epidural blood patch resolved the symptoms completely.

Following the above cases we audited the incidence of tinnitus in our practice. We prospectively followed 50 patients and documented the incidence of tinnitus during our routine follow up.
Results: 2 out of 50 patients reported tinnitus post spinal. None of these were new onset.
Conclusions: Timely epidural blood patch is an effective treatment for post dural puncture tinnitus (1, 2, 3) and proved beneficial for two of our patients.

Our audit and the above cases highlight the need for informing the patients about its possible occurrence and the need for routine follow up.

Unawareness amongst patients may delay treatment and prolong morbidity. We plan to introduce these changes to our practice to further improve our service.

A RETROSPECTIVE COMPARISON OF TRAMADOL, DICLOFENAC AND FENTANYL IN COMBINATION WITH PROPOFOL FOR DILATATION AND CURETTAGE

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Purpose/Objective: The aim of our study was to compare the effects of tramadol, diclofenac and fentanyl together with propofol in patients having dilatation and curettages.
Materials and Methods: After approval of ethics committee, aged 18–70 years, 90 patients were included in the study. Patients were divided into three groups. Administrations; Group D: 100 mg diclofenac intramuscularly 30 minutes before induction, Group T: 100mg tramadol intravenously 15 minutes before induction, Group F: fentanyl 1 μgr/kg intravenously for induction. Induction was provided with propofol 2 mg/kg and total doses of propofol required were recorded. Peroperarif and postoperetif hemodynamic parameters and spO2 were recorded. Visual Analog Scale (0–10), Ramsay Sedation Scale (0–6), Aldrete Recovery Scale (0–10) were assesed postoperatively at the 1st, 5th, 10th, 120th minutes.
Results: Postoperative systolic blood pressure and mean arterial blood pressure were significantly lower in Group F. 1st minute Aldrete scores were significantly lower in Group D and Group T. Propofol consumption was significantly lower in Group F.

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Conclusions: Fentanyl usage decreased propofol amount and recovery score was increased accordingly. Hypotension should be considered for high-risk patients. There were no statistically significant difference between the groups regarding analgesic effectiveness. It has been concluded each can be used alternatively in patients having dilatation and curettages.

ADMISSIONS TO INTENSIVE CARE FROM THE OBSTETRIC POPULATION: A 10 YEAR REVIEW OF CASES FROM THE PRINCESS ALEXANDRA HOSPITAL

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Purpose/Objective: To determine whether changes in causes, duration and outcomes in parturients admitted to ICU at Princess Alexandra Hospital (PAH) have occurred over the past decade.

Materials and Methods: Two separate retrospective reviews from 2003–2007 (review 1) and 2008–2012 (review 2) were performed from analysis of their medical notes and ICU charts.

Results: The obstetric unit at PAH previous has increased the number of deliveries from 3000 per to 4600 in the last 3 years. Of the 70 cases identified, 69% occurred within review 2, reflecting the increased number of deliveries. All admissions were unplanned. Haemorrhage accounted for 29% of total admissions and was the commonest reason for admission in both reviews (44% and 37% respectively). Respiratory problems (22%) and sepsis (9%) became more common in review 2. 81% of admissions in review 1 were less than 48 hours and required level 2 observation. This remained unchanged in review 2. Antenatal admissions increased from 5% in review 1 to 16% in review 2. There were no maternal deaths in review 1, but 4 were accounted for in review 2: 3 cases due to intracerebral events at presentation and 1 from overwhelming sepsis.

Conclusions: Obstetric admissions to ICU thankfully remain uncommon. The duration of admissions and care required remains unchanged at PAH. Haemorrhage, in keeping with other studies, remains the commonest reason for admission. The increase in admission rate seen may be attributed to increasing maternal comorbidity. Presently there is sufficient capacity within PAH ICU to adequately care for these patients.

PURINES OF BLOOD, CEREBROSPINAL FLUID, AND THE QUALITY OF SPINAL ANESTHESIA FOR CESAREAN SECTION

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Purpose/Objective: Explore the relationship of indicators purine spectrum of blood, cerebrospinal fluid and the characteristics of spinal anesthesia for cesarean section.

Materials and Methods: We examined 30 pregnant women, who before starting spinal anesthesia for cesarean section was performed over the fence of venous blood, in the performance of spinal anesthesia (before the introduction of anesthesia) – fence CSF. Purines was determined by direct spectrophotometry.

Take into account the following characteristics of spinal anesthesia administered dose of spinal ropivacaine mg, speed of onset, depth and height of the spread of spinal block, the need for additional administration of intravenous analgesics and anesthetics. Using parametric and non-parametric correlation analysis, nonparametric comparisons of two groups by Mann-Whitney U Test.

Results: Dose spinal ropivacaine significantly positively correlated with serum levels of guanine, hypoxanthine, adenine and xanthine.

Time of onset of adequate spinal block significantly correlated positively with the level of serum guanine, hypoxanthine, and block height – with a negative concentration guanine and xanthine.

Mothers with high-quality, adequate spinal block, which do not require the additional use of intravenous anesthetics differed from women with a low, not enough adequate spinal block, a lower concentration of guanine in blood serum.

Conclusions: The level of guanine in blood serum can be used to predict the quality of spinal anesthesia in obstetrics, and possibly to define indications for preemptive use of combined spinal-epidural or general anesthesia instead of the single-stage single-dose spinal anesthesia.

THROMBOPROPHYLAXIS FOR CAESAREAN SECTIONS UNDER REGIONAL ANAESTHESIA: A COMPLETED AUDIT CYCLE

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Purpose/Objective: Pregnancy is associated with a significantly increased risk for venous thrombo-embolism. Highest risk period for venous thromboembolism is post partum with LSCS being one of the major risk factors.

Current local standards for thromboprophylaxis are:

Time interval between performance of central neuraxial block/removal of epidural catheter and subsequent administration of LMWH should be 4 hours.

Time interval between last dose of LMWH and performing a central neuraxial blockade should be 12 hours.

Our aim was to re-audit the change in practice following our previous audit in 2009 looking at the prescription and timing of administration of LMWH subsequent to the performance of central neuraxial block or removal of epidural catheter.

Materials and Methods: Following local ethics committee approval, we collected data retrospectively from case notes of patients who underwent LSCS under regional anaesthesia in September 2011.

Results: 4 patients didn't receive LMWH and 2 of these were high risk based on BMI and age.

More than 90% patients received thromboprophylaxis after 6 hours of caesarean section.

Conclusions: We noticed some improvement in the numbers of patients receiving LMWH compared to previous audit, however, there is a need for increased awareness and education of midwives, obstetricians and anaesthetists regarding the thromboprophylaxis guidelines and improvement in compliance with the policy.

BARICITY VARIATION OF BUPIVACAINE PLUS FENTANYL FOR SUBARACHNOID ANESTHESIA FOR CAESAREAN SECTION

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Purpose/Objective: The present study was realized in order to compare the anesthetic effectiveness of bupivacaine - fentanyl in different concentrations of dextrose in subarachnoid route for Caesarean section.

Materials and Methods: Double blind study, 60 patients was randomized, with ages between 18 and 40 years, ASA I–II, for Caesarean section class 3 or 4 divided in 3 groups, designated A, B and C correspond to dextrose 2, 4 and 6 % respectively, with Bupivacaine 6,25 mg plus fentanyl 25 μg. Demographic data, episodes of maternal hypotension and bradycardia were quantified, initiate and duration of the sensitive blockade to the pinprick and cold, pallesthesia and motor blockade, satisfaction of the mother and the

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surgeon, adverse events and effect of the anesthesia on the fetus and newborn. A $p < 0,05$ was considered to be statistically significant.

Results: There was no differences in the demographic data, events of maternal hypotension was less in the group C ($p < 0,05$), three solutions with dextrose, were sufficient to provide level and surgical time from the statistical point of view, the group C presented minor deep sensibility in external malleolos ($p < 0,05$), only 5 cases were compatible with neonatal asphyxia, nevertheless Apgar's values were major of 7 points, with postnatal satisfactory evolution.

Conclusions: The three mix of Bupivacaine - fentanyl for subarachnoid anesthesia are clinical effective, nevertheless, while major it is the quantity of used dextrose major hemodynamics stability and quality of blockade was obtained.

INFLUENCE OF INTRA-ABDOMINAL PRESSURE (IAP) AND BODY MASS INDEX (BMI) IN PREGNANCY ON THE DEVELOPMENT OF SPINAL BLOCK FOR CESAREAN SECTION

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Purpose/Objective: The aim of the study was to investigate the influence of BMI and IAP on the development of spinal block for cesarean section.

Materials and Methods: The study included 210 pregnant women with gestational age of 38–40 weeks. IAP, BMI have been studied before spinal anesthesia. The upper level of sensory block and incident of hypotension were studied. For spinal anesthesia used 0.5% marcaine Heavy with fentanyl (12.5 mcg). All pregnants were divided into two groups. In first group (104 persons) – dose of marcaine was corrected (from 7.5 mg to 12.5 mg) according to the level of IAP. In the second group (106 persons) - the anesthesiologist did not know the level of IAP and used a dose of marcaine (an average of 13 ± 2,1 mg) according to his own experience.

Results: In 10% pregnant, IAP was less than 15 cmH_2O, in 35% – 16-21 cmH_2O, in 35% - 22–27 cmH_2O, in 15% - 28–34 cmH_2O and in 5% - more than 34 cmH_2O.

In pregnant women with obesity, IAP was 27% higher than in non-obese pregnant women.

Average level of sensory block in the first group was Th7±2 and in the second group - Th4±2. Likewise, hypotension in the first group was recorded as 25%, and in the second group 75%.

Conclusions: Only 10% pregnants have a normal IAP. The combination of IAP greater than 22 cm H2O, and obesity contributes to the development of high spinal block and hypotension. For the prevention of this complication, a reduction in the dose of local anesthetic (average 25%) is needed.

THROMBOPROPHYLAXIS FOR CAESAREAN SECTIONS PERFORMED AT NOTTINGHAM UNIVERSITY HOSPITALS NHS TRUST

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Purpose/Objective: Venous thromboembolism (VTE) remains significant direct cause of maternal death (third after sepsis and pre-eclampsia & eclampsia).

The current guidelines for thromboprophylaxis are

RCOG Green Top Guideline 37a (2009) recommend:

Stratify patients as per their risk factors.

Don't give LMWH for 4 hours after spinal anaesthesia or removal of epidural catheter.

Calculate dose as per the total body weight.

NUH NHS Trust guidelines (2008) recommend:

40mg subcutaneous LMWH (and 20mg if <50 kg) as thromboprophylaxis in recovery room after general anaesthesia or single-shot spinal and withhold first dose of LMWH until 4 hrs after epidural catheter removal.

Materials and Methods: Following approval and registration with local audit office, we performed a retrospective audit for caesarean sections performed at NUH NHS Trust in the month of July 2012 to assess appropriateness, timing of thromboprophylaxis administration and adequacy of its dose.

Results: 29 (36%) patients having elective C section received LMWH as thromboprophylaxis although they didn't meet RCOG crtiteria.

87(68%) patients received LMWH within 4 hours of spinal anaesthesia.

42% patients received thromboprophylaxis within 4 hours following C section under general anaesthesia.

22% patients received LMWH within 4 hours of removal of epidural catheter.

88% patients received thmboprophylaxis dose appropriate for their weight.

25% patients received the 2nd dose of thromboprophylaxis after 24 hours.

Conclusions: Need to update guidelines regarding thromboprophylaxis in accordance with NICE and RCOG recommendations.

Improve timing of 1st and 2nd dose of LMWH by education, training and increase awareness about thromboprophylaxis among anaesthetic and obstetric trainees and midwives.

COMPARISON COURSE OF PREGNANCY RELATED CARPAL TUNNEL SYNDROME IN LACTATING AND NON-LACTATING WOMEN DURING THE FIRST 6 MONTHS AFTER DELIVERY

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Purpose/Objective: Entrapment of median nerve in carpal tunnel is called carpal tunnel syndrome(CTS). The main purpose of this research is to compare the natural course of the syndrome during the first 6 months after delivery in the women feeding their children using powder milk and breast feeding mothers.

Materials and Methods: The present research was carried out since January 2010 to January 2013 in 50 pregnant women. The women with symptoms and signs of CTS visited by OB&Gyn specialist and then referred to physiatrist for electrodiagnostic studies. After confirming the CTS and delivery, women classified in two groups: lactating and non-lactating women. Follow up of clinical and electrodiagnostic of women were done in first 6 months after delivery.

Results: Complete recovery in breast feeding, non-breast feeding and all mothers were14.3%, 23.5% and 17.7% respectively. Partial recovery in severe and moderate stages in two groups were 31.1% and 6.5% respectively. There were not complete recovery in severe and moderate stages in two groups, but there were complete recovery in mild stage in breast feeding, non-breast feeding and total mothers 50%, 66% and 57% respectively. Rate of complete recovery in non-lactating women is 1.64 times of lactating women.

Conclusions: The relief of symptoms and reduction of severity in CTS in the women who feed their children on powder milk is higher than those who breast feed their children.Pregnancy related CTS would not usually resolve after delivery and must be follow-up by clinical symptoms and electrodiagnostic studies.

AN USUAL THING THAT IS RARE TO HAPPEN - POST EPIDURAL-BLOCKADE PRIAPISM: HAS IT EVER HAPPENED TO YOU?

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Purpose/Objective: Priapism after neuroaxial anaesthesia for endo-urology procedures is a rare but important complication, that can hamper or even postpone the procedure. It is our purpose to present a case of a hypertensive patient posted for elective penile and perineal urethroplasty, and review the present theory to allow a better understanding of the available treatment options for intra-operative priapism.

Materials and Methods: 41 years old male admitted with urethra stenosis for elective penile and perineal urethroplasty. Routine preoperative

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evaluation revealed known hypertension for ten years, renal transplant 9 years before, dislipidemia and major depressive syndrome. Lab analysis showed Hb-13,3g/dL and 1,3 of serum creatinine, with no other alterations on pre-operative routine tests.

A neuroaxial blockade was performed through epidural catheter with 18G needle at L3–L4 with 10ml of 0,75% ropivacaine, with a sensory loss up to T10 dermatome. Five minutes after the sensitive block, a severe rigid erection developed.

Results: Since there is no glycopyrrolate available for intravenous administration in our hospital, we preformed a sedoanalgesia and controlled heart rate with a beta-blocker. No drainage of the cavernous sinus was performed, nor was administered intracavernous noradrenaline, since the procedure was executed despite the priapism. It resolved 4,5 hours after set in, as the sensitive block reversed. No supplemental analgesia was administered through the epidural catheter.

Conclusions: 'Anaesthetic erection' during transurethral surgery can be dangerous and many pharmacological and non pharmacological approaches have been described in the past. Knowledge of the pathophysiology is key and herewe revisit it and its different approaches.

NEURAXIAL ANAESTHESIA: WHAT IF THE PATIENT COLLAPSES?

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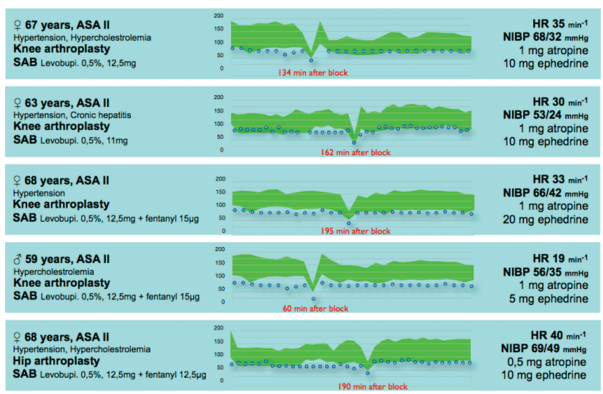
Purpose/Objective: Neuraxial anaesthesia is far well known for its safety and numerous advantages in orthopaedic surgery. However, anaesthesiologists must be aware of the risk of cardiovascular events in this context, such as Bezold-Jarisch reflex (BJR). This is motivated by cardiac mecanoreceptors' activation inducing bradycardia, hypotension and peripheral vasodilatation. The authors' aim is to review and compare five cases of BJR after subarachnoid block (SAB).

Materials and Methods: Case Report.

Results: The cases are illustrated in the following picture.



In all cases SAB was achieved with levobupivacaine with or without fentanyl. Despite the initial stability, it was reported sudden cardiovascular collapse with severe bradycardia and hypotension (heart rate (HR): 31±8 min-1; mean arterial pressure: 44±7 mmHg). There was also complete reversion to normal hemodynamic signals with sympathomimetic administration in less than 90 seconds.

Conclusions: Neuraxial anaesthesia induces somatossensorial and sympathetic block with consequent peripheral vasodilatation. Despite some weak co-existing parasympathetic block, it is an insufficient opposition to vagal stimuli conduction. In this situation, vagal stimuli may justify a significant episode of bradycardia, hypotension and risk of progression to cardiac arrest. Indeed, BJR is believed to be responsible for the sudden events previously described. This work recognizes the importance of neuraxial pharmacophysiology knowledge in the eviction and treatment of these phenomenons. It also alerts for the crucial importance of adequate monitoring of these patients in a differentiated post-anaesthetic care unit.

HORNER'S SYNDROME FOLLOWING LUMBAR EPIDURALS

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Purpose/Objective: The reported incidence of Horner's syndrome after lumbar epidurals appears to be 0.4–2.5%. It is more common in pregnant patients and mainly occurs during caesarean section. We report 6 cases of Horner's syndrome after lumbar epidural during an 18 years period. The pathophysiology is unknown. Mechanisms invoked include the anatomical and physiological changes of pregnancy; sympathetic fibre hypersensitivity due to increased progesterone; inadvertent misplacement of the catheter subdurally.

Materials and Methods: Data was prospectively collected from April 1996 to April 2013 following epidural and combined spinal epidural (CSE) techniques in obstetric patients.

Results: Six cases of Horner's syndrome were reported. There were 7960 epidurals and 3480 CSE performed during this period. Four cases after epidural for labour analgesia with 10–20 ml of bupivacaine 0.1% and fentanyl 2micrograms/ml, one patient with epidural top up for caesarean section with 10mls bupivacaine 0.5% and 10mls lignocaine 2% and fentanyl 100micrograms, and one patient with CSE (intrathecal heavy bupivacaine 0.5% and diamorphine 300micrograms) epidural top up 40 minute after intrathecal dose. One patient had a second lumbar epidural for labour analgesia 2 years later without developing Horner's syndrome.

Conclusions: Our results show that the overall incidence of Horner's syndrome after epidural and CSE were 1 in 9060; less than the quoted figure of 1 in 40 to 1 in 250. All the cases of Horner's syndrome resolved spontaneously. Our case of a repeated epidural with no associated Horners may argue against the changes of the pregnant state.

A COCKTAIL SAVED THE DAY

G. Duignan[1], A. Biswas[1]. [1]*Anaesthesia, Galway University Hospital, Galway, Ireland.*

Purpose/Objective: A 94 year old gentleman, was admitted for excision of a squamous cell carcinoma from the angle of the mouth. He had a background of dementia, chronic renal failure, chronic obstructive pulmonary disease, obstructive sleep apnea, hypertension and a very poor functional capacity. His baseline creatinine was 220 mEq/dl. He had a BMI of 37.

Materials and Methods: The initial plan of primary closure after excision of the squamous cell carcinoma from the angle of the mouth was not appropriate due to the extent of disease.

Instead, a rotational pectoralis flap was performed by the surgical team. Thus we were confronted with the consequences of a surgery far more

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extensive than anticipated. Due to his multiple co-morbidities, safe postoperative analgesia was an important consideration.

Results: Preoperative paravertebral block with oral opioids would have been ideal for postoperative analgesia had we known beforehand the extent of surgery. Instead we performed a cocktail of peripheral nerve blocks. A combination of infraorbital, mental, superficial cervical and multiple intercostal nerve blocks saved the day. Along with oral opioids in reduced dose, the combination provided excellent postoperative analgesia for this gentleman.

Conclusions: When the individual blocks are rationally chosen, the use of multiple blocks covering extensive areas of the body can be beneficial to the individual patient.

ANAESTHESIA FOR OPEN REDUCTION AND INTERNAL FIXATION OF TIBIA IN A PATIENT WITH PRIMARY PULMONARY HYPERTENSION TREATED WITH INTRAVENOUS PROSTACYCLIN

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Purpose/Objective: Primary pulmonary hypertension (PPH) is a progressive disease with frequent morbidity and mortality during anaesthesia. We present a case report of a patient with severe PPH undergoing surgical stabilisation of a tibial plateau fracture under regional anaesthesia. Prone position was required for optimal surgical access. Her current treatments included continuous infusion of intravenous prostacyclin at a rate of 126 ng/Kg/min via a Hickman line. An echocardiogram showed moderate to severe right ventricular (RV) dysfunction. A recent right heart catheterization showed RV pressure of 88 mmHg with a cardiac index of 2.1 l/min/m^2.

Materials and Methods: After a multidisciplinary meeting a decision was made to do the operation under regional anaesthesia as it has the least cardiorespiratory impact with no risk of spinal hematoma. General anaesthesia was our back up plan. Arterial line, central line, and sciatic nerve catheter were inserted before the operation. For the operation she had a sciatic block through the sciatic catheter, a femoral block, and a fascia iliaca block (longitudinal approach) as it was difficult to visualize the lateral femoral cutaneous nerve. All blocks were done under ultrasound guidance. She was given oxygen (6 l/min) and she was commenced on remifentanil target controlled infusion (1–3 ng/ml) during the operation.

Results: The patient was pain free and tolerated prone position very well. The operation was successfully completed under regional block and remifentanil sedation.

Conclusions: Our experience with this patient suggests that regional block with sedation is a suitable option for lower limb surgery in carefully selected patients.

DELAYED ONSET OF PERIPHERAL NERVE BLOCKADE IN A MYOPATHIC PATIENT- ANAESTHETIST OR NERVE

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Purpose/Objective: The speed of onset of regional anaesthesia is dependent on Local Anaesthetic (LA) type, concentration, adjunct, nerve type, nerve proximity, frequency of nerve activation and tissue pH. Nerve blocks commonly work within 90 mins. We present a case report of prolonged delay of onset of regional anaesthesia with effective blockade.

Materials and Methods: A 23 year old female with history of congenital myopathy manifesting as marked truncal weakness required surgery for an ankle fusion. She had severe kyphoscoliosis stabilised with Harrington rods resulting in a severe restrictive lung defect (FEV_1- of 500 mls). Surgery was undertaken with a Sciatic and Saphenous nerve block.

Results: Popliteal and Saphenous nerve blocks were performed using a total of 30mls of Laevobupivacaine . Effective Saphenous blockade was achieved while the sciatic territory remained incomplete. Surgery was postponed due to failed block. 5 hours after block placement the lower leg was immobile and insensate. The block persisted overnight with no sequelae. Surgery was rescheduled and the blocks repeated at the start of the list, before sending the patient back to the ward. Again, a fully effective block was present 5 hours after insertion allowing a three hour ankle fusion operation to proceed uneventfully.

Conclusions: Ehlors Danlos (type III) is associated with partial or complete topical LA resistance (1). This is the first report of LA nerve blockade resistance with myopathy. The reproducible delayed onset maybe due to a calcific process of nerve which was also seen on ultrasound within the musculature.

1. Arendt-Nielse L, et al. Acta Anaesthesiol Scand. 1990 Jul;34(5):358–61.

CARDIAC OUTPUT MONITORING IN A PATIENT WITH SEVERE AORTIC STENOSIS SUBMITTED TO PARTIAL HIP REPLACEMENT UNDER CONTINUOUS SPINAL BLOCK

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Purpose/Objective: Neuraxial blocks are usually avoided in patients with severe aortic stenosis due to the hemodynamic changes.

We describe a case of a patient with a severe aortic stenosis who had undergone a partial hip replacement (PHR) under continuous spinal block (CSB), with cardiac output (CO) monitoring.

Materials and Methods: 84 year-old female with severe aortic stenosis and congestive heart failure, severe COPD, hypertension, atrial fibrillation and coronary artery disease, scheduled to a PHR.

The patient was previously medicated with midazolam and a femoral block with ultrasound guidance was made to facilitate positioning. After that, a CSB was made using a Tuhoy needle and a 20G catheter.

Results: Two boluses of 1mg of bupivacaine 0,1% were administered throw the spinal catheter and after confirming sensitive block at T10 the patient was positioned for the surgery. After 20 minutes, a subarachnoid perfusion of bupivacaine 0,1% was initiated at a rate of 2mL per hour.

CO was monitored using LiDCOrapid ®. During all procedure the patient was stable and with no change in CO.

Post operative analgesia consisted of acetaminophen and subarachnoid bupivacaine perfusion at the initial rate, with an optimal pain control.

Conclusions: Minimally invasive CO monitors can play an important role in the hemodynamic approach of high risk patients. With this case, we have demonstrated that the CSB is a safe anesthetic approach, with minimal hemodynamic changes, and can be considered in patients in whom neuraxial block was usually contra-indicated.

SPINAL MYOCLONUS FOLLOWING CAUDAL EPIDURAL: A CASE REPORT

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Purpose/Objective: Spinal myclonus is a non-generalised movement disorder with several classifications and aetiology[1, 2]. Although the pathophysiology is not entirely known, several mechanisms have been postulated, involving various receptors and neurotransmitters1. There have been rare reports of spinal myoclonus following central[3] and peripheral regional anaesthesia[4] with opioids and local anaesthetic agents implicated.

Materials and Methods: We report a case of spinal myoclonus following a caudal epidural for chronic back pain.

Results: A 55-year-old female had an uneventful elective caudal epidural with local anaesthetic and steroids to treat her chronic back pain. She had a past medical history of a lumbar discectomy. On arrival in the PACU, the patient was alert and conscious and developed myoclonic jerks of both lower limbs with gradually increasing frequency and severity. Midazolam was administered intravenously and she was observed overnight following which her myoclonus resolved. A magnetic resonance imaging (MRI) of the lower thoracic and lumbar spine and head was performed with no abnormalities were reported. The patient was followed-up for three days and then discharged with no recurrence of myoclonus.

Conclusions: Spinal myoclonus can occur any time after neuraxial block[3]. Treatment is directed at treating the cause and the use of drugs (benzodiazepines, anticonvulsants) and regional anaesthesia. Anaesthetists should be aware of this rare complication of regional anaesthesia, especially in susceptible patients, and how to manage it. This case is unique as there few reports of myoclonus after epidural without opioids.

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PROTHROMBIN COMPLEX CONCENTRATE FOR RAPID REVERSAL OF WARFARIN ANTICOAGULATION TO ALLOW NEURAXIAL BLOCKADE, A CASE REPORT

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Purpose/Objective: The development of Prothrombin Complex Concentrates (PCCs) has led to better outcomes in patients receiving emergency reversal of warfarin anticoagulation. However, most published data describes the use of PCCs in the setting of major bleeding or emergent major abdominal surgery, with little information on neuraxial blockade. We describe a case of rapid warfarin reversal using PCC and subsequent surgery under spinal anaesthesia in an 87 year old lady, for whom general anaesthesia was deemed high risk.

Materials and Methods: Her international normalised ratio (INR) on the morning of surgery was 1.8, precluding the use of neuraxial blockade, however it was felt that given the need for imminent surgery, immediate reversal of the warfarin was indicated. Based on data extrapolated from the manufacturer's recommendations on PCC dosing, and recent publications regarding PCC dosing for the emergency reversal of warfarin, we administered a single dose of 23 units/kg PCC, and a dose of vitamin K (5mg). Her INR 1 hour following PCC was 1.2, and a spinal anaesthetic was administered. The patient then underwent excision of melanoma deposits and satellite lesions from her lower leg, as well as groin dissection.

Results: There were no surgical complications, the patient recovered satisfactorily, and there were no thrombotic or hemorrhagic events at 30 days postoperatively.

Conclusions: This case study demonstrates a novel use of Prothrombin Complex Concentrates; in certain patient populations, PCCs may be safely used for immediate reversal of warfarin anticoagulation to allow for neuraxial blockade, thus allowing safer anaesthesia and better patient outcomes.

EVALUATION OF THE EFFECT OF PERI-OPERATIVE CONTINUOUS LUMBAR PLEXUS BLOCK UPON THE INCIDENCE OF ISCHEMIC CARDIOVASCULAR EVENTS IN ELDERLY PATIENTS WITH HIP FRACTURE.

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Purpose/Objective: Perioperative myocardial ischemia occurs in 35% of elderly patients undergoing hip fracture surgery. No studies have addressed the effect of continuous perineural analgesia in the incidence of adverse cardiac events during the perioperative period.

The main objective was to evaluate the efficacy of perioperative continuous lumbar plexus block in reducing the risk of cardiac ischemic events of elderly patients undergoing surgery for hip fractures, expressed as a reduction of ischemic events per subject.

Materials and Methods: After IRB approval and informed consent, patients older than 60 years, ASA II-III, with risk factors for or known coronary artery disease were enrolled. After admission, patients were randomized to conventional analgesia using opioid IVPCA (intravenous patient-controlled analgesia) or continuous lumbar plexus (LP) block analgesia, both started preoperatively and maintained until postoperative day three. Continuous ECG monitoring with ST segment analysis was recorded and serial cardiac enzymes and pain scores were registered during the entire period.

Results: Thirty-one patients (IVPCA 14, LP 17) were enrolled. There were no major cardiac events during the entire period of observation. The number of ischemic events recorded by subject during the observation period was 6 in the LP group and 3 events in the PCA group. This difference was not statistically significant (P=0.618). There were no statistically significant differences between the groups in terms of pain scores.

Conclusions: Our data suggests that the incidence of cardiac ischemic events during the perioperative period of elderly patients with hip fracture is not modified by the use of continuous perineural analgesia, compared with conventional systemic analgesia.

COMPARISON OF THE EFFECTS OF ULTRASOUND-GUIDED FASCIA ILIACA COMPARTMENT BLOCK AND REMIFENTANIL INFUSION ON POSITIONAL PAIN IN PATIENTS UNDERGOING HIP FRACTURE SURGERY UNDER SPINAL ANESTHESIA

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Purpose/Objective: Hip fractures are commonly seen in elderly with a high mortality (1). The aim of this prospective, randomized study is to compare the effects of fascia iliaca compartment block(FICB) and remifentanil infusion on positional pain before spinal anesthesia in patients undergoing surgery for hip fracture.

Materials and Methods: 31 ASA I-III patients aged 60-90 undergoing hip fracture surgery were randomly allocated into 2 groups as FICB(N=15) and remifentanil infusion(n=16). In Group FICB, ultrasound-guided FICB by using 30 ml of levobupivacaine 0.375% was performed, in Group R intravenous remifentanil at a rate of 0.15 μg/kg/min was infused before spinal anesthesia. In Group FICB, 20 minutes after the block and in Group R after obtaining a sedation score of 2, position was given for performing spinal anesthesia and position quality scores were assessed. Positional and postoperative pain were evaluated with VAS, VPS at rest, movement. Nausea-vomiting, additional analgesic requirement, motor blokade and quality of sleep were recorded.

Results: Demographic data and duration of the operation were similiar in both groups. In Group R, blood pressure between 5–30 minutes were significantly lower than Group FICB. There was no significant difference in terms of postoperative pain and side effects.

Conclusions: We suggest that ultrasound-guided FICB and remifentanil infusions are effective methods in preventing positional pain during spinal anesthesia but FICB is a safer method in patients requiring hemodynamic stability.

Reference:

1) Monzon DG, Iserson KV, Vazquez JA. Single fascia iliaca compartment block for post-hip fracture pain relief. J Emerg Med 2007; 32(3): 257–262.

DISTAL NERVE BLOCKS FOR CARPAL TUNNEL RELEASE SURGERY

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Purpose/Objective: This study intended to assess the performance of distal brachial plexus block as valid alternative to brachial plexus block, particularly the axillary approach, to carpal tunnel release surgery.

Materials and Methods: We realize a prospective study in patients scheduled for release of median nerve surgery in outpatient procedure. Seventeen patients, 31.3% ASA 1classification, 50% ASA 2 and 18.8% ASA 3, with average ages of 58.37 years were proposed for release of median nerve with ulnar and median nerve block in the region of the forearm, guided by ultrasonography. The volume of local anesthetic was injected in order to surround the nerve and create a typical ultrasound image of "doughnut".

Results: Average volumes used were: 7ml of lidocaine 1.5% in the median nerve (SD 1.58) and 4.63ml in cubital nerve (DP 1.20). The average time required to obtain sensitive blockade of the surgical area was 3.38 min (SD 1.2). Only 6.3% of the patients needed rescue analgesia.

Conclusions: The ultrasound allows accurate identification of peripheral nerves and administration of reduced doses of local anesthetic. The median nerve in the distal region of the forearm features a small percentage of motor fibers, so the use of neurostimulator may not produce motor response and increase the risk of complications. The distal median and cubital nerve block is an effective anesthetic technique, with good quality of analgesia after carpal tunnel release surgery, maintaining the functionality of the forearm, thus adapting the objectives of outpatient surgery.

THE EFFICACY OF ULTRASOUND-GUIDED ABDOMINAL PERIPHERAL NERVE BLOCKS IN PATIENTS UNDERGOING VENTRAL INTERBODY SPONDYLODESIS

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Purpose/Objective: Study Design: A prospective, randomized, study was used to compare two anesthesia methods for reconstructive spine surgery. Objective: To assess the analgesic efficacy of two anesthetic methods during 48 hours perioperative period after ventral spondylodesis.
Materials and Methods: The study included 50 patients (women - 32 men - 18, age - 29–58 years, ASA I–II). All patients were randomly allocated to two groups: Group T (n=25) was used TAP-block and general anesthesia with sevoflurane and fentanil during surgery and Group G (n=25) was used general anesthesia with sevoflurane and fentanil and then systemic administration of opioids after surgery. After induction of anesthesia patients in Group T were underwent unilateral TAP-block with ropivacaine under ultrasound control (SonoSite, USA). At the end of the surgery the catheter was placed into the TAP and the bolus of ropivacaine was injected two times a day for 3 days.
Results: Patients with TAP-block needed for additional administration of narcotic analgesic occurred for longer times. 14 patients in Group T (56%) did not need for opioids. In the Group T there were less pain at rest and in motion and higher patient satisfaction. There was no pain in 12 patients in Group T (48%) during the first 48 hours.
Conclusions: The single-shot and then continuous TAP-block with ropivacaine as a component of anesthesia in ventral lumbar surgery provides better pain control during and after surgery, earlier mobility and higher satisfaction. The TAP-block is easily and safely to perform under ultrasound control. This technique deserves further study in the setting of spinal surgery.

ULTRASOUND GUIDED NERVE BLOCK - AWAKE OR ASLEEP? - A SURVEY.

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Purpose/Objective: To do a survey on how Anaesthetists performed their block in adults - asleep or awake.
Materials and Methods: Anaesthetists of all grades in two hospitals in London were asked to complete a questionnaire and the results were analysed
Results: 97 forms were collected.

30 (31%) were Consultants, 42(43.3%) were Specialist Registrars, 22 (22.6%) were Senior House Officers(SHO) and 3(3.1%) were Non-Consultant Career Grade (NCCG) anaesthetists.

The average years of anaesthetic experience was 7.34 years.

94 (97%) of them said their practice involved doing nerve blocks.

32 (34%) preferred ultrasound. 23 (24.4%) preferred nerve stimulator and 39 (41.5%) preferred both ultrasound and nerve stimulator.

The average experience with ultrasound nerve blocks was one year.

Nine people who used ultrasound still preferred nerve stimulator for nerve blocks.

80 (85%) people had experience with ultrasound nerve blocks.

33 (41.25%) did them awake, 21 (26.25%) did them asleep and 26 (32.5%) did both awake and asleep blocks.

The common reasons for doing ultrasound nerve blocks awake are safe (65%), medico-legal (41.25%), easy (13.75%), successful (6.25%), departmental policy (1%) and others (7.5%).

The common reasons for performing asleep ultrasound nerve blocks are comfortable for patients (35%), patients' preference for asleep blocks (40%), easy (17.5%), successful (2.5%), safe (6.25%) and others (1%).
Conclusions: ?twb=.4w?>This survey shows more anaesthetists still preferred awake blocks. The main reasons being safety and medico-legal. But it also shows increasing number of anaesthetists are happy to do nerve blocks asleep with ultrasound. The main reasons being patients' comfort and preference.

INFLUENCE OF AGE ON ONSET TIME AND DURATION OF SENSORY BLOCKADE FOR ULTRASOUND GUIDED SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK

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Purpose/Objective: Minimum effective anaesthetic volume required for ultrasound guided supraclavicular brachial plexus block (US-SCB) is reduced in elderly patients reflecting structural changes of the brachial plexus (1). During the above study, we also analysed the onset time and duration of effective US-SCB in middle aged (<45y) and elderly patients (>65y).
Materials and Methods: Onset time and duration (minutes) of complete sensory blockade (loss of sensation to pinprick) in distal nerve territory of brachial plexus (ulnar, median, radial, musculocutaneous) was analysed in 22 elderly and 22 middle aged patients undergoing upper limb surgery using US-SCB. Administrated volume of local anaesthetic was in accordance with study protocol (step-up/step-down sequence model, the volume for the next patient is determined by the outcome of the previous block).
Results: The onset time differed between middle aged and elderly group for every nerve (26.5±3.5 vs 22.5 ± 3.1, P= 0.003 ulnar n.; 25.0±3.3 vs 20.2 ± 3.0, P=0.0001 median n.; 25.7±4.0 vs 20.7 ± 4.7, P=0.0007 radial n.; 25.9±3.8 vs 20.6 ± 4.6, P=0.0004 musculocutaneous n.) as well as duration of sensory blockade (164.6±15.1 vs 213.5 ± 25.8, P=0.0001 ulnar n.; 147.1±23.1 vs 192.7 ± 27.0, P=0.0002 median n.; 144.6±23.8 vs 177.3± 27.1, P=0.004 radial n.; 149.6±24.4 vs 199.6± 26.1, P= 0.0001 musculocutaneous n.).
Conclusions: Shorter onset time and longer duration of sensory blockade using US-SCB was observed in elderly patients.

REVIEW OF ANAESTHESIA FOR ORTHOPAEDIC UPPER EXTREMITY SURGERIES AT THE UNIVERSITY COLLEGE HOSPITAL, IBADAN, NIGERIA

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Purpose/Objective: Despite the advantages of regional blocks over general anaesthesia for upper extremity surgery, upper limb regional anaesthesia is under-utilised in Nigeria. This study was to evaluate the types of anaesthesia employed for upper extremity procedures in our centre.
Materials and Methods: After obtaining approval from the institutional ethics committee, all records of patients who had upper extremity surgeries were retrieved from the anaesthetic register from 1st January 2011 to 31st December 2012.
Results: A total of 209 patients with a male to female ratio of 1.7:1 were studied. The mean age was 35.9 ± 20 years. Overall, regional anaesthesia accounted for 67% of upper limb orthopaedic surgeries and 33% general anaesthesia during the period under review. Brachial plexus blocks constituted 86.3% of the regional techniques, the remaining cases were done using local anaesthetic infiltration by the surgeons.
Conclusions: There is a predominant use of peripheral nerve blocks for orthopaedic upper extremity surgeries in our centre; where until recently, only general anaesthesia was employed even for hand surgeries.

PATIENT SATISFACTION WITH SUB TENON BLOCKS FOR DAY CASE CATARACT SURGERY.

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Purpose/Objective: Ophthalmic surgery is undertaken within multidisciplinary units, it is a recognized sub-specialty of anaesthetic practice. The goal is to ensure a comprehensive, quality service dedicated to the care of patients and to the education and professional development of staff.

The purpose was to-

To evaluate patient satisfaction for cataract surgery and identify any areas for improvement.
Materials and Methods: A questionnaire was formulated to ascertain the patient's experience and pain relief.
Results: Number of cases: 44

Age: range 45 – 97, average 73

If cataract: 1st eye- 21 – 48%

2nd eye- 23 – 52%

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ASA	number	%
1	6	14%
2	32	72%
3	6	14%

Patient's mobility: Fully mobile 30 – 68%
Restricted 11 – 25%
Wheel chair 3 – 7%

Type of operation	cataract	vitrectomy
	98%	2%
Subtenon Block	100%	100%
Topical used Proxymetacaine	100%	100%

Needle/cannula Subtenon needle- 6 – 14%
Abbocath canula- 38 – 86%

Conclusions: Patients appear to be happy with the anaesthetic services.

Majority (90%) find the block reasonably comfortable or pain free (although there were no peribulbar blocks in this sample).

One patient (53 y old) wanted more information about the block.

Some of our patients (7%) find positioning on our trolleys uncomfortable. However, this may be a reflection of the fact that 32% of our patients had restricted mobility.

Recommendations: Write an information leaflet about eye blocks, including description of patient's position on trolley.

Repeat survey using larger sample and include peribulbar blocks.

Survey to see difference in quality of block and patient's experience with subtenon needle and abbocath cannula.

Reaudit after changes have been implemented.

NEUROSTIMULATION OR ULTRASOUND-GUIDED INFRACLAVICULER BLOCK

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Purpose/Objective: The aim of this study was to compare infraclaviculer block properties performed using neurostimulation (NS) and ultrasound guided (USG) tecniques for upper limb surgery.

Materials and Methods: After approval by the hospital ethics committe, 40 patients (18–85years) with ASA;I-III, BMI<35kg/m^2 who were scheduled for elective hand, wrist and forearm surgeries were included. Patients were randomly selected to receive either a NS or USG. 15 ml of levobupivacaine 0,375% and 15 ml of lidocaine 1% (total 40 ml) was prepared as local anaesthetic mixture. In grNS; the stimulating needle was connected to the negative pole of the nerve stimulator and set to deliver 1.5mA current impulses of 0.1ms duration at a frequency of 2Hz. In grUSG, under direct visualization, the needle in line with the probe was inserted caudaposteriorly to the neurovascular space and local anesthetic was injected in a U-shaped distribution posterior of the axillary artery. Block performance time(min) and number of vascular puncture were recorded. The degree of sensory and motor block for each terminal nerve was recorded by the same investigator who performed the block. Degree of patient comfort related to the block procedure was noted on a numerical scale (0–6).

Results: Procedure times were significantly shorter in grUSG compared with grNS (3.7±2.6min/11.3±4.7 min, P=0.000). The number of vascular puncture was significantly lower in gr USG compared with grNS (0.1±0.3/0.6±0.8, P=0.022). Degree of patient comfort were significantly higher in grUSG compared with grNS (4.9±0.3/4.3±0.7, P=0.001)

Conclusions: USG-guided infraclavicular block is more rapid and comfortable for the patient and anesthesiologist.

ULTRASOUND EVALUATION OF THE RELATIONSHIP BETWEEN THE FEMORAL NERVE AND THE FEMORAL ARTERY AT THE LEVEL OF THE INGUINAL FOSSA

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Purpose/Objective: The ultrasound technique for peripheral nerve blockage is an essential tool for anaesthetic management at present. However, anatomical variation may interfere with the detection of target nerves. We investigated the relationship between femoral nerve (FN) and femoral artery (FA) for femoral nerve block (FNB) at the level of the inguinal fossa with ultrasound.

Materials and Methods: Fifty-two patients undergoing major surgeries were evaluated for the distance between FN and FA, the sizes (major and minor axis) and the depth of FN from the body surface. We analyzed demographic factors of the patients [height, body mass index (BMI), and age] and evaluated ultrasound measurement parameters for correlations.

Results: The distance between FN and FA was 0.39±0.34 cm [mean±SD (standard deviation)]. The major axis of FN was 1.1±0.3 cm, and the minor axis was 0.34±0.10 cm. The depth of FN from the body surface was 1.00±0.30 cm. Age showed a significant correlation with the distance between FN and FA (R=0.69). FN tended to descend posterior to FA, and the distance between FN and FA was shorter in younger patients. Weight and BMI were correlated with the depth of FN (R=0.62 and 0.66, respectively).

Conclusions: Age is supposed to be the most decisive factor influencing the distance between FN and FA. In general, ageing induces the degeneration of connective tissues in the human body, which may lead to our results. A reminder of these facts may help refine the ultrasound technique for FNB.

HAMSTRING DONOR-SITE BLOCK DO NOT IMPROVE POSTOPERATIVE ANALGESIA AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

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Purpose/Objective: The purpose of this study was to evaluate the effectiveness of using a hamstring donor-site block in controlling postoperative pain levels after anterior cruciate ligament(ACL) reconstruction with autogenous hamstring graft, in patiens receiving Neuroaxial Anesthesia.

Materials and Methods: Over a 9 month period, 60 patients underwent ACL reconstruction with hamstring autograft. All patients received a femoral nerve block with Ultrasound technique. The patients were randomly assigned to groups with and without a hamstring donor-site block. There were 30 patients in each group.

The block group received a 20-mL injection of 0.25%Levobupivacaine into the hamstring donor site through an arthroscopic shaver sleeve, the other group received a 20-mL injection of saline. Both groups received postoperative pain medications as needed. Postoperative pain scores were taken by use of a visual analog scale (VAS) and recorded on the PACU, at 6hour postoperative, and at 18hours postoperative.

Results: For the block group, mean VAS scores were 0 on PACU, 1,9 ± 1,3 (0–6) at 6hour, and 1,5± 1,9 (0–5) at 18hours. For the standard treatment group, mean VAS scores were 0 on PACU, 2,2 ± 2,3 (0–6) at 6hour, and 0.8 ±1,3 (0–4) at 18hours. The groups had no statistically significantly mean VAS scores on PACU, at 6hours (P 0.15), and at 18hours (P 0.13). There were no complications in either group.

Conclusions: Injection of the hamstring donor site with local anesthetic through an arthroscopic shaver sleeve showed no improvement in postoperative pain levels in patients undergoing autogenous hamstring ACL reconstruction under Neuroaxial anesthesia.

PREDICTIVE VALUE OF PSYCHOSOCIAL FACTORS IN HIP AND KNEE ARTHROPLASTY - A PROSPECTIVE CLINICAL STUDY WITH 8 YEARS FOLLOW UP

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Purpose/Objective: The major objective of our prospective 8-year follow-up study is determining predictive factors (sociodemographic, pain, psychosocial) on the success (postoperative pain and satisfaction with the operation) of elective orthopaedic joint surgery. A further minor objective is comparing pain related outcome within certain elective orthopaedic joint surgery.
Materials and Methods: Data was obtained from the orthopaedic center Heidelberg from patients undergoing THA (total hip arthroplasty), TKA (total knee arthroplasty), meniscal repair of the knee, and hallux valgus corrective surgery. 260 patients were recruited during the years 2005–2006 and followed up until 2013. Preoperative data (sociodemographic data, pain parameters, pain location, psychosocial parameters) and follow- up data (pain parameters, satisfaction with the previous surgery, psychosocial parameters) were collected by using the PHQ-D (Patient Health Questionnaire, German version).
Results: At baseline the sample consisted of 260 patients, the mean age being 59 years. 86 patients had THA, 71 underwent TKA, 58 had arthroscopic meniscal repair, and 45 patients had hallux valgus corrective surgery. A total of 249, 247 and 234 patients were followed up at 6-/12-/24/96- months.
Conclusions: Presurgical intense pain, major depression, somatization, and panic disorder predict postoperative pain within a 8- year follow-up period. Dissatisfaction with previous operation is predictable within the 8- year follow-up when depression, somatization and panic disorder underlies. Within the different kinds of elective orthopedic joint surgery, arthroplasty reduces perioperative pain most effectively compared to the minimal invasive surgery of meniscal arthroscopic repair surgery and hallux valgus correction. Preoperative screening of psychopathological symptoms could prevent postoperative pain and failure of elective surgery.

SAFETY AND EFFICACY OF INTRATHECAL OPIOIDS IN A DISTRICT GENERAL HOSPITAL.

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Purpose/Objective: Intrathecal opioids provide effective prolonged analgesia after surgery. Delayed respiratory depression is an uncommon but feared complication of spinal opioids. It is recommended that 2-hourly observations are performed for 24 hours following intrathecal Morphine or Diamorphine administration. To support enhanced recovery after elective orthopaedic surgery our department avoids the use of PCA-morphine, using only intrathecal opioids when possible. This audit aims to determine the adequacy of post-operative observations following intrathecal opioids.
Materials and Methods: Case notes were assessed retrospectively to determine whether spinal-opioid observation charts were completed correctly. Post-operative pain scores at 2, 4, 6, and 8 hours were noted in addition to significant adverse events.

The spinal-opioid observation chart was re-designed followed by re-audit. Education was provided to nursing staff. A report was disseminated to ward managers with incorporation into a safety brief. A bedside Intrathecal-Alert Notice was introduced to provide a visual cue to nursing staff. A final re-audit was performed.
Results: *First Cycle* 18/30 (60%) had correct post-operative observations.
Second Cycle 14/24 (58%) had correct post-operative observations.
Final Cycle 22/25 (88%) had correct post-operative observations.
Overall 65/79 had pain scores <2 (Scale 0 to 4) at all times.

One patient developed late respiratory depression, this was detected and treated appropriately.
Conclusions: Although respiratory depression is rare, appropriate post-operative observations are essential. Systematic changes have improved compliance with this standard. Low pain scores confirm the efficacy of intrathecal opioids. Improved post-operative analgesia with reduced parental opioid use should facilitate earlier mobilisation and hospital discharge of patients.

POSTOPERATIVE PAIN RELIEF IN PATIENTS AFTER TOTAL KNEE REPLACEMENT WITH FEMORAL PERINEURAL CATHETER USING CONTINUOUS INFUSION OF LOCAL ANESTHETIC SOLUTION

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Purpose/Objective: Total knee arthroplasty often results in severe postoperative pain. It is a clinical challenge to achieve adequate analgesia in earlier postoperative period.

We present our experience in postoperative pain relief using regional techniques in patients after total knee replacement.
Materials and Methods: It is a prospective study of 35 patients. For postoperative pain relief we performed continuous femoral nerve block, "in plane" technique.

For the continuous femoral nerve block were used as local anesthetics Levobupivacaine (20 patients) and Ropivacaine (15 patients). A bolus of LA (0,375% Levobupivacaine or 0,5% Ropivacaine) was administrated and after that was started continuous infusions (0,125% Levobupivacaine or 0,2% Ropivacaine).

Ten patients became 15 ml of bolus solutions and the others 25 patients - 20 ml.

The infusions rate of local anesthetic was 6–9 ml/h.

Pain relief was assessed by VAS, target values VAS≤3.

In 15 patients were used stimulating catheter-guided perineural placement.
Results: Both levobupivacaine 0.125% and ropivacaine 0.2% provide similar analgesia after total knee arthroplasty. There were no differences between the groups in pain score, motor block and patient's satisfaction.

The group of patients, who had became 20 ml as a bolus had lower pain score and better satisfaction, compare to group with 15 ml bolus.

Use of stimulating catheters probably provides an increased quality of continuous femoral perineural blockade, but we still have not a sufficient experience.
Conclusions: The results showed that US-guided continuous femoral nerve block provides a good quality analgesia and an excellent short term side effect profile.

THE EFFICACY OF FOUR QUADRANT TRANSVERSUS ABDOMINIS PLANE (TAP) BLOCK ANALGESIA IN PATIENTS UNDERGOING EMERGENCY LAPAROTOMY

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Purpose/Objective: Patients undergoing emergency laparotomy predominantly receive opioid-based analgesia as epidural analgesia is often contraindicated. Major disadvantages with opioid analgesia include poor dynamic analgesia and side effects that delay recovery. We have been using continuous TAP analgesia for patients undergoing emergency laparotomy for five years. There are two types of TAP Blocks: Subcostal for upper abdominal and Posterior for Lower abdominal surgery. The major disadvantages of TAP blocks are dermatomal limitation and short duration of action. We modified our technique by inserting bilateral TAP catheters in either the subcostal or posterior TA planes depending on the extent of the major part of the surgical incision (upper or lower abdomen) and performed TAP blocks in the other two quadrants, thus offsetting the dermatomal limitation. Morphine PCA was provided if the incision extended vertically across the T10 Dermatome.

Aim of the audit was to evaluate four quadrant TAP analgesia in patients undergoing emergency laparotomy at our centre.
Materials and Methods: All patients undergoing four quadrant TAP analgesia were evaluated on:pain scores at rest and on coughing (NRS), requirement for morphine PCA 48 hour morphine consumption and patient satisfaction.
Results: Preliminary analysis revealed 32 patients received four quadrant TAP analgesia over 18 month period. 21 patients (65.62%) did not require PCA. In the 11 patients (34.37%) who required PCA, the average 48 hour morphine consumption was 44 mg. Patient satisfaction was good or excellent in 84%.
Conclusions: Four quadrant TAP is an effective technique for postoperative analgesia for emergency laparotomy, even if epidural analgesia is not contraindicated, due to its excellent side effect profile.

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MODIFIED ULTRASOUND GUIDED TRANSVERSUS ABDOMINIS PLANE (TAP) BLOCK FOR LAPAROSCOPIC CHOLECYSTECTOMY

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Purpose/Objective: Laparoscopic cholecystectomy is one of the most common procedures in the UK. Different forms of TAP blocks are being used as part of the multimodal approach. The concept of a modified TAP block was presented by Rafael Blanco at the Annual ESRA meeting in Bordeaux in 2012. In this block, local anaesthetic is injected between layers of the aponeurosis of the transversus abdominis muscle, close proximity to the quadratus lumborum muscle. Paravertebral spread of injectate was demonstrated.

Materials and Methods: We retrospectively analyzed and compared 42 consecutive patients who underwent laparoscopic cholecystectomy under general anaesthetic. Some patients had bilateral modified TAP blocks (Group 1 n = 14) using Ropivacaine 0.2%. The remainder of the group had general anaesthetic without the block (Group 2 n = 28). All of them had port infiltration. We assessed the total opioid consumption and pain scores in both groups on two occasions: when discharged from PACU and the highest pain score whilst still in the hospital.

Results: Average age was 46.2 in Group 1 and 45.1 in Group 2. Average opioid consumption was 33% lower in Group 1. Average PACU discharge pain score was 50% lower and average maximum pain score was more than 25% lower in the block group.

Conclusions: The modified TAP block for laparoscopic cholecystectomy is safe. The patient group demonstrated considerable reduction in pain scores and opioid consumption. It can be considered as a component of a multimodal management in enhanced recovery in patients undergoing laparoscopic cholecystectomy.

POSTOPERATIVE PAIN AND HAEMORHEOLOGICAL STATUS DEPENDING ON ANESTHESIA IN PATIENTS WITH FEET AND ANKLE JOINT TRAUMA

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Purpose/Objective: To study the postoperative pain and haemorheological status at various options of anesthesia in patients with feet and ankle joint trauma.

Materials and Methods: 75 patients were involved in our study. 25 patients in the 1st group received spinal anesthesia *per se.* In the 2nd group (n=25) spinal anesthesia was combined with an local infiltration anesthesia, and in the 3rd group (n=25) – with a peripheral nerves blocks. Rheological parameters (blood viscosity, plasma viscosity, hematocrit, erythrocyte aggregation and deformability, leukocyte adhesion) and the intensity of pain (using a 10-point visual analogue scale) were determined before and in 24 hours after operation.

Results: Pain was the strongest in the 1st group in 24 hours after operation (5,8(1,56) on VAS), less in the 2nd group (5,13(1,4) on VAS) and minimal in the 3rd group (4,26 (0,9) on VAS). It was found that viscosity of blood and plasma, erythrocyte aggregation and viscosity of erythrocyte suspension (that characterized its deformability) increased in the 1st group in 24 hours after operation. Indicators characterized status of blood fluidity were decreased in the 2nd group expect the viscosity of erythrocyte suspension. The most positive changes of hemorheological status were noted in the 3rd group: all these parameters were decreased in 24 hours after operation, that indicate on the normalization of condition of fluidity of blood.

Conclusions: Spinal anesthesia in a combination with peripheral nerves blocks allows to achieve not only more effective postoperative analgesia, but also normalization of the blood rheology in patients with feet and ankle joint trauma.

COMPARISON OF POST OPERATIVE PAIN SCORES POST SUBACROMIAL DECOMPRESSION: INTERSCALENE BLOCK VS ROUTINE ANALGESIA.

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Purpose/Objective: Subacromial decompression is associated with significant post operative pain. Interscalene nerve blocks are viewed by some as the gold standard for achieving post operative pain relief. Complications of upper limb blocks can be serious. Our study looked at the differences in post operative pain scores of patients undergoing subacromial decompression under general anaesthesia receiving either interscalene nerve block or standard analgesia.

Materials and Methods: Data was collected from two groups of ASA 1 and 2 patients. One group (n=22) received an interscalene nerve block with 30ml 0.25% Levobupivacaine . The other group (n=21) received routine analgesia consisting of induction dose of fentanyl 1.5mic/kg, perioperative morphine 0.10-0.15 mg/kg IV, paracetamol 1g IV, parecoxib 40mg IV and post operative tramadol 50-100mg as required (if pain score above 3). Post operatively the patients were asked to score their pain using a numerical pain scale between 0-10 with 0 being pain free and 10 being the worst pain. They were scored in recovery and 24 hours post operatively.

Results: In recovery patients who received interscalene nerve blocks were most comfortable (Average pain score with block 0.31 Vs 3 without block). At 24 hours patients who just received standard analgesia were the most comfortable (Average pain score without block 1.42 Vs 3.09 with block).

Conclusions: Looking at the risks and complications associated with interscalene nerve block our study showed the superiority of interscalene block only during the first few hours postoperative. Those who received interscalene blocks had a higher pain score 24 hours post surgery compared to those who received standard analgesia.

SURVEY OF POST OPERATIVE REGIONAL ANAESTHESIA TECHNIQUES FOR MAJOR ABDOMINAL SURGERY (SPRATS)

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Purpose/Objective: Epidural analgesia is considered to be the gold standard analgesic technique for major abdominal or pelvic surgery. However regional anaesthetic techniques supplemented with parental analgesics are becoming more popular. SPRATS was designed to assess the current practice throughout the South West Peninsula.

Materials and Methods: SPRATS is a project of the SWARM collective, a trainee led, consultant mentored research network operating at all 6 NHS Trusts in the Peninsula Deanery . The project was registered as service evaluation/audit at each site. During the two-week study period we collected anonymised prospective data on all elective & emergency abdominal and pelvic operations in each hospital. Local detailed data on type of surgery and analgesic technique was transcribed to a central database for analysis.

Results: SPRATS data collection is ongoing. Thus far there are 64 completed datasets, with 200 predicted at completion. Of these patients, 35 (54%) were male with a mean age of 65yrs. Scheduled surgery accounted for 43 (67%) of the total and general surgery accounted for 47 (73%) of the cases, 25 (39%) via a midline laparotomy. Data will be presented by type of surgical incision and by site.

TABLE. No caption available.

	Spinal	Epidural	Rectus Sheath	TAP	Wound infiltration
Midline Laparotomy	3 (12%)	11 (44%)	9 (36%)	0 (0%)	1 (4%)
Total cases	8 (12.5%)	19 (30%)	17 (26.5%)	7 (11%)	13 (20%)

Conclusions: Preliminary findings suggest that thoracic epidural analgesia remains the most commonly used technique for midline laparotomy. Further findings will be available following completion of data collection.

THORACIC PARA VERTEBRAL BLOCK VERSUS SYSTEMIC OPIOIDS IN POST THORACOTOMY ANALGESIA

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Purpose/Objective: thoracic paravertebral block versus systemic opioids on post-thoracotomy analgesia.

Materials and Methods: Randomized controlled trial included forty patients undergoing thoracotomy divided into 2 groups, 20 patients received 20 ml bupivacaine 0.05% incremental injection via a catheter inserted in

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thoracic para vertebral space, 20 patients received systemic. Visual analogue scale (VAS), total morphine consumption ,time to first analgesia request, changes in pulmonary function and side effects were recorded postoperatively.
Results: VAS at rest was lower in paravertebral group at all measurements points except 16, 20 and 24 hs postoperatively, pain on coughing showed significant difference at 8 and 16 hs, postoperative consumption of morphine was 36 (22-42mg) in morphine group versus 9 (2-22mg) in para vertebral group. Total bupivacaine was 300-420mg in first 24hs. time of first analgesic request was significant in morphine group. VAS at first analgesic request was not statistically different between 2 groups, no significant difference in peak expiratory flow rate preoperatively, after 12hs or 24hs.
Conclusions: Continuous thoracic para vertebral block with bupivacaine provides effective analgesia after thoracic surgery compared to systemic analgesia with significant less incidence of complications such as pulmonary complications, PONV and pruritis.

FOREHEAD REGIONAL ANAESTHESIA FOR TUMORECTOMY IN PLASTIC SURGERY

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Purpose/Objective: To describe a case report of a 94 y/o patient which was operated due to a basal cell carcinoma 5x4x2cm and needed resection of the forehead skin from the helix of the one ear to the another and then up 10cm upper the eyebrows.
Materials and Methods: After sedation with 50mcg fentanil she desaturated to 83%. As we saw she was extremely sensitive to opioids due to her elderly, we proposed regional anesthesia for the procedure. The surgeons marked the skin that had to be removed and covered with a skin graft and we took into account its sensitive nerve innervation. Consequently bilateral nerve block of supraorbital, supratrochlear and auriculotemporal nerves had to be performed. With a 28 gauge needle and a 10ml syringe we injected 2ml of a solution of Lidocaine1% and Levobupivacaine0,25% in the supraorbital foramen and 2ml of subcutaneous injection in direction to the root of the nose; in order to block the supraorbital and supratrochlear nerves. With a 25 gauge quincke needle 4ml were injected subcutaneous from the lateral part of the eyebrow to the helix, so sensitive branches of the auriculotemporal nerve were blocked. The regional anesthesia was performed bilaterally and 16ml were used.
Results: The procedure was carried out without incidences in spontaneous ventilation and no necessity of supplementary analgesia.
Conclusions: Regional blocks of the nerves that innervate the head are very important and can help us to avoid general anesthesia in elderly patients who are at high risk if receiving general anesthesia.

MERALGIA PARESTHETICA DEVELOPED DURING POSTOPERATIVE EPIDURAL ANALGESIA AFTER TOTAL KNEE ARTHROPLASTY

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Purpose/Objective: Meralgia paresthetica (MP) is a painful mononeuropathy of the lateral femoral cutaneous nerve (LFCN), presenting as paresthesia, pain, and numbness in the anterolateral aspect of the thigh. We report a rare case of MP of the contralateral leg developed during postoperative epidural analgesia after total knee arthroplasty.
Results: 58- year-old man was scheduled to undergo left total knee arthroplasty. He had a history of surgery of lumbar. Preoperative MRI revealed the lumbar epidural fibrosis. During spinal-epidural anesthetic procedure he did not complained of paresthesia or pain of lower limb. 3 days after surgery, he complained of the paresthesia, numbness, and sharp pain at anterolateral area of nonoperated thigh during epidural analgesia. The epidural catheter was promptly removed. Electromyography showed a neurologic lesion at lateral femoral cutaneous nerve, the level of L3. MP persisted for 6 months despite conservative treatment. The LFCN block was performed for the purpose of diagnostic with adequate visualization of LFCN using ultrasound in the patient. However the symptom of MP sustained after LFCN block and subscided after a year.
Conclusion: In elderly patients or patients with abnormal anatomy, dispersion of the local anesthetic longitudinally and laterally may be limited in the epidural space. In our patient it is suggested that the cause of neurologic injury may be compression of L3 nerve root by epidural bolus and continuous infusion. Therefore, slowly injection and use of the lower volume of epidural bolus and continuous infusion of local anesthetic may be required.

A CASE OF SUBDURAL HEMATOMA AFTER EPIDURAL BLOOD PATCH IN A SPONTANEOUS INTRACRANIAL HYPOTENSIVE PATIENT WITH MULTI-LEVEL CEREBROSPINAL FLUID LEAKAGE

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Purpose/Objective: Spontaneous intracranial hypotension (SIH) is caused by spontaneous cerebral spinal fluid (CSF) leakage of unknown etiology at the level of spine. It is characterized by an orthostatic headache in the absence of a past history of a trauma or a dural puncture. A 42-year-old male visited the department of Neurosurgery due to severe headache.
Materials and Methods: The onset was about one month before admission to hospital, in spite of local medication headache was gradually getting worse. a MR myelogram was taken, but not demonstrated CSF leakage site.
Results: Radionuclide cisternography (RNC) was performed, and showed that the CSF leaked to the left at the upper thoracic level (T1-2) and to the right at the lumbar level (L2). On day 13 of admission autologous blood was injected under fluoroscopic guidance between T1-T2. A 18G Touhy needle was employed using hanging drop method after loss of resistance with saline in the Left interlaminar approach. Using a sterile technique, 6 mL of autologous blood was injected into the epidural space. Next day, his pain was 4/10 on VAS at head up position. . After 1 week EPB was performed using similar technique at L2-3 in right interlaminar space with 12mL autologous blood. The patient's headache was resolved gradually. But next day, headache was exacerbated and 10/10 on VAS.
Conclusions: Physical and neurologic examinations were normal, but brain CT was done because of constant headache. Brain CT indicated a bilateral SDH, next day subdural hematoma were drained through left burr hole.

ULTRASOUND-GUIDED PULSED RADIOFREQUENCY TREATMENT OF THE INTERCOSTAL NERVE: THREE CASES

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Purpose/Objective: Pulsed Radiofrequency treatment (PRF) can be effectively used to treat chronic pain. The correct identification of the targeted tissue is of great importance. For this purpose we used US-guided intercostal PRF to treat three subjects (a 33-year-old female, a 66-year-old male, and a 73-year-old male) who had been diagnosed with various diseases; intercostal neuralgia, post-thoracotomy pain syndrome and post-herpetic neuralgia in the pain unit.
Materials and Methods: In the lateral decubitus position the targeted ribs were marked at 8 cm lateral to the spinous processes. An ultrasound machine with a linear transducer probe was used to perform the intercostal nerve RF. The US probe was placed on the marked area in the longitudinal plane, and using an appropriate tilt, the ribs and the pleura became visible (Fig 1). The RF needle was viewed with the in-plane technique and was then directed toward the caudal edge of the ribs. When the edge of the needle was observed to be in the intercostal groove, the location of the concerned intercostal nerve was verified both by motor nerve stimulation and by confirming that the impedance value was 300-350 ohm. PRF was applied at 42 °C for 120 s with a RF generator .
Results: The patients reported pain relief within 30 minutes and remained at the lower limit (NRS scores 0-2) throughout the six-month follow-up period. No complications such as pneumothorax or hemothorax were observed in the patients.

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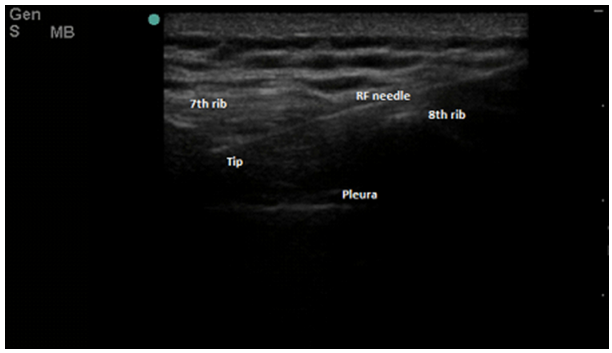

FIGURE 1. Ultrasound image of the RF cannula, pleura, 7th and 8th ribs in an in-plane technique.

Conclusions: US-guided PRF of intercostal nerves may be effective and safe.

A CASE OF DIFFICULT ULTRASOUND-GUIDED FEMORAL NERVE BLOCK DUE TO CONFUSING ARTEFACT AND UNUSUAL NERVE LOCATION

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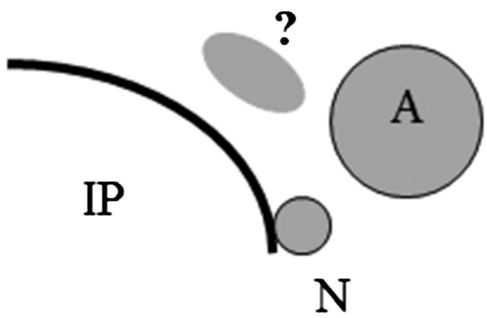
Purpose/Objective: Anatomy of femoral nerve varies[1]. Artefact exists with ultrasound (US). Artefact and anatomical variation together render challenging the US-guided femoral block. We show in a case that electro-stimulation has helped "separate the wheat from the chaff".

Materials and Methods: We report the case of 45-year-old female (56 Kg, 158 cm) scheduled for total knee replacement. A continuous femoral nerve block was given preoperatively. Ultrasound Sonosite M-Turbo was used. Electro-stimulation was associated for verification during needle insertion (out of plane) and during placement of stimulating catheter.

Results: The cross sectional sonogram of the region of interest showed an artefact at the usual location of the FN lateral to the artery. But, no motor response was elicited (even 2.5 mA, 0.1ms, 2 Hz) when the needle was placed on different points and through this image. Finally quadriceps twitches were elicited when the needle reached the FN in a region deep posterior and lateral to the artery (illustration). The iliopsoas and other muscles of the operated lower limb were atrophic. Thanks to electro-stimulation, this US-guided continuous femoral block was successful.



A: artery; IP: iliopsoas muscle; N: nerve

Conclusions: Our case is probably not unique in which nerve stimulation has helped. We conjecture that long under-use of the painful leg may result in an atrophy of iliopsoas muscle and in sinking FN down to an aberrant position. This may also be an anatomy variation[1].

1. Reg Anesth Pain Med 2008;33:109-14.

REPORT OF AN EFFECTIVE AWAKE THORACIC EPIDURAL ANAESTHETIC FOR MAJOR ABDOMINAL SURGERY IN TWO HIGH-RISK PATIENTS WITH SEVERE PULMONARY DISEASE

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Purpose/Objective: Awake thoracic epidural anaesthesia as the sole anaesthetic technique was successfully employed for two high risk surgical patients with chronic obstructive pulmonary disease undergoing abdominal surgery.

Materials and Methods: The first case was an elective open sigmoid colectomy in a sixty one year old cancerous patient with chronic obstructive pulmonary disease [COPD] and recent thoracotomy for a wedge resection of a bronchial adenocarcinoma.

The second case was an emergency open cholecystectomy in an adult patient with end-stage COPD.

Reviewing the literature, no similar cases were reported recently.

Results: The procedure was tolerated well by both patients.

The anaesthetic technique has shown to reduce intra-operative and post-operative cardiac, respiratory and gastrointestinal complications.

The anaesthetic technique may have contributed to the prompt, complications free recovery experienced by both patients.

Conclusions: The suggested regional anaesthetic technique could be a practical and a safe way to perform anaesthesia for some selected cases of critically ill patients with severe pulmonary disease.

THE USE OF UNILATERAL ILIOINGUINAL/ ILIOHYPOGASTRIC, TRANSVERSUS ABDOMINIS AND RECTUS SHEATH BLOCK WITH CONSCIOUS SEDATION IN A HIGH RISK PATIENT WITH INCARCERATED INGUINAL HERNIA.

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Purpose/Objective: Three muscle layers compose the abdominal wall namely; transversus abdominis (deep), internal oblique (middle) and external oblique (superficial). The paired rectus abdominis muscles lie either side of the midline. The anterior rami of T7 – T12 and L1 run between transversus abdominis and internal oblique supplying the anterior abdominal wall and associated parietal peritoneum. We present a case of a high-risk patient in whom abdominal nerve blockade was used with conscious sedation.

Materials and Methods: A 91 year old female presented to hospital with a left sided incarcerated inguinal hernia with small bowel obstruction. She had a background of severe valvular heart disease, heart failure and a pulmonary artery pressure of 70mmHg. Previously, she had been refused general anaesthesia on the advice of both consultant cardiologists and anaesthetists.

Results: Following full discussion and informed consent, unilateral T.A.P block and rectus sheath block were performed under ultrasound guidance. Ilioinguinal/iliohypogastric block was performed using a landmark technique. A mixture of 1% lidocaine with adrenaline and 0.5% levobupivicaine was used. Anaesthesia to cold stimulus was demonstrated over the inguinal region and the patient had no response to skin incision. Some discomfort in the form of pressure on retraction of the peritoneum and manipulation of the bowel was experienced, and was managed with small aliquots of alfentanil and ketamine over a 60 minute period.

Conclusions: We have demonstrated that surgical anaesthesia to the skin and parietal peritoneum is possible from abdominal nerve blockade. Further IV analgesia and sedation may be required for visceral peritoneal manipulation.

REVISION OF LOOP COLOSTOMY UNDER ULTRASOUND-GUIDED TRUNK BLOCK AND SEDATION

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Purpose/Objective: Patients often present for emergency abdominal procedures with medical issues causing both general anaesthesia (GA) and central neuraxial blockade (CNB) to pose significant risks. It is theoretically feasible to use specific trunk blocks, but there are limited publications on

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how to approach this anaesthetic challenge. We report a case of colostomy revision under ultrasound-guided regional anaesthesia (RA).

Materials and Methods: A 52 year old male with metastatic sigmoid adenocarcinoma underwent a loop colostomy creation complicated by pulmonary embolism on postoperative day (POD) 9, and was started on enoxaparin 1mg/kg BD. He developed stoma obstruction which was planned for stoma refashioning on POD 13. Room air SpO2 was 88%. He was also coagulopathic with an INR of 1.45. At this point, anticoagulation had been ceased for 17 hours.

Prior to induction, he was found to be in supraventricular tachycardia requiring beta blockade.

Results: As CNB was contraindicated, we decided to proceed with surgery under truncal nerve blockade to minimize cardiorespiratory perturbations associated with GA. Ultrasound-guided RA was administered using the following: 1. Ilioinguinal block with 10ml lignocaine 1.5%, adrenaline 1:200,000 2. Subcostal block with 10ml lignocaine 1.5%, adrenaline 1:200,000 and 5ml ropivacaine 0.5% 3. Rectus sheath block with 5ml lignocaine 1% and 15ml ropivacaine 0.5%. Surgery proceeded uneventfully under TCI propofol up to 1.5mcg/ml, with supplemental dexmedetomidine, fentanyl and ketamine. Good surgical conditions were obtained and the patient remained stable.

Conclusions: When CNB and GA are potentially hazardous, abdominal procedures can be safely carried out under trunk blocks.

FAT EMBOLISM SYNDROME FOLLOWING URGENT DEBRIDEMENT AND APPLICATION OF SKELETAL TRACTION FOR THE RIGHT FEMUR: A CASE REPORT.

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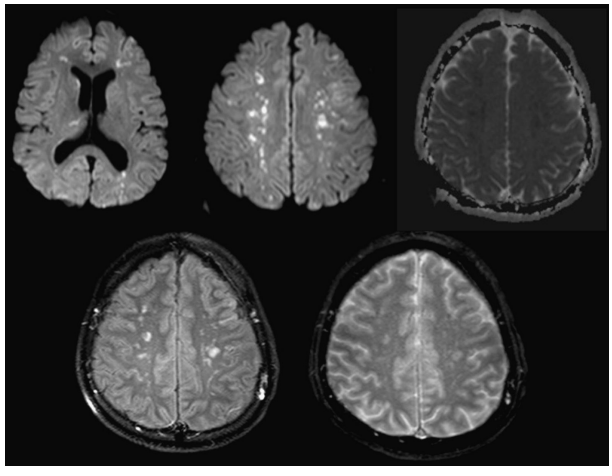
Purpose/Objective: To describe a healthy patient with manifestations of fat embolism syndrome (FES) following urgent debridement and application of skeletal traction for the femur and review the diagnosis, investigation and management of this condition.

Materials and Methods: A healthy 23-year-old man was injured in a motorcycle accident and underwent urgent debridement of the open tibia fracture and the patella and application of skeletal traction for the right femur. After one hour of surgery, the patient was suddenly agitated and immediately sent to do a non-contrast cerebral computed tomogram which showed no abnormalities.

Results: At a ward, the patient developed a generalized tonic-clonic seizure and progressed into a coma with the GCS of 6. Petechial skin rash was noted on the anterior chest. Laboratory data including electrolytes, glucose and toxicological screening were unremarkable. Magnetic resonance imaging (MRI) of the brain at postoperative 24 hours was obtained which revealed multiple punctiform hyperintense lesions on T2-weighted and FLAIR scattering at multiple area. (Picture 1)



These MRI findings were consistent and provided a confirmation of clinical suspicious of cerebral FES. His postoperative course showed gradual improvement with a slowly resolving encephalopathy in the period of four months.

Conclusions: FES is a known complication of long bone trauma and a clinical diagnosis characterized with a classic triad: respiratory insufficiency, neurologic impairment and a petechial rash. MRI of the brain can be used to confirm the diagnosis in atypical manifestation. Early immobilization of fractures reduces the incidence of FES and supportive care is the mainstay of therapy for clinically apparent FES.

SAFETY OF ANALGESIA PROTOCOLS - OUR DEPARTMENT EXPERIENCE

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Purpose/Objective: Our aim was to assess the safety of analgesia protocols, with regional versus intravenous techniques, implemented in our department.

Materials and Methods: The files of 2319 patients were analyzed retrospectively. The analgesic technique chosen was one of the follows: intrathecal morphine, epidural morphine, intravenous morphine, intravenous tramadol, intravenous meperidine and peripheral nerve block. The adverse effects were evaluated postoperatively at 0h and at 24h: sedation, pruritus, nausea and vomiting, paresthesia, and neuromuscular blockade.

Results: 73% of patients were evaluated at 0h and 94% at 24 hours postoperatively. Patients who had sedation at 0h/24h: intrathecal morphine 12,5%/0%, intravenous morphine 0%/1,72%, intravenous tramadol 0,42%/0%. Patients who had pruritus at 0h/24h: intrathecal morphine 25,06%/17,65%, epidural morphine 1,17%/11,52%, intravenous morphine 0%/1,72%, intravenous tramadol 0,17%/12,32% and peripheral nerve block 1,69%/1,23%. Patients who had parestesia at 0h/24h: epidural morphine 0,9%/0,2%, intravenous tramadol 0,3%/0 and peripheral nerve block 5%/0%. Patients who presented neuromuscular blockade at 0h/24h: epidural morphine 1,8%/0,7%, intravenous tramadol 0,3%/0% and peripheral nerve block 3,4%/0%. Patients who had nausea and vomiting at 0h/24h: intrathecal morphine 12,5%/18%, epidural morphine 5%/22%, intravenous morphine 12,1%/15%, intravenous tramadol 2%/15% and peripheral nerve block 3,4% / 11,1%.

Conclusions: In the evaluated patients were not detected serious complications of post-operative analgesia, including respiratory depression or permanent neurological damage.The most common adverse effect was postoperative nausea and vomiting, with a higher prevalence in patients who had epidural morphine for analgesia. We advocate a thorough knowledge of the adverse effects of drugs used in analgesia of patients, in order to enable the prevention, early detection and treatment.

ACUTE PAIN SERVICE – FIRST YEAR IN A HOSPITAL CENTER

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Purpose/Objective: The purpose of this study is documenting our experiences, outcomes and complications encountered in our acute pain service (APS).

Materials and Methods: We analyzed data collected in our institution during all year 2012. The assessment team in APS is composed by an anesthesiology specialist and a trained pain nurse. We analyzed patient demographic characteristics, the modalities of analgesia and the use of no conventional analgesic devices, the effectiveness of pain relief and the adverse effects/complications. Pain scores were obtained daily on Categorical Verbal Scale.

Results: In our study we included 1293 patients. 64,6% were women and 35,4% were men. Support was given to 7 surgical specialties: General Surgery (22,2%), Thoracic Surgery (1,9%), Urology (2,9%), Gynecology and Obstetrics (24,1%), Otolaryngology (0,6%), Orthopedics (47,3%) and Plastic Surgery and Reconstruction (0,8%). The majority of patients had between 60 and 80 years of age. The most frequent analgesia were intravenous drug infusion balloon (DIB) endovenous (51,6%) and Epidural DIB (15,8%). Most of the patients were discharged from the APS by the second day on the service. The majority of patients had no pain at rest and had slight pain in motion. Most frequent associated complications were nausea and

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vomiting (18,7%), dizziness (1,9%), pruritus (1,7%), hypotension (0,9%) and constipation (0,98%).

Conclusions: Support was provided to various specialties and most of the patients had controlled pain. Several devices were used for analgesia of post-operative pain. Complications remain rare. With further advancements in the provision of acute postoperative analgesia, the APS will continue to play an important role for the surgical patient.

MILITARY CONSIDERATIONS FOR SUPRACLAVICULAR CATHETER IN GUNSHOT WOUND FOREARM

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Purpose/Objective: Continuous Peripheral Nerve Block (CPNB) in upper limb trauma patients is well established. Their use in military patients requires some special considerations.

Materials and Methods: A 19-year-old Royal Marine sustained an isolated gunshot wound to the left forearm whilst on foot patrol in Afghanistan. Once transferred by helicopter to the Role 3 hospital in Camp Bastion, he underwent a plain x-ray followed by immediate debridement and fasciotomies.

An intra-operative decision was made to proceed to CPNB for post-operative pain management. Patient consent was not feasible in the Emergency Department due to distracting tourniquet pain and subsequent ketamine administration so an agreement was reached between two anaesthetists and the surgeon that it was in the patient's best interests.

Considerations included the prolonged evacuation chain back to the UK, opiate avoidance as risk of aspiration strapped supine to stretcher, further surgery and possibly improved chronic pain figures.

Results: INR and Rotem were within normal limits.

An ultrasound guided supraclavicular catheter was sited and tunnelled. The patient was then extubated and airlifted that night. CPNB infusion was administered via an aircraft friendly elastomeric 'bomb'. The patient, nursing staff and evacuation chain advantages to a simple, single use pump outweigh the less reliable infusion rates and lack of interrogation and bolus facilities.

Conclusions: A standard infusion of ropivicaine 0.2% at 10ml/hr was used. Ropivicaine has a wider margin of safety with the same analgesic effect, but less motor block than bupivicaine. Although marginal, these remain important considerations for an early ambulatory patient in a prolonged airborne evacuation chain.

IMPLEMENTING CHANGE: THE CHALLENGE OF INTRODUCING RECTUS SHEATH CATHETERS FOR POST-OPERATIVE PAIN MANAGEMENT

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Purpose/Objective: The use of rectus sheath catheters (RSCs) for post-operative analgesia after open abdominal surgery is increasing. Bolus doses of local anaesthetic into the posterior rectus sheath, in combination with patient controlled opiate analgesia, may be as effective as epidural analgesia, whilst many of the risks are avoided.[1] The efficacy of RSCs depend on regular top-up doses of local anaesthetic in the post-operative period by trained staff.

When this technique was introduced to our hospital it was necessary to implement protocols for management of RSCs on the ward. Initially, we set out to train the ward nursing staff to deliver top-up doses on a 24 hour basis, which proved a lengthy process. There was a gap in service provision, particularly during the out-of-hours period.

Our aim was to determine if training non-anaesthetic junior doctors to perform this task would bridge the period before nursing staff were adequately trained.

Materials and Methods: The drug charts of 33 patients with RSCs post abdominal surgery were examined. The average interval between top-up doses in the first 48hrs was calculated in each case.

House officers were given a presentation at induction to their surgical rotation, and instructive posters displayed in ward doctors' offices.

Results: The average interval between doses was 11.9hrs before and 8.3hrs after training was delivered. This improvement reflected an increase in the number of timely out-of-hours doses administered.

Conclusions: Our results show that a simple training intervention increased the frequency of doses in the early post-operative period. This represents an improvement in our service provision.

IMPACT OF PERIOPERATIVE ANALGESIC TREATMENTS ON PAIN INTENSITY AFTER TOTAL KNEE ARTHROPLASTY

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Purpose/Objective: Total knee arthroplasty (TKA) a major common orthopedic procedure is associated to severe postoperative pain which prevents early mobilization and delays successful rehabilitation. The study examinates the impact of perioperative pain treatments on pain trajectories after TKA.

Materials and Methods: After IRB approval, postoperative pain trajectories (Chapman, J Pain 2011) were recorded from day1 to day8 (VAS 0-10) at rest and mobilisation in patients undergoing primary TKA. A single surgeon performed all surgeries under standardized anesthesia protocole (multimodal analgesia with LIA technique) to ensure optimal recovery. Statistical analysis used Pearson's correlations , $p<0.05$ was significant.

Results: 128 patients were included, males/females ratio: 39/89, age 68± 10 yrs. Positive correlations were found between hospital pain at day1 and pain at home at day8 (at rest:0.478, P<0.001 and at mobilisation:0.375, P<001).

Impact of perioperative treatments on pain intensity at various time points is reported in table: (0) no effect;(+) increased pain;(-) decreased pain.

Treatment	Effect on pain at rest	Effect on pain at mobilisation
Preoperative	non selective NSAIDs (0); AAS (0); opioids (0); steroids (0);	non selective NSAIDs (0); AAS (-) from days 1 to 3; opioids (+) from days 4 to 8; steroids (-) until day8
Intraoperative	sufentanil (-) at days 1&2; ketamine (0); MgSO4 (-) at days 1&2; pregabalin (-) at day 0	Sufentanil (0); ketamine (-) from days1 to 8; MgSO4 (-) from days1 to 4; pregabalin (0)
Recovery room	Cryotherapy (0)	Cryotherapy (-) at day1

Conclusions: Some perioperative treatments demonstrate a longlasting impact on postoperative pain which deserves further studies to improve TKA rehabilitation (steroids, ketamine and MgSO4 seem to improve pain at mobilisation while chronic opioids do not).

CROSS-SECTIONAL RETROSPECTIVE STUDY ON THE INFLUENCE OF THE ANAESTHETIC TECHNIQUE IN POSTOPERATIVE PAIN CONTROL IN THE UNILATERAL INGUINAL HERNIOPLAST FOR A 6 MONTHS PERIOD

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Purpose/Objective: Appreciate the postoperative pain at discharge and 24 hours later taking into account the type of anaesthetic technique and the successful block for inguinal hernia repair.

Materials and Methods: The study includes patients operated in outpatient surgery system between January and June 2012. Evaluation of postoperative pain by visual analog scale (VAS).

Results: 57 patients were included; 52 men (91%) and 5 women (9%), average age 57.9 years (range 22-87 years). 10 patients (17%), were dismissed by hospital admission.

We performed subarachnoid anaesthesia (prilocaine 50mg or hyperbaric bupivacaine 10mg) to 63% of patients. In 51% block was nonexistent. A 36% of the subarachnoid anaesthesia are complemented with (TAP) transversus abdominis plane (20 ml mepivacaine 1% + bupivacaine 0.25%) or ilioinguinal-iliohypogastric and 5.5% gets surgical wound infiltration (10ml mepivacaĭne 1% + bupivacaine 0.25%). VAS average at discharge 0.4, after 24 hours: 0.2.

General anaesthesia to 27% (86% balanced, 14% TIVA). 81% received TAP blockade, 9.5% local wound infiltration. VAS average at home discharge: 0.28, after 24 hours: 0.5.

Conclusions: The postoperative pain control is perceived by the patient as satisfactory or very satisfactory with an VAS average < or equal to 0.5, regardless of the anaesthetic technique used at discharge and at postoperative 24 hours.

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Initial pain control is better in patients with any type of block, and this is necessary if general anaesthesia is performed. Surprisingly, in the 51% of subarachnoid anaesthesics any blocking is performed and the VAS at discharge does not differ from those which do have block.

PROSPECTIVE AUDIT ON USE OF INTRATHECAL MORPHINE FOR POST-OPERATIVE ANALGESIA AFTER CAESARIAN SECTION IN SLIGO GENERAL HOSPITAL

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Purpose/Objective: to assess:

1) effectiveness and safety of routinely used doses of ITM for postoperative analgesia after caesarean section.
2) establish frequency of side-effects
3) reasons for failure
4) need for supplemental analgesia and it`s effectiveness.
5) to find out requirements for resque analgesia.

Materials and Methods: Prospective audit of every case of ITM for caesarean section, doses, all supplemental analgesics from the moment of surgery until discharge.

Level of postoperative pain and effectiveness of provided analgesia,overall satisfaction with pain relieve , doses of resquie and supplimental analgesia, side-effects and complications were recorded from the time of surgery untildischarge.

Results: 118 cases of use of ITM for the period from July 2012 until January 2013 were recorded.

Audit results proved:

1) Good analgesic effectiveness of ITM after caesarian section.
2) Low requirements for resquie analgesia.
3) Nil complications was recorded.
4) Importance of regular supplemental analgesia with NSAIDs and Paracetamol
5) There is no significant difference between 100 and 150 mcgs of ITM was found regarding effectiveness, side-effects and safety profile. Most frequent side- effect is pruritus, easily treated.

Conclusions:

1) routinely used dose of 100-150 mcgs of ITM is safe and effective way of analgesia in early postoperative period after caesarean section
2) associated with only minor, clinically non-significant side –effects.
3) more effective if supplemented with regular NSAIDs and paracetamol.
4) nearly almost eliminate use of opioids in post-operative period.
5) there is no need for supplemental opioids immediately after surgery before onset of effect of ITM.

QUALITY OF ANALGESIA FOR DAY CASE UPPER LIMB SURGERY: A PATIENT FOLLOW UP SURVEY

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Purpose/Objective: Regional anaesthesia offers an adjunct or alternative to general anaesthesia for day case upper limb surgery. However, when plexus blocks are used the quality and duration of analgesia is unknown as patients have returned home.

Materials and Methods: A 3-week audit of analgesia for all day case upper limb surgery was conducted. Anaesthetists completed a form detailing the use of local anaesthesia for each case. Patients consented to a follow-up telephone questionnaire at 48 hours covering post-operative pain, analgesic medication taken and suggestions for improvement.

Results: There were 65 patient forms completed and 61 were followed-up (94% response rate).

Twenty nine of the patients received a plexus block - 100% of the 13 shoulder operations, 56% of the 16 bony operations, and 18% of the 34 soft tissue procedures: pain scores for these patients are shown in Fig 1.

Five of the 29 patients who had a plexus block reported severe pain in the first 48 hours; 4 of these stated that they did not take analgesia prior to the block wearing off overnight.

Duration of nerve block ranged 9-36 hours (mean 18.2 hours, SD 7.4) and was not related to the type or volume of local anaesthetic.

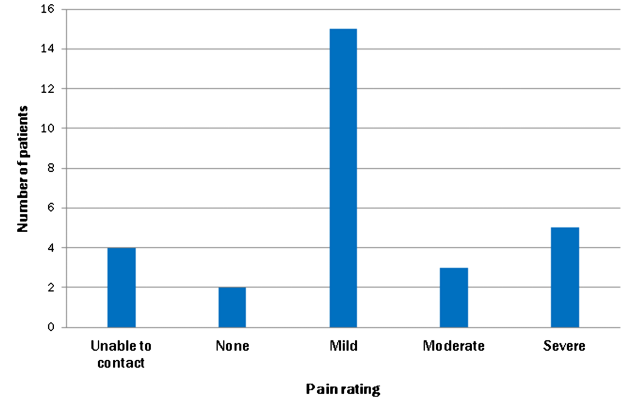

FIG 1. Post operative pain in patients receiving a plexus block.

Conclusions: Plexus blocks can provide effective post operative analgesia for upper limb surgery, however there is wide variation in block duration. The proportion of patients with severe post op pain could be reduced by improved patient education (including written discharge information) emphasizing the need for regular analgesia **before** the block wears off.

COMPARISON OF THE ANALGESIC EFFICACY OF CAUDAL MORPHINE VERSUS HEMOSTATIC SPONGE IMPREGNATED WITH MORPHINE FOR LUMBAR LAMINECTOMY

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Purpose/Objective: To compare caudal versus hemostatic sponge soaked in preservative-free morphine for postoperative pain control in lumbar laminectomy.

Materials and Methods: we conducted a prospective study with 30 patients (22-59 years), ASA I-II, both sexes, Neurosurgery Service of the Hospital Universitario de Caracas, scheduled for elective laminectomy, randomized (15 patients per group): group E = Sponge, Group C = Caudal Analgesia.

Results: No statistically significant intergroup differences were observed in the variables studied. All patients had effective pain control in the postoperative period, only one patient had nausea and vomiting (Group C). Equal amounts of patients required rescue analgesia in both groups: 33% based on NSAIDs. Ambulation time was similar between the two groups.

Conclusions: We conclude that the application of morphine in both ways, are equally effective for postoperative analgesia laminectomy.

SERVICE EVALUATION OF POST OPERATIVE PAIN RELIEF USING ULTRASOUND GUIDED RECTUS SHEATH CATHETERS FOR EMERGENCY LAPAROTOMIES AND UNPLANNED ELECTIVE OPEN ABDOMINAL SURGERIES

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Purpose/Objective: Upper abdominal surgery can cause significant postoperative pain. Inadequate postoperative analgesia may cause morbidity. Epidural analgesia may be relatively contraindicated in emergency patients.

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Local anaesthetic infusion through rectus sheath catheters inserted under ultrasound-guidance may prove a safe alternative. We obtained approval from our hospital Caldicott guardian for publication of this data.

Materials and Methods: Following written, informed consent from patients, we recorded postoperative pain scores and total opioid usage for 48 hours following emergency laparotomy and unplanned open abdominal surgeries. We inserted bilateral rectus sheath catheters (Contiplex Tuohy, B Braun, Melsungen, Germany) under ultrasound-guidance at the end of surgery and administered a bolus of 20ml 0.375% L-bupivacaine bilaterally followed by continuous infusions (Accufuser, Woo Young Medical Co., Ltd, Seoul, Korea) of 0.2% ropivacaine at $5ml.hr^{-1}$ with a patient controlled bolus of $2ml\ 60min^{-1}$. All patients were given a morphine PCA device.

Results: We present data from 12 patients as part of our ongoing evaluation. Five patients experienced moderate pain in the recovery room; seven reported mild or no pain. Three patients experienced moderate or greater pain at 6 hrs and two patients experienced moderate or greater pain at 12, 24 and 48 hours. Six patients used 4-18 mg of morphine in the first 24 hours; six required up to 110 mg. Four patients required 12-18 mg in the second 24 hours; 8 required up to 65 mg. There were no complications reported.

Conclusions: Rectus sheath catheter local anaesthetic infusions are well tolerated and may reduce post-operative opioid requirement following midline laparotomy.

SPINAL ANAESTHESIA IN HIGH RISK PEDIATRIC PATIENTS: AN INDIAN EXPERIENCE FROM A TERTIARY CARE INSTITUTE

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Purpose/Objective: Spinal anaesthesia in paediatric patents is less often used due to short duration of action, lack of post-operative analgesia and lack of technical expertise. Use of this technique is mainly limited to ex-premature infants at risk of peri-operative apnoea. In this retrospective audit performed in high risk infants and children with a variety of associated co-morbidities, safety and efficacy of spinal anaesthesia was assessed and whether general anaesthesia can be avoided was evaluated.

Materials and Methods: Retrospective review of data was performed over five year period in infants and children with associated co-morbidities who received spinal anaesthesia for a variety of surgical procedures.

Results: Total twenty children(including 10 infants)of ASA status II/III received spinal anaesthesia for lower abdominal and lower limb surgeries lasting 45-100 minutes. Associated comorbidities were: respiratory: 8, cardiac: 2, renal: 3, ex-premature: 6 and congenital anomaly: 1 patient. There was no major perioperative medical or anaesthesia related complication. Successful blockade was achieved in all the patients and none of them required conversion to general anaesthesia.

Conclusions: Spinal anaesthesia can be considered safe and efficacious technique in infants and children with associated comorbidities who are at high risk of perioperative complications.

STRUCTURED TRAINING IN PAIN MEDICINE FOR ANAESTHETIC TRAINEES

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Purpose/Objective: TO INCREASE AWARENESS AMONG ANAESTHETIC TRAINEES IN THE U.K. AND EUROPE REGARDING RECENT CHANGES IN PAIN MEDICINE TRAINING IN THE U.K.

Materials and Methods: INFORMATION AVAILABLE ON FACULTY OF PAIN MEDICINE SECTION OF ROYAL COLLEGE OF ANAESTHETISTS WEBSITE.

Results: The criteria for the completion of Advanced training in Pain Medicine require the trainee to have successfully completed:

1. 4 A-Cex (Clinical Evaluation Exercise) – one per quarter
2. 4 CbD (Case based discussion)– one per quarter
3. 6 DOPS (Demonstration of procerdural Skills)
4. 1 MSF (Multi Source Feedback)– to be completed in the first half of training, and repeated if unsatisfactory
5. 2 written Case Reports
6. Logbook
7. Quarterly review (appraisal) with the Local Pain Medicine Educational Supervisor (LPMES).

It is the responsibility of the LPMES to nominate assessors suitable for Advanced Pain Medicine training, and it is the responsibility of the trainee to contact the assessor to arrange a date and time for the assessment.

All completed assessments will be recorded on the e-portfolio, will be available for review by the ARCP panel, and the RAPM on request.

The competency check form should be completed during month 12 and forwarded to the RAPM. The RAPM and trainee should have a meeting at the end of month 12. It is expected that the RAPM will closely supervise training and assessment, and meet at regular intervals with the trainee.

Conclusions: On successful completion of advance pain training and passing the Faculty of Pain Medicine exam, trainee will gain Fellowship of Faculty of Pain Medicine (FFPMRCA) or Diploma in Pain Medicine.

SUCCESSFUL USE OF A CONTINUOUS SCIATIC NERVE CATHETER TECHNIQUE TO PROVIDE PERIOPERATIVE ANALGESIA FOR BELOW KNEE AMPUTATION IN A 7 WEEK OLD INFANT.

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Purpose/Objective: Background and Aims

Regional analgesia techniques are gaining popularity as a means of providing perioperative analgesia for children. Despite this, case reports of the use of catheter techniques in young infants having major limb surgery are rare. We present a case of below knee amputation performed in a 7 week old infant in whom perioperative analgesia was successfully provided by subgluteal sciatic continuous nerve blockade.

Materials and Methods: A 7 week old full-term infant weighing 5.3 kg was booked for elective amputation of congenitally malformed lower leg and foot. Constrictive tissue rings were present, as a consequence of amniotic fibrous bands in utero. The constrictive rings were further complicated by congenital lymphoedema and congenital toe amputation on the affected side. A decision was made to electively amputate the affected lower leg below the knee. Anaesthesia was maintained using sevoflourane and intra- and post-operative analgesia was provided by femoral nerve block combined with a subluteal sciatic continuous catheter infusion.

Results: Pain scores were monitored using the CRIES scale and the maximum was 5/10. The infusion was continued for 40 hours postop after which oral medicines were the mainstay of analgesia.

Conclusions: Sciatic nerve technique in this case successfully controlled the pain following amputation. Such techniques are rare in this age group but some of the advantages include: stress response attenuation and avoidance of central neuraxial techniques and their potential risks.

EXPOSURE TO LOCAL ANESTHETICS CAUSES NEURONAL CELL DEATH OF THE DEVELOPING MOTOR NEURON

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Purpose/Objective: In developing brain, neuronal cell death after general anesthesia has recently been reported. To avoid the general anesthetics-induced neurotoxicity, regional anesthesia can be chosen as an alternative to general anesthesia in neonate or infants. However, the possibility of toxicity of local anesthetics on developing neuron has not been investigated yet. We examined the effect of local anesthetics on the developing motor neuron using primary culture of spinal motor neuron.

Materials and Methods: Embryonic day 14-15 Sprague Dawley rats were used. The ventral parts of the spinal cords were dissected and cultured. Arabinosidecytosine was treated to enhance the purtity of motor neurons. The motor neurons were treated either with vehicle (group C) or various concentration of lidocaine (1, 10, 100, 1000 uM; group L1, L10, L100, L1000, respectively) for 12 hours. The viability was assessed by trypan blue

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exclusion and LDH assay. Between group comparison was performed with Kruskal-Wallis test.
Results: Median (interquatile range), P < 0.001; Group C vs Group L100, Group C vs Group L1000.

TABLE 1. % survival assessed with trypan blue exclusion

group	C	L1	L10	L100	L1000
% survival	98.1(4.0)	98.8(2.3)	99.4(3.3)	6.5 (7.5)*	4.5 (5.0) *

Median (interquatile range), * P < 0.001; vs. group C

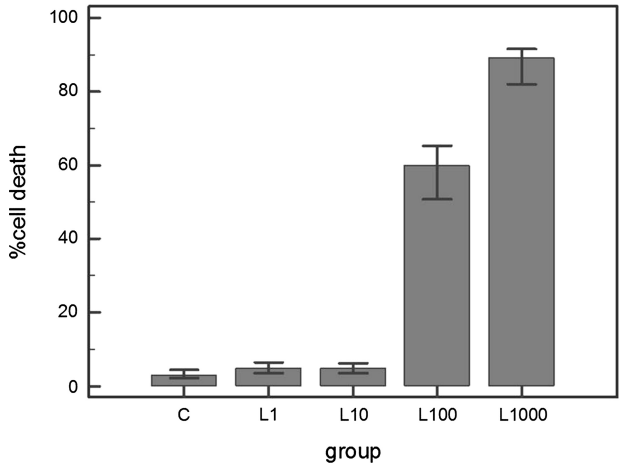

FIG 1. % cell death assessed with LDH

Conclusions: Conclusion: 12 hour treatment of high dose lidocaine (> 100 uM) induced significant cell death of motor neuron derived from late embryonic period. Our results may suggest a possible neurotoxicity of local anesthetics on developing motor neuron.

IN GENTLE NUMBERS TIME SO IDLY SPENT. A BIBLIOGRAPHIC STUDY OF ULTRASOUND-GUIDED REGIONAL ANAESTHESIA IN CHILDREN

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Purpose/Objective: Ultrasound-guidance (USG) in regional anaesthesia is receiving enormous scientific attention these years. Since 1978, almost 1400 papers involving 40,000 patients have been published on the subject. However, most publications seem to address regional anaesthetic issues that directly or indirectly pertain to adults. The purpose of this study is to investigate if the same degree of attention has been bestowed on paediatric patients.
Materials and Methods: A bibliographic and quantitative analysis of Medline-indexed studies from 1978 to present involving USG regional anaesthesia. Eligible publications were classified according to type and year of publication, block extremity, and author's country of origin. A total of 136 papers published between 2003-2013 were included [20 RCTs, 19 cohort studies, 28 case studies, 9 technical reports, and 60 commentaries/reviews].
Results: Authors were from Europe (54%, in particular Austria, France and Switzerland), USA/Canada (30%), or Australasia (16%). 2189 children participated in randomized or cohort studies, of which 67% dealt with truncal nerve blocks (in particular ilioinguinal-iliohypogastric and TAP), 14% with upper extremity nerve blocks (in particular infraclavicular), and 19% lower extremity nerve blocks (in particular sciatic). The distribution among other studies (case reports, technical papers, or commentaries) were 46%, 30%, and 24%. Only three cohort studies investigated perineural catheters, all of which were for sciatic nerve block. USG for epidurals and caudals were emerging from 2005.
Conclusions: Compared to USG regional anaesthesia publications in adults, paediatric studies have emerged late and infrequently. Clinical studies have focused on truncal blocks for minor surgeries (appendectomy, hernia repair), and rarely on blocks for major orthopaedic surgery.

COMPLEX REGIONAL PAIN SYNDROME (CRPS) - A 21ST CENTURY CHALLENGE OF PAIN MANAGEMENT IN PAEDIATRIC POPULATION.

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Purpose/Objective: CRPS is a painful and disabling syndrome that is described by a constellation of symptoms including pain that is disproportionate to the inciting event, sensory disturbances, allodynia/hyperasthesia, autonomic and motor dysfunction. It is well described in the adult population but there are relatively few data in paediatric population. Treatment is difficult, with many patients being refractory to multiple pharmacological regimens. Regional techniques have been used with varying degrees of success.

Our aim is to observe the outcome of lumbar sympathetic plexus blockade combined with continuous catheter infusion of sciatic and femoral nerve in relieving lower limb CRPS pain and thereby allowing progression in physical therapy.
Materials and Methods: This is a retrospective case notes review of 9 patients who presented with lower limb CRPS to our centre from April 2010 to April2013. Each patient had a single injection of X-ray guided lumbar sympathetic plexus blockade followed by continuous catheter infusion (femoral and sciatic) of 0.125% levobupivacaine for 72hrs.
Results: 8 out of 9 patients (8 female and 1 male) were subsequently able to participate in physical therapy with degrees of improvement in daily activities. Unfortunately one patient did not respond at all. In 3 patients, following successful initiation of physical therapy, blocks were repeated for further progression of physical therapy.
Conclusions: It is essential to approach CRPS in a multimodal fashion, given the debilitating nature of disorder and variability of response, early intervention such as continuous peripheral nerve catheter will aid in restoring function and facilitate rehabilitation.

LITERATURE REVIEW OF CRITERIA FOR VASCULAR ACCESS: PICCLINE VS.PORT-A-CATH - INDICATIONS, COMPLICATIONS, DIFFERENCES AND SIMILARITIES

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Purpose/Objective: The aim of the study is to establish indications for piccline, periferally inserted venous catheters and centrally inserted venous catheters (CIVC) depending on therapy modalities as well as pros and Cons for these two different methods regarding diagnosis, infused solutions complications and presumed duration of therapy.
Materials and Methods: Literature review based on PUBMED. Search criteria - keywords ``central venous catheter`` CVC, peripherally inserted central catheter PICC, PRLVT- picc-related large vein thrombosis, CLABSI - central line associated bloodstream infection, CVAD - central venous access device. Analysis of 8 articles published 1995-2012.
Results: PRLTV frequency varies between 8,4 % up till 9,8% and is partly-dependent on solutions delivered via catheters. CLABSI occurs in 2,5-2,8% and the risk factors includes most often : type of CVAD, tunneled or not, diagnosis of aggresive hematological disease, side of insertion and number of prior insertions. Catheter fractures were realted to tearing of the catheter and of the junction of catheter - hub.
Conclusions: Piccline is being increasingly used for infection treatment, however the amount of such complications as thrombosis, phlebitis and catheter fracture in comparison with complications for CVC and Port - a -cath should be evaluated and studied with focus on level needed for medical staff education and training. It may be first choice option for neurological intensive care, parenteral nutrition and antibiotics, providing that experienced team answers for approach to catheter placement, maintenance and follow up.

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Prospective randomised trials for different patient groups depending on diagnosis, solution, duration of therapy, coagulation and immune status are needed.

THORACIC PARAVERTEBRAL NERVE BLOCK IS EFFECTIVE TO CONTROL POSTOPERATIVE PAIN IN PEDIATRIC PATIENTS UNDERWENT OPEN RENAL BIOPSY

N. Miyazawa[1], T. Ogiwara[1], S. Ishikawa[1], C. Sekishima[1]. [1]*Anesthesia, Tokyo Metropolitan Children's Medical Center, Tokyo, Japan.*

Purpose/Objective: Ultrasound-guided paravertebral nerve block has recently been used in thoracic surgical procedures, such as lung surgery and mastectomy. We used this technique in pediatric patients who underwent open renal biopsy. Most of them are prohibited to use NSAIDs as postoperative analgesics because of chronic renal diseases. The aim of this study is to evaluate the efficacy of this block for postoperative pain relief after open renal biopsy.

Materials and Methods: After the approval of the ethical committee of our institute, we retrospectively evaluated pediatric patients from patient records. We received the written informed consent from parents before surgery.

All patients were anesthetized before ultrasound-guided paravertebral nerve block. A 22 gauge block needle (Stimuplex^{TM} Ultra, B-Braun) was inserted via intercostal space between the 10th and 11th in-plane view. When the needle reached to the paravertebral space, 0.375% ropivacaine 0.3-0.4ml/kg was injected viewing the pleura pressed down by local anesthetic.

All patients were examined by senior anesthesiologists in the next morning and pain score was obtained using the Wong-Baker FACES scale or the FLACC score for small children.

Results: Thirty-four patients were involved in this study. Average age was 69±34 (mean±SD) months (median 67, range 13-121), operation time was 39±9 minutes, anesthesia time was 105±14minutes. Four children required analgesics within 24 hours after surgery. There were no major complications after surgery.

Conclusions: Thoracic paravertebral nerve block with ropivacaine was an effective method to prevent postoperative pain after open renal biopsy.

COMPARISON OF ABDOMINAL WALL BLOCKS AND EPIDURAL BLOCK AS POSTOPERATIVE ANALGESIA FOR THE LAPAROSCOPIC SECOND-STAGE FOWLER-STEPHENS ORCHIOPEXY IN CHILDREN

N. Miyazawa[1], Y. Haraguchi[1], A. Shinto[1], C. Sekishima[1], S. Yamamoto[1]. [1]*Anesthesia, Tokyo Metropolitan Children's Medical Center, Tokyo, Japan.*

Purpose/Objective: The laparoscopic two-stage Fowler-Stephens orchidopexy for pediatric intraabdominal testes has been popular in recent years because of high preservation rate of testes. In the second-stage, orchiopexy is performed by incising the peritoneum to mobilize testes. This may cause both somatic and visceral pain after surgery. We evaluated postoperative pain retrospectively compering epidural analgesia (group E) and abdominal wall block (group AW).

Materials and Methods: This study was approved by the ethical committee of our institute, and written informed consent was obtained from parents before surgery.

All children were anesthetized before nerve blocks. In group AW, we performed rectus sheath block, and transversus abdominis plane block in either side of abdomen with 0.2% ropivacaine 0.3ml/kg. In group E, epidural catheter was inserted between L1/L2, and 0.15-0.2% ropivacaine was infused continuously after surgery. For laparoscopy, one camera port is placed in the umbilicus and two accessory ports are placed at the umbilical level on either side of the abdomen. Postoperative pain control was evaluated by one of senior anesthesiologists next morning. Chi-square test was used to compere patients' demographical characteristics.

Results: Five patients were in group E and six patients were in group AW. There was no significant demographical difference between groups. One patient required analgesic after epidural catheter was removed in group E, and one patient complained of abdominal pain in group AW. Other patients did not complain any pain after surgery.

Conclusions: Abdominal wall blocks are as effective as epidural block as postoperative analgesia for the second-stage laparoscopic Fowler-Stephens orchiopexy in children.

COST MANAGEMENT OF BLOOD TRANSFUSION IN GENERAL AND REGIONAL ANAESTHESIA TECHNIQUES AT THE DEPARTMENT OF ORTHOPAEDICS

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Purpose/Objective: The aim of study was to analyze costs of regional versus general anesthesia techniques through a retrospective study. Using an interdisciplinary approach of cost management in health care institutions, independent financial analysis of costs of surgical procedures and resource utilization was conducted.

Materials and Methods: 181 patient's medical records were analyzed during different surgical procedures performed under regional or general anesthesia. Data such as duration of operation and anesthesia, total costs of physician and material used during the procedure, as well as anesthesia technique were extracted from the records and elaborated.

Results: Ratio of regional to general anesthesia was 61%:39% in the observed 4 month period. Average total cost of regional anesthesia operation, calculated from the surgical lists for the observed four month period, was 11,6€, while average total cost of general anesthesia was 44, 8€. Thereby costs of anesthesia technique were lower ($p<0,01$) for regional anesthesia. Both material and medication costs showed statistically and clinically relevant difference, since they were significantly less in regional anesthesia group ($p<0,01$).

Conclusions: Study showed clear economic benefits of regional anesthesia compared with general anesthesia. It was concluded that regional anesthesia indeed does have lower costs than general anesthesia. Great discrepancy between physicians' salary and the salary they actually earn by spending specific amount of time working in the OR suggest poor resource utilization.

EVALUATION OF POSTEROMEDIAL TRANSDISCAL SUPERIOR HYPOGASTRIC BLOCK: A COMPARISON OF THE FLUOROSCOPIC GUIDANCE VERSUS CT GUIDANCE.

D. abbas[1]. [1]*Aneasthesia and pain management, National cancer institute /cairo university, cairo, Egypt.*

Purpose/Objective: Superior hypogastric plexus block (SHPB) has been performed for intractable pain in patients with pelvic cancer. However, the anatomic barriers to elective blockade of the SHP are considerable. The iliac crest and L5 transverse process are potential barriers to proper needle placement in superior hypogastric plexus block (SHPB) for pelvic cancer pain. Several investigators reported successful SHPB using a paramedian transdiscal approach. Another new single puncture approach, posteromedian transdiscal, has been described in this study we evaluated this approach and compared fluoroscopic guidance versus CT guidan.

Materials and Methods: Sixty patients with cancer pelvic pain were randomly allocated into 1 of 2 groups the fluoroscopic guided or the CTguided posteromedian transdisca superior hypogastric plexus block (SHPB)l : Visual analog score, daily morphine consumption, duration of the procedure, side effects, and satisfaction score were recorded.

Results: The mean visual analog score, daily morphine consumption were significantly decreased in both groups and the satisfaction score was significantly increased in both groups after the procedure, no significant difference between both groups but the incidence of parathesia was significantly higher in the fluoroscopy group than the CT group and the failure rate was significantly higher in CT group than fluoroscopy group.

Conclusions: Both approaches of posteromedian transdiscal superior hypogastric block are effective but the CT guided approach is safer and the fluoroscopic approach is easier so we recommend to combine both approaches together; to start with CT guidance and complete with fluoroscopic guidance.

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FLUOROSCOPIC STELLATE GANGLION BLOCK FOR POSTMASTECTOMY PAIN: A COMPARISON OF THE CLASSIC ANTERIOR APPROACH AND THE OBLIQUE APPROACH

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Purpose/Objective: Stellate ganglion block is usually performed with the classic anterior paratracheal approach. The anatomy of the stellate ganglion being in close proximity to various critical structures renders a number of complications, potentially associated with its blockade. The aim of this study was to assess the analgesic e?cacy and safety of a new approach of the stellate ganglion block using an oblique fluoroscopic view.

Materials and Methods: Fifty patients with postmastectomy pain syndrome were randomly allocated into 1 of 2 groups: the anterior paratracheal stellate block group and the oblique fluoroscopic stellate block group. Four blocks were performed for each patient using the same approach each time. The results were evaluated in terms of pain intensity, morphine consumption, and allodynia surface area. Patient satis-faction score, skin temperature, side effects were recorded and compared between the 2 studied groups after each block.

Results: The mean visual analog scale score, daily morphine consumption, and areas of allodynia were significantly decreased and the PSS was significantly increased after each block and for up to 3 months after the last block in both the groups. However, there were no statistically significant differences between the 2 groups at the same study period apart from PSS, which was statistically more significant in group oblique at certain times. The incidences of side effects were significantly more in group classic than in group oblique.

Conclusions: The oblique fluoroscopic approach of the stellate ganglion block is as effective as the anterior paratracheal approach but is safer and more satisfactory to the patients.

KNOWLEDGE ABOUT PAIN CLINICS AND PAIN PHYSICIAN AMONG GENERAL PRACTIONER IN PAKISTAN - A CROSS SECTIONAL SURVEY

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Purpose/Objective: There is an ongoing debate about what qualifies one to be called a "pain physician" who can run the "Pain clinic". Currently the discipline of Anaesthesiology is producing the majority of pain physicians. During literature search we were unable to find any Pakistani or other South Asian countries data available regards knowledge of general physicians (GPs) about pain clinics and pain physician. The main objective of the study was to assess the awareness of general practioners regarding existence of pain clinic and pain physician.

Materials and Methods: A total of 411 general practioners were included in this cross sectional survey. A questionnaire consisting of 10 questions was designed to identify their knowledge about existence of pain clinics and pain physicians. Questionnaires were completed in the field and edited for the inconsistencies and in-completeness.

Results: Only 52.6% of general practioners were aware about the existence of pain clinics. 37.5% believes that neurologists are the pain physicians and only 10.9% knew that pain clinics are run by anaesthesiologist. The vast majority (85%) are unaware about the modern pain relieving methods used in pain clinics.

Conclusions: The survey indicates that nearly half of the general practioners are not aware about the existence of pain clinics & pain physicians and majority are unaware about new pain relieving methods.

MINDFULNESS AND CHRONIC PAIN

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Purpose/Objective: Mindfulness is a non-judgemental awareness of physical sensations and associated cognitive function. It is postulated to decrease the suffering associated with chronic pain (Grossman *et al* 2004). The use of Mindfulness meditation techniques is designed to teach patients how to live fuller, healthier, more adaptive lives.

To determine whether patients with chronic pain who attend a Mindfulness programme demonstrate an improvement in quality of life, increased levels of functionability, a reduction in psychological-related symptoms and improvement in the patient global impression of change scale (PGIC).

Materials and Methods: During 2011-2012 five groups of approximately 10 participants completed the programme (n = 50).

Outcome questionnaires were collected and included:

Short Form Health Survey (SF- 36) reports health related quality of life (QoL)

Hospital Anxiety and Depression Score (HADS)

Brief Pain Inventory (BPI)

Patients' Global Impression of Change (PGIC)

Self Reported Changes using evaluation forms

Results: Participants Reported Improvements Following Mindfulness Intervention

40% in Functionability

45% in Quality of Life

60% improvement in Psychological related symptoms

79% improvement in Patient Global Impression of Change Scale (PGIC).

Although patients' reports of pain intensity remained unchanged, there was a positive response in both health -related quality of life and level of functioning, a reduction in psychological-related symptoms and a significant improvement in the global impression of change scale following the programme.

Conclusions: Results demonstrate that positive changes have occurred in the lives of patients with chronic pain. Mindfulness meditation is an acceptable intervention in this patient group.

CONTINUOUS OR BOLUS ANALGESIA VIA THE EPIDURAL CATHETER (EDK) FOLLOWING A HIP OR A KNEE REPLACEMENT?

M. Cesar Komar[1], I. Bricman[2]. [1]*Anaesthesiology, General Hospital Slovenj Gradec, Slovenj GRadec, Slovenia,* [2]*Orthopedics, General Hospital Slovenj Gradec, Slovenj Gradec, Slovenia.*

Purpose/Objective: After hip and knee replacements, the early rehabilitation and mobilization is one of the most important goals. The good analgesia with minimal side effects after operation is very important condition.

Is the epidural delivered analgesic mixture better in bolus or in a continuous manner?

Materials and Methods: Our study proved the local ethic commission.

We reviewed 100 patients (50 hip and 50 knee replacements) operated by one surgeon in 2 years period.

Patients in group A received 0,125 % Chirocain 100 ml with 0,2 mg Fentanyl in continuous infusion through PCEA-pump and IV Metamizol / 12 h and Piritramid 5 mg IV (VAS >5).

Patient in group B received analgesic mixture 0,125 % Chirocain with 10-15 mg Morfin chlorid or 0,2 mg Fentanyl, with boluses on 6, 8, 12 hours, into the EDK , all other the same like in group A.

We measured pain, the amount of local anesthetic, rescue medication, patient's satisfaction, comorbide diseases, side effects, demographic dates and BMI, beginning the rehabilitation, duration of hospitalization.

Results: For analysis we used statistic programme SPP.

Our study isn't finished yet, but our mediate results shows that the epidural analgesia is very good for the patients after a total hip and knee replacement. There are some small differences in analgesia in both groups, and some more side effects in the continuous a group A than in the B group with boluses.

Conclusions: At the congress we will represent our final statistically computerized dates.

INTRADISCAL THERMAL RADIOFREQUENCY TO CONTROL DISCOGENIC PAIN

C. Gracia[1], R. Armand Ugon[1], P. Magalló[1], R. Aloma[1], J. Coma[1], M. Moncho[1], J. Masdeu[1], C. Batet[1]. [1]*Anesthesiology and pain medicine, adjunt, barcelona, Spain.*

Purpose/Objective: Discogenic pain is present in 28-40% of back pain consultations. Radiofrequency electric field applied in nucleus pulposus

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may change the conductivity of nerve endings and activate the immune system providing a reduction in pain.
Materials and Methods: We performed Thermal Radiofrequency at 60ºC, 70ºC and 75ºC for six minutes into the intervertebral disc nucleus pulposus in 15 patients with refractory discogenic pain. Cosman needles 20G, TIP-15. Cosman 4G Radiofrequency Generator. Radiological control. The levels involved were defined by clinical criteria and pre-procedure discography. We value relief of pain, analgesic consumption and the return to normal activity at 5 and 12 months.
Results: We studied 15 patients (10 men and 5 women) with a mean age of 49.38 years. Levels treated were L4-L5 (6 patients), L5-S1 (8 patients) and both levels in one patient. At 5 months follow-up, 9 patients had a reduction in pain of >50% and at 12 months the effect was maintained in all these patients. They resumed their usual activities of daily living. Four of them discontinued all pain medication. Only one of the fifteen studied patients required surgical treatment. No complications associated with the procedure were recorded. The intervention was rated as satisfactory by all patients.
Conclusions: Our findings suggest that Thermal Radiofrequency applied to the intervertebral disc nucleus pulposus can be considered as a therapeutic alternative for patients with refractory discogenic pain. A randomized controlled study to confirm our results would be justified.

EVALUATION OF PERIOPERATIVE PAIN IN THE CARPAL TUNNEL SURGERY PERFORMED BY ULTRASOUND-GUIDED AXILLARY BLOCK

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Purpose/Objective: The carpal tunnel syndrome (CTS) is a common pathology that generates pain. Few studies have focused on the evolution of perioperative pain and its neuropathic component. The main objective of this study is to assess the evolution of perioperative pain in this surgery.
Materials and Methods: It is a single-center prospective observational study, conducted between April and August 2012 in the clinic Lille Sud on 83 patients operated for CTS in day surgery. Patients were informed of the conditions of the study and their consent obtained during the pre-anesthesia consultation. Analgesics were prescribed precociously (paracetamol and ketoprofen, tramadol when pain) with an early first administration upon return to home. An evaluation of the pain numeric scale (EN) and its neuropathic participation (DN4 -neuropathic pain in four questions≥ 4) was performed preoperatively and J1 / J5 postoperative.
Results: More than 1/2 patients have moderate or severe pain (EN> 3/10), neuropathic in 85% of cases (DN4 ≥ 4). From Day 1, only 15.7% of patients still have an EN> 3 ($p < 0.001$), neuropathic in 16.9% of cases ($p < 0.001$). On day 5, less than 5% of patients are pain (EN> 3). During the surgery, 94% of patients had EN <3, none of which need to complement or sedation.
Conclusions: This study has highlighted, with specific tools for assessing pain, a significant number of patients have a high level of preoperative pain, with a large participation of neuropathic pain. CTS surgery associated with the systematic analgesic treatment has helped to reduce the pain very quickly.

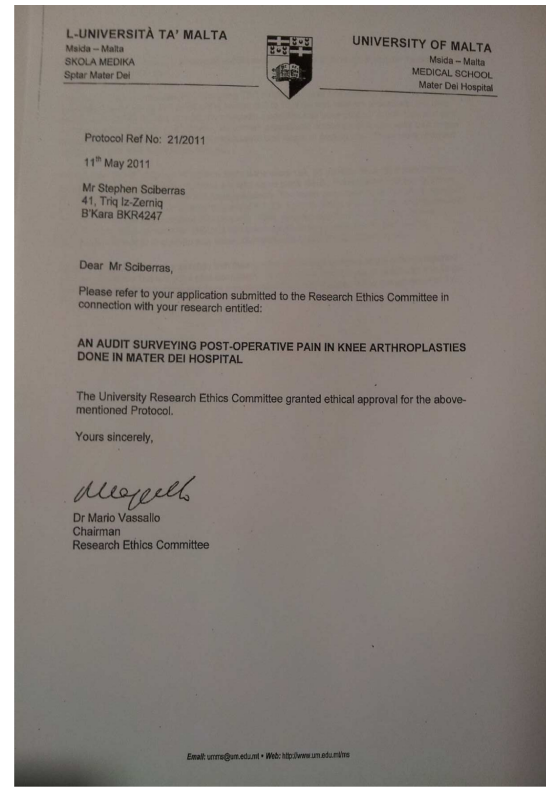
LONG TERM EFFECTS OF CERVICAL SPINAL CORD STIMULATION IN PATIENTS WITH CHRONIC RADICULAR PAIN DUE TO FAILED NECK SURGERY SYNDROME.

H. Smits[1], M. puylaert[1], J. Van Zundert[1], P. De Vooght[1], R. Mestrum[1], R. Heylen[1], P. Vanelderen[1]. [1]*Department of Anesthesiology Intensive Care Emergency Care and Pain Therapy, Ziekenhuis Oost-Limburg, Genk, Belgium.*
Purpose/Objective: Spinal cord simulation (SCS) is an effective treatment for radicular pain in patients with failed back surgery syndrome. However, data concerning outcome of SCS for intractable cervical radicular pain due to failed neck surgery syndrome (FNSS) are sparse (1,2). We performed a retrospective study to investigate the long-term effects of cervical SCS in the latter patient group.
Materials and Methods: A retrospective chart review was performed in 14 patients with FNSS and intractable chronic cervical radicular pain. VAS scores were taken at the following moments:
· T0: before SCS implantation,
· T1: 1 month after SCS implantation.
· T2: after a follow-up of 98,3±17.6 months.

VAS-scores at T0, T1 and T2 were compared using a two-tailed paired *Student t*-test (significance level $P<0.05$). Data are presented as mean±SEM.
Results: Patient age was 55 ± 2.5 years (7 male). At T1 and T2 VAS scores were markedly decreased compared to T0 (2.7±1.5 *vs.* 8.6±0.18, $P=0.011$ and 4.0±0.4 *vs.* 8.6±0.18, $P=0.029$, respectively). The global perceived effect at T2 was an improvement of 66 ± 2.4 **%**. At the end of follow-up, 13 patients were prepared to undergo the same procedure if necessary. Six re-interventions were needed: 3 due to lead fractures and 3 due to lead dislocations.
Conclusions: SCS provides a safe and long-term pain relief in patients with FNSS suffering from intractable chronic cervical radicular pain.

ASSESSMENT AND EFFICACY OF CURRENT POST-OPERATIVE ANALGESIC METHODS AFTER TKR SURGERY IN MATER DEI HOSPITAL MALTA

B. Vella[1], S. Sciberras[1], P. Attard Cortis[1], M. Pullicino[1], P. Ezaguy[1]. [1]*Anaesthesia Intensive Care and Pain Medicine, Mater Dei Hospital, Msida, Malta.*
Purpose/Objective: To assess efficacy and any shortcomings of the analgesic methods currently in use, for the purpose of improving future practice.
Materials and Methods: Data was collected from patients undergoing TKR surgery in Mater Dei Hospital, Malta. We recorded daily pain scores, using numerical rating scores of 0 to 10. We used patient's anaesthetic and drug sheets to record which anaesthetic and analgesic modalities had been utilized, in both intra and post-operative periods, and to what extent. The primary anaesthetic outcomes assessed were pain scores. Secondary outcomes included time to mobilisation and length of post-op stay. These were analysed using univariate and multivariate analysis.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SKOLA MEDIKA
Spitar Mater Dei

UNIVERSITY OF MALTA
Msida – Malta
MEDICAL SCHOOL
Mater Dei Hospital

Protocol Ref No: 21/2011

11th May 2011

Mr Stephen Sciberras
41, Triq Iz-Zerniq
B'Kara BKR4247

Dear Mr Sciberras,

Please refer to your application submitted to the Research Ethics Committee in connection with your research entitled:

AN AUDIT SURVEYING POST-OPERATIVE PAIN IN KNEE ARTHROPLASTIES DONE IN MATER DEI HOSPITAL

The University Research Ethics Committee granted ethical approval for the above-mentioned Protocol.

Yours sincerely,

Dr Mario Vassallo
Chairman
Research Ethics Committee

Email: umre@um.edu.mt • Web: http://www.um.edu.mt/re

Results: From a total of 106 patients, 91 patients were done under GA. 85 patients received a femoral nerve block (FNB), of which 23 also received a sciatic nerve block (SNB). Paracetamol use was common, but diclofenac was only used in 15‰ intraoperatively. The mean pain score at rest on the evening of surgery was 3.3 (CI:2.7-3.9) and on movement 5.7 (CI: 5.0-6.3). FNBs showed a non-significant trend (p 0.014) in reducing pain scores. Patients with SNBs reported significantly lower pain scores on passive movement (p.value =0.018) and had lower opioid requirements. There was no significant association between FNBs/SNBs and time to mobilisation (p.values ≥0.05).

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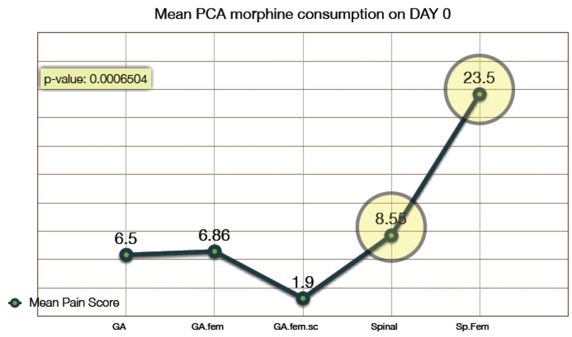
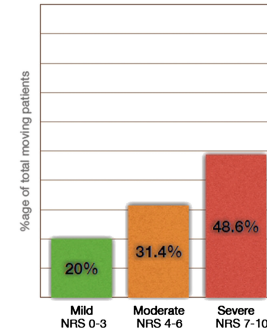
Post-op Opioid Consumption



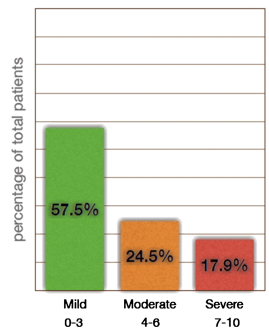
Pain on Movement Day 1

- Most patients (n=105) were able to perform passive movements
- Mean pain score: 6.01
  - Only 20% (n=21) were in no or mild pain
  - 48.6% were in severe pain



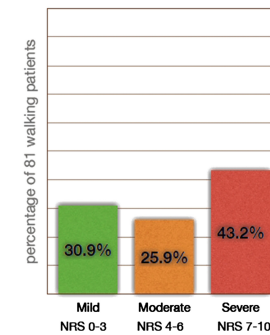
Pain at rest Day 0

- Mean pain score: 3.32
- Most patients in mild or no pain
- 17.9% of patients were in severe pain



Pain on Walking Day 1

- 76.4% of total patients were able to walk on day 1 (n=81)
- Similar proportions of GAs and Spinals were able to walk (77.8% vs 73.3% respectively)
- Pain
  - Mean pain score 5.21
  - 43.2% were in severe pain



Length of post-op stay

- Range 2 -12 days
- Mean 5.31 days
- No link to any particular anaesthetic or analgesic technique
- Time to mobilisation had a strong correlation

VARIABLE	p-values
age	0.3299
gender	0.4057
Ga or Spinal	0.9145
FNB	0.3917
SNB	0.8039
paracetamol	0.8948
nsaids	0.6985
Morphine PCA	0.1106
pain movement day0	0.4353
pain movement day1	0.6200
time to mobilisation	0.0041

Pain on Movement - Day 0

- **NSAIDs** group - significantly less pain by a factor of 1.9
- **SNB** group - significantly less pain by a factor of 2.5
- **SNB** group - significantly lower opioid requirements

VARIABLE	p-values
gender	0.34
age	0.27
GA vs Spinal	0.4
paracetamol	0.613
NSAIDs	0.0197
PCA	0.52
PNB	0.26
FNB	0.159
SNB	0.018

Conclusions: Most patients claimed to be satisfied with their overall experience however many patients reported severe pain in the first two days post-operatively. We observed that the use of diclofenac and single shot SNBs are effective components of a multimodal analgesic strategy in the management of TKR pain.

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AN ENCOUNTER WITH INADVERTENT INJECTION OF LARGE VOLUME OF LOCAL ANAESTHETIC IN SUBARACHNOID SPACE-3 CASE REPORTS.

I. Adadevoh[1]. [1]*Anaesthesia, National Orthopaedic Hospital Igbobi Yaba Lagos, Lagos, Nigeria.*

Purpose/Objective: Background and aim – Two years previously, epidural catheter was rare in our practice. Most procedures amenable to neuraxial block were performed under spinal anaesthesia. To keep abreast with epidural technique, injection down needle is used. Three remarkable manifestation of large volume of anaesthetic injected into subarachnoid space were encountered. These are presented to illustrate different facet of clinical manifestation of substantial volume of local anaesthetic in subarachnoid space. Insight on dearth of equipment and its influence on safe anaesthesia are seen.

Materials and Methods: Methods- Three stable patients (ASA1), for procedure of lower limbs under epidural anaesthesia were involved. Intravenous fluid preload, vital signs, oxygen saturation were within acceptable order. Electrocardiogram and automated bloodpressure apparatus were not available. Aseptic measures were observed and using a glass syringe,the epidural space was identified by loss of resistance to air in sitting position via L3L4. Test dose inappropriate as needle sticking on patient may shift after 5mins.

Results: Result-Following slow injection of 8-10mls 0.5% plain bupivacaine, patients 1&2, 42 and 36 years old males developed, death and sleep like demeanour respectively with no verbalization, respiration and radial pulsation. Patient 3, 52years old woman manifested convulsion, unconsciousness and apnoea. Major arteries, blood pressure were not assessed, to allow early resuscitation. Lung ventilation with 100% oxygen, rapid fluid infusion, intravenous diazepam and adrenaline were commenced. Resuscitation continued for 30-40mins before respiration and consciousness returned. Patient 2 further had tracheal intubation and longer ventilation. All survived without neurological deficits.

Conclusions: Conclusion-Preparedness, early recognition and quick institution of appropriate treatment saved situation.

THEOPHYLLINE ADMINISTRATION IN THE TREATMENT OF SEVERE POSTSPINAL PUNCTURE HEADACHE IN A CHILD

S. Atici[1], E. Gerim[1], M. Kömür[2]. [1]*Anesthesiology, Mersin University, Mersin, Turkey,* [2]*Pediatric Neurology, Mersin University, Mersin, Turkey.*

Purpose/Objective: The use of theophylline has been recently reported in the pharmacologic treatment of post spinal puncture headache (PSPH). In this report we aimed to present a child with PSPH who was treated by theophylline.

Materials and Methods: A 16 years old girl with subacute sclerosing panencephalitis suffering from PSPH was sent to Algology department. A diagnostic lumber puncture (LP) was performed seven days ago using 22 G spinal needle and no complication was reported during the procedure. The child complained from severe headache and was brought to pediatric emergency department three days after the LP. The child was hydrated by intravenous saline, parasetamol was given and discharged on the same day. Four days after the discharge the child complained from headache, nausea, vomiting and brought to the hospital again. Physical examination, routine laboratory investigation and cerebral CT were completely normal. VAS score was found to be seven.The child was thought to suffer from PSPH and theophylline infusion was started at a dose of 4 mg/kg/h (total dose 160 mg) after ECG monitorization. Soon after the theophylline administration the VAS score dropped the one and the child seemed very comfortable.No complication including aritmia was observed during theophylline administration.The child was discharged four hours after the treatment.

Results: The patient never readmitted to the hospital because of headache.

Conclusions: Severe PSPH is rare in children.Theophylline administration should be considered as a choice of treatment in PSPH prior to any other invasive treatment modalities.

PERI-OPERATIVE PAIN MANAGEMENT IN A PATIENT WITH MYOTONIC DYSTROPHY UNDERGOING MAJOR GYNAECOLOGICAL LAPAROTOMY

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Purpose/Objective: Myotonic Dystrophy (MD) is a chronic, progressive and inherited multisystem disorder involving skeletal, smooth & cardiac muscles with serious anaesthetic implications. We present an innovative and effective pain management of a patient with MD undergoing laparotomy by using regional anaesthesia techniques.

Materials and Methods: A 29 years old, known case of MD with extensive endometriosis was scheduled for Total Abdominal Hysterectomy and bilateral Salpingo-Oophrectomy. After informed consent of the patient and establishing standard monitoring, combined spinal-epidural (CSE) was established at L2/3. Spinal block to T6 was established with 2.7mls of hyperbaric Bupivacaine. After inhalational induction, trachea was intubated with 7.0 mm oral endotracheal tube. Anaesthesia was maintained with O2/Air & Sevoflurane. No muscle relaxant or opiates were used during the surgery. Hemodynamically, patient remained stable throughout the surgery. At the end of surgery the epidural analgesia was initiated with 15 mls of 0.25% Levobupivacaine.

Results: Post operatively the patient was transferred to high dependency unit(HDU). During 48 hours stay in HDU, analgesia was provided with epidural Bupivacaine and a single dose of Oramorph 15mls. Before transfer to the ward, epidural catheter was reomed and bilteral ultrasound-guided transversus abdominis plane (TAP) catheters were inserted. For the next two days the analgesia was provided by TAP block using 20 mls of Levobupivacaine on each catheter, regular paracetamol and non-steriodal anti-inflammatory drugs. Patient was dischatged home on 4th post-op day.

Conclusions: CSE and continuous TAP block along with light general anaesthesia provided safe and effective anaesthesia and analgesia in a patient with myotonic dystrophy undergoing major laparotomy.

INADVERTENT SUBDURAL INJECTION CAUSING RESPIRATORY DISTRESS REQUIRING GENERAL ANAESTHESIA

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Purpose/Objective: To educate others in recognition and management of inadvertent subdural injection during attempted neuro-axial blockade.

Materials and Methods: A case report of an inadvertent subdural injection of 10ml 0.5% bupivicaine, during attempted epidural anaesthesia in a 73 year old woman undergoing femoral-popliteal bypass surgery. Initial anaesthetic plan was for epidural anaesthesia only.

During the procedure the epidural space was located uneventfully at L2/L3, 10ml 0.5% bupivicaine injected and catheter threaded. Fifteen minutes later she became unable to breathe adequately and complained of upper limb weakness. No loss of consciousness, no haemodynamic instability seen. Respiratory distress severe enough to require general anaesthesia and ventilation.

Results: Injection had inadvertently been given into the subdural space, after 90 minutes the effects had started to wear off and spontaneous ventilation returned. Post-operatively patient made a complete recovery without any neurological complications from subdural injection.

Conclusions: Having reviewed the literature there are some subtle signs in this case that may have indicated that the catheter was subdural. It is important to make all anaesthetists who site epidurals of the potential for this complication. (Incidence is quoted at 0.083%).

Even when regional technique intended for sole anaesthetic, you should always be prepared for complications and the need for a general anaesthetic.

CHEST TRAUMA WITH RIB FRACTURES: THORACIC PARAVERTEBRAL BLOCK (TPVB) OR PLEURAL BLOCK (PB) ? CASE REPORTS.

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Purpose/Objective: *TPVB provide excellent analgesia in chest trauma with rib fractures (1.) The question is, can pleural block (2) be an alternative in such situations? Analgesia and pulmonary functions between TPVB and PB were compared in two chests trauma.*

Materials and Methods: *At the Hospital and after informed consent, one patient, male, 43-years-old, BMI = 25, had a bicycle fall resulting in T3-T7 rib fractures was submitted to a TPVB and the another patient, male,*

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31-years-old, BMI = 28, had a motorcycle fall with T1-T7 rib fractures to a PB. Both blocks were performed with catheter and 20 ml bupivacaine 0.25% (bp 0.25%). Both had pain previously measured by the Numeral Pain Scale = 9 (NPS - zero = no pain; 10 = maximum pain); and pulmonary functions with VM1 Ventilometer®. - Clement Clarke. The TPVB was performed, according to Eason and Wyatt´s technique and PB according to Kvalheim and Reiestad´ s technique. The 2nd dose of 20 ml bp 0.25% with 8 ml of 300 Iopamiron® (total=28 ml) was performed whose images were compared with clinical anesthetic outcomes. Modal analgesia to pain rescue was made with morphine and NSAIDs.

Results: CT dye images (figures 1, 2), pulmonary functions and pain improvements (table) were compared in both blocks.

Conclusions: Both, TPVB and PB, seem to be equivalent in pain mitigation and pulmonary functions.

A SPINAL CATHETER SAVES THE DAY.

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Purpose/Objective: We report a case of an 82 year old lady with dilated cardiomyopathy who presented with fractured neck of femur.

Her medical history included congestive cardiac failure, atrial fibrillation, hypertension, angiodysplasia, hypothyroidism and chronic kidney disease with a baseline creatinine of 150 umol/l. She had vulvectomy and bilateral groin dissection for a squamous cell carcinoma of vaginal wall in 1996.

Materials and Methods: Initial laboratory investigations revealed acute on chronic renal impairment(urea 20 mmol/l, creatinine 160 umol/l) with hyperkalaemia (K 7mmol/l).

Chest X-ray showed gross cardiomegaly without pulmonary oedema or effusions.

Transthoracic echocardiography confirmed the presence of a severely dilated right ventricle, severe biatrial dilatation, severe mitral and tricuspid valve regurgitation and pulmonary hypertension (RVSP=SPAP> 50mmHg).

The patient was deemed unfit for intermittent haemodialysis and her asymptomatic hyperkalaemia was managed conservatively prior to surgery.

Results: A spinal catheter technique was chosen to ensure haemodynamic stability and to avoid an increase in pulmonary vascular resistance. Prior to positioning for spinal anaesthesia an ultrasound guided femoral nerve block was performed using 20ml of 0.375% bupivacaine. Repeated boluses (0.3 ml) of 0.5% bupivacaine were administered through the 22G spinal catheter at patient's request(1.2ml in total). The spinal catheter was removed at the end of surgery. Postoperative analgesia was maintained with paracetamol and systemic opioids. No postdural puncture headache or neurological sequelae were noted.

Conclusions: This case highlights the role of a spinal catheter in the management of high risk orthopaedic patients. In addition, it illustrates risks and challenges associated with anaesthesia for patients with pulmonary hypertension.

NEEDLE BLOCK FOR EXTRACAPSULAR CATARACT EXTRACTION AND TRANSCONJUNCTIVAL DIODE LASER IN A HIGH RISK PATIENT

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Purpose/Objective: A high risk severely demented restless patient due to raised intraocular pressure unsuitable for GA presented for extracapsular cataract extraction and transconjunctival diode laser. Needle block with monitored anaesthesia care was employed with a successful outcome.

Materials and Methods: Case report: A 79 year lady, severely demented, unable to swallow and uncooperative presented with severe restlessness due to phacomorphic glaucoma with raised IOP (50 mmHg). Cataract surgery and transconjunctival diode laser were offered. General anaesthesia and block requiring patient cooperation were considered unsuitable. Needle block with monitored anaesthesia care was considered appropriate. 20 mg propofol was administered over 20 minutes. Small needle retrobulbar block was administered with a 27G, 2 cm long needle percutaneously in the extreme inferotemporal quadrant [3] and 4 cc of 2% lidocaine was injected. Surgery was uneventful and the postoperative IOP was noted to be within normal limit after a few hours and subsequently the restlessness settled.

Results: The usefulness of retrobulbar block has been advocated in high risk patients undergoing ophthalmic surgery [2,3]. Sedation was considered hazardous but the patient had to be still during surgery.

Conclusions: A shallow retrobulbar block with small dose of propofol provided sufficient operating condition for surgery and helped in alleviating discomfort.

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CASE SERIES OF AMBULATORY TIBIAL OSTEOTOMY WITH FEMORAL BLOCKADE

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Purpose/Objective: POP pain is dominant complain and main reason for prolonged convalescence and hospital stay. the use of multimodal analgesia offers benefits in ambulatory surgery. POP pain management aims not only to decrease pain but also to increase patient outcomes, the use of femoral block has been recognized as technique to control it, as well as reduce the use of opioids, and side effects, duration of hospital stay and the POP care cost.

Materials and Methods: We report 13 Ambulatory patients with tibial osteotomy. they received standardized GA, preoperative US-guided femoral block and catheter for POP analgesia. The femoral block was "in plane" performed. 10 ml of bupivacaine 0.5% and 10 ml of lidocaine 1% 1:400 under direct US guidance followed by the placement of the catheter and the verification of the correct US placement. The elastomeric pump was left in place since the beginning of the surgery, bupivacaine 0.125% without epinephrine 270ml, 5ml/h. As well as ketorolac 30mg intraoperative. oral NSAIDs and acetaminophen for 5–7 days and 3 visits/day/3 days by a nurse.

Results: In the PACU the VAS was under 2/10, only one patient required additional analgesic at home. All patients reported high levels of satisfaction with their POP analgesia. The elastomeric pump was left 2 days.

Conclusions: The continuous femoral block could be an efective strategy for reducing POP pain and opioid consumption. The US guided continuous femoral block in combination with oral NSAIDs and acetaminophen for 5 to 7 days provided excellent pain relief and avoided the use of opioids.

VASOVAGAL CARDIAC ARREST DURING SPINAL ANESTHESIA FOR CESAREAN SECTION

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Purpose/Objective: The vasovagal response is characterized by inappropriate combination of bradycardia and paradoxical vasodilation. In daily life, most vasovagal episodes are self limited and easily treated. However, during general anesthesia or neuraxial block-induced sympathectomy, an acute reduction in venous return or a sudden increase in vagal tone after surgical manipulation can cause serious vasovagal response. Its risk factors may be high neuroaxial anesthesia, hemorrhage or postural change, and aortocaval compression in full-term women. During spinal anesthesia for cesarean section, these factors can be combined and serious outcomes such as cardiovascular collapse or cardiac arrest can occur.

Materials and Methods: case report: Results: A 38-year-old women at 38 weeks of gestation with histories of non-sustained ventricular arrhythmia and newly developed vasovagal syncope during pregnancy was scheduled to undergo spinal anesthesia for elective cesarean section. Sensory block level reached T3 after spinal anesthesia and vital sign of the parturient was stable. Shortly after placental expulsion, sudden bradycardia and cardiac arrest was observed. The patient was fully recovered after immediate CPR with rapid injection of epinephrine 1 mg, hydration, chest compression and administrastion of oxygen. The parturient discharged unenventfully fifth day after Cesarean delivery.

Conclusions: This case illustrates a serious potential risk of vasovagal response superimposed on neuraxial anesthesia during cesarean section. Cardiac arrest can occur in patient with or without a history of syncope episode. Careful history taking, appropriate preoperative evaluation, and massive

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preload management are required for prevention of its occurance. Once persistent cardiac arrest occurs, immediate treatment with epinephrine and CPR should be performed for successful recovery.

ZYGOMATIC IMPLANTS PERFORMED UNDER REGIONAL ANAESTHESIA AND CONSCIOUS SEDATION: A PERSONAL EXPERIENCE WITH A PERSONAL TECHNIQUE

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Purpose/Objective: Modern oral surgery achieves better results through the combination of RA with conscious sedation (CS). Anaesthesiologist must take into account long duration of surgery, patient comfort, complications management. Patients must be fully informed because her/his active collaboration is mandatory for a successful outcome.

Materials and Methods: We report our experience regarding the one-day rehabilitation of edentulous maxilla in 2 patients scheduled for implantation of maxillary implants, including zygomatic implants (ZI) (figure 1). Monitoring of the patient consisted of ECG, NIBP, SpO2 , BIS and clinical observation. CS was performed with i.v. titration of diazepam and RA with bupivacaine (table 1). Patients were fully satisfied.

Results:

TABLE 1. Patients, surgery and anaesthesia features.

Patient/surgery/duration/ complications	Female, 50y, 55kg, ASAII / maxillary implants, including bilateral ZI / 110 minutes / uneventful	Male, 60y, 68kg, ASAII / maxillary implants, including bilateral ZI / 70 minutes / uneventful
Bilateral nerves blocks performed	Great Palatine Infraorbital Middle Superior Alveolar Nasopalatine Posterior Superior Alveolar Zygomatic Zygomaticofacial Zygomaticotemporal	Great Palatine Infraorbital Middle Superior Alveolar Nasopalatine Posterior Superior Alveolar Zygomatic Zygomaticofacial Zygomaticotemporal
Total dose of: diazepam, bupivacaine 0.5% with epinephrine 1 : 200.000	Diazepam: 42 mg Bupivacaine: 215 mg Epinephrine: 215 mcg	Diazepam: 22mg Bupivacaine: 215 mg Epinephrine: 215 mcg

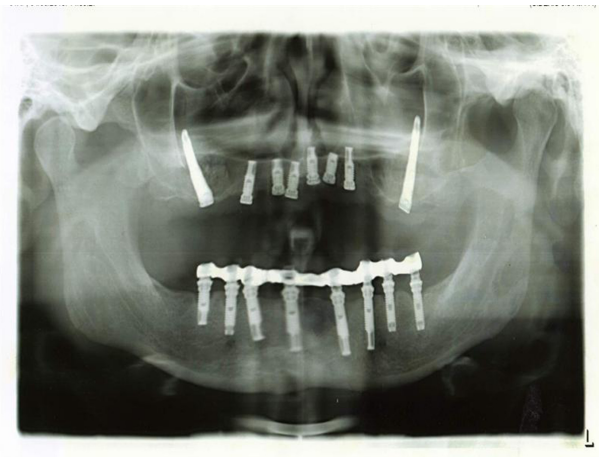

FIGURE 1. One-day rehabilitation of edentulous maxilla; Mandibular one-day rehabilitation was earlier performed.

Conclusions: We stress a poor known intra-operative complication described in this field, the trigeminocardiac reflex (TCR): sudden onset of parasympathetic activity with bradycardia, hypotension, asystole, apnea, gastric hypermotility during central or peripheral stimulation of any of the sensory branches of the trigeminal nerve.

ULTRASOUND GUIDED BILATERAL RECTUS SHEATH BLOCK FOR PARAUMBILICAL HERNIA REPAIR: A NEW TECHNICAL APPROACH A CASE STUDY

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Purpose/Objective: We describe a new approach during ultrasound guided rectus sheath block with injection between anterior layer of rectus sheath and rectus abdominis muscle in three patients scheduled for paraumbilical hernia repair.

Materials and Methods: After LMA general anesthesia, ultrasound guided bilateral rectus sheath block with injection just under anterior layer of the rectus sheath was performed with Bupivacaine 0.25% as 0.25 ml/kg in each side, figure1. All cases received 1mcg/kg fentanyl on induction and additional doses were given if tachycardia and/or hypertension more than 20% of baseline was noticed. Intra and postoperative opiods requirement were documented.

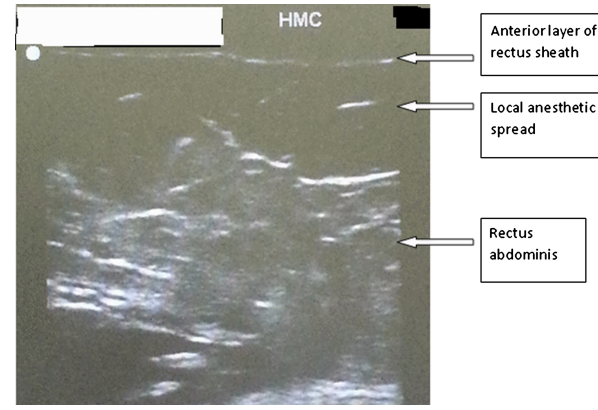

FIGURE 1. Distension of the space of front of rectus abdominis muscles on both sides after local anesthetic injection.

Results: There were stable intraopertive hemodynamic parameters in the three patients inspite of using a single induction dose of fentanyl. The postoperative analgesia was extended for the first 14–16 hours without need for systemic analgesics There were no complications in any of the three patients.

Conclusions: This new ultrasound guided approach for bilateral rectus sheath block by injection anterior to rectus abdominis for paraumbilical hernia repair is efficient, more easy and may prevent possible complications related to the classical approach.

This promising result may be the start for more definitive prospective randomized controlled trials.

ULTRASOUND-GUIDED SERIAL PARAVERTEBRAL BLOCKS FOR MANAGEMENT OF NEUROPATHIC CHEST PAIN IN A CHILD WITH PECTUS CARINATUM

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Purpose/Objective: Pectus carinatum is a congenital deformity characterized by protrusion of the sternum and ribs. Children with this condition can experience chest-wall pain, the exact cause of which is poorly understood. Surgical repair, which may alleviate this pain, is often delayed until after the adolescent growth spurt in order to prevent possible recurrence during puberty.

Materials and Methods: A 12 year-old boy with pectus carinatum presented to our pain clinic reporting a one-year history of persistent chest-wall pain (T2-T4 dermatomes). An extensive workup did not reveal any specific cause

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of his symptoms. Surgical consultation was obtained and the patient was advised to delay surgical repair until after the pubertal growth spurt. Despite aggressive medical management and physical therapy, he didn't achieve any relief of his pain. We performed ultrasound guided bilateral PVBs at T3-T4 using 5 mL of 0.25% Bupivicaine + 4mg dexamethasone for each injection.
Results: The patient's pain disappeared for two weeks (VAS 0/0) and then gradually returned with decreased intensity (VAS 5/10). After the third block, the complaints of pain, allodynia, and hyperesthesia were successfully relieved for a 5-month follow up period.
Conclusions: The patient's pain relief far outlasted the conduction blockade, which may be due to reduced central sensitization as well as an interruption of the established circuit between nociceptor, central nervous system, and motor unit. Our case demonstrates an instance in which a child with pectus carinatum deformity developed neuropathic chest pain that completely resolved after treatment with serial ultrasound guided PVBs.

BILATERAL COMBINED ULTRASOUND TAP AND ILIOINGUINAL-ILIOHYPOGASTRIC BLOCK IN A PEDIATRIC PATIENT SUFFERING FROM CONGENITAL HYPOPLASTIC LEFT HEART SYNDROME

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Purpose/Objective: We describe a transversus abdominis plane (TAP) block combined with ilioinguinal-iliohypogastric block both performed with ultrasound-guided technique in a cardiopatic pediatric patient. It appears that this technique has never been performed in pediatric patients also suffering from congenital heart disease.
Materials and Methods: Case Description: A 1-year-old male baby with congenital hypoplastic left heart was admitted for bilateral hernia repair. He weighted 9.2 kg and because of his heart disease we placed careful to hemodynamic stability. Inconsistent blockade of ilioinguinal-iliohypogastric nerve is common after TAP block so we decided to combine it with ultrasound ilioinguinal-iliohypogastric block. With ultrasound-guided procedure we performed an ultrasound TAP block using needle 50mm-22 Ga. The TAP block was performed visualizing external oblique, internal oblique and transversus abdominis muscles, 0.3 ml/kg levobupivacaine 0.25% was administered between the internal oblique and transversus abdominis muscles. The needle was retracted and reintroduced to perform an ultrasound ilioinguinal-iliohypogastric block (0.3 ml levobupivacaine 0.25%). All blocks were performed bilaterally.
Results: An excellent perioperative hemodynamic stabilty was obtained in this cardiopatic patient.
Conclusions: The described echoguided blocks are complementary and even if ilioinguinal and iliohypogastric block comprises one part of TAP block, they may be incomplete and a little amount of local anesthetic around the two nerves may better cover analgesia using lower doses of local anesthetics with advantage when block is performed bilaterally. In our case the baby was suffering from hypoplastic left heart syndrome with hig risk of hypotension in case of general and neuraxial anesthesia. The above ultrasound blocks assured hemodynamic stability.

A REGIONAL ANESTHESIA EXPERIENCE IN A TRAUMATIZED INFANT

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Purpose/Objective: To present an interesting case report of the advantages of providing epidural analgesia to an infant requiring prolonged hospitalization, suffering allegedly from BATTERED BABY SYNDROME with multiple rib fractures.
Materials and Methods: A two month old baby was hospitalized with multiple rib fractures and hemothorax, as a suspected case of parental neglect and assault. On admission to PICU, the child was intubated for respiratory distress. Radiology revealed multiple right sided rib fractures(1–9). Opioid analgesia was initiated incrementally with fentanyl infusion of upto 1micg/kg.hr. As weaning and extubation was not possible,epidural analgesia was planned. A size 19G epidural catheter was inserted at T7 level and was fixed 4cms at skin level. The epidural was activated with a bolus of 2ml of 0.25% Bupivacaine followed by a continuous infusion of 0.15% @ 2ml/hr. In the next 2 days, Bupivacaine concentration was gradually tapered down to 0.1% , 0.08% and eventually to 0.06% at the rate of 1ml/hr. During this period child was able to move limbs,was pain-free and the opioids were tapered and stopped. Neonatal/Infant Pain Scale(NIPS) was used for pain assessment. The epidural catheter was removed after six days with the childs ventilatory parameters markedly improving and the child was extubated, remained comfortable and pain free.
Results: Epidural analgesia for this child undoubtedly improved pain scores, facilitated recovery and avoided prolonged intubation and hospitalization. Unwarranted opioid side-effects were also avoided.
Conclusions: Epidural analgesia is no doubt,a powerful weapon to the pediatric anesthesiologist and intensivist for management of infants with rib fractures and compromised ventilatory parameters.

EXPERIENCES OF PERFORMING TRANSFORAMINAL BALLOON ADHESIOLYSIS IN PATIENTS WITH FAILED BACK SURGERY SYNDROME

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Purpose/Objective: Epidural fibrosis is a common occurrence following spinal surgery and an important causative factor of FBSS. It has been suggested that lysis of epidural fibrosis can reduce epidural fibrotic tissue and improve the delivery of administered drugs to the target lesion, thereby reducing pain.
Materials and Methods: A 76-year-old female patient who had undergone two lower back surgeries-left partial laminectomy for disc herniation four years prior. Lower back pain and numbness in the left calf had developed about 6 months after the last operation. Despite various treatments, she complained of persistent symptoms and we therefore decided to perform transforaminal balloon adhesiolysis. A filling defect in the medial side of her left L5 pedicle was confirmed by fluoroscopy using a contrast medium. A 3-Fr Fogarty catheter was introduced into the epidural space of her left L5 intervertebral foramen, followed by serial balloon decompression. After removal of the Fogarty balloon catheter, she was administered 3 mL of a mixture of 0.8% lidocaine, 20 mg triamcinolone, and 1500 IU hyaluronidase. There were no complications throughout the procedure.
Results: For the next 17 weeks, the patient reported reduced leg pain (2 of 10), improved functional status (28%), and increased walking time (60 minutes). Eighteen weeks after treatment, her symptoms reoccured, but were more tolerable (4 of 10) than prior to treatment.
Conclusions: Epidural adhesiolysis using a Fogarty catheter via the transforaminal approach to reach the target area is a useful procedure for treating FBSS in patients who have demonstrated limited improvement.

PERIPROSTHETIC FRACTURE FIXATION OF FEMUR UNDER REGIONAL ANAESTHESIA IN A PATIENT WITH SEVERE AORTIC STENOSIS

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Purpose/Objective: Background: 82 yr old female with background history of Cognitive impairment and severe aortic stenosis with gradient of 117 mmHg came to hospital with history of unwitnessed fall. Patient unable to give history of event due to cognitive impairment and acute confusion. Examination revealed tender swollen left thigh without neurovascular compromise.

X-Ray of left femur revealed spiral peri-prosthetic shaft fracture. Previously patient was deemed not suitable for surgical AVR, as the cardiologists and surgeons felt that she would not tolerate cognitive decline associated with cardio-pulmonary bypass. High risk nature of anaesthetic/operation explained to family. DNAR form signed prior to surgery.
Materials and Methods: Apart from routine monitoring, Invasive arterial line to monitor blood pressure was inserted. Propofol was used for sedation. Metaraminol infusion was used to maintain blood pressure.

Continuous Lumbar plexus nerve block (Capdevilla approach,): sterile technique, under sedation, Stimucath set (Arrow International, Stimucath 19Gx600mm), 1mA to 0.5mA threshold. 10ml 0.5% Chirocaine bolus administered.

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Sacral Plexus block (Para sacral approach): 100mm Uniplex Nanoline needle 1mA to 0.5mA threshold, 10ml 0.5% Chirocaine injected.
Results: Patient comfortable throughout the operation which lasted for 90 minutes. Postop operatively patient was sent to the ward with 0.2% Ropivacaine infusion via lumbar plexus catheter at 5ml/hr via elastomeric pump along with paracetamol and codeine. Patient was comfortable on the ward.
Conclusions: As this patient was high risk for general anaesthesia, we used our regional anaesthesia technique to anaesthetise this patient. Advances in the field of regional anaesthesia has made it possible to anaesthetise medically challenging patients.

INFRACLAVICULAR BLOCK/SPINAL ANESTHESIA FOR THE PATIENT WITH PLEURAL EFFUSION, CONGESTIVE HEART FAILURE, CHRONIC LEUKEMIA AND DIABETES MELLITUS.

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Purpose/Objective: Regional anesthesia provides consciousness, spontaneous breathing,continuous airway reflexes and better analgesia for postoperative period to the general anesthesia.Regional blocks are also useful for patients with chronic disease(especially pulmonary).This report aims to discuss spinal anesthesia-infraclavicular block combination for upper and lower-extremity surgery.
Materials and Methods: 73y, 45kg, ASAIVstatus,female-patient operated for left-femur and left radius-fracture. There was atrial fibrillation, congestive heart-failure,chronic lenfosytic leukemia,diabetes mellitus and hypertension for her 5-years history.

The sounds of the pulmonary osculation decreased bilaterally and the heart beat was arrhythmic.

Chest X-Ray:Cardiothoracic Index:?,Thorax-BT and BT-Angiography: Heart was bigger than normal,pleural effusion signs were bilateral hemithorax,there was consolidation in right pulmonary. The blood gases preoperatively: pH:7.39, pCO_2:35, pO_2:43.5, spO_2:76.6, Lac:22, HCO_3:21.9.

Preoperatively, the patient's BP:130/94mmHg, HR:103/min, SpO2:% 90 ($2mldk^{-1}O_2$ with face mask).We thought that the combination of infraclavicular block-spinal anesthesia was better.We performed initially infraclavicular block 2cm medial-2cm inferior from the coracoid process of the scapula with stimulation needle,via nerve-stimulator. After the localization of plexusus-brachialis, was given 10ml% 2 lidocaine–20ml% 0.5 levobupivacaine. The sensational and motor block were adequate in 16^{th}min. Secondly spinal anesthesia was done from L3-L4 spinal space with the 26 G-atraumatic spinal-needle and was given % 0.5 levobupivacaine 2.5ml.
Results: 5min later the Bromage was 3 and the block level was L1.10min later the operation started. Maximum block-level wasT7 and the operation-time was135min.Both operations done simultaneously. The patient was painlessly operated, stayed one hour in recovery room, and only needed analgesic after4^{th}hour of the operation in the ward.
Conclusions: The choices of regional anesthesia and the local anesthetic are important for proper operation and suitable patients. Peripheral blocks are useful for postoperative pain-assessment.In conclusion the combination of regional anesthesia is better alternative for the patients with trauma (upper-lower extremity).

ACUTE COMPARTMENT SYNDROME AND REGIONAL ANAESTHESIA: A CASE REPORT.

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Purpose/Objective: We describe the case of a 19 year old ASA I male, who was scheduled to undergo revision of right radius open reduction internal fixation.
Materials and Methods: Combined general anaesthesia with brachial plexus block was planned. An ultrasound guided supraclavicular brachial plexus block was performed using 10 mls each of 2% lidocaine/adrenaline and 0.5% bupivacaine. The surgery proceeded uneventfully.
Results: 20 minutes post extubation patient complained of pain along the lateral border of the forearm. The pain was described as a dull persistent pain on the ventral aspect of the forearm and deep inside the fingers with sparing of the palm, the dorsum of forearm and hand. Intravenous paracetamol , diclofenac and morphine up to 10 mg was administered with no relief. 2 hours post block, pain intensity was 10/10 in spite of a demonstrably dense sensory and motor block. On examination forearm was tender to touch, swollen and tense. The fingers were pale with prolonged capillary refill time. There was no radial pulse which was confirmed with an immediate doppler. Patient was immediately moved to operating theatre for re exploration. A large haematoma was discovered. A bleeding vessel was found and haemostasis secured. The patient was transferred to the recovery room.

Upon follow up there were no further sequel and the patient returned for formal recision 2 days later.
Conclusions: A compartment syndrome can present in the setting of a densely working peripheral nerve block. The 6 P's are reliable signs/symptoms when used with high suspicion of index. Pulselessness can be an early sign.

LOW-DOSE EPIDURAL ANAESTHESIA IN PARTURIENT WITH MILD DILATED CARDIOMYOPATHY.

E. Shifman[1], S. Sokologorsky[1]. [1]*Department of Anaeshesiology and Critical Care Medcine, Peoples' Friendship University of Russia, Moscow, Russia.*
Purpose/Objective: Dilated cardiomyopathy (DCM) is a rare (1:7000 live births) disorder with a very high rate of mortality. Women with DCM are at a high risk for complications during pregnancy.
Materials and Methods: 17-years old parturient attended to our clinic at 35 weeks' gestation with shortness of breath, periferal edema, noctural dispnoea and a tight chest. She had a 8-years DCM history after myocarditis due to infection. She presented severe mitral and mild tricuspid regurgitation. Her blood presssure was 135/70 mmHg, heart rate 72 bears/min. Physical examination revealed systolic murmur and peripheral edema. On 4th day stay in clinic elective cesarean section (CS) under epidural anaesthesia (EA) was perfomed. After 3,0 mL 2% lidocaine test dose epidural catheter was placed and she received 0,75% ropivacain 20 mL with fentanyl 25 μg incrementally. During surgery her haemodynamics remained stable and oxygen saturation was maintained at 95-98%. A healthy baby was delivered at 4th min of CS. Intraoperative blood loss was 800 mL and was filled with balanced crystalloid solution, autologous blood and madnesium sulfate 25% 20 mL. 3 hours after surgery EA with 4ml/h of 0,1% ropivacaine and fentanyl 50 μg were initiated. Infusion of magnesium sulfate 25% 50 mL 2mL/h was administrated.
Results: Echocardiography findings before and 5 day after CS demonstrated improvement of haemodynamic parameters. No signs of heart failure were presented on 8th day after CS.
Conclusions: Low-dose EA may be used not only as anaesthesia of choice on parturients with DCM but as a component of perioperative haemodynamic management also.

ANAESTHETIC MANAGEMENT OF A PATIENT WITH ESCOBAR SYNDROME (MULTIPLE PTERYGIUM SYNDROME) FOR LSCS

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Purpose/Objective: Patients with Escobar syndrome pose specific challenges to the anaesthetist. We present our anaesthetic expereince for LSCS in a woman with this condition.
Materials and Methods: Short statured primi with Escobar syndrome was admitted for LSCS at full term. She had severe kyphoscoliosis, restricted hand movments, atrophic shoulder, webbed neck and limited mouth opening. Lumbar spine was easily palpable. Spinal anaesthetic was administered with 2.4 mls 0.5% Bupivacaine and 300 mcg Diamorphine. 20 minutes later, block level was T4 on right and T6 on left side. GA was planned. Tracheal intubation was succesful with awake FOI and Remifentanil TCI. GA maintained with TIVA Propofol and Remifentanil. Both mother and baby had satisfactory outcome.
Results: Main anaesthetic consideration in Escobar syndrome is difficulty with central neuraxial block due to kyphoscoliosis. Following succesful CNB, local anaesthetic spread may fail due to abnormal curvature or septal bands. They also have difficult airway due to limited mouth opening and joint webbing and may need awake FOI. Their short stature warrants smaller ET tubes

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for intubation. Due to Malignant Hyperthermia risks, consideration should be given to using TIVA and Rocuronium for anaesthetic maintenance.
Conclusions: This is the first case report of succesful anesthetic management of patient with Escobar syndrome for LSCS following unsuccesful spinal anaesthesia. Careful planning, back-up plans and clear communication between staff is crucial to succesful anaesthetic conduct for LSCS in patients with complex syndromes like Escobar syndrome.

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AXILLARY BLOCK FOR HAND SURGERY USING 50:50 MIXTURE OF 0.75% ROPIVACAINE AND 2% LIGNOCAINE WITH 1:200,000 EPINEPHRINE: A POST-OPERATIVE PATIENT EXPERIENCE AND SATISFACTION SURVEY

S. Agarwal[1], B. Purushothaman[1], M. Leonard[1]. [1]*Anaesthetics, Queen Elizabeth Hospital, Birmingham, United Kingdom.*

Purpose/Objective: Local anaesthetics mixtures used for axillary blocks vary in terms of their efficacy, duration of anaesthesia and analgesia. The usual practice in our hospital, a tertiary referral centre for hand surgery, is to use a 50:50 mixture of 0.75% ropivacaine and 2% lignocaine with 1:200,000 epinephrine for an ultrasound-guided, stimulator-aided, 3 nerve technique. We evaluated the patient experience including block duration, pain scores and overall patient satisfaction.
Materials and Methods: After obtaining verbal consent, patients who had undergone hand surgery under axillary block were contacted 24-48 hours later by telephone. The responses of contactable patients were collected on a proforma and analysed.
Results: Ninety patients were included. The age range was 16-65 years (mean: 37.3 years) and 73.3% were male. No sedation was required in 97.8%. The total volume of the anaesthetic mixture instilled was 20-40 ml (mean: 28.2 ml). The duration of the block could be ascertained in 93.3% patients. Sensation returned after 4.5-27 hours (mean: 10 hours, 6 min; median: 8 hours). Only 97.77% continued with the rest of the survey. Of these, pain scores of 0 (none), 1-3 (mild), 4-6 (moderate) and 7-10 (severe) were reported in 13.6%, 22.7%, 29.5% and 34.1% patients, respectively. The majority found the procedure as expected (90.9%) and the information adequate (93.2%). All patients were satisfied and 90.9% patients reported that they would consider this regional anaesthetic again, if required.
Conclusions: Regional block for hand surgery is tolerated well in our centre. The majority of patients report a good experience and the overall patient satisfaction is very high.

IS COMBINED LUMBAR PLEXUS AND SCIATIC NERVE BLOCK SAFEST ANAESTHESIA TECHNIQUE IN HIGH RISK PATIENTS FOR LOWER LIMB SURGERY?

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Purpose/Objective: Objective of our study is to confirm the safety and efficacy of combined lumbar plexus and sciatic nerve block for lower limb surgery in high risk patients in comparison with general or neurexial anaesthetic techniques..For lower limb surgeries general, spinal and epidural anaesthesia has been used with variable safety profiles especially when associated with high risk (ASA III-IV) patients.
Materials and Methods: Twelve patients (n 12) mean age 71 years, ASA III-IV, with severe cardiac dysfunction,were planned for lower limb surgeries, between January 2012 till May 2013. Patients were randomely choosen to have combined lumbar plexus and sciatic nerve block as sole technique for anaesthesia.
Results: Median pain score(VAS) intraoperatively was 0,median sedation score (modified Wilson)was 1 in eleven patients (91.6%) and 2 in one patient (8.3%),mean duration of surgery was 2 hours,ten patients(83.3%) did not require any topup local infiltration during surgery ,while two patients (16.6%) required local anaesthetic infiltration once ,nine patients(75%) has VAS 0 in PACU,eight patients (66.6%) still had VAS of 0 at 4 hours, while three (25%) still had no pain 8 hours post op.There were no complications related to combined block they had except one patient has sedation score of 2 in PACU. There was no negative effect on there cardiac status during the perioperative period. All patients were satisfied with the anaesthetic technique used.
Conclusions: Considering the high safety and comfort profile for this technique in our study,we recommend combined lumbar plexus and sciatic nerve block for high risk patient provided the expertise is available.

COMBINED SCIATIC AND FEMORAL NERVE BLOCKS FOR INFRAINGUINAL ARTERIAL BYPASS SURGERY IN HIGH RISK PATIENT

A.M. Mafra[1], A.C. Castro[1], J.E. Eça[2], S.C. Carneiro[3], F.C. Correia[4], R.S. Santos[4], D.F. Figeuiredo[4]. [1]*Anesthesiology, Centro Hospitalar de Trás-os-Montes e Alto Douro, Vila Real, Portugal,* [2]*Anesthesiology, Centro Hospitalar de Tâmega e Vale de Sousa, Penafiel, Portugal,* [3]*Anesthesiology, Hospital Pedro Hispano, Matosinhos, Portugal,* [4]*Anesthesiology, Centro Hospitalar do Porto, Porto, Portugal.*

Purpose/Objective: Vascular surgical patients usually have atherosclerotic and other coexisting diseases, influencing perioperative management[1]. Severe aortic stenosis(AS) is associated with high morbidity/mortality[2]. Choice of anesthetic technique influences both surgical stress and intraoperative hemodynamic response[1].Femoro-popliteal bypass surgery (FPBS) is usually performed under general/spinal/pidural anesthesia. Peripheral regional anesthesia(PRA) could be a valuable choice in high-risk patients[3].
Materials and Methods: Case report: Two patients, both men (82 and 64 year-old), ASA IV, with grade IV peripheral arterial disease, proposed for FPBS. Both had multi cardiovascular risk factors (typeII diabetes mellitus, hypertension, dislipidemia and smoking);severe coronary disease, classIII (NYHA) heart failure(HF), global hypokinesia of the left ventricle with low LVEF (< 30%), severe AS (functional area<0.5 cm^2). A femoral and a sciatic nerve blocks were performed with ultra-sonography (US) guidance. The patients remained awake and both procedures progressed favorably, with adequate level of anesthesia, hemodynamic stability and postoperative analgesia.
Results: FPBS is usually performed under GA or central nerve blocks[1]. GA can be associated to wide hemodynamic changes in patients without cardiac reserve. Spinal and epidural anesthesia commonly results in hypotension which may be exacerbated and have negative implications in patients with severe AS[2]. PRA techniques provide suppression of surgical stress response, avoid hyperdynamic response to light GA and reduce the risk of postoperative respiratory complications. It also improves regional blood flow to the limb and avoids the use of cardiac depressant agents.
Conclusions: This report emphasizes the advantages (intraoperative hemodynamic stability with an acceptable postoperative course) of PRA for FPBS, presenting it as a possible choice.

REGIONAL ANAESTHESIA DOCUMENTATION – AN AUDIT CYCLE

R. Barr[1], S.K. Arava[1]. [1]*Anaesthetics and Intensive care, Craigavon Area Hospital, Belfast, United Kingdom.*

Purpose/Objective: Ultrasound guidance has renewed interest in Regional anaesthesia with increasing number of blocks performed. Accurate record keeping is part of good medical practice, facilitates data collection for audit, research and can be used in legal proceedings [1].
Materials and Methods: Prospective audit between January-June 2012 looked at documentation of peripheral nerve blocks (PNB) using NYSORA based proforma[2]. Changes were made to our anaesthetic record sheet based on findings. We re-audited in March-April 2013 closing the audit loop.
Results: Initial audit collected data on 25 PNB. Areas of concern included poor documentation of consent, side, 'stop before you block', level of sedation, minimal currents and complications (Table). Two main issues needed addressed:

Inadequate space/prompts on existing anaesthetic record

A lack of consensus on minimum dataset to be documented

Following implementation of a modified anaesthetic record incorporating simple tick boxes for minimum essential data and education regarding the importance of RA documentation, we re-audited a sample of 15 PNB.

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Audit cycle	PNB (n)	Side (%)	SBYB (%)	Consent (%)	Asepsis (%)	Level of sedation (%)	Minimal PNS current (%)	Complications (%)
Jan-Jun 2012	25	25	8	63	75	67	67	67
Mar -Apr 2013	15	100	100	67	40	93	100	47

Conclusions: The quality of RA documentation was inadequate in our unit. Significant improvements were noticed following implementation of modified anaesthetic record. Attention now needs to be focused on improving documentation of consent, asepsis and complications.

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WHY MAKE REGIONAL ANAESTHESIA DIFFICULT? PROPOSALS FOR USG NERVE BLOCKS WITH GREATER PATIENT AND PRACTITIONER COMFORT

K. Jensen[1], J. Børglum[1]. [1]*Anaesthesia and Intensive Care Medicine, Bispebjerg Hospital, Copenhagen, Denmark.*

Purpose/Objective: Nerve stimulator-based regional anaesthesia greatly depends on surface anatomical landmarks for the initial needle approach. Practitioners trained in this technique often find fault with ultrasound-guidance (USG), claiming it has nothing new to offer in terms of efficacy or safety. An often overlooked advantage of USG is, however, to make identification of neural targets easier, to be less dependable on variations in surface anatomy, and to improve patient comfort during the procedure by fewer needle passes and patient repositionings.

Materials and Methods: This is a proposal for the use of seven selected truncal and lower extremity nerve blocks that have recently been published. The nerve blocks have been chosen as easy-to-perform alternatives to common textbook techniques involving either epidurals, double pop, nerve stimulator or USG techniques for analgesia and anaesthesia of the abdominal wall or lower extremity. Criteria for inclusion were easy patient handling and few necessary needle passes.

Results: The seven USG alternatives are described in figure 1, with proposed probe types and needle approaches. All blocks may be administered with the needle in-plane and the probe axis perpendicular to the neural target.

Nerve block type	Textbook method	Simplified method
Abdominal wall	Patient on contralateral side; TAP, paravertebral or epidural	Patient supine with pillow under buttock; quadratus lumborum block; approach lateral or medial (transmuscular), linear or curved probe
TAP	Patient on contralateral side; double pop at triangle of Petit	Patient supine; medial approach in each hemiabdomen (linear probe)
Lumbar plexus	Patient on contralateral side; paravertebral approach with nerve stimulator	Patient on contralateral side; shamrock technique at Tuffier's line; medial approach (curved probe at L4 transverse process)
Sacral plexus	Patient on contralateral side; gluteal approach with nerve stimulator	Patient on contralateral side; parasacral parallel shift, gluteal approach (curved probe)
Sciatic proximal	Patient on contralateral side or leg rotated contralaterally; lateral, gluteal or subgluteal approach	Patient supine; medial approach (curved probe proximal femur)
Sciatic at popliteal fossa + saphenous nerve	Patient supine, then on contralateral side or with elevated leg on a rest; anterior, then lateral approach in popliteal fossa	Patient supine; SPEDI technique (single penetration dual injection), medial approach (curved probe mid-femur)
Sciatic at popliteal fossa	Patient on contralateral side or with elevated leg on a rest; lateral approach in popliteal fossa	Patient supine; leg rotated outwards, medial approach (linear probe in popliteal fossa)

Conclusions: While conceding that large-scale studies on success rates and clinical applications need to be undertaken, we are suggesting that these alternatives to common abdominal wall or lower extremity blocks may be as easy to administer as textbook methods, but with greater patient and practitioner comfort, and with easier patient handling.

A RETROSPECTIVE AUDIT OF THE ANAESTHETIC MANAGEMENT OF SHOULDER ARTHROPLASTIES

V. kaushik[1], S. Sothisrihari[1], S. Kumaran[1], P. Kakodkar[1]. [1]*Anaesthetics and critical care, Northampton General Hospital, Northampton, United Kingdom.*

Purpose/Objective: There is very little published data describing demographic profile of the population and the quality of anaesthetic management received by patients undergoing Shoulder arthroplasty (SA).

The aims of our audit were

1. To describe the demographic profile of the population presenting for SA in a district general hospital in the UK.
2. To identify factors for quality improvement in the anaesthetic management of these patients.

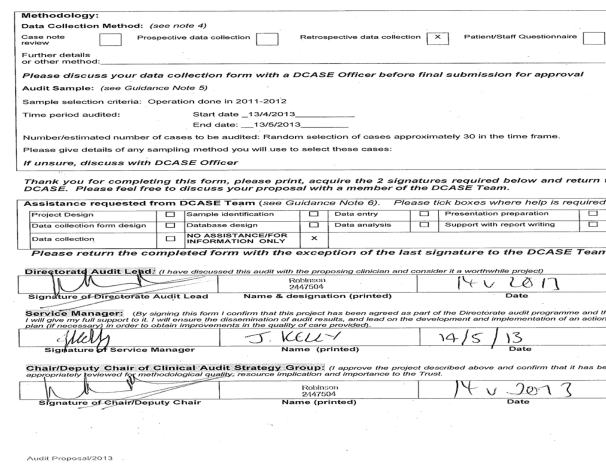
Materials and Methods: We reviewed cases of shoulder arthroplasties done in 2011-12. Data of interest were captured on a standard form and transferred to Excel sheet for analysis.

Results: We examined 31 case notes. The demographic profile of the population studied is summarised in table. We identified a high prevalence of comorbidities, anaemia and antiplatelet therapy in these patients. We identified that interventions such as preoperative gabapentine; intraoperative ketamine, NSAID, tranexamic acid useful for enhanced recovery were not used for SA.

Postoperative pain was adequately managed with Interscalene block (ISB) and oral analgesics.

Age (years) (mean +SD)	Gender (Female %)	No. of comorbidities (median +IQR)	% BMI>30	Anaemia % Female<12gm% Males <13gm%	Antiplatelet therapy(APT) %
74.10 and 6.91	80.64%	Median -2 and IQR-2-3	51.61%	F-13/31= 41.93% M- 3/31= 9.67%	25.80% patients were on APT

Conclusions: Our audit found a high prevalence of anaemia, obesity and anti-platelet therapy in a high-risk elderly population undergoing SA. We found that postoperative pain can be adequately managed with interscalene block and oral analgesics. We suggest studying the benefits of enhanced recovery interventions (used in other major joint replacement) in SA.


Methodology:
Data Collection Method: (see note 4)
Case note review ☐ Prospective data collection ☐ Retrospective data collection ☒ Patient/Staff Questionnaire ☐
Further details or other method:
Please discuss your data collection form with a DCASE Officer before final submission for approval
Audit Sample: (see Guidance Note 5)
Sample selection criteria: Operation done in 2011-2012
Time period audited: Start date 13/4/2013 End date: 13/5/2013
Number/estimated number of cases to be audited: Random selection of cases approximately 30 in the time frame.
Please give details of any sampling method you will use to select these cases:
If unsure, discuss with DCASE Officer
Thank you for completing this form, please print, acquire the 2 signatures required below and return to DCASE. Please feel free to discuss your proposal with a member of the DCASE Team.
Assistance requested from DCASE Team (see Guidance Note 6). Please tick boxes where help is required
Project Design ☐ Sample identification ☐ Data entry ☐ Presentation preparation ☐
Data collection form design ☐ Database design ☐ Data analysis ☐ Support with report writing ☐
Data collection ☐ NO ASSISTANCE/FOR INFORMATION ONLY ☒
Please return the completed form with the exception of the last signature to the DCASE Team
Directorate Audit Lead: (I have discussed this audit with the proposing clinician and consider it a worthwhile project)
Signature of Directorate Audit Lead — Robinson 2447504 Name & designation (printed) — 14 v 2013 Date
Service Manager: (By signing this form I confirm that this project has been agreed as part of the Directorate audit programme and that I will give my full support to it, I will ensure the dissemination of audit results, and lead on the development and implementation of an action plan (if necessary) in order to obtain improvements in the quality of care provided).
Signature of Service Manager — J. KELLY Name (printed) — 14/5/13 Date
Chair/Deputy Chair of Clinical Audit Strategy Group: (I approve the project described above and confirm that it has been appropriately reviewed for methodological quality, resource implication and importance to the Trust.
Signature of Chair/Deputy Chair — Robinson 2447504 Name (printed) — 14 v 2013 Date
Audit Proposal/2013

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ID No. (office use only)

DCASE Audit Proposal Form

All non mandatory clinical audit projects being entered on the Trust forward programme must be approved by DCASE before they start. Please discuss your proposal with one of the DCASE Audit Officers.

(Please see Guidance Notes which are available within a separate document)

Your Details: *(Main audit project contact)*

Name: Dr Vipul.Kaushik	Directorate: Anaesthetics
Position / Job Title: ST6	Ward/Dept: Anaesthetics
Email: Vipul.kaushik@ngh.nhs.uk	Tel: 4863 Bleep:

Audit Title: *(see Guidance Note 1)*

A RETROSPECTIVE AUDIT OF THE ANAESTHETIC MANAGEMENT OF SHOULDER ARTHROPLASTIES.

Has this audit been identified as a result of an SUI / Near Miss / or Risk — No

If yes, has the Risk been identified on your Directorate Risk Register — No

Please provide Risk Register No.

(For office use only) Low / Medium / High / Priority Audit

Project Team:

Name	Job Title	Specialty	Role within Project (data collection, Supervisor etc)
Vipul Kaushik	ST6	Anaesthetics	Data collection, analysis, presenter
Saranga Sothisrihari	ST3	Anaesthetics	Data collection, analysis
Senthil Kumaran	Consultant	Anaesthetics	Supervisor
Prashant Kakodkar	Consultant	Anaesthetics	Supervisor

Participation Details:

What areas will this audit impact on (eg. another profession / Specialty / Trust)	Who in this area have you discussed/agreed this audit with? Name	Job Title	Date Agreed
Orthopaedic			
Anaesthetics	Dr P Kakodkar	Consultant	April 13, 2013
Trust			

DAY TO DAY MANAGEMENT OF A BUSY REGIONAL ANAESTHESIA BLOCK SERVICE IN A TERTIARY REFERAL HAND CENTRE.

M. Leonard[1], A. Jenkins[1], A. Chinyimba[1], S. McColl[1], F. Robertson[1], K. Houston[1], M. Bowden[1]. [1]*Department of Anaesthesia, Queen Elizabeth Hospital, Birmingham, United Kingdom.*

Purpose/Objective: To demonstrate the successful set up and running of a busy hand centre anaesthetic service, delivering upper limb regional anaesthesia to around 4500 patients per year.

Materials and Methods: The Birmingham hand centre provides surgical input for around 4500 patients per year. 95% of these operative procedures are performed under regional anaesthesia. The service has expanded from around 30% regional anaesthesia in only 4 years.

The service is unique to the UK in its use of physicians assistants in anaesthesia (PA(A)'s). PA(A)'s are fundamental to the running of the service and perform around 75% of all upper limb anaesthesia in the trust, as well as introducing and managing innovations within the area to improve patient experience and throughput.

Results: By providing a PA(A) within the block service ensures a continuity of service delivery. A consistent presence in the area ensures the smooth running and innovative introductions which make the Birmingham Hand Centre one of the busiest and most efficient block areas in the UK.

Conclusions: The presence of a PA(A) in the block area ensures that there is always a competent member of staff available, this enhances the training and support of junior members of the anaesthetic team, and ensures smooth running of a busy block service.

Familiarity of an area induces innovative ways to enhance the service, and as a group the model has been adapted to provide an efficient and safe patient journey with very positive feedback from all concerned.

UPPER ARM AND AXILLAR ARTERIOVENOUS FISTULA SURGERY UNDER REGIONAL ANESTHESIA: PARTICULARITIES

D. Gomes[1], C. Lobo[1], J. Barros[1], M. Pereira[1]. [1]*anestesia e terapêutica da dor, centro hospitalar de trás os montes e alto douro, Vila Real, Portugal.*

Purpose/Objective: Medical history of end-stage renal disease patients report several lost patency episodes of arteriovenous fistula (AVF), multiple surgical interventions with increasing complexity, extension and more proximal approaches (upper arm/axilla - UAA). Complex local innervation, anatomic deformities and severe illness dare the regional anesthesiologist.

Report our institution's experience considering UAA AVF surgery with ultrasound-guided brachial plexus block (USG-BPB) and literature review.

Materials and Methods: Methods: Retrospectively were reviewed six patients who underwent UAA AVF surgery (picture1) with USG-BPB and immediate post-operative pain, during the last 6 months. Literature review on Pubmed[R].

Results: A modified axillary approach was used in four patients and a supraclavicular block on the other two. A combination of mepivacaine1,5% (10-20mL with or without NaHCO3), ropivacaine0,5% (10-30mL) or/and levobupivacaine0,5% (10-20mL) was used. All six patients completed the procedure successfully with excellent post-operative pain control. Two patients needed extra anesthetic intervention: One from the modified axillary approach group complained of pain on the intercostobrachial territory, resolved with local infiltration. The other, from the supraclavicular block, referred pain on the medial aspect of the upper arm. With intravenous analgesia and sedation, surgery was completed. No reports were found in the literature considering this specific, more demanding surgery using an USG-BPB.

Conclusions: USG-BPB can be a good option for UAA AVF surgery. Although, some anatomical and nerve territory innervation of that specific body area should not be neglected for the benefit of a successful procedure and patient safety.

SURVEY ON USE OF REGIONAL BLOCK NEEDLES AND ULTRASOUND GUIDANCE.

K. Nyangoni[1]. [1]*Anaesthetics, Royal Derby Hospital, Bridgend, United Kingdom.*

Purpose/Objective: Regional blocks offer several advantages to patient care such as superior postoperative analgesia, reduced incidence of chronic pain states, reduced incidence of postoperative nausea and vomiting and faster return to normal function. Traditionally regional blocks were performed using anatomical landmarks, seeking paraesthesia and using nerve stimulators to locate the target nerve(s). The needles commonly available for regional blocks have an attachment to a nerve stimulator to reflect the traditional method of nerve block guidance. Our aim for doing this survey was to know whether anaesthetists practising in England would accept to use a regional block needle without an attachment to a nerve stimulator.

Materials and Methods: An online questionnaire was sent to 39 hospitals in England with the aim to find the current practise on regional blockade in England. Information was sought on the type of needle commonly used by respondents and the method used for needle guidance.

Results: They were 170 respondents of which 76.5% were consultant anaesthetists. 97.5% of respondents had access to an ultrasound machine for performing nerve blocks. 62% of respondents indicated they would use a needle without a nerve stimulator attachment, to use for regional blockade.

Conclusions: The survey reveals that the majority of respondents have access to an ultrasound machine for nerve blockade, and would accept to use a needle without an attachment to a nerve stimulator. This may have cost saving implications as such a needle may be available at a lower cost than one with a nerve stimulator attachment.

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TRANSVERSUS ABDOMINIS PLANE BLOCK WITH ROPIVACAINE 0,2% AFTER OPEN RADICAL PROSTATECTOMY: A PROSPECTIVE COHORT STUDYT

H. roberto[1], S. Narvaez Galan[1], M. Llacer Perez[1], L. Ramirez Rondon[2]. [1]*SERVICIO DE ANESTESIOLOGIA Y REANIMACION, HOSPITAL COSTA DEL SOL, Málaga, Spain* [2]*Facultad de Ciencias de la Actividad Fisica y el Deporte, Universidad de Granada, Granada, Spain.*

Purpose/Objective: Open radical retropubic prostatectomy (ORRP) is associated with moderate pain and discomfort. We hypothesized that a transversus abdominis plane (TAP) block would reduce post-operative pain, morphine consumption and opioid-related side effects compared with placebo in this population.

Materials and Methods: This is a prospective cohort study. We analyze patients udergoing open prostatectomy surgery (performed in general anaesthesia) that received bilateral TAP block with ropivacaine 0.2% 40ml on each side. Post-operatively, all patients treated with ketorolac and paracetamol, followed by oral paracetamol and ibuprofen at regular doses and intervals, and rescue analgesia with oral morphine from 0 h to 24 h post-operatively.

Results: The primary outcome is the Visual analogue scale pain score 4 h at p*ost-anesthesia care unit (PACU)*. Secondary Outcome Measures are VAS pain score at 12h and 24h, incidence of adverse effects (nausea, sedation, vomiting), cumulated morphine consumption (at PACU and room). The study is still open.

Conclusions: TAP block with ropivacaine could improve a basic multimodal analgesic regimen (VAS at 4h, 12h, 24h), and would reduce opioid consumption and side effects.

ULTRASOUND GUIDED PERIPHERAL NERVE BLOCKS (USPNB) TO AID IN THE DIAGNOSIS AND TREATMENT OF UPPER LIMB SPASTICITY

O.G. Hargrove[1], A. Pawa[1], G. Dua[1]. [1]*Anaesthetic Department, Guy's and St Thomas' NHS Foundation Trust, London, United Kingdom.*

Purpose/Objective: We report a potentially novel use of USPNB for diagnosis and treatment of upper limb spasticity (ULS).

Materials and Methods: AB was a 23 year old gentleman with pronounced ULS of his left elbow and wrist secondary to a childhood cerebellar haemangioblastoma excision. Despite previous biceps and brachialis lengthening procedures he was troubled by his ULS whilst running. He presented to us having been listed for removal of wrist metalwork under regional anaesthesia. It was decided that by doing the nerve blocks in sequence the major contributory muscle groups to his ULS could be identified. Therefore he received selective nerve blocks of the radial and ulnar nerves with lidocaine to see if relaxation of his brachioradialis and flexor digitorum profundus respectively would relieve his flexion deformities. Once they were relaxed as a result of the nerve block it became apparent though increased range of movement that spasticity of both these muscles was exacerbating the upper limb deformity. This led to botulinum toxin (BT) being administered under ultrasound guidance into the corresponding muscle belly. It was hypothesised a non-response would suggest joint or muscle contracture which would not be suitable for BT injection.

Results: We believe this to be a more rapid way of diagnosing ULS than BT administration and helps prevent unnecessary BT injections. Ultrasound guided BT administration may also be more accurate than landmark guided.

Conclusions: It remains to be seen whether these techniques truly inform surgical decision-making, and this patient will be followed up in the near future.

WITHOUT AN ULTRASOUND MACHINE: OLD TECHNIQUES ARE STILL USEFUL; ANKLE BLOCK FOR FOREFOOT AMPUTATION IN A COPD PATIENT IN OXYGEN THERAPY AND CARDIOLOGICAL DISORDERS

I. Kotsimpogeorgou[1], A. Manoudis[1], E. Margonis[2]. [1]*Anesthesiology, Larissa General Hospital, Larissa, Greece,* [2]*General Surgery, Larissa General Hospital, Larissa, Greece.*

Purpose/Objective: A 75 year old patient, ASA IV with Chronic Obstructive Pulmonary Disease (COPD) and oxygen therapy for 18 hour daily, diabetes, and heart failure with an injection fraction of 35% was presented for forefoot amputation due to gangrene. At the supine position he was dyspnoic. The lack of an ultrasound machine, the known difficulty of performing peripheral nerve blocks in diabetic patients in conjunction with his co morbidities lead us to perform an ankle block.

Materials and Methods: The patient received an ankle block with 25ml ropivacaine 0.75%. The block was performed by injecting 5 ml of the solution, in each one of the 5 terminal nerves (deep and superficial peroneal, sural, tibial and saphenous). No paresthesia was elicited intentionally and no nerve stimulator was used. It was performed using only anatomical landmarks. We recorded the time of administration of the first postoperative pain medication, the patient's satisfaction from the anaesthetic technique, as well as the presence of any complications.

Results: The ankle block provided excellent surgical anesthesia and postoperative analgesia for 365 min. There were no complications and the patient and the surgeon were satisfied from the anesthetic technique. The duration of surgery was 50 minutes.

Conclusions: The ankle block is a safe and efficient anesthetic technique. Many anesthesia departments do not have an ultrasound machine to perform peripheral nerve blocks, so even techniques based on anatomical landmarks turn out to be useful.

PERIPHERAL NERVE BLOCKS IN THE SUPER OBESE

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Purpose/Objective: A 47-year-old male with a history of hypothyroidism, hyperlipidemia, bipolar disorder, and super morbid obesity (BMI 75) presented with acute wound dehiscence and tendon re-rupture following a quadriceps tendon repair surgery six weeks earlier. During the original operation, a femoral nerve block was performed given his unfavorable body habitus. The patient reported discomfort during his first surgery and additional sedation (dexmedetomidine infusion) was required as an adjuvant. For the second surgery, which included washout of wound, repair of ruptured tendon as well as the placement of external fixation device to allow healing, it was decided that a combination of femoral and popliteal blocks would provide better anesthesia and analgesia.

Materials and Methods: During surgery, specifically for the placement of pins in the fibula, the patient experienced profound discomfort requiring the judicious use of midazolam and small boluses of ketamine.

Results: Post-operatively, a popliteal nerve block was performed in PACU with immediate pain relief.

Conclusions: This case reviews the anatomical and technical difficulty of performing nerve blocks in the super obese, the benefits of regional anesthesia and of the avoidance of general anesthesia in this difficult population, and reviews the relevant literature.

PERIPHERAL NERVE BLOCK IN A PATIENT WITH CHARCOT-MARIE-TOOTH DISEASE

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Purpose/Objective: Charcot-Marie-Tooth Disease (CMTD) is a motor and sensitive peripheral demyelinating neuropathy. Classically, in these patients, general anesthesia (GA) is the technique of choice. The use of regional anesthesia or analgesia remains controversial, due to the possibility of nervous injury.

This report aims to explore the use of regional analgesia (RA) under ultrasound (US) guidance in a patient with CMTD, and clarify if the use of US can help to avoid the risk of nervous injury.

Materials and Methods: 42-years-old male patient, ASA II, scheduled to open reduction and internal fixation of a humeral fracture. A registry of prior neurologic deficits was made, as well as ultrasonographic alterations (diffuse hypertrophy and hipoecogenecity).

The anesthetic plan consisted of US guided braquial plexus block, supraclavicular approach, with 20mL of ropivacaine 0,2%. GA was induced after sensitive block.

Results: A small concentration of local anesthetic was used to minimize the possibility of neural injury. Total motor function was recovered 2.5 hours

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after the block was made. The analgesic effect lasted for 12 hours, with no need to rescue analgesics. Neurologic deficits were assessed on the third day and on the third month after surgery, without exacerbating the preexisting damage.

Conclusions: The assessment of prior neurologic deficits and the risk/beneficial analysis are crucial in patients with neurologic diseases who are potential candidates for RA techniques.

The RA under US guidance may be a secure anesthetic and analgesic option in patients with CMT disease, especially if small concentrations of LA are used.

MASSIVE PULMONARY EMBOLISM AFTER SPINAL ANESTHESIA.

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Purpose/Objective: A 65 years old man,with hypertension, was admitted for operation with right femoral fracture,8 days after falling.

Materials and Methods: At the operating room, standard monitoring was applied. Prehydration was achieved with 500ml Hydroxyethyl starch 130/0.4 and 1000 ml R/L. His BP, HR and PO_2 was 160/85 mmHg, 85 beats/min, and 96%, respectively. Spinal anesthesia was administered with patient in left lateral position, using a 22-gauge Quincke spinal needle at the L3-4 interspace with 20 mg xylocaine, 10mg chyrocaine and 10γ fentanyl. Then he was placed in the supine position. During the pin-prick test, BP was 60/40 mmHg and HR 115 beats/min and despite the repeated intravenous administration of ephedrine, etilephrine, noradrenaline and crystalloids, BP didn't increase. Left radial artery was cannulated for continuous BP monitoring. Arterial blood gas analysis revealed pH 7.354, $PaCO_2$ 32.6 mmHg, PaO_2 57.2 mmHg, HCO_3 18.4 and SaO_2 85.5%. Patient presented tachypnea but no haemoptysis or chest pain. Transthoracic echocardiography revealed enlargement of the right atrium and right ventricle and hypokinesia, which were consistent with PE. IV heparine 5,000 IU was administered. Emergency chest CT showed thromboembolism of stem and pulnomary arteries bilateral. Patient was then transported to the intensive care unit.

Results: In the ICU, patient recieved enoxaparine 80mg x 2, esomeprazole magnesium and Venturi mask 60%. He remained haemodynamically stable, full of consciousness and after two days he was transported to Cardiology Clinic.

Conclusions: The mechanism of this near-fatal complication seems to be the detachment of venous thrombi, during the movement of the patient.

AN EASY METHOD FOR DIFFICULT SPINAL ANAESTHESIA

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Purpose/Objective: Introduction: When preparing for spinal anesthetic blokade, especially in obese, elderly or pregnant patients, it is important to find landmarks on the patient to find the interspace between lumbar 4^{th} and 5^{th} or lumbar 3^{th} and 4^{th} vertebrae.

Materials and Methods: A total of 258 patients, ASA I-III, with a history of more than two failed spinal blockade attempts were included into our clinical observational study. The preparation of spinal blockade includes; 1- sitting position, 2- a- palpation of iliac crests, b- a staight line connection between midline and iliac crest, c- a straight line downward connection from iliac crest to midline at a 45 degrees. The spinal blockade is performed at our landmark point with Gauge 26 pencil point needle with spinal heavy bupivacaine 0.5%. The motor blockade and sensorial dermatome levels and hemodynamic parameters (mean arterial pressure, heart rate, peripheral oxygen saturation (sPO2) were collected.

Results: The mean age of the whole group was 47.56±4.61. From 258 patients the spinal blockade was performed at the first attempt using our landmark in 198 (76.7 %) patients in the first attempt and in 60 (23.3%) patients in the second attempt. The motor and sensorial blockade was successful in all patients. Hemodynamically from 258 patients a decrease in mean arterial pressure more than 20% in comparison to baseline was observed in 18 (7 %) patients.

Conclusions: In this study, we showed that during spinal blokade in patients with more than two failed attemps, our application landmark point in sitting position provides a technical easiness and successful performance of the spinal blockade.

THORACIC PARAVERTEBRAL BLOCKADE WITH SEDATION FOR BREAST SURGERY: A HISTORICAL CASE SERIES

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Purpose/Objective: Thoracic Paravertebral Block (TPVB) provides superior analgesia for breast surgery when used in conjunction with general anaesthesia (GA)[1]. It has recently undergone a resurgence with improvements in ultrasound (US) technology[1, 2]. For some patients GA is either contraindicated or undesirable. We present a historical case series of 28 patients who received a TPVB with sedation alone for breast surgery including mastectomy and axillary clearance.

Materials and Methods: Ethics committee approval was not obtained given the historical nature of the data. A target controlled infusion of propofol or remifentanil was used for conscious sedation during block placement and surgery. In all cases author 4 performed the block using a 16G Tuohy needle at one or two thoracic levels, a high frequency US transducer, a cranio-caudal in-plane technique[2] and enhanced needle visualization software[3]. Up to 30ml of local anaesthetic was injected, according to weight. This was initially Bupivacaine 0.5% but later changed to a 50:50 mixture with Lignocaine 2% and Clonidine 150µg to improve onset time. Adequate block was confirmed by testing temperature sensation and by the surgeon prior to incision.

Results: 28 ASA II, III and IV patients were included, between 2008 and 2012. Most were elderly with significant co-morbidities. Satisfactory operating conditions were achieved for all except one, who's extensive co-morbidities precluded GA, necessitating cancellation.

Conclusions: TPVB is an effective and reliable form of anaesthesia for breast surgery when performed under US guidance. It is a useful anaesthetic technique for patients in which GA is undesirable or poses an unacceptable risk.

EXPERIMENTAL RESEARCH OF FLUID LEAKAGE AFTER DURAL PUNCTURE BY DIFFERENT TYPES SPINAL NEEDLES

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Purpose/Objective: The aim of the study was to investigate the loss of fluid from the experimental model of the dural sac, by the puncture of two different types of needles i.e Quincke and Pencil Point sized 25G.

Materials and Methods: 150 punctures were performed with needles of sized 25 G (50 punctures - Pencil Point, 50 punctures - Quincke parallelly and 50 - perpendicularly along the fibers). The dura maters were withdrawn from 19 cadavers in forensic autopsy. To assess the effect of autolysis, cadaveric material was divided into 2 groups. In the first group (12 cadavers), the dura was removed up to 15 hours after death. In the second group (7 cadavers), the dura was removed from 15 to 24 hours after death.

Results: Maximum flow time in the first group was 15 minutes and the second group - 45 minutes. The minimum flow time in the first group was 2 minutes and the second group - 15 minutes. In the first group, the minimum fluid loss recorded by the puncture of Quincke parallelly along the fibers (0.35 ± 0.1 ml), and the Pencil Point (0.5 ± 0.2 ml). The maximum fluid loss: by the puncture of Quincke parallelly – 15.6 ± 2.1 ml, perpendicularly to the fibers - 28 ± 3.6 ml, and by the Pencil Point – 12.8 ± 2.4 ml.

Conclusions: The average loss of fluid after the puncture of the needle sized 25G is 6.2 ± 1.8 ml. Average time of closure of the holes – 5.4 ± 1.2 minutes.

THE INFLUENCE OF LATE POSTURAL CHANGE AND CSF ALBUMIN ON THE SENSORY LEVEL OF SUBARACHNOID ANAESTHESIA WITH PLAIN BUPIVACAINE 0.5% AND FENTANYL

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Purpose/Objective: Factors known to affect intrathecal spread of local anaesthetics are drug baricity and initial patient position, while concentration

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of proteins in the CSF and late patient position change are less investigated. The aim of this study was to determine the effect of late (>60 minutes after subarachnoid puncture) postural change and CSF albumin on the sensory level of block after subarachnoid anaesthesia with plain bupivacaine with fentanyl.

Materials and Methods: This prospective observational clinical study was granted Ethics Committee approval. A CSF sample of 0.5 ml (to measure albumin levels) was obtained before subarachnoid anaesthesia with 2.6 ml plain bupivacaine 0.5% and 20 μg fentanyl. Following the end of the surgical procedure, patients were placed at 34°anti-Trendelenburg position. Cold and pinprick sensation was examined immediately before, and at 0, 5, 10, 15, 20 and 30 minutes after repositioning. Statistical analysis was performed with Spearman's rank, Friedman and Chi-square goodness-of-fit test (vs. expected percentage of 0%).

Results: Forty-six patients (41% female), aged 66.3±15.8 years, were studied. Clinically significant late cephalic extent (≥2 dermatomes) of the block for cold and pinprick was found in 28.2% ($p<0.0001$) and 10.9% ($p<0.0001$) of patients, respectively, up to 170 minutes after subarachnoid puncture. This was not related to CSF albumin ($p=0.456$, $p=0.103$, respectively) or the time between subarachnoid anaesthesia and postural change ($p=0.291$, $p=0.212$, respectively).

Conclusions: Late postural change to anti-Trendelenburg position, but not CSF albumin or time after subarachnoid puncture, was associated with cranial extent of sensory block after subarachnoid administration of plain bupivacaine and fentanyl.

ULTRASOUND ESTIMATES FOR EPIDURAL PUNCTURES: INCREASING UNDERESTIMATION AS THE ACTUAL NEEDLE DEPTH TO THE EPIDURAL SPACE INCREASES.

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Purpose/Objective: Spinal ultrasound is promoted and helpful in neuraxial anesthesia, especially when traditional landmarks are difficult to identify. Prediction of epidural space depth is an advantage of the US assisted technique. Literature is not conclusive in the underestimation of the distance. We measured the skin to ligamentum flavum-dura mater complex depth by US in the transverse median plane (UD) and compared it with the actual needle depth (ND).

Materials and Methods: We included 41 pregnant women that needed a combined spinal-epidural anesthesia for labor or cesarean section. We measured the depth of the epidural space in the transverse median plane at the point of insertion, using a 4 Mhz curved array probe. The measurements were compared with the actual ND, performed by the same experienced anesthesiologist, using the loss-of-resistance technique with saline. Data were analyzed with a Bland-Altman analysis as previously reported in the study of Sahota et al.

Results: The UD and the actual ND were 4.43 (CI: 4.16 – 4.70) cm and 5.24 (CI: 4.90 – 5.57) cm, respectively. The Bland-Altman analysis showed a mean difference of 0.81 cm and 95% limits of agreement of +- 1,31 cm. As indicated by the regression line, UD is proportionally underestimated as compared to the ND, with an increasing estimation error as the ND increases (slope = 0,37 +- 0,17, $p < 0,001$).

Conclusions: The estimation error of the ultrasound measured depth of the epidural space in the transverse median plane increases by increase of the actual needle depth.

USE OF 2% HYPERBARIC PRILOCAINE FOR SPINAL ANESTHESIA IN AMBULATORY SURGERY

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Purpose/Objective: In this prospective trial, we evaluated the efficacy of 60 mg of 2% (20mg/ml) hyperbaric prilocaine for spinal anaesthesia in terms of sensory and motor block onset, sensory and motor block resolution, resumption of spontaneous diuresis, in outpatients undergoing elective short-duration (60 minutes) ambulatory surgery.

Materials and Methods: Twenty-one patients (30-75 years, American Society of Anesthesiologists grade I-II) were enrolled in this study: 57% were subjected to operative hysteroscopy, 43% undergone inguinal hernia repair.

We measured: times to sensory and motor block onset, expansion of the sensory and motor block, time to sensory and motor block resolution, time to first urinary voiding, demand of analgesics and side effects.

Results: We recorded an average onset of motor block in 4 minutes, an average onset of sensory block in 8 minutes. Mean time of sensory and motor block resolution was 95 minutes (range 40-150 min). The average time of recovery of diuresis was 120 min (range 40-200 min). No one needed rescue doses of analgesics during the first three hours after the end of surgery. We observed two cases of burning sensation.

Conclusions: Spinal anaesthesia with 3ml (60 mg) of 2% hyperbaric prilocaine is suitable for ambulatory surgery. Prilocaine demonstrated a short duration of surgical block, an effective analgesia with a T8-T10 level sensory block, a rapid recovery of diuresis. For these reasons Prilocaine can be recommended for short pelvic surgery.

OXYBUPROCAINE AND PROXYMETACAINE FOR PROLONGED SPINAL ANESTHESIA BY COADMINISTRATION OF PHENYLEPHRINE IN RATS

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Purpose/Objective: Phenylephrine that can be added to spinal local anesthetic solutions to prolong the duration of action. Here we investigated whether phenylephrine potentiates the effect of spinal anesthesia with oxybuprocaine and proxymetacaine.

Materials and Methods: The experimental procedures were approved by the Institutional Animal Care and Use Committee our University and were conducted according to IASP ethical guidelines. Rats received spinal anesthesia with oxybuprocaine or proxymetacaine co-injected with phenylephrine, and two neurobehavioral examinations (motor function and nocicception) were evaluated.

Results: Intrathecal oxybuprocaine or proxymetacaine at a dose of 0.25 μmol exhibited a spinal blockade in motor function and nociception. Co-administration of oxybuprocaine (0.25 μmol) or proxymetacaine (0.25 μmol) with phenylephrine (0.1%) displayed greater spinal anesthesia than oxybuprocaine (0.25 μmol) alone or proxymetacaine (0.25 μmol) alone, respectively.

Conclusions: Our preclinical data showed that oxybuprocaine or proxymetacaine elicited spinal anesthesia. When combined with phenylephrine, either oxybuprocaine or proxymetacaine produced a supra-additive effect of spinal anesthesia.

ULTRASOUND GUIDED PARAVERTEBRAL BLOCK, CAN WE IMPROVE THE LEARNING PROCESS?

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Purpose/Objective: The benefits of paravertebral block (PVB), in terms of pain relief and patient outcome have been suggested (1, 2). However this procedure requires advanced interventional skills. This preliminary study evaluates the transfer of competence in mater of ultrasound guidance (US) for PVB.

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Materials and Methods: The participants were anesthesiologists who gave informed consent and had a teaching including 30 min lecture on US for PVB, and 5 min individual hands on workshop using a 7-13Mhz linear probe (Sonosite Edge™ Bothell, A, USA) on a non obese live model. The age and experience in US peripheral nerve blocks with at least weekly practice were noted .group A, n=28: 24 months or less of experience ; group B, n=28: more than 24months of experience. They were asked to perform in 5 min three tasks: obtention of an optimum paramedian sonogram of the paravertebral region at T4 level upon agreement of two experts, measurement of skin -T4 transverse process and skin-pleura distances. The number of attempts and the scanning time were recorded. Data were expressed as mean ± SD and assessed with Microsoft Xlstat software (SPSS, Chicago, IL).
Results: No difference in two groups concerning age, obtention of optimum sonogram, measurement of skin-T4transverse process and skin-pleura distances. Groupe B had lower scanning time and number of attempts than group A. Table 1

TABLE. Ultrasound guided paravertebral block learning process. (p < 0.05*, ns; not significant.)

Participants	Group A: n=28	Group B: n=28
Experience in peripheral US-guided nerve blocks (months)	≤24	>24
Age(yr old)	43 ± 9,04	42 ± 6,86
Obtaining an optimum paravertebral sonogram	28/28 (ns)	28/28 (ns)
Measurement of skin-T4 transverse process distance	28/28 (ns)	28/28 (ns)
Measurement of skin-pleura distance	28/28 (ns)	28/28 (ns)
Number of attempts	1,71 ± 0,59	1,57 ± 0,57*
Scanning and measurement time (seconds)	85,80 ± 36,57	80,10 ± 33,12*

Conclusions: The capacity to restore learning of paravertebral sonoanatomy in order to perform this block is quite easy. The experience in US peripheral nerve blocks allows a faster execution of the procedure.

ULTRASOUND-GUIDED PARARADICULAR INJECTION IN THE LUMBAR SPINE: A COMPARATIVE STUDY OF PARASAGITTAL APPROACH VERSUS PARASAGITTAL OBLIQUE APPROACH

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Purpose/Objective: A prospective randomized trial was carried out to compare parasagittal approach (group P) and parasagittal oblique approach (group PO) in ultrasound (US)-guided pararadicular injection in the lumbar spine. Accuracy, contrast spread pattern, incidence rate of intravascular injection, and the precision of spinal level were evaluated.
Materials and Methods: The protocol was approved by the Institutional Review Board of Seoul St. Mary's Hospital of Catholic University (KC11OISI1005). A total of 90 injections performed in 42 adult patients were allocated to one of two groups. We identified the pararadicular aditus plane (PAP) using the previously published method. In group P, the transducer was positioned perpendicularly over the skin. In group PO, the US beam was tilted approximately 25° medially toward the PAP. A bent-needle (22-gauge, 100-mm) was inserted with an in-plane technique. The contrast media was injected under the fluoroscope.
Results: The contrast was in the targeted pararadicular compartment in 83 cases (92.2%). Injections were impossible in 2(4.4%) and 5 cases (11.1%), in group P and group PO, respectively. The contrast distribution pattern with successfully injected was intraforaminal in 17 cases (39.5%) in group P, and in 35 cases (87.5%) in group PO (*pp*=1.000). Intraepineural pattern were found in 13 cases (30.2%) in group P, and 8 cases (20%) in group PO (*p*=0.284).
Conclusions: US-guided pararadicular injection using parasagittal oblique approach made a significant difference in intraforaminal spread of contrast compared to parasagittal approach.

ULTRASOUND ANALYSIS OF THE ACCURACY OF LANDMARK APPROACH TO CENTRAL NEURAXIAL BLOCKS IN ANAESTHESIA

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Purpose/Objective: Correct identification of vertebral level could prevent damage to the spinal cord during a central neuraxial block (CNB). Evidence suggests that ultrasound (US) imaging of the spine by an experienced operator leads to correct identification of vertebral level in >90% of the patients. National Institute for Health and Clinical Excellence also recommends using US for CNB.

Our aim was to determine the discrepancy between landmark technique and US to identify level of insertion of CNB.
Materials and Methods: Three experienced US operators retrospectively performed US of spine post-operatively in 91 patients having a lumbar CNB by landmark method from January to March 2013 in St Mary's Hospital and Manchester Royal Infirmary. The documented vertebral level at which CNB was performed was noted and compared with the actual vertebral level identified by US.
Results: 63 patients had a spinal, 23 had an epidural and five had a combined spinal-epidural anaesthesia. The median body mass index (BMI) was 27.9kg/m^2. Landmark technique was only accurate in 45.4% of patients. There was no statistically significant correlation between the experience of operator and accuracy. 19% of patients had a CNB at the level of L1-2 or above. 5.5% had poor documentation of the level performed. Raised BMI and difficulty in palpation of landmarks resulted in statistically significant decrease in the accuracy (p<0.05 Fisher's Exact Test).
Conclusions: All patients having a lumbar CNB should have US of their spines to identify the correct vertebral level. Better US equipment, staff education and improved documentation would aid in providing safer patient care.

PROSPECTIVE AUDIT COMPARING PAIN AND PATIENT RESPONSES OCCURRING DURING PERIPHERAL VENOUS CANNULATION AND NEURAXIAL NEEDLE INSERTIONS WHEN PERFORMING NEURAXIAL BLOCKADE: A PILOT STUDY.

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Purpose/Objective: Background: Prior to commencing general anaesthesia or neuraxial analgesia, it is routine to insert a peripheral intravenous (iv) cannula. Most patients readily accept the insertion of an I.V.cannula for induction of general anaesthesia, but many hesitate to have a 'spinal' needle inserted because they consider this to be more painful.
Aim: To compare the 'overall' pain of venous cannulation with that of subsequent neuraxial needle insertion in patients undergoing lumbar neuraxial (spinal or epidural) analgesia .
Materials and Methods: With Ethics Committee application submitted, Hospital Anaesthesia Department approval and written, informed consent, 30 consecutive patients were audited. A protocol for subcutaneous and interspinous injection of lignocaine 2% containing adrenaline 1:200,000 using a 25 gauge needle prior to iv cannula and neuraxial needle insertions was followed.

During lignocaine injections, iv cannula and neuraxial needle insertions, a nurse recorded objective patient responses 9movement, grimace, vocalisation) and the anaesthetist used a Verbal Pain Scale (0 = no pain; 10 = maximum pain) to gauge objective and 'overall' pain.

(Analysis: Chi squared and paired 't' tests, p<0.05 significance).
Results: 10 male and 20 female patients (mean age 51 SD 22 years, range 17 to 82 years) were audited.

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Subjective responses were observed overall in 6(20%) and 9(30%) of patients during cannulation and neuraxial needle insertions, respectively (p=0.8, not significant).

Objective mean overall pain scores of 2.50 SD 2.09 and of 2.83 SD 2.50 ('t'=0.55, not significant) were reported for venous cannulation and neuraxial needle insertions.

Conclusions: This audit suggests that peripheral venous cannulation and lumbar neuraxial blockade are similarly uncomfortable.

EVALUATION OF INTERADDUCTOR APPROACH IN NEUROLYTIC BLOCKADE OF OBTURATOR NERVE IN SPASTIC PATIENTS

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Purpose/Objective: Adductor spasticity is common complication of spinal cord and brain injury. It needs treatment if interferes with activities of daily living. Obturator neurolytic blockade is cost effective possibility to treat spasticity. In this study, we assessed the efficacy of interadductor approach in alleviating the spasticity.

Materials and Methods: Obturator neurolysis using 8–10 ml 6% phenol was given under the guidance of peripheral nerve stimulator in twenty spastic patients. Technical evaluation included number of needle insertions, time to accurate location of the nerve, depth of needle insertion and success rate. Pain, spasticity, hip abduction range of motion (ROM), number of spasms, gait and hygiene were evaluated at 1st hour, 24th hour, end of the first week and in the first, second and third month.

Results: The spasticity, range of motion, hygiene and spasms improved at all time intervals from baseline (p value = 0.000). There was significant improvement in pain and gait score.The MAS and spasm frequency values at 1st month were significant in comparison to 2nd and 3rd month (p = 0.005 and p = 0.000 respectively) while ROM values at 1st month were significant only from 3rd month (p = 0.000). There was significant difference between 2nd and 3rd month (p value = 0.011 with MAS, 0.000 with ROM and 0.002 with spasms) indicating return of spasticity but improvement was still significant from the baseline.

Conclusions: The interadductor approach led to decrease in spasticity with increase in ROM of hip and better hygiene with efficacy lasting for 3 months.

LUMBAR PARAVERTEBRAL BLOCK AND ULTRASOUNDS: SO LINEAR?

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Purpose/Objective: Inguinal herniorrhafy is a surgical procedure that can be performed by using general, regional and local anesthesia.

Outpatient surgery requires an anesthetic management that ensures the surgeon optimal conditions for intervention but also preoperative pain control and sudden discharge.

The PVB combined with light sedation decreases the incidence of central blocks abnormalities.

Ultrasound lumbar PVB is generally performed with a convex probe, however a linear probe can be successfully used.

Materials and Methods: 2 patients submitted to this procedure; analgo-sedation with Fentanest 100μg and Midazolam 2mg.

Sterile ultrasound linear probe and 22G needle 120mm.

Short axis approach. Spine anatomy explored with the ultrasound linear probe.

Needle inserted out-of-plane with its tip stricly near to the probe perpendicularly to the skin. We obtained a contact with transverses process then we overtook it (≈1cm more).

T11-L1 block performed with Levobupivacaine 0.375% 20mL.

During surgery, the PVB was integrated by sedation in spontaneous breathing (Propofol TCI 2 μg/mL at the effect site).

Results: Surgery performed without further administration of analgesics. Discharge was not delayed. Pain controlled without drugs.

Conclusions: Currently scientific literature describes the use of convex ultrasound probe to perform lumbar PVB.

However the block can be successfully executed using a linear probe and advancing with the needle parallel to the latter to create a track in the displacement of tissues.

It could be a safe and alternative procedure if a convex probe is not available.

The PVB is a viable and safe technique in day-surgery when the surgical team doesn't have confidence with local anesthesia and it fulfills discharge criteria (PADSS).

IS THE ULTRASOUND GUIDE "SINGLE SHOT" FEMORAL NERVE BLOCK GOOD ANALGESIA FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION SURGERY - PROSPECTIVE RANDOMISED STUDY

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Purpose/Objective: Femoral nerve block (FB) is a common technique of analgesia for postoperative pain control after anterior cruciate ligament reconstruction surgery.

The aim of this study is compare the effects of two different types of femoral analgesia in development of postoperative pain, need for rescue analgetics, and strength of the quadriceps femoris muscle in early postoperative time.

Materials and Methods: 60 patients were included in this prospective, randomized study. They were randomized into two groups, SSFNB (single shot femoral nerve block) and CFNB (continuous femoral nerve block). FB in group SSFNB was performed with ultrasound, whilst FB in group CFNB was performed with nerve stimulator. The VAS score was assessed every two hours at rest and in motion. We measured needs for rescue analgetisc (morphin through patient-controlled analgesia) and strength of the quadriceps femoris muscle at 12 and 24 hours after operation.

Results: There was no statistically significant differences between groups regarding demographic characteristics and ASA status. CFNB group had lower VAS score as well as lower rescue analgesics use, but it is not statistically significant . There were no statistically significant differences in postoperative complications between groups.

Maximum voluntary isometric contraction of the quadriceps femoris muscle was statistically significant higher in SSFNB group ($P < 0.05$) 24 hours after operation, but 12 hours after operation there were not statistically significant differences between groups.

Conclusions: SSFNB is good analgesia after anterior cruciate ligament reconstruction surgery with minor loss of muscle strength of quadriceps femoris muscle in early postoperatively period.

DEXMEDETOMIDINE AS AN ADJUVANT TO ROPIVACAINE PROLONGS SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK: A VOLUNTEER STUDY

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Purpose/Objective: Supraclavicular brachial plexus block provides safe, effective, low cost anaesthesia with good postoperative analgesia. This study was conducted to compare the analgesic efficacy and safety of Dexmedetomidine for brachial plexus blockade along with Ropivacaine

Materials and Methods: This prospective double blind study was conducted on 60 patients of age 18 to 60 years posted for various upper limb surgeries and randomly allocated into two equal groups of 30 each.

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Control group received injection Ropivacaine (0.75%) 30 milliliter plus 2 milliliter normal saline,

Dexmedetomidine group received injection Ropivacaine (0.75%) 30 milliliter plus dexmedetomidine (0.5 microgram/kg).

Assessment of motor and sensory blockade, pulse, systolic blood pressure, respiration and side effects were noted every 3 minutes for first 30 minute and every 10 minute till end of surgery.

Pain was assessed using a standard 100 mm ***Visual Analogue Scale (VAS)*** and Motor block by ***Modified Bromage Scale*** by an independent anesthesiologist.

Sensory block was tested using alcohol swabs

Results: The onset of both motor and sensory block in control group is faster than in dexmedetomedine group. The duration of sensory and motor block was longer in dexmedetomidine group.

Where as, dexmedetomidine group was more hemodynamic stable and greater postoperative analgesia.

On the other hand three cases of bradycardia and two cases of hypotension were noticed in dexmedetomidine group while two patients were found to be allergic to dexmedetomidine

Conclusions: Dexmedetomidine is a useful drug for combination with ropivacaine as it prolongs the duration of analgesia in supraclavicular brachial plexus block besides providing hemodynamic stability and postoperative analgesia.

THE EFFECT OF MUSICOTHERAPY ON ANXIETY IN PATIENTS UNDERGOING REGIONAL ANESTHESIA: A PILOT STUDY

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Purpose/Objective: Orthopedic surgery under regional anesthesia could be a cause of discomfort and anxiety during either the preoperative period in the theatre, and/or block placement, and/or surgery. Premedication and/or sedation are commonly used to avoid and control them, but they are not devoid of side effects. The advantage of music on anxiety, discomfort and pain is well known. The aim of this study was to assess the impact of musicotherapy on patients undergoing orthopedic surgery under ultrasound guided axillary block (USAX).

Materials and Methods: 20 patients, ASA I-III scheduled for orthopedic surgery under USAX were included. Every patient was equipped with an occlusive headphone. Group N (n=10; ambient noise delivered by a mini amplifier-speaker), Group M (n=10; patient-selected music). Comfort, anxiety and pain were assessed using a visual analogic scale. After surgery, the overall satisfaction was assessed using a 10-item score evaluating comfort, stress, pain, and anxiety. Vigilance (open *vs* closed eyes) was noted. The efficiency of the block and the existence of complications were noted.

Results: The success of BAX was 100% in the two groups. Overall satisfaction was of better quality in group M. The vigilance of patients was superior in group B than in group M.

Conclusions: USAX is not a source of pain or significant discomfort. However, musicotherapy provides additional comfort and reduces anxiety.

REGIONAL ANESTHESIA INJECTION PRESSURES COMPARING SKILLED ASSISTANTS WITH 'SAFE INJECTION IN REGIONAL ANESTHESIA PUMP' (SAFIRA) IN A SIMULATED ULTRASOUND GUIDED TECHNIQUE

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Purpose/Objective: Intra-neural injection during regional anesthesia risks nerve injury when pressures above 11 psi are applied. We tested operating department practitioners (ODP) during a simulated regional technique, recording pressure during injection. We then used a new injection pump where 20 anesthetists injected against a series of pressures.

Materials and Methods: An investigator simulated performance of an US guided block on a phantom. Each ODP participant was asked to aspirate and inject 2mls of local anesthetic. They were told not to inject if not happy to. Before each injection, a second investigator applied a constant pressure between 5 and 30 psi to the injection system in random order using a pressure generator.

The SAFIRA pump has 2 buttons attached to the needle for injecting and aspirating. It limits injection pressure to less than 11 psi. 20 anesthetists used the SAFIRA system against random pressures as above. An independent observer confirmed whether the pump would inject or not.

Results: Fourteen of the 20 ODP participants (70%) injected at 15 psi or above.

The pump injected at 5 and 10 psi in all attempts. At 15 psi or above the pump did not inject in any attempts.

Conclusions: Avoidance of high pressure intra-neural injection reduces the risk of nerve injury during regional anesthesia techniques. Our results confirm that the majority of skilled participants would inject at higher pressures than considered to be safe. The SAFIRA pump, which limits the pressure, is not only safer but also allows the anesthetist to control the injection.

SURVEY OF ANAESTHETISTS' FASCIA ILIACA BLOCK TECHNIQUE FOR NECK OF FEMUR FRACTURES IN THE EMERGENCY DEPARTMENT, LEADING TO DEVELOPMENT OF A TRAINING PROGRAMME.

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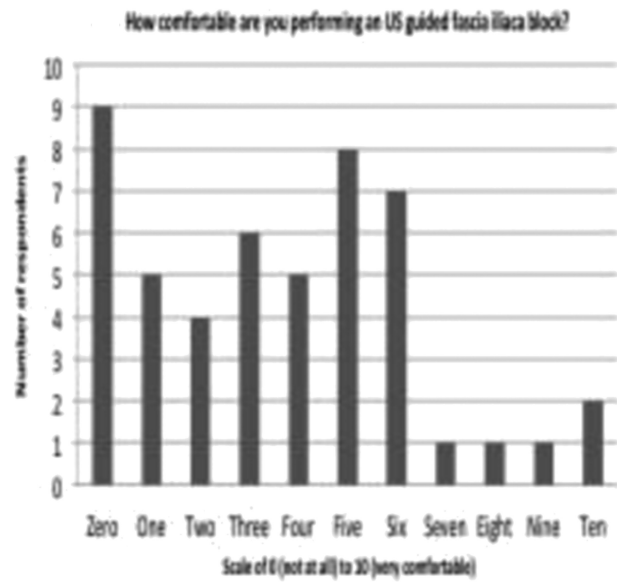
Purpose/Objective: The Association of Anaesthetists of Great Britain and Ireland recently issued guidelines on the peri-operative management of proximal hip fractures. As part of the initial management, peripheral nerve blockade is recommended, administered by trained medical staff. Our aim was to determine the prevalence and range of techniques used, and to organise a training course to establish a standardised ultrasound guided approach.

Materials and Methods: A survey questionnaire was produced, with questions on technique, concentrations and volumes of local anaesthetics used and familiarity with the sono-anatomy of the femoral triangle and ultrasound-guided blocks in general. After the survey, training sessions on ultrasound-guided fascia iliaca blockade were instituted.

Results: There were 50 respondents; 52% consultant anaesthetists and 46% trainees. 72% had performed fascia iliaca blocks in theatre, with 24% having never performed the block. Of these blocks, 66% were performed with a landmark technique. As the graph shows, confidence in an ultrasound-guided technique was low.



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Conclusions: The majority of anaesthetists in our department use a landmark based technique, despite evidence that ultrasound-guided techniques are more successful. This is in part due to a lack of confidence in ultrasound-guided regional blockade in general, and a lack of familiarity with the sono-anatomy of the femoral triangle. A training programme was devised with presentations, live model scanning and phantom needling practice. This will be repeated regularly for new trainees, and will also be extended to emergency department medical staff.

ROPIVACAINE OR LIDOCAINE/BUPIVACAINE MIXTURE FOR AXILLARY BRACHIAL PLEXUS BLOCKADE?

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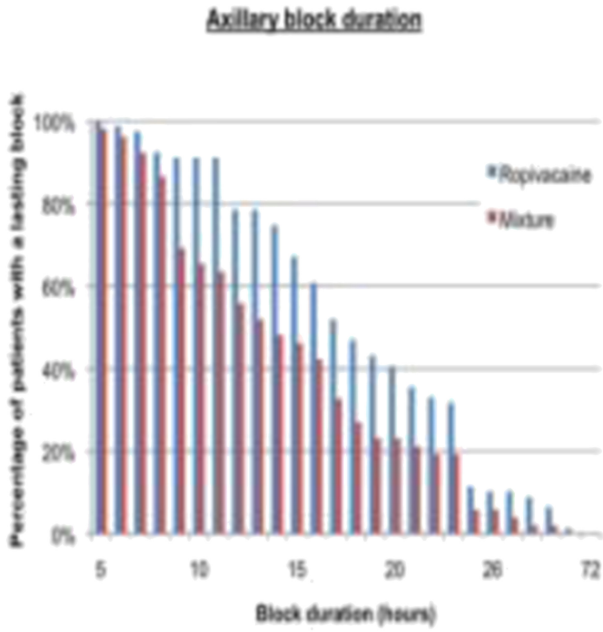
Purpose/Objective: Mixing local anaesthetic solutions introduces the potential for drug errors. We therefore switched from using a 50/50 mixture of 2% lidocaine (with 1:200,000 adrenaline) and 0.5% L-bupivacaine (mixture) to 1% ropivacaine for patients receiving axillary brachial plexus (BP) blockade for awake hand surgery.

Materials and Methods: We routinely use telephone follow-up for all day case patients following BP blockade to obtain information including block duration, additional analgesic requirements and patient satisfaction (audit logged with the Trust's Clinical Governance department who deemed formal ethical approval unnecessary).

Results: We reviewed 174 axillary blocks (73 mixture, 101 ropivacaine). The median onset in both groups was 10-15 minutes. Mean volumes used were 27mls for mixture and 24mls for ropivacaine with mean duration of action being 16 and 20 hours respectively.

Our unit policy is to recommend routine oral analgesia before bedtime, however only 61% took painkillers before going to bed, 29% took more than simple analgesia. One third of patients awoke during the night with pain (31% mixture, 41% ropivacaine).

Patients in both groups were 97% satisfied with their block. 90% would have a repeat block and 96% would recommend the block to others.



Conclusions: Ropivacaine is a simpler and safer alternative to mixing two separate local anaesthetic agents for use in axillary nerve blockade. It has rapid onset and provides long-lasting analgesia. We need to further emphasise the need for prophylactic analgesia at bed-time to avoid a disturbed night's sleep.

AN AUDIT OF THE EFFECTIVENESS OF INTERSCALENE BLOCKS FOR POST OPERATIVE ANALGESIA FOLLOWING SHOULDER SURGERY

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Purpose/Objective: In our institution shoulder surgery comprises high proportion of orthopaedic work. Peri-operative analgesia using opoid is common but not without complication.

Recent advances permitted these procedures performed as day cases with anaesthetic technique influencing outcome. We assessed anaesthetic techniques with quick turnover, pain scores & opoid requirement.

Materials and Methods: We performed an audit of pain relief for shoulder surgery. This included analgesia peri-operatively, its complication including VAS scores, opoid dosage, sedation & nausea score, and time spent in recovery.

We assessed twenty five patients undergoing shoulder surgery (ASAs I to III). They received inter-scalene blocks with GA, or GA alone.

Results: 68% (18) of patients received inter-scalene nerve block and 32% (7) patients received systemic analgesia.

The average opoid used was 135mcg of fentanyl (block group) vs 228.5mcg (non-block group). 4/7 patients (non-block group) required opoid compared to 1/18 (block group). 18 patients received antiemetic whereas one patient felt nausea. Sedation score were higher in non-block group.

VAS score was high in 3/7 patient (block gr) compared to 2/18 patients (non-block gr). One patient had rescue block in GA group.

The time spent in recovery was 45.8 min (block gr) vs 64.6 minute (non-block group).

Conclusions: We conclude that pain control was better in block group with reduction in opoid requirement & length of stay in recovery.

This allowed us to adopt block with GA as routine practice were possible.

RADIAL TUNNEL NERVE BLOCK IS USEFUL IN THE DIAGNOSIS OF RADIAL TUNNEL SYNDROME

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Purpose/Objective: Radial tunnel syndrome is a rare cause of elbow/forearm pain which can be difficult to diagnose clinically. No definitive diagnostic tool is currently available. Previously blind injections have been performed leading to improvement of surgical outcomes, are however imprecise. Surgical success however depends on appropriate patient selection. Improved Ultrasound (US) technology allows accurate identification of the deep radial nerve as it passes through the supinator muscle where it can be blocked with precision. We hypothesised that this would allow better patient selection for surgery.

Materials and Methods: 10 Patients with clinical symptoms suggestive of radial tunnel syndrome underwent US guided diagnostic block of the radial nerve at the supinator muscle using 1 ml of 0.5 % Chirocaine. Wrist drop due to extensor muscle weakness innervated by the deep radial nerve confirmed correct placement. Complete pain relief was taken as a positive response and surgical release offered.

Results: 7 patients had temporary complete relief of symptoms following the injection and underwent surgical release of the nerve. A further 2 patients achieved sustained improvements of symptoms and did not require surgery. 1 patient had no pain relief and did not proceed to surgery. Of the 7 patients undergoing surgery 6 had complete resolution of their symptoms after surgery, 1 patient developed CRPS which settled over 12 months.

Conclusions: Accurate US guided diagnostic block of the deep radial nerve in the supinator canal confirms the diagnosis of radial tunnel syndrome and appears to be a useful aide to select appropriate patients for surgical release.

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A MOTOR SPARING KNEE BLOCK FOR KNEE SURGERY - ANATOMICAL CONSIDERATIONS

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Purpose/Objective: Conventional nerve blocks for total knee arthroplasty, whilst giving superior analgesia postoperatively, cause motor weakness, may inhibit mobilisation and have been implicated in falls. We describe the anatomical basis of a new concept for a motor sparing knee (MSK) block.

Materials and Methods: The cutaneous innervation of the knee is via Lateral Cutaneous Nerve of Thigh (LCNT) to the anterolateral aspect of the thigh; Intermediate Cutaneous Nerve (IMCNT) branches off the femoral nerve, passes over the sartorius muscle to the anteromedial aspect of the thigh; Infrapatellar Nerve (IPN) innervates the anteromedial aspect below the knee. Knee joint and patella are innervated via Genicular Nerves (GN) which receive input from femoral, sciatic and obturator nerves to 5 branches arising at the 4 corners of the knee joint plus a medial middle genicular nerve.

Results: LCNT is identified between sartorius and tensor fascia latae muscles, IMCNT more medial traversing sartorius muscle. IPN is reliably blocked within the subsartorial canal at midthigh level, also affecting saphenous nerve and potentially motor branches to vastus medialis muscle (VMM). The 3 main GN are located superomedial, ~lateral and inferomedial to the knee at the epicondyles and tibial plateau respectively. GN supplying the posterior capsule can be blocked deep to the popliteal artery.

Conclusions: All nerves supplying the knee can be identified on US either directly (LCNT, IMCNT) or indirectly by bony (GN) or perivascular structures (IPN) allowing a complete motor sparing block of the knee (except potentially VMM). 6-7 injections are required for a full MSK block.

OPTIMAL PROBE POSITIONING FOR ULTRASOUND GUIDED SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK

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Purpose/Objective: The supraclavicular approach to the brachial plexus is a popular ultrasound(US) guided nerve block for surgeries from shoulder to hand. Current educational material is variable in its demonstration of ideal target US image and probe position. We aimed to correlate optimum US image with US probe position.

Materials and Methods: 6 volunteers, lying at an angle of 45°, had the brachial plexus scanned bilaterally. US images containing the Subclavian artery overlying the first rib and the three divisions were obtained(1). Three dimensional transducer position was recorded for the best image using an accelerometer(ADXL335,Analogue Devices Inc,MA) and angle measure of probe to clavicle. Visibility of the Suprascapular nerve and plexus length were noted.

Results: Common probe positions are parallel to the clavicle or obliquely angled across the anterior triangle of the neck.

Transducer position	Probe angle in relation to first part of clavicle	Average angle of probe rotated around long axis from vertical	Plexus length	Suprascapular nerve visible
Oblique	41° (30-47)	14° (1-24) (Probe handle away from midline)	129 (75-165)	Y4 N2
Clavicular	N/A	8 (-2-20) (Probe handle moved anteriorly)	175 (125-212)	Y5 N1

Conclusions: A supraclavicular brachial plexus view including all important structures can be obtained by a transducer positioned at approximately 40° to or parallel to the clavicle. The Clavicular position provides a longer plexus view as it images the brachial plexus at a tangent. The Oblique position provides a true cross sectional view of the plexus giving a shorter more reliable representation, optimising the plexus for regional anaesthesia.

1). Murata H, et al. Anesth. Analg. 2012 Aug;115(2):470–3.

SHOULD WE STILL WORRY ABOUT ANATOMICAL VARIATIONS OF SCIATIC NERVE?

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Purpose/Objective: Sciatic nerve (SN) originates from L4-S3 roots and gives in the popliteal region two nerve trunks, tibial and common fibular nerves. This division occurs at variable level and accounted for failure of popliteal block before the use of ultrasonography for nerve blockade (1). We examined with ultrasound the anatomical variations of sciatic nerve in popliteal fossa.

Materials and Methods: 62 Patients gave informed consent to participate in this study which was performed in recovery room. A 7-13 MHz linear probe (Sonosite Edge™ Bothell, WA, USA) was applied in popliteal fossa with patient in supine position. Distances from the division of the SN to the popliteal fossa crease were measured with calipers (degree of accuracy ±1mm), recorded and compared between left and right legs by paired t –test. Data were expressed as mean ± SD and compared by Student t test. P values ≤ 0, 05 were considered statistically significant. Microsoft Xlstat software was used for all statistical analysis.

Results: 62 Patients, age: 46±17,5 yr old; height:168,5±7,2cm; weight:67,5±14,9kg; BMI:23,1±4,3kg/m2.There was no difference in the measured distance neither by sex. (52, 5 ± 14, 0 mm and 53, 5± 13, 7 mm) for male and female respectively;nor between the left and the right legs (53, 3 ±13, 6 mm and 52, 7±14, 1 mm respectively). For two patients (3, 3%) the division occurs at more than 100 mm(102mm and 105mm) above the popliteal fossa crease.

Conclusions: The use of ultrasonography shows that sciatic division in popliteal fossa occurs lower than expected from the traditional surface landmarks.

AN AUDIT OF DAY CASE HAND TRAUMA PATIENTS RECEIVING BRACHIAL PLEXUS BLOCK ANAESTHESIA IN A TERTIARY REFERRAL CENTRE

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Purpose/Objective: To improve efficiency and patient throughput for hand trauma, a policy was implemented in 2011 to guide same day discharge of patients receiving a brachial plexus block (BPB). This policy incorporates a nurse-led telephone follow-up after discharge and subsequent clinic appointment. The aim of our audit was to assess the implementation, effectiveness and safety of this guidance.

Materials and Methods: We retrospectively reviewed patients' notes and nurse-led discharge proformas. We collected data on patient satisfaction, complications, pain control, discharge information and patient follow-up. Data was also collected on the local anaesthetic mixture used and block duration.

Results: We reviewed the data for 44 patients between December 2012 and April 2013. The number of patients reviewed was significantly less than the number of BPBs performed, as the majority of patients did not have telephone follow up. The incidence of complications was 1/44 (2%). 100% patients were satisfied with the block. 4/44 (9%) patients received inadequate discharge information. 1/44 (2%) did not receive discharge analgesia. The length of time from return to ward to discharge was 3.3 ± 2.5h (mean ± SD). The duration of block was 6.89 ± 2.5h (mean ± SD).

Conclusions: This audit demonstrates that day case BPBs are safe and effective with excellent patient satisfaction. Adherence to our policy is poor and routine telephone follow-up was inconsistent due to time and manpower constraints. However, all the patients were reviewed in clinic and the majority had an emergency contact number. Processes are being implemented to improve adherence to the policy.

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CONSENT FOR BRACHIAL PLEXUS BLOCKS – A PATIENT RECALL SURVEY.

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Purpose/Objective: Taking consent for nerve blocks is highly varied (1), yet it plays an important role in both involving the patient in their own care, and protecting the anaesthetist against malpractice suits.

In this study we look at the variation in patient experience of consent for brachial plexus blocks for shoulder surgery.

Materials and Methods: After discussion with the ethics committee we studied 25 consecutive patients undergoing shoulder surgery, who had consented to follow up. After 24-48 hours they completed a telephone questionnaire looking at recall of commonly occurring and serious risks, their involvement in anaesthetic choice and documentation of the consent.

Table 1: Consent for interscalene block documentation and patient recall of material risks

	Percentage of patients recalling consent	Percentage of charts documenting consent
Blood Failure	[illegible]	52
Ptosis	76	76
Hoarse voice	88	96
Nerve Damage	76	92
Infection	88	96
Offer of Alternative analgesia	48	96
Risk of Unrecognised injury during paraesthesia	52	4

Results: The majority of patients recall being warned of the risks of failure, ptosis, hoarse voice, nerve damage and infection. Fewer recall being warned of risk of unrecognised injury during paraesthesia and even less felt they were offered alternative analgesia. Documentation of consent in the notes was mixed but in the majority more patients appeared to have been consented than the notes would suggest.

Conclusions: Insufficient recall of the consent process may weaken a practitioners' defence against malpractice. Additionally inappropriate documentation may further weaken this. We believe that a standardised consent may improve this process, and enhance our ability to inform patients adequately.

REGIONAL NERVE BLOCKADE - A SURVEY OF ASEPTIC PRACTICE

J. Walker[1], D.E. Hughes[1], I. Mowat[1]. [1]*Anaesthesia and Pain Medicine, Royal Perth Hospital, Perth, Australia.*

Purpose/Objective: Recent case reports warn of the contamination of ultrasound coupling gel in multi-patient use bottles with virulent micro-organisms. We wanted to know how widespread was the use of this gel when performing ultrasound guided blocks.

Materials and Methods: We conducted a survey of over 300 fellows of the Australia and New Zealand College of Anaesthetists (FANZCA) in order to clarify individual steps taken to achieve asepsis in regional anaesthesia. Surveys were distributed electronically to 1034 individuals with FANZCA registration. 301 surveys were completed (29%).

Results: We found that aseptic practice when performing a single shot block was similar whether or not ultrasound was employed. Skin preparation with antiseptic liquid was universal but low proportions of practitioners used face masks (~30%); drapes (~40%); gowns (~10%). Non-sterile gloves were used by ~30% when performing single shot blocks. This was in marked contrast when a nerve catheter was placed where practice mirrored steps taken to ensure asepsis in neuraxial anaesthesia. Interestingly, while multi-patient use gel was not used in placing regional nerve catheters it was used in single shot blocks by 28% of the same individuals.

Conclusions: No case report to date has yet linked the use of multi-patient use bottled gel contaminated with micro-organisms to iatrogenic infection following regional anaesthesia. However, with the increasing popularity of ultrasound guided regional anaesthesia it can only be a matter of time. We suggest guidance should specifically preclude the use of potentially non-sterile gel when performing any regional anaesthetic whether or not a catheter is left in situ.

FEMORAL NERVE BLOCK USING 0.25% VERSUS 0.5% BUPIVACAINE FOR ANALGESIA AFTER ARTHROSCOPIC ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

A. iamaroon[1], S. Tangwiwat[1], B. Sirivanasandha[1], P. Halilamien[1], Y. Lertpenmetha[1], S. Sirimaneewattana[1], S. Surachetpong[1], S. Puangchan[1]. [1]*Anesthesiology, Siriraj hospital, Bangkok, Thailand.*

Purpose/Objective: Femoral nerve block (FNB) with varying concentrations of bupivacaine is often used for postoperative analgesia after anterior cruciate ligament (ACL) reconstruction. This study investigated whether 0.5% or 0.25% bupivacaine provided better analgesia with less effect on quadriceps strengths.

Materials and Methods: After ethics committee approval, one hundred patients were randomized to receive a FNB with 20 mL of 0.5% or 0.25% bupivacaine. The effectiveness of FNB was assessed before spinal block. Data regarding demographic, time to first pain, time to first analgesic, pain scores, morphine use, and recovery of sensory and motor function were recorded during the first 48 h after surgery.

Results: No differences were found in demographic data, effectiveness of FNB, time to first pain and cumulative morphine consumption. Median time to first morphine requirement was 12 h in group 0.5% bupivacaine and 10 h in group 0.25% bupivacaine (P = 0.048) (Fig. 1). Pain score at 18 h was lower in group 0.5% bupivacaine compared with group 0.25% bupivacaine (P = 0.001) (Fig. 2). When specify to the patellar tendon graft subgroup, the patients requiring morphine were 70% in group 0.5% bupivacaine and 90% in group 0.25% bupivacaine (P = 0.029). The recovery of sensorimotor function was not different between groups.

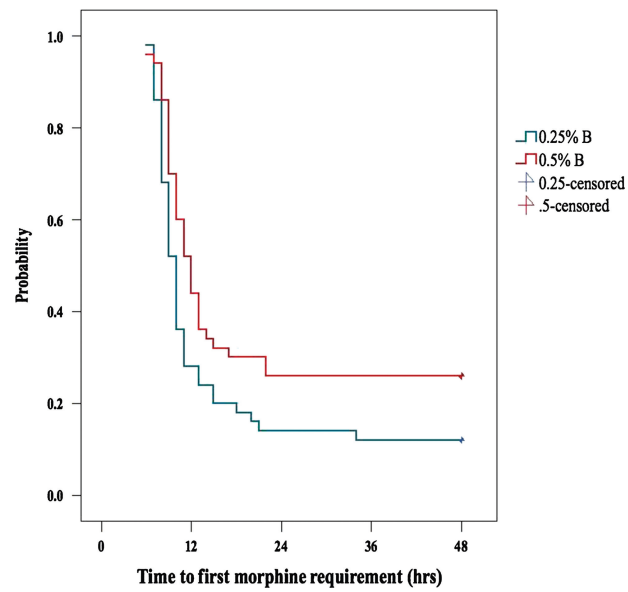

FIG. 1. Time to first analgesic.

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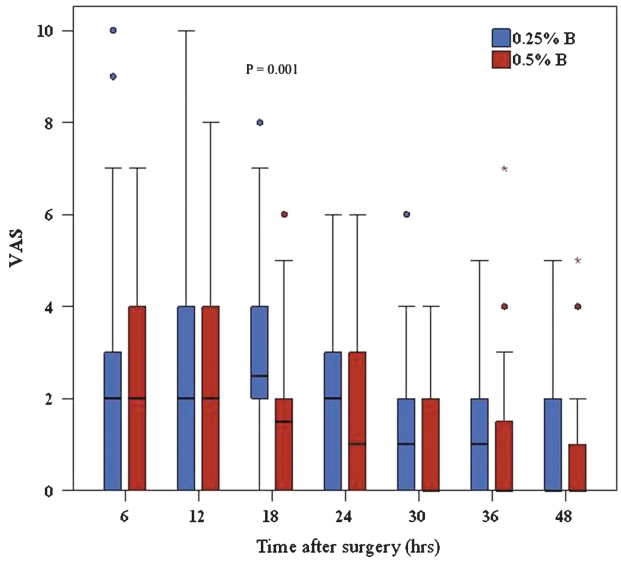

FIG. 2. Visual analog scores.

Conclusions: FNB with 0.5% bupivacaine provided longer time to first analgesic and lower VAS score at 18 hours after ACL reconstruction when compared to 0.25% bupivacaine. Both concentrations showed a similar effect on quadriceps strengths.

WHICH NERVE BLOCKS ARE BEING ASSOCIATED WITH ULTRASOUND-GUIDANCE ON THE INTERNET?

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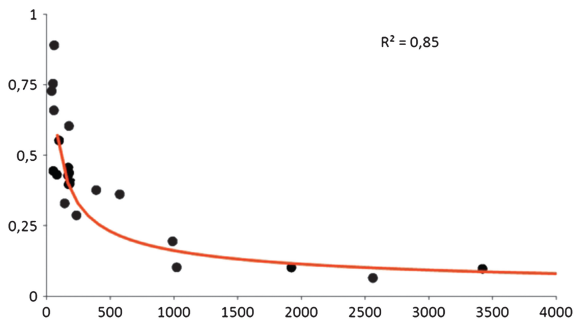
Purpose/Objective: Internet resources on medical issues are being used by laymen and clinicians with increasing rates. These resources are becoming more accessible and complex and reflect important trends in scientific literature and everyday clinical practice. The purpose of this study is to ascertain to which degree ultrasound-guidance for peripheral nerve blocks (PNBs) is being reported on English-speaking internet sites.

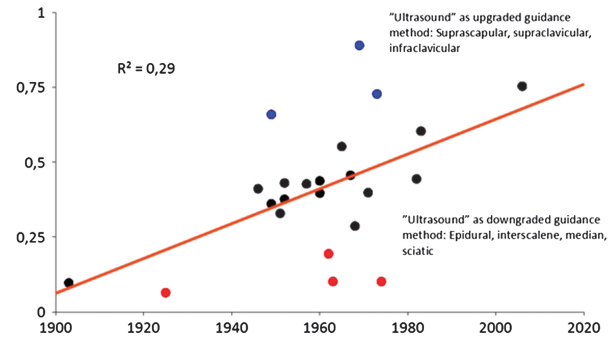
Materials and Methods: A Google search using the name of the PNB (e.g. 'femoral nerve block') with or without the suffix 'ultrasound', and a PubMed search identifying the first Medline publication of that PNB. The fraction of Google hits with ultrasound relative to total hits is displayed as a function of total hits or the year of the first PubMed indexed publication of that particular PNB. 21 upper extremity, truncal or lower extremity PNBs are investigated. Spinals and epidurals are included for comparison.

Results: While neuraxial blocks each have 2.5-3.4 milion hits, PNBs each have 38 to 988 thousand Google hits. The fraction of these hits that report on ultrasound for nerve blocks is highly predictable, with an inverse relationship to overall reporting rate (Figure 1).



Y-axis, fraction of Google hits with the suffix "ultrasound" for each PNB type, by total number of Google hits (in thousands) for that PNB type. Red tendency line with correlation index.

This fraction is also well defined by a linear relationship with year of first PubMed publication, but with outliers either providing more or fewer hits than expected (Figure 2).



Y-axis, fraction of Google hits with the suffix "ultrasound" for each nerve block type, by year of first PubMed publication. Red tendency line with correlation index. Blue dots, PNBs with more "ultrasound" hits than expected. Red dots, PNBs with fewer "ultrasound" hits than expected.

Conclusions: When using a Google search as a crude surrogate parameter for the amount of internet resources on regional anaesthesia, particularly upper extremity, truncal and saphenous nerve blocks seem to be given the most focus on ultrasound guidance. Remarkably, these results resemble trends in the scientific literature.

ANKLE BLOCK AND MULTIMODAL ANALGESIA FOR DAY CASE FIRST RAY SURGERIES

S. Katti[1]. [1]*Anaeasthesia, RJ&AH Orthopaedics hospital, Oswestry, United Kingdom.*

Purpose/Objective: A significant proportion of first ray surgery is now performed as day cases. However, in our hospital between January 2010 and January 2011, only 14% of patients were actually discharged on the day of operation. There was considerable variation in how patients were anaesthetised and what analgesia was administered. We undertook to assess the efficacy of the ankle block and a standardised multimodal analgesia regimen.

Materials and Methods: 50 patients planned as day case procedures to the first ray were selected prospectively. All these patients received a dose of pregabalin,

pre-operatively and an ankle block with GA/Spinal for surgery and multimodal analgesia post operatively. Patients were contacted 24 hrs post operatively via telephone.

Results: 45 patients were followed up successfully and 43 were compliant with the prescribed regimen. 98% of patients were discharged on the same day as surgery. 100% reported elevating the foot for the first 24 hrs and had taken the regular analgesics as required. 100% reported of not having a pain score of 6 or above in the first 24hrs, and some took tramadol to address this. Only 4.5% reported sickness and 9.0% reported nausea but none of them vomited. The overall compliance was 96% (95% CI 84% TO 100%).

Conclusions: This protocol with ankle block resulted in a significant increase in patients going home on the day following first ray surgery. The hospital statistics has jumped from 14% to 57% for 2012-2013. A departmental protocol has been developed in line with the above method.

EFFECT OF LOCAL ANAESTHESIA ON MICROCIRCULATION

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Purpose/Objective: Among the mechanisms that regulate the blood flow in small vessels, autonomous nervous system has a large importance. Nerve blockage during locoregional anaesthesia may thus affect the

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microcirculation that can be quantified using Laser Doppler flowmetry, that is a non-invasive tool.

Materials and Methods: A preliminary study has been carried out by acquiring and analysing blood flow on the forearm during a nerve blockage performed on the right arm.

The effect of the nerve blockage has been analysed both in time and frequency domain.

Results: At baseline, the blood flow presents a well-defined periodic pattern, replicating the pressure pulsation caused by heartbeat, as can be observed in Fig. 1(a). After the injection of the anaesthetic, the periodicity of the flow is disrupted, as shown in Fig. 1(b).

The analysis of the frequency spectrum of the same signal can provide a more detailed description of the situation. The frequency spectrum, estimated using the Burg method, of the signal before and after the injection of the anaesthetic is shown in Fig. 1(c) and Fig. 1(d), respectively. The large peak corresponds to the heartbeat frequency (approx 1Hz) that is clearly dominant in the spectrum. However, the blockage of the nervous control on the flow the peak is attenuated. This effect can be correlated to the reduced tone of the vessels that reduces the elasticity of the arterioles.

Conclusions: This preliminary result suggest that the measure of the spectral properties of the blood flow may thus be used to evaluate the level of blockage on the autonomous nervous system.

THE EFFECT OF HYALURONIDASE IN INTERLAMINAR LUMBAR EPIDURAL INJECTION FOR FAILED BACK SURGERY SYNDROME

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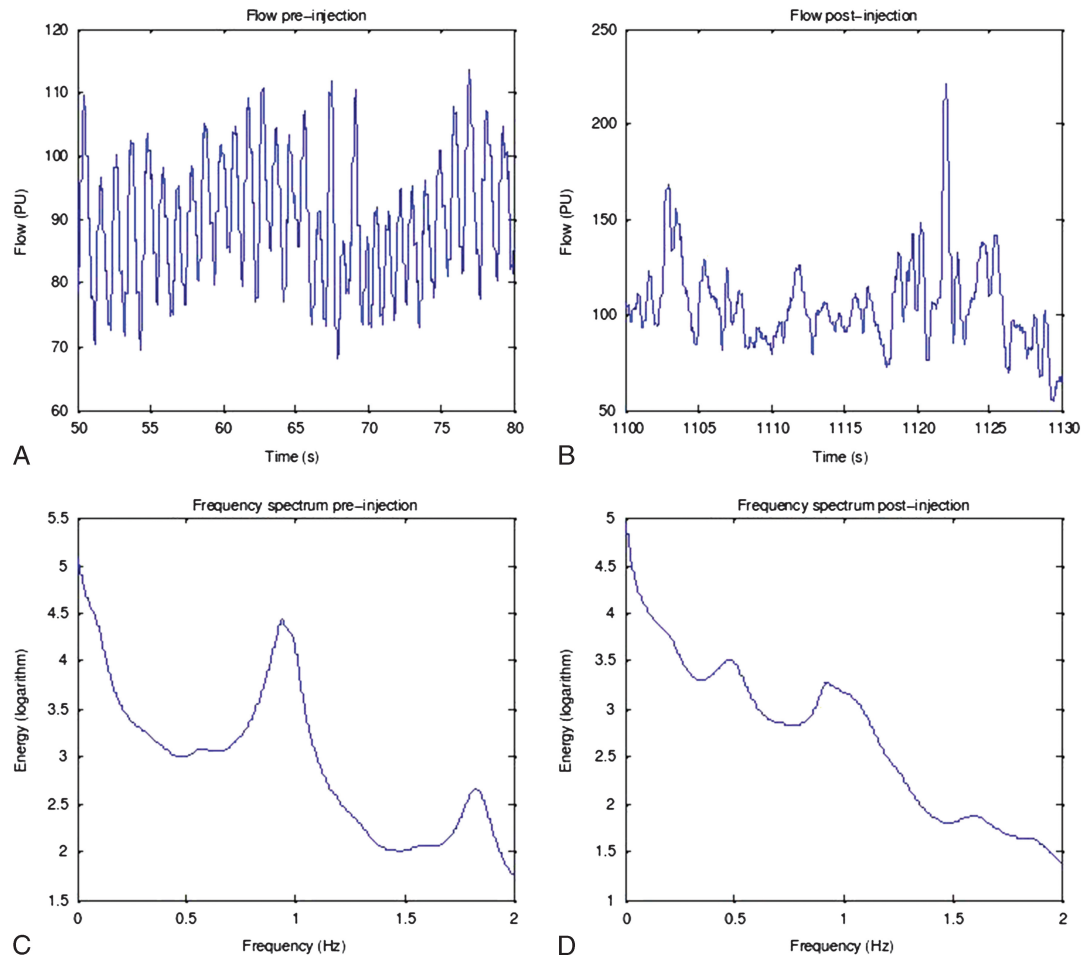
Purpose/Objective: To evaluate the effect of hyaluronidase in patients with failed back surgery syndrome (FBSS) treated with interlaminar lumbar epidural injection (ILEI).

Materials and Methods: Sixty patients suffering from severe low back pain and sciatica were randomly allocated into three groups. Group T received ILEI with 2 ml triamcinolone 40 mg/ml and 5 ml bupivacaine 0.25%. Group H received ILEI with 1500 IU hyaluronidase and 5 ml bupivacaine 0.25%. Group TH received ILEI with 1500 IU hyaluronidase, 2 ml triamcinolone 40 mg/ml and 5 ml bupivacaine 0.25%. The effect was evaluated using Visual Analogue Scale (VAS) and Oswestry Disability Index (ODI) at pre-injection, 2 weeks, 6 weeks and 12 weeks after ILEI.

Results: After 2 weeks and after 6 weeks, patients in both Group T and Group TH had significant effectiveness more than Group H in decrease of VAS and ODI. After 12 weeks, only patients in Group TH had significant effectiveness in decrease of VAS and ODI ($p<0.05$). In every period, Group TH had the most effectivess in decrease of VAS and ODI after ILEI.



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Conclusions: ILEI for FBSS with triamcinolone and hyaluronidase is considered to have more long term effectiveness to reduce pain and improve function after ILEI than injection with triamcinolone alone or hyaluronidase alone.

COMPARISON OF BLIND AND ULTRASONOGRAPHY GUIDED APPROACH OF SUPRASCAPULAR NERVE BLOCK

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Purpose/Objective: To compare ultrasonography guided versus blind approach in a randomised, single blind trial examining the efficacy of suprascapular nerve block in patients with non-specific shoulder pain.

Materials and Methods: A total of 40 patients with shoulder pain lasting for more than 1 month were included in this study. After 1:1 randomization, patients were included in the blind group (n=20) or in the ultrasonography guided group (n=20) of suprascapular nerve block. All patients were evaluated before and after treatment, in terms of Shoulder Pain And Disability Index (SPADI) and nerve conduction study.

Results: Significant improvements were seen in all pain scores and disability in the shoulders receiving both types of nerve block, with no significant differences in the improvement of pain and disability between the two approaches. However, amplitude changes of nerve conduction study using ultrasonography guided approach were larger (baseline ; 6.12±2.39, after 5 min ; 3.74±1.95) than blind approach (baseline ; 5.94±2.11, after 5 min ; 5.26±1.84) ($p<0.05$).

Conclusions: This study suggests ultrasonography guided approach of suprascapular nerve block is injected closer to the nerve compared to blind approach.

SWITCHING AWAY FROM TWITCHING? AN AUDIT ON AVAILABILITY AND ATTITUDES TO THE USE OF PERIPHERAL NERVE STIMULATORS IN A TEACHING CENTRE

I.J.S. Lewin[1], S. Lobo[1]. [1]*Department of Anaesthetics, Queen Alexandra Hospital, Portsmouth, United Kingdom.*

Purpose/Objective: While use of ultrasound (US) in performance of peripheral nerve blockade (PNB) is increasing across the globe, landmark technique remains a core skill tested in professional examinations, and, when suitable US equipment is unavailable, it is necessary that serviceable nerve stimulators are present where PNB is performed. Locally, there is a perception that nerve stimulators are frequently missing or not serviceable. Hence, we assessed availability and serviceability of internal nerve stimulators (NS) and anaesthetists' perceptions and attitudes towards their usage.

Materials and Methods: All operating theatres in a teaching centre where PNB regularly occurs were surveyed to ascertain the presence of a NS, its correct location and if it was in a serviceable condition. 24 anaesthetists on the day of the survey were questioned on their perception of NS availability and their own use of NS.

Results: Of the 9 operating theatres where PNB is regularly performed only 7 had NS present and none were in their allocated theatres. 100% of the NS found during the survey were deemed serviceable. All 24 of the anaesthetists questioned used NS in their routine practice but only 13 checked availability and serviceability of NS in their routine equipment check. 20 anaesthetists stated NS were missing on occasion and 11 believed that the hospital did not have enough.

Conclusions: Instances of NS unavailability occur but are fewer than is perceived and could be reduced by confirmation of NS availability and serviceability during the routine equipment check.

A QUESTIONNAIRE ON THE PREVENTION OF WRONG-SIDED NERVE BLOCK IN THE NORTH WESTERN DEANERY

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Purpose/Objective: Wrong-sided nerve blocks could be potentially disastrous, especially with the number performed increasing yearly. We therefore surveyed anaesthetists at North Western Deanery over a 12-month period to gain an insight into their experiences of wrong-sided nerve blocks, opinions on how to minimise this "never event" and routine local practices with an aim to propose a universal guideline.

Materials and Methods: We conducted a questionnaire for anaesthetists of any grade in our deanery by inviting them by emails, to complete an online survey of their grades, their frequency in performing peripheral nerve blocks, their involvements of any wrong-sided nerve blocks or near-misses and their awareness of any guidelines at their hospitals. Free text sections were used for their routine practices in prevention of wrong-sided nerve blocks and suggestions on further improvement.

Results: 59% of the 244 respondents were consultants. 61.5% performed peripheral nerve blocks either weekly or monthly. >30% had been involved in wrong-sided nerve blocks or near-misses in the past. In their routine practices, 46.3% would confirm with an awake patient prior to induction of general anaesthesia and 36.5% would check surgical site marking marked by the surgeons. A majority of respondents would recommend verbal confirmation with patient on arrival to anaesthetic room, anaesthetic time-out immediately prior to nerve block, specific marking for anaesthetic-related procedures using sticker/pen on ward and warning signs on ultrasound machines.

Conclusions: We proposed a step-wise guideline for prevention of wrong site procedures. Further education, campaign to increase awareness and reduce distraction are also recommended.

NOVEL US-GUIDED APPROACH TO THE LUMBAR PLEXUS BLOCK, WITH IN-PLANE VIEW OF THE NEEDLE

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Purpose/Objective: Background and aims: Ultrasound (U.S.) studies of lumbar plexus block (L.P.B.) position the transducer in the dorsal region. Visualizing the needle shaft and tip is often difficult when the U.S. beam and needle are at an acute angle. We present a novel US-guided approach to the L.P.B. that shows the needle in plane.

Materials and Methods: Methods: Patients were in lateral decubitus position. A low frecuency transducer was positioned over the lateral abdominal wall at the level of the iliac crest. Psoas muscle, vertebral body and transverse process of L4 were identified. Next, the needle insertion point in the dorsal paravertebral region was chosen based upon the image seen on the U.S. monitor.

Results: Results: We studied 53 patients (19/34 Male/Female). In 49 patients (92%), lumbar plexus (L.P.) was identified with real time ultrasound guidance, spread of local anesthetic was observed and the block was performed. Four patients in whom it was not possible to see the L.P., neurostimulation allowed location, always under ultrasound vision of the other anatomical structures. Two patients with body mass index greater than 35 kg/m^2 (one 37.4 and the other 43) had adequate vision and blocking was performed without difficulty. No complications related to the technique were observed.

Conclusions: Conclusions: We present a novel US-guided approach. This technique allows an easy and fast approach to performing L.P.B., with a lateral transverse view of anatomical structures and an in-plane view of the needle. This approach allows performance of the L.P.B. in patients in whom other techniques have shown limitations.

PLASMA LEVOBUPIVACAINE CONCENTRATION AFTER ABDOMINAL BLOCK

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Purpose/Objective: In lower abdominal surgery, the rectus sheath block (RSB) and transverse abdominal plane (TAP) block are becoming the most common technique. It is well known that injection of a large dose of local anaesthetics may result in toxic plasma concentrations. Levobupivacaine (LEV) is commonly used for these techniques, however, plasma concentrations of LEV with maximum dose of 150mg after these blocks have not been previously reported.

Materials and Methods: Thirty adult patients undergoing elective lower abdominal laparoscopic surgery were recruited and received bilateral ultrasound-guided RSB or TAP block before operation (150 mg of LEV diluted

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to 60 ml). Arterial blood was collected every 15 min for the first hour, then every 30 min for the following hours until the patient returned to the ward.
Results: In the RSB group, the mean peak total LEV concentration occurred 45 min post-injection and was 1.249 mcg/ml. In the TAP group, the mean peak total LEV concentration occurred 30 min post-injection and was 1.863 mcg/ml, and there was correlation with the level of albumin.
Conclusions: Rectus sheath block using 150 mg of LEV produces relatively low blood plasma concentrations that are well below the neurotoxic level. In contrast, TAP block with 150 mg of LEV results higher concentration than RSB. We should be careful for the amount of LEV with TAP block.

A COMPARISON OF MEDIAL VERSUS COMBINED (SUPERFICIAL AND DEEP) CERVICAL PLEXUS BLOCK FOR CAROTID ENDARTERECTOMY

D. Nalos[1], P. Neumann[1], D. Bejsovec[1]. [1]*ARO, Masaryk Hospital, Ústí nad Labem, Czech Republic.*

Purpose/Objective: To compare the method of combined deep and superficial cervical plexus block (group A) with ultrasound-guided medial cevical plexus block(group B).
Materials and Methods: We enroled100 patients undergoing planned carotid endarterectomy. Patients were randomly divided into two groups of 50 each. The factors studied were quality of the block, complications, satisfaction of patients and surgerons and the time it took to perform the block.
Results: The groups did not differ in the effectivness of the block. Statistically significant differences were found in the aspiration of blood in 7 cases in group A vs 0 in group B, The time taken to perform block 4.8min. (A) vs 2,4 min.(B). The total requirement of local anesthetics were reduced in the medial cervical block (B). Satisfaction of patients and surgerons was similar.
Conclusions: Ultrasound assited medial cervical block is comparable to the combined suprficial and deep cervical plexus block in its analgetic an anesthetic potency. Given the documented risk of deep cervical plexus block, we recommend the safer alternative of ultrasoun assisted medial cervical plexus block.

IS AN "INJECTION PRESSURE MONITOR" A USEFUL TOOL PERFORMING ULTRASOUND GUIDED PERIPHERAL NERVE BLOCKS? CLINICAL EXPERIENCES (PRELIMINARY RESULTS)

U. oberndorer[1], R. cumlivski[1], S. leitner[1], O. koellner[1], N. seidel-ahyai[1], G. redl[1]. [1]*Anaesthesia, oss speising vienna, vienna, Austria.*

Purpose/Objective: Ultrasound guidance has increased the safety of regional anaesthesia to a certain degree, but still we are faced with nerve lesions. The literature clearly indicates that the injection pressure is rising in intraneural position of the needle. Aim of this clinical investigation was to implement the use of a pressure injection monitor at a big orthopaedic centre and describe our experiences.
Materials and Methods: 20 (100 are planned) different peripheral nerve blocks were performed alike the daily routine plus a "Bsmart injection pressure monitor". The Monitor was placed between the syringe and the injection line.

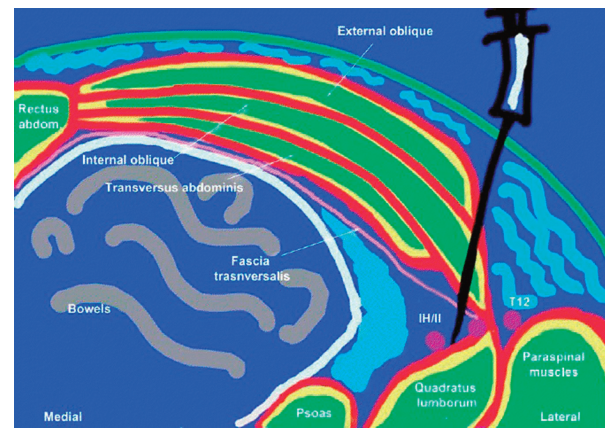
The monitor indicated a pressure 15-20 psi (pound/square inch) yellow, a pressure >20 psi red. All events, syringe-size, type of nerve block, experience of anaesthetist was recorded. Moreover the quality of visualisation by the ultrasound was recorded. Neurological control of all patients was reported.
Results: We had high-pressure alarm (red = >20 psi) in 10% and pressure indication (yellow = 15-20 psi) in 15% of all patients. In all cases the needle was immediately brought in another position and the injection was performed with low pressure. No neurological damage was recorded.
Conclusions: The clinical investigation increased the awareness of the injection pressure in the performing team. 10% red and 15% yellow events indicate the frequency of potential high pressure injections and the sensitivity of this tool. All alarm events changed the process of the performing college. As long as we are faced neural damage following regional anaesthesia we need to make it saver.

COMPARISON OF ULTRASOUND-GUIDE QUADRATUS PLANE BLOCK VERSUS FEMORAL BLOCK FOR POSTOPERATIVE ANALGESIA IN NECK FEMORAL FRACTURE

T. Parras[1], R. Blanco[2]. [1]*Anaesthetic, University Hospital Lewisham, London, United Kingdom,* [2]*Anaesthetic, King´s College Hospital. London, London, United Kingdom.*

Purpose/Objective:
1. Compare the analgesic effect of the ultrasound-guided TAP posterior approach (Quadratus Plane Block) with femoral block in patients undergoing surgery for a neck femoral fracture.
2. Analize the VAS score, sensitive and motor block during the following 24 hours.

Materials and Methods: The Quadratus Plane Block is a fascial block, where the local anaesthetic is injected where the internal oblique muscle finishes and quadratus lumborum appears (Fig. 1).



We performed a RMI in a volunteer injecting 30 mls of 0,125% levobupivacaine adding gadolinium.

We observed the extension from T10 to L1 (Fig. 2).

A clinical trial, approbed by Ethical Commision of Jaen University Hospital (Fig. 3), after written consent inform of 104 patients (52 each group).

Quadratus Plane Block group (QPB): 30 mls 0.125% levobupivacaine.

Femoral Block group (FB) was injected 10 mls 0.25%levobupivacaine.

Both blocks ultrasound-guided (Fig. 4).

After the block: spinal anaesthesia with 0.5% Marcain without opioids.

In the recovery both groups received PCEA of morphine during the next 24 hours.

VAS, quality of sensitive and motor block was compared when the patients arrived in recovery, at 6, 12, 18 and 24 hours after. Opioids total amount administered in PACU and in 24 hours, stay in PACU, patient satisfaction were recorded and inmediate secundary effects.

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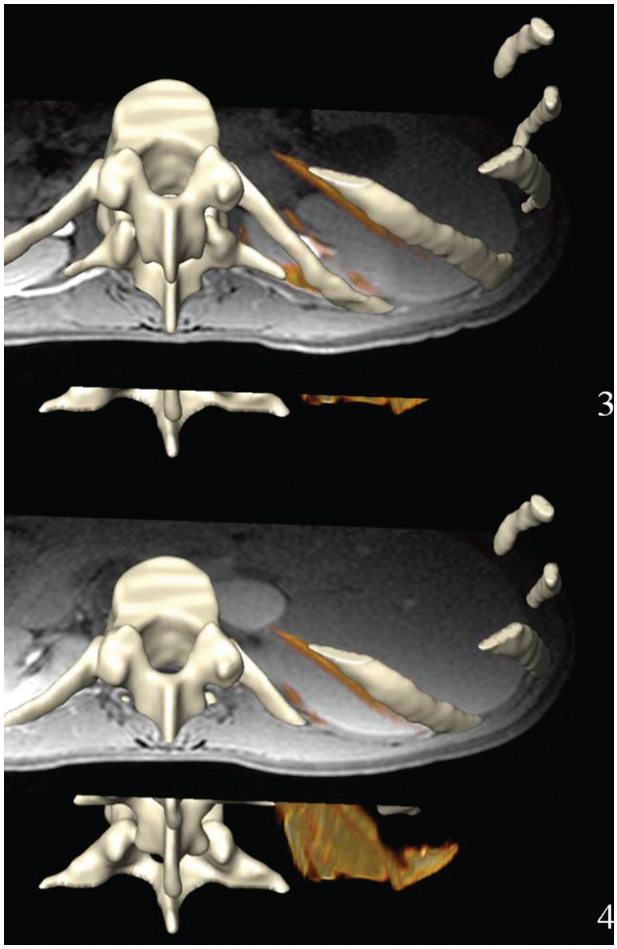


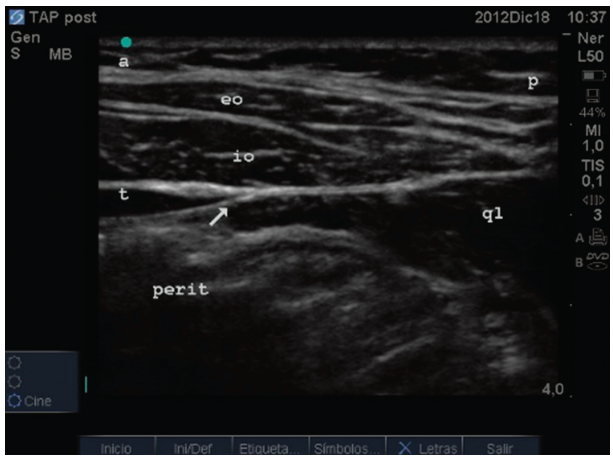
Results: VAS (Fig. 5), opioids were lower in QPB, p<0.01.

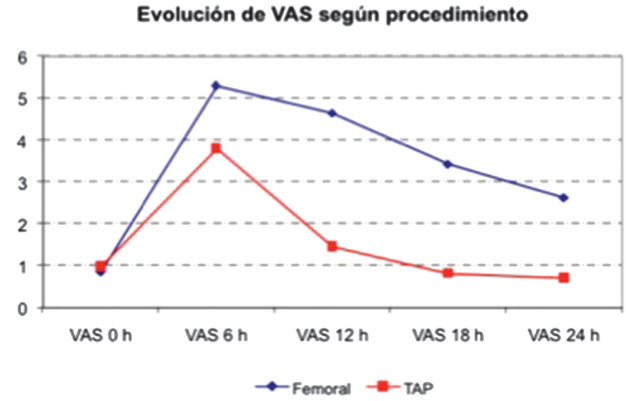
Stay in PACU were lower in QPB with p<0,05. Similar sensitive and motor block (p>0,05).

Patient satisfaction was better in QPB, not statistically significant (p=0.08).

Inmediate secundary effects: three paresthesias in FB.

Conclusions: QPB provides better analgesia than FB for hip arthroplasty





SURGEON ADMINISTERED RECTUS SHEATH BLOCK CAN BE AN EFFECTIVE ALTERNATIVE TO EPIDURAL FOR LAPAROTOMIES WITH MIDLINE INCISIONS

V. Paul[1]. [1]*Anaesthetics, Wexham Park Hospital, Slough, United Kingdom.*

Purpose/Objective: Epidurals are generally the mainstay for effective analgesia for laparotomies involving midline incisions. Where they are contra-indicated, various modalities can be used. One such under-used modality is the rectus sheath block, especially when administered under direct vision by the surgeon. An observational study of 4 cases I was recently involved in suggests that these blocks are a very serious alternative to epidurals.

Materials and Methods: Simple observation of 4 cases where epidurals were either contra-indicated or refused. All 4 were emergency laparotomies with mid-line incisions extending either side of the umbilicus. Fentanyl 100 mcg for induction followed by intra-operative morphine 10 mg and Paracetamol 1g was administered. At the end of the operation, rectus sheath block was established by the surgeon with local anaesthetic injected under direct vision. 2-3 mg/kg of 0.25% Bupivacaine was used. Morphine PCA and regular Paracetamol were prescribed postoperatively.

Results: Follow-up for 48 hrs showed very low pain scores (0-2), minimum requirement for PCA (20-30mg over 48 hrs), and good patient satisfaction.

Conclusions: Rectus sheath blocks administered under direct vision can give effective analgesia comparable to epidurals for surgeries involving long midline incisions. The ease of administration, time saved and minimal risk involved with this technique gives it the edge over epidurals.

INTERSTERNOCLEIDOMASTOID APPROACH TO THE BRACHIAL PLEXUS ABOVE THE CLAVICLE REVISITED UNDER THE LIGHT OF ULTRASOUND.

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Purpose/Objective: The Intersternocleidomastoid (ISCM) approach[1] to the brachial plexus (BP) practiced now under ultrasound (US) was surveyed in order to verify on real time its safety.

Materials and Methods: After informed consents, patients scheduled for shoulder surgeries were preoperatively given the ISCM blocks. US-guidance was now associated routinely. Neurostimulation was combined to locate nerves and prevent phrenic damage. The needle was inserted (in plane) and advanced from medial to lateral[1]. Levobupivacaine 0.5% was injected (10 or 20mL). Taking advantage of US, we surveyed the blocks from 2009 to 2011 focusing on scanned adjacent anatomy. Block installation and eventual respiratory troubles were recorded.

Results: We have surveyed 60 patients (36 women and 24 men). They were 52 ± 19 yr., 71 ± 13 kg and 166 ± 10 cm. The jugular vein was oversized but avoidable in three patients. The phrenic nerve was stimulated in six patients and seen in one out of six. The BP appeared typically between the anterior and middle scalene muscles. No pleural dome was visualized. Dense blocks of the shoulder, of the radial and musculocutaneous nerves were achieved within 10 ± 3 min. Three patients expressed transient respiratory discomfort without distress.

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Conclusions: This survey confirms our saying that the lung is not in danger under ISCM approach[1]. This anterior approach of the US-guided interscalene block is easy. Neurostimulation is mandatory to prevent phrenic nerve damage.

1. Anesth Analg 1997 ; 85 : 111-6

PREDICTORS OF PATIENT SATISFACTION AND FUTURE ACCEPTANCE OF REGIONAL ANAESTHESIA FOR HAND SURGERY

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Purpose/Objective: Measuring patient satisfaction is an important tool for monitoring quality of healthcare services. Identifying and subsequently rectifying factors adversely affecting patient satisfaction may result in improved care.

Materials and Methods: We present data from telephone follow-up of approximately 1000 patients who underwent hand surgery under ultrasound guided regional blocks in a large tertiary hospital. Our primary outcomes included (1) patient's satisfaction with regional anaesthesia, and (2) future acceptance of regional anaesthesia for hand surgery. We correlated the primary outcome data with an array of predefined parameters.

Results: Over 90% of patients surveyed indicated high degree of satisfaction with their anaesthesia and readiness to undergo future hand procedures under regional block only. Satisfaction seemed to be adversely affected by moderate/severe pain during the block or postoperatively, technique failure requiring conversion to general anaesthesia, significant motor block and female gender. Conscious sedation during block performance appeared to improve patient satisfaction. Factors that significantly impacted on patients' future acceptance of regional anaesthesia were moderate/severe pain at block, significant motor block, conversion to general anaesthesia and low overall satisfaction. However, closer review of patients who categorically refused future awake surgery under regional block revealed that half of them actually experienced an uncomplicated anaesthesia and pain free surgery, even describing the whole process as excellent or good.

Conclusions: Patient satisfaction with anaesthetic care is only partially determined by well defined technical aspects of the regional blockade. Difficult-to-define psychological factors are likely to play an equally important role.

TO COMPARE LIDOCAINE2%/CLONIDINE IN COMBINATION WITH BUPIVACAINE 0.5 % ALONE IN EQUAL VOLUMES FOR COMBINED SCIATIC-SAPHENOUS NERVE BLOCK IN TERMS OF SELECTIVITY OF BLOCKADE

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Purpose/Objective: We aimed at comparing lignocaine 2% + clonidine 1.5 mcg/kg with bupivacaine 0.5% in terms of selectivity following combined sciatic-saphenous nerve block.

Materials and Methods: Thirty consecutive ASA l-lll patients scheduled for semi elective bimalleolar surgery of the ankle were recruited. Patients were randomly allocated to receive either i. lignocaine 2% + 1.5 mcg/kg clonidine (group L) or ii. plain bupivacaine 0.5% (group B) for combined sciatic-saphenous nerve block. After an established block all patients recieved a standardised general anaesthesia. Post operatively sensory/motor blockade were assessed every 2 hours until complete resolution of the block. Time to first request for rescue analgesia, sedation post block performance and any haemodynamic instability perioperatively were also recorded.

Results: Two patients were excluded due to protocol breech leaving 14 patients per group. The sensory and motor block in group B was significantly longer (26.7 +/- 3 and 24.4+/- 4.4) when compared to group L (10.2 +/- 2.92 and 8.57 +/- 1.98 respectively), p=0.00001. The block onset time was significantly lesser in group L than group B for sciatic sensory 18.5 +/- 5.6 (L) vs 26.4 +/- 4.5 (B), p=0.0004 and motor block 13.2 +/- 5.4 (L) vs 21.4 +/- 6.3 (B), p=0.001. Thirteen patients in group L requested rescue analgesia compared to one patient in group B, one patient experienced haemodynamic instability perioperatively.

Conclusions: We conclude that the lidocaine plus clonidine combination induced sensory and motor blockade of lesser duration than that acheived with an equal volume of bupivacaine 0.5%.

AN AUDIT OF ULTRASOUND USE IN TRANSVERSUS ABDOMINAL PLANE BLOCKS BEFORE AND AFTER EDUCATIONAL INTERVENTION.

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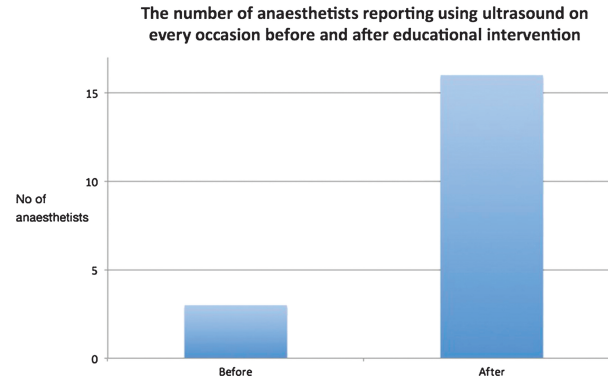
APurpose/Objective: A recent paper on the use of landmark technique for Transversus Abdominal Plane blocks (TAP) identified that in less than 25% of cases, the injectate was in the correct plane. This audit aimed to identify the use of ultrasound for TAP blocks before and after educational intervention.

Materials and Methods: A survey was circulated to anaesthetists on their use of ultrasound for TAP blocks and knowledge of complications. These results were presented at the end of a Journal Club session on the paper: *Should we stop doing blind transversus abdominis plane blocks? McDermmott et al. Br J Anaesth. 2012 Mar;108(3):499-502*. Clinicians were then re-audited.

Results: 17 respondents completed the audit (89% response rate). 25% reached the gold standard of using ultrasound on every occasion. The majority thought that correct placement of local anaesthetic was successful up to 50-75% of cases. No one reported any complications. After educational intervention 94% felt that this knowledge would change their practice.

Conclusions: This audit identified that careful and strategic educational intervention within current structures of departmental meetings can lead to a significant change in peoples practice.



EFFECT OF ADDING DEXAMETHASONE TO MEPIVACAINE ON INFRACLAVICULAR BRACHIAL PLEXUS BLOCKADE IN UPPER EXTREMITY SURGERY

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Purpose/Objective: Corticosteroids have been used successfully to prolong the duration of local anesthetic action after peripheral nerve and epidural blockade. The addition of dexamethasone to mepivacaine would prolong the duration of analgesia after ultrasound-guided infraclavicular brachial plexus block for patients undergoing upper extremity surgery.

Materials and Methods: We present 10 cases of adult patients undergoing ambulatory surgery under infraclavicular brachial plexus blockade were randomized to receive either 20 mL mepivacaine 1.5% plus dexamethasone 4mg (2ml) or 20 mL mepivacaine 1.5% plus 2 mL normal saline.

The primary outcome measure was time to first request of additional analgesia. Secondary outcomes included onset times of sensory and motor blockade, pain and satisfaction scores, analgesic consumption, and block-related complications.

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Results: The median duration of analgesia was significantly prolonged in the Dexamethasone group compared with the Normal group. The onset times of sensory and motor block were similar between the groups. No complications were reported.
Conclusions: The addition of dexamethasone to mepivacaine prolongs the duration of analgesia but does not reduce the onset of sensory and motor blockade after ultrasound-guided infraclavicular block compared with mepivacaine alone.

POPLITEAL SCIATIC NERVE CATHETER: HOW DEEP TO BE STABLE?

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Purpose/Objective: The perineural sciatic nerve catheter is the gold standard technique to ensure a highly effective analgesia after foot and ankle surgery. Its efficacy depends on the proximity of the catheter tip with respect to the nerve.

We evaluated the influence of the initial depth positioning of the catheter on its stability.
Materials and Methods: After local ethic committee approval, 60 patients undergoing foot or ankle surgery under regional anesthesia, were included in this prospective study.

A popliteal sciatic nerve block was performed using the out of plane ultrasound approach. After an initial injection of 15 ml of ropivacaine 0,5%, patients were randomly divided in 2 groups:
- Group A (n=30): Catheter tip deposited at the tip of the needle without further advancement.
- Group B (n=30): The needle was inserted 1 to 2 cm more cephalad into the puddle of local anesthetics, before positioning the catheter.

Its position was confirmed by hydrolocalisation, immediately and at 24 postoperative hour.

A perinerve puddle was considered as good position.

The statistical analysis used a Chi2 test to compare the qualitative variables. The significance value was defined as a p<0,001.
Results: At 24th hours, the ultrasound localisation of the catheter showed that only 12 catheters out of 30 were in a correct position in group A (40%), compared with 29 catheters out of 30 for the group B (93%) (p<0,001).
Conclusions: A short catheterisation (1-2 cm) of the sciatic nerve is necessary and sufficient to ensure the stability of the perineural catheter in the postoperative period.

DO WE REALLY STOP BEFORE WE BLOCK? AN AUDIT OF PRACTICE IN A UNIVERSITY TEACHING HOSPITAL.

M. Salman[1], J. Han Gan[1], A. Soodan[1]. *[1]Anaesthetics, University Hospital Lewisham, London, United Kingdom.*
Purpose/Objective: Wrong side regional blocks are infrequent but serious incidents in anaesthetic practice. The 'Stop Before You Block' (SBYB) campaign was launched in 2011 as an effort to reduce such errors by performing additional checks. We audited the awareness of this initiative and the compliance with the procedure in our Anaesthetic Department.
Materials and Methods: Confirmatory checks done before performance of regional blocks were observed. A separate questionnaire examining the knowledge of the SBYB initiative was subsequently completed by anaesthetists and operating department practitioners.
Results: 30 regional blocks were audited. In 100% of cases, the WHO checklist was completed in the anaesthetic room with confirmation of the surgical site on the consent form and visualization of the site mark. None of the anaesthetists placed a separate mark on the block site. Immediate pre-block checks were done in only 53% (16/30) of cases. Re-checking of the correct side on the consent form was done in only 20% (6/30) of cases. Of the cases where immediate pre-block checks were not performed, 14% (2/14) were done in a theatre that had no reminder poster displayed, while in 42% (6/14) the operator was teaching a junior colleague.

78% of respondents to the questionnaire were aware of all the required SBYB steps. When asked to rate the usefulness of visual reminders, only 28% rated the displayed wall posters as 'very useful'.
Conclusions: More emphasis should be placed on increasing awareness of and improving compliance with the SBYB procedure.

ULTRASOUND GUIDED ANKLE BLOCK - SUCCESS RATES AND INCIDENCE OF POST OPERATIVE PARASTHESIA

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Purpose/Objective: The purpose of the current study was to present data from our institution with regards to the analgesic and anaesthetic effectiveness of ultrasound guided ankle blockade as well as to document the incidence of short and longer term parasthesia.
Materials and Methods: Ongoing, prospective study with 21 patients undergoing foot surgery. General anaesthesia was administered in addition to the regional technique and total anaesthetic time was documented. The block was formally assessed post-operatively in recovery; data collected included whether or not the patient was pain free over the surgical site, sites of parasthesia and whether any opioid was administered. A follow up interview was conducted at 72 hours and 2 weeks to assess the time at which full sensation returned, the site of any persisting parasthesia and time at which analgesia was first required.
Results:

TABLE 1. Block Success and Incidence of Post operative Parasthesia

Mean total anaesthetic time (mins)	26.8
% Pain free at surgical site	66.7
% with parasthesia in all blocked distributions	81.0
% with residual numbness at 72 hours	14.3
% with residual numbness at 2 weeks	9.5
% of Failed blocks (no parasthesia on testing)	5.0

Conclusions: The majority of patients (66%) were pain free in recovery. 9.5% of patients in our series had residual numbness at two weeks. Ongoing service evaluation will enable more accurate estimation of the incidence of post operative sensory changes following ultrasound guided ankle blockade.

"HOUR GLASS" PATTERN RECOGNITION SIMPLIFIES FACIA ILIACA COMPARTMENT BLOCK

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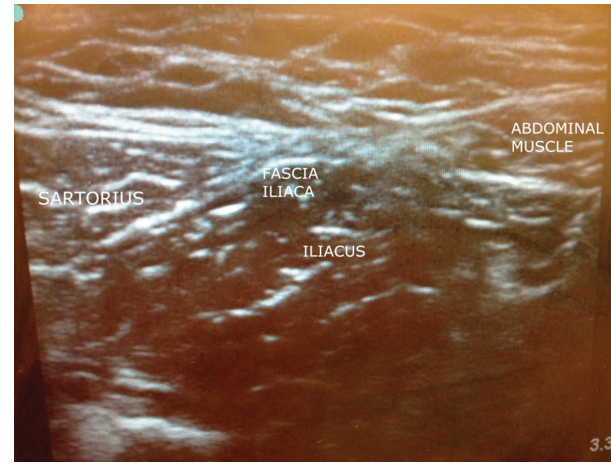
Purpose/Objective: Use of ultrasound to help identify the fascial planes may lead to the fast onset and increased success rate[2]. The inplane Suprainguinal approach[3] described by P Hebbard et al. requires advanced ultrasound skills, which probably may be a reason that this block technique has not become popular.
Materials and Methods: While repeatedly using the above technique in models to identify the fascia Iliaca, we consistently came across an hour glass pattern which aids in recognition of Fascia Iliaca and simplifies the performance of fascia Iliaca block.



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A high frequency linear ultrasound transducer probe with depth set to approximate 3.3 cms is placed on the anterior superior iliac spine and pointing towards Xiphisternum.

The probe is then moved medially along the inguinal ligament keeping the same angle till the hour glass pattern is recognized which is usually at the junction of medial 2/3 and lateral 1/3 of the inguinal ligament.

The inferior part of the hour glass is formed by the Sartorius muscle and the superior part by the abdominal muscles. Very consistently the deep circumflex iliac artery is seen just beneath the posterior part of superior hour glass (abdominal muscle).

The muscle under the hour glass is the iliac muscle and the fascia Iliaca can be easily recognized overlying the Iliacus muscle which makes fascia Iliaca block very easy.

Results: This simple hour glass pattern recognition helps In the easier identification.

Conclusions: This technique acts as a perfect conduit between the local in syringe and lumbar plexsus.

PATIENT EXPERIENCE OF HAND SURGERY UNDER REGIONAL ANAESTHESIA

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Purpose/Objective: The UK National Health Service is continually striving to provide good quality care and at the centre of this, is patient experience. We undertook an evaluation of patient experience in the hand surgery unit at Leeds General Infirmary that currently delivers acute and elective surgery to approximately 1500 patients/year, with majority being day case procedures.

Materials and Methods: 200 patients were sent questionnaires to assess aspects of their journey through the hand surgery unit. This included questions on information and consent, attitude of staff and experience of anaesthesia, surgery and recovery. Comments were requested regarding service improvement.

Results: We received 57 completed questionnaires from patients of whom all received brachial plexus block. 58% patients were elective cases and the remaining acute. 60% received information about anaesthetic before admission and 68% of them rated it as excellent or very good. Information provided by anaesthetist on the day of surgery was rated positively by 91% of patients. 4 patients complained of discomfort at both tourniquet and operating site whilst 1 other patient had isolated tourniquet pain during surgery. The overall care provided exceeded expectations for 61% of patients. 96% of patients commended staff for their supportive care and attitude and would recommend this hand surgery unit. Comments received regarding service improvement focused on waiting times and information giving.

Conclusions: Although our findings are from a small sample of the patient population, they show overall good patient satisfaction. Suggested areas for improvement included waiting times, information giving and quality of regional block.

QUALITY COMPARISON OF ULTRA SOUND GUIDED PARAVERTEBRAL BLOCK VS IV OPIOID + LA INFILTRATION FOR ANALGESIA AFTER BREAST SURGERY.

A. Thottungal[1], Z. Petrovic[1], P. Thorat[1], N. Taylor[1]. [1]*Anaesthetics, Medway NHS Foundation Trust, Medway Gillingham, United Kingdom.*

Purpose/Objective: This audit was done with local committe approval to compare quality of analgesia provided by ultrasound guided paravetebral block (PVB) vs IV opioid+ LA infiltration technique, side effects of each and to recommend the preferable technique.

Materials and Methods: Retrospective audit.

February- September 2011.

Total 40 cases (20 cases of single anaesthetist- Dr. A. Thottungal for US guided PVB group and 20 cases from other Anaesthetists for IV opioid+ LA infiltration group).

The parameters checked were technique, intra operative use of Paracetamol, NSAIDs, Opioids, amount of local anaesthetic, pain score and nausea score at the the time of admission and discharge from recovery, use of opioids and anti emetics during the stay in recovery.

Results:

TABLE. No caption available.

Group	LA volume	Intraoperative Morphine	Paracetamol	Diclofenac Sodium	Pain on admission to recovery -VAS	Pain on discharge -VAS	Morphine use in recovery	Antiemetics
PVB (Dr A.T)	15-20ml	0 mg-16 cases 4mg -4 cases with LA	18 cases	15 cases	19 cases-0/10 1case- 2/10	3 cases-2/10.	1 case-6mg	0 cases
GA	15-30ml	10 mg-17 cases 0mg- 3 cases with LA	16 cases	12 cases	18 cases-0/10 1 case-2/10 1 case-4/10	8 cases-2-9/10 average 4.25	4 cases- average 7mg 2 cases-PCA	4 cases

Conclusions: IV opioid + LA infiltration group had increased pain scores needing rescue analgesia and antiemetics compared to PVB group.

As a conclusion Ultra sound guided Paravertebral block for breast surgery improved the intra and post operative analgesia, reduced need for rescue opioids post operatively and reduced post operative nausea / vomiting. It improved quality of perioperative care and patient experience.

PATIENTS WITH DIFFICULT PERIPHERAL INTRAVENOUS ACCESS IN PREFERENCE SURGERY: ULTRASOUND GUIDED TECHNIQUE

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Purpose/Objective: We seek to demonstrate handiness, expedition and efficacy of ultrasound guided technique for Peripheral IntraVenous Access (PIVA) as well as its own superiority over traditional technique, in patients with difficult PIVA.

Materials and Methods: The study was conducted on patients of several preference surgery specialties from September 2012 to April 2013. Inclusion criterion was difficulties in seeing and palpating any veins at physical exam. We enrolled 420 patients, randomized in two groups: (A) 215 patients- intravenous access obtained at once trough ultrasound guided technique, (B) -205 patients- intravenous access obtained with ultrasound guided method after at least 2 previous failed attempts with traditional technique. Outcomes measured were: number of attempts necessary, time to cannulation (measured from first needle-skin touch to the testing of procedure success) and possible complications. No one of the operators involved had a specific ultrasound guided PIVA training.

Results: We succeeded in obtaining an ultrasound guided PIVA in all cases. In A we observed a mean of 1,2 punctures and a mean time to cannulation of 2,8 minutes. In B we observed a mean of 1,4 attempts and a mean time to cannulation of 3 minutes. Any complication wasn't revealed in both groups.

Conclusions: The mean number of attempts close to 1 and the mean time to cannulation so short in group A reveal handiness, rapidity and efficacy of ultrasound technique. The statistically not revealing difference of parameters measured between the two groups and the success rate of 100% support superiority of ultrasound guided technique over traditional one.

'STOP BEFORE YOU BLOCK'- WHAT'S STOPPING US?

B. Vowles[1], L. Robertson[1], C. Urquhart[1]. [1]*Deaprtment of Anaesthetics, Western Infirmary & Gartnavel General Hospitals, Glasgow, United Kingdom.*

Purpose/Objective: The occurrence of 'wrong site' peripheral nerve blockade is increasing. Despite local agreement with the 'Stop before you block' (SBYB) campaign, laminated posters in anaesthetic rooms and a recent case presented at our M&M meeting, anecdotal reports suggested that up-take within our department was at best inconsistent.

We therefore sought to determine whether people were consistently 'stopping' before they performed a peripheral nerve block and what factors were felt to be a barrier.

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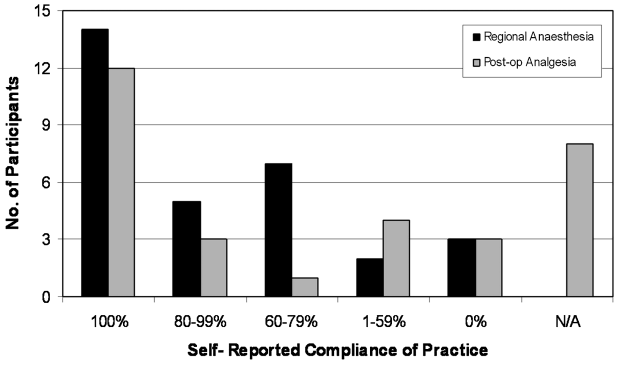
Materials and Methods: We conducted a survey of anaesthetists and anaesthetic assistants in our department. The questionnaire explored awareness of the campaign, self-reported compliance with SBYB measures and perceived barriers to performing these. We performed a literature review to identify common themes surrounding wrong site procedures and evaluate implementation of measures for improving patient safety.

Results: Questionnaires were completed by 31 participants (8 consultants, 11 trainees and 12 anaesthetic assistants). 96.8% were aware of the SBYB campaign. Despite this, self-reported compliance was poor with less than 50% of respondents reporting that they always conduct a SBYB pause (Figure 1). Highlighted barriers to compliance included: time concerns, lack of understanding of SBYB requirements, lack of motivation to comply and alternative personal habits surrounding peripheral nerve blockade. A number of interventions have been proposed in the literature to address such barriers, although none have shown improved outcomes.



Conclusions: Although awareness of the SBYB campaign is good, understanding of requirements and compliance with the campaign could be improved. Addressing this may remove some of the barriers to SBYB and improve patient safety.

COMPOUND IMAGING & ECHOGENIC NEEDLE DESIGN- EFFECTS ON NEEDLE VISIBILITY AND TISSUE IMAGING

T. Wiesmann[1], A. Borntträger[1], M. Zoremba[1], M. Neff[1], H. Wulf[1], T. Steinfeldt[1]. [1]*Department of Anaesthesiology & Intensive Care Medicine, Philipps University, Marburg, Germany.*

Purpose/Objective: Needle visualization in ultrasound- guided regional anesthesia can be improved by using needles of echogenic design. Software solutions such as compound imaging might further improve imaging of both needle and tissue; these effects have not yet been studied.

Materials and Methods: A total of 200 video clips of in-plane needle insertions were obtained in embalmed cadavers with a conventional needle and an echogenic one at five different insertion angles, with both conventional B mode ultrasound imaging and compound imaging technology. Visibility of needle shaft, needle tip and needle artifact rate were assed by a blinded investigator on a 4-point ordinal scale. The effects on tissue image quality and speckle artifacts were also assessed. Stepwise linear regression was performed to differentiate effects on needle visibility scores.

Results: Imaging of the needle shaft and tip were significantly enhanced when compound imaging technology was used ($p<0.0001$). Use of echogenically designed needles or shallow needle insertion angles improved visibility of both shaft and tip (both $p<0.0001$). With compound imaging, there are fewer needle artifacts, and tissue imaging quality and speckle artifact rate are significantly improved.

Conclusions: Compound imaging technology enhances needle imaging with both echogenic and conventional needles. Tissue imaging and speckle artifacts are also optimized. Echogenic needle design results in better needle visibility scores in both B-mode and compound imaging.

THE EFFICACY OF THE RECTUS SHEATH BLOCK AS A SOLE ANESTHETIC TECHNIQUE FOR THE REPAIR OF UMBILICAL HERNIA IN HIGH-RISK PATIENTS

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Purpose/Objective: The rectus sheath block(RSB) is used for analgesia after Umbilical Hernia (UH) repairs.This block, is quite simple with low risk of side effects.The purpose of the study is to evaluate the efficacy of RSB for repair UH used as a sole anaesthetic technique in high-risk patients.

Materials and Methods: After written informed consent,38 patients with significant co-morbidities who underwent an elective of small UH repair were included in this study. The RSB was performed using a regional block needle 50 mm in four points,3 to 4 cm from the midline bilaterally above and below the umbilicus. The needle was introduced at right angles to the skin, passed it until a loss resistance of the anterior rectus sheath and advanced further until the firm resistance of the posterior rectus sheath was felt. In this space eight milliliters of Bupivacaine 0.25% was injected at each of sites. Ten milliliters of Bupivacaine was infiltrated in the incision line. Demographic data, ASA physical status, possible infiltrations or more sedation during surgery, perioperative complications, surgical time, patient satisfaction were collected.

Results: There were, 32 males and 6 females patients, 21 ASA/II, 17/III. The mean age was 72.4±12 years.The intervention lasted 37±11 minutes. The block was effective in 35 patients (87.5 %). In 3 patients(12.5%) intraoperative infiltration of Lidocaine and more sedation were necessary. In all cases the surgery ended under this block.No perioperative complications occurred. All the patients were satisfied.

Conclusions: We suggest that RSB is a good alternative anesthetic technique for UH surgery particularly in the high-risk patients.

COMPARISON OF INTRATHECAL LEVOBUPIVACAINE COMBINED WITH SUFENTANIL, FENTANYL, OR PLACEBO FOR ELECTIVE CAESAREAN SECTION: A PROSPECTIVE, RANDOMIZED, DOUBLE-BLIND, CONTROLLED STUDY

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Purpose/Objective: In this prospective, randomized, double-blind, controlled study, our aim was to compare the effect of adding fentanyl or sufentanil to levobupivacaine on the intraoperative anesthesia quality, block characteristics, the newborn and the mother, surgical satisfaction, and the duration of postoperative analgesia.

Materials and Methods: Ninety three patients were randomized into three groups (n=31), with all patients receiving levobupivacaine (2.2±0.2 ml 0.5%, Group C), while Group S also received sufentanil (2.5 mg), and Group F also received fentanyl (10 mg) intrathecally. Patients' demographics, block characteristics, hemodynamics, newborn and maternal side effects, surgeon satisfaction score, time to first analgesia requirement and additional analgesic use within 24 hours were recorded.

Results: In the sufentanil and fentanyl-added groups, sensory and motor block levels were achieved more rapidly ($p<0.001$), and hemodynamic values were affected negatively to a greater extent in the sufentanil group ($p<0.05$). The end of sensory block time and the time of first analgesic requirement were longer in the sufentanil group ($p<0.001$). Additional analgesic requirement during the 24 hours period was lowest in the sufentanil group, and highest in the control group ($p<0.001$). Postoperative pruritus was more frequent in the sufentanil group ($p<0.001$) and surgeon satisfaction score was significantly lower in the control group ($p=0.003$).

Conclusions: It was demonstrated in our study that the addition of sufentanil and fentanyl to intrathecal levobupivacaine during caesarean section surgeries increased block quality and duration than levobupivacaine alone, and also that the addition of sufentanil led to a greater decrease in postoperative analgesic requirement than fentanyl.

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PROPHYLACTIC PHENYLEPHRINE

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Purpose/Objective: Prophylactic infusion of phenylephrine (PE) has been advocated in order to reduce the incidence of hypotension after spinal anaesthesia for caesarean section. However, the evidence is inconsistent. Moreover, concerns have been raised about an overshooting reactive hypertension. We set out to identify the relevant literature and to perform a meta-analysis.

Materials and Methods: A systematic literature search of PubMed, Embase, CINAHL, LILACS, CENTRAL, and ISI WOS was performed. For meta-analysis, the random effects model was applied; risk ratio (RR) and 95% confidence intervals (CI) were calculated.

Results: We identified 21 randomised controlled double-blinded trials reporting on 1504 patients. All trials used ≥10 mg bupivacaine. The RR for predelivery hypotension after PE infusion compared to no prophylaxis was 0.36 (95% confidence interval (CI) 0.18 to 0.73), compared to ephedrine (E) infusion the RR was 0.58 (95% CI 0.39 – 0.88). For combinations of PE and E versus E alone infusion the RR was 0.73 (95%CI 0.55 – 0.96). PE infusion compared with no prophylaxis also significantly reduced the risk of postdelivery hypotension, nausea and vomiting. Hypertension, bradycardia and neonatal endpoints including Apgar scores and umbilical cord blood gas analysis did not differ.

Conclusions: Although effective in reducing the risk for hypotension, fur ther evidence is needed before PE infusion can be recommended for routine clinical practice, especially after low dose bupivacaine (≤8mg). This meta-analysis could not give an answer to the issue of reactive hypertension secondary to PE infusion.

INCIDENCE OF POST DURAL PUNCTURE HEADACHE IN PARTURIENTS IN NOTTINGHAM CITY HOSPITAL OVER 1 YEAR PERIOD

S. Singh[1], S. Bhayani[1], A. Biswas[1]. [1]*Anaesthetics, Nottingham University Hospitals, Nottingham, United Kingdom.*

Purpose/Objective: The incidence of unintentional dural puncture in parturient is estimated to be around 1.5%. Complication such as post dural puncture headache (PDPH) occurs in about 0-5% cases following spinal anaesthesia and 70 to 80% cases following accidental dural puncture during epidural. Previous studies have identified risk factors such as young age, low Body Mass Index (BMI), operator experience in development of PDPH.

The aim of this study was to determine the incidence and predisposing factors in development of PDPH in parturient at Nottingham city hospital.

Materials and Methods: This is a retrospective observational study conducted at tertiary maternity unit over a period of twelve months (January 12 –December 12). Case notes of women with PDPH were reviewed to analyse data. Risk factors such as maternal age, BMI, number of attempts for spinal or epidural, experience level of the operator leading to PDPH were reviewed.

Results: Over this period 1222 epidurals and 984 spinal anaesthesia were performed. Of these, 21 cases had accidental dural puncture. PDPH occurred in 14 cases with mean maternal age of 27.4 years, mean BMI of 23.3. Junior trainees performed 10/14 cases. Most cases 11/14 of PDPH occurred following single attempt at procedure.

Conclusions: The incidence of dural puncture was 1.6 % following epidural. PDPH occurred in 66.6% cases following epidural and 0.1% after spinal anaesthesia. Low BMI (<25) and operator experience contribute to the occurrence of PDPH. Number of attempts at procedure do not influence incidence. These results will help us to better inform the patients improve practice and training.

COMPARISON OF THE EFFECTIVENESS OF PERCUTANEOUS EPIDURAL NEUROPLASTY BETWEEN FBSS PATIENTS AND NON-FBSS PATIENTS.

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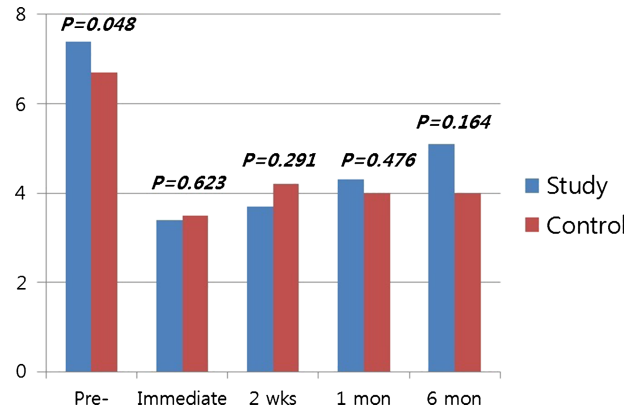
Purpose/Objective: Recently percutaneous epidural neuroplasty is in the spotlight as a non-surgical treatment of spinal disorders. Many patients suffer from failed back surgery syndrome(FBSS) that cause chronic pain after spinal surgery. In this study, we compared the effectiveness of percutaneous epidural neuroplasty between FBSS patients and non-FBSS patients.

Materials and Methods: A total of 65 patients who underwent percutaneous the epidural neuroplasty in Pain Clinic of Gangnam Severance Hospital from Jan. 2009 to Dec. 2012, were divided into two groups: Control group (n=43) without FBSS and Study group (n=22) with FBSS. To evaluate the effectiveness of procedure, VAS scores were checked in each group at the time of pre-procedure, immediate post-procedure, 2 weeks, 1 month and 6 months after procedure. VAS scores of both groups were analyzed at each time point by using t-test.

Results: The mean VAS scores of pre-procedure were statistically different in each group (Control vs Study = 6.7±1.2 vs 7.4±1.2, $P = 0.048$). The mean VAS scores of immediate post-procedure, 2 weeks, 1 month and 6 months after procedure did not showed statistically significant difference between two groups (Fig.1).



Conclusions: In FBSS patients, percutaneous epidural neuroplasty can achieve comparable relief of pain to non-FBSS patients.

USE OF TRANSVERSUS ABDOMINIS PLANE BLOCKS TO FACILITATE DAY SURGERY FOR ILIAC CREST BONE GRAFTS: RESULTS OF A NATIONAL SURVEY.

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Purpose/Objective: There is increasing encouragement to undertake surgery as day cases[1] We have started to perform hand surgery requiring iliac crest bone grafting, as day cases.

Bone is often harvested from the iliac crest for scaphoid/wrist surgery. Donor site pain is the most common post-operative complaint, (up to 46%)[2], and can interfere with early mobilisation[3] and discharge[4]. The nerve supply to the iliac crest is from the L1 nerve root via the iliohypogastric and ilioinguinal nerves. We routinely perform supraclavicular nerve blocks for hand/wrist analgesia and an ultrasound guided transversalis abdominis plane block (TAP) for graft site analgesia. We conducted a National survey of Hand Surgeons, questionnning whether they performed this surgery as day case and the reasons that this might not be performed.

Materials and Methods: We sent a survey to 483 hand surgeons, asking whether they perform hand or wrist surgery with iliac crest bone grafts as day cases and the common reasons leading to an inpatient stay.

Results: 148 hand surgeons replied (30.6%). 146 (88.4%) performed surgery requiring iliac crest bone grafts. Only 53.7% discharged their patients as day cases. Of the patients not discharged, pain was the most frequent reason for an inpatient stay (74.6%), followed by surgical factors (13.6%). Only 8.4% replied that their anaesthetist routinely used TAP blocks for iliac crest pain.

Conclusions: We routinely discharge patients as day cases after surgery requiring iliac crest bone grafting. Donor site pain is the most common reason for delayed discharge and this can be alleviated by performing TAP blocks.

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FEMORAL NERVE BLOCK- OR INTRAVENOUS- PCA ANALGESIA FOR EARLY PHYSICAL REHABILITATION AFTER ACL-RECONSTRUCTION IN"FAST-TRACK" ORTHOPEDICS

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Purpose/Objective: 'Fast-track'-orthopaedics characterizes early start of physical rehabilitation (PHR). Quality of mobilization depends on pain therapy success and motor function and muscle strength preservation. PCA-analgesia, continuous intravenous (IV) and regional-femoral nerve block (FB) makes the modern base of acute pain therapy. The aim of study was to determine more effective PCA-analgesia (IV-PCA vs. FB-PCA) for PHR after ACL-reconstruction.

Materials and Methods: After hospital Ethic Committee approval, forty adults (33-51 age, ASA I/II) scheduled for ACL-reconstruction were included in prospective, randomised, observer-blinded study. Spinal anaesthesia (12.5 mg, 0.5% levobupivacaine, G27;Pencil-Point) was performed in all patients. Patients were divided in two equal groups. In IV-PCA group-intravenous (fentanil 1 μg $kg^{-1}h^{-1}$) and in FB-PCA group-femoral block (0.125% levobupivacaine, 8 ml h^{-1}) PCA-analgesia (IV-PCA: fentanil 10μg/8min/x6max; FB-PCA: 0.125% levobupivacaine, 8ml/30min/x3max) was established after surgery. VAS was assessed by Acute Pain Servis protocol during 24-hours and accepted as satisfactory if ≤3. Diclofenac (75 mg) and paracetamol (1g) was added i.v. if VAS≥4. Start of PHR was planned six-hours after surgery.

Results: FB- and IV-PCA provided effective analgesia during first 24-hours after ACL-reconstruction (VAS≤3). PHR was possible 6-hours after surgery in 85% of FB-ACL (IV-PCA=20%)(P=0,0001) due to lower VAS 0,7+/-0,2 (IV-PCA=3,0+/0,2) and adverse side effects (15%; muscle weakness)(IV-PCA=45%; sedation 5%, POVN 15%, dizziness 10%, hypotension 15%) (P<0,0001). Additional analgesic-doses were more need in IV-PCA (40%) (FB-PCA=10%)(P<0,0001).

Conclusions: FB-PCA allows more successful pain-free PHR for ,,fast-track'ACL-reconstruction compare to IV-PCA, excluding 15% of the FB-PCA patients in whom residual muscle weakness was present and disabled the onset of PHR.

ENHANCED RECOVERY PROGRAMME FOR PRIMARY KNEE ARTHROPLASTY- IS MORPHINE SULPHATE (SLOW RELEASE) CAPSULE COST EFFECTIVE ALTERNATIVE TO OXYCODONE(MODIFIED RELEASE), FOR POSTOPERATIVE ANALGESIA?

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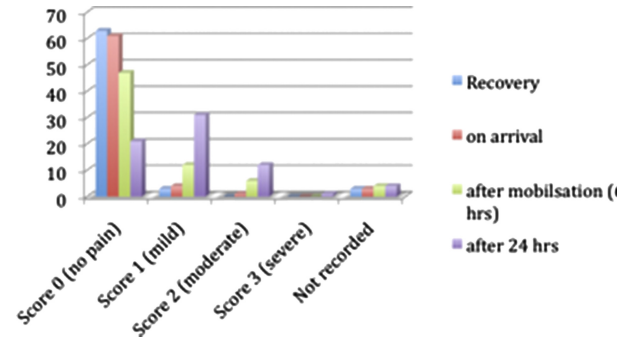
Purpose/Objective: Enhanced recovery pathway for primary knee arthroplasty have shown improvements to patient satisfaction and good clinical outcomes, multimodal analgesia being one of the key component. Oxycodone modified release(MR) tablets are routinely used for postoperative analgesia in majority of enhanced recovery pathways. We chose morphine sulphate slow release (SR) capsules for cost benefits.

We aim to measure the quality of analgesia and side effect profile of morhine sulphate SR capsules in peri-operative setting after primary knee arthroplasty.

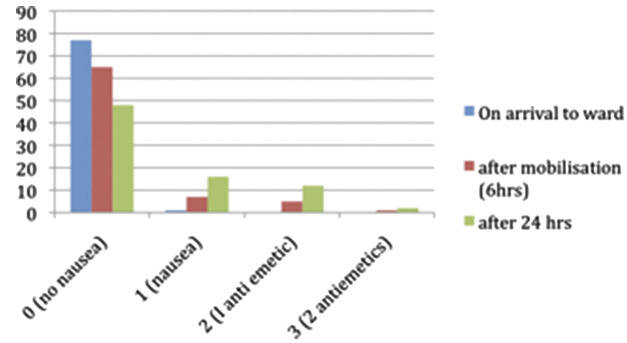
Materials and Methods: Following the approval from local clinical audit committee, 78 patients who had primary knee arthroplasty and followed enhanced recovery pathway were surveyed for pain, nausea and vomiting scores at 0, 6,12 and 24 hrs postoperatively.

Summary of enhanced recovery pathway for TKR

Results: Pain scores



Nausea and Vomiting scores



Conclusions: Morphine sulphate(slow release) capsules provide good analgesia with less nausea and vomiting and offer cost effective alternative to Oxycodone(MR) in enhanced recovery knee arthroplasty pathways.

TABLE. No caption available.

Perioperative analgesia with Paracetamol 1g qds, Ibuprofen 400mg tds, Gabapentin 300 mg (100mg if >70yrs) bd for 5 days.
Lansoprazole 30 md od.
Spinal anaesthesia with 0.5% heavy bupivacaine 2–2.5 ml, sedation if needed.
Tranexamic acid 500 mg iv at induction, at torniquet deflation and 6 hrs postoperatively.
Joint infiltration: 100 ml of 2mg/ml ropivacaine with 1mg adrenaline, 50 mls of 2mg/ml ropivacaine subcutaneously.
Morphine sulphate SR capsule 20 mg bd 4 doses, first dose in recovery before spinal wears off.
Codiene phosphate 60 mg qds, after 4 doses of morphine sulphate SR capsules.
Oral morphine if needed.

POSTERIOR NERVE BLOCKS (LUMBER PLEXUS & SACRAL PLEXUS) PROVIDE SUPERIOR ANALGESIA THAN ANTERIOR (FEMORAL. OBTURATOR &LATERAL FEMORAL) NERVE BLOCKS AFTER TOTAL HIP ARTHROPLASTY

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Purpose/Objective: Peripheral nerve blocks (PNB) are frequently used for peri-operative pain relief in THA. In this non-randomized study PNB performed posteriorly were compared to nerve blocks performed anteriorly for their analgesic efficacy and usage of opiates in the post operative period.

Materials and Methods: After verbal consent, 20 ASA1-3 patients, divided equally in 2 groups(A & B) received PNB for post operative pain relief after THA surgery. Group A received anterior nerve blocks (Femoral, Obturator &Lateral Femoral Cutaneous Nerve). Nerve blocks were performed by a single operator using Sonosite EDGE (Sonosite Inc.Bothell.WA.USA) and 40 mls (20,10,&10 mls respectively) of Levobupivacaine 0.25%.

Group B received ultrasound guided Lumbar & Sacral Plexus blocks performed by the same operator.20 mls of Levobupivacaine 0.25% was used to block each plexus.

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All blocks were performed in patients under general anaesthesia. Intra-operative supplemental analgesia included I.V Paracetamol 1G and I.V Morphine as required. All patients received Morphine as PCA for post-operative pain relief.

Pain score (1-4) and Morphine consumption were recorded during the 24 hours following the surgery.

Results: There were no complication related to nerve blocks. Group A had a median pain score of 2 during the 24 hours post operative period and used 36 mgs (SD 4.8) of Morphine as compared to group B which had median pain score of 1 and used 14 mgs (SD 2.2) of Morphine.

Conclusions: lumbar and sacral plexus blocks provide superior analgesia and have higher morphine sparing effect than anterior PNB, comprising femoral, obturator and lateral femoral cutaneous nerve blocks.

COMPARISON OF CONTINUOUS LUMBAR PLEXUS AND EPIDURAL BLOCK FOR ANALGESIA IN HIP ARTHROPLASTY

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Purpose/Objective: Hip arthroplasty (HA) requires potent postoperative analgesia (POA). Epidural block is commonly used, but continuous lumbar plexus block (CLPB) may offer advantages in POA quality and rehabilitation. Our purpose was to compare POA, side effects and complications of those techniques in HA.

Materials and Methods: Retrospective analysis (January, 2011 – March, 2013) of epidural and CLPB POA in patients subject to HA. Patients were submitted to subarachnoid block or general anesthesia. Additionally, some patients underwent an epidural (ropivacaine 0.1%, 5ml/h), whereas the remainders were subject to CLPB by posterior approach (ropivacaine 0.2%, 5ml/h). Rest/movement pain (intensity score 0-10), rescue doses, side effects and complications were compared (SPSS v17.0).

Results: We analyzed 162 patients of which 77 had epidural and 85 had CLPB. These groups were similar in age (67.22±11.57), sex and ASA. We found no differences in number or intensity of pain complaints (0-2 in 94.12% CLPB vs. 96.10% epidural), needed rescue dose (76.47% CLPB vs. 77.92% epidural without need) and time to discharge (88,3% at 72h). Complications and side effects incidence of each group were rare (Table 1), so significant differences between the techniques cannot be inferred.

TABLE 1

	Rescue Dose	Sedation	Respiratory Depression	Motor Blockade	Sensory Block	Nauseas/ Vomiting	Pruritus
Epidural	17	-	-	3	20	8	7
CLPB	20	1	-	1	14	3	-

Conclusions: CLPB proved to be an effective technique for HA analgesia. It provides similar POA with lower incidence of side effects than epidural. Further studies with a larger sample are required to evaluate CLPB efficacy and risk profile.

121 CASES OF CLEFT LIP AND PALATE CASES IN INDIA, WITH THE NORTHERN CLEFT FOUNDATION. UTILISING OPIATE SPARING TECHNIQUES TO MAINTAIN PATIENT SAFETY AND ANALGESIA.

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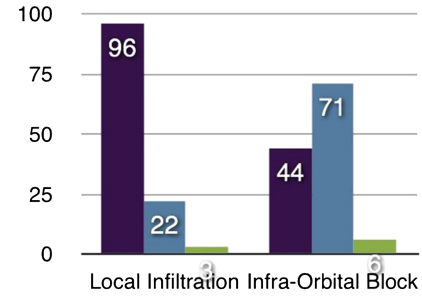
Purpose/Objective: The Northern Cleft Foundation organise an annual charitable trip to India to perform cleft lip and palate corrections. Due to the lack of post operative monitoring and the opiate naivety of patients, opiate sparing techniques are utilised to provide analgesia and maintain patient safety.

Materials and Methods: Prospective data was collected over the 12 day period.

Patients underwent inhalational induction and maintenance using Halothane and Nitrous Oxide. In selected adult cases intravenous induction was preferred. Intra-operative analgesia included, fentanyl 10mcg/kg and intravenous paracetamol 15mg/kg. Intravenous morphine was administered at the discretion of the anaesthetist: 0.25-0.5mg/kg. Local anaesthetic infiltration and Infra orbital nerve blocks were performed. All patients had one or both techniques depending upon the surgery. (graph 1)



Results: 121 cases were completed: cleft palate and lip repairs and related operations.

Pain scores were assessed in recovery using the FLACC or LADDER systems.

Pain scores were low, FLACC and LADDER average scores were 1.4 and 1.5 respectively. 76% of patients did not require rescue analgesia, 9 (7%) patients required morphine in recovery. Patients were prescribed regular paracetamol and ibuprofen post-operatively. One patient (0.8%) required morphine on the ward.

Conclusions: Multi-modal analgesia, local infiltration and nerve blocks allowed for minimal administration of opiates. This analgesic strategy maintained low pain scores and safety on the ward. Patient safety during the camp is paramount and the continued use of these techniques allows for a high level of patient care.

CHRONIC POSTSURGICAL PAIN PREVENTION: SURGICAL SITE INFILTRATION OF TRAMADOL VS LEVOBUPIVACAINE

T.L. Di Gennaro[1], M.B. Passavanti[1], M.C. Pace[1], F. Coletta[1], P. Sansone[1], V. Pota[1], S. D' Arienzo[1], R. Stumbo[1], L. D' Ambrosio[1], C. Aurilio[1]. *[1]Department of Anesthesiolgical Surgical and Emergency Sciences, Second University of Naples, Naples, Italy.*

Purpose/Objective: Surgery- related nerve injuries trigger molecular changes often expressed in chronic postsurgical pain (CPsP).

We evaluated the role of tramadol wound infiltration in perioperative pain management to assess analgesic postoperative requirements and chronic postsurgical pain incidence.

Materials and Methods: We enrolled 80 female ASA II, 30 to 55 aged patients scheduled for central quadrantectomy and reconstruction with Grisotti's inferior dermo-glandular flap for retroareolar breast cancer. Partecipants were randomly allocated into 2 groups of 40 components each according to surgical site infiltration performance. Patients of group T were administered tramadol 100 mg/20 mL. Patients of group L were administered levobupivacaine 2,5% 20 mL. Perioperative pain management was assessed by paracetamol 1000mg/100mL intraoperatively and postoperatively (t.i.d. for 48 hours). Pain was assessed through NRS at awakening (t0), 3(t1), 12(t2), 24(t3), 48 hours(t4) and 6 months(t5) postoperatively. A Douleur Neuropathique (DN4) questionnaire was performed at anestesiological visit and at t5.

Results: No patient reported chronic neuropathic pain at the anestesiological visit. Group T complained no pain everytime (but 4 patients reported vomiting and NRS= 3 at t1). In group L 60% of patients complained of weak pain (NRS=2 to 3), 25% of patients complained of moderate pain (NRS=4) from t0 to t3, 15% of patients reported no pain everytime. No patient reported CPsP.

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Conclusions: All patients reported satisfactory surgical acute and chronic pain management. tramadol wound infiltration provided the best analgesia ($p<0.01$) maybe because of tramadol interference with monoamine reuptake, TRPV1, opiate, γ-aminobutyric acid type A and *N*-methyl-d-aspartate ionotropic receptors and Na^+ and K^+ delayed rectifier channels.

THE TRANSVERSUS ABDOMINIS PLANE BLOCK FOR TOTAL LAPAROSCOPIC HYSTERECTOMY: A RANDOMIZED CONTROLLED TRIAL

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Purpose/Objective: Transversus Abdominis Plane (TAP) block is an effective analgesic technique for general and gynaecological surgery, either with laparoscopic and laparotomic approach. We investigated whether ultrasound-guided bilateral Tap block could improve postoperative analgesia in terms of morphine consumption, postoperative anaesthesia care unit (PACU) and surgical ward discharge times, functional capacity and PONV in patients undergoing elective total laparoscopic hysterectomy (THL).

Materials and Methods: After Ethical Committee approval and informed consent, 44 American Society of Anesthesiologists' (ASA) status I-III women undergoing THL were enrolled in the present observer-blinded, randomized, controlled trial and divided into 2 groups: group T (n=22) received TAP block after Total Intravenous Anaesthesia (TIVA) induction with 20ml of 0.375% levobupivacaine, group P (n=22) did not receive any block. Postoperative morphine consumption, time to White's score ≥ 12/14 in the Post Anaesthesia Care Unit (PACU), time to PADSS score ≥ 9/10 in the surgical ward, numerical rating scores (NRS) for pain, postoperative functional capacity (2min walking test) and side effects were registered.

Results: Group T showed lower morphine consumption in PACU (5.2mg vs 7.14mg, $p = 0.04$). Moreover, intraoperative propofol consumption during TIVA resulted greater in group P. White's scores, PADDS scores, NRScores for pain, functional capacity and 24-hour morphine consumption were instead comparable between groups. No difference was also registered in PONV incidence.

Conclusions: Bilateral TAP block proved to be an effective analgesic technique in the immediate postoperative period, reducing PACU morphine consumption in patients undergoing TLH. Nevertheless no difference in functional capacity, nor time for home discharge were registered between groups.

A PRELIMINARY STUDY OF BUSCOPAN AS ANALGESIA FOR POST HEMORRHOIDECTOMY ANOPLASTY USING NUMERIC RATING SCALE IN ST LUKE'S MEDICAL CENTER PHILIPPINES

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Purpose/Objective: The major problem after hemorrhoidectomy is postoperative pain. Hemorrhoidectomy causes reflex spasm of the involuntary internal anal sphincter and the voluntary external sphincter. Spasm may be a source of anal pain after hemorrhoid surgery. Buscopan acts by inhibiting cholinergic transmission in the abdominal and pelvic parasympathetic ganglia, thus relieving spasm in the smooth muscles of gastrointestinal, biliary, urinary tract. This study aims to determine whether buscopan has potent part in multimodality analgesia.

Materials and Methods: One hundred twelve adults ASA I and II without history of hypertension and heart disease. Patients aged between 18 and 60 year who were scheduled for hemorrhoidectomy anoplasty entered the study. Patients were randomly assigned to one of two treatments groups using computer generated randomization. Group A is control group and B is experimental group. Spinal anesthesia was induced with the following agents: bupivacaine 0,5% heavy 12 mg under sedation. The A group was given ketorolac, meperidine, and saline solution. The B group was given ketorolac, meperidine, and buscopan.

Results: The pain scores of subjects in each group decreased incrementally, with pain scores highest in the PACU and lowest 48 hours post operative. Comparing between groups, both median and mean pains scores were significantly higher in the control than in the treatment group (higher scores indicate more severe pain) for all periods of observation, with the difference in score highest during stay in the PACU and lowest 48 hours post operative.

Conclusions: Addition of Buscopan significantly decreased pain for up to 48 hours post operative compared to placebo.

INTRATHECAL MORPHINE (ITM) VERSUS FEMORAL NERVE BLOCK (FNB) FOR ELECTIVE PRIMARY HIP ARTHROPLASTY POST-OPERATIVE ANALGESIA.

R. Jadhav[1], A. Davies[1]. [1]*Anaesthetics, Fremantle hospital Health Service, Fremantle WA, Australia.*

Purpose/Objective: Introduction: An ageing population ensures primary hip arthroplasty is commonly performed. Providing good analgesia with minimal side-effects facilitates ambulation and post-operative recovery[1,2]. This study compares ITM with FNB for post-operative analgesia.

Materials and Methods: Fifty-one patients underwent elective primary hip arthroplasty over a 3-month period. Inclusion criteria were those who had 100μg ITM and those who received FNB. Exclusion criteria were chronic pain, and combination of ITM with FNB. Analgesic efficacy was determined by average pain score on VAS and post-operative opioid consumption (morphine equivalent) at 24h and 48h. Average nausea scores, ability to mobilize at 24h and 48h were also recorded.

Results: Thirty-one patients met the inclusion criteria. Eleven had ITM and 20 had FNB. Pain scores at 24h were lower with ITM. Sixty-four% scored 0/10 on VAS, 18% 1-3/10, 18% 4-6/10. Ten% patients in FNB group scored 0/10 at 24h, 25% 1-3/10, 60% 4-6/10, 5% 7-10. Average opioid consumption with ITM was 8.6mg and 12.5mg at 24h and 48h respectively, compared with 41.6mg and 17.5mg with FNB. Nausea scores were very similar in both groups. Sixty-four% of patients could mobilize at 24h and all mobilized at 48h with ITM. 45% mobilized at 24h and 80% at 48h with FNB.

Conclusions: Primary hip arthroplasty can be adequately managed by a variety of analgesic techniques[3]. Both ITM and FNB provide good analgesia[4], however this study demonstrates reduced pain with ITM, implying superior analgesia[1]. It may be noted that FNB in addition to ITM is unlikely to add benefit[2], but this requires further evaluation.

DOES TRANSVERSUS ABDOMINIS PLANE(TAP) BLOCK PROVIDE ANY BENEFIT IN ANALGESIA IN LIVE RELATED RENAL TRANSPLANT RECIPIENTS? A RETROSPECTIVE AUDIT

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Purpose/Objective: Postoperative pain control in renal transplant surgery is challenging due to recipients pre morbid condition and altered pharmacokinetics of opioids.A recent randomised trial involving landmark TAP block suggested an ultrasound guided approach could improve analgesic efficacy in renal transplant surgery. We, retrospectively, audited and reviewed our clinical practise by measuring postoperative total fentanyl consumption, pain and nausea scores in live related renal transplant recipients.

Materials and Methods: A total of 166 consecutive patients were identified who underwent live related renal transplant in 2009-2011. 161 patients were included and recipients with ultrasound guided TAP block (n=76) and compared with those without TAP block (control n=85). Both groups had received a standard general anaesthetic with patient controlled fentanyl analgesia and paracetamol. Student's t-test and Mann Whitney U test were used for statistical analysis. The primary outcome was total fentanyl consumption in first 24 hours and other outcomes measured included pain and nausea scores.

Results: There was a statistically significant reduction in intra operative fentanyl consumption between the two groups [TAP (mean,SD) 277.3 (93) mcg and control (mean,SD) 330(139) mcg ,$p<0.005$)] . However, this didn't progress to statistical and clinical significance in overall fentanyl consumption in the first 24 hour post operatively [TAP (mean, SD) 2086 (919) mcg and control (mean,SD) 2321 (1023) mcg ,$p=0.162$)]. There were no changes in nausea and pain scores in either of the two groups.

Conclusions: The addition of TAP block in live related renal transplant provided a limited benefit in analgesia that did not extend beyond the intra operative period.

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THE EFFECT-SITE CONCENTRATION OF REMIFENTANIL FOR PREVENTING COUGH DURING AWAKENING AFTER ANESTHESIA FOR ABDOMINAL SURGERY

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Purpose/Objective: The administration of short-acting opioids can be a reliable and safe method for preventing cough during emergence from anesthesia. We studied the effect-site concentration (EC) of remifentanil to suppress cough waning of propofol-remifentanil TCI.

Materials and Methods: Twenty ASA I-II patients, aged 23-66 years undergoing abdominal surgery were included in this study. EC50 and EC95 of remifentanil for preventing cough were determined using the method of Dixon . The EC of propofol in the action to extubation , mean arterial pressure and heart rate (HR) were recorded.

Results: The EC50 of remifentanil that suppressed coughing was 1.33 ng ml-1 with the "up-and-down" method of Dixon. The EC95 was 2 ng ml-1. The EC of propofol at awakening was similar in patients with or without cough, but HR and BP was higher among those who coughed. No clinically significant hypoventilation was observed.

Conclusions: Coughing during emergence from anesthesia can lead to a number of potentially dangerous effects, such as laryngospasm, adverse hemodynamic changes and increased intracranial pressure. Opioids used at the end of surgery can provide a sweet awakening by reducing cough, restlessness and deleterious hemodynamic changes. However, these agents can also cause depression of ventilation and delayed awakening. The administration of remifentanil can be a reliable and safe method, but the appropriate dose or concentration at the site of action remains to be defined.

INTRATHECAL OPIATES FOR THE POST-OPERATIVE PAIN MANAGEMENT OF PATIENTS UNDERGOING LAPAROSCOPIC NEPHRECTOMY: MARGINAL EFFORT FOR MARGINAL GAINS.

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Purpose/Objective: To compare the post-operative course of patients undergoing laparoscopic nephrectomy with an enhanced recovery approach using intrathecal opiates as primary post-operative analgesia against those receiving parenteral opiates.

Materials and Methods: The case notes of patients undergoing laparoscopic nephrectomy between 2009 and 2012 were examined. Eighteen patients had a conventional anaesthetic with sevoflurane and parenteral opiates and 9 patients had intrathecal opiates and desflurane. The following outcomes were compared: length of recovery stay,pain, sedation and nausea scores in recovery, post-operative analgesia and anti-emesis use and length of post-operative hospital stay.

Results: The length of stay in recovery was similar in the two groups. Six of 9 patients in the intrathecal group had minimal pain scores (0 and 1) compared with 9/18 in the parenteral group. Of those patients experiencing moderate pain (pain scores 2-5), 2/9 were in the intrathecal group, and 5/18 (40%) were in the parenteral group. No patients in the intrathecal group experienced severe pain as against 4/18 (22%) of patients in the other group. Overall the length of post-operative stay was 5.3 days (Std dev 2.3) in the parental opiate group compared with 4.1 days (Std dev 1.3) in the intrathecal opiate group (Students t-test, p=0.1).

Conclusions: Patients receiving intrathecal opiates were more comfortable in recovery. Overall their hospital stay was almost a day shorter, though the small numbers in this study precluded significance. Following nephrectomy, creatinine levels rise in all patients. Obviating the need for parenteral opiates would be logical and appears to benefit the patient and shorten their hospital stay.

INTRAPERITONEAL INSTALLATION OF ROPIVACAINE BEFORE SLEEVE GASTRECTOMY REDUCES MORPHINE CONSUMPTION

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Purpose/Objective: Laparoscopic sleeve gastrectomy is a common bariatric surgical procedure.Given that morbidly obese patients are at great risk for respiratory depression, limited use of opioids for postoperative analgesia is important.The aim of this study is to evaluate the effect of preemptive intraperitoneal ropivacaine in obese patients undergoing sleeve gastrectomy.

Materials and Methods: The study was conducted on 30 patients with BMI > 30kg/m2 who underwent laparoscopic sleeve gastrectomy under general anesthesia.They were randomly allocated in two groups.Group A received intraperitoneal instillation of 10ml ropivacaine 0,1% before surgical dissection, whereas group B received the same volume of normal saline.Postoperatively, both groups received rescue analgesia with PCA with morphine. Study end-points included morphine consumption, pain scores (VAS 1-10) at rest and on deep breathing or movement, incidence of opioid side effects including nausea and vomiting, as well as sedation and/or respiratory depression over the first 24 hours after surgery.

Results: Both groups were similar with respect to age, BMI, gender and duration of surgery. Patients in the placebo group required higher doses of morphine 27,5mg (20,5-38,5) as compared with the ropivacaine group10mg (7,5-15). Nausea, vomiting and sedation scores were the same in both groups.We did not observe signs of local anesthetic toxicity.The degree of pain at rest did not differ significantly between the two groups. However, pain scores on deep breathing and movement were significantly lower in the ropivacaine group (Group A 5 ± 2,4 vs. Group B 2 ± 1,8).

Conclusions: Intraperioneal instillation of ropivacaine before sleeve gastrectomy is a safe procedure and obese patients are benefited by reducing postoperative opioid requirements.

PERI OPERATIVE ANALGESIA AND POST THORACOTOMY PAIN SYNDROME: PRELIMINARY RESULT OF ANALGO. THO.PA. STUDY

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Purpose/Objective: Chronic pain complaints after thoracic surgery represent a significant clinical problem in 25—60% of patients. The available data have major inconsistencies in collection of pre-, intra- and postoperative data that may influence Post Thoracotomy Pain Syndrome (PTPS), thereby hindering precise conclusions as well as preventive and treatment strategies.

The aim of this study is to verify and to compare the incidence of PTPS, in two groups of patients: EVA group (patients who received General Anesthesia plus endovenous analgesia) and HTEA group (patients who received General Anesthesia plus High thoracic epidural analgesia and Oxycodone plus Naloxone per os).

Materials and Methods: Observational study: 40 EVA e 40 HTEA patients respectively.

The health status of each patients is investigated with SF-12; pain (NRS e VDS), SpO2, hemodynamic parameters, shivering and PONV where evaluated in the 3 days after surgery; SF-12, NRS, VDS, neuropathic pain (DN-4) e intestinal function (BFI) were also evaluated after 2, 4, 6, 8 months after surgery.

After a descriptive analysis, we will stratify the population on the type of analgesia. We will use the t-student test or non-parametric test (Mann Whitney). The significance level is $p = 0.05$.

Results: After 4 months we observed 40 patients: 20 in EVA group and 20 in HTEA group. The incidence of PTPS was significantly less in HTEA vs. EVA (6.51% vs. 39.8 %, $P = 0.029$).

Conclusions: Preliminary results suggest that HTEA intraoperative and Oxycodone+Naloxon post operatively reduce PTPS in patients undergoing thoracotomy.

THE ENHANCED RECOVERY PROGRAMME FOR PRIMARY KNEE ARTHROPLASTY: ARE PATIENTS COMFORTABLE 24 HOURS POSTOPERATIVELY?

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Purpose/Objective: Postoperative pain is often severe after knee arthroplasty. Local infiltration analgesia (LIA) as part of enhanced recovery programmes (ERPs) has been shown to offer good analgesia and facilitate earlier hospital discharge. As the local anaesthetic wears off and patients start mobilising the possibility of pain 24 hours after LIA remains high, warranting some

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centres to leave a nerve catheter in-situ for local anaesthetic boluses 24 hours post-surgery.

As part of the ERP surgeons inject 100mls of 2mg/ml ropivicaine with 1mg adrenaline into the joint before inserting the metal components, and a further 50mls of 2mg/ml ropivicaine subcutaneously before wound closure.

Our aim was to investigate pain scores for the first 48 hours after knee arthroplasty. Within the ERP all patients were prescribed multimodal analgesia including paracetamol, NSAIDs, gabapentin and slow-release morphine sulphate tablets.

Materials and Methods: Following local clinical audit committee approval pain scores were recorded at various intervals within the first 48 hours post-surgery, in 38 patients who underwent primary knee arthroplasty in the month of December 2012.

Results:

Pain score	None	Mild	Moderate	Severe	No data
In recovery	30	2	2	4	0
On arrival to ward	30	3	3	2	0
Post-mobilisation	8	12	5	8	5
24 hours post-op.	14	13	7	3	1
48 hours post-op.	22	9	5	0	2

Conclusions: These results suggest that pain scores increase after initial mobilisation and gradually improve 24 hours post-surgery, signifying that adequate analgesia must be ensured before mobilisation, with rescue analgesia prescribed as appropriate.

GABAPENTIN FOR POSTOPERATIVE PAIN CONTROL AFTER PRIMARY KNEE ARTHROPLASTY: IS SEDATION AN ISSUE?

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Purpose/Objective: Gabapentin, an anticonvulsant, has recently been shown to improve analgesic efficacy of opioids, reduce consumption of analgesics and decrease opioid-related side effects. However, depending on the dosage it can increase the incidence of sedation and dizziness [1]. Our objective was to examine the sedative effects associated with gabapentin in the perioperative setting following primary knee arthroplasty.

Materials and Methods: Following local clinical audit committee approval sedation scores were recorded for the first 48 hours post-surgery in 33 patients who underwent primary knee arthroplasty in the month of December 2012. All patients were prescribed regular gabapentin routinely as part of an enhanced recovery programme; 300mg twice a day, or 100mg twice a day if patients were more than 70 years of age. The first dose was given preoperatively on the morning of surgery.

Sheffield sedation scores were used for assessment; 1 - awake and agitated, 2 - awake and comfortable, 3 - opens eyes to voice, 4 - opens eyes to touch, 5 - responds to suction, 6 – unrousable.

Results:

Sedation score	1	2	3	4	5	6	no data
24 hours postop	7	26	0	0	0	0	0
48 hours postop	1	27	0	0	0	0	5

Conclusions: Although preliminary these results suggest gabapentin at the doses above does not cause sedation. However, the limited number of patients precludes any definitive conclusions regarding its side effects to be made.

1. PWH Peng et al. Use of gabapentin for perioperative pain control: a meta-analysis. Pain research and management. 2007; 12(2): 85-92.

PECS BLOCK AS PART OF A MORPHINE SPARING ANAESTHETIC TECHNIQUE FOR BREAST SURGERY: INITIAL RESULTS

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Purpose/Objective: The pecs block has been described as a simpler and safer alternative for paravertebral blocks in breast surgery(1). We describe our initial experience of using this block for breast surgery.

Materials and Methods: With hospital audit committee approval, a convenient sample of patients (on two breast lists) were blocked as part of a multimodal anaesthetic technique. All blocks were done by anaesthetists experienced in regional anaesthesia. Data were collected on demographics, anaesthetic techniques, intraoperative and postoperative analgesic requirements.

Results: 19 patients receiving 21 blocks were studied. Two received bilateral blocks. 14 patients had mastectomies with axillary sampling or clearance, five had breast reductions or implant replacements with capsulotomies.

Intraoperatively, all patients received paracetamol and NSAIDS (if tolerated); 13 patients received tramadol or fentanyl. Only four patients received intraoperative morphine. 13 patients received local anaesthetic in their surgical drains.

Postoperatively, 12 patients did not require any analgesia. Only four patients required morphine.

Anatomically, the pecs block blocks the lateral and medial pectoral nerves; ideally further nerves are blocked for complete breast analgesia (2). The advantages of the pecs block over paravertebral or multiple blocks are safety, speed and ease of the block technique. In this study, instead of other blocks, we usesd non-morphine IV analgesics where possible.

Conclusions: We surmise that by further refinement, the pecs block can be used (as part of a multimodal technique) for breast analgesia, reducing or completely eliminating patients' morphine requirements. We encourage others to incorporate pecs block in a multimodal breast analgesic technique and report their results.

ULTRASOUND-GUIDED DEEP AND SUPERFICIAL CERVICAL PLEXUS BLOCKS FOR POST-OPERATIVE PAIN RELIEF FOR REPAIR OF FRACTURED CLAVICLES: A CASE SERIES OF 29 PATIENTS

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Purpose/Objective: Open repair of fractured (ORIF) clavicles are a common day-case procedure in which postoperative pain can be problematic. Brachial plexus blocks result in suboptimal analgesia with undesirable side-effects e.g., motor blockade. Case reports have suggested deep and superficial cervical block (DCPB, SCPB) may have a place. Ultrasound (US) promotes safe execution of DCPB & SCPB.

Our study aimed to identify the effectiveness of US-guided DCPB & SCPB for clavicle surgery.

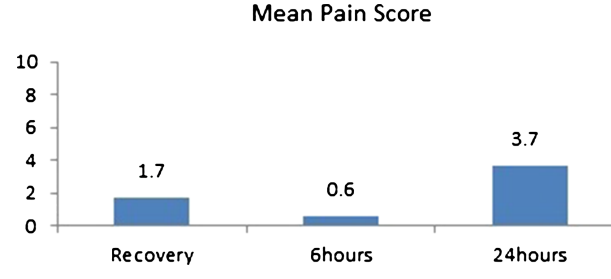
Materials and Methods: In 29 consecutive ORIF clavicles, general anaesthesia was induced. 15mls 0.25%Levobupivacaine was then infiltrated at C4 (DCPB) and at the mid-point of sternomastoid muscle (SCPB) using high frequency US. Paracetamol and diclofenac were given perioperatively and 72hours post-operatively. Supplemental analgesia was given if necessary, and its use documented.

Pain scores (verbal rating 0-10) were recorded in recovery, at 6 and 24 hours. The most severe pain score at any point and time to its development were noted. Immediate complications were recorded.

Patient consent was obtained and ethical approval sought; it was deemed unnecessary as this was an evaluation of a service already provided.

Results:

In recovery, 3patients required supplemental local anaesthetic (5-10ml 0.25% Levobupivicaine C3-5) and 1patient required intravenous morphine. Mean time to onset of most severe pain was 11.3hours scoring 6.3/10.



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17% patients had upper limb sensory changes. 20.7% patients developed Horner's Syndrome and 6.9% developed a hoarse voice.

Conclusions: US-guided DCPB and SCPB offers a safe and effective means of providing high quality postoperative analgesia following ORIF clavicles.

TRANSITION FROM INTERSCALENE BLOCK TO ORAL ANALGESIA AFTER SHOULDER SURGERY

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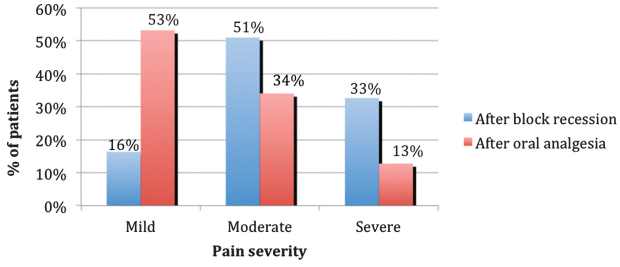
Purpose/Objective: All single injection nerve blocks are limited by an effective duration[1]. We aimed to assess the effectiveness of pain control with oral analgesia when the single shot interscalene block started to wear off after elective day case shoulder surgery.

Materials and Methods: ASA 1-3 patients undergoing elective shoulder surgery between November 2011 and August 2012 were recruited. All patients received a standard general anaesthetic and single shot interscalene brachial plexus block with 30 mL of 0.25% bupivacaine. Patients who were undergoing a major shoulder surgery i.e. frozen shoulder were excluded. Discharge analgesia included paracetamol, NSAIDS and dihydrocodeine / tramadol. Patients were phoned after 24 hours to collect demographic/surgical data and pain scores (1-mild, 2-moderate, 3-severe).

Results:



49 patients were included in the study. All patient had their operation during the day and in 30 (66%) patients the block receded between 22:00 hours and 06:00 hours next day. Graph 1 shows the severity of pain before and after taking analgesia. The pain severity changed to mild after taking analgesia in more than half of the patients. No patient mentioned that the pain completely vanished after taking oral analgesia. 4 patients sought medical attention at the peak of their pain.

Conclusions: Significant number of patients experience severe pain despite oral analgesia. We suggest that all patients undergoing shoulder surgery should be informed about this prior to discharge and offered an option of overnight stay.

Reference:

1. Fredrickson MJ et al. Anaesthesia, 2010, 65, 608–624

BENEFITS OF SUPERFICIAL CERVICAL PLEXUS BLOCK FOR THYROID SURGERY: POST-OPERATIVE PAIN MANAGEMENT IN ETHIOPIA

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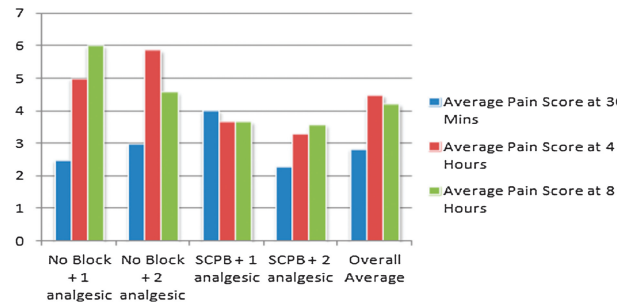
Purpose/Objective: This post-operative pain audit was undertaken in Gondar University Hospital (GUH), Ethiopia to assess the viability of performing Superficial Cervical Plexus Blocks (SCPB) for analgesia. The extreme poverty of the 50,000 households that GUH serve, mean that paying for analgesics is not always financially feasible. The patients have to purchase their medication for post-operative usage. Local anaesthetic solutions are provided free by the government.

Materials and Methods: We assessed post-operative pain scores, EBL, surgical classification of thyroid size and number of analgesics that patients received. There were only 2 anaesthetists proficient in SCPB technique. We assessed all patients operated on over a 2 week period to collate our data. We did not look into the possible PONV benefits of SCP as most patients cannot afford anti-emetics. In the 2 week period there were 17 thyroidectomies and 2 hemi-thyroidectomies performed. Ten patients received a SCPB block and nine patients did not. None of the patients received local infiltration of the wound.

Results: In our small group, we found that having a SCPB did not reduce the pain scores at 30 minutes post-op but significantly reduced pain scores at 4 & 8 hours. Interestingly, pain scores and EBL were not affected by the size of the thyroid masses.

SCPB	No of Analgesics	Surgical Time	Pain Score 30 Mins	Pain Score 4 Hours	Pain Score 8 Hours	EBL > 200mls
Yes	2	65	3	4	4	Yes
Yes	1	71	3	4	4	No
Yes	1	55	5	4	4	No
Yes	1	60	4	3	3	No
Yes	2	62	2	3	4	Yes
Yes	2	57	2	4	5	Yes
Yes	2	65	2	3	3	Yes
Yes	2	70	2	3	3	No
Yes	2	93	4	3	3	No
Yes	2	88	1	3	3	No
No	1	64	2	5	6	No
No	2	90	3	5	6	No
No	2	64	3	5	5	No
No	2	58	5	6	5	No
No	1	59	3	5	6	Yes
No	2	72	4	6	5	Yes
No	2	71	3	6	5	No
No	2	50	2	7	Discharged home	No
No	2	59	1	6	6	No



Conclusions: In the resource poor setting of Ethiopia, doing SCPB can greatly benefit the patient. There is still benefit in performing the block at the end of surgery. Intra-operative analgesia is often covered by the anaesthetic doses of ketamine used for induction and sometimes maintenance of anaesthesia.

EFECTIVENESS OF LOCAL INFILTRATION ANALGESIA (LIA) IN FAST TRACK ORTHOPEDIC SURGERY.

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Purpose/Objective: Local infiltration analgesia (LIA) has been proposed for postoperative pain management leading early rehabilitation in arthroplasty fast-track surgery.

The aim of this study is to assess the analgesic efficacy of LIA with multimodal perioperative analgesia in primary total hip (THA) and knee (TKA) arthroplasties in the first year of implementing a Fast-track programme in our hospital.

Materials and Methods: A prospective study includes 90 patients ASA I-II, 44 THA and 46 TKA in fast-track set-up under spinal opioid-sparing anaesthesia. Patients received LIA using 200 mg. levobupivacaine as a part of a multimodal analgesia with oral gabapentin, paracetamol and NSAIDs.Oral opioids were given as rescue analgesia (morphine 10 mg.). Mobilization was planned 4 hours after surgery.

Mean Visual Analogue Scale (VAS) scores at 4, 24 and 48 hours, rescue analgesia requeriments, perioperative incidents and hospital stay were recorded.

Results: Mean scores (VAS) at 4h.,24h. and 48h. were 2, 2.3 and 2 in TKA group and in THA group were 2.1, 3.2 and 2.1. Patients that required rescue analgesia during first 24h. were 24% in TKA and 43% in THA respectively. Six patients in THA presented orthostatic intolerance during early mobilization and 3 patients in TKA needed urinary catheterization.

Mean hospital stay was 4.4 and 4.2 days in TKA and THA respectively.

Conclusions: LIA in multimodal regimen gives effective pain relief after THA and TKA, facilitating fast-track recovery process. It seems more

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successful in knee than in hip surgery although after three days hip patients have less pain.

THE EFFECT OF SPRAYING 0.25% LEVOBUPIVACAINE ON THE ANTERIOR CHEST PAIN AFTER ROBOTIC THYROIDECTOMY: PRELIMINARY STUDY OF 21 PATIENTS

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Purpose/Objective: Robotic thyroidectomy is frequently performed but postoperative pain in anterior chest area after robotic thyroidectomy is remained as concerns owing to extent flap dissection and tension during the operation. The aim of this study is to evaluate the anterior chest pain and the effect of levobupivacaine spraying on postoperative pain control in patients with robotic thyroidectomy.

Materials and Methods: Twenty one patients scheduled for robotic thyroidectomy were randomized into control group (group A, n = 10) or levobupivacaine group (group B, n = 11). At the end of surgery, patients in group A and B were sprayed with the same volume (30 ml) of normal saline and 0.25% levobupivacaine, respectively, on flap dissection area. Total intravenous anaesthesia was used for induction and maintenance of anaesthesia. Pain scores in anterior chest area, the consumption of patient controlled analgesia (PCA), and other adverse effect were assessed at 1 h, 6 h, 24 h, and 48 h postoperatively.

Results: Patients in group B showed less pain scores in anterior chest area than those of group A at 1 h (42 ± 5 vs. 60 ± 11, P <0.01) and 6 h (30 ± 17 vs. 68 ± 15, P <0.01) postoperatively. PCA consumption of group B was less than that of group A at 1 and 6 h after surgery, though it did not reach statistical significance. There were no significant differences in adverse effects.

Conclusions: Levobupivacaine spray in flap dissection at the end surgery effectively reduced pain scores in anterior chest area and PCA consumption without adverse events after robotic thyroidectomy.

PERIOPERATIVE PREGABALIN AND CONTINUOUS WOUND INFILTRATION OF LOCAL ANAESTHETICS IN PATIENTS FOLLOWING THORACOTOMY

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Purpose/Objective: Pregabalin is effective both at controlling postoperative pain and preventing chronic neuropathic pain. Continuous local anaesthetic infiltration is a simple and inexpensive method to provide postoperative analgesia. We tested the hypothesis that pregabalin administered perioperatively and continuous local anaesthetic solution will aid the analgesic management of post-thoracotomy patients.

Materials and Methods: Forty five patients received either placebo (PLCB), pregabalin (PRG) or pregabalin and continous wound infusion (PRG + CWI) of local anaesthetics. Postoperative data collection included opioid consumption, VAS scores at rest and during cough and incidence of side effects. At 1 and 3 months from surgery patients were assessed with the LANSS scale for neuropathic pain.

Results: VAS scores were significantly lower in the PRG+CWI group ($p<0.05$) at rest while during cough the placebo group had higher scores than both treatment groups ($p<0.001$ at most instances). Morphine consumption measured at 48 hr PO revealed a significant difference between the three groups; PLCB: 49 ± 11mg, PRG: 33 ± 10mg and PRG+CWI: 28 ± 11mg ($p<0.001$ between placebo and the other two groups). The incidence of neuropathic pain (LANSS score >12) was more frequent in the placebo group (1-month: PLCB: 10 pts , PRG: 0 pts and PRG+ CWI: 1 pt ($p <0.001$), 3 months: PLCB: 5 pts , PRG: 0 pts and PRG+ CWI: 0 pts ($p <0.001$)).

Conclusions: Perioperative administration of pregabalin significantly reduces pain scores and opioid consumption in post-thoracotomy patients. Incidence of neuropathic pain was lower with pregabalin whereas continuous wound infiltration of local anaesthetics did not improve analgesia in this study population.

ENHANCED RECOVERY WITH INFILTRATIVE ANALGESIA FOR LOWER LIMB TOTAL ARTHROPLASTIES

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Purpose/Objective: Enhanced Recovery Pathway(ERP) is followed for elective hip and knee arthroplasties. Streamlined protocol is ensured for a better patient outcome and quicker discharge. This prospective audit looked at pain-relief, mobilisation and length of stay.

Materials and Methods: 50 patients were followed . A Spinal anaesthetic is administered without opioids. 0.2% Ropivacaine is infiltrated and a periarticular catheter inserted. Ropivacaine infusion 6-8mls is used for up to 24hrs. Simple analgesics and oral opioids are prescribed. Early mobilisation at 4-6hrs is encouraged.

Results: 18% were mobilised in 4-6hrs and 56% mobilised after 12hrs.

Day1- 72% pain scores<4 at rest and 58% on movement.

Without catheters- 67% pain scores<4 at rest and only 33% on movement

Day2- 86% pain scores <4 at rest and 62% on movement.

For Total Knee Replacements, 73% had >60% range of movement on day1 and 95% on day2.

72% were discharged by day4 and another 24% on day5.

Conclusions: Pain scores were satisfactory at rest but high during physiotherapy. Patients without catheters had higher pain scores. Mobilisation target of 4-6hrs were not achieved in a large number of patients due to low blood pressure and logistic problems like late returns from theatre and lack of staff to aid mobilisation. The TKR patients achieved good range of movements early. A large number of patients were discharged by Day4 and 96% by day5. Additional doses of oral opioids were suggested before physiotherapy. Extra fluids and Ephedrine prescriptions recommended to maintain blood pressure. Better staff deployment and education have been suggested to improve early mobilisation.

POSTOPERATIVE ANALGESIA FOLLOWING SURGERY FOR FRACTURED NECK OF FEMUR: A COMPARISON OF PERIARTICULAR INFILTRATION OF LOCAL ANAESTHETIC WITH SYSTEMIC POSTOPERATIVE ANALGESICS

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Purpose/Objective: Fractured neck of femur is a common cause of admission to hospital for elderly patients and required operative fixation. In our hospital, surgical fixation of fractured neck of femur is routinely performed under spinal anaesthesia with bupivacaine. This provides excellent conditions for the surgery and gives satisfactory analgesia in the early postoperative period. However, clinical observation indicates that a period of inadequate analgsia often occurs after the offset of intrathecal local anaesthetic effect. Wound infiltration with local anaesthetic may improve the pain control in the early postoperative period.

Materials and Methods: With ethics committee approval and having obtained written informed consent, 38 patients will be recruited by randomly allocated to one of two groups. All patients will recieve spinal anaesthesia, 2.0 ml of 0.5 % bupivacaine. The patients in the second group will recieve peri-surgical site infiltration before wound closure with a solution of 0.5 % levobupivacaine 2 ml/kg with epinephrine made up to a volume of 1.5 ml/kg with saline.

Results: The data collection was started in January 2013 and is ongoing, we recruited 26 patients to date. We can't report results because do not brake the randomization. We expect to finish the data collection in the end of June 2013.

Conclusions: The results and conclusions will be ready in August.

EFFICACY OF POST INCISIONAL WOUND INFILTRATION OF LEVOBUPIVACAINE ON POSTOPERATIVE PAIN AND ANALGESICS CONSUMPTION AFTER HEPATIC RESECTION

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Purpose/Objective: Wound infiltration of local anesthetics reduces postoperative pain and analgesic agents consumption.In this study we assessed the analgesic effect of wound infiltration of levobupivacaine after partial hepatic resection.
Materials and Methods: Thirty patients undergoing partial hepatic resection in general endotracheal anaesthesia participated in this study.They were ASAI-II, aged 50-65yr.They were divided into two groups.15 patients (Group L) received 40 ml of 0.25%levobupivacaine infiltration and other 15 patients(Group P)received 40 ml of 0.9% saline infiltration.Both groups received the infiltration in fascia before closure of skin.Patients were maintained in general endotracheal anaesthesia.Tramadol 100mg was given to supplement analgesia at the end of procedure.Postoperative analgesia was provided with intramuscular tramadol 100 mg on demand and the time to first analgesic request was noted.Intravenous paracetamol was used as rescue analgesia.The severity of pain and sedation was measured 2,6,12 and 24h after surgery.Pain was assessed using visual anologue scale(VAS).Quantity of sedation was measured by Ramsey Sedatin Scale.
Results: During the first 6 h after surgery, pain scores were lower(mean value 2) in group L,compared with group P where mean pain scores were 4.The mean time to the first request for analgesic was longer in patients in group L(7.25h),compared with group P(2.35h).There were significant difference between groups in consumption of analgetics.The mean total tramadol consumption in L group was 133.3 mg,in P group 220 mg.Mean sedation level(Ramsey score)was 2 in group L and 3 in group P.
Conclusions: Wound infiltration levobupivacaine given before skin closure decreases postoperative pain,reduces analgesic agents consumption and delays patients request for analgesia after hepatic resection.

THE USE OF CONTINUOUS FASCIA ILIACA COMPARTMENTAL BLOCK IN PERI-OPERATIVE PAIN MANAGEMENT FOR FRACTURE NECK OF FEMUR

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Purpose/Objective: The pain following fracture neck of femur (FNF) can be associated with significant morbidity, especially in the elderly. These patients are typically frail with multiple co-morbidities and on numerous medications. The pain can be difficult to manage safely and effectively in this group of patients. We study the effectiveness of continuous fascia iliaca compartmental block in providing peri-operative analgesia for these patients.
Materials and Methods: 15 Patients with FNF were identified and consented for fascia iliaca compartmental block (FICB). The technique involved supra-inguinal approach for the introduction of a regional block needle in the upper thigh under ultrasound guidance and injection of local anaesthetic solution in the fascia iliaca plane. Catheter was subsequently inserted under ultrasound guidance and a continuous local anaesthetic infusion was given via the catheter into fascia iliaca compartment peri-operatively. Patients were followed up using a standard numerical rating pain scale for intensity of pain assessment.
Results: 14 patients were successfully followed up. 1 patient was unable to comment on pain score due to dementia. Mean pain score prior to surgery post continuous fascia iliaca compartmental block was 3.7. Postoperatively, mean pain score was 1.5 and 1.6 at day 1 and 2 respectively. There was no complication and local anaesthetic toxicity identified during the study.
Conclusions: The safety and utility of regional nerve blocks for the relief of pre and postoperative pain is well established and validated in medical practice. Based on our study, we conclude that FICB with continuous local anaesthetic infusion can result in fast and effective analgesia in patients with FNF.

TRANSVERSUS ABDOMINIS PLANE BLOCK WITH AND WITHOUT INTRAVENOUS PATIENT CONTROLLED FENTANYL POST LIVER RESECTION

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Purpose/Objective: Coagulation changes can associate liver surgery particularly in cirrhotic patients. Aim is to compare postoperative analgesic efficacy of Transversus abdominis plane block (TAP) with and without intravenous patient controlled analgesia (IVPCA). This is a hospital based comparative study.
Materials and Methods: After ethics committee approval and informed consent 50 cirrhotic CHILD A patients were randomly divided into two equal groups. **Group (IVPCA)**: Intravenous patient controlled analgesia using Fentanyl (10 microgram/ml) bolus of 10μg, 10 min lock out and a maximum dose per hour 90μg. **Group (IVPCA+TAP)**: TAP with ultrasound guidance before skin incision on both sides with 20 ml 0.375% Bupivacaine and repeated every 8 hours via a catheter inserted before final closure in the Transverse Abdominis plane. Standard coagulation tests (SCT) and rotational thromboelastometry (ROTEM) were monitored.
Results: Age and sex comparable ($P > 0.05$). Visual Analogue Scale (VAS) lower at 12, 18, 24, 48 and 72hr ($P < 0.01$) in IVPCA+TAP group. Ramsy Sedation Score (RSS) lower after 72hr in IVPCA+TAP vs IVPCA (1.57± 0.74 vs 2.2±0.41 respectively, $P < 0.01$). Heart,Systolic Blood Pressure and Fentanyl consumption lower in IVPCA+TAP at 24, 48, 72 hr ($P < 0.05$). ICU stay significantly shorter with TAP (2.61±0.74 vs 4.35±0.79 days, $P < 0.01$). In both groups PT and INR showed temporary hypocoagulability, while ROTEM results were normal.
Conclusions: Combining TAP with IVPCA increased the effectiveness of pain management and reduced Fentanyl consumption with shorting Intermediate Care stay.

INTEROSSEOUS NERVE BLOCK MAY BE BENEFICIAL FOR CRPS TYPE 1 OF THE WRIST/HAND

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Purpose/Objective: The anterior and posterior interosseous nerve (ION) supply the wrist joint and are occasionally surgically cauterized in cases of chronic wrist pain. Their function in CRPS has not been explored. We present 4 cases of patients with CRPS type 1 affecting the wrist/hand where a series of US guided ION blocks was performed.
Materials and Methods: 4 patients with CRPS type 1 affecting wrist and hand presented in pain clinic over the period of 12 months. Stellate ganglion blocks were ineffective. ION blocks were then offered and performed under US guidance using an out of plane approach at the level of the pronator quadratus muscle, depositing 3 ml of local anaesthetic deep to the muscle followed by advancement of the needle through the interosseous membrane and depositing a further 3 ml LA posterior in a mirror position.
Results: Significant improvement of hand function and pain reduction was achieved in 2 patients with CRPS of within 3-9 months duration. 2 patients with CRPS of over 18 months duration did not benefit. Clinically the responders showed improved function, reduced oedema and pain within minutes of the intervention. Blocks were coordinated with hand physiotherapy and further improvements in function were achieved with each subsequent ION block.
Conclusions: In cases of CRPS type 1 affecting the hand/wrist and of limited duration a trial of interosseous nerve blocks may be useful to improve function and pain. Blocks are technically easy under Ultrasound control. In chronic CRPS this block appears to be of no benefit.

INTRATHECAL MORPHINE PUMP FOR DERCUM'S DISEASE

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Purpose/Objective: Adiposis Dolorosa (AD) or Dercum's disease is a rare, poorly understood disease characterized by multiple painful subcutaneous lipomas mainly distributed on the trunk and extremities. It is difficult to treat and the pain associated with it can be very debilitating. We describe the very successful unprecedented management of a case of AD in a young adult male using an intrathecal morhine pump.
Materials and Methods: Mr DD is 42 years old with a 6 years history of nociceptive pain around his Lipomas in both hands, upper limbs and abdomen with marked limitation of functions. He has tried alongside more than

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150 lipoma surgical excisions a whole range of opioid and adjuvant pain medications.His pain was opioid responsive but he was troubled with the side effects on escalation of the dose.

After exclusion of all depressive and anxiety disorders we decided to admit him to our Pain Unit for a 4 day trial of intrathecal opiates. After 2 successfull active trials and one placebo trial a permenant intrathecal pump was introduced, it was filled with 120mgs morphine and 17mls of 0.9% saline at a rate of 1mg/day.

Results: After 4 months, he reported significant pain relief (VAS dropped from 8/10 to 2/10) and improved function, he returned to his full time job and stopped all his opioid medications.

Conclusions: Patients with difficult nociceptive pain conditions could benefit from intrathecal opiates especially when systemic opiates can't be tolerated.

EFFECT OF PULSED RADIOFREQUENCY TREATMENT PERFORMED IN CONJUNCTION WITH TRANSFORAMINAL EPIDURAL STEROID INJECTION IN CHRONIC LUMBOSACRAL RADICULAR PAIN PATIENTS.

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Purpose/Objective: Lumbosacral radicular pain (LRP) syndromes are characterized by a radiating pain caused by irritation of the corresponding nerve root. Pulsed radiofrequency (PRF) lesioning technique is recently advocated and has shown to be an effective modality. We tested the effect of PRF treatment performed in conjunction with transforaminal epidural steroid injection (TFEI) in chronic LRP patients.

Materials and Methods: The RF needle (4 inch, 10mm curved tip) was positioned closely to the DRG under fluoroscopy. PRF treatment was applied at 42 ? for 120 seconds in three cycles for the PRF group and sensory stimulation without lesioning was applied to the control group.

The successful response of primary outcome was defined as: 1) Reduction of at least ≥50% or ≥4 points in the NRS without a increase in ODI, MQS, or <4 in the GPE; or 2) Reduction of at least 30% or 2 points in the NRS, with a simultaneous decrease of ≥25% in ODI or decrease of ≥25% in analgesics or mean score of ≥6 points in the GPE scale. The secondary outcome measures included the NRS, ODI, and analgesic consumption.

Results: 59 patients (PRF Group = 28, control Group = 31) were allocated in the study.

Primary outcomes: The proportion of patients with successful treatment results were higher in the PRF group compared with the control group during the 3 month follow-up examination.

Conclusions: Adjuvant PRF treatment to the compromised DRG resulted in higher treatment response compared with TFEIs alone, and provided significant short and mid-term pain relief of the treated patients.

EFFICACY OF THE NAVIGABLE PERCUTANEOUS DISC DECOMPRESSION DEVICE (L'DISQ) IN PATIENTS WITH THE CERVICAL HERNIATED NUCLEUS PULPOSUS

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Purpose/Objective: A prospective clinical trial study was conducted to evaluate the clinical outcomes of percutaneous disc decompression using the navigable disc decompression device (L'DISQ) in cervical disc herniation (CDH) patients through 1 year.

Materials and Methods: 7 patients (male=4, mean age=43.4±6.8) with persistent neck axial/radicular pain refractory to conservative treatments were treated using L'DISQ. The tip of L'DISQ can be accurately placed into herniated nucleus by operating control wheelunder fluoroscopic guidance. Plasma energy induced by radiofrequency was used for ablation. Before each ablation, brief electrical stimulations were preceded to ensure safety and static ablation was performed, then. All the patients had been diagnosed as CDH through physical examinations and MRI study. Clinical outcome was determined by visual analogue scale (VAS), Oswestry disability index (ODI), neck disability index (NDI) and bodily pain scale (BP) of Short Form-36, assessed at 1 week, 1month, 6 months, and 1 year.

Results: The VAS fell from 7.29±0.76 to 1.14±1.07 scores at 48 weeks post procedure. At 48 weeks the ODI had fallen from 35.43±15.00 to 7.14 ±3.63%, and the NDI from 43.86±14.81 to 7.71±5.09 points. The SF-36 BP dropped significant improvement from 32.73±5.67 to 52.44±6.81 scales.

Conclusions: Following decompression with L'DISQ we measured clinically significant pain improvement and decreased disability for patients with both cervical radicular and axial pain caused by protruded and extruded discs.

TRANSVERSUS ABDOMINIS PLANE BLOCK FOR ABDOMINAL SURGERY IN CHILDREN: THE RESULTS OF AN AUDIT

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Purpose/Objective: Different regional techniques are being used for pain relief after abdominal surgery in the paediatric population. Although the transverse abdominis plane block is often used for pain relief in the adults, it's use is relatively new in the paediatric population. The aim of our audit was to evaluate the quality and duration of pain relief following a TAP block in children having had abdominal surgery. Approval was obtained from the hospital audit committee and no ethics approval was required.

Materials and Methods: TAP blocks were placed after induction of general anaesthesia and before the start of surgery. Iv paracetamol, fentanyl and/or morphine were added when needed. Data collected included type of procedure, age, weight, placement of TAP block, type/volume of local anaesthetic used, intra-operative and postoperative analgesia given, hourly pain scores up to 48 hours postoperatively (NIPS/FLACC/Self reporting) and complications of TAP block.

Results: 100 patients were audited of which 87 fulfilled the inclusion criteria. 77% were less than 1 year old. Adequate pain relief (pain score less than 4) was achieved in over 93% of all patients. Additional intravenous opioids were given to 54 patients intraoperatively and to 46 patients postoperatively. 24 patients did not need any iv opioids intra- or postoperative.

Conclusions: The results of our audit add to previous published data demonstrating good quality of analgesia achieved with a TAP block in children having undergone abdominal surgery. Depending on age and type of procedure it may eliminate or reduce the need for iv-opioids which makes it a good alternative to neuraxial analgesia especially in the very young.

OBESE PATIENTS' COMPLICATIONS IN REGIONAL ANAESTHESIA

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Purpose/Objective: Patients with a higher body mass index (BMI) are believed to have less well identifiable anatomic landmarks and therefore may have higher complication rates in routine regional anaesthesia. We therefore analyzed the influence of obesity on acute and postsurgical complications defined within a national registry for regional anaesthesia.

Materials and Methods: The German network for regional anaesthesia database was analyzed. 27,652 patients ≥ 14 years were subdivided according to WHO into the following groups: I. normal weight, BMI 18.5 - 24.9 kg/m^2 (n=9,274); II. overweight, BMI 25.0 - 29.9 kg/m^2 (n=10,633); III: morbidly obese, BMI 30.0 - 70.3 kg/m^2 (n=7,745). Acute complications during placement included termination due to anatomy and compliance, multiple skin puncture, bloody taps, accidental dura puncture, paraesthesia, analgesia failure and intoxication with local anaesthetics, respectively. Postsurgical complications included nausea, vomiting, pruritus, hypotension, urinary retention and respiratory depression. Differences among the groups were tested with ANOVA and Chi-Square. Odds ratios (OR [95% confidence interval]) were calculated with logistic regression.

Results: Gender and ASA score were equally distributed among the groups. Whereas acute complications increased with BMI (19.1%; 20.1%; 24.7%,

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OR: 1.39 [1.29 - 1.49] in group I.; II.; III.; respectively), postsurgical complications decreased with BMI (4.6%; 3.2%; 2.7%, OR: 0.57 [0.48 - 0.68]). Patients' satisfaction (0-10 mean) tended to increase with BMI (8.44; 8.49; 8.62), whereas providers' satisfaction with pain therapy was not influenced by patients' BMI.

Conclusions: Obesity seems to be associated with an increased rate of acute complications whereas postsurgical complications are less frequent compared to normal weight patients. Patients' satisfaction tended to be higher amongst obese patients.

PATIENTS' RISK FOR CATHETER ASSOCIATED INFECTIONS IN REGIONAL ANAESTHESIA

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Purpose/Objective: Obesity is believed to increase the risk of surgical site infections and may increase the risk of catheter associated infections in regional anaesthesia. We therefore analyzed the influence of obesity on catheter associated infections defined within a national registry for regional anaesthesia.

Materials and Methods: The German network for regional anaesthesia database was analyzed between 2007 and 2012. 28,249 patients ≥ 14 years were subdivided according to WHO into the following groups: I. underweight, BMI 13.2 - 18.49 kg/m^2 (n=597); II. normal weight, BMI 18.5 - 24.9 kg/m^2 (n=9,274); III. overweight, BMI 25.0 - 29.9 kg/m^2 (n=10,633); IV: morbidly obese, BMI 30.0 - 70.3 kg/m^2 (n=7,745). The analysis focused on peripheral and neuraxial catheters and catheter associated infections. Differences among the groups were tested with ANOVA and Chi-Square. Odds ratios (OR [95% confidence interval]) were calculated with logistic regression.

Results: Gender and ASA score were equally distributed among the groups. Significant differences were found in diabetes (5.5%; 6.5%; 10.7%; 18.8% in group I.; II.; III.; IV.; respectively) and peripheral catheter procedures (41.9%; 42.7%; 46.7%; 52.4%). The incidence of infection (3.9%; 2.8%; 2.8%; 3.1%) did not differ among the groups. The incidence of infection was significantly different in the subgroups of peripheral (2.4%, OR: 1.05 [0.45 - 2.41]; 2.3%, OR: 1.00; 2.8%, OR: 1.23 [0.94 - 1.61]; 3.8%, OR: 1.66 [1.28 - 2.17]) and neuraxial catheters (4.9%, OR: 1.57 [0.94 - 2.61]; 3.2%, OR: 1.00; 2.7%, OR: 0.85 [0.68 - 1.06]; 2.3%, OR: 0.71 [0.55 - 0.93]).

Conclusions: Extreme obesity constitutes a risk factor for infections of peripheral catheters, in contrast to lesser infections of neuraxial catheters.

ACCURACY OF ULTRASOUND IMAGING VERSUS MANUAL PALPATION FOR LOCATING THE INTER-VERTEBRAL LEVEL.

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Purpose/Objective: Efficacy of epidural analgesia depends on placement of the epidural catheter at the appropriate level. Manual palpation using surface landmarks to identify the desired inter-vertebral level may not be a reliable method. Ultrasonography is an alternative technique but requires training and may increase procedure time. The objective of this study was to compare the accuracy of ultrasound imaging with manual palpation for locating the inter-vertebral level.

Materials and Methods: We included post-operative adult patients without an epidural catheter who were scheduled to have a chest radiograph in the recovery room. A radio-opaque marker was placed at random at an inter-vertebral space along the thoracic or lumbar spine of the patient (in the field of the chest radiograph). The level of inter-vertebral space corresponding to the radio-opaque marker was determined by palpation technique by one anaesthetist. Two other anaesthetists (A and B) blinded to the result of manual palpation, independently used ultrasonography to determine the level of inter-vertebral space. A consultant radiologist assessed the radiographs to determine the correct position of the marker.

Results: 64 patients were included in the final analysis. Accurate identification by manual method was 31/64(48%), by Ultrasound A was 27/64(42%) and by Ultrasound B was 22/64(34%). The difference in accuracy between manual palpation and ultrasound imaging was not statistically significant (p=0.71). Also ,there was no difference in accuracy based on gender or body mass index.

Conclusions: Ultrasound imaging may not be superior to manual palpation for identifying inter-vertebral level.

UTILIZATION OF CENTRAL NEURAXIAL AND PERIPHERAL NERVE BLOCK IN A SUB- SAHARAN SETTING.

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Purpose/Objective: Regional anaesthesia (RA) has several advantages, including prolonged anaesthesia and hemodynamic stability in critically ill and elderly patients. It promotes early ambulation, reduces hospital stay and decreases burden on health facilities.This study aimed to determine the frequency of use of RA among Nigerian Anaesthetist.

Materials and Methods: A self-designed questionnaire was administered to consultants (40%) and residents (60%) in anaesthesia who attended the 20th Annual conference of the Nigerian Society of Anaesthetists, November 2012. Questions asked were1) Types and frequency of RA done 2) Types of local anaesthetic (LA) agents employed 3) methods of nerve location4) complicationsobserved.

Results: A total of 124 questionnaires were administered but 80 people participated. Only 62 completely filled questionnaires were analyzed. Eighty percent (49) of the respondents had performed peripheral nerve block (PNB), while 98 % (60) had performed central neuraxial block. Axillary nerve block (36/59%)was the most common PNB performed. Bupivacaine (58/95%) and Lidocaine(57/93%) were the most frequently used LA. Levobupivacaine (6/10%) and Ropivacaine (7/12%) were rarely used. Anatomical land mark (56; 92%), followed by peripheral nerve stimulator (29; 48%), was widely used to locate nerves. Haemorrhage (24; 39%), seizure (9; 14%), cardiac arrest (9; 14%), and nerve damage (3; 5%) were the complications of RA observed.

Conclusions: Anaesthetists in Nigeria use central neuraxial block more frequently than peripheral nerve block. There is need to encourage the use of peripheral nerve block.

EFFECT OF VERSATIS A TOPICAL 5% LIDOCAINE PATCH ON TRAUMATIC RIB FRACTURE PAIN.

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Purpose/Objective: Versatis (5% lidocaine) patch originally licensed for post herpetic neuralgia has, in small trials, been shown to reduce acute pain scores in those with traumatic rib fractures. This analysis aimed to establish overall patient satisfaction, reductions in pain score and opiate use, whilst observing for safety of application in patients admitted with rib fractures to a major trauma centre.

Materials and Methods: A case series of forty-five patients admitted with rib fractures and treated with Versatis was collected during 2012. Patient age, gender, pain scores, details of rib fracture/s, presence of polytrauma, ASA and analgesia use before, during and after Versatis application was collated 'real time' on a case by case basis as well as details of adverse events. Comparisons were made between pre-application of patch and at day 3.

Results: Pain scores (0-3) were collected before and on day 3 after patch application. Scores before vs day 3: 3 (56% vs 2%); 2 (33% vs 10%); 1 (10% vs 22%) and 0 (10% vs 34%). 72% of patients stopped or reduced their IV opiate use by 56% and 16% respectively. 94% of patients stopped or reduced

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their oral opiate use by 63% and 31% respectively. No adverse effects were noted despite significant co-morbidities within our population.
Conclusions: Patients treated with Versatis (5% Lidocaine) patch showed substantial reductions in oral and IV opiate consumption along-side a marked decrease in pain score. Use appears safe, even in those with significant co-morbidity and associated polytrauma. 100% of patients were satisfied with this treatment modality.

PERIOPERATIVE OXYCODONE FOR PAIN TREATMENT IN FRACTURED NECK OF FEMUR

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Purpose/Objective: The management of severe perioperative pain for fractured neck of femur is challenging, because of age and patients' co-morbidities. The efficacy of oxycodone in postoperative pain has been demonstrated in several studies, but it is still not recommended for preoperative use and for the first 24 h postoperatively. We evaluated perioperative pain management and side effects for hip fracture repair with a multimodal approach. We used oral oxycodone, oxycodone-naloxone, in both cases associated to acetaminophen in elderly patients, or the standard protocol.
Materials and Methods: Thirty nine patients scheduled for hip fracture repair were randomly allocated to different study groups: oxycodone (OXY), oxycodone-naloxone (OXN) and standard treatment (Control). Each patient was then followed for 72 hours.

Patients of OXY group (n=13) and OXN group (n=13) received, respectively, controlled-release Oxycodone 5 mg (OXY) and Oxycodone/Naloxone 5 mg/2.5 mg (OXN) at admission, before spinal anesthesia, then every 12 hours postoperatively.

Patients in the Control group (n=13) received acetaminophen 1 g before performing spinal anesthesia and tramadol 100 mg every 12 hours postoperatively.

Perioperative pain was assessed using a verbal numerical rating scale (NRS) both at rest and dynamically.

We used ANOVA test for appropriate comparison between groups.
Results:

Mean NRS scores and standard deviation of groups in the perioperative period

	A		Surgery		POD 1		POD 2	
	R*	D*	R*	D*	R*	D*	R*	D*
OXY	3.9 ± 2.3	5.5 ± 1.6	0.8 ± 1.2	2.8 ± 1.9	0.1 ± 0.3	2.3 ± 1.4	0.08 ± 0.2	2 ± 1.3
OXN	5.5 ± 1.5	6.1 ± 1.4	0.5 ± 1.9	3.7 ± 1.9	0.5 ± 1.05	1.8 ± 1.7	0.2 ± 0.8	2.2 ± 1.2
Control*	4.6 ± 1.9	7.0 ± 1.8	2.25 ± 1.3	4.9 ± 2.6	1.5 ± 1.4	4 ± 2.6	1.4 ± 1.3	3.4 ± 1.9

A: admission; POD: Post Operative Day; R: rest; D: dynamic; *significant statistical difference between groups

	OXY *(n=13)*	OXN *(n=13)*	Control *(n=13)*
Rescue analgesia n (%)	0	1 (8%)	3 (23%)
Nausea n (%)	2 (15%)	1 (8%)	2 (15%)
Vomiting n (%)	0	1 (8%)	0
Delirium n (%)	1 (8%)	2 (15%)	2 (15%)
Constipation n (%)	10 (78%)	10 (78%)	12 (92%)
Respiratory depression n (%)	0	0	0

Demographic characteristics of groups were homogeneous. Other results are shown in the table.
Conclusions: As expected, from our preliminary data it seems that groups treated with multimodal approach using oral oxycodone plus acetaminophen had a better pain control. It's interesting that the incidence of side effects was not different between groups. Therefore, perioperative oxycodone use should be further investigated.

QUALITY EVALUATION OF THE ANESTHESIA RECORDS – EPIDURAL ANALGESIA DURING LABOUR

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Purpose/Objective: Documentation deficiencies were demonstrated in studies of handwritten anesthesia records accuracy. These deficiencies suggest that quality of anesthesia records can be improved. The goal of our study was to assess the quality of anesthesia records at our institution in documenting epidural analgesia (EA) for labour.
Materials and Methods: After ethics committee approval, all anesthesia records created during the first 6 months of 2010 were retrospectively reviewed and 14 elements were evaluated: patient identification, anaesthesia team identification, vital signs before and after EA, patient position during cateter placement, approach used (mid-line/paramedian), loss of resistance (saline/air), interspace used, depth of loss of resistance, length of catheter inserted, needle characteristics, presence/absence of complications, local anaesthetics and adjuncts used and efficacy achieved.
Results: A total of 547 handwritten records were reviewed. 99% had patient identification and 100% had anaesthesia team identification. Vital signs were registered in 73% before and in 16% after initiation of EA. 74% had patient position records, 18% had the approach used, 7% had loss of resistance. The interspace used were in 37% of records, depth of loss of resistance in 34%, length of catheter inserted in 24%, needle characteristics in 9%, presence/absence of complications in 29% of the records, local anaesthetics and adjuncts used and efficacy achieved in 98% and 3% of records respectively.
Conclusions: Our results suggest that the quality of our anesthetic records should be improved. Special attention should be given to documentation of the effects and technical characteristics of EA for labour at our institution.

TRAINING IN PAIN MEDICINE AMONGST FOUNDATION PROGRAMME (FP) DOCTORS IN THE UK; ARE WE DOING ENOUGH?

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Purpose/Objective: Safe prescription of analgesia is essential for patient safety. We aim to elucidate the current level of training and confidence amongst UK FP trainees in safely managing analgesia.
Materials and Methods: All FP doctors in Leeds, UK were invited to complete an online survey. Doctors were scored for the level of training received and confidence using a question series that closely relates to the FP curriculum.
Results: 48 Doctors returned questionnaires; 20 having had recent formal training. Doctors did not receive teaching in postoperative day case (85%) and inpatient (57%) surgery or medical inpatient (32%), opioid dependant (87%) and cancer (66%) patients. Additionally, 47% were not taught about opioid conversion.

Confidence was assessed using a standard self-reported confidence scale across 7 questions. This demonstrated low mean confidence scores in opioid dose conversion, changing route, prescribing for elderly/children and managing opiate toxicity. Higher mean confidence scores were observed for understanding dosage, frequency and common side effects.

The mean self rated confidence difference between those who had (16.80) and had not (15.67) received formal training was 1.13 (95% CI -1.11-3.37) p=0.3131 demonstrating no statistically significant difference amongst these groups.

41 (93%) wished for pain medicine to become part of hospital induction and for access to a well-designed e-learning package.
Conclusions: Pain medicine is a vital part of FP education, yet we demonstrate that this is unstructured and sporadic. Confidence amongst trainees is low and the current programme does not improve this. Access to a tailored e-learning package is sought and will be implemented in the future.

ESRA-0310 Miscellaneous
WRONG SITE REGIONAL BLOCKS – A NOVEL AID TO PREVENTION

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Purpose/Objective: The 'Stop Before You Block' (SBYB) Campaign was introduced by the Safe Anaesthesia Liaison Group (SALG) in response to several reported wrong site regional anaesthesia blocks. In our department we have

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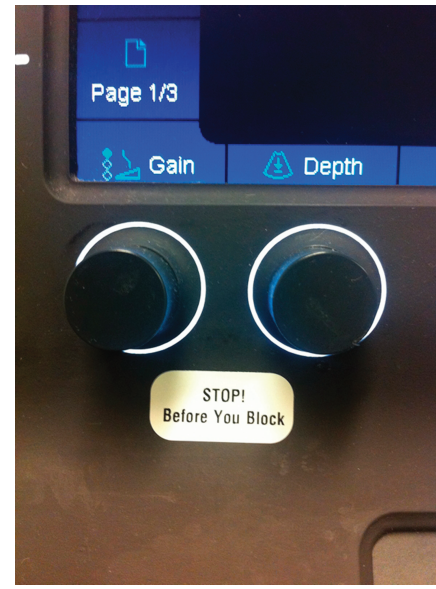
experienced wrong-sided blocks and have implemented a novel intervention to help reduce the incidence.

Audit in our department showed a failure to adhere to the SBYB protocol; this step could have prevented these errors from occurring but it was often omitted. We sought to add an extra visual reminder to anaesthetists that would be seen immediately before block performance.

Materials and Methods: We sourced cheap, tough, waterproof laminated stickers with 'STOP! Before You Block' written on them. These were attached to clean probes and ultrasound machines. As we routinely use a transparent probe cover placed immediately prior to scanning, this sticker does not pose an infection risk and acts as a last minute reminder to SBYB. If this sticker was missed, then one under the frequently used "gain" and "depth" buttons should be seen.

Results: The attached pictures demonstrate the durability of the stickers after one months use.



Conclusions: This intervention appealed to the anaesthetic body within our department and the stickers appear to withstand probe disinfection procedures and do not interfere with the functioning of the probe or machine. We believe this to be a cheap, simple and safe intervention that may well contribute to reduced incidence of this anaesthetic complication. We await re-audit of adherence to SBYB.

INFLUENCE OF UK GUIDELINES ON ANAESTHESIA PROVISION FOR CATARACT SURGERY IN SINGAPORE

C.M. Kumar[1], E. Seet[1], K.F. Koh[1], A. Joshi[1]. [1]*Anaesthesia, Khoo Teck Puat Hospital, Singapore, Singapore.*

Purpose/Objective: The choice and provision of anaesthesia for cataract surgery vary worldwide. There are no ophthalmic anaesthesia guidelines in Singapore, local anaesthesia is exclusively provided by ophthalmologists, sedation is common for which fasting is prerequisite. UK practices guidelines based anaesthesia [1] and some of the guidelines were implemented in Singapore. The aim of this audit was to assess impact of implementation of UK guidelines in Singapore.

Materials and Methods: After approval from the department audit steering committee, the audit was conducted over a 4 weeks period after implementation in patients undergoing cataract surgery under local anaesthesia. Perioperative data pertaining to type of anaesthesia, explanation and sedation were collected.

Results: Out of 190 patients, 118 (62%) patients received no information about anaesthesia and anaesthesia was provided by surgeon, topical anaesthesia (34%) and needle blocks (30%) respectively. Anaesthetist informed 70 of the patients (37%) and performed sub-Tenon's block in all patients. 9.5% patients received sedation including 1% medical indications.

Conclusions: Introduction of UK guidelines and active anaesthetist involvement improved information to patient and reduced need for sedation (100% to < 10%).

Reference:

1. Kumar CM et al. Local anaesthesia for ophthalmic surgery—new guidelines from the Royal College of Anaesthetists and the Royal College of Ophthalmologists. Eye 2012; 26: 897-8.

"COMPRESSION SIGN" OR "Z TEST" – A SIMPLE COMPRESSION TEST TO IDENTIFY SUITABILITY OF THE ARTERY FOR CANNULATION USING ULTRASOUND.

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Purpose/Objective: Aim of this prospective observational study was to help identify the suitability of the radial artery for cannulation by using 'compression sign' or 'Z test'

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Background- Radial artery access is popular due to collateral supply from ulnar artery, besides consistent anatomy, ease of cannulation and low rate of complications. It is superficial and easily palpable, an advantage for the traditional landmark guided technique.

Real time ultrasound guidance has improved the success rate of Radial artery (RA) cannulation. We observed an association of blocked RA with loss of its lumen's compressibility on ultrasound scan.

Materials and Methods: The RA cannulations were performed using real time ultrasound guidance in patients listed for cardiac surgery over 12 months. The RA at wrist was scanned to localize. Subsequently RA was compressed and released by moving ultrasound probe up and down on its Z-axis. This resulted in collapse of lumen on application of pressure, followed by its bounce back on release of pressure when artery was patent.

Results: Pressure on ultrasound probe in Z axis resulted in collapse of the RA, which bounced back on release of the pressure. In five patients RA did not collapse and only got displaced from its normal position on application of pressure. Subsequent ultrasound and Doppler scan of these arteries revealed a blocked lumen with no or minimal blood flow.

Conclusions: Normal RA is easily compressible on ultrasound examination. This simple and easy to obtain observation could be used to determine suitability of the artery using ultrasound and called 'compression sign' or 'Z test'.

THE PREVENTIVE EFFECT OF DILUTED BEE VENOM IN THE SPINAL NERVE LIGATION INJURY NEUROPATHIC PAIN MODEL

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Purpose/Objective: The bee venom (BV) is generally known as a substance that causes the pain. But in some previous studies, when injected subcutaneously the BV has been reported to be effective in some inflammatory diseases such as rheumatoid arthritis and osteoarthritis, neuropathic pain model.However it is the absence of studies on the antiallodynic effect in BV, when it injected directly into the nerve-induced allodynia.The purpose of this study is to investigate aspects of the antiallodynic effect of the BV when it injected into the damaged nerve.

Materials and Methods: We used 30 male Sprague-Dawley rats divided into three groups. After induction of anesthesia, we expose the L5 spinal nerve and administered the BV (0.05mg, 0.1mg) or normal saline in perineural sheath of L5 spinal nerve. After 3 hours, We ligated the L5 spinal nerve in rats. Also, the control group injected with saline solution, nerve ligation was carried out after 3 hours after. Ligation after 5, 7, 9, 11, 13, 17, 21, 21, 25, and 29 days mechanical and cold allodynia was measured. And 7 days after surgery, we were taken to the dorsal root ganglion in rats and observed by immunofluorescence microscopy.

Results: Mechanical allodynia was inhibited expression 5-9 days after surgery and cold allodynia expression was inhibited dose-dependent manner during the entire experimental period.

Conclusions: The perineural pretreatment of BV effectively inhibited the development of neuropathic pain in the SNL animal model.

DIABETES AS A RISK FACTOR FOR CATHETER RELATED INFECTIONS - AN ANALYSIS OF A CLINICAL REGISTRY.

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Purpose/Objective: The incidence infectious complications associated with continuous regional anesthesia is a matter of concern. Our objective was to determine whether patients suffering from diabetes are at increased risk.

Materials and Methods: During a 5-year period, 36.881 patients undergoing continuous regional anesthesia in german hospitals were evaluated. The presence of diabetes (NIDDM and IDDM), gender, age, antibiotic prophylaxis, location, number of skin punctures and duration of catheter use were analysed as risk factors by univariate analysis, followed by logistic regression analysis.

Results: The overall incidence of infection was 3.1%. Among diabetics (n= 3.990, infection rate: 4.2%) patients taking insulin had highest infection rate (IDDM 4.5% vs. NIDDM 4.0%). Lumbar epidurals were associated with a higher risk compared to thoracic epidurals (7.0% [LEA] vs. 5.2% [TEA]). Multiple attempts (5.4% vs. 3.8%, p= 0.04), age <65 years (5.0% vs. 3.7%, p= 0.04) and catheter use of more than 3 days (5.8% vs. 1.5%, p < 0.001) were associated with higher infection rates whereas gender and the use of antibiotic prophylaxis had no influence. Logistic regression analysis of diabetic subgroup revealed LEA, age < 65 years and catheter use > 3 days as independent risk factors for infection.

Conclusions: The presence of diabetes is associated with an increased risk for catheter related infections in regional anaesthesia. Specific care should be taken in order to avoid and detect infections in this population.

NEEDLE TIP VISUALIZATION IN 8 DIFFERENT ORIENTATIONS USING A BLUE PHANTOM AND NOVEL TRAINING DEVICE

E. McCarron[1], S. Ridler[1]. [1]*Anaesthesia, Countess Of Chester Hospital, Chester, United Kingdom.*

Purpose/Objective: To assess how well the needle tip was visualised using ultrasound in different orientations.

Materials and Methods: 26 anaesthetists were asked to demonstrate their view of the needle tip during a simulated nerve block on a Blue Phantom trainer, mounted on a novel device allowing 8 different hand/phantom orientations. In plane needling tasks were performed. Table 1 and Diagram 1.

Experience/Number of blocks performed using ultrasound by each candidate	Number of candidates
0	6
<10	6
10-29	10
30-49	2
40-69	1
>70	1

Needle position	Minimum Value for % time needle tip visualised	Maximum value for % time needle visualized	Median value % time needle tip visualised	Number of candidates who punctured (/26)
1	7.5	98.6	45	6
2	3.3	87.5	30.9	9
3	15	100	44	9
4	7.8	82.5	34.5	7
5	8.3	80.4	41.7	3
6	20	100	43.2	4
7	4.5	75.8	22.5	9
8	5.8	91.7	20.4	12

Results: Anaesthetic experience ranged from 0.25 to over 20 years. 9 candidates had attended an ultrasound course. 13/26 candidates said they had been given specific instruction how to do ultrasound guided needling

Conclusions: Huge variation in proportion of time needle seen

Reasonable views in TAP simulatio

This information would be useful in advance of supervising an individual performing a block

With these numbers needle tip visualization was best in positions which correspond to the TAP block - also had the least punctures

Worst visualisation in position 8 and most punctures

ASEPTIC PRECAUTIONS BEFORE CENTRAL AND PERIPHERAL NERVE BLOCKS - A SURVEY OF CURRENT PRACTICE

D. McCawley[1]. [1]*Dept Of Anaesthetics, RVH, Belfast, United Kingdom.*

Purpose/Objective: The purpose of this survey was to identify what aseptic precautions were being used by Anaesthetist staff when performing central and peripheral nerve blocks.

Materials and Methods: An online survey was sent out to a total of 40 Anaesthetic staff. Eight questions were asked.

(1)-Which agent do you use to prep the skin?

(2)-Do you wait for the cleaning prep to dry? If yes, for how long do you wait?

(3)-Do you wipe it with a towel?

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(4)-Do you take measures to keep the cleaning agent away from your spinal/regional tray?
(5)-And finally do you change your mask for each procedure?

Results: Out of a total of forty questionnaires there were 25 completed responses.

23 people normally use Chloraprep, one person Hydrex, and one Betadine.

96% of the anaesthetists wait for the cleaning prep to dry, with just over 50% of respondents waiting for the cleaning prep to be visibly dry.

92% do not wipe with a towel.

18 out of the 25 routinely take measures to keep the cleaning prep separate to their regional tray.

And 18 Anaesthetists would routinely use a new face mask for each procedure.

Conclusions: Over half of the anaesthetists questioned would not wait for the cleaning prep to dry.

Along with this several people would wipe the prep with a towel, which is not good practice.

Most surprising was that 7 anaesthetists do not take measures to avoid contamination of their regional tray with cleaning prep, despite several high profile cases which have resulted in neurological complications arising from this.

CENTRAL VENOUS CANNULATION: A SURVEY OF THE USE OF ULTRASOUND IN A DISTRICT GENERAL HOSPITAL

D. Quemby[1], A.M. McEwen[1]. [1]*Anaesthesia, South Devon Healthcare NHS Foundation Trust, Torquay, United Kingdom.*

Purpose/Objective: Central venous cannulation is a common procedure associated with significant morbidity. Traditional landmark techniques have a success rate of 60%-95% and a complication rate of 5%-19% (1). Ultrasound guided techniques are well established and have been shown to improve success rates and reduce complications. In the UK they are recommended by the National Institute for Health and Clinical Excellence (2).

Materials and Methods: We conducted a survey of our anaesthetic department on the use of ultrasound for central venous cannulation. Responses were received from 15 consultants and 14 trainee anaesthetists.

Results: 100% of trainees used an ultrasound guided technique compared with 66% of consultants. All trainees had received training compared to 93% of consultants. Almost all consultants (90%) had placed fewer than 5 central lines in the past year compared with trainees who had all placed at least 10.

Conclusions: Despite widespread availability of ultrasound, 17% of anaesthetists in our department (all consultants) preferred the traditional landmark technique. Reasons cited were time constraints and an impression that ultrasound guided techniques were not advantageous. The fact that most central lines in our department are performed by trainees may be preventing some consultants from gaining enough exposure to become confident in ultrasound guided techniques.

1. McGee DC, Gould MK. Preventing complications of central venous catheterization. NEJM 2003;348:1123-33.
2. NICE Technology Appraisal No 49: guidance on the use of ultrasound locating devices for placing central venous catheters. Available at: http://www.nice.org.uk/nicemedia/live/11474/32461/32461.pdf.

REGIONAL ANAESTHESIA IN THE ANTICOAGULATED PATIENT: A SURVEY OF PRACTICE

D. Quemby[1], A.M. McEwen[1]. [1]*Anaesthesia, South Devon Healthcare NHS Foundation Trust, Torquay, United Kingdom.*

Purpose/Objective: The risks of regional anaesthesia in anticoagulated patients are well documented and numerous guidelines have been published on the management of such patients (1).

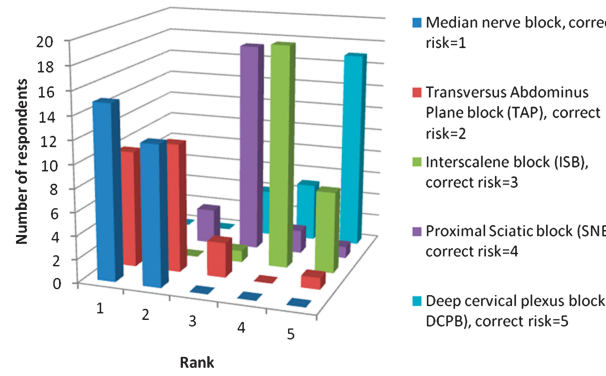
Materials and Methods: We conducted a survey of 29 anaesthetists in our department to ascertain knowledge of this subject.

Results: Participants were asked whether neuraxial anaesthesia (NA) or Interscalene block (ISB) would be appropriate in several scenarios involving anticoagulated patients. Responses were considered correct if they corresponded with published guidance (1):

Correct responses (% of participants)

Scenario	NA	ISB
Within12hrs LMHW	79	79
Within 24hrs treatment dose LMWH	59	57
Within 7 days Aspirin	79	79
Within 7 days Clopidogrel	86	86
Within 36hrs Dabigatran	74	69
INR>1.4	72	75

Participants were also asked to rank 5 blocks in order of increasing risk (1=low risk, 5=high risk) in anticoagulated patients:



Conclusions: The decision to undertake regional anaesthesia always involves consideration of the risks and benefits. Even in anticoagulated patients the benefits might occasionally outweigh the risks. However, it is important to be aware of published guidelines to aid decision making. Only 24% of respondents were aware of such guidelines and we have therefore begun a departmental education programme.

1. Regional Anaesthesia in Patients with Abnormalities in Coagulation. AAGBI 2011. Available at: www.aagbi.org/sites/default/files/RAPAC%20for%20consultation.pdf

ULTRASOUND CONFIRMATION OF GUIDE-WIRE POSITION DURING CENTRAL VENOUS CANNULATION: A SURVEY OF PRACTICE IN A DISTRICT GENERAL HOSPITAL

D. Quemby[1], A.M. McEwen[1]. [1]*Anaesthesia, South Devon Healthcare NHS Foundation Trust, Torquay, United Kingdom.*

Purpose/Objective: Accidental arterial puncture and subsequent intra-arterial catheter insertion during central venous cannulation causes significant morbidity and occasionally mortality. Even with ultrasound guided techniques it is relatively easy to inadvertently puncture and thread the guide-wire into the artery (1). However, using ultrasound to confirm guide-wire position will help prevent subsequent dilation of the incorrect vessel and thus significant morbidity.

Materials and Methods: We conducted a survey of our anaesthetic department on the use of ultrasound to confirm guide-wire position prior to vessel dilation. Responses were received from 10 consultants and 14 trainee anaesthetists.

Results: 83% of respondents used a real time technique and 17% an ultrasound assisted technique. 88% used an out-of-plane technique and 12% an in-plane technique. Only 29% checked guide-wire position prior to dilation and even fewer (17%) imaged the catheter within the vein.

Conclusions: Using ultrasound to confirm guide-wire position prior to vessel dilation is quick and easy to learn, requires no additional equipment and may prevent significant patient morbidity. All anaesthetists should therefore be encouraged to adopt this practice. Based on the results of this survey, we have begun a departmental education programme,

1. Blaivas M, Adhikari S: An unseen danger: frequency of posterior vessel wall penetration by needles during attempts to place internal jugular vein central catheters using ultrasound guidance. Crit Care Med 2009;37:2345-2349

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VALIDATION OF THE ACOUSTIC, MECHANICAL AND ELASTIC PROPERTIES OF THE SOFT EMBALMED THIEL HUMAN CADAVER DURING ULTRASOUND GUIDED REGIONAL ANAESTHESIA.

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Purpose/Objective: The ideal model for regional anaesthesia training should look and feel like a patient, replicate ultrasound appearance of tissue and reproduce , fascial penetration, and injection. The Thiel embalmed human cadaver, is soft preserved, minimises formaldehyde use and enables full flexibility of the limbs.

Materials and Methods: Acoustic, mechanical and elastic properties of Thiel tissue were validated in 3 studies. (1) B-Mode ultrasound of nerve, muscle, vessels on 7 occasions over 28 weeks, and visibility assessed using a 7-point ordinal scale, 4-point Vienna scale and a histograms of brightness. (2) Extraneural and intraneural stiffness or Young's modulus (kPa) of peripheral nerves and tissue in two cadavers and patients using shear wave elastography[1] (Supersonic Imagine, Aix-en-Provence). (3) Measurement of fluid spread and dynamics in 30 Thiel cadavers and patients during interscalene, median and femoral nerve blocks using strain elastography[2] (Zonare, CA) and ImageJ (NLM, Washington, DC).

Results: Median [IQR] visibility of nerves was 5.0[4.75 - 5.5]. Likert scale and Vienna scale were correlated, $r = -0.65$, $p < 0.001$. Using a mixed effects model (NCSS, Utah) cadaver intraneural stiffness 32.5(95%CI: 31.2 to 33.7) kPa and extraneural stiffness (3.5(95%CI: 3.4 to 3.6)kPa was no different from volunteer and patient measurements. Strain displacement increased with volume of injectate (1>5ml) in Thiels and patients. In both, a reflective or sinusoidal fluid flow pattern was detected.

Conclusions: The Thiel soft embalmed cadaver has similair acoustic, elastic and mechanical properties to humans when used for UGRA.

SOMETHING (NOT) FOR THE WEEKEND? WRIST FRACTURE PATIENTS DON'T RECEIVE NERVE BLOCKS AT THE WEEKEND.

C. Morris[1], V. Athanassoglou[1], J. Strachan[2]. [1]*Anaesthetics, Buckinghamshire Hospitals NHS Trust, Oxford, United Kingdom,* [2]*Nuffield Dept of Anaesthetics, Oxford University Hospitals NHS Trust, Oxford, United Kingdom.*

Purpose/Objective: To assess whether all patients with fixation of wrist fracture in our institute have equal access to the benefits of regional anaesthesia.

Materials and Methods: Retrospective notes audit of one year's cases of internal fixation of wrist fracture with regard to day / time of surgery, anaesthetic and analgesic technique, duration of case, intraoperative opioid use, post operative pain score, rescue analgesia, post operative nausea and vomitting and time to discharge.

Results: Approximately 75% less cases received regional anaesthesia at weekends compared with cases midweek. Overall rate of regional anaesthesia lower than expected (only 20% of all cases). No association between nerve block and overall duration of case. Severe pain in recovery in patients without nerve block or strong opioid given.

Conclusions: Reasons for reduced rate of regional anaesthesia at weekends unclear. Weekday trauma lists largely run by dedicated consultant trauma anaesthetists. Weekend trauma lists delivered by junior anaesthetists, but usually with immediately available consultant supervision. Many junior trainees, and majority of general on call consultants may not be confident performing upper limb nerve blocks.

Midweek wrist trauma often operated on by specialist upper limb trauma surgeons, who are supportive of regional anaesthetic techniques. Weekend operating often by registrars / non specialist consultants. May have unfounded fears regarding risk of compartment syndrome. Also may believe that regional anaesthesia adds unacceptable time delays to operating list.

Plan to organise upper limb surgery into more dedicated lists with specialist surgeon and anaesthetist. Re audit next year.

ARE WE COMPLIANT ABOUT DOCUMENTATION OF REGIONAL ANAESTHESIA PROCEDURES

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Purpose/Objective: Consent is an integral part of anaesthetic practice. The AAGBI working committee made basic recommendations. It suggests anaesthetists should record details of preoperative discussion in the patient record, noting risks,benefits and alternatives explained. A record of regional anaesthesia should include discussed risks with the patient, technique of Regional anaesthesia, use of aseptic technique. An anaesthetic record can have important medico legal implications.

Materials and Methods: We did a retrospective audit consisting of 100 cases involving peripheral nerve blocks in elective surgery. The main aim of this audit was to assess the documentation of risks associated with RA. Moreover we have looked at the recording of technique, use of Ultrasound (U/S) and aseptic techniques used.

Results: The significant finding was that 32% anaesthetic charts did not contain information about discussed risks of RA with patients.The complication most highlighted was nerve damage. U/S guided RA was used in 24 % of cases and only 4 clinicians mentioned needle visualization and 8 documented spread of local anaesthesia. There was no documentation about the technique in 13 % of the cases. There was no record of aseptic technique in 43% of anaesthetic charts.

Conclusions: This audit highlights the inadequate documentation of risks of RA with the patients, technique and aseptic approach during peripheral nerve block.We are not compliant with AAGBI standards. Use of U/S is not common despite NICE guideline recommendation.Providing written leaflets to the patients not only will allow us to deliver necessary information but also would standardize the documentation of risks and complications of RA.

A COMPARISON OF COMBINED PSOAS- SCIATIC NERVE BLOCK AND SPINAL ANESTHESIA FOR INTERTROCHANTERIC FRACTURES IN ELDERLY PATIENTS.

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Purpose/Objective: Traditionally, fractures of the lower limb are operated under central neuraxial blockade.

In elderly patient this may lead to hemodynamic instability leading to excessive I.V. fluid administration , vasopressor use, and decompensation of conditions as cardiac or respiratory failure.

Peripheral nerve block, causing milder sympathetic blockade may have favourable outcomes regarding hemodynamic stability and postoperative analgesia in elderly patients.

Materials and Methods: Eighty seven patients, age> 65 , undergoing fixation of intertrochanteric fractures, on an emergency basis. Patients were randomized in two groups. First investigator applied a combined psoas -sciatic block (group A, n=42), while the second applied spinal anesthesia (group B, n=45).

Baseline vital signs and VAS pain scores at rest were recorded . Vital signs were recorded every 5 minutes . Investigators followed a strict protocol regarding fluid ,vasopressor and blood administration.Postoperative VAS pain scores were recorded at times 2,6,12,24 and 48 h (t=0 at skin incision).

Results: No significant differences regarding demographics ,age, ASA category, blood pressure at beginning.

There was statistically significant difference regarding intraoperative systolic blood pressure (U=566,5 , p=0.001) and postoperative pain scores.

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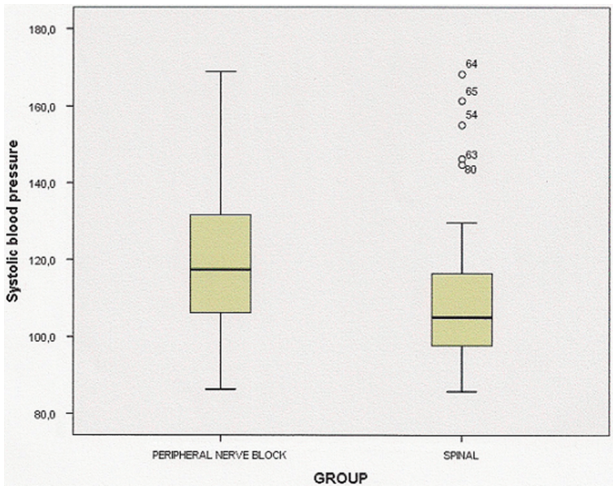
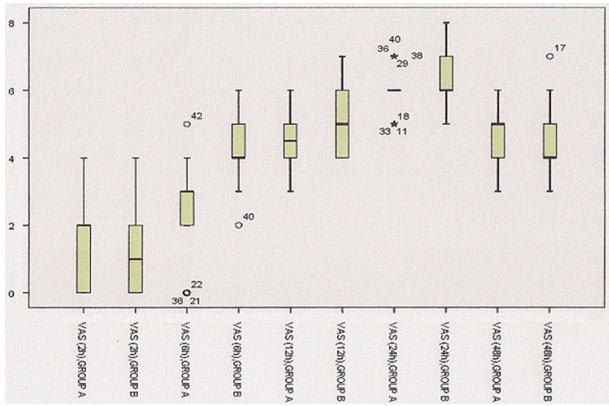
There was a statistically significant difference regarding IV fluids administration. (U=1369,5 , p<0.001). Mortality in the first 15 days were 4.76% (A) vs 13.3% (B).





Conclusions: The combined psoas sciatic block seems to have specific advantages in elderly patients.

Greater hemodynamic stability , less need for IV fluids and vasopressors, longer lasting analgesia .It is possible that PNB reduces mortality, since main postoperative cause of mortality is heart failure decompensation. Main drawback of the peripheral nerve block is longer time needed to be performed.

COMPETENCY IN PERIPHERAL NERVE BLOCKS, HOW MANY IS ENOUGH?

S. Phillips[1], D. Timbrell[1], M. Baloch[1]. [1]*Anaesthetics, Frimley Park Hospital, Frimley, United Kingdom.*

Purpose/Objective: Exposure to regional anaesthesia varies throughout training programs, but is there a minimum clinical experience needed to be competent? Non-technical skills are required to be proficient in regional anaesthesia, however the more a technical skill is performed the better one would become. Can and should we assign a number to the amount of times a specific block is performed in order to be competent at that block?

We asked trainees what experience they felt was necessary.

Materials and Methods: We surveyed registrars within our school of anaesthesia. We asked how many blocks (specific blocks listed) they had performed and how many did they feel were needed to be competent (options: zero, 1-9, >20, >30).

Results: For simpler blocks 40% of trainees felt they should be performed up to 9 times before being competent at the procedure.

More complex blocks had no consensus on the amount of times the block should be performed.

Conclusions: There is no uniformity in the number of blocks that trainees require before becoming competent. However most trainees stated that between 1-9 times was adequate exposure. This is in contrast to the suggested number of 30, required for the European diploma of regional anaesthesia. The 'watch one, do one, see one' mantra of previous years is thought to no longer exist, but current practice in the UK uses training tools where a single supervised block is often 'signed off' as competency.

Further studies should look at the validity, reliability and assessment of competency regarding technical skills.

REHYDRATION THERAPY WITH CARBOHYDRATE DRINK FOR PREVENTING POSTOPERATIVE NAUSEA AND VOMITING (PONV) AFTER LOW DOSE OF SPINAL MORPHINE IN PATIENTS UNDERGOING TOTAL KNEE REPLACEMENT (TKR)

M. Raksakietisak[1], T. Chinachot[1], A. Iamaroon[1], Y.O.S. Thabpenthai[1], P. Halilamien[1], B. von Bormann[1], S. Siriratwarangkul[1]. [1]*Anesthesiology, Faculty of Medicine Siriraj Hospital Mahidol University, Bangkok, Thailand.*

Purpose/Objective: Preoperative oral carbohydrate (CHO) drink can increase patient comfort. The efficacy of oral rehydration with 10% CHO for reducing the incidence and severity of postoperative nausea and vomiting (PONV) after low dose of spinal morphine is still questioned.

Materials and Methods: After ethical committee approval and obtaining informed consent, 100 patients scheduled for unilateral TKR were randomly allocated into two groups. Group I (study group), 50 patients drank 400 ml of 10% CHO in the night before and another 400 ml 2 h before surgery. Group II (control group), 50 patients had no drink. Both groups received the same spinal morphine (0.2 mg) and other pain management. The incidence and severity of PONV within 24 hr in two groups were compared. The intensity of thirst, hunger, dry lip, dry throat, and anxiety were recorded preoperatively.

Results: The incidence and severity of PONV were not different (81.2% VS 72.0%, p=0.536). The scores for thirst, hunger, dry lip and dry throat were not different but patients in group I had higher anxiety scores (3.6 ±3.0 VS 3.3 ±3.8, p=0.043).

Conclusions: Oral rehydration with carbohydrate drink before spinal morphine had no effect on the PONV.

COST ANALYSIS TO IMPROVE EFFICIENCY IN REGIONAL ANAESTHESIA

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Purpose/Objective: Spending power of publicly funded hospitals in United Kingdom is affected due to efficiency drive. Anaesthetic services are under increased pressure to cut costs of consumables and drugs. Published report suggests that cost of regional anaesthesia is lower due to theatre efficiency, early discharge and less manpower use. Our aim is to analyse the cost of consumables and drugs used for regional and general anaesthesia and advice on areas for improvement in cost efficiency.

Materials and Methods: We retrospectively collected the data on regional and general anaesthesia for day case plastic surgery trauma lists. List of all consumables and drugs used were noted. Costs per item were used for analysis. Data on length of preoperative and postoperative stay in the ward were noted.

Results: Data was collected from 57 patients who had either Regional Anaesthesia or General Anaesthesia. 8 patients were excluded from analysis. Demographic data were comparable in both groups. Average length of stay pre-procedure (Median 105mins vs. 180mins) and post-procedure (median 45min vs157min) was higher in general anaesthesia group. Regional anaesthesia drugs and consumables cost 5% more than that of general anaesthesia. However costs of inhalational anaesthesia, oxygen gas, breathing circuit were not included for analysis due to calculation difficulties.

Conclusions: Though the face value of consumables and drugs are higher for regional anaesthesia, we are achieving efficiency through reduced manpower and length of hospital stay. Our analysis gave us insight into cost of products, which in turn allowed redesigning the products used to further lower the cost.

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MSC IN REGIONAL ANAESTHESIA: ANALYSIS OF MODULE ONE FEEDBACK FROM THE FIRST STUDENT COHORT.

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Purpose/Objective: The University of East Anglia has developed the first higher degree in Regional Anaesthesia in the UK, supported by The Royal College of Anaesthetists, the Association of Anaesthetists of Great Britain and Ireland and Regional Anaesthesia UK.

E learning and distance learning techniques are employed to provide a flexible learning environment. Problem based learning scenarios are used to stimulate discussion and learning.

Materials and Methods: Seventeen students comprising the first cohort of this new degree, were asked to provide feedback on Module one: Anatomy and applied anatomy applicable to regional anaesthesia, via an electronic questionnaire. A 59% response rate was achieved. Students were asked to comment on content, website, module teaching, module tutors and module objectives. Results were collated, analysed and presented for review.

Results:

	Answer (percentage)			
Student feedback question	**Extremely**	**Very**	**Moderately**	**Slightly**
Confident with applied micro anatomy of central and peripheral nervous system	0	60	40	0
Confident with applied anatomy of brachial, lumbar and sacral plexus	10	50	40	0
Confident with applied anatomy of upper and lower limb	20	50	30	0
Confident with applied anatomy of spinal and paraspinal structures	10	60	30	0
Confident with applied anatomy of thorax and trunk	10	60	30	0
Confident with eponymous regional techniques	10	30	50	0
Confident with management of anatomical variations	0	20	50	30

Conclusions: Overall feedback was very positive with the majority of students feeling this course provided a well-organised, accessible, relevant and up-to-date regional anaesthesia curriculum. Students demonstrated high confidence levels with applied anatomy in relation to regional anaesthesia.

A POSSIBLE ROLE OF UNINJURED ADJACENT L4 NERVE IN THE DEVELOPMENT OF PERIPHERAL NEUROPATHIC PAIN AFTER L5 SPINAL NERVE LIGATION IN RATS

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Purpose/Objective: Spinal nerve ligation is a commonly used animal model of neuropathic pain with rats developing hyperalgesia and allodynia in the hind paw after L5 spinal nerve ligation. The skin of the foot of the rat is innervated mainly by L4-L5 nerves. This study investigated the role of adjacent uninjured L4 in the production of heat hyperalgesia after L5 injury.

Materials and Methods: Left L5 spinal nerve was ligated and sectioned in rats. After 3 days, both hind paws were immersed in water at different temperatures (37, 42, 47 and 52°C) under sevoflurane anesthesia for 2 minutes and the animals were sacrificed 5 minutes later. Then, sections from L3-L6 spinal segments were stained immuncytochemically for phosphorylated Extracellular Regulated Kinases (pERK) as a pain activity marker.

Results: Normally, no pERK immunoreactivity could be detected in the normal spinal cord but it is activated in neurons in the superficial dorsal horn by noxious heat stimuli. A linear trend was observed in increase of number of pERK positive neurons on injured side from 37-52 °C. The number of positive pERK neurons was significantly higher in the ipsilateral side of L4 spinal segment, which receives innervation from uninjured L4, compared with contralateral control side in 47 and 52 °C treated-groups.

Conclusions: The present study supports that L4 nerve is a potential cause of heat hyperalgesia after L5 nerve injury. The data provide important basis for further revelation of the mechanisms of neuropathic pain and the development of new pain relief strategies.

CEREBRAL DESATURATION DOES NOT PREDICT POSTOPERATIVE COGNITIVE DEFICITE IN BEACH CHAIR POSITION - IMPACT OF DIFFERENT ROPIVACAINE CONCENTRATIONS FOR INTERSCALENE BLOCKS

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Purpose/Objective: Interscalene nerve blocks could lead to significant drop in both mean arterial pressure (MAP) and cerebral oxygenation during surgery in beach chair (BC) position and may result in catastrophic damage to cerebral structures and functional integrity. This study is focused on the impact of different concentrations of low volume Ropivacaine on cerebral blood flow (CBF) and oxygenation and POCD.

Materials and Methods: After IRB approval (BB90/12) and written consent 43 patients undergoing elective shoulder surgery NIRS and MAP were monitored in BC position randomised to interscalene blocks of 10 ml Ropivacaine 0.2% or 0.75%, pre- and 24 h postoperative cognitive function was assessed using the combined Minimal-Mental-State and Clockdrawing Examination.

Results:

	Desaturation (n=15)	**no Desaturation (n=28)**	
MAP drop (mean±SD)	53,73±10,01	42,03±14,92	p=0,002

	Ropivacaine 0.2%	**Ropivacaine 0.75%**	
n	23	20	
MAP drop (mean±SD)	44,52±12,93	47,95±16,13	p=0,44
Desaturation:	7	8	p=0,73
- MAP drop (mean±SD)	51,57±7,87	55,62±11,77	p=0,45
- AUCmin% (mean±SD)	14,62±23,65	36,48±38,39	p=0,16
- POCD	0	0	

In 15 pts of both groups there was sigificant drop in cerebral saturation, linked to a significant higher drop in MAP in these pts compared to non desatured pts.

There was no difference in MAP- or cerebral saturation drop between both concentrations of Ropivacaine. Non of the cerebral desaturated pts developed a POCD.

Conclusions: NIRS monitoring might help in detecting critical lowered CBF and proper augmentation. Cerebral saturation drop is not predictive for POCD.

There is no difference in affecting the hemodynamics of CBF between Ropivacaine 0.2% or 0.75%, thus no advantage of lower concentrations regarding CBF and POCD.

ENHANCED RECOVERY: EFFECT OF AGE, GENDER AND ASA GRADE.

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Purpose/Objective: Evidence based enhanced recovery programs have been implemented to improve patient outcomes, speed up recovery and reduce length of hospital stay. Our study looked at the effects of age, gender and ASA on the length of hospital stay after total knee replacement in patients receiving enhanced recovery.
Materials and Methods: We conducted a retrospective study of 73 patients who underwent total knee replacement between March 2011 and October 2012. Patients received oral oxycontin 10mg and gabapebtin 300mg one hour preoperative, the operation was done under spinal anaesthesia 3 ml hyperbaric Bupivacaine 0.5% and postoperative analgesia was regular oxycodone 10-20 mg BD, Gabapentine 300 mg BD and oxycodone 5-10 mg four hourly as required. We compared 37 ASA 2 patients (Av. Age 68.3) with 36 ASA 3 (Av. Age 76.9) patients looking at length of hospital stay. We then compared the length of stay between male and female patients from each group.
Results: We found that the length of stay in hospital was greater in ASA 3 patients (5.9 days) compared to ASA 2 patients (4.27 days). We also found that females stayed longer in hospital than males in both groups. The group with the longest stay were ASA 3 females (6.8 days).
Conclusions: There will always be patient groups who will stay longer than others. Our study has shown that ASA 3 females will have the longest hospital stay despite enhanced recovery program.

COMMEMORATIVE PLAQUE SET UP ON THE NATIVE HOUSE OF CARL KOLLER IN SUSICE TO HONOUR ONE OF THE GREATEST CONTRIBUTORS OF LOCAL ANAESTHESIA.

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Purpose/Objective: The reputed Austrian ophthalmologist Dr. Carl Koller (born 03.12.1857 Susice, Austria, now Czech Republic - died 21.03.1944 New York, USA), began his career at the Vienna General Hospital and introduced cocaine as a local anaesthetic for eye surgery, for which he received many international distinctions. Very little is known about Koller's ancestors.
Materials and Methods: During a ceremonial meeting on December 2, 2012, organised by anaesthesiologist Gimunova and historician Lhotak, a memorial plaque was set up on the native house of Doctor Carl Koller in Susice to commemorate his 155th birth anniversary and to show tribute to one of the most important native men of Susice.

Results: Koller's Jewish family roots were in Teplice-Sobedruhy and Bilina (now Czech Republic). His father Juda Leopold Koller, a businessman, was the son of Wolf Koller, son of Isak Koller and Sarah Thal from Teplice-Sobedruhy. Carl's mother Wilhelmine, daughter of Carl Rosenbaum, came from Bilina. His godfathers came from Susice: Leopold Weil and Daniel Furth (owner of a large factory producing safety matches). Carl had five sisters.
Conclusions: After the death of his wife, Juda Leopold Koller moved to Vienna from Susice in 1862, where he died in 1908. Their only son Carl grew up in a family with his stepmother and became later a medical doctor. Dr. Carl Koller was forced to leave Vienna after a duel in 1885. Carl Koller used to say that he was born in the Middle Ages (in a small historical town) and he lived into the Atomic Age in the USA.

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Abstracts and Highlight Papers of the 32nd Annual European Society of Regional Anaesthesia & Pain Therapy (ESRA) Congress 2013
Late Breakers

UPPER ABDOMINAL SURGERY UNDER SPINAL ANESTHESIA: A SAFE AND FEASIBLE PRACTICE

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Purpose/Objective:

1. To demonstrate the safety of an anaesthetic technique to perform open cholecystectomy in hospitals with low level equipment in an International cooperation situation.
2. To apply this technique in patients with associated pathology.

Materials and Methods: Open cholecystectomy was done under spinal anaesthesia (SA) in 22 patients in rural areas in Bolivia.

Routine monitoring, premedication and peripheral venous infusion were carried out.

Spinal anaesthesia with Hyperbaric Bupivacaine 0.5% (15 mgr ≥ 1.50 m height, 12,5 mgr < 1.50 m height) + Fentanyl 50 µgr was performed.

Post anaesthesia patients were placed in Trendelemburg position to achieve the desired level (T4).

Desketoprofen + Paracetamol Intravenous was administered in the postoperatory. Tramadol if patient needed more analgesia.

Results: Twenty-one patients began oral intake within 24 h post surgery and were discharged before 48 h. One patient required nose gastric tube.

Table 1 Patient details and outcome indicators.

Demographics	
Sex(M:F) n	17:5
Age (yr)	47 (28-68)
Weight (Kg)	66 (12.1)
Height (cm)	154(7.1)
BMI (kg.m^{-2})	27 (22-38)
Outcome	
Duration of surgery (min)	42 (30-65)
Conversion to general anesthesia	0
Surgeon evaluation (poor, adequate, excellent)	0:0:22
Discharge (48h-72)	21:1
Tramadol's needs	
Yes (2h-6h-24h)	1:9:10
No	2

Table 2 Monitoring side effects and postoperative pain

Bradicardia	5 %
Hypotension	59.1%
Intraoperative nausea vomiting	0
Postoperative nausea	45,5%
Postoperative vomiting	23,3%
Respiratory depression	0
Median pain score(VAS)	
2 hours	0.82 /1.81 (SD)
6 hours	3.50 / 1.793 (SD)
24 hours	2.55 /1.18 (SD)

Conclusions: When asked about the best technique to do open cholecystectomy in under equipped hospitals, no data was found.

In patients undergoing abdominal surgery with general anaesthesia, postoperative pulmonary complications are 4-22%. In severe chronic pulmonary disease situation, postoperative complications are 37%.

Our main fear was that the spinal block could lead to respiratory failure and cardiovascular instability. No patients had respiratory depression.

After the experience, this technique was successfully applied in patients with severe respiratory disease.

Open cholecystectomy under spinal anaesthesia is safe and feasible. It has minimal complications and low level of pain.

It may be an option for patients with cardiopulmonar disease or contraindication for general anaesthesia.

INTRADURAL LEVOBUPIVACAINE VERSUS BUPIVACAINE FOR ORTHOPEDIC SURGERY: ANESTHETIC AND NEURO-OPHTALMOLOGICAL EFFECTS

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Purpose/Objective: The aim of the study was to compare the anesthetic and neuro-ophthalmological effects of isobaric levobupivacaine and bupivacaine when intrathecally administered for knee arthroscopy.

Materials and Methods: A prospective, double-blind, randomized study with 60 ASA grade I–II patients aged 18–65 years awaiting knee arthroscopy under spinal anesthesia. Local Ethic Committee approval was obtained. There were two patient groups which received 12.5 mg of isobaric bupivacaine or 12.5 mg of isobaric levobupivacaine. The characteristics of sensory and motor blockade, hemodynamic variables, postoperative visual analogical scale (VAS), rescue analgesia, time to micturate, neuro-ophthalmological effects, and patient and surgeon satisfaction were recorded.

Results: One bupivacaine group patient had general anesthesia due to technical failure. No significant intergroup differences were observed for ASA classification, time to micturate, demographic data, surgery type and duration, and patient/surgeon satisfaction. Similar hemodynamic parameters and sensory and motor blockade duration were found for both groups. There were no neuro-ophthalmological effects in either group. Sensory ($p=0.018$) and motor blockade onset ($p=0.003$) was faster in the bupivacaine group. T6(T2-T12) and T3.5(T2-T12) were the highest sensory block levels for the levobupivacaine and bupivacaine groups, respectively ($p=0.008$). It took less time to regain the maximum motor blockade in the bupivacaine group ($p=0.014$). The levobupivacaine group required use of earlier analgesia ($p=0.025$).

Conclusions: Isobaric bupivacaine and levobupivacaine are analogous anesthesias for knee arthroscopy which are tolerated well. However for bupivacaine, sensory and motor blockade onset was faster, and a higher sensory blockade with a longer post-operative painless period was achieved.

SPINAL ANESTHESIA IN ARTHROSCOPIC MENISCECTOMIE: 0.5% HYPERBARIC BUPIVACAINE AND HYPERBARIC PRILOCAINE 2%: WHICH IS THE ANESTHETIC OF CHOICE?

S. Di Santo[1]. *[1]Anesthesia and Pain Unit, Ospedale Santo spirito, Bra, Italy.*

Purpose/Objective: The aim of this study is to compare the quality of the block, the recovery time of motor activity, the incidence of bladder globe and the occurrence of Transient Neurologic Symptoms (TNS) in patients undergoing arthroscopic meniscectomy under spinal anesthesia with hyperbaric bupivacaine 0, 5% vs. 2% hyperbaric prilocaine.

Materials and Methods: After informed consent, were recruited 140 patients undergoing surgery for arthroscopic meniscectomy. According to the alternation principle, patients underwent spinal anesthesia with hyperbaric bupivacaine 0.5% (No. 70) (group B) and hyperbaric prilocaine 2% (No. 70) (group P). In the post-operative patient evaluation was done by a different anesthesiologist. The occurrence of TNS was evaluated

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Results: Five patients in group B and no patient in group P required the vesical catheter.

Significant differences between the two groups were observed in the complete regression of the motor block (211 min vs 110 min group B vs group P) and complete resolution of sensory block (169 min vs 76 min). Important halving the time of the first spontaneous voiding group P with respect to B.

Conclusions: At the first follow-up no patients of both groups reported the occurrence of TNS. But the hyperbaric prilocaine 2% seems to show better handling than the hyperbaric bupivacaine 0.5% as a result of a more rapid recovery and sensory-motor that bladder function.

POSITIONAL BACKACHE: A RARE PRESENTATION OF DURAL PUNCTURE, ASSOCIATED WITH AN UNUSUAL RADIOLOGICAL FINDING

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Purpose/Objective: We are reporting a rare case of post dural puncture positional backache. Thoracic back pain without headache following dural puncture has been reported previously.

Materials and Methods: A 29 year old woman with BMI of 23.3 was posted for elective Right Tibial Osteotomy under spinal anaesthesia. Accidental Dural puncture was recognised on insertion of introducer needle through which the anaesthetic was administered. The Anaesthetic and Surgery thereafter were uneventful. Patient was warned of a high risk for development of PDPH.

Results: During the next few days she complained of intermittent, mild, generalised and non-positional headache which was well managed with simple analgesics.

Patient also complained of positional backache at the site of Spinal injection which was initially easily managed but gradually became incapacitating by fifth post operative day. She denied any other associated symptoms.

An urgent MRI was performed which showed collection of fluid (C.S.F) anteriorly rather than posteriorly from L3 to S1.

An uneventful epidural blood patch was performed with immediate and sustained relief.

Conclusions:

1. Post dural puncture phenomenon could present predominantly as backache which can sometimes be positional.
2. PDPP could be delayed, atypical and easily missed and hence needs a high index of suspicion
3. Low threshold for blood patch in cases of dural puncture with large-bore needles.

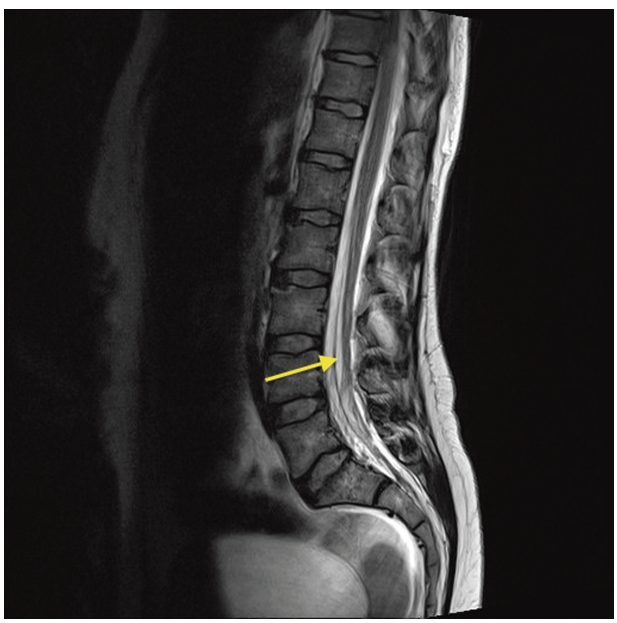

FIGURE 1.

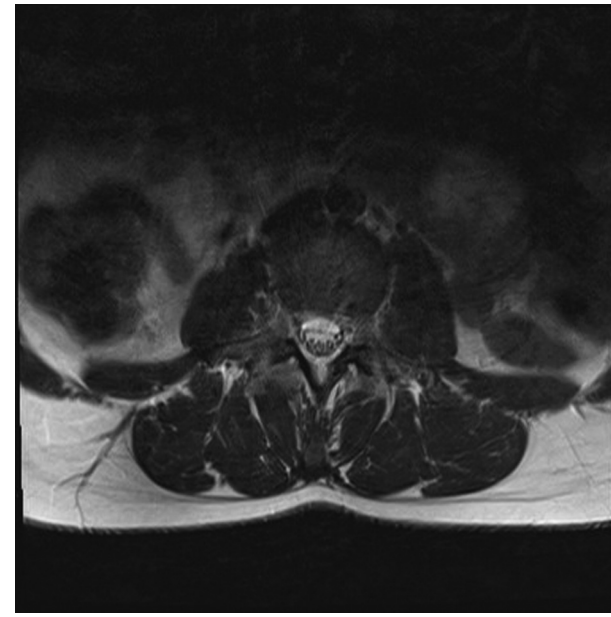

FIGURE 2.

AREA UNDER CURVE (AUC) OF THE PHOTOPLETHYSMOGRAPHIC SIGNAL - DETECTING THE SYMPATHETIC BLOCK ONSET UNDER EPIDURAL ANAESTHESIA

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Purpose/Objective: Photoplethysmographic signal reflects sympathetic activity below the level of epidural anaesthesia block. Level of sensoric block is equal to the level of sympathetic block. Photoplethysmographic curve is dependent on alterations in photoplethysmographic signal strength and duration. Altering any of those two parameters, the "area under curve" of photoplethysmographic signals alters as well.

The aim of this study was to investigate wether the area under curve, togeher with pulse transit time and photoplethysmographic signal amplitude, can be used to estimate sympathetic block onset.

Materials and Methods: Epidural anaesthesia with 0.5% bupivacaine at the L3/L4 level was administered to 40 patients. Biopac system – SS4LA pulse Plethysmograph Transducer was used to record data. Recorded data were: amplitude – photoplethysmographic signal maximum, pulse transit time and area under curve. Differences between two measurements of single parameters at the same patients were tested using nonparametric test for dependent samples (Wilcoxon's pair test). Differences between three or more measurements of single parameters at the same patients were tested using nonparametric variance analysis for dependent samples (Friedman ANOVA). $p < 0.05$ was taken as a level of statistical significance.

Results: Epidural anaesthesia lead to statistically significant change of area under curve, photoplethysmographic signal amplitude and pulse transit time ($p < 0.05$).

Conclusions: Sympathetic block onset during epidural anaesthesia changed the area under curve, pulse tranit time and photoplethysmographic signal amplitude statistically significant. Area under curve can be used to detect sympathetic block onset.

POST-IMPLEMENTATION OF NEW SPINAL NEEDLE EVALUATION QUESTIONNAIRE

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Purpose/Objective: Following publication of NPSA Safer Spinal Part A in January 2011, our institution conducted a structured evaluation following which the use of 24G Pajunk Surety spinal needles to conform to these

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standards was implemented. Having instigated this change, our objective was to investigate the spinal needle usage preferences of staff prior to implementation, and evaluate the subsequent experience and satisfaction level of anaesthetic staff with the new needle.

Materials and Methods: An online questionnaire using Survey Monkey was sent to 56 consultant and career grade anaesthetists in our department. The questionnaire consisted of 16 questions regarding the preferences of staff prior to implementation (preferred needle manufacturer, tip design, gauge) and a comparison of these preferences with the 24G Pajunk Surety needle (practical feel, ease of use, success rate and perceived safety benefit). Staff were asked to rate the needle overall and rank their degree of support for complying with NPSA guidance.

Results: The response rate was 52%. The majority (74-89%) of anaesthetists agreed that the practical feel, ease of use and success rate with the new needles was comparable to their previously preferred equipment. When asked to rate the new needle, the modal score was a positive 8/10. There was support for department's choice of spinal needle and implementation of NPSA standards (89% same or better than previous preference).

Conclusions: Overall the feedback gained from this evaluation gave us a positive indication that the recent implementation of NPSA safety standards and change of spinal needle has been well received in our department.

DEXAMETHASONE AS ADJUVANT DRUG TO LOCAL ANESTHETIC SOLUTION

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Purpose/Objective: Dexamethasone is one of the newest and still controversial adjuvants to local anesthetic solution in peripheral nerve block. It is not yet clear the minimum effective dose and whether it is really harmless.

Materials and Methods: We observed the effect of 4 mg dexamethasone added to local anesthetic solution of the more commonly used block in our department – interscalenal, infraclavicular, femoral, subgluteal, popliteal, posterior tibial nerve block at the ankle. We compared the effect on the control group with the same amount of LA, but without dexamethasone.

Results: The results are quite impressive. 4 mg Dexamethasone nearly doubles the duration of single shot blocks regardless of the application site. Furthermore we did not observe any case of rebound pain – a well-known phenomenon when we do not use catheter technique.

We did not observe any sign of neurotoxicity or metabolic disturbances. All patients returned sensory and motor function the next day and they had lower pain scores and higher satisfaction than the control group who had their block expired during the night and had received rescue medications.

Conclusions: Dexamethasone 4 mg is clinically safe as adjunct to local anesthetic solution for single shot blocks. In many cases it may replace continuous blocks, saving us time and adding comfort to the patient.

It is still not known if peripheral nerve block with dexamethasone can mask postoperative compartment syndrome. We do not know the effect of repetitive blocks on the peripheral nervous system for example a patient who needs several surgical explorations for a short period of time.

ARE PATIENTS SATISFIED AFTER PERIPHERAL NERVE BLOCKADE? RESULTS FROM AN INTERNATIONAL REGISTRY OF REGIONAL ANESTHESIA

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Purpose/Objective: Little is known about patient satisfaction following peripheral nerve blockade (PNB). In this study, we analyse data from an International Registry of Regional Anesthesia. This project, formerly known as the Australian and New Zealand Registry of Regional Anesthesia, is a prospective multi-centre clinical registry that monitors and reports on the quality and safety of PNB. The primary objective of this analysis was to report the results of a newly developed patient rated outcome questionnaire and to determine predictors associated with happiness to have the PNB repeated in the case of future surgery.

Materials and Methods: This questionnaire comprised three domains - information provision, pain and discomfort, and interaction with their anesthesiologist. These domains and questions were derived from this registry's results and from previously validated questionnaires.

Results: The main outcome question "if you were to have a similar operation again would you be happy to have the same PNB again?" was answered in 61.6% of our study population. 94.58% of completed responses were "yes" and 5.42% were "no". Over 90% were satisfied or completely satisfied with information provided and the anesthesiologist-patient interaction. Patients who reported severe symptoms in response to any of the questions in the pain domain (including block recession) were less willing to undergo repeat PNB.

Conclusions: This study has documented high levels of patient satisfaction relating to provision of information and interaction with the anesthesiologist. The responses to questions comprising pain and discomfort were variable, indicating the need for clinicians to attend to issues relating to pain.

STOP BEFORE YOU BLOCK (SBYB): IMPLEMENTION OF A NEW CHECKLIST TOOL TO IMPROVE COMPLIANCE WITH THE SBYB PROCESS IN THE ANAESTHETIC ROOM

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Purpose/Objective: Despite the introduction of the SBYB campaign in 2011 there have been instances of wrong site block at Worcestershire Royal Hospital (WRH) and the Alexandra Hospital, Redditch (AHR). A Quality Improvement Meeting considered that documentation and adherence to the SBYB check was poor and inconsistent amongst anaesthetic staff. By enabling other members of the anaesthetic team to initiate the process, we expected that compliance with SBYB would increase and improve patient safety.

A SBYB sticker was developed to improve documentation and to assist anaesthetic and theatre staff to initiate and engage in the process.

Standard:- 100% of patients undergoing regional blockade should have a completed sticker on their anaesthetic chart.

Materials and Methods: Retrospective review of 164 anaesthetic charts of patients undergoing regional blockade between November 2012-February 2013 at WRH and AHR.

Results: 88.5% of patients had a SBYB sticker in their notes. 73% of the stickers were fully completed.

A survey of anaesthetic assistants revealed that the sticker has increased their awareness and confidence to initiate the SBYB checklist if not instigated by the Anaesthetist.

Conclusions: The SBYB sticker has improved documentation and adherence to the checklist and anaesthetic assistants feel more empowered to initiate the SBYB process.

A local policy has been developed to increase awareness and improve compliance with the SBYB sticker. All new staff will be educated at induction on the policy and a re-audit is in progress.

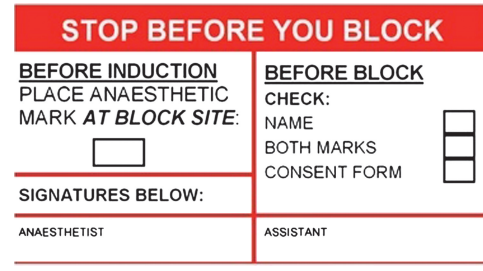

FIGURE . SBYB sticker.

PATIENT SATISFACTION AFTER SUBTENON BLOCK

S. Chaudhari[1], C. Persad,[1] S. Garstang[1]. [1]*Anaesthetics, Alexandra Hospital, Redditch, United Kingdom.*

Purpose/Objective: Subtenon block is a safe, simple and effective block widely used in ophthalmic surgery. Local anaesthetic is deposited under the tenon's capsule which is a thin membrane enveloping the globe and separating it from orbital fat.

The aim of this audit was to assess the patient satisfaction with anaesthesia and analgesia.

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Materials and Methods: The audit was done prospectively involving 100 patients undergoing cataract surgery. Patients were informed and consented during preoperative assessment. Subtenon block was performed under sterile conditions using standard local anaesthetic and adjuvant drugs. We looked for efficacy of block, local and systemic complications in the operating theatre. Patients were asked to complete the patient satisfaction section of the audit form before discharge.
Results: Our audit demonstrated that akinesia was present in 100% patients. Chemosis was observed in 31%, minimal bruising in 13% and subconjunctival haemorrhage in 2% patients. We didn't have major bleeding and systemic complications.

Our results showed that 98% patients were satisfied with anaesthesia while remaining 2% patients didn't report the satisfaction grade.

Regarding analgesic efficacy, 83% cases had no pain during the surgery while mild pain was felt in13% patients and moderate pain in 1% patient. 3 patients didn't report the pain score.
Conclusion: The findings of our audit demonstrated good patient satisfaction rate with subtenon block.

100% patients were satisfied with anaesthesia and only one patient had moderate pain. There were no major complications reported following the block. The incidence of minor complications observed was less than reported in other studies.

DAY CASE SHOULDER SURGERY USING INTERSCALENE BRACHIAL PLEXUS BLOCK

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Purpose/Objective: Pain management post shoulder surgery can be difficult. High doses of opioids may be needed[1,2,3], subjecting patients to established opioid side effects. The Interscalene Brachial Plexus block (ISB) under ultrasound guidance is a regional anesthetic technique routinely used for shoulder surgery, providing both safe and excellent surgical anesthesia and post-operative pain relief. Therefore reducing post-operative recovery time, opioid analgesia need and thus opioid side effects[4].
Aims:
- Assess efficacy of ISB analgesia for day case shoulder surgery perioperatively and 72 hour post-operative.
- Assess overall patients' satisfaction and complications with ISB.

Materials and Methods: 30 day case shoulder surgery under ISB patients were consented and discharged the day of surgery, with standard postoperative analgesia. Telephone interview for 3 days postoperatively asked patients: Pain score at 0, 24, 48 and 72 hours post operation, overall satisfaction with the block, adequacy of analgesia taken and complications with ISB.
Results: 30 patients ASA grades I to III were included. Mean pain score at 0, 24, 48 and 72 hours post-operation were 0.7, 4.9, 3.4 and 2.9 respectively. 93% (28/30) rated intra-op analgesia excellent. 1 patient had pain requiring intravenous analgesia intra-operatively and 1 patient had few aches during surgery. There was 97% (29/30) satisfactory rate, with 93% (28/30) would prefer ISB in future surgery. 93% (28/30) felt analgesia given was adequate after surgery.
Conclusions: Our study suggests a combination of regional analgesia and good compliance with oral analgesia leads to acceptable pain scores and high rates of patient satisfaction following shoulder surgery under ISB.

REGIONAL ANAESTHESIA AND ANTI-COAGULATION: CURRENT OPINION IN OUR DEPARTMENT

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Purpose/Objective: The occurrence of severe bleeding due to peripheral nerve block (PNB) is very rare, indeed too rare to reliably quantify its risk. However, several professional bodies have published guidelines relating to this practice. These guidelines are not necessarily adhered to. We undertook a survey of anaesthetists in our department to gauge their opinion on performing a variety of PNBs on patients receiving different anti-coagulant medication.
Materials and Methods: A questionnaire was delivered to each anaesthetist in our department. It asked which anti-coagulant medication the anaesthetist deemed safe to perform each PNB listed. Answers for both landmark and ultrasound-guided techniques were requested. For warfarin and heparin, acceptable laboratory test results were asked for. Anaesthetists were asked to specify a period of treatment cessation for any medication they deemed unsafe.
Results: Aspirin was regarded as safe by the majority of respondents. Clopidogrel, however, was regarded as unsafe by most. Subcutaneous heparin was generally regarded as safe; however, most anaesthetists would not perform PNB on patients receiving intravenous heparin, or low-molecular-weight heparin without treatment cessation. An International Normalised Ratio of less than 1.5 was the most popular response for safe PNB, as was a platelet count of greater than 70.

For every PNB and medication, ultrasound guidance produced an increase in the proportion of anaesthetists who deemed the PNB safe.
Conclusions: Opinion amongst the anaesthetists in our department does vary, and differs to the guidance available. Our department is hoping to use our results to produce local guidelines to aid both consultant and trainee anaesthetists at our hospital.

THE APPLICATION OF C-ARM FLUOROSCOPIC CONE-BEAM CT FOR NEUROLYTIC SPLANCHNIC NERVE BLOCK

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Purpose/Objective: Computed tomography (CT) guided percutaneous neurolytic splanchnic nerve block (SNB) has been established as an invaluable treatment for refractory abdominal pain. The recent development of C-arm cone-beam CT (CBCT) has made it possible to perform both fluoroscopic real-time observation and three-dimensional CT image acquisition by the same instrument without patient's movement. We report our experience of this novel technique of CBCT-guided SNB.
Materials and Methods: Eleven patients underwent CBCT-guided SNB. A 22-gauge bevel-tipped needle is advanced from the posterior approach alongside the vertebral bodies into the retrocrural space under real-time continuous fluoroscopic observation. The needle position was also confirmed with intrrupted 3D-CT images. Then the mixture of lidocaine and iopamidol was injected. After the spread of the mixture was assessed with fluoroscopic image and 3D-CT image, the mixture of 99% ethanol and iopamidole was injected through the same needle. The efficacy of SNB was assessed with numerical rating scales(NRS) of pain and the dose of opioids in terms of oral morphine.
Results: The NRS changed from 1(0 – 6) to 0 (0 – 4) with a significant difference (p=.04). The dose of morphine decreased significantly from 22mg (0-240mg) to 0mg(0-60mg) (p=.01). No significant complications were observed.
Conclusions: The CBCT-guided SNB is considered a safe and effective method which provides analgesic effects with a small dose of neurolytic agents.

INFLUENCE OF ARM POSITION ON ULTRASOUND VISIBILITY OF THE AXILLARY PLEXUS

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Purpose/Objective: Axillary brachial plexus block is performed by separate injections targeting radial, median, ulnar, and musculocutaneous nerve. These nerves are arranged around the axillary artery, where ultrasound visualization of the radial nerve can be challenging.

Primary aim of this study was to investigate which arm position increases visibility of the radial nerve. Secondary aims were visibility and position of other axillary nerves during varying postures.

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Materials and Methods: After ethical committee approval, bilateral ultrasound examinations of the axillary plexus were performed on 20 volunteers. Each arm was placed in different positions (shoulder(S)90°/180°, elbow(E) 0°/90°) and scans were performed proximal in the axilla(P) and 5 cm distally to this point(D), resulting in eight different scans stored for off-line analysis. Visibility scores on a six-point scale, distances and angles relative to the artery were assessed by two blinded anesthesiologists. Data were expressed as mean±SD. One way repeated measurement ANOVA was used to compare visibility scores and distances in different scan positions. Value of $p < 0.05$ was considered statistically significant.
Results: No significant differences between positions were found in visibility score of radial ($p=0.359$) and musculocutaneous nerves ($p=0.073$). Visibility of the median nerve was improved in positions S90°/E0°/D and S180°/E0°/P ($p=0.02$) and the ulnar nerve in S180°/E 0°/P and D ($p=0.007$). Greatest distance between artery and radial nerve was 7.4±4.7mm at an angle of 120±14° in position S180°/E 0 °/D.
Conclusions: Visibility of the radial nerve did not significantly improve by different positionings. S180°/E0° provided the best overall visibility and accessibility of all nerves.

DO YOU "STOP BEFORE YOU BLOCK"?

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Purpose/Objective: 'Stop before you block' (SBYB) is a national patient safety initiative aimed at reducing the incidence of wrong-sided nerve blockade. It involves clinicians pausing to confirm the site and side of the procedure immediately before inserting the needle in addition to verifying the World Health Organisation checklist. Following six critical incidents in the last two years involving wrong-sided nerve blocks in our trust, it has been implemented as best practice. The aim of this audit was to assess our compliance with SBYB.
Materials and Methods: Operating Department Practitioners (ODP's) were interviewed retrospectively following 50 different cases to establish whether SBYB had taken place prior to peripheral nerve blockade. Data was also collected on their understanding and ability to correctly define SBYB.
Results: SBYB was carried out in only 37% of cases assessed and incorrectly defined by 40% of ODPs although no wrong-sided blocks were reported. It is clear adherence with SBYB is suboptimal, increasing the risk of further wrong-sided blocks and endangering patient safety.
Conclusions: This highlights a deficiency in the knowledge of the 'stop before you block' patient safety campaign. In recent years, compliance has dramatically improved with the WHO check list, in part due to a change of ethos and culture in the theatre environment. We feel that similar results can be achieved in regional anaesthesia utilizing the 'stop before you block campaign'. We plan to deliver an educational program to anaesthetists and theatre staff and will be re-auditing to assess the efficacy of our intervention.

CLINICAL AUDIT OF READMISSION FOLLOWING UPPER LIMB ORTHOPAEDIC PROCEDURES USING REGIONAL ANAESTHESIA

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Purpose/Objective: The purpose of this clinical audit was to determine the frequency and causes of readmission after day case upper limb orthopaedic surgery performed under regional anaesthesia at Lancashire Teaching Hospital Trust. The objectives of this study were to establish new protocols, based on our findings, to reduce readmission rates.
Materials and Methods: A retrospective audit was performed of patients readmitted to Royal Preston Hospital and Chorley District Hospital accident and emergency department following upper limb orthopaedic surgery with regional anesthesia between 1st October 2011 and 1st October 2012. Patients were identified using Bluespiers and QlikView software. 16 patients out of 336 were identified and a case note review was performed of each patient. Data was inputted and analysed using Microsoft Excel.
Results: There was a readmission rate of 4.8% and with all 16 patients readmitted within one day of the procedure. The commonest presenting complaint causing readmission was pain (75% of patients), followed by swelling (12.5% of patients). There was 1 case each of bleeding (6.25% of patients) and dislocation (6.25% of patients). Only 25% of patients readmitted with pain were prescribed analgesia on initial discharge post-procedure. Of those readmitted with swelling, 50% were advised to elevate their arm in a sling post procedure.
Conclusions: Readmission following upper limb orthopaedic procedures using regional anaesthesia are preventable. Analgesia provided on discharge (paracetamol and dihydrocodeine) would reduce pain associated with cessation of regional anaesthesia 12–24 hours post-procedure. Detailed advice regarding elevation of operated limbs would prevent post-operative swelling causing readmission.

USE OF MODIFIED EPIDURAL INFORMATION CARD FOR IMPROVING INFORMATION FOR OBSTETRIC EPIDURAL IN ANTE-NATAL CLINIC

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Purpose/Objective: our first stage of audit proved that by giving information of procedure and risks to mothers both in ante natal & Labour wards improved their Knowledge but women undergoing induction were having prostin induced Labour pain and two groups MEIC and Non MEIC were separated in time so it was decided to educate mothers who wanted an epidural in Antenatal Clinic with MEIC and test their Information before and after epidural with a Questionnaire and the same questionnaire was to test the knowledge of mothers who got information as per current practice ie family, friends and verbal information.
Materials and Methods: 50 women who received information in antenatal clinic using modified epidural information card (MEIC AC) were inculded after consenting to this study.At the same time a 2nd homogenious group of 50 mothers who got information as per the current practice (Non MEIC AC) were included.All patients received the verbal information before doing the epidural.A pre epidural questionnaire was used to test the knowledge before doing the epidural.on the first postpartum day, the interview aimed to establish what women in both groups had understood when she gave her consent rather what she had discovered afterwards using a post epidural Questionnaire with same 13 questions as pre epidural questionnaire.
Results: In 12 out of 13 questions there was a significant improvement in no of correct answers in Modified epidural information AC group
Conclusions: Modified EIC should be made available to pregnant mothers in GP clinincs, ante natal clinics and ante natal wards for making informed consent legally valid.

COST EFFECTIVENESS OF A CONTINUOUS TAP BLOCK IN OBSTETRICS: A REVIEW OF 49 CASES

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Purpose/Objective: Healthcare expenditures put constraints on medical care delivery. C-section is associated with substantial postoperative pain and discomfort. Effective pain relief may allow for earlier ambulation, improved infant care and reduced postoperative complications reducing the costs of care. The TAP block as part of a multimodal analgesia approach provides pain relief comparable to epidural or Intrathecal techniques, reducing opioid requirements. Review goal was to illustrate the cost effectiveness of a continuous TAP block (cTAP) following Caesarian section.
Materials and Methods: Data were collected on 49 C-Sections performed by single surgeon. Patients received either cTAP with elastomeric pump or epidural infusion or spinal injection. Both groups had IV and oral narcotics as needed for breakthrough pain.
Results: The two groups were equivalent in demographic characteristics. cTAP patients, showed a 38% reduction in the consumption of narcotics, did not use antiemetic or antipruritic agents, were more likely to ambulate day of delivery, foley catheters removed 9 hours earlier and were discharged 1.1 days earlier ($p < 0.001$). Pain was well controlled in both groups throughout hospital stays. This evaluation revealed a $945 cost savings per patient

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receiving a cTAP. Amortized for 400 C-sections this is equivalent to a yearly $360,000 savings for the institution. This evaluation illustrates the ability to discharge patients earlier with a continuous catheter in-situ to accelerate time to discharge.
Conclusions: Capacity management in Labor and Delivery Departments is no easy task. Regional analgesic therapies may accelerate time to discharge and improve a hospital's ability to manage bed space, a critical factor in achieving optimal financial performance.

QUALITY ASSESSMENT OF COMBINED OBSTETRICS AND ANAESTHESIA TEAMS' PRACTICE FOR EMERGENCY CAESAREAN SECTIONS IN A COUNTY HOSPITAL, A RETROSPECTIVE AUDIT

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Purpose/Objective: Anaesthesia related maternal deaths have largely been attributed to the use of general anaesthesia for caesarian section. Two audits conducted in our unit in 2001 and 2005 showed a 49% and 91% rate of regional anaesthesia respectively. The Royal College of Anaesthetists has set standards at an 85% rate of regional anaesthesia and less that 3% conversion rate for emergency caesarian sections. To qualitatively test our current units practice, we retrospectively audited all emergency caesarian sections performed from the 1st of July 2009 to the 31st of May 2010.
Materials and Methods: The number of Emergency caesarian sections, technique of anaesthesia used, decision to delivery interval time and maternal ages were recorded.
Results: 204 cases were included in this audit. The regional anaesthesia rate was 79.9% with a conversion rate of 1.5%. The mean decision to delivery intervals were 14.61 and 29.74 minutes for the category 1 and 2 groups respectively, $p < 0.05$.
Conclusions: The rate of regional anaesthesia for emergency caesarian sections was lower than that recommended by the college. This rate was much lower in category 1 caesarian sections (48.8%), which may prompt the need to review the recommendations and make them category specific.

LOW-DOSE EPIDURAL VS. COMBINED SPINAL-EPIDURAL ANALGESIA IN LABOUR: A RANDOMISED CONTROLLED TRIAL

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Purpose/Objective: To compare the efficacy and safety of combined spinal-epidural (CSE, with the spinal component using low-dose heavy bupivacaine without opioid) with epidural analgesia in labour.
Materials and Methods: Following Ethics Committee approval, 60 consenting adult ASA I-II primigravida with strict inclusion criteria were randomly allocated to two equal groups. The Epidural Group received 10ml of a mixture of 0.1% bupivacaine and 2μg/ml fentanyl, followed by a 6ml first bolus after 10min if needed (not considered as a top-up). In the CSE Group, 0.5% (heavy) bupivacaine 2.5mg was used to produce spinal block (without concomitant use of any opioid). All patients received 8ml/h continuous background infusion, with a provision of patient-controlled top-up bolus of 6ml with a lock-out interval of 12min. The subjects were monitored for pain (VAS), details of top-up, sensory/motor block, haemodynamics, progress of labour, mode of delivery, foetal and neonatal monitoring, maternal satisfaction, and any adverse effects. Primary outcome was total drug consumption during labour (ml/h).
Results: Mean total drug consumption during labour was significantly less in the CSE group (9.69 ml/h) than in Epidural group (13.52 ml/h; $P < 0.001$). CSE also led to significantly faster onset of analgesia and sensory block. There was no significant difference between the two groups with regard to all other variables as mentioned above.
Conclusions: CSE with the spinal component using low-dose heavy bupivacaine without opioid required less drug consumption, and produced faster onset of pain control and sensory block than low-dose epidural analgesia. There were no other significant inter-group differences regarding efficacy, safety and satisfaction.

SPINAL ANESTHESIA FOR LASER THERAPY OF TWIN-TO-TWIN TRANSFUSION SYNDROME AND TWIN REVERSE ARTERIAL PERFUSION SEQUENCE

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Purpose/Objective: Fetoscopic laser therapy is the only treatment of twin-to-twin transfusion syndrome and twin reverse perfusion sequence, which attempts to rectify the source of the diseases – altered blood flow in multiple monochorionic, diamniotic gestation. The vascular anastomoses between fetuses are coagulated with laser and normal blood flow through placenta is restored. Our objective is to determine, that spinal anesthesia combined with conscious sedation provides optimal pain relief during such procedures.
Materials and Methods: Eight charts of parturients (ASA I,II) with TTTS or TRAPS qualified for fetoscopic laser therapy between April 2011 and May 2013 were retrospectively reviewed. All procedures were conducted under low volume, high concentration spinal anesthesia (9 -11mg of Bupivacaine SH + 25ug fentanyl). Continuous infusion of propofol (average 0,085 mg/kg/min) was administered intravenously to provide good surgical conditions and to ensure comfort of patients and fetuses during operation. In one case 0,1mg fentanyl and 2mg of midazolam was used for sedation.
Results: The intrauterine managements were performed successfully in all cases. The level of spinal blockade reached Th4-Th6. Mean drop of blood pressure was about 20%, some patients required small doses of efedryne. During the operations parturients received 1000 -1500ml of fluids. Due to regional anesthesia the patient was free from pain and due to sedation fetal responses to surgical stimuli were suppressed. None of the patients required intubation. We did not notice postoperative pulmonary edema.
Conclusions: Spinal anesthesia combined with conscious sedation provides stable analgesia and anesthesia during endoscopic laser ablation.

A REPEAT AUDIT CYCLE OF RESPONSE TIMES FOR OBSTETRIC EPIDURAL ANALGESIA USING DATA FROM CONTEMPORANEOUS ELECTRONIC RECORDS

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Purpose/Objective: AAGBI/OAA guidelines state that the interval between being informed of an epidural request and attending to the mother 'should not normally exceed 30 minutes, and must be within one hour except in exceptional circumstances.' Previous audits showed poor compliance with this standard; attendance within 30 minutes and an hour were 67% and 77% respectively in May 2011. The purpose of this re-audit was primarily to assess whether better availability of a second anaesthetist (from a neighbouring hospital) has resulted in an improvement in response times.
Materials and Methods: Data was collected from 208 electronic patient records relating to epidurals sited over a period of ten weeks of which 150 were outside of normal working hours. The following times were recorded: epidural requested, first attendance by anaesthetist and any reasons stated for significant delay.
Results: The interval between request and attendance was within 30 minutes in 100/208 (48%) and within 60 minutes in 161/208 (77%) of patients. The results for attendance within 30 minutes and 60 minutes were 34/58 (58%) and 53/58 (91%) respectively within normal working hours and 65/150 (43%) and 108/150 (72%) respectively outside normal working hours. The commonest reason for a significant delay was the on-call anaesthetist being busy in theatre.
Conclusions: This audit showed that compliance with the AAGBI/OAA standard has worsened as compared with the previous audit. Our recommendations include reorganisation of equipment, increased assistance for the on call anaesthetist and continuous re-audit. These results provide supporting evidence for the provision of a second on-site anaesthetist outside normal hours.

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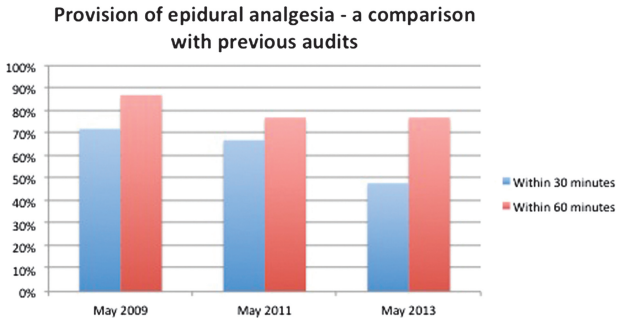

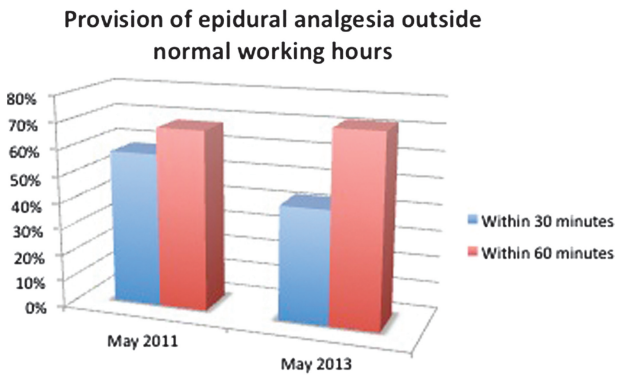

PARAVERTEBRAL PHLEGMON IN CAESAREAN SECTION UNDER EPIDURAL ANESTHESIA

M. Zarif[1]. [1]*Department of Anesthesiology, University Hospital of Coimbra, Coimbra, Portugal.*

Purpose/Objective: The paravertebral phlegmon is an infrequent complication that can have dramatic consequences. The main objective of this case was to discuss the importance of prevention, early diagnosis and directed treatment of this entity.

Materials and Methods: A 32-year-old woman, 38 weeks of pregnancy submitted to urgent caesarean section under lumbar epidural anesthesia. Puncture and placement of the epidural catheter (EC) were atraumatic and aseptic. 24 hours later she started to refer lumbar back pain. After 48 hours, the EC was removed and inflammatory signals were detected at the puncture site. Topic antibiotherapy was prescribed. After 72 hours progressive clinical deterioration was observed with clinical signs of back pain, severe frontal headache, neck flexion, fever, swelling and purulent secretion at the insertion site of the EC. Increase of the inflammatory parameters was demonstrated. The MRI revealed soft tissue phlegmon on the left paraspinal region of L1-L4. Intravenous antibiotherapy was initiated.

Results: The phlegmon was surgically drained. The presence of staphylococcus aureus was confirmed. Gradual improvement occurred and 1 month after only slight back pain was refered.

Conclusions: During the technique were advocated all measures of asepsis which makes it more likely that this complication is due to inadequate aseptic conditions during hospitalization. This aspect serves to highlight the importance of the postoperative management of these devices. The differential diagnosis should be early and treatment should consist of an urgent percutaneous drainage and prolonged antibiotherapy

ARRHYTHMOGENIC RIGHT VENTRICULAR DYSPLASIA IN PREGNANT WOMAN SUBMITTED TO CESAREAN SECTION

M. Zarif[1]. [1]*Department of Anesthesiology, University Hospital of Coimbra, Coimbra, Portugal.*

Purpose/Objective: Arrhythmogenic Right Ventricular Dysplasia (ARVD) is characterized by fibrofatty replacement of the right ventricular myocardium, ultimately causing failure and malignant arrhythmias. The aim is to highlight the importance of knowledge of this disease and its anesthetic implications.

Materials and Methods: Pregnant of 37 weeks, 33 years, ASA III, proposed for elective cesarean section. History of ARVD, mitral valve prolapse, hyperthyroidism and gestational diabetes. Treated with Sotalol. Family history of sudden cardiac death. After administration of midazolam, lumbar epidural anesthesia was realized (L4-L5 level).

Results: During surgery there was a period of self-limiting supraventricular tachycardia maintained for 20 seconds without hemodynamic instability. The postoperative period was uneventful.

Conclusions: ARVD must be face as a propensity to arrhythmias and emergency means should be available and accessible. Should be performed anxiolysis because acute emotional stress can trigger arrhythmias. Beta blockers should be kept in the perioperative period, even in the surgery morning. Despite the absence of specific recommendations on the use or prevention of any anesthetic drug or technique in ARVD, the choice should be based primarily on the degree of cardiac dysfunction. For these reasons it was considered one the epidural technique is safe and suitable in this case.

A SURVEY OF PATIENT REPORTED COMPLAINTS IN DAY CASE THEATRES OVER ONE YEAR

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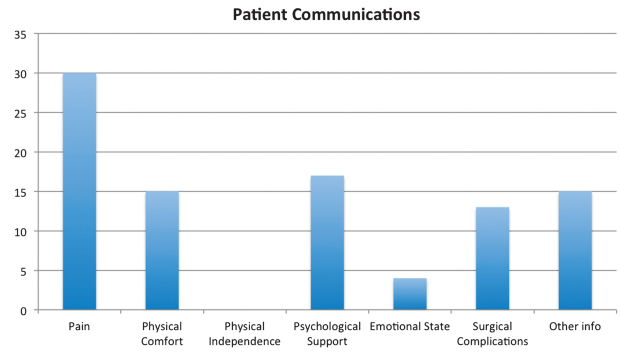
Purpose/Objective: To evaluate patient reported problems following all day case anaesthetics over the period of one year, to improve the service of our day case theatres.

Materials and Methods: Patients on discharge were given a phone number to contact if they had any questions or concerns. Nursing staff would answer the calls, and log each patient communication into a designated book. This was reviewed after one year.

Results: From March 2012 to March 2013, 5124 operations were performed in day case theatres. 94 patients (1.8%) called the information number with their queries. Due to the large variety of calls, they were grouped into problems concerning: pain, physical comfort, physical independence, psychological support, emotional state, surgical complications and other information. The absolute number and type of patient communications are shown in the graph.

Conclusions: The majority of the calls were due to inadequate analgesia (31.9%), and patient discomfort (16%). The rest included anxious patients requiring reassurance, oozing wounds, and information needed for removal of urethral catheters. Following this, day case theatre staff were encouraged to give all patients post-operative pain information leaflets, and encourage patients to take regular oral analgesia, even if still numb from a nerve block. Surgical teams were informed of the results, and the urology teams will create a patient information leaflet for urology catheter issues. The patient communications over the coming year will be collected to see if there's any reduction in patient contact rates.



ASSESSING QUALITY OF RECOVERY AFTER DAY-CASE ANAESTHESIA USING THE QOR VALIDATED QUESTIONNAIRE; A METHODOLOGY

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Purpose/Objective: Quality of recovery after anaesthesia is an important measure of the early postoperative health status of patients. Most studies evaluating recovery after anaesthesia have focused primarily on physiological endpoints, recovery times and the incidence of major morbidity and

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mortality. We would like to concentrate on quality of recovery from a patient's perspective. This would help us evaluate the quality of our day-case anaesthesia service, and specifically if regional anaesthesia improves quality of recovery.

Materials and Methods: The Quality of Recovery 15 questionnaire (QoR-15)[1] is a validated, reliable and efficient evaluation of postoperative recovery. It assesses physical and mental well-being, focusing on pain, physical comfort, physical independence, psychological support and emotional state. It can be completed in less than two minutes, and can be used over the telephone.

Results: Using this tool, we are assessing adult surgical patients after their anaesthesia in orthopaedic day-case theatres. The questionnaire is administered to patients pre-operatively, and by telephone at 24h, 48h and seven days postoperatively, by research nurses.

Conclusions: The study has been running for one month, obtaining data from 93 patients. It will run for 6 months, aiming to obtain >500 patient data sets. Quality of recovery between general and regional anaesthesia will be compared.

1. The QoR-15; Development and Psychometric Evaluation of a Postoperative Quality of Recovery Score. PA Stark, PS Myles et al; Anesthesiology 2013; 118:00–00

CONTINUOUS TAP CATHETERS FOR OUTPATIENT USE FOLLOWING HYSTERECTOMY, A COMPARATIVE CHART REVIEW

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Purpose/Objective: To compare the efficacy of continuous TAP infusions to institutional standard of care in alleviating postoperative pain following gynecologic procedures.

Materials and Methods: Data were collected in a retrospective manner on 41 women who underwent hysterectomy performed by a single surgeon. Patients receiving the ONQ PainBuster continuous Transversus Abdominus Plane Block (cTAP) plus IV and oral narcotics and Toradol for breakthrough pain. Patients in the Control group received IV and oral narcotics and NSAIDs as needed for breakthrough pain Three (3) patients in the Control group received an epidural infusion and 4 had a single injection TAP block prior to surgery.

Results: Overall the patients receiving post-operative pain management with ONQ showed an 81% reduction in the total consumption of narcotic analgesic agents. In the ONQ cTAP group, one patient required the use of an antiemetic agent. In the control group antiemetic use was reported in 45% of patients. Patients in the control group were 11.4 times more likely to experience postoperative nausea vomiting (PONV) than those receiving the ONQ. Foley catheters were removed on average 12 hours earlier in the ONQ cTAP group.

As an additional benefit all 17 cTAP patients were sent home with the continuous infusion thus allowing additional time without the need for supplemental narcotics once discharged.

Conclusions: This evaluation highlights the use of a continuous TAP block in offering superior postoperative pain management and potential to accelerate time to discharge.

COMPARISON OF THE EFFECT OF TRANSVERSUS ABDOMINIS PLANE BLOCK OR CONVENTIONAL ANALGESIA ON PAIN SCORES, PATIENT SATISFACTION AND CHRONIC PELVIC PAIN AFTER TOTAL ABDOMINAL HYSTERECTOMY

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Purpose/Objective: This study aims to assess the effect of TAP block on pain scores, patient satisfaction & the incidence of chronic pelvic pain in patients undergoing Total Abdominal Hysterectomy (TAH).

Materials and Methods: Following ethical approval, 30 patients were recruited in this single centre, double blind trial. Patients were randomised to receive either TAPB (landmark technique) with 1mg/kg 0.375% levobupivacaine or 'sham' subcutaneous injection. All patients received a standard analgesia regimen (morphine 0.1 mg/kg intraoperatively & PCA morphine postoperatively). Postoperative pain scores were assessed at 1, 4, 24 and 48 hours. Patient satisfaction was assessed with the QoR-40 questionnaire at 48 hours and incidence of chronic pain at 12 weeks using the short form McGill MPQ.

Results: 29 patients completed the study with no significant differences between groups in either age or weight or mean intraoperative dose of morphine (7.7 vs 7.6 mg).

There was no significant difference in pain scores between the two groups at anytime in the postoperative period (Table 2).

(Data are Mean (SD) or number of times additional analgesia required.)

Overall patient satisfaction was high with patients with mean satisfaction scores of 82% (TAPB) compared with 86% (PCA) (p=0.25). There was no significant difference between MPQ scores between the two groups (p=0.68), however 26% patients had an incidence of chronic postoperative pain.

Conclusions: This study further demonstrates the unclear position of TAPB in postoperative pain management despite previously encouraging studies.

TABLE 1. Demographic Data of patients undergoing TAH randomised to receive either TAP or sham block

	TAPB + PCA (n=16)	PCA Only (n=13)
Age (years)	46 (7.13)	45 (7.22)
Weight (kg)	77.2 (16.80)	75.6 (13.46)
ASA (I/II)	3/13	6/7

TABLE 2. Postoperative VAS pain scores and morphine consumption in both groups

Time Post Procedure	4 Hours			24 Hours			48 Hours		
	TAPB + PCA	PCA Only	p value	TAPB + PCA	PCA Only	p value	TAPB + PCA	PCA Only	p value
VAS (Rest)	5.6 (1.71)	5.0 (2.54)	0.51	4.4 (2.55)	4.3 (2.63)	0.92	3.1 (1.64)	2.7 (1.65)	0.59
VAS (Movement)	7.2 (2.05)	6.8 (2.27)	0.61	7.0 (1.86)	6.9 (1.73)	0.86	5.3 (2.28)	6.15 (1.70)	0.28
Cumulative PCA Morphine Consumption (mg)	15.9 (8.78)	15.9 (6.42)	0.99	50.9 (21.52)	44.2 (15.74)	0.36	65.4 (26.24)	72.5 (39.84)	0.57
Additional analgesia required (No.)	0	1	-	3	2	-	5	10	-

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CLINICAL EFFECTIVENESS OF PERCUTANEOUS ADHESIOLYSIS VERSUS TRANSFORAMINAL EPIDURAL STEROID INJECTION IN PATIENTS WITH POST LUMBAR SURGERY SYNDROME

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Purpose/Objective: A number of patients of post lumbar surgery syndrome (PLSS) don't experience satisfactory results after epidural injection, because of perineural or epidural adhesions which is main cause of PLSS, prevents spread of the injectate into the epidural space. Percutaneous adhesiolysis (PA) has the ability to eliminate the deleterious effects of such adhesions. This study was to evaluate the effectiveness of PA versus transforaminal epidural steroid injection (TFESI) for treating patients with PLSS and to compare the clinical efficacy of PA according to the type of surgery.

Materials and Methods: Ninety seven patients were included who underwent PA or TFESI for chronic pain of at least 3 months' duration after lumbar surgery at least 6 months before. We compared the Numeric Rating Scales for back pain (NRS back) and leg pain (NRS leg) and the Oswestry Disability Index (ODI) before surgery and 2 weeks and 3 months after surgery between two groups. Then, we divided the PA group into decompression and fusion surgery subgroups and compared the clinical scores between them.

Results: The proportion of successful results was higher for PA group than for TFESI group according to 3-months posttreatment NRS leg and ODI. Within PA group, the proportion of successful results was significantly higher in decompression subgroup than in fusion subgroup according to 3-month posttreatment NRS leg and 2-week posttreatment ODI.

Conclusions: PA was more effective than TFESI in treating patients with PLSS and also showed better clinical efficacy in decompression subgroup than in fusion subgroup.

LUMBAR PLEXUS BLOCK AND HIP SURGERY

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Purpose/Objective: The lumbar plexus block (LPB) is a useful technique for hip surgery. In this study we intended to do a thorough review on the efficacy and complications of this technique in our Department, during the year 2011.

Materials and Methods: We collected the data of all 70 patients that were submited to LPB during the year 2011. All the blocks were executed under ultrasound and electrostimulation technique. Parameters related to the patient and side effects were recorded. Interventions needed were also noticed.

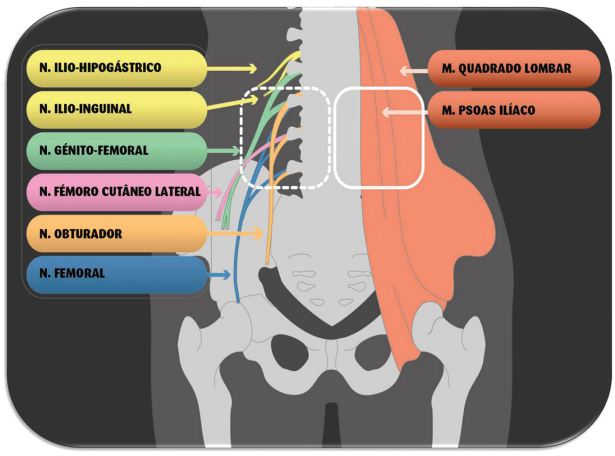

FIGURE.

Results: In 86% of patients the degree of pain according to the numerical scale was 0, either at rest or in motion. In the remaining cases the pain score decreased to 0 after top-up with a bolus of local anesthetic via perineural catheter. No side effects were determined, except sensory block grade 2 in 15% of the cases. The perineural catheter utilization and monitoring in the Acute Pain Unit stood between 48 and 96h. There were no complications recorded, neither the need for technique or analgesic protocol modification.

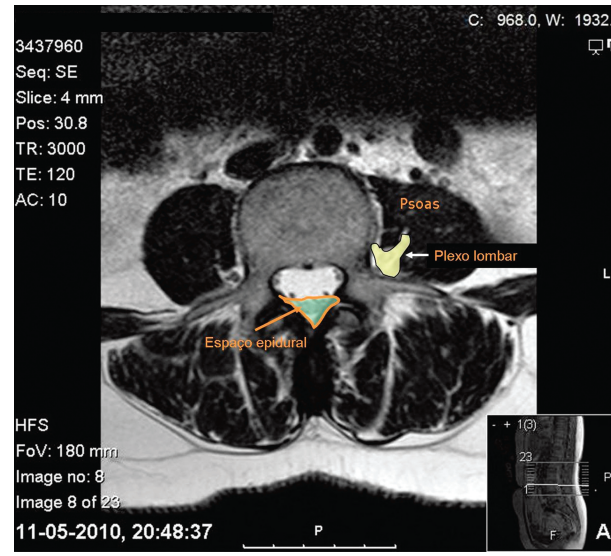

FIGURE.

Conclusions: The LPB has a high degree of patient satisfaction, allowing good perioperative analgesia and positive influence on the surgical outcome. It has a low incidence of side effects and complications and is an effective alternative in patients where neuraxial blocks are not suitable. The recent use of ultrasound in this type of blocks has increased its efficacy and safety.

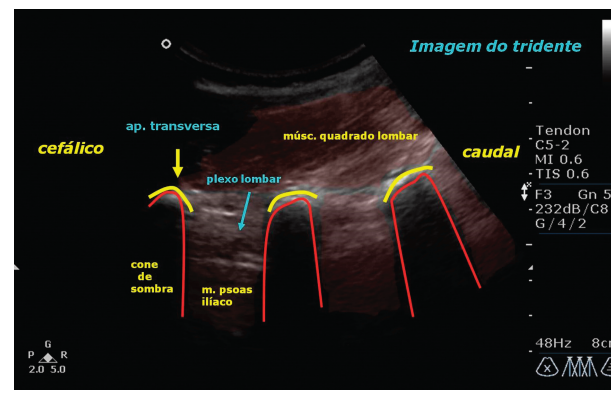

FIGURE.

HIGH DOSE/VOLUME SUBARACHNOID ISOBARIC 0.5% BUPIVACAINE INJECTION IN DOGS

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Purpose/Objective: This study aimed to evaluate the hemodynamic and other possible side effects of 0.5% high volume intratechal bupivacaine in dogs undergoing ovary-hysterectomy.

Materials and Methods: Ten dogs were randomly assigned to receive 1.5 mg kg^{-1} preservative free 0.5% isobaric bupivacaine (group I) and ten dogs received 0.3ml kg^{-1} distilled water and 5 g kg^{-1} intravenous fentanyl immediately before surgery begun (group II).Intrathecal injections were performed at the L6-L7 or L5-L6 vertebral spaces. Drugs were inject at a rate of 15 seconds ml^{-1}. Before subarachnoid injections, CSF and injectate density were recorded. Hemodynamic monitoring was performed throughout the procedure.

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Results: Group II presented bradycardia after fentanyl injection (7/10). Time to perform intrathecal injections were 127 ± 95,69 seconds. One dog had CSF density of 1008 g/L and the other 19 dogs presented CSF density of 1006,2 ± 0,63 g/L. Density solutions were 1006 for 0.5% bupivacaine and 1000 for distilled water. All dogs in group I showed absence of patellar reflex immediately after subarachnoid bupivacaine injection. None of the animals in group II presented motor blockade. Duration of motor blockade in group I was 181,00 ± 40,40 minutes. No other relevant clinical complication or side effects were observed after high dose/volume intrathecal bupivacaine injection during or immediately after surgery, and 1, 7, 14, and 30 days post injection.
Conclusions: The intrathecal administration of 1.5 mg kg^{-1} preservative free 0.5% isobaric bupivacaine does not produce acute or long term neurotoxicity in dogs.

ESRA-0693 Chronic Pain Management
CLINICAL CHARACTERIZATION OF FIBROMYALGIC PATIENTS ATTENDING A CHRONIC PAIN UNIT(CPU) IN COIMBRA HOSPITAL AND UNIVERSITY CENTER - A RETROSPECTIVE STUDY

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Purpose/Objective: Fibromyalgia(FM) is a chronic illness that presents with widespread musculoskeletal pain and higher pain perception in specific anatomic sites-tender points(1). It is frequently associated with a constellation of symptoms, including fatigue, sleep difficulties, anxiety and depression(2). This research aims to describe socio-demographic and clinical characteristics of fibromyalgic patients in a CPU.
Materials and Methods: We included patients admitted to our Unit between January 2001 and December 2012. This is a retrospective descriptive analysis based on demographic and clinical characteristics recorded from clinical process and phone contact. The patients were evaluated with VAS and HADS questionnaires. Data were analyzed using SPSS20.0® to execute descriptive statistics. Consent was approved by the Ethics Committee.
Results: Sixty patients were recruited(n=60), 55(91.7%) were women, mean age was 56±10years. Most patients reported moderate to severe pain in the first observation; 46(79.3%) had a VAS score≥6, the cut-off for pain of disabling intensity. Other socio-demographic and clinical characteristics are showed in tables below.

		Antidepressant therapy N (%)				Anxiolytic therapy N (%)	
		Yes	No			Yes	No
Depression levels	<9	3 (14,3)	8 (30,8)	Anxiety levels	<9	6 (17,1)	1 (7,7)
	≥9	18 (85,7)	18 (69,2)		≥9	29 (82,9)	12 (92,3)
Fisher's test p=0,300				Fisher's test p=0,656			

Conclusions: Baseline socio-demographic and clinical characteristics of this group were comparable to european literature about FM. Our results suggest that FM is strongly associated with stressful life event, generalized pain of moderate to severe intensity, anxiety/depressive disorders and psychiatric history.

References:

(1)AmJMed.(2009)122(12 Suppl):S14-21, (2)PainResTreat.(2012) ID426130

PREVALENCE OF ANXIETY AND DEPRESSION IN FIBROMYALGIC PATIENTS: RELATION WITH ANTIDEPRESSANT AND ANXIOLYTIC THERAPY - A PROSPECTIVE STUDY

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Purpose/Objective: Fibromyalgia(FM) is a chronic illness that presents with widespread musculoskeletal pain and fatigue(1,2) frequently associated with anxiety and depressed mood.

This study aims to evaluate and correlate anxiety and depression levels, with the use of anxiolytic/antidepressant therapy respectively, in FM patients in a Chronic Pain Unit.
Materials and Methods: We included patients with FM attending our Unit for at least 1year. This is a prospective study of antidepressant and anxiolytic therapy and it's correlation with the results of HADS questionnaire. Numerical data were analyzed using Fisher's test. Consent was approved by the Ethics Committee.
Results: Sixty patients were recruited, and 47 filled out a HADS questionnaire. Twenty seven patients had a previous diagnosis of depression of which, 6 with postpartum depression. There was a slight prevalence of anxiety levels (N=41-83,7%) over depression(N=37-77,1%). The correlation between FM patients' therapy and depression/anxiety are shown in the table.

		Antidepressant therapy N (%)				Anxiolytic therapy N (%)	
		Yes	No			Yes	No
Depression levels	<9	3 (14,3)	8 (30,8)	Anxiety levels	<9	6 (17,1)	1 (7,7)
	≥9	18 (85,7)	18 (69,2)		≥9	29 (82,9)	12 (92,3)
Fisher's test p=0,300				Fisher's test p=0,656			

Conclusions: There isn't a statistical significant correlation (p>0,05) between antidepressant/anxiolytic therapy and depression/anxiety levels. Despite the treatment these patients maintain high levels of depression and anxiety which is consistent with FM characteristics. A possible explanation for our results is the high number of patients with a previous diagnosis of long course major depression, nevertheless our sample is too small to draw conclusions.

References:

(1)AmJMed.(2009)122(12 Suppl):S14-21, (2)PainResTreat.(2012)ID426130

CHRONIC POST-SURGICAL PAIN: WHAT HAS CHANGED BETWEEN 3 AND 9 MONTHS AFTER SURGERY?

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Purpose/Objective: Chronic Post-Surgical Pain (CPSP) develops after surgery, has at least 2 months of duration, excluding other causes of pain. Our study aimed to evaluate the incidence of CPSP 3 months after surgery and the pain status and treatment 9 months after surgery.
Materials and Methods: After approval from ethics committee, a prospective study was conducted in patients scheduled for elective surgery during 15 days in 2012. Exclusion criteria: inability to give informed consent, cognitive impairment, pain prior to surgery. Assessments were performed preoperatively (T0), 3 months after surgery (T1) for all participants, 9 months after surgery (T2) for those with CPSP at T1. If patients had any pain that they could relate to the surgical procedure at T1 and T2, and there weren't other causes of pain, they were considered CPSP cases, would answer to Brief Pain Inventory (BPI), and asked about their current treatment and referral. Parametric tests were performed for comparisons ($p<0.05$).
Results: From 66 patients, 11 had CPSP at T1 (17%). Two couldn't be contacted at T2. From the remaining nine, two didn't present CPSP at T2. In both, the pain resolved spontaneously without medication. The remaining seven still presented CPSP. None of them were referenced to a Pain Specialist.
Conclusions: The majority of patients with CPSP at T1 remained with CPSP at T2. We failed to show differences in BPI scores between T1 and T2, probably due to the sample size. Our study suggests a lack of adequate treatment and no referral to Pain Specialists.

EFFECT OF RELATIVE INJECTATE PRESSURES ON THE EFFICACY OF LUMBAR TRANSFORAMINAL EPIDURAL STEROID INJECTION IN PATIENTS WITH LUMBAR FORAMINAL STENOSIS

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Purpose/Objective: Lumbar transforaminal epidural steroid injections (TFESIs) are procedures often utilized in the treatment of lumbar foraminal stenosis. To assess the relationship between relative injectate pressure of contrast injected into the epidural space from lumbar transforaminal epidural steroid injections (TFESIs) and short-term pain reduction.
Materials and Methods: Forty patients underwent single-level lumbar TFESI for unilateral lumbar radicular pain attributed to foraminal stenosis. The relative injectate pressure was measured. The effect of relative injectate

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pressure and TFESIs on change in the Roland 5-point pain score from before the procedure to 2 weeks after treatment was examined.
Results: After the TFESIs, the patients, regardless of pressure, did obtain pain relief. The mean relative injectate pressure was 13.0 cmH_20. The pressures in patients who experienced improvement and those who did not experience improvement patients were 12.9 cmH_20 and 13.2 cmH_20, respectively. There was no statistically significant correlation between pain relief and injectate pressure
Conclusions: The gradient of relative injectate pressure did not affect the immediate outcomes of TFESI.

TEACHING TENS - IMPROVING THE PATIENT EXPERIENCE

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Purpose/Objective: Transcutaneous electrical nerve stimulation (TENS) is used for the treatment of chronic pain. Patients attend an individual session during which they are taught the theory and practical aspects of TENS. Sessions take 30 minutes and occur once weekly in clinic during which a maximum of 5 patients are seen leading to waiting times of up to 2 months. This leads to patient dissatisfaction.

A group teaching session was proposed in an attempt to reduce waiting list times.
Materials and Methods: A 90 minute pilot group session was undertaken. Each of the 8 participants was given a TENS machine and information leaflet. The first 30 minutes was an explanation of the theories behind TENS and it's safe use. Next there was a practical demonstration during which participants attached the TENS machine to their forearms and trialled different settings. The staff then went around the group to individually teach participants where best to place the pads for their pain and to answer questions.
Results: The Group were all were 'Very Satisfied' with the explanation they received about how the TENS machine worked. The group rated the session overall as 'Excellent'.
Conclusions: We have found a more effective way of teaching patients regarding TENS therapy.

By running two group sessions in one morning the capacity of patients that can be seen has increased by 400% resulting in reduced waiting times and increased patient satisfaction. As fewer sessions will be required, there will be financial savings for the department.

PREVALENCE OF ANXIETY AMONG FIBROMIALGIC PATIENTS (FP)

L. Pereira[1], S. Castanheira Marques[1], P. Garrido[2], A. Valentim[1] *[1]Anaesthesiology, Centro Hospitalar e Universitário de Coimbra, Coimbra, Portugal, [2]Psychiatry, Centro Hospitalar e Universitário de Coimbra, Coimbra, Portugal.*
Purpose/Objective: HADS is a questionnaire widely used to evaluate anxiety and depression and is a useful tool in patients with chronic diseases[1]. The aim of this study is to measure Anxiety and Depression scores in a FP population.
Materials and Methods: Clinical reports of FP admitted between January 2001 and December 2012 in a Chronic Pain Unit(CPU) were reviewed and HADS recorded. Consent was approved by the Ethics Committee of our hospital. Numerical data are presented as mean and standard deviation and were analyzed using the Pearson´s correlation coefficient(PCC).
Results: Fifty-seven FP were admitted at our CPU. Eight were excluded for missing values. The HADS anxiety mean value was 14(SD±5), with a minimum value of 3 and maximum of 21. The HADS depression mean value was 12(SD±4), minimum 0, maximum 18. The PCC between the anxiety and depression scales was 0.41. Applying the cut-off values proposed by Snaith and Zigmond[2], 77.1% showed *possibly* relevant levels of depression and 83.7% of anxiety. The total percentage of patients with high score(15-21) for anxiety was 46.9%.
Conclusions: The mean anxiety score was higher than observed in other studies[3](14Vs12.11), with a large percentage of patients showing high scores. Although the PCC demonstrated a moderate intercorrelation, the value was lower than reported in previous studies[4](0.49-0.63). These FP showed a large component of anxiety, which could be explained by the long term psychiatric disorders and chronicity of Fibromyalgia.

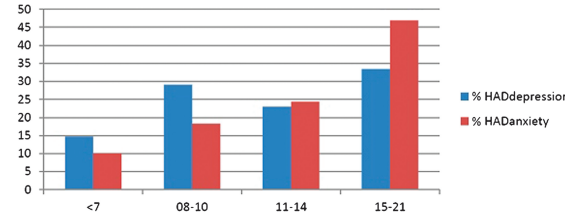

FIGURE.

DRUGS ASSOCIATED TO OPIOIDS IN CANCER PAIN CONTROL

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Purpose/Objective: To study the drugs associated to opiods administered in cancer pain control.
Materials and Methods: Our retrospective study included 40 oncological patients with mean age of 69±14.12 under palliative care.
Results: Morphine 0,05 mg/kg/day was given to 70% of the patients while methadone 0.20mg/kg/day, tramadol 7.40mg/kg/day, meperidine 0.64mg/kg/day and fentanyl 0.007mg/kg/day were administered to 16,6% of the patients.

Non steroidal antiinflamatory/Analgesic such as dipyrone 3.70 mg/kg/day (90%) and tenoxican 0.79mg/kg/day or ketoprofen 2,7 mg/kg/day (10%) were identified in opiods association in these patients.

Benzodiazepine such as clonazepam 0.671mg/kg/day, midazolam 0.139mg/kg/day, alprazolam 0.006mg/kg/day, lorazepam 0.012mg/kg/day, bromazepam 0,092 mg/kg/day and diazepam 0.131mg/kg/day were associated to 53,3% of the patients.

Neuroleptics (haloperidol 0,0627mg/kg/day ,chlorpromazine ,135mg/kg/day, levopromazine 0,653mg/kg/day, quetiapine 0,68mg/kg/day)rpromazine, lide to opiods in 68,1% re given to 16,6%. were associated to opiods in 68,1% of the patients.
Conclusions: Benzodiazepines are associated to opiods in cronic pain control in order to reduce the dosage of opiod.

Antiplatelet side effect related to dypirone should be considered in these patients.

Although neuroleptics are central nervous system depressants, extrapyramidal side effects such as akathisia should be evaluated when this group of drug is associated to opiods in cancer pain control.

A CASE OF POSTHERPETIC NEURALGIA, CERVICAL MYELITIS, AND CEREBRAL VASCULOPATHY CAUSED BY VARICELLA ZOSTER VIRUS IN PREVIOUSLY HEALTHY NINE-YEAR-OLD CHILD

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Purpose/Objective: Varicella Zoster virus (VZV) is a neurotropic herpes virus that infects nearly all age of people. Here we report a case of postherpetic neuralgia in a healthy child.
Case: A previously healthy nine-year old boy presented to our hospital with 1-month history of pain and itching sensation over his posterior neck and occipital area. He had developed painful pruritic vesicles 5 months before. While the skin rash had seemed to be healed, he developed severe pain and itching sensation. He was found to become irritable, anxious and finally depressed. His mother recalled that he had suffered from varicella before 1 year of age. On physical examination, he was shown to have hyperesthesia with multiple crusts and scars in the distribution of the C2-C4 dermatomes. The serum VZV IgM revealed equivocally positive and VZV IgG was positive. Brain MRI revealed increased signal intensity along grey matter of superior

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frontal, middle frontal and singulated gyrus on T2 weighted images. Under the diagnosis of postherpetic neuralgia, and cervical myelitis, he was treated with intravenous acyclovir (30mg/kg) and gabapentin for pain control for 3 weeks His symptoms were all resolved within the 3 weeks. Without any neurologic impairment, the patient has been well for 1 year.

Results: We experience serious complications of VZV reactivation in an immunocompetent child.

Conclusions: However, serious complications of VZV involving central nervous system can contribute to chronic pain and lifelong impairment even though it is very rare in immunocompetent hosts. Physician should also be aware of these rare complications in the pediatric populations without immunologic abnormalities.

EFFECT OF PULSED-RADIOFREQUENCY TREATMENT AT TYPE 1 NEUROFIBROMATOSIS PATIENT

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Purpose/Objective: Neurofibromatosis is autosomal dominant trait disease which characterized as light-brown skin lesions with subcutaneous, intramuscular, or intracranial involvement. Severe pain sensation is frequently accompanied, and surgical resection is often performed. However, surgical resection has reported with high recurrence rate. Here we report a case of Pulsed-Radiofrequency Treatment with Ultrasound at Neurofibromatosis.

Materials and Methods: 29 year-old male with type 1 neurofibromatosis was referred to our pain center due to right flank pain. His pain intensity was 8/10. 1x1cm2 neuroma-like structure was found on his abdominal ultrasound. Diagnostic block was performed with 1ml of 0.125% Chirocaine 1 ml, and 5 mg of triamcinolone acetonide. His symptom was improved for 1 weed with VAS score of 3/10. Therefore, pulsed radiofrequency was performed under ultrasound guidance. After 50Hz, 0.5V of sensory stimulation, pulsed radiofrequency with 42°C heat was performed 3 times for 120 seconds.

Results: The patient discharged our pain center with the VAS score of 1/10 without recurrence of pain.

Conclusions: The surgical resection of neurofibromatosis has not only technical limitations of approach due to multiple lesions, but also high recurrence rate. Pulsed radiofrequency should be considered as long term treatment of neurofibromatosis in terms of multiple performance and financial benefit.

EPIDURAL ANALGESIA IN A PATIENT WITH PARTIAL SACRAL AGENESIS DURING CHILDBIRTH: A CASE REPORT

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Purpose/Objective: Sacral agenesis is a rare congenital malformation within the Caudal Regression Syndrome (CRS) which varies from isolated and asymptomatic coccygeal aplasia to sacral, lumbar and thoracic vertebrae with severe neurological dysfunctions.

Materials and Methods: We report a 41-year-old pregnant patient with asymptomatic partial sacral agenesis (PSA).

Lumbosacral MRI showed PSA with L5 sacralisation, lowering L3-L4 to the L4-L5 level. Spinal cord ended at L1. The distance between the skin surface and the epidural space (ES) was 9cm.

She was admitted in the 41+5th week. Epidural analgesia (EA) was placed in sitting position. The ES was found at 6cm and entered using an 18-gauge Tuohy needle with loss of resistance at the L3-L4 interspace in a midline approach. After negative aspiration for blood and CSF, a 20-gauge multiorifice epidural catheter was advanced. A test dose of 3ml of lidocain 2% with epinephrine was followed by a loading dose of 7ml continued by epidural infusion at 10ml/h until delivery of levobupivacain 0,125 %.

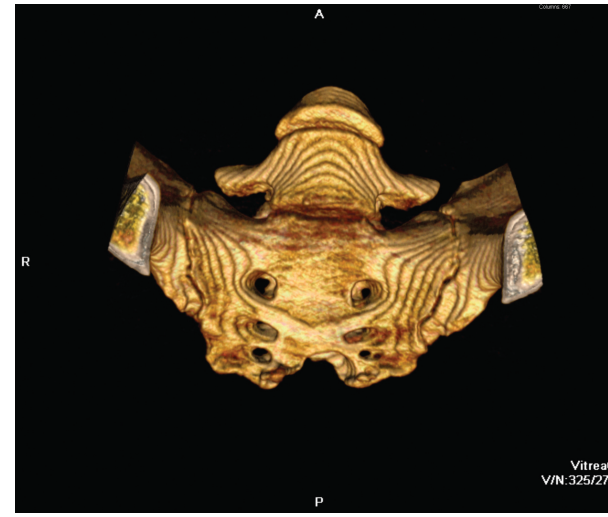

FIGURE.

FIGURE.

Results: No adverse effects or technical difficulties observed. After delivery, she presented headache, pallor, dizziness and heart palpitations. Haemoglobin dropped 4g/dL. No nausea or vomits were present. MRI discarded postdural puncture headache. Conservative treatment was administered.

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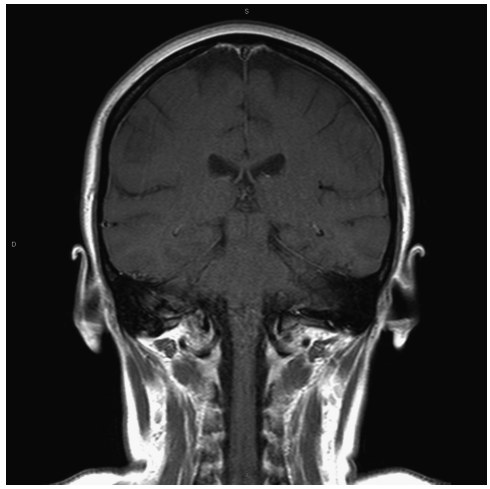

FIGURE.

Oral iron was continued.

Conclusions: CRS presents with a scarce frequency and is diagnosed during the intrauterine period or early childhood. This case of an asymptomatic pregnant woman, recently diagnosed of CRS, is worth noting given the few related references in literature and considering the possibility of using, managing, and applying average procedures during labour.

SUBDURAL ANALGESIA - IS THERE A ROLE FOR THIS KIND OF ANALGESIA?

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Purpose/Objective: Unintentional subdural placement catheter may complicate up to 1% of epidural blocks.

Materials and Methods: We performed a thoracic epidural block for analgesia after traumatic multiple rib fractures. Epidural space was identified by loss of resistance to air technique and a multi-orifice epidural catheter was introduced at T4-5 interspace. A test dose was given after negative aspiration and it was negative.

An infusion of ropivacaine 0,2% at 5ml/h was started, and twenty minutes after, the patient complained of decreased sensibility of the lower body, tongue paresthesia, disartria, hypotension and bradicardia, with no evidence of motor weakness. The infusion was stopped and catheter position was radiologically confirmed by a thoracic x-ray with contrast administration through the catheter, which showed a contrast spread compatible with a subdural catheter position.

Results: The infusion was changed to Ropivacaine to 0,1% at 2ml/h and the patient remained hemodynamically stable, maintaining controlled pain, with no need for supplemental analgesia, and without any sedative effects or respiratory depression, during the 48h in which the infusion was kept.

Conclusions: Subdural blockade remains a less well recognized complication of neuroaxial anesthesia and it's necessary a high suspicious level.

There is evidence to support the use of inadvertently inserted subdural catheters to provide continued analgesia, since the attempt of an additional epidural placement may be unsuccessful and the subdural placement may recur. However, the anaesthetist must be aware of possible complications.

Further studies are needed to improve the knowledge of this clinical entity and clarifying the role of the subdural space in neuraxial analgesia.

LAPAROSCOPIC CHOLECYSTECTOMY UNDER CONTINUOUS SPINAL ANESTHESIA IN A PATIENT WITH STEINERT´S DISEASE

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Purpose/Objective: In patients with Steinert's disease (SD) regional anesthesia is the best choice to avoid myotonia. We report the use of continuous spinal anesthesia (CSA) for laparoscopic cholecystectomy (LC), which is not described in literature.

Materials and Methods: A 35 year-old caucasian female, with SD causing mild restrictive lung disease, was scheduled for elective LC.

After standard monitoring, continuous spinal block was performed at L2-L3 level with a spinocath kit (24 G, 29G). T4 level was achieved after titrated administration of 20 µg of fentanyl, 5 mg of hyperbaric bupivacaine 0.5% plus top up with 5 mg of isobaric bupivacaine 0.5%. Postoperative spinal analgesia was maintained during 24h.

During the perioperative period a ventilatory support was instituted, spirometry and blood gasometry were assessed (Table 1).

The patient was discharged home 48 hours after surgery.

TABLE 1. Blood gas analysis and lung function tests (BIPAP ST 6/14 cm H2O and cough-assist device established 12h before surgery until 24h after surgery)

	Preoperative	Intraoperative (Intra-abdominal pressure 8 mmHg)	Postoperative
FEV 1/FVC (%)	76.50%	82,58%	76,64%
pH	7.554	7,587	7,552
pO2 / pCO2 (mmHg)	116,1 / 24.5	115,1 / 24,5	117,8 / 22,2

Results: CSA has been used with success in high risk patients for abdominal surgery. Mitjans et al described an uneventful case of CSA in a patient with SD proposed for abdominal hysterectomy.

CSA allowed a sensory block suitable for the surgery and minimal respiratory impairment. Postoperative pain control was effective and no complications of the technique were noticed.

Conclusions: CSA is an appropriate technique for LC and valuable in SD patients.

UNILATERAL HORNER´S SYNDROME FOLLOWING LOW CONCENTRATION LEVOBUPIVACAINE INFUSION FOR LABOR EPIDURAL ANALGESIA

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Purpose/Objective: We report a case of Horner´s syndrome (HS) following lumbar epidural analgesia for labor and delivery with low local anesthetic concentration.

Materials and Methods: A 32-year-old, 65-kg, 165-cm primigravida, presented in labor at 40 weeks´gestation. With patient in sitting position, a 20-gauge epidural catheter was inserted into the L3-L4 interspace through a 18-gauge Tuhoy needle. A test dose of 3ml of levobupivacaine 0.25% was injected. Five minutes later, two doses of 5 ml of levobupivacaine 0.25% plus 50 µg fentanyl were injected. An epidural infusion of 0.06% levobupivacaine with fentanyl 1µg ml^{-1} was started at 12ml h^{-1} and with sensory block of T6. Two hours after the initial bolus epidural she underwent a vaginal delivery. After delivery left-sided ptosis, miosis and conjunctival congestion were noted. The patient´s symptoms and signs gradually and spontaneously resolved completely over the next two hours.

Results: The majority of the case reports of HS after lumbar epidural block occurred in obstetric patients. Various theories have been proposed as to the cause of Horner´s syndrome associated with epidural anesthesia in pregnancy; however, the exact mechanism is not known and multiples factors are almost certainly involved: sympathetic fiber hypersensitivity, the volume and distribution of the injected anesthetic, and abnormal anatomic changes of epidural space.

Conclusions: Medical staff should bear in mind that HS is a complication of epidural regional anesthesia. Prompt recognition of this syndrome and determination of its cause as lumbar epidural anesthesia can prevent unnecessary, costly, and potentially dangerous diagnostic testing and can reassure both clinican and patient.

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CESAREAN SECTION IN A PATIENT WITH BRUGADA SYNDROME

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Purpose/Objective: We report a patient suffering with Brugada syndrome who had epidural and spinal anesthesia with levobupivacaine.

Materials and Methods: A 32-year-old pregnant woman was scheduled for cesarean because she had two previous cesareans. The patient had a negative flecainide response, with normal exercise stress test and normal ECG. The decision was made to proceed with epidural analgesia with levobupivacaine. Afterwards we had to make a spinal anesthesia because epidural analgesia failed with levobupivacaine 18ml. Spinal anesthesia with levobupivacaine 8 mg and fentanyl 20 μg was given. In addition to standard monitorization , external defibrillator was placed. The intraoperative and postoperative period were otherwise unremarkable.

Results: Drug-induced Brugada syndrome is an inherited ion channelopathy that manifests with ECG changes, ventricular arrhytmias, and sudden death in afflicted patients following exposure to various drugs. The classic findings of pseudo-right bundle branch block with "coved" ST segment elevation in the right precordial leads may not be apparent until it is unmasked by precipitating agents such as propofol, beta-receptor blockers, alpha-receptor agonist, and local anesthetics.

Conclusions: Anesthetic management of Brugada syndrome is focused on counteracting excessive vagal tone and avoiding of precipitating agents. Local anesthetic use in these patients should be approached with caution. However, in cases where the benefits of regional anesthetic techniques may outweigh the potential risks of general anesthesia, levobupivacaine may be safe because it remains united to sodium channels less time than others local anesthetics such as bupivacaine, so the risk of arrhythmias could be reduced.

CAUDAL EPIDURAL BLOCK IN A PEDIATRIC PATIENT WITH NOONAN´S SYNDROME

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Purpose/Objective: We describe the anesthetic management in a 3-year-old boy with Noonan´s syndrome admitted for inguinal herniorrhaphy.

Materials and Methods: A 3-year-old boy was admitted for inguinal herniorrhaphy. The electrocardiogram was suggestive of left ventricular hypertrophy. A echocardiogram performed demonstrated concentric hypertrophy of left ventricle and mild pulmonary stenosis. Evaluation of his airway demonstrated a high palatal arch, moderate degree of micrognathia, dental malocclusion, and a webbed neck. Radiologic studies showed a mild degree kyphoscoliosis and lordosis. He was premedicated 45 min pre-operatively with midazolam orally. Maintenance of anesthesia was provided with oxygen, air and midazolam. He had a caudal epidural block without complications. Noninvasive blood pressure measurement, ECG and pulse oximeter, was applied. Hemodynamic parameters were maintained at baseline values with judicious use of IV fluids.

Results: Noonan´s syndrome is a rare clinical entity and represents the phenotype of Turner´s syndrome with normal chromosome studies. This patients are usually mentally retarded, and have right-sided cardiac lesions, usually pulmonary valve dysplasia. In addition a large proportion have a hypertrophic cardiomyopathy. The potential anesthesia problems presented by a patient with Noonan´s syndrome relate to impairment of cardiopulmonary function, the possibility of a difficult airway and the problem of technical difficulty with regional anesthesia.

Conclusions: Several of the features of Noonan´s syndrome may cause anesthetic problems. The presence or absence of facial, cardiac or musculoskeletal abnormalities should be determined pre-operatively. Anesthesia for patients with hypertrophic obstructive cardiomyopathy should avoid tachycardia, hypotension, and peripheral vasodilation, and maintain preload and afterload.

RESPONSE TO ROCURONIUM IN A PATIENT WITH CHARCOT-MARIE-TOOTH DISEASE AND HELLP SYNDROME

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Purpose/Objective: Charcot-Marie-Tooth disease (CMTD) and HELLP are two diseases that individually pose challenges and require anesthetic management precautions. We describe the case of a pregnant woman with both diseases.

Materials and Methods: A 38-year-old first-time mother at gestation week 34, with CMTD, arrived at the Accident and Emergency department for edema in lower limbs and epigastric pain. She was diagnosed with HELLP syndrome. After her clinical symptoms worsened, an urgent cesarean was decided. Given that local anesthesia was not possible for a low platelet count, it was performed under general anesthesia. Rapid sequence intubation was assessed with atropine, propofol and 50 mg of rocuronium. Anesthesia was maintained with air/oxygen and propofol infusion using sugammadex (2 mg kg^{-1}) to reverse the neuromuscular blockade (NMB). The patient was extubated 45 minutes after rocuronium administration, and showed adequate alert status and force, without signs of respiratory involvement.

Results: CMTD is a uniform demyelinating polyneuropathy that is hereditary in nature and occurs with distal weakness, muscle atrophy and sensory loss. The effects of neuromuscular blocking drugs in patients with CMTD are highly variable.

Conclusions: The use of rocuronium appears to be a safe option in patients with simultaneous CMTD and HELLP syndrome to avoid possible risks of succinilcholine in neuropathies and to benefit from a quick NMB. Finally, we consider neuromuscular monitoring to be a prudent measure to be taken wherever possible in these patients because magnesium sulfate administration and the presence of neuromuscular disease can alter the response to the NMD used.

THE DIAGNOSIS AND TREATMENT OF A PATIENT WITH SUBDURAL HYGROMA ACCOMPAINED BY PARENQUIMAL AND SUBARACHNOID HEMORRHAGE AFTER EPIDURAL ANALGESIA

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Purpose/Objective: We describe a patient with an unrecognised dural puncture after epidural analgesia who was treated for psychiatry and who was later diagnosed with a subdural hygroma accompanied by parenchymal and subarachnoid hemorrhaging.

Materials and Methods: A 34-year-old Czech woman, at gestation week 35 who was admitted into hospital for labour. She had epidural analgesia without complications and she underwent an uneventful vaginal delivery.

On day 2 after delivery, the patient developed postdural puncture headache (PDPH) and improved with rest, fluids and analgesia. Eight days after the lumbar puncture, she was re-admitted for PDPH, confused behaviour and was diagnosed by a psychiatrist with possible puerperal psychiosis or drug withdrawal syndrome.

The next day, she developed a severe holocraneal headache, paresthesias, felt drowsy, seizures, proceeding to intubation. The cranial-computed tomography (CCT) showed subdural hygroma, parenchymal and subarachnoid hemorrhaging.

A surgical intervention was decided. After she was extubed a blood patch was performed for persistent PDPH. A spinal magnetic resonance imaging (MRI) checked the absence of a cerebrospinal fluid (CSF) leak. Finally she was discharged after a 12-day hospital stay.

Results: The PDPH after dural puncture is not the only cause of headache in pregnancy. Headache in pregnancy also includes preeclampsia, migraine, drug-induced headache and intracranial pathologies. Intracranial pathologies include subdural hygromas and haematomas, intracerebral haemorrhaging and venous sinus thrombosis.

Conclusions: Anesthetists need to know the different causes of headache in pregnancy. Failure to recognise these neurological complications after

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persistent headaches and altered consciousness following epidural analgesia can lead to delayed diagnoses, with subsequent serious implications.

CESAREAN SECTION IN A PATIENT WITH HIGH THORACIC PARAPLEGIA UNDER COMBINED EPIDURAL-SPINAL ANESTHESIA

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Purpose/Objective: The anesthetic management of a pregnant woman with chronic T4/T5 paraplegia and twin pregnancy is described.

Materials and Methods: A 38-year-old primigravida with T4/T5 paraplegia of 13 years duration was scheduled for an elective cesarea at the 35th week of gestation. She required oxygen through nasal cannula. An epidural catheter was sited at the L3/4 intervertebral space, after which spinal anesthesia was achieved in the left lateral decubitus position with 2 ml of 0.5% isobaric bupivacaine and 100μg fentanyl. Epidural infusion was used for analgesia for 24 hours postoperatively. During the operation and postoperatively the patient remained pain free with no episodes of hypertension. The level of sensory block reached was not higher than T5 (injury level).

Results: Patients such as this have many general medical problems including impaired alveolar ventilation, cardiovascular instability, anemia, altered thermoregulation, urinary infection, bowel management and skin care. Anesthetic considerations include hyperkalemia after suxamethonium, the risk of autonomic hyperreflexia and unpredictable spread of local anesthetic in a distorted spine. We decided upon a technique of combined spinal-epidural anesthesia after considering the risks of hyperreflexia that might occur during and after operation.

Conclusions: Autonomic hyperreflexia can lead to significant morbidity and mortality so preventive measures should be taken and treatment available. Hypertension ocurring in patients at risk for autonomic hyperrreflexia must be managed aggressively. Spinal anesthesia has been extensively used and epidural infusions have been recommended for labour. Hypotension and tachycardia should be treated with intravenous fluids and a directly acting alpha agonist.

ANESTHESIA IN PREGNANT WOMAN WITH CHRONIC CHAGAS DISEASE

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Purpose/Objective: We report a case of a parturient with chronic Chagas disease to discuss the characteristics of the disease and of the problems encountered in the anesthetic management.

Materials and Methods: A 35-year-old Ecuadorean pregnant woman presented to labor at 38 weeks gestation. Prenatal history revealed an electrocardiogram with normal sinus rhythm at a rate of 67 bpm, right bundle branch block with left anterior fascicular block. Chest radiographs showed a mild cardiomegaly. Echocardiography revealed mild mitral regurgitation, mild left ventricular dilatation, and ejection fraction was 40%. Physical examination was remarkable for systolic ejection murmur. An uncomplicated labor course with analgesia epidural was followed by the normal delivery of a 3100g female.

Results: Chagas disease is a chronic, systemic, parasitic infection caused by the protozoan Trypanosoma cruzi. It is endemic to Central and South America; however, today it is not uncommon to find early or advanced-stage tropical diseases in countries where they were once considered unusual. This disease causes degeneration of autonomic nerve plexi, leading to severely dilated cardiomyopathy, mega-esophagus and mega-colon.

Conclusions: Chagas disease presents the anesthesiologist with a challenging constellation of pathophysiology and management issues. They include severe systolic dysfunction and dilated cardiomyopathy, ventricular arrhythmias, relative resistance to inotropes and pressors and esophageal involvement leading to dysphagia. The illness is not usually diagnosed because of the nonspecific nature of the signs and symptoms. However, the anesthesiologist must suspect the presence of these abnormalities, even during the intermediate phase of the disease process when the patient is asymptomatic.

ANTERIOR LENS CAPSULE RUPTURE AFTER PERIBULBAR ANESTHESIA COMBINED WITH APPLICATION OF HONAN BALLOON

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Purpose/Objective: To describe an extremely rare case of anterior capsule tear after peribulbar anesthesia.

Materials and Methods: A 90-year-old male had peribulbar anesthesia for cataract surgery. His medical and ocular histories were otherwise non contributory. Peribulbar anesthesia consisted of a 5 ml inferior and a 4 ml superior injection of a 1:1 mixture of 2% mepivacaine, 0.75% bupivacaine, both without vasoconstrictor and hyaluronidase. Honan balloon was applied at 35 mim Hg for 15 minutes.

Results: Before operating the ophthalmologist realized a paracentral, anterior capsule tear without inflammation signs. No previous records of capsular abnormalities on slit-lamp examination were described. The patient did not refer previous ocular or periocular trauma. This rupture is illustrated with frames of the surgical video. The continuous curvilinear capsulorrhexis was possible but difficult to perform and was wider than normally in order to dodge the tear. Then a successful phacoemulsification with intraocular lens insertion into the capsular bag was performed. One month after the surgery, the patient achieved a best-corrected visual acuity of 0,8 (decimal scale).

Conclusions: Peribulbar anesthesia combined with application of Honan balloon for cataract surgery may induce an anterior lens capsule rupture. When using this technique it seems advisable to minimize the volume of anesthetic agents injected into the orbit.

SCALP BLOCK - AN INTERESTING INDICATION

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Purpose/Objective: Awake craniotomy under scalp block is preferable for anasethetising patients for surgeries related to epilepsy and tumours near speech area and for taking stereotactic biopsies. It helps the surgeons assess the patient intraoperatively when needed. This is a case where scalp block was given for uncommon indication.

Materials and Methods: A 33-year-old female with five months of amenorrhea presented with a painful swelling in the midline of the scalp which was bleeding. It was present since her childhood which gradually increased in size without any neurological deficits.

The CT angiogram showed a posterior parietal arterio-venous malformation. The patient subsequently was posted for emergency excision of the swelling.

On preanaesthetic assessment all investigations were normal and the anesthetic plans were discussed with the patient. In view of the precious pregnancy and hesitation for general anaesthesia a scalp block was planned.

Results: An excellent analgesia was obtained with scalp block bilaterally using the following technique.

Technique: A total volume of 30 ml with 0.25% Bupivacaine 15ml and 1% xylocaine with adrenaline 15 ml was infiltrated bilaterally using spinal needle. In view of her pregnancy no additives or i.v supplementation were given.

Conclusions: Scalp block is the only preferred technique for anesthetizing pregnant patients with least adverse effects for mother and foetus. Proper counseling should be done pre-operatively for a successful block.

THE TREATMENT OF PAROXYSMAL SYMPATHETIC HYPERACTIVITY IN PATIENTS WITH SEVERE TRAUMATIC BRAIN INJURY BY USING VAGOSYMPATHETIC BLOCKADE

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Purpose/Objective: Paroxysmal sympathetic hyperactivity (PSH) is a syndrome that develops after traumatic injury of the brain and is characterized by acquired, paroxysmal and simultaneous reverse increased activity of the sympathetic nervous system and motor activity. It occurs in 15-33% of patients with severe traumatic brain injury in the acute phase of recovery and is associated with a significantly worse prognosis and increased

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duration of hospitalization in the ICU. Now there are no evidence-based data or guidelines on this matter.
Materials and Methods: Patient A., 18, with diagnosis: Severe brain injury, subarachnoid hemorrhage. He had hyperthermia to 39.5 ° C, chills, acrocyanosis, arterial hypertension 160/80-150/80 mm Hg, and tachycardia of 100-120 beats / min. PSH was diagnosed and treated by metoprolol (200 mg/day), baclofen (15 mg/day). The frequency and intensity of attacks PSH increased, despite the maximum dose of therapy, accompanied besides negative neurological dynamics. To purchase paroxysms were only effective thiopental sodium and chlorpromazine.
Results: We performed left-side cervical vagosympathetic blockade through interscalene access. Over the next 5 minutes the pulse rate decreased, sweating and hyperthermia have been stopped. After the blockade any attack PSH did not arise. After 56 days of treatment the patient in stable condition and clear consciousness was transferred to a rehabilitation center.
Conclusions: Cervical vagosympathetic blockade can can be an effective method for treatment Paroxysmal sympathetic hyperactivity in patients with severe brain trauma.

TREATMENT OF CERVICAL CANCER-INDUCED TENESMUS WITH INFERIOR HYPOGASTRIC PLEXUS BLOCK VIA COCCYGEAL TRANSVERSE APPROACH

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Purpose/Objective: Tenesmus can be defined as the constant urge to defecate or urinate even after defecation or urination. Tenesmus commonly occurs with inflammatory bowel disease and irritable bowel syndrome, as well as being one of the manifestations of colorectal cancer.
Materials and Methods: We report a case of a cervical cancer patient with tenesmus who was treated with fluoroscopy assisted inferior hypogastric plexus block. A 62-year-old woman complanined of tenesmus and coccygodynia for 1 week. The patient was diagnosed with cervical cancer in 2011 and was attending follow-up visits in the obstetrics and gynecology outpatient clinic after receiving total hysterectomy and both salpingoadenexectomy. Initially the patient received sono-guided caudal block and ganglion impar block in the pain clinic with no symptom improvement. She was then treated with fluoroscopy assisted inferior hypogastric plexus block via coccygeal transverse approach.
Results: The coccygeal transverse approach is more safe and effective than the frequently used transsacral approach.
Conclusions: The inferior hypogastric plexus block was performed twice, and the patient remains symptom free with no tenesmus.

GIANT ADNEXAL TUMOR – THE ADVANTAGES OF ULTRASOUND GUIDED PROCEDURES

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Purpose/Objective: The giant ovarian tumors are mainly benign and have a low malignant potential. Recent advances in healthcare and patient education decreased the frequency of such tumors.

This case is about a 37 year old female patient with a giant ovarian cyst proposed for an abdominal laparotomy.
Materials and Methods: The patient had a history of medicated hypertension and obesity. Her physical condition was limited by her tumor, with easy fatigability and dyspnea under moderate tasks.

The CT scan revealed a "bulky cystic formation (43x38x32cm), with well-defined borders and heterogeneous texture, occupying the entire peritoneal cavity with extrinsic growth, conditioning marked diastasis of the rectus abdominal, upper deviation of the abdominal organs and viscera, with probable starting point in the left ovary."
Results: The patient was proposed for an abdominal laparotomy under regional anesthesia, having performed the following procedures with US guidance: placement of an epidural catheter at the level of T10-T11; CVC placement at internal jugular vein and a radial arterial catheter. During the surgery, a giant left ovarian cyst was extracted, mostly with liquid component, having been drained approximately 50 liters and performed a left anexectomy.

Surgery and postoperative period occurred without complications. Histological examination revealed that it was a mucinous cystadenoma. The patient is fully recovered, showing a greater ability to perform daily tasks.
Conclusions: Although benign, giant ovarian tumors affect the physiological status of the patient, due to dimensions that can achieve. The ultrasound guided procedures are very useful in these kind of patients, whose physical conditions are difficult.

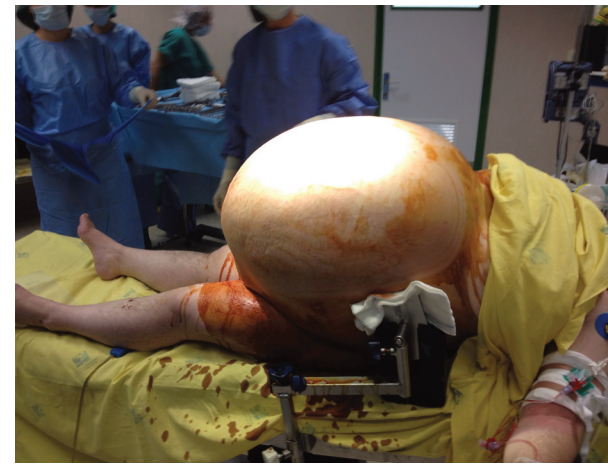

FIGURE.

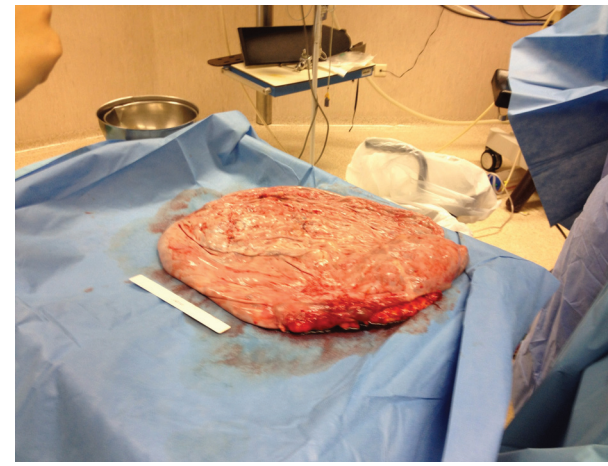

FIGURE.

A SURVEY OF KNOWLEDGE ABOUT LOCAL ANAESTHETIC TOXICITY IN A DISTRICT GENERAL HOSPITAL

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Purpose/Objective: Local anaesthetics are used in most departments around the hospital. We conducted a survey to assess practitioners knowledge in local anaesthetic toxicity and its management around a UK DGH.
Materials and Methods: We conducted a snapshot survey of practitioners in a variety of departments in the hospital. We tested knowledge in:
- maximum safe doses
- signs of local anaesthetic toxicity
- treatment of severe LA toxicity

Results: 60/150 (40%) practitioners replied from all grades and specialities including maternity, surgery, medicine, radiology, anaesthetics and emergency medicine. 58/60 (96.6%) responders used local anaesthetics in their practice. Only 12/60 (20%) knew the safe doses for local anaesthetics. 11/60 (18.3%) knew the signs of local anaesthetic toxicity. 21/60 (35%) knew that intralipid was a treatment for severe LA toxicity. 19/60 (31.6%) were aware of guidelines available in the management of severe LA toxicity.

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Conclusions: Awareness of the safe doses is essential to all practitioners using local anaesthetics and an improvement in the knowledge of local anaesthetic toxicity is required. In order to do this, we have:
- fed back the results to all the departments
- provided guidance in safe doses of LA on laminated sheets to be stored with LA
- provided guidance in the management of LA toxicity and where intralipid is stored
- we will be providing simulation-based training

TRANEXAMIC ACID AND DEXMEDETOMIDINE ON PERIOPERATIVE BLOOD LOSS IN BILATERAL TOTAL KNEE REPLACEMENT – A RANDOMIZED CONTROLLED STUDY

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Purpose/Objective: Total knee replacement in adults can be associated with significant blood loss, often requiring allogenic blood transfusion. Tranexamic acid (TEA) reduces blood loss and red cell transfusions in patients undergoing total knee arthroplasty (TKA) however, there is not much literature on the role of tranexamic acid and dexmedetomidine in patients undergoing bilateral TKA in a single stage procedure. We conducted this study to elucidate the effects of dexmedetomidine on blood loss and clotting factors.

Materials and Methods: One hundred and thirty adult patients were randomly allocated to 1 of 2 groups as group 1(TAS) received TA of 10 mg/kg, and Normal saline as infusion throughout the intraoperative period. Group 2 (TAD) received TA of 10 mg/kg and dexmedetomidine 0.5mic/kg intravenous infusion throughout the intraoperative period. The primary outcome was the total perioperative estimated and calculated blood loss intraoperatively and 24 h postoperatively The following parameters were estimated. Preoperative Hb, PCV, postoperative hemoglobin (Hb), PT, APTT, INR total drain output of each limb and number of blood units transfused.

Results: The postoperative hemoglobin was significantly reduced in Group 2 (TAD) ($p<0.05$). Total blood loss was significantly higher in placebo group when compared to Dex group. There was no significant change in PT, APTT, INR among the two groups preoperatively and postoperatively. Total drain output of each limb was significantly reduced in dex group when compared to placebo group ($p<0.05$).

Conclusions: The combination of Tranexamic acid and dexmedetomidine significantly reduced the perioperative blood loss and the need for requirement of blood transfusion in bilateral total knee replacement.

REGIONAL ANAESTHESIA PRACTICE IN GREECE (ESRA HELLAS REPORT): A MULTICENTER, NATIONWIDE SURVEY AND REVIEW OF CURRENT INTERNATIONAL LITERATURE

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Purpose/Objective: RA (CNBs & PNBs) is well-established surgical anaesthesia-analgesia modality, although information on its nationwide extent of use is sparse in literature.

ESRA Hellas performed a Multicenter, Nation-Wide, Retrospective, Cross-Sectional Survey, in order to study-document RA application rates in Greek Hospitals, during the year 2011.

Materials and Methods: Survey (March 1st to June 30th 2012) was based on responses to a Structured Questionnaire, being emailed to Chairmen of Greek Anaesthesiology Departments (participating collaborators). Following completed Questionnaires collection, received data descriptive-comparative analysis was performed.

Results: Survey response rate was 51.56%, representing all Greek Hospitals categories and all country geographical regions. Data analysis was mainly based on feedback from 40 Public Hospitals, incorporating 182.007 operations (approximately 40% of those performed during 2011), since Private Sector responders, in the vast majority, did not perform RA. RA was applied for surgical anaesthesia in 45.8% of reported procedures. Spinal was the technique of choice in orthopaedic surgery (application rate 52% over 83.265 RA procedures). Epidural (application rate 23.3%), was mostly used in obstetrics-gynaecology procedures. Combined-Spinal-Epidural and PNBs were less commonly instituted (11.2% and 13.5% of RA techniques respectively). PNBs were more frequently used for lower-limb-surgery. Greek Senior Anaesthesiologists (94.49%) are very familiar with CNBs, whereas almost half of them (46.38%) declare PNBs application capability into routine practice. Limited exposure to equipment-techniques and lack of education-training were PNBs under-utilization causative factors.

Conclusions: RA is commonly applied in Greece, although all Greek Anaesthesiologists do not routinely practice all techniques. A more concise Questionnaire is necessary for better future reporting.

EFFECTS OF ACUTE NORMOVOLEMIC HEMODILUTION (ANH) ON PERIOPERATIVE COAGULATION AND PLATELET FUNCTION IN TOTAL HIP REPLACEMENT

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Purpose/Objective: Total hip replacement is one of the major orthopedic surgeries causing substantial blood loss in perioperative period. We evaluated the effect of acute normovolemic hemodilution (ANH) on blood coagulation.

Materials and Methods: We performed laboratory tests including hemoglobin, hematorcit, platelet count, PT-INR, aPTT, electrolyte, rotational thromboelastometry (ROTEM), and whole blood impedance aggregometry (WBA). After spinal anesthesia, blood samples were obtained at three time points: 1) before the initiation of ANH, 2) after the end of ANH, and 3) after retransfusion.

Results: After ANH, ROTEM parameters changed to hypocoagulable pattern. CFT of INTEM was lengthened by 35.3%, whereas α-angle and MCF of INTEM were decreased by 6.0% and 6.4% respectively compared with preoperative value. CT and CFT of EXTEM were increased by 36.4% and 33.8%, respectively, whereas the α-angle and MCF of EXTEM were decreased by 7.1% and 11.7%, respectively. MCF of FIBTEM decreased by 31.4% compared with the preoperative value. After retransfusion, ROTEM values showed similar pattern compared with after ANH values, and there were no statistical differences between the values after ANH and after retransfusion. There were no significant differences at each time point values in platelet function. Post-retransfusion platelet counts were significantly decreased compared with preoperative values ($P = 0.012$). Post-retransfusion hemoglobin and hematocrit values were not significant different compared with post-ANH values. PT-INR was significantly increased compared with preoperative value ($P = 0.012$), whereas the aPTT was not significantly prolonged.

Conclusions: ANH induced the hypocoagulable state, and the post-retransfusion parameters of ROTEM and WBA showed similar pattern compared with values after ANH.

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