EPIDURAL ANALGESIA IN CARDIOTHORACIC SURGERY:

Does it prevent chronic postoperative pain?

Eleni Moka

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Creta InterClinic Hospital
Heraklion – Crete Greece

In official cooperation
with University of Mainz – Germany
Definition of Pain (IASP)

“An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage”

Merksey H & Bogduk N, IASP Press, 1994
Chronic pain after surgery

W. A. Macrae

The Pain Service, Ninewells Hospital and Medical School, Dundee DD1 9SY, UK

Br J Anaesth 2001; 87: 88–98
Chronic Post – Surgical Pain (CPSP)

- Neglected topic
- no accepted definition
- debatable if a single definition useful
- most definitions: descriptive

offer a time frame for chronicity beginning 2 / 3 months post – surgery

Macrae WA & Davies HTO, IASP Press, 1999
Chronic pain is one of the **most common** and **serious long term** problems after surgery.

**Percentages** of pain persisting long after surgery can be very high!!

**Macrae WA, Davis HTO**  
*Epidemiology of Pain. IASP Press, 1999*  
*Br J Anaesth, 2008*
Chronic Post Surgical Pain (CPSP)

Risk Factors

PREOPERATIVE

INTRAOPERATIVE

POSTOPERATIVE

- Type of surgery
- Reoperation
- Nerve Damage
- Moderate / Severe Preoperative Pain
- Moderate / Severe Acute Postoperative Pain
- Age
- Pts Personality (Hyperenergetic)
- Radiotherapy / Chemotherapy
- Psychosocial Factors

Perkins FM, Kehlet H Anesthesiology, 2000
Visser E Acute Pain, 2006
Epidemiology of Transition of Acute to Chronic Pain Postoperatively

All Surgical Procedures

RISK of development of CHRONIC Postoperative Pain in percentage of 5 – 80%

Chronic Post Surgical Pain

Cardiac Surgery
Thoracic Surgery
Pain of at least 2 months duration post – surgery or at / beyond 6 months post – surgery

ongoing stress disability

Perkins FM, Kehlet H. Anesthesiology, 2000
Visser E. Acute Pain, 2006
## Estimated incidence

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Estimated incidence of chronic pain</th>
<th>Estimated chronic severe (disabling) pain (&gt;5 out of score of 10)</th>
<th>US surgical volumes (1000s)†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amputation</td>
<td>30–50%</td>
<td>5–10%</td>
<td>159 (lower limb only)</td>
</tr>
<tr>
<td>Breast surgery (lumpectomy and mastectomy)</td>
<td>20–30%</td>
<td>5–10%</td>
<td>479</td>
</tr>
<tr>
<td>Thoracotomy(^4-(^7)</td>
<td>30–40%</td>
<td>10%</td>
<td>Unknown</td>
</tr>
<tr>
<td>Inguinal hernia repair(^8-(^10)</td>
<td>10%</td>
<td>2–4%</td>
<td>609</td>
</tr>
<tr>
<td>Coronary artery bypass surgery(^11-(^13)</td>
<td>30–50%</td>
<td>5–10%</td>
<td>598</td>
</tr>
<tr>
<td>Caesarean section(^14)</td>
<td>10%</td>
<td>4%</td>
<td>220</td>
</tr>
</tbody>
</table>

*Gall bladder surgery not included, since preoperative diagnosis of pain specifically from gall bladder is difficult and persistent postoperative pain could therefore be related to other intra-abdominal disorders. †National Center For Health Statistics, Ambulatory and Inpatients Procedures, USA, 1996.

**Table 1: Estimated incidence of chronic postoperative pain and disability after selected surgical procedures**

### Persistent Postsurgical Pain: risk factors and prevention


Henrik Kehlet, Troels S Jensen, Clifford J Woolf
Is there anything that we as doctors could improve in our practice???

Decrease Percentages
Does **acute postoperative pain treatment** prevent the occurrence of postoperative chronic pain syndromes?

What is the role of **epidural analgesia** in cardiothoracic operations?
What is the Evidence???
Postoperative pain management and outcome after surgery

Francis Bonnet*
Professor and Chairman

Emmanuel Marret MD, PhD
Assistant Professor
Département d’Anesthésie Réanimation, Hôpital Tenon, Université Pierre et Marie Curie,
4 rue de la Chine, 75970 Paris cedex, France
Chronic Post Surgical Pain
Thoracic Surgery
Post – Thoracotomy Pain Syndrome (PTPS)

Severity & Duration

Thoracotomy Pain
- generally severe
- increased intensity
- Persists along thoracotomy scar 1, 2, 6 months or later
- may last for weeks & after 5 years chronic in 30% of pts

50% pts limited daily life

Tziavangos E & Schug SA (Editorial Review)
Regional anaesthesia and perioperative outcome
Curr Opin Anesthesiol, 2006; 19: 521 – 525

Sentrurk Mert (Editorial Review)
Acute and Chronic Pain after Thoracotomies
Curr Opin Anesthesiol, 2005; 18: 1 – 4
Post – Thoracotomy Pain Syndrome (PTPS)

**Incidences: Great Variability**

- Dajckman et al (1991), 54%
- Kalso et al (1992), 44%
- Connacher et al (1992), 5%
- Richardson et al (1994), 22.3%
- Keller et al (1994), 11%
- Landreneau et al (1994), 30%
- Bertrand et al (1996), 63%
- Pertunnen et al (1999), 61%
- Obata et al (1999), 33%
- Rodgers et al (2000), up to 80%
- Pluijms et al (2006), 52%

*Sentrurk Mert (Editorial Review)*  
*Acute and Chronic Pain after Thoracotomies*  
*Curr Opin Anesthesiol, 2005; 18: 1 – 4*

*Wildgaard K et al. (Critical Review)*  
*Chronic PTPS: Mechanisms and strategies for prevention*  
*Eur J Cardiothorac Surg, 2009; in press*
Post – Thoracotomy Pain

Pathogenesis: very complicated

Types of Thoracotomy Pain:

- **nociceptive pain** (tissue damage and ribs)
- **neuropathic pain** (peripheral nerves) in half of the patients with CPTS
- **sympathotonic state** (surgical manipulation/trauma of cardiac parasympathetic nerves)
- pain is **aggravated** by respiration and coughing
- pain **exacerbated** by the presence of chest tubes and drains

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Senturk M. Curr Opin Anesthesiol, 2005; 18: 1 – 4


Post – Thoracotomy Pain
Pathophysiology – Aetiology

• Rib Retraction & Intercostal Nerve Damage
• Thoracotomy Type – Incision Type
  - posterolateral approach
  - muscle – sparing thoracotomy
  - video assisted thoracoscopcy
  - robotic surgery
• Closure of Thoracotomy
  - pericostal sutures
  - intercostal sutures
CHOICES FOR PAIN CONTROL

- Administration of opioids via IV, IM, or IV PCA routes
- Thoracic Epidural Analgesia (TEA)
- Paravertebral blocks
- Intercostal nerve blocks
- Intrapleural catheter
- Cryoanalgesia has been used

Chronic Post – Thoracotomy Pain (CPTP)

- A priori knowledge of pts at highest risk for PTPS – CPTP would allow targeted interventions to be deployed
  - prior to
  - during
  - after operation

Shaw A & Keefe FJ et al.
Genetic and environmental determinants of postthoracotomy pain syndromes
Curr Opin anesthesiol, 2008; 21: 8 – 11

Pluijms WA et al.
Chronic post-thoracotomy pain: a retrospective study
Acta Anaesthesiol Scand, 2006; 50: 804 – 808
Chronic Post – Thoracotomy Pain (CPTP)

• Aggressive management of early postoperative pain may reduce the likelihood of long – term CPTP

Katz J et al.
Acute pain after thoracic surgery predicts long – term PTP

Pluijms WA et al.
Chronic post-thoracotomy pain: a retrospective study
Acta Anaesthesiol Scand, 2006; 50: 804 – 808
Chronic Post – Thoracotomy Pain (CPTP)

• Most analgesic techniques aim in neuropathic and nociceptive components
• Preemptive analgesia: prevention of central sensitization due to
  - incisional injury
  - inflammatory injuries of perioperative period

Senturk M
Acute and Chronic Pain after Thoracotomies
Curr Opin Anesthesiol, 2005; 18: 1 – 4

Wildgaard K et al. (Critical Review)
Chronic PTPS: Mechanisms and strategies for prevention
Eur J Cardiothorac Surg, 2009; in press
TEA: Mainstay of Postoperative Pain

- good evidence
  aggressive pain control & dynamic analgesia
  epidural analgesia with LA ± opioid
  following thoracic surgery
  -- improves pulmonary function
  -- reduces morbidity
  -- reduces the length of stay in ICU

De Cosmo G et al. (Review Article)
Analgesia in Thoracic Surgery
Minerva Anestesiol, 2009; 75: 393 – 400

Kozian A et al. (Review Article)
Non – analgesic effects of thoracic epidural anaesthesia
Curr Opin anesthesiol, 2005; 18: 29 – 34
36 scientific papers
CPTP – PTPS: variability in prevalence, around 50% - 60%
3 – 16% severe pain
82 – 90% direct pain relation to surgical site
aching, burning, tenderness, numbness
impact of chronic pain on daily life
RCTs: concept of timing in relation to a preemptive effect
Effects of Preemptive Epidural Analgesia on Post-thoracotomy Pain

Choon Looi Bong, MBChB, FRCA,* Miny Samuel, MSc, PhD,† Ju Mei Ng, MBBS, FANZCA,‡ and Chris Ip-Yam, MBChB, FFARCSI, FRCA, FAMS, MBA‡

Journal of Cardiothoracic and Vascular Anesthesia, Vol 19, No 6 (December), 2005: pp 786-793

- Metaanalysis of RCTs on CPTP
- 6 studies included / 458 pts
- Preemptive TEA for acute / chronic PTPS
- 3 of 6 studies: CPTP up to 6 months
  - Senturk M et al. Anesth Analg, 2002
  - Ochroch EA et al. Anesthesiology, 2002
- TEA: significant reduction in acute pain severity 24h / 48h postoperatively (p < 0.05)
CPTP: 39.2 – 48.6%
Acute pain: good predictor of CPTP
Prevention of acute pain: effective in prevention of CPTP
Preemptive TEA: trend towards reduction of CPTP
Overall incidence of chronic pain at 6 months
TEA vs Control Group: no significant difference (RR 1.32)
Double blind study
70 pts / thoracic surgery / TEA
12 pts eliminated from the study
TEA – pre group (n = 28), TEA – post group (n = 30)
VAS Scores lower in the TEA – pre group
4h, 2d, 3d postoperatively
Groups did not differ in postoperative use of indomethacin till day 7
FIGURE 3 Numerical rating scale three and six months after operation. * $P < 0.05$. 

### TABLE III  Long-term post-thoracotomy pain

<table>
<thead>
<tr>
<th></th>
<th>3 months</th>
<th></th>
<th>6 months</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre group</td>
<td>Post group</td>
<td>Pre group</td>
<td>Post group</td>
</tr>
<tr>
<td>Pain free (%)</td>
<td>50*</td>
<td>23</td>
<td>67†</td>
<td>33</td>
</tr>
<tr>
<td>Long-term pain (%)</td>
<td>50</td>
<td>77</td>
<td>33</td>
<td>67</td>
</tr>
<tr>
<td>continuous</td>
<td>7</td>
<td>4</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>intermittent</td>
<td>93</td>
<td>96</td>
<td>100</td>
<td>90</td>
</tr>
<tr>
<td>interfering with life (%)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Taking medications for pain (%)</td>
<td>11</td>
<td>23</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

*P < 0.05, †P < 0.01 compared with the Post-group
Randomized Prospective Study

112 patients randomized, 69 finally analyzed

- Pre - TEA (22), Post - TEA (24), IV - PCA (23)
- Acute Pain assessed 48hr postoperatively
- CPTP 6 months

Acute postoperative pain: less in pre – TEA (p < 0.05)
Chronic Post – Thoracotomy Pain at 6 months

- Pts having pain on the 2nd postoperative day had chronic pain in 83%

- Preoperative Initiation of TEA is a preferable method in preventing acute and long term PTP

Table 3. Results of the Questionnaire at the Sixth Month

<table>
<thead>
<tr>
<th>Results</th>
<th>All patients (n = 69)</th>
<th>Group Pre-TEA (n = 22)</th>
<th>Group Post-TEA (n = 24)</th>
<th>Group IV-PCA (n = 23)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain at 6 mo*</td>
<td>43 (62%)</td>
<td>10 (45%)</td>
<td>15 (63%)</td>
<td>18 (78%)</td>
</tr>
<tr>
<td>Pain lasting at least 2 mo*</td>
<td>47 (68%)</td>
<td>11 (50%)</td>
<td>16 (67%)</td>
<td>20 (87%)</td>
</tr>
<tr>
<td>NRS*</td>
<td>1 ± 1.0 (0–4)</td>
<td>0.6 ± 0.8 (0–3)</td>
<td>0.9 ± 0.9 (0–3)</td>
<td>1.4 ± 1.2 (0–4)</td>
</tr>
<tr>
<td>Affecting daily life</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

TEA = thoracic epidural analgesia; PCA = patient-controlled analgesia; NRS = numeric rating scale.
NRS is given in mean ± sd (minimum–maximum).
* P < 0.05 between Group Pre-TEA and Group IV-PCA.
Low-dose Intravenous Ketamine Potentiates Epidural Analgesia after Thoracotomy

Manzo Suzuki, M.D.,* Syuji Haraguti, M.D.,† Kikuzo Sugimoto, M.D., Ph.D.,‡ Takehiko Kikutani, M.D.,* Yoichi Shimada, M.D., Ph.D.,§ Atsuhiro Sakamoto, M.D., Ph.D.‖

Fig. 2. Changes in the numerical rating scale (NRS) scores for usual pain (A) and worst pain (B) in the ketamine (KM) and control (M) groups up to 6 months after surgery. The NRS is an 11-point scale where 0 = no pain and 10 = worst possible pain. Horizontal bars indicate the 10th, 25th, 50th, 75th, and 90th percentiles of the patients.
Ketamine

- The most promising drug for CPTP
- Possesses properties against pathological pain
- Rational choice for preemptive analgesia
- Further studies are needed regarding epidural use
Thoracic Epidural with Morphine does not prevent PTPS: a survey of 159 pts


- Retrospective study
- 159 pts interviewed / divided two groups
- Pain free group (pain < 3 months), n = 94
- Pain group (pain > 3 months), n = 65
- 41% pts PTPS (21 ± 12 months)
- Most pts mild pain – discomfort
- 6.2% severe burning pain & depression
- GA & TEA pts: 39% PTPS
  GA alone pts: 42% PTPS
  (p > 0.05)
112 pts / TEA use either preoperatively or postoperatively

No differences in pain scores between the groups
  - During hospitalization
  - After discharge
  - At 1y follow – up

CPTP 21.2% in general

Prevalence of post – thoracotomy pain:
  may be modified with rates as low as 21%
  with aggressive perioperative pain management.

Women reported greater pain and discomfort
BUT irrelevant to TEA application
Post-thoracotomy pain after thoracic epidural analgesia: a prospective follow-up study

E. Tiippana, E. Nilsson and E. Kalso
Department of Anaesthesia and Intensive Care Medicine, Helsinki University Central Hospital, Helsinki, Finland

- N=114, 111 analyzed, not RCT
- Postop TEA = 89, other = 22
- VAS>=3 at 3 and 6 months
  - TEA = 8/89 (11%), 7/89 (12%)
  - Other = 4/22 (29%), 3/22 (23%)
- No statistical analysis
- Lower incidences of CPTP than previous studies
- Extended postoperative analgesia up to 1wk at home is warranted
A Systematic Review of Randomized Trials Evaluating Regional Techniques for Postthoracotomy Analgesia

Girish P. Joshi, MB, BS, MD, FFARCSI*
Francis Bonnet, MD, FRCA†
Rajesh Shah, FRCS (C/Th)‡
Roseanne C. Wilkinson, PhD§
Frederic Camu, MD∥
Barrie Fischer, FRCA‡
Edmund A. M. Neugebauer, PhD#
Narinder Rawal, MD**
Stephan A. Schug, MD (Cgn), FANZCA, FFP MANZCA††
Christian Simanski, MD‡‡
Henrik Kehlet, MD§§

BACKGROUND: Thoracotomy induces severe postoperative pain and impairment of pulmonary function, and therefore regional analgesia has been intensively studied in this procedure. Thoracic epidural analgesia is commonly considered the “gold standard” in this setting; however, evaluation of the evidence is needed to assess the comparative benefits of alternative techniques, guide clinical practice and identify areas requiring further research.

METHODS: In this systematic review of randomized trials we evaluated thoracic epidural, paravertebral, intrathecal, intercostal, and interpleural analgesic techniques, compared to each other and to systemic opioid analgesia, in adult thoracotomy. Postoperative pain, analgesic use, and complications were analyzed.

RESULTS: Continuous paravertebral block was as effective as thoracic epidural analgesia with local anesthetic (LA) but was associated with a reduced incidence of hypotension. Paravertebral block reduced the incidence of pulmonary complications compared with systemic analgesia, whereas thoracic epidural analgesia did not. Thoracic epidural analgesia was superior to intrathecal and intercostal techniques, although these were superior to systemic analgesia; interpleural analgesia was inadequate.

CONCLUSIONS: Either thoracic epidural analgesia with LA plus opioid or continuous paravertebral block with LA can be recommended. Where these techniques are not possible, or are contraindicated, intrathecal opioid or intercostal nerve block are recommended despite insufficient duration of analgesia, which requires the use of supplementary systemic analgesia. Quantitative meta-analyses were limited by heterogeneity in study design, and subject numbers were small. Further well designed studies are required to investigate the optimum components of the epidural solution and to rigorously evaluate the risks/benefits of continuous infusion paravertebral and intercostal techniques compared with thoracic epidural analgesia.

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*Click the text in the blue boxes below for further information*

A new clinical tool for postoperative pain management in common surgical procedures

A set of procedure-specific, evidence-based recommendations

Managed and developed by anaesthesiologists and surgeons

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- Laparoscopic Cholecystectomy
- Total Hip Arthroplasty
- Abdominal Hysterectomy
- Open Colonic Resection
- Hemiortraphy

prospect has been presented at many international meetings.

You can see prospect at these future meetings in 2006.

Although this website is supported by Pfizer and developed by Choice Medical Communications, the views expressed are not those of either Pfizer or Choice Medical Communications. The recommendations are derived by consensus of the members of the prospect Working Group.
Figure 8. Overall PROSPECT recommendations: regional techniques for post-thoracotomy analgesia. *Either thoracic epidural local anesthetic (LA) + opioid or paravertebral block with LA is recommended as the primary analgesic approach; further studies on efficacy and safety are necessary to determine which technique is superior. **If intercostal LA is used, administration by continuous infusion is recommended, despite limited data, because of the requirement for continuous analgesia for the long duration of post-thoracotomy pain.
TEA and CPTP

- TEA ‘Gold standard’ for acute PTP
- Focus on pre-emptive
- Perioperative TEA may reduce CPTP

Senturk M
Acute and Chronic Pain after Thoracotomies
Curr Opin Anesthesiol, 2005; 18: 1 – 4

Wildgaard K et al. (Critical Review)
Chronic PTPS: Mechanisms and strategies for prevention
Eur J Cardiothorac Surg, 2009; in press
Good quality long term RCTs are still required
Chronic Post Surgical Pain
Cardiac Surgery
Chronic Post Surgical Pain & Cardiac Surgery Terminology

- Post CABG Pain Syndrome (PCP)
- Non – Cardiac Thoracic Pain after Sternotomy
- Chronic Post – Sternotomy Pain
- Post – Sternotomy Neuralgia
- Chronic Post – Surgical Chest Pain
- Postoperative Sternalgia
- Chronic Postoperative Leg / Arm Pain after CABG

Chronic Post – Sternotomy Pain
Aetiology & Mechanisms

- Sternum Osteomyelitis – Osteitis / Postoperative Infection
- Bone Fractures / Musculoskeletal Trauma
- Incomplete Bone Healing
- Sternocostal Chondritis
- Costal Fractures
- Brachial Plexus Injury
  - (Sharma AD et al. Anesth Analg, 2000)
- Nerve Entrapment due to Sternal Wire Sutures (Entrapment Neuropathy)
  - (Defalque RJ, Bromley JJ. Anesth Analg, 1989)
- Hypersensitivity Reactions against Metal Wires
- Internal Mammary Artery Harvesting / Intercostal Neuralgia
Chest wall pain after CABG surgery using Internal Mammary Artery graft: A new pain syndrome?

- Toronto Western Hospital Pain Clinic
- 11 pts CABG
- IMA harvesting
- 4 months – 5 years postoperatively
- Chest wall pain

Possible Aetiology
Injury to the anterior branches of the intercostal nerves at the site of harvesting

Mailis A et al, Heart & Lung 1989
Poststernotomy Neuralgia: A New Pain Syndrome
Ray J. Defalque, MD, and Joel J. Bromley, MD

- 54 pts (CABG, AVR) / follow up 6 months
- Pain Initiation: 6 wks postoperatively
- Possible Mechanism:
  Scar entrapped neuromas of small terminal rami of anterior branches of upper intercostal nerves
- Aetiology:
  Section / Damage of nerve rami
  - by sternal wires
  - by needles inserted at sternal margin of interchondral spaces
  Marked scar reaction by sternal wires
Chronic post-sternotomy pain

E. Kalso, S. Mennander, T. Tasmuth and E. Nilsson
Department of Anaesthesia and Intensive Care Medicine, Helsinki University Central Hospital, Helsinki, Finland

- 625 CABG pts
- Follow up 2 – 3 y post surgery
- Letter Interview
- Sternotomy related pain duration > 6 months: 37% of pts
- Chronic post sternotomy pain: 28%
- Moderate to severe pain: 38%
- IMA harvesting not correlated with chronic pain
- Correlation of severity of acute postoperative pain with chronic pain development
- Younger ages at higher risk
- Sleep disturbances: 1/3 of pts with chronic sternalgia
The incidence of chronic post-sternotomy pain after cardiac surgery – a prospective study

J. Meyerson¹, S. Thelin², T. Gordh¹ and R. Karlsten¹
¹Multidisciplinary Pain Treatment Centre, Department of Anaesthesiology, and Department of Thoracic and ²Cardiovascular Surgery, University Hospital, Uppsala, Sweden


- **318 cardiac surgery pts** (Uppsala University Hospital)
- **1 year** postoperatively: questionnaire
- **28%** reported chronic poststernotomy pain
- Most pts experience modest pain intensity
- **13%** reported moderate pain (VAS ≥ 30 mm)
- **4%** reported severe pain (VAS ≥ 54 mm)
- No association with IMA harvesting
- No difference between CABG – Valve Surgery
Pain after Cardiac Surgery

A Prospective Cohort Study of 1-Year Incidence and Intensity

Pasi Lahtinen, M.D.,* Hannu Kokki, M.D., Ph.D.,† Markku Hynynen, M.D., Ph.D.‡

• 213 cardiac surgery pts (CABG)
• Full sternotomy, All IMA harvesting
• Follow – up survey
  - 4 days & 1, 3, 6, 12 months postoperatively

1 year postoperatively
Chronic post Sternotomy Pain
17% at rest, 31% at movement

14% of pts: mild
1% of pts: moderate
2% of pts: severe

• Upon movement persistent pain was more common
• Pts with moderate – severe acute postoperative pain chronic poststernotomy pain more frequently
Epidural analgesia

Chronic Post – Sternotomy Pain
Is HTEA worth the risk in cardiac surgery???
Persistent Pain After Cardiac Surgery: An Audit of High Thoracic Epidural and Primary Opioid Analgesia Therapies

Sue C. Ho, MBBS, FANZCA*, Colin F. Royse, MBBS, MD, FANZCA†‡, Alistair G. Royse, MBBS, MD, FRACS‡§, Arthur Penberthy, MBBS, FANZCA*, and Roderick McRae, MBBS, FANZCA, FFIANZCA‡

*Department of Anaesthesia, Monash Medical Centre; †Department of Pharmacology, University of Melbourne; and Departments of ‡Anaesthesia and Pain Management and §Cardiothoracic Surgery, The Royal Melbourne Hospital, Melbourne, Australia

- 244 pts CABG 1997 – 1999
- Audit on an intention to treat basis
- HTEA 150 pts, OPIOIDS 94 pts
- Persistent pain at any site 29%
- Post – Sternotomy pain 25%
- Severe pain unable to cope with 1%

### Comparative Audit of HTEA and OPIOID Groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>HTEA (n = 150)</th>
<th>OPIOID (n = 94)</th>
<th>P – value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex(M / F)</td>
<td>112 / 38</td>
<td>72 / 22</td>
<td>0.762</td>
</tr>
<tr>
<td>Age (years)</td>
<td>66.1 ± 0.86</td>
<td>67.1 ± 0.85</td>
<td>0.434</td>
</tr>
<tr>
<td>Time from Operation (months)</td>
<td>16.9 ± 0.64</td>
<td>23.3 ± 1.46</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>% Persistent Sternotomy Pain</td>
<td>24.7</td>
<td>25.5</td>
<td>0.880</td>
</tr>
<tr>
<td>VAS</td>
<td>2.8 ± 0.3</td>
<td>3.4 ± 0.4</td>
<td>0.205</td>
</tr>
<tr>
<td>PRI</td>
<td>15.2 ± 1.9</td>
<td>11.9 ± 1.7</td>
<td>0.209</td>
</tr>
</tbody>
</table>

VAS = Visual Analogue Scale on a 0 – 10 scale; PRI = The McGill Pain Rating Index; HTEA = High Thoracic Epidural Analgesia. Continuous Variables are mean ± SD.
Can chronic poststernotomy pain after cardiac valve replacement be reduced using thoracic epidural analgesia?

M. K. Jensen and C. Andersen
Department of Cardiothoracic Anaesthesia, Odense University Hospital, Odense C, Denmark


- 49 pts studied
- AoV / MV surgery
- 35 pts TEA, 14 pts non – TEA
- 1.5 after surgery
- Questionnaire regarding
  - acute pain management
  - complications of HTEA
  - chronic post sternotomy pain
  - any wound pain
Table 4

<table>
<thead>
<tr>
<th></th>
<th>+ TEA (n = 35)</th>
<th>- TEA (n = 14)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sternotomy pain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>37%</td>
<td>21%</td>
<td>NS</td>
</tr>
<tr>
<td>No</td>
<td>60%</td>
<td>71%</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>3%</td>
<td>7%</td>
<td></td>
</tr>
<tr>
<td>Severe pain</td>
<td>5.6%</td>
<td>0%</td>
<td>NS</td>
</tr>
</tbody>
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*Two patients experienced malfunctioning catheters and would not choose thoracic epidural analgesia (TEA) again. The patients commented that they did not know of another pain regime and therefore were unable to reply to the question.*
Follow-up of a 564 pts
Cardiac surgery between 1999 – 2002
Chronic Pain Post Surgery: 23%
  - 80% pain 1 or more d/wk
  - 50% VAS score > 4
  - 31% analgesic requirements
Greater analgesic needs perioperatively
Increased risks of chronic postoperative pain
Longer time elapsed from surgery to survey
Less likely to report chronic postsurgical pain
The prevalence of chronic chest and leg pain following cardiac surgery: a historical cohort study

J. Bruce, N. Drury, A.S. Poobalan, R.R. Jeffrey, W.C.S. Smith, W.A. Chambers


● 1080 responders
● Prevalence of Post Cardiac Surgery Pain: 39.3%
  - 130 chronic chest pain
  - 100 chronic post saphenectomy pain
  - 194 pain at both sides
● Mean Time since Surgery: 2 years
● Impact on Quality of Life
● Prevalence of chronic pain decreased with age
  55% < 60 years, 34% >70 years
● Risk factors
  - BMI > 25
  - preoperative angina
Nothing to Disclose

Except: YOU WILL NEED YOUR THINKING CAPS!
Difficulties in Studying Chronic Post Surgical Pain Post Cardiothoracic Surgery

The Role of Epidural Analgesia

- Long term follow-up
  - Time
  - Patient cooperation
  - Record keeping
  - Contacts
- Multicentre vs single centre
- Lack of randomization
- Small patients’ groups – retrospective studies
- Lack of familiarity with HTEA in cardiothoracic surgery
- Risks of HTEA

Akkaya T & Ozkan D. AGRI, 2009
Difficulties in Studying Chronic Post Surgical Pain
Post Cardiothoracic Surgery
The Role of Epidural Analgesia

- Nothing in the literature until only 20 years ago
- Clinicians’ ignorance in the past
- Role of surgeon in chronic post surgery pain pathogenesis
- Lack of uniform perioperative care
- Extensive neuroanatomy of thoracotomy/sternotomy pathogenesis
- Modern neurophysiology of pain has only been around for 20 years
- Role of multimodal analgesia: may be very important

A large PRCT that pays meticulous attention to the above is the only way to determine any benefit of epidural analgesia

If a study ignores one of these it will fail

Wildgaard K et al. Eur J Cardiothorac Surg, 2009
Implications of Surgery

- Initial afferent barrage of pain signals
- Secondary inflammatory response
Peripheral Nervous System
Central Nervous System

1. amplification
2. prolongation

of postoperative pain

Katz J, Seltzer Z
Expert Rev Neurother, 2009; 9: 723 - 744
Persistent Postsurgical Pain

• the consequence either of ongoing inflammation or, much more commonly, a manifestation of neuropathic pain, resulting from surgical injury to major peripheral nerves.
Mechanisms associated with PERIPHERAL SENSITIZATION to pain

Kehlet H, Jensen TS, Woolf C
Lancet, 2006; 367: 1618 – 1625
Central Sensitization

Burke S, Shorten GD
When pain after surgery does not go away

Kehlet H, Jensen TS, Woolf C
*Lancet*, 2006; 367: 1618 – 1625
Postoperative Hypersensitivity State

Primary Hyperalgesia
Secondary Hyperalgesia

Kehlet H, Jensen TS, Woolf C
*Lancet*, 2006; 367: 1618 – 1625
Persistent Postsurgical Pain: Risk Factors and Prevention

Kehlet H, Jensen T, Woolf CJ

The Lancet, 2006; 367 (9522): 1618-1625
Functional pharmacological options for pain management

- Systemic opioids
- Psychological methods

CNS

- Epidural and intrathecal opioids, LA and non-opioids
- TENS

- Epidural LA

- LA (infiltration, PNB)
- NSAIDs
- Paracetamol
- Opioids

ESRA-AZ POPM 2005

from N. Rawal
Given the advances in understanding of the pathogenesis of pain and the amount of discomfort and distress involved, no patient should be expected to experience ... moderate or severe pain postoperatively.
Pain Relief Strategies

“The bad news is that using highly targeted drugs ... may not be enough to reduce nociceptive input to the spinal cord... the long sought magic bullet may not be found”

Alan Basbaum 2004
Transition from acute to chronic postsurgical pain: risk factors and protective factors

- Chronic post surgical pain develops in an alarming pts proportion
- Every chronic pain was once acute
- Who will develop chronic pain after cardiothoracic surgery???
- Risk Factors
- Protective Factors
  - Surgery / Anaesthesia / Analgesia
  - Biological
  - Psychosocial
  - Socio - Environmental
  - Patient – Related
  - Genetics of chronic postsurgical pain
    human genes polymorphism
    postsurgical pain phenotypes
    post genomic era

Katz J & Seltzer Z

Between the painful part and the patients’ experience of pain lies the nervous system.

Burke S, Shorten GD
When pain after surgery does not go away
“All daring actions begin from necessities”

Evripides

Only when we have the tools to identify the mechanisms responsible for the chronic pain in a particular individual and then the capacity to reverse the mechanisms, will the management of chronic pain really advance.

Recognition of the role of genetic variation & susceptibility

Chronic post sternotomy and post thoracotomy pain may be extremely amenable to preventive intervention if those who are at high risk could be identified in advance of the stimulus that induces pain

The goal awaits ......
Future studies are increasingly important to monitor the risk-to-benefit ratio from the use of Epidural Analgesia in cardiothoracic surgery for chronic postsurgical pain prevention.
No MORE THINKING!!!!!
Turn it OFF!!!

Thank you!!