Thoracic Epidural Technique: Current status

XXV ESRA Congress

Monte Carlo, Monaco

Sept 6-9, 2006

E. Argyra
Assist. Prof.
Department of Anaesthesiology and Pain Management
Aretaieion Hospital

National and Kapodistrian University of Athens

Greece

Define technique

- Epidural injection or catheter insertion in the epidural space in the region of thoracic spine
- Purpose: to administer a local anaesthetic, opioid or combination of both and or addition of adjuvant drugs
- Bolus or continuous administration

Anatomy of the spine

Illustrations from: Danilo Jankovic

Regional Nerve Blocks and Infiltration Therapy

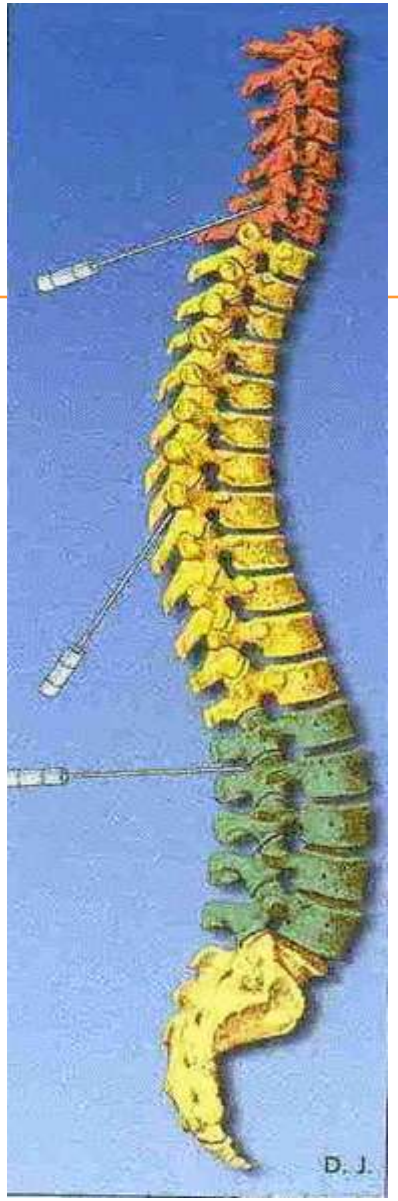
3rd Edition 2004 ABW. Wissenschaftsverlang

Level of epidural

- High Thoracic Epidural C7, T1-3
- Central Area T4-9
- Lower thoracic T10-T12- L1

Differences in

- Indications
- Level of Analgesia
- Procedure
- Physiological Sequelae



TEA - indications

- Anaesthesia and perioperative analgesia
- High risk patients (ICU)
- PAIN THERAPY
- Acute Pain
  - Trauma (rib fractures)
  - Acute pancreatitis
- Chronic pain
- Post herpetic Neuralgia
- Cancer Pain

TEA and Surgical procedures		
Anatomical Area	Procedure	Injection level
Chest	Cardiac surgery Pulmonary resection Esophagectomy	T2 T4-6
Upper abdomen	Gastrectomy Liver, Pancreas	 T6
Exraperitoneal Retroperitoneal Surgery	Vascular Surgery Renal	T8
Lower Abdomen	Bowel resection, Gynaecologcal tumor	 T10

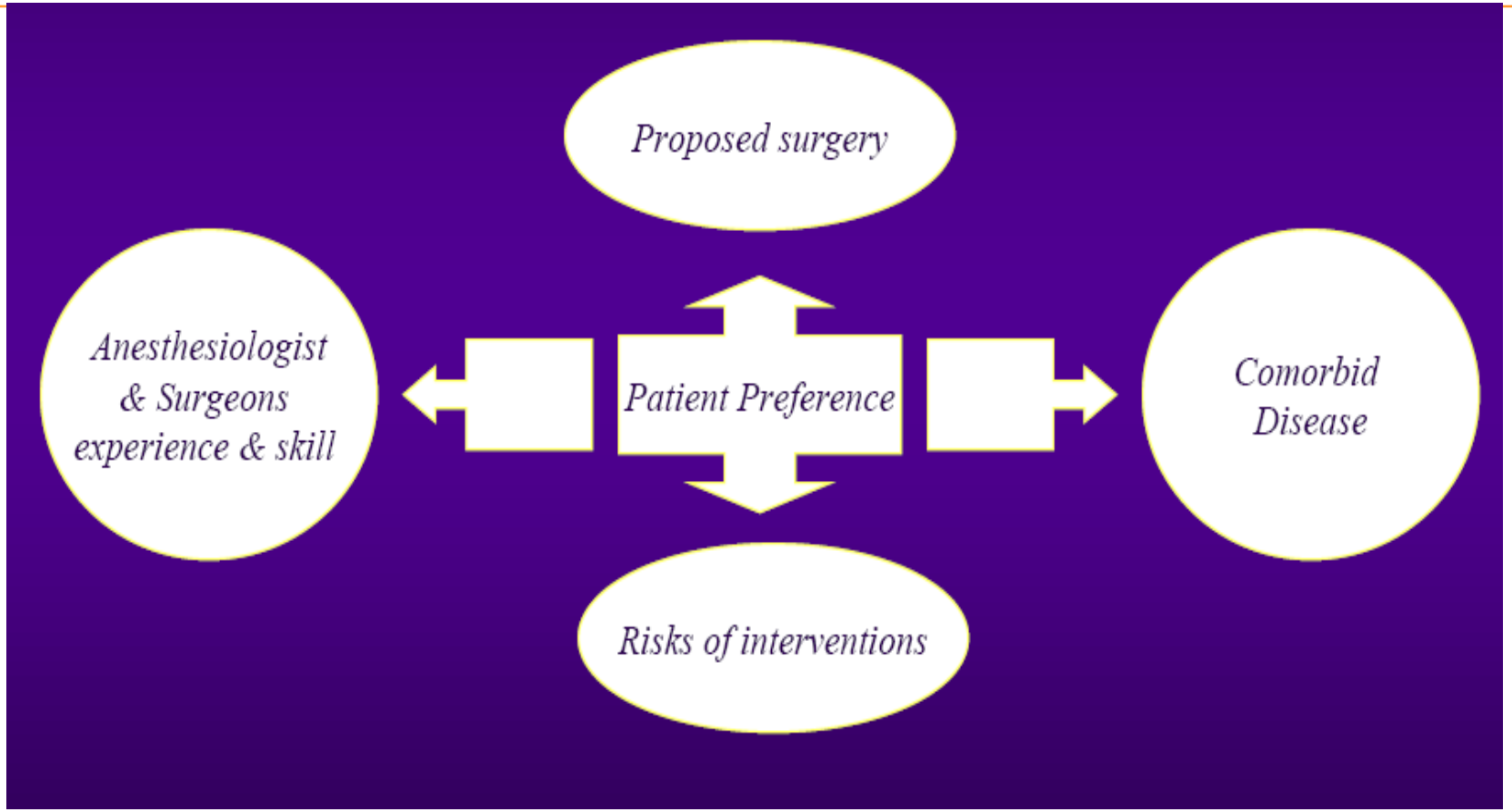
Contraindications

- Patient's refusal
- Patient under general anaesthesia
- Coagulation disorders, Anticoagulant therapy
- Sepsis- Local Infection- Immune deficiency
- Shock- Severe Hypovolaemia
- Acute deceases of brain and Spinal cord
- Raised intracranial pressure
- Allergy to local anaesthetics (+ intradermal tests)

Contraindications: Relative

- Chronic disorders of brain and spinal cord
- Severe deformities of spine
- Spinal fusion- metastasis
- Caution: in Cardiovascular decease

Patient Selection



Procedure

- Obtain Informed Consent-preferably written
- After
  - Detailed Information on Advantages
  - Possible Disadvantages
  - Risks (and rare but serious complications)
- Prerequesites
  - Experienced
  - or properly supervised anaesthetist

Informed consent- an integral part of the decision

inform patient on the highest risks and complications of common and rare / catastrophic events like:

- epidural haematoma being especially for cardiac surgery in coangulated patients 1: 1500 (100-fold higher than the non-cardiac patient population)
- epidural abscess 1: 800-1980
- dural puncture 1 : 200
- risk of epidural failure 1: 2.

D. Kamming & W. Davies, EJA 22: 85-88 2005

Who is doing it?

- Epidural anaesthesia the most difficult invasive anaesthetic procedure to master
- Success rate 80% after 90 attempts
  - Konrad et al Anesth Analg 1998;86: 635

Table 1. Success Rate and Recommended Case Load

Procedure	Success rate (%)	Recommended case load (Mean)	95% confidence interval for success rate[a]
Intubation	90	57	0.80–0.99
Spinal anesthesia	90	71	0.75–1.0
Epidural anesthesia	78	90	0.71–0.85
Brachial plexus block	87	62	0.76–0.97
Arterial line	84	60	0.60–1.0

[a] Confidence intervals are given for the mean recommended numbers (values were calculated from all 11 residents).

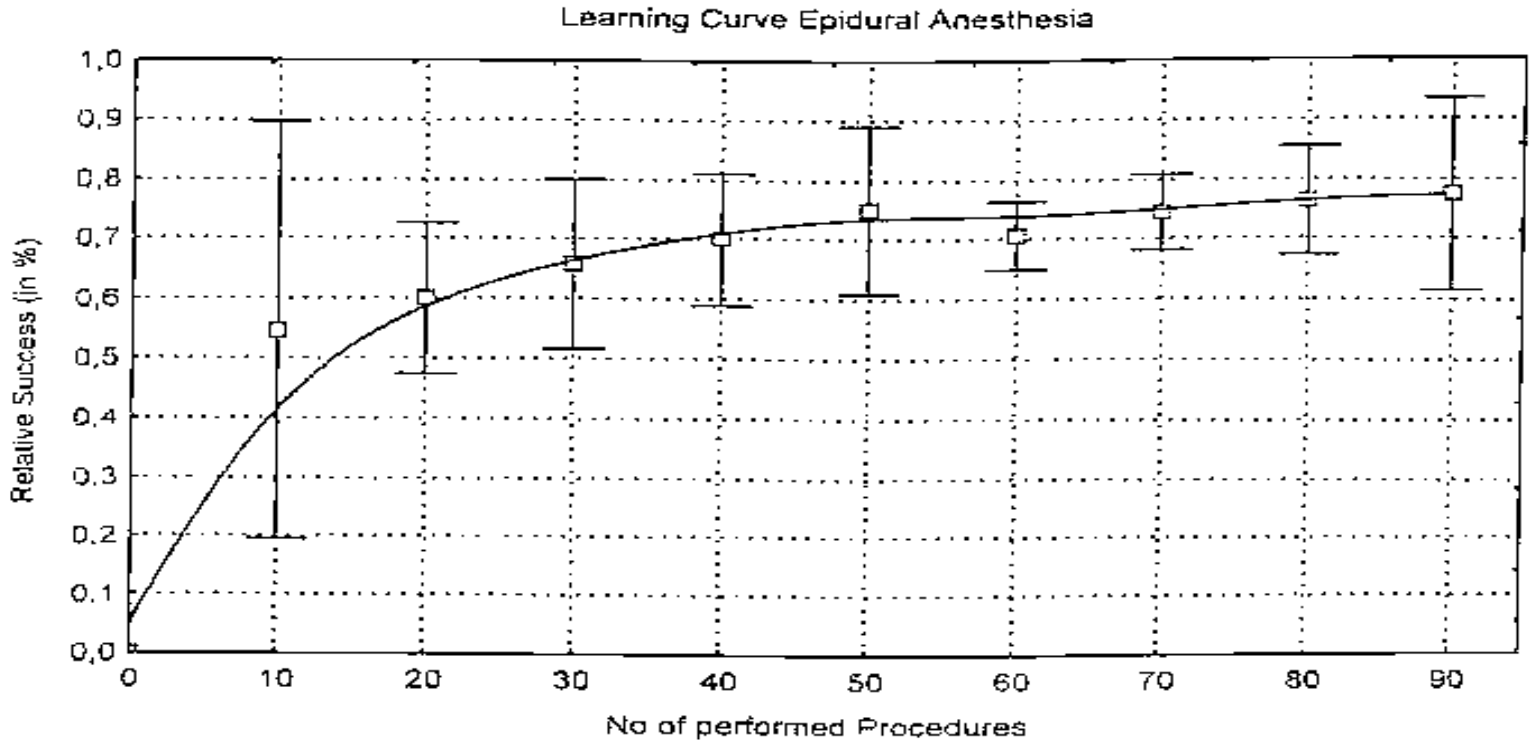


Figure 4. The epidural anesthesia learning curve.

Assessment of skills

- Standard of assessment? NO valid tool exists for evaluation of technical proficiency in epidural anaesthesia let alone TEA

- Scores should be developed on a system consisting of a global- rating form and a task-specific checklist and validated

Objective Assessment of Manual Skills and Proficiency in Performing Epidural Anesthesia—Video-Assisted Validation

Zeev Friedman, M.D., Rita Katznelson, M.D., Isabel Devito, M.D., F.R.C.P.C., Mughina Siddiqui, M.D., and Vincent Chan, M.D., F.R.C.P.C.

Regional Anaesthesia and Pain Medicine, Vol 31, No 4 (July - August), 2006: pp 304-310

Proficiency in performing Epidural Anesthesia- Video assisted Validation

Scores on a system that consists of a global-rating form and a task-specific checklist had a significant relation to the number of epidural insertions performed (ie, experience). The interrater reliability of these assessment tools was very strong.

Friedman Z. et al Reg Anesth. Pain Med. 2006;34:304

checklist

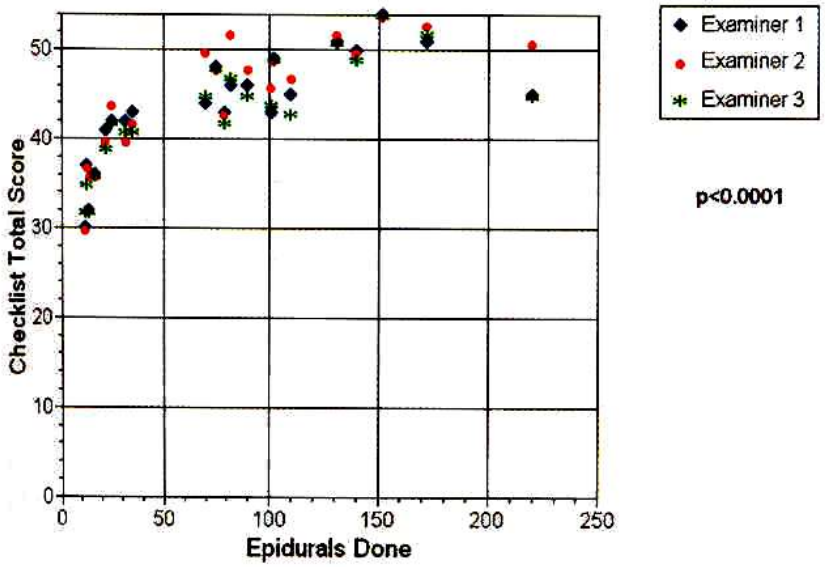


Fig 1. Total checklist scores *v* epidurals done.

Global rating scale

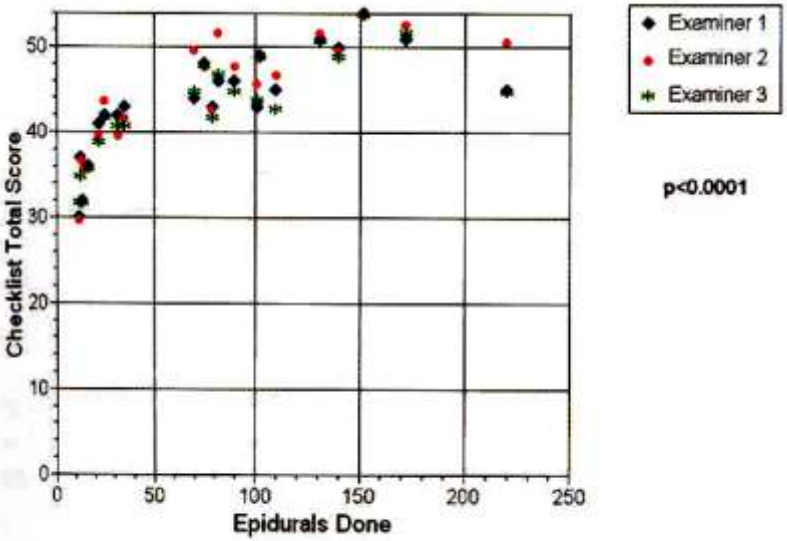


Fig 1. Total checklist scores *v* epidurals done.

Preparation

- Emergency equipment- anaesthetic machine
- Readiness for intubation
- Emergency drugs
- Intravenous access-Preload (250-500 ml)
- Monitoring

Aseptic technique

- Clear and precise procedure not available
- No data supporting which precautions to use when performing central neuraxial blocks
- Aseptic practice varies tremendously between practitioners
- Conflicting evidence on the frequency and/or likelihood of reducing clinical infections (abscess-meningitis)

Aseptic technique

- Guidelines for prevention of surgical site infections, may be extrapolated for regional anaesthesia (suggestive evidence)
- Until relationship between contamination, colonization and clinical infection is defined, efforts should be directed at minimizing intrinsic and extrinsic sources of infection, when performing a RA technique

D. L. Hepner: Gloved and Masked- Will gowns be next? Editorial Anesthesiology 105 (2) 2006

Procedure description: Hospital policy

Protocol intended to

- reduce variability in practice
- be effective according to best available evidence
- easy to implement
- avoid unnecessary cost

Benhamou D et al. Regional Anaesth. Highlights 2004

Procedure description: Hospital policy

- Any person involved must wear cup, new face mask, (Grade B) patient wear cup
- Anesthesiologist in usual OR clothes must
- Wash hands with antiseptic soap (Grade A)
- Dry on sterile towel (Grade B)
- Sterile gloves (Grade D)
- Sterile gown unnecessary??

Benhamou D et al. Regional Anaesth. Highlights 2004

Procedure description

- Disinfect back at least twice, large area centrifuge manner
- Antiseptic solution allowed to dry (B) between disinfections alcoh. chlorhexidine, povidone-iodine 1min alcohol-iodine 1-2min A
- Wipe off excess (D)
- Drape securely with sterile towel (D),
- Disposable equipment (D), non-touch technique (D)
- Drugs drawn through filter (D), injected after filter removal
- Transparent sterile dressing
- Infusion of sterile mixtures, preferably continuous (Grade D)
- Antiseptic hand-washing & swabbing before hub manipulation
- Inspect catheter tip for completeness - insertion site for inflammation (D)

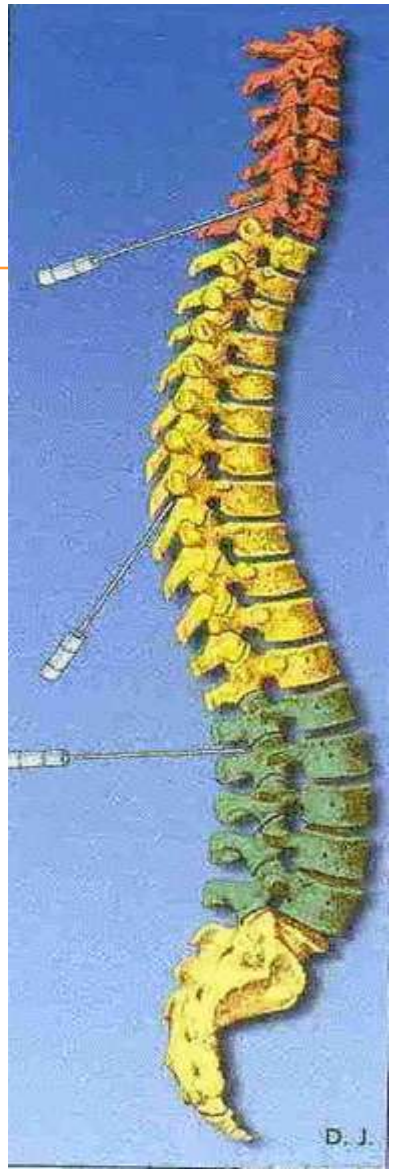
Procedure cont.

- Aseptic techniques and Regional Anaesthesia

  Consensus conference to clarify good practice for neuraxial techniques 2004 ASRA annual spring meeting, Orlando, Florida
- Hebl J.R The importance and Implications of Aseptic Techniques during Regional Anaesthesia Reg. Anaesth. Pain Medicine 2006; 31:331-323
- Hebl JR, Neal JM Editorial: Infectious Complications: A New Practice Advisory, by Reg. Anaesth. & Pain Medicine 2006;31:291

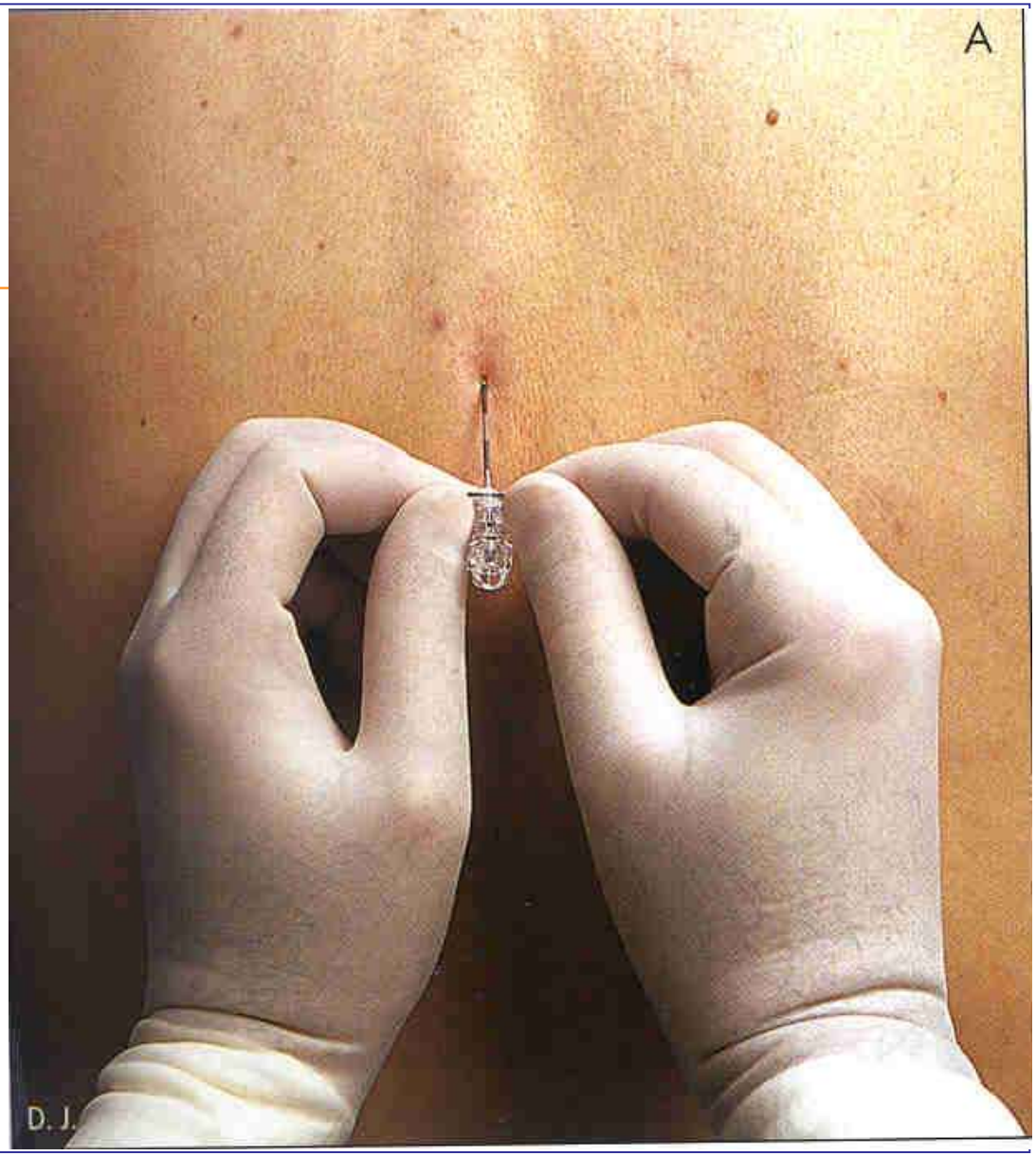
Technique

- Upper and lower region:
  spinous processes
  almost parallel to the sagital plane
  angle almost same as in lumbar region
- Mid region:
  caudal angle, laminae slanted
- T10-12: distance from skin slightly less
  shorter spinous processes

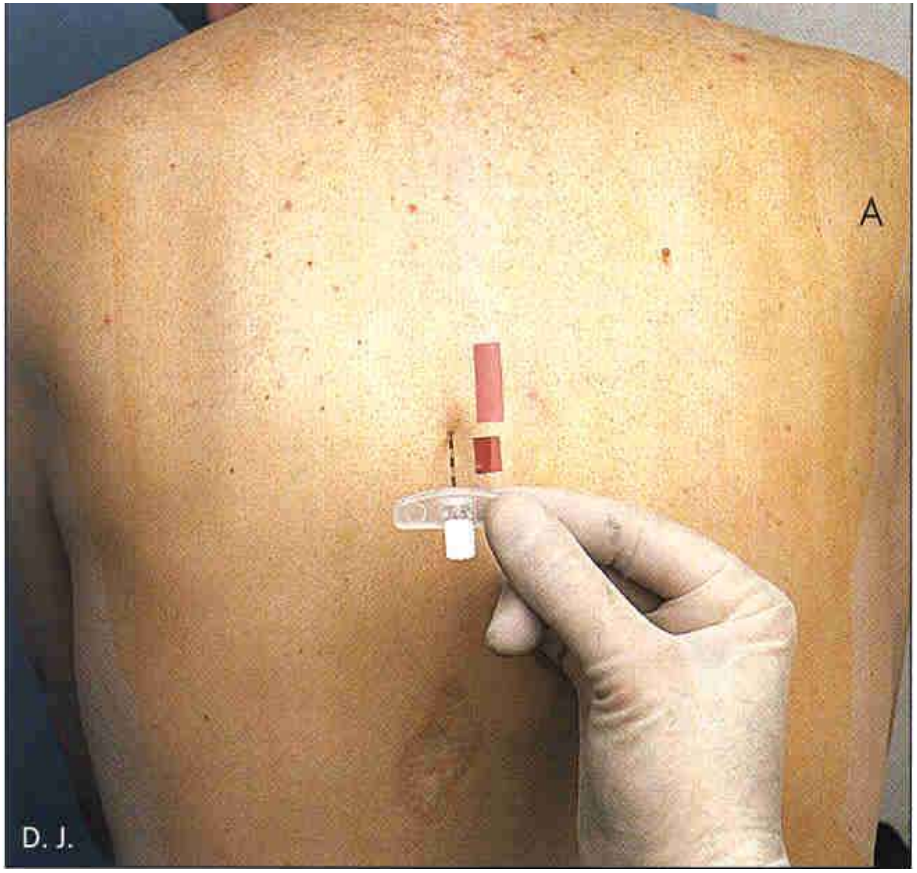


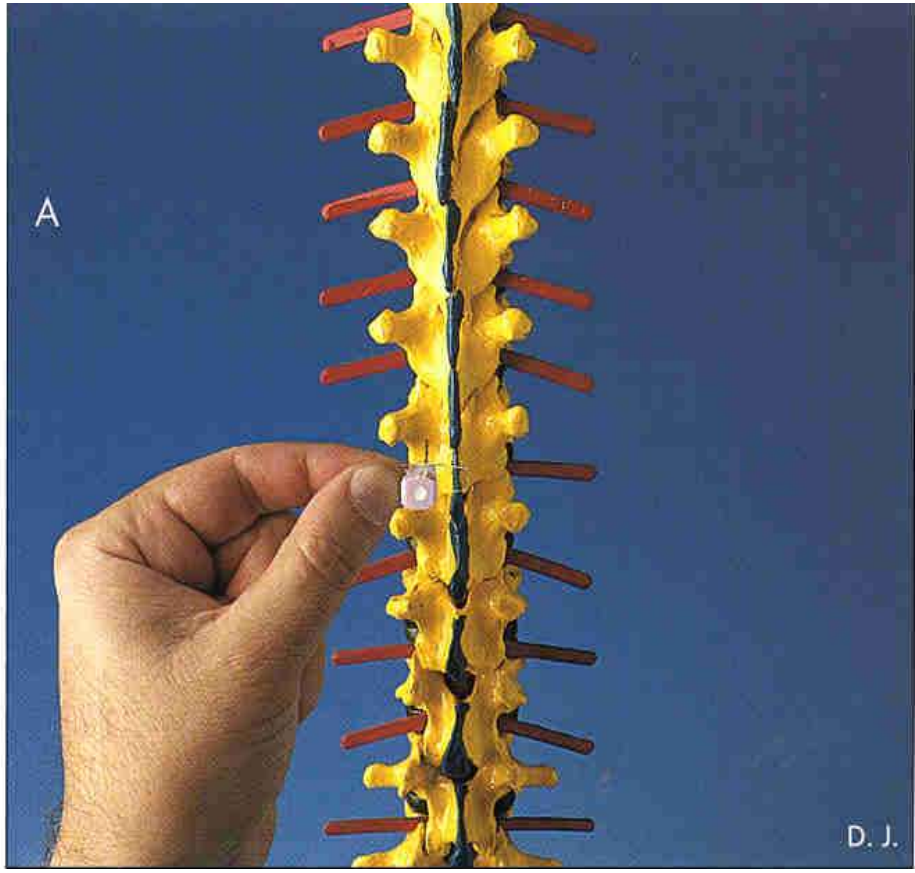
Approach

- Median
- Patient sitting

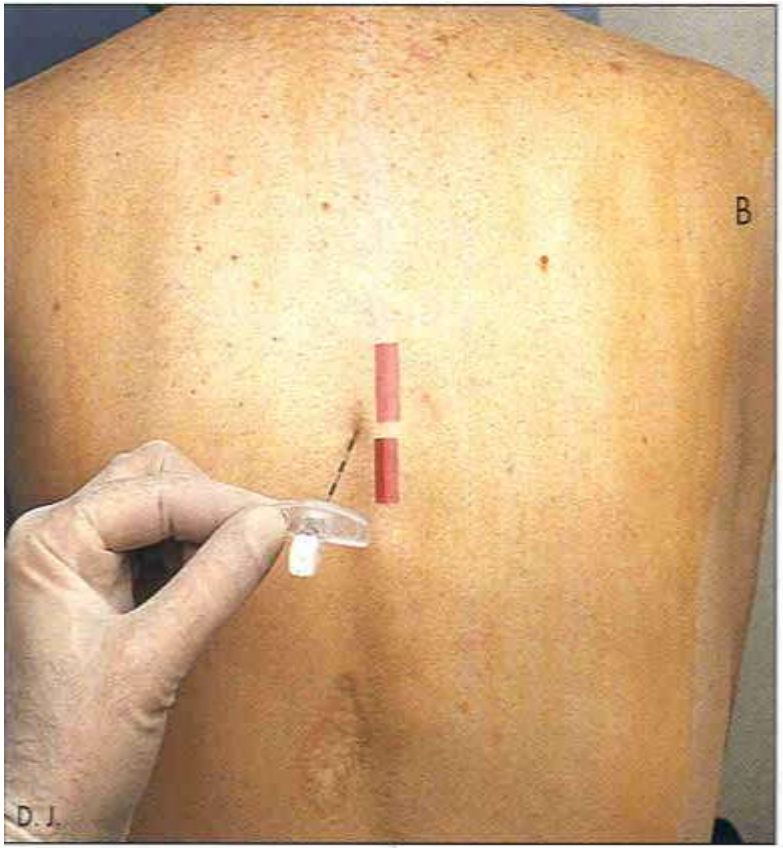


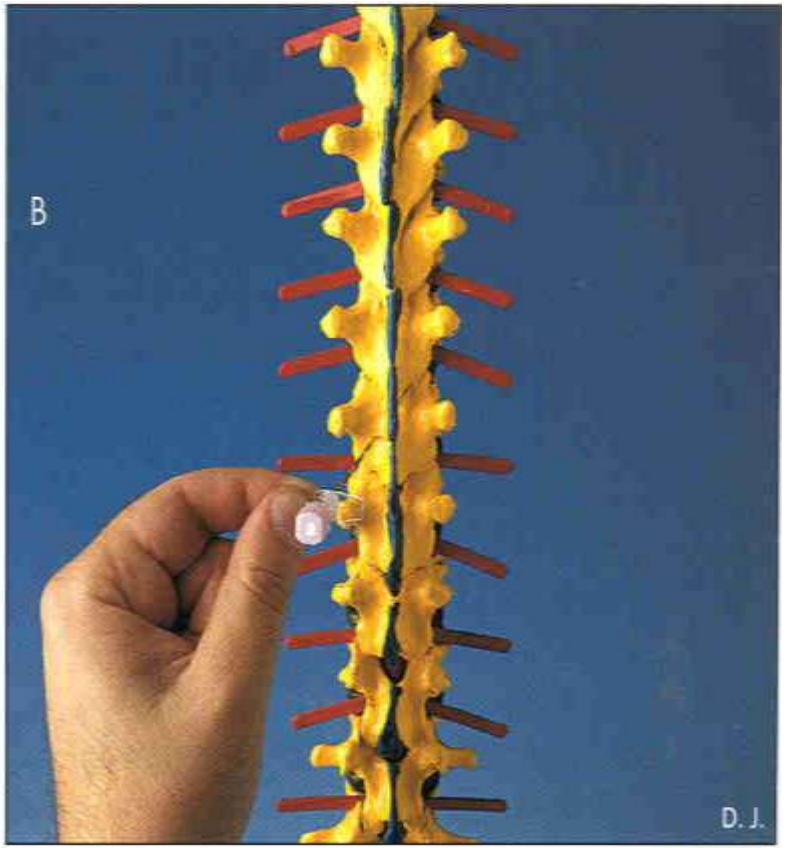
Paramedian approach:
step 1: Needle position 1.5 cm lateral to the caudal tip of the spinous process



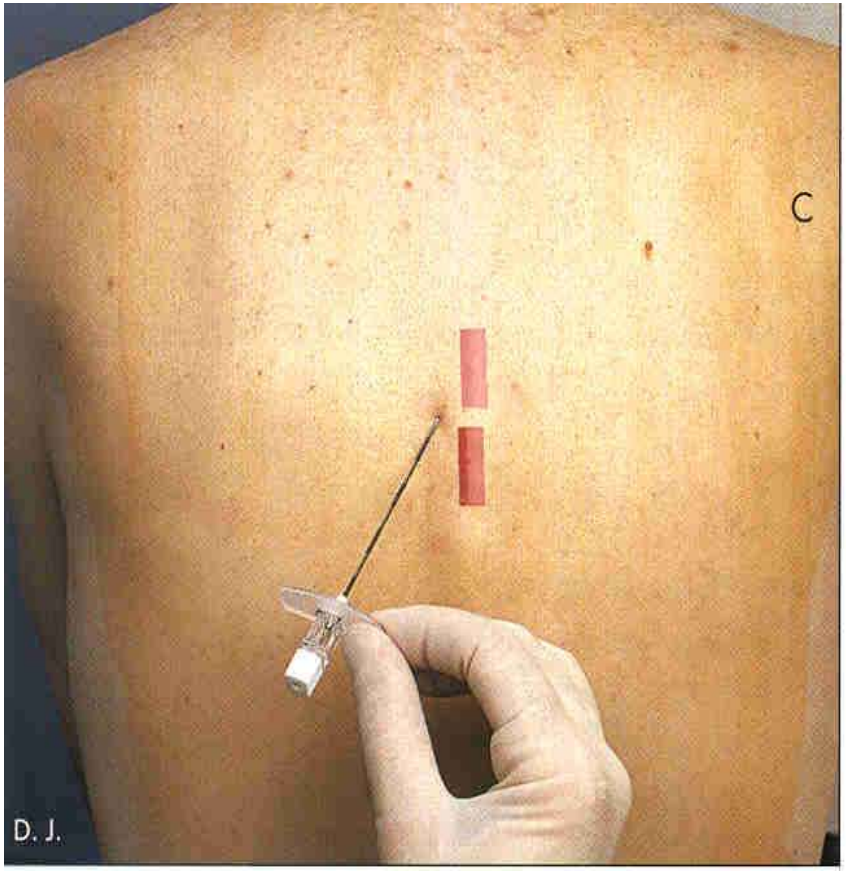


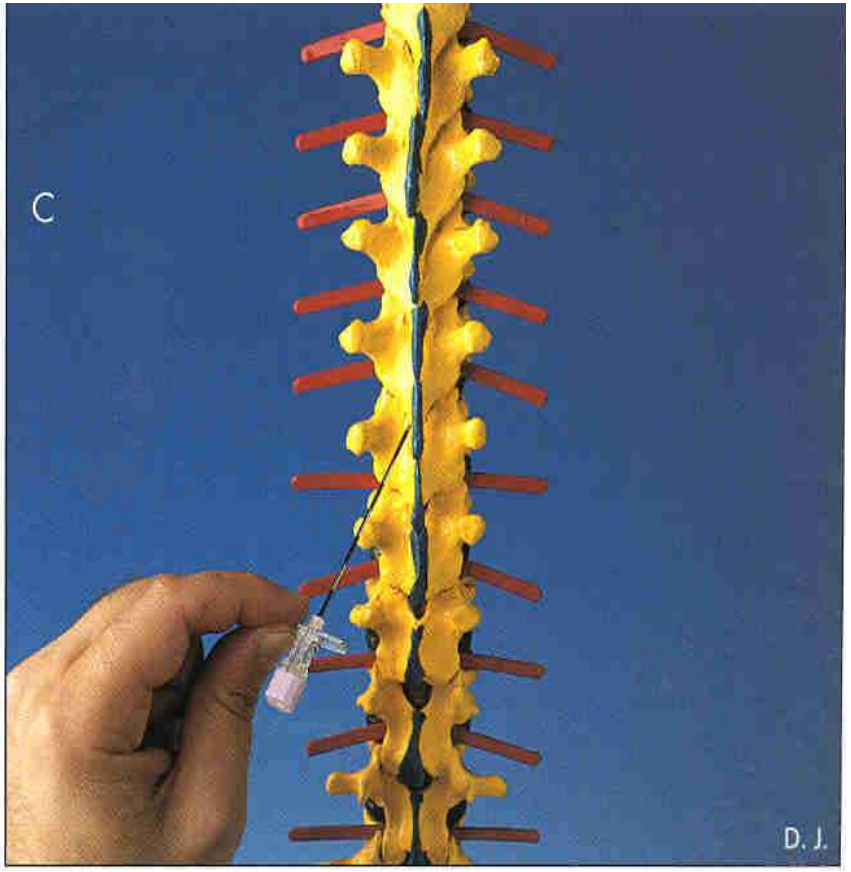
Step 2: Needle angle of 15° to the sagital plane





Step 3: angle 50-60° to the skin surface





Depth of TE space paramedian approach

998 patients standardized technique

- mean TE depth: 5.11 ± 0.94 cm
- Positive corel. with body weight, body mass index
- unrelated to sex, age, body height
- each 10 kg of increase in b.w. ~ 0.39-cm increase in depth
- paramedian depth 0.34 cm longer at upper thoracic levels above T9, than bellow T10

Hui-Chin Lai et al. Journ. Clin Anesth. 2005; 17: 339-343

Depth or distance from skin

Prediction by CT using Pythagorean triangle trigonometry

- CT-derived depth of the epidural space compared with the actual depth of needle insertion
- CT-derived and actual depths of the epidural space highly correlated ($r = 0.88$, $R2 = 0.78$, $p < 0.0001$).
- CT-der. depth > than actual depth between 0.03 to 0.49 cm
- No associations between CT-deriv or actual depth and age, weight, height or body mass index.

Carnie J, et al Anaesthesia 2002;57:701-4

British Journal of Anaesthesia 92 (2): 271–3 (2004)
DOI: 10.1093/bja/aeh053

BJA

SHORT COMMUNICATIONS

Prediction of the distance from skin to epidural space for low-thoracic epidural catheter insertion by computed tomography

M. C. Kao[1], S. K. Tsai[1], W. K. Chang[1], H. T. Liu[1], Y. C. Hsieh[1], J. S. Hu[1]* and M. S. Mok[2]

[1]*Department of Anesthesiology, Veterans General Hospital-Taipei, School of Medicine, National Yang-Ming University and* [2]*Taipei Medical University, Taipei, Taiwan*

**Corresponding author. E-mail: sktsai@vghtpe.gov.tw*

Background. It may be clinically useful to predict the depth of the epidural space.

Methods. To investigate the accuracy of preoperative abdominal computed tomography (CT) in prediction of the distance for low-thoracic epidural insertion, a single group observational study was conducted in 30 male patients undergoing elective major abdominal surgery requiring epidural analgesia for postoperative pain relief. Using the paramedian approach, low-thoracic epidural insertion at T10–11 interspace was performed with a standardized procedure to obtain an actual insertion length (AIL). According to the principles of trigonometry, an estimated insertion length (EIL) was calculated as 1.26 times the distance from skin to epidural space measured from the preoperative abdominal CT.

Results. The mean (SD) EIL and AIL were 5.5 (0.7) and 5.1 (0.6) cm, respectively, with a significant correlation (r=0.899, P<0.01). The EIL tended to have a higher value than the AIL (0.4 (0.3) cm). There were significant correlations of both EIL and AIL with weight (P<0.01), BMI (P<0.01), and body fat percentage (P<0.01), but not with height (P>0.05).

Conclusions. We conclude that the preoperative abdominal CT is helpful in prediction of the distance for low-thoracic epidural insertion using the paramedian approach.

Br J Anaesth 2004; **92**: 271–3

Distance skin to epidural space

Prediction with preop. abd. CT

observational study, 30 male, elect. major abd. surg.

Paramedian T10±1

Standardized procedure to obtain an actual insertion length (AIL)

estimated insertion length (EIL) calculated :distance from skin to epid. space (measured from the preop) CTx1.26

Results. EIL 5.5 ± 0.7 AIL 5.1 ±0.6 cm signif cor 0.899

Sign. Corr of EIL, AIL with weight, BMI, body fat %

not with height

Identification of the epidural space

- Loss of resistance technique
- Hanging drop
- Ultrasonography
- Fluoroscopy
- MRI, CT prediction
- Electrical stimulation (paediatrics)

Ultrasound imaging of the thoracic epidural space

20 volunteers Th 5-6

both techniques identified landmarks of TEDS, good correlation with MRI

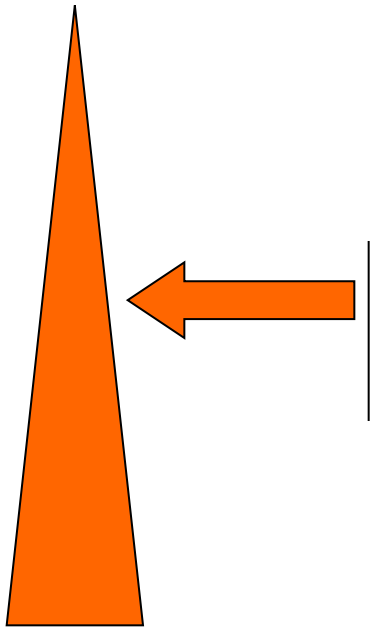
MR images easier to interpret

US better in the depiction of dura mater

Grau T et al Reg Anesth Pain Med. 2002 Mar-Apr;27(2):200

Ligamentum flavum

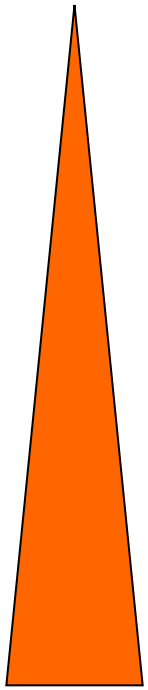
Thinner from spinal to cervical spine



thoracic area 1mm

Epidural space: a few mms before the spinal tap!!

- Cervical spine : 2-3 mm
- Thoracic 3-5 : mm
- Lumbar : 6mm



Predicting the difficult block

- A prospective study (595 neuraxial blocks 424 epidurals 373 thoracic)
- Quality of Landmarks and obvious Spinal deformity better predicts the ease or difficulty of neuraxial block than body habitus

Sprung J. et al Anesth Analg 1999;89: 384-9

Identification of the epidural space

- Gaps in the ligamenta flava are frequent at the cervical and high thoracic levels but become rare at T3/T4 and below

Lirk P. et al Anesthesiolology 2003;99:1387

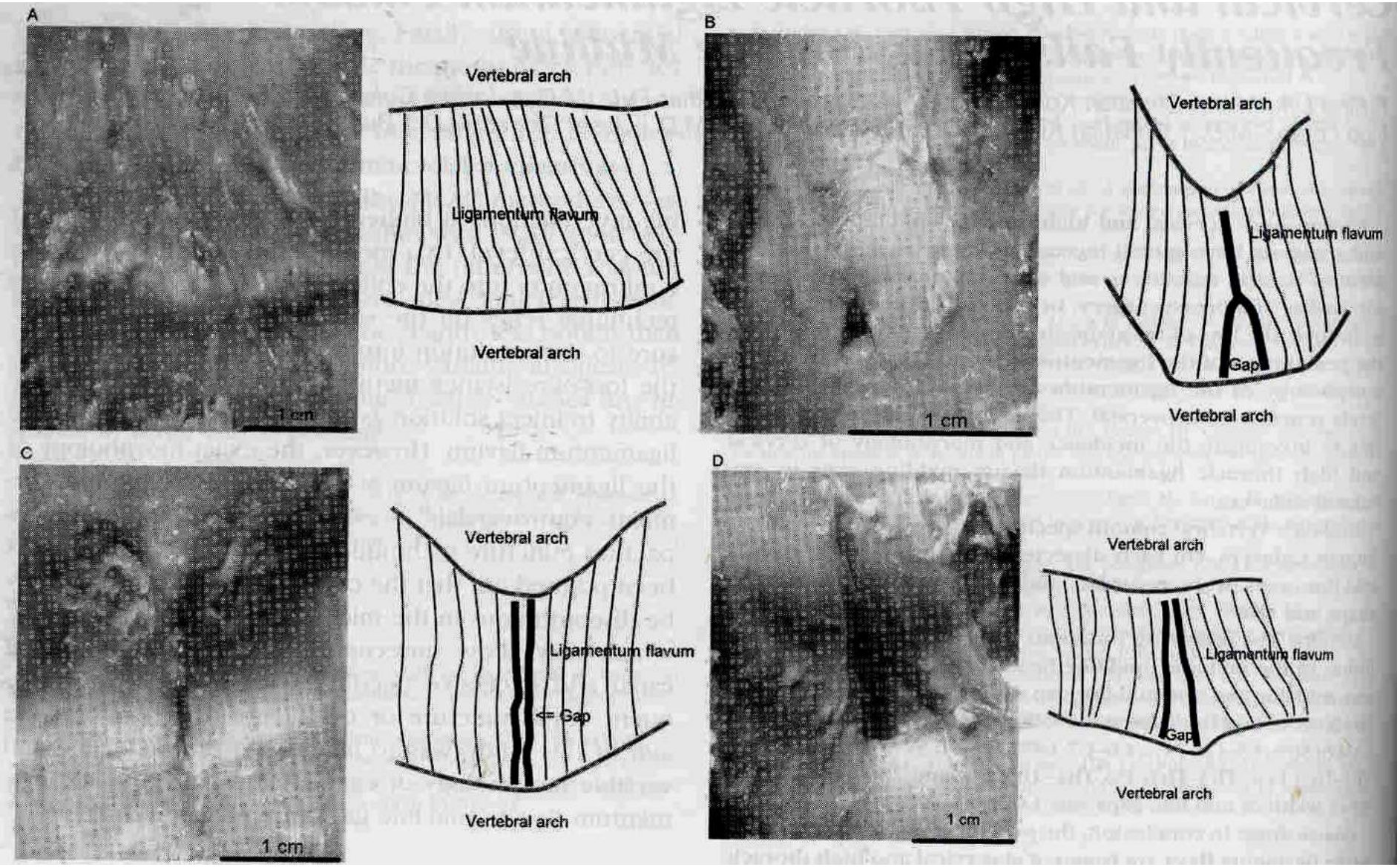

A
1 cm
Vertebral arch
Ligamentum flavum
Vertebral arch
B
1 cm
Vertebral arch
Ligamentum flavum
Gap
Vertebral arch
C
1 cm
Vertebral arch
Ligamentum flavum
Gap
Vertebral arch
D
1 cm
Vertebral arch
Ligamentum flavum
Gap
Vertebral arch

Table 1. Variations of Ligamentum Flavum Anatomy at the Investigated Levels

	C3/C4	C4/C5	C5/C6	C6/C7	C7/T1	T1/T2	T2/T3	T3/T4	T4/T5	T5
	4	9	10	14	12	16	18	30	41	
	0	2	1	1	8	22	24	19	8	
	8	14	27	27	16	6	3	2	1	
	0	1	1	0	7	4	2	0	0	
Gaps/total	8/12 (66%)	17/26 (65%)	29/39 (74%)	28/42 (66%)	31/43 (68%)	32/48 (66%)	29/47 (61%)	21/51 (41%)	9/50 (18%)	9/ (18

Row 1 lists the number of specimens with complete fusion, row 2 lists those with incomplete fusion with a gap in the caudal third, row 3 represents those w mid-line gaps throughout the entire height, and row 4 depicts those with mid-line gaps enlarging in the caudal third. Combined incidences of rows 2–4 summarized as "total."

Thoracic EP

- Considered negative at the moment of epidural puncture induced by tenting of the dura
- Pressure measured using a closed pressure system after insertion of a Tuohy needle at T7-8
- High negative E.P, up to -60 mmHg, observed at the moment of puncture. becoming positive in ~ 30 secs in 12 of 13 patnts stabilized at +3.7 +/- 3.2 mmHg within 90 sec

Okutomi T et al Can J Anaesth. 1993;40:1044-8

Continuous monitoring of TEP at T7-T8

- increases with 5 and 10 cm H2O PEEP
- increases in the Queckenstedt test
- decreases in the head-up position

  Iwama H, et al J Crit Care 2000;15:60-3
- Positive and greater than CVP

  D. Watson (Paper in ESRA congress)

Test dose review

- injection of 10 or 15 µg of epinephrine: Evidence for intravascular misplacement detection in nonpregnant adult patients (increase in either SBP≥ 15mmHg or in HR ≥ 10bpmd (**recommended)**
- no RCT demonstrating or verifying which local anaesthetic and best dose to detect intrathecal or subdural misplacement currently 45-60 mg of lignocaine is used
- **incidence of unrecognized intrathecal (0.53%) or subdural (0.8%) epidural catheter misplacement is extremely infrequent**
- to be clinically useful **a** test with a PPV (positive pressure value) close to 100 is needed

J Guay The epidural test dose: a review Anest Analg 2006;102:921

Dosage in the thoracic region

5-30% < than lumbar ~ 0.5-0.8 ml / segment

Local anaesthetics

- **Ropivacaine**
  Incremental bolus injection: 0.75%, 5-15 (depending on the injection site).
  Infusion: 0.2% 8-10 ml/h (max 37.5 mg/h)
- **Bupivacaine**
  Incremental bolus injection: 0.25-0.5%, 4-6mL (for 2-4 thoracic segments)
  Infusion: 0.125%, 5-10 mL/h
- **Levobupivacaine**
  Incremental bolus injection: 0.25-0.5% 4-6 mL (for 2-4 thoracic segments)
  Infusion: 0.25%, 5-10 mL/h

Dosage

Combination of local anaesthetics and opioids

- **Ropivacaine - sufentanil**

  Bolus : Ropiv.0.5% 7-9 ml/T8-9, 10-12ml/T9-11 sufent.30 µg

  infusion : Ro. 0.2% + sufent. 0.5 µg/ml 5-7 mL/h

- **Bupivacaine - sufentanil**

  Bolus: Bup. 5 mL 0.25%, + 1 µg/ml sufentanil

  infusion : Bupiv. 0.125-0.0625% + sufent. 0.2-0.3 µg/ml 5-10 ml/h

- **Bupivacaine - fentanyl**

  Bolus: Bupiv.0.25-0.5% 5 ml + 50 µg fent.

  infusion : Bupiv. 0.125% + 1-2 µg/ml fent. 6-10 mL/h

HTEA: Dosing **morphine vs fentanyl**

200 patients **ropivacaine 0.2% +** fentanyl 2 µg/ml

VS **ropivacaine 0.2%** + morphine 20 µg/ml

Morphine may be superior and more cost-effective than fentanyl as adjunct to 0.2%rop. for TPCEA after thoracotomy or upper abd. surgery

Royse CE, et al Anaesth Intensive Care. 2005;33:639-44

My own preference

Ropivacaine - Fentanyl

- Bolus : Ropivacaine 0.5% + fent.100µg

  7-9 ml T8-9, 10-12 ml, T9-11
- Infusion: Ropiv. 0.2% + fent. 0.4 µg/ml 5-7 ml/h

British Journal of Anaesthesia 95 (5): 685–91 (2005)
doi:10.1093/bja/aei238 Advance Access publication September 23, 2005

BJA

REGIONAL ANAESTHESIA

Comparison of three different epidural solutions in off-pump cardiac surgery: pilot study

J. F. Olivier[1], N. Le[1], J. L. Choinière[1], I. Prieto[2], F. Basile[2] and T. Hemmerling[1]*

- Sixty patients undergoing TEA >1 h before heparin at T2–T4
- bupivacaine 0.25%, 8 ml, 15 min before surgery and extubation, 10 ml h1 during surgery block-randomized for one of the three treatments, up to 72 h
- bupivacaine 0.125% alone,
- bupivacaine 0.125% + fentanyl 3 mg/ml
- bupivacaine 0.125% + clonidine 0.6 mg
- Pain scores, infusion rates, respiratory function (PaO2- PaCO2), haemodynamic state recorded
- Pain control was very good, Respiratory function, haemodynamic stability no different between groups using similar infusion rates for up to 48h after surgery
- No neurological complications Paraesthesia similar in 3 groups.
- immediate extubation feasible with all TEA regimens.

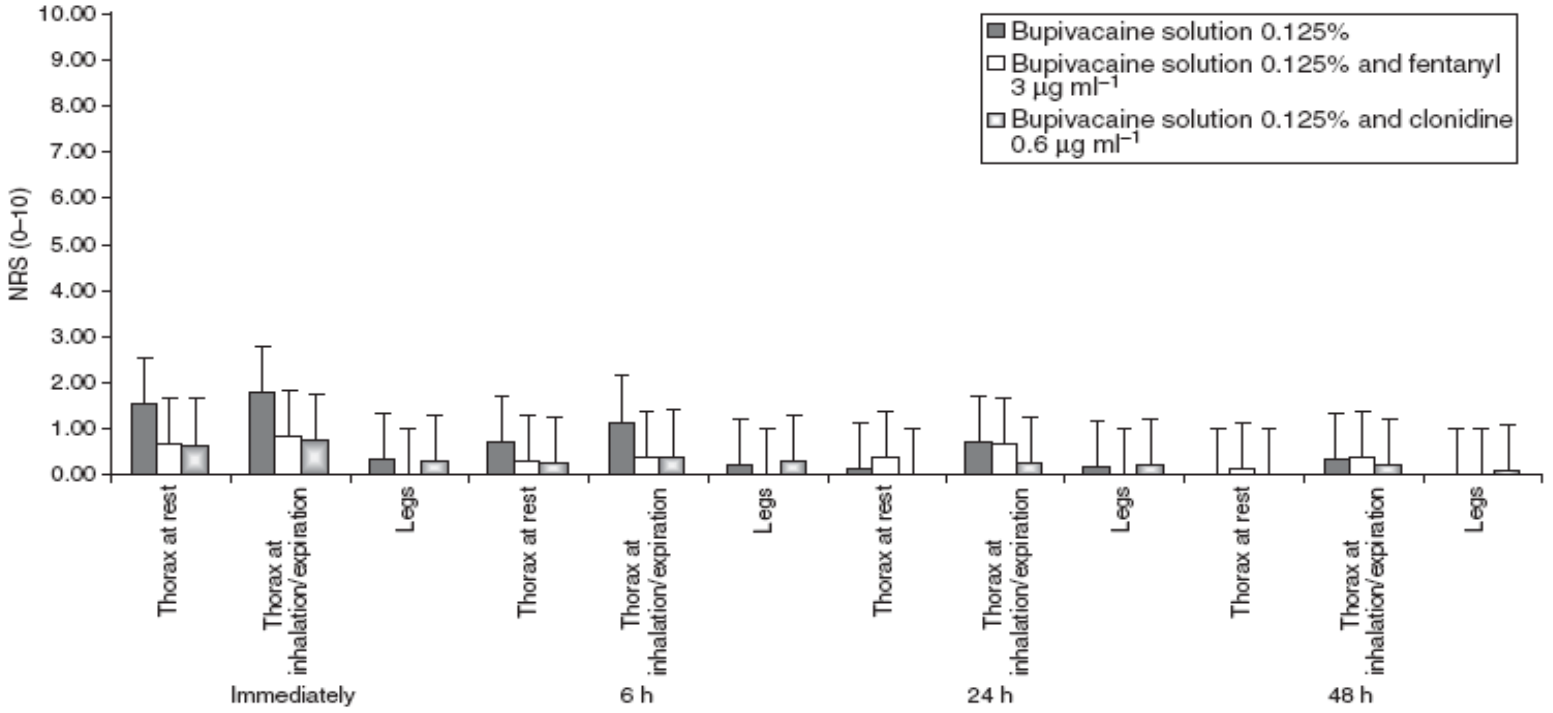


Fig 3 Pain scores for the thorax at rest and at maximal inspiration/expiration. The pain scores for the leg wound are also presented. A numerical pain scale was used, ranging from 0=no pain to 10=maximal imaginable pain. Pain scores were recorded immediately after surgery and 6 h, 24 h and 48 h after surgery. Data are presented as mean (SD).

Epidural tap

- Little information on the effects of epidural needle design or technique of insertion on cerebrospinal fluid leak or PDPH
- cadavers study: epidural needle gause the most important predictor of CSF leak
- Leak > with 17g Hustead < with 20g Tuohy

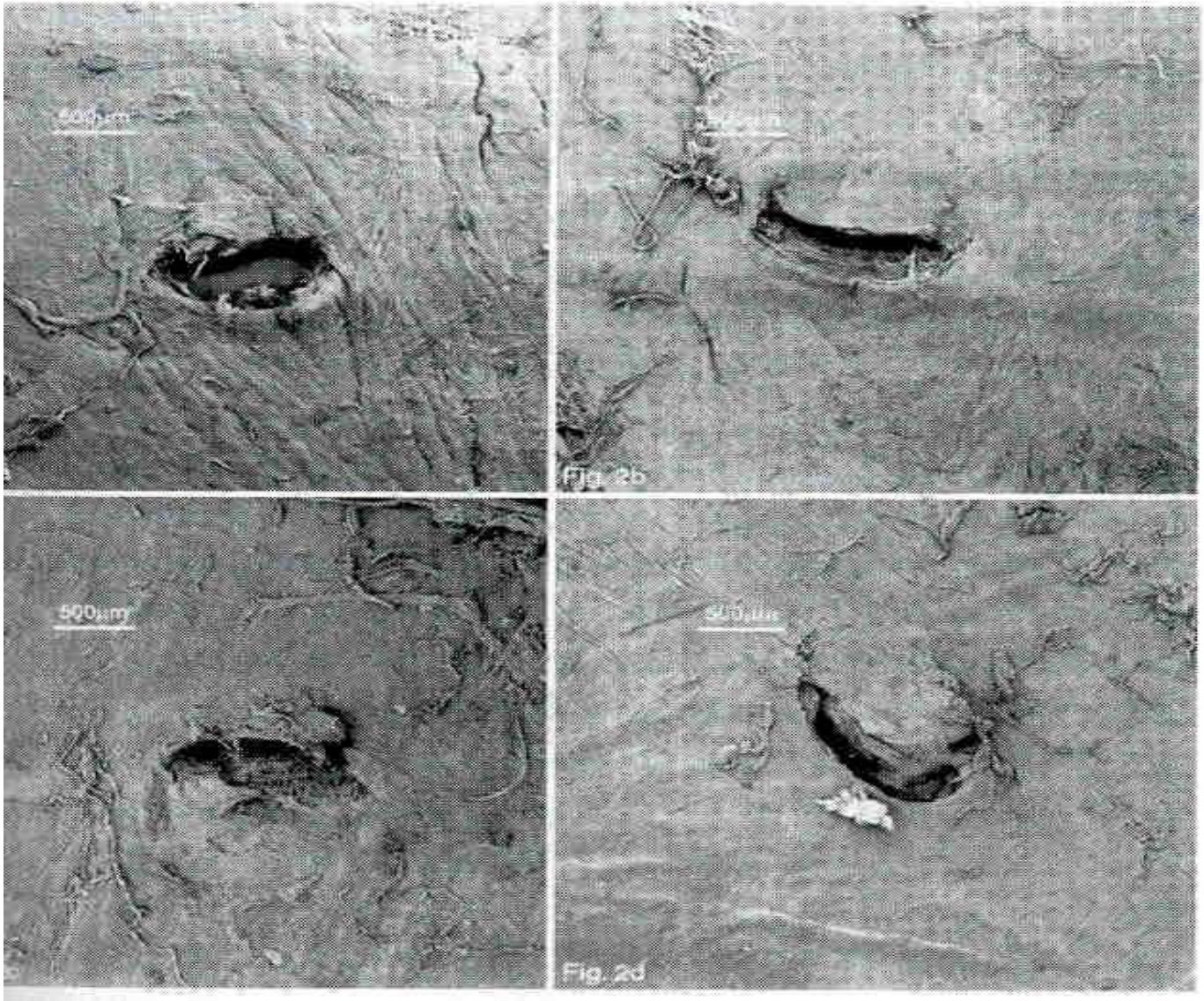
Angle P. et al Anesthesiology 2003;99:1376

Epidural tap

Clinical studies

- Accidental puncture with 20-g Tuohy needles at mixed anatomic levels using loss of resistance to saline are associated with large reductions in PDPH compared to larger epidural needles

  Banks et al Int J Obstetr Anesth 2001;10:172



2. Scanning electron microscopic images of (*a*) a 17-gauge stead epidural needle puncture (bevel parallel, 90° angle), (*b*) 7-gauge Tuohy epidural needle puncture (bevel parallel, 90° gle), (*c*) an 18-gauge Special Sprotte® epidural needle punc- e (90° angle), and (*d*) an 18-gauge Crawford epidural needle ncture (bevel parallel, 90° angle).

Table 2. Effect of Epidural Needle Design on CSF Leak (90° Punctures, Bevel Parallel), Cadaver n = 10

Epidural Needles	17-Gauge Hustead	17-Gauge Tuohy	18-Gauge Tuohy	20-Gauge Tuohy	18-Gauge Special Sprotte®	18-Gauge Crawford
17-Gauge Hustead	516 ± 319	0.3668	0.2922	0.0018*	0.2078	0.1326
17-Gauge Tuohy		405 ± 209	0.8312	0.0024*	0.6468	0.4312
18-Gauge Tuohy			420 ± 191	0.0003*	0.4324	0.2707
20-Gauge Tuohy				100 ± 112	0.0162	0.0001*
18-Gauge Special Sprotte®					360 ± 208	0.9698
18-Gauge Crawford						356 ± 121

In the event of a bloody tap

- it has been suggested to delay surgery for 24h which has significant moral, organizational, and financial implications
- every patient should be closely monitored postoperatively using a standard protocol to assess any symptoms or signs of spinal cord compression.

Vandermeulen EP et al, *Anesth Analg* 1994;79:1165

Epidural patch ??

- Autologous blood ~10 mls
- Saline infusion
- Dextrane 40 (Barrios-Alacron et al Reg Anesth 1989)
- Dextran 40 or Polygeline (Haemaccel) M. Chanimov et al EJA 2006;23;776 (experimental) No toxic effects

Targeted thoracic epidural blood patch under electrical stimulation guidance

- case report: use of electrical epidural stimulation (Tsui test) to confirm accurate placement of a thoracic epidural catheter when administering an epidural blood patch for headache management in a patient suffering from spontaneous intracranial hypotension.
- A 41-yr-old female presented a history of postural headache symptoms worsening over several years. Two previous blood patches at T11-12, T10-11 short-term relief
- spontaneous dural tear at T2-T4 confirmed by nuclear flow. The epidural site was accessed at T6 with a Tuohy needle. Arrow catheter with electrode adapter was advanced under nerve stimulation guidance to T4. 10 ml autologous blood injected
- confirmed on MRI, 1h postprocedure, between T3 and T9. Sustained headache relief achieved.

Morley-Forster PK, et al Can J Anaesth. 2006 Apr;53(4):375-9.

Technical Problems

Attempted withdrawal through needle: shearing of catheter

- Surgical exploration not recommended: Inform patient
- Inserting more than 2-4cm: coiling-knotting
- Difficulty in removing, radicular pain: apply gentle continuous traction

Failure of technique

- Epidurals failed to achieve adequate analgesia in between 33% and 50% of patients in two large studies

McLeod GA et al, *Anaesthesia* 2001; 56: 75

Rigg JR et al, *Lancet* 2002; 359: 1276

- not specified where catheters were placed
- in LTEA placement considered more difficult

L. Salvi et all Correspondence TEA EJA 2005;22:723

Failure of technique

677 patients failure rate 6.9% (C7-T7) due to:

- Inability to find the epidural space 3.8%
- Catheter not positioned properly 1%
- Block not properly functioning 2.1%
- Dural puncture 1%
- Blood tap 1%
- Vasovagal reaction 0.6%

Probable failure rate ~ 10%- 30%

Salvi et all EJA 2005;22:723

CV problems

- **Hypotension** from excessive sympathetic blockade
  Moore CM et all, *Br J Anaesth* 1995; 75: 387
- may compromise coronary, spinal cord and cerebral perfusion pressure

  Kirno K et al, *Anesth Analg* 1994; 79: 1075
- Volume replacement and vasoconstrictors are required in 50-90% of patients

  Stenseth Ret al *J Cardiothorac Vasc Anesth* 1995; 9: 503
- **Bradycardia** and myocardial depression requiring pacing
  Reiz S et al, *Br J Anaesth* 1986; 58: 778

Neurologic complications

- ASA Closed claims database against anaesthesia care providers:
- 4183 claims reviewed, 105 lumbosacral roots, 84 spinal cord.
- related to paresthesias during needle or catheter placement or pain during injection of local anaesthetic.
- Definite mechanism of injury is rarely determined.

  Cheney FW et al. Nerve injury associated with anaesthesia: a closed claim analysis. Anesthesiology 1999;90:1062-9
- Not documented if we have to abandon procedure or replace needle in case of paresthesia

  Horloker T. Complications of region anaesth. IARS 2004:56

recent paraplegia reports

- Spinal cord compression/haematoma, infarction, trauma Kao MC Anest Analg 2004;99:580
- Unrecognized spinal cord catheterization in elder anaesthetized patient

  Yoshitakka T. Anesth Analg 2006;103:513
- Intrinsic spinal cord lesions complicating epidural anesthesia and analgesia: report of 3 cases

  Wilkinson PA J Neurol Phychiatry 2002;72:537

TEA and infection

- Infections after TEA not specifically studied, extremely rare
- Darchy et al investigated the safety of EA in 75 patients admitted to ICU. No epidural abscess. 5/9 patients with positive cultures of the insertion sites + tip cultures Staphylococcus epidermitis. Removal of catheter
- In contrast 1 year survey in Denmark incidence of spinal or epidural abscess after epidural analgesia was 1/1930 and likelihood of persisting deficits 1/4343
- Mean period of catheterisation 11 days, concomitant thromboprophylaxis, no antibiotics Wang et al, Anesthesiology 1999;91:1928-36

Epidural abscess

- The incidence has been reported as being as high as 1 : 800 in non-obstetric epidurals if the catheter is left in longer than 48h (Phillips JM et al, *Br J Anaesth* 2002; 89: 778-782).

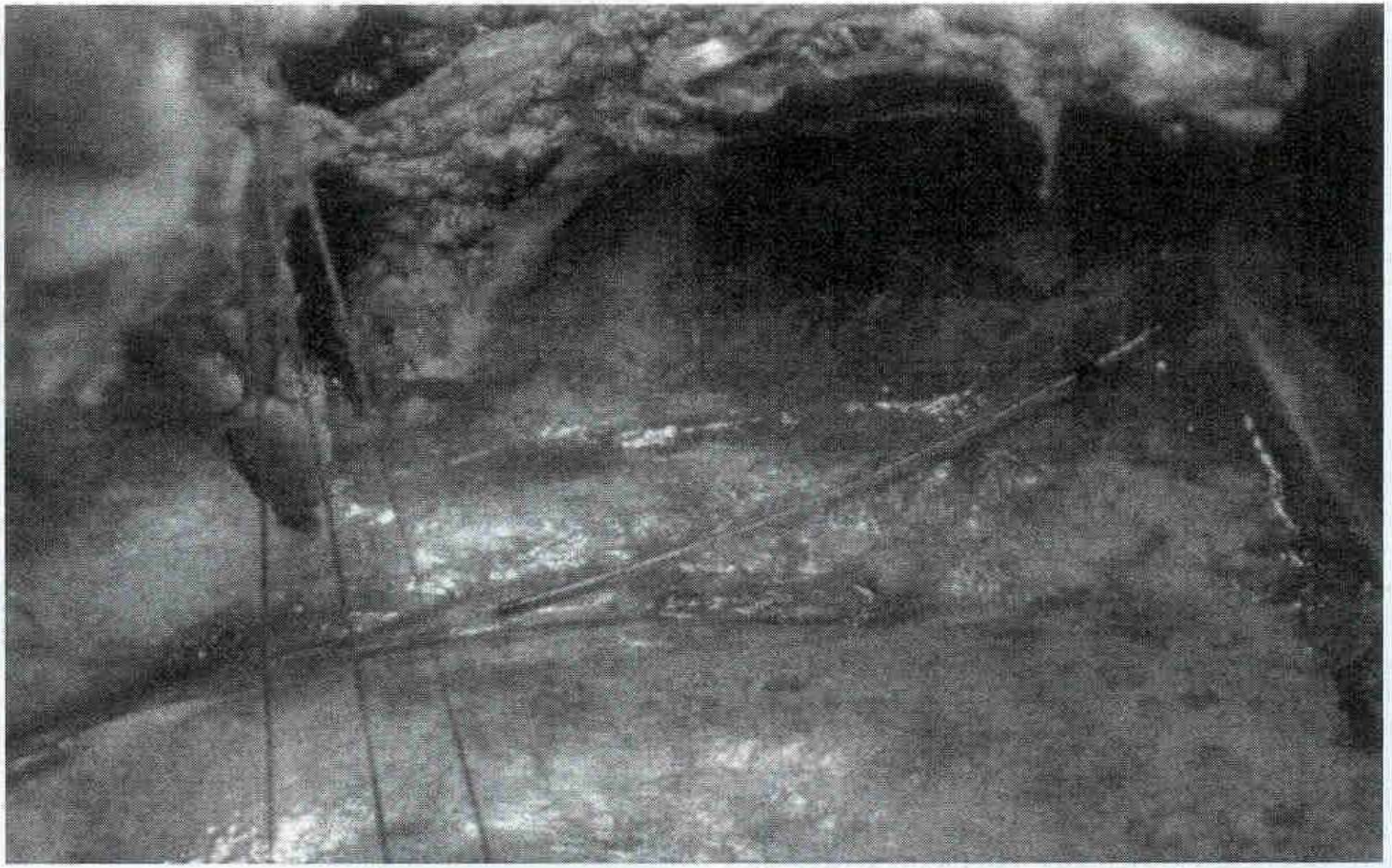
- Regional Anaesthesia in the Febrile or Infected Patient, Denise J Wedel et al Reg Anesth and Pain Med.2006;31:324
- Regional Anaesthesia in the Immunocompromised Patient, Terese T Horlocker et al Reg Anesth and Pain Med.2006;31:334

TEA Uncommon complications

- Incidence of incomplete bilateral blocks unknown
- Pleural puncture, pneumothorax 4 reports in paramedian approach, 1 in midline
- Insert 1-2 h before surgery in awake patient
  Detect by demonstrating adequate block

Eti Z, etal Anest. Analg 2005;100:1540

Paterman B. Can J anaesth 2005;52:443



ıcic epidural catheter lying in the chest cavity.

Neuraxial blockade and haematoma in cardiac surgery

- The safety of performing regional anaesthesia immediately before systemic anticoagulation with heparin required for CPB is controversial (Turnbull KW et al, *J Cardiothorac Vasc Anesth* 1996; 10: 961-962).
- Epidural haematoma may occur and cause spinal cord compression with catastrophic irreversible neurological damage.

Risk of epidural Haematoma after TEA in cardiac surgery

	95 % confidence intervals	99 % confidence intervals
Epidural	1:1,500 – 1:150,000	1:1000 – 1:1,500
Spinal	1:3,600 – 1:220,000	1:2,400 – 1:220,000

Ho A.M. Chest 2000

Minimize the haematoma risk

- Guidelines for central neuraxial anaesthesia for cardiac surgery do not exist
- precautions: select patients with normal coagulation function
- normalization of coagulation before instrumentation, insertion postoperatively after demonstration of a normal activated clotting time
- avoidance of repeated attempts,
- postponement of surgery for 24h after bloody tap,
- instrumentation >1h before systemic heparinization,
- optimization of haemostasis after CPB
- removal of epidural catheter only after normal haemostasis
- close neurological surveillance
- use of midline technique
- administration of saline solution through the needle to distend the epidural space before insertion of the catheter.

- Evidence not existing on various aspects of TEA
- Experienced or properly supervised anaesthetist should perform the block. Level of experience has to be documented
- Select patients, Inform patients, decide level of intervention according to procedure
- Risk of devastating complications is lessened if precautions are observed

put patient in your shoes

do no harm