

# Plugging a post-operative pain gap

## Use of TAP blocks for rescue analgesia

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# Declaration

- I have assisted the pharmaceutical company Abbott in the production of an educational DVD about TAP blocks.
- All honoraria and payments I have received from my collaboration with Abbott have been used to fund my voluntary work in Myanmar (formerly Burma) in association with a Worthing based charity 'Eyessee'.





# TAP (Transversus Abdominis Plane) Blocks

- What are TAP blocks?
- How are TAP blocks performed?
- Review of published work with TAP blocks
- Extending the role of TAP Blocks to include rescue analgesia

# TAP Block Anatomy

Costal margin

Skin (Reflected)

Rectus Abdominis Muscle

External Oblique Muscle

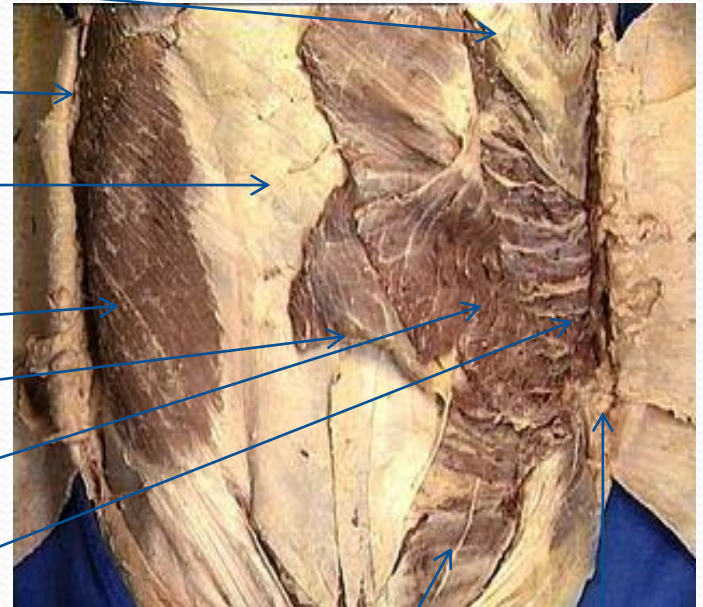
Umbilicus

Internal Oblique Muscle

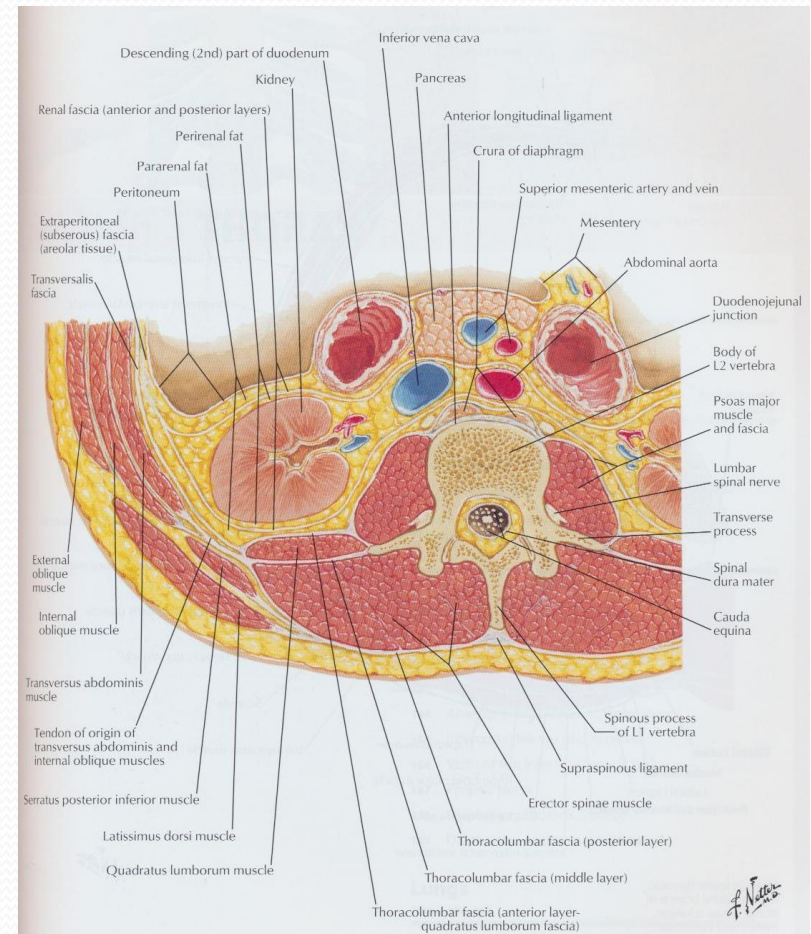
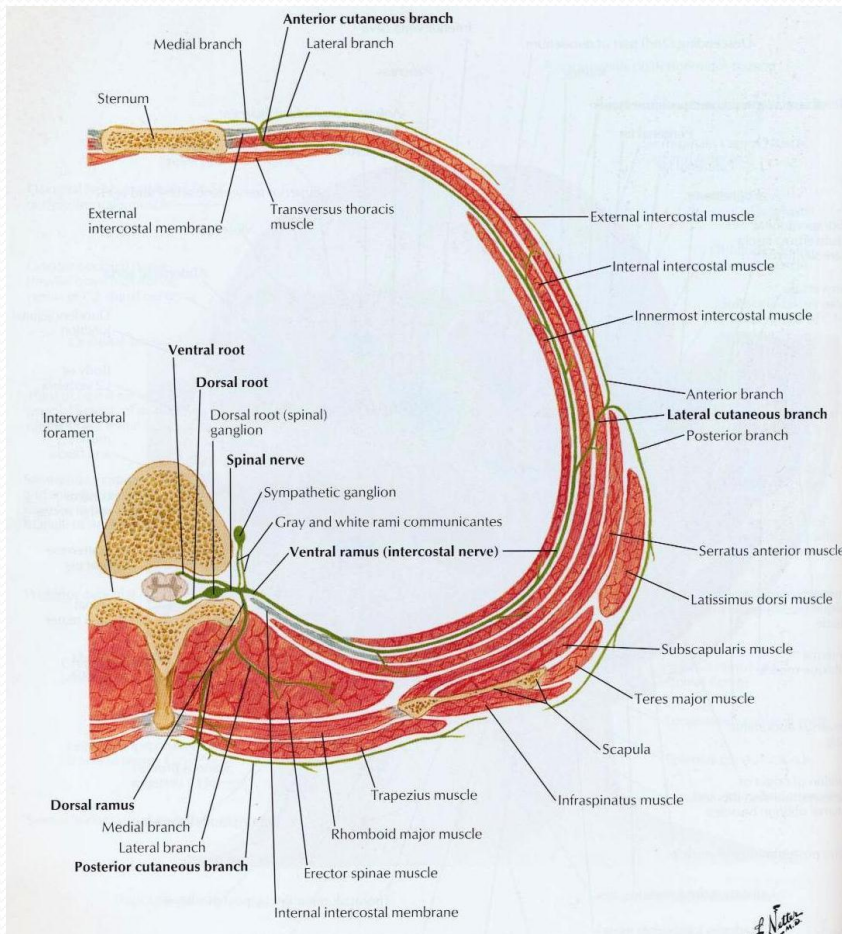
Transversus Abdominis  
Muscle

Ilio-Inguinal Nerve

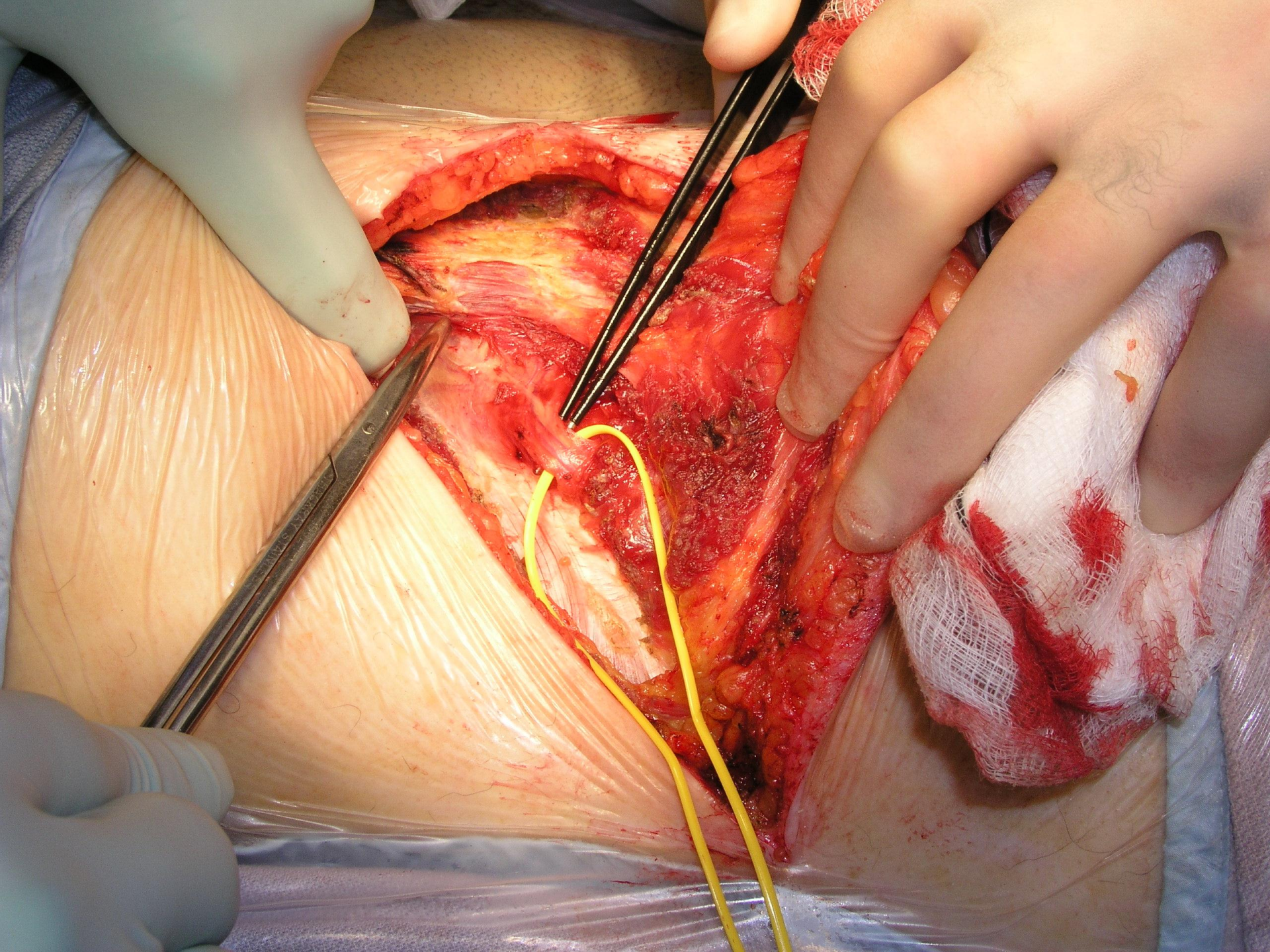
Iliac Crest



# Thoracic and Abdominal walls compared

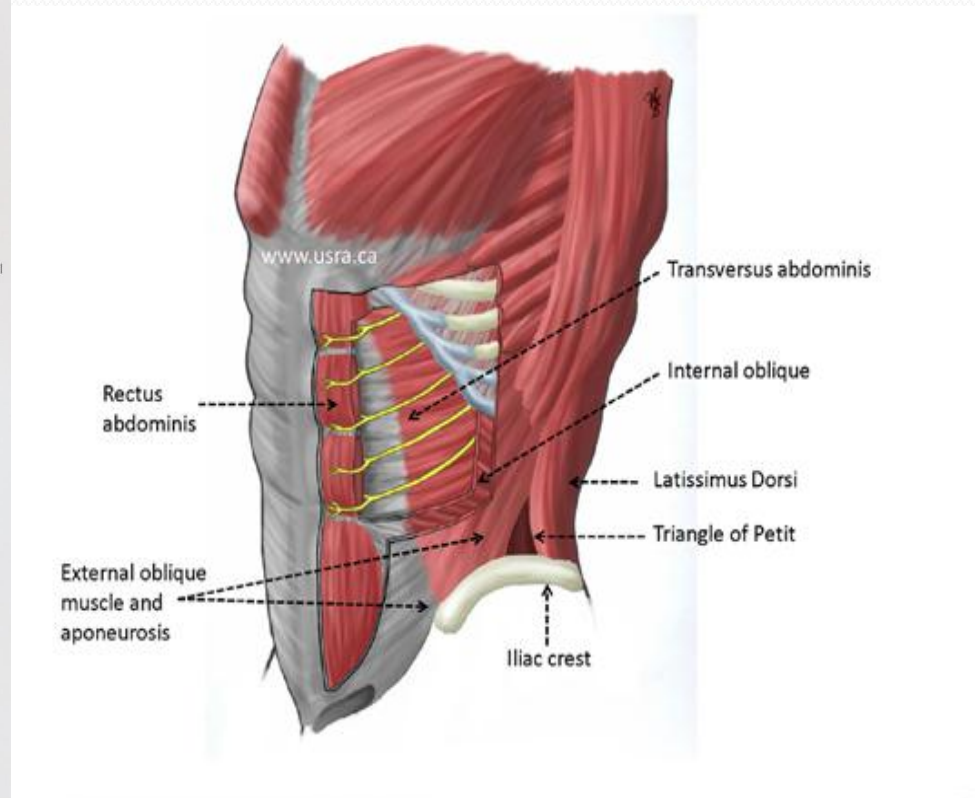
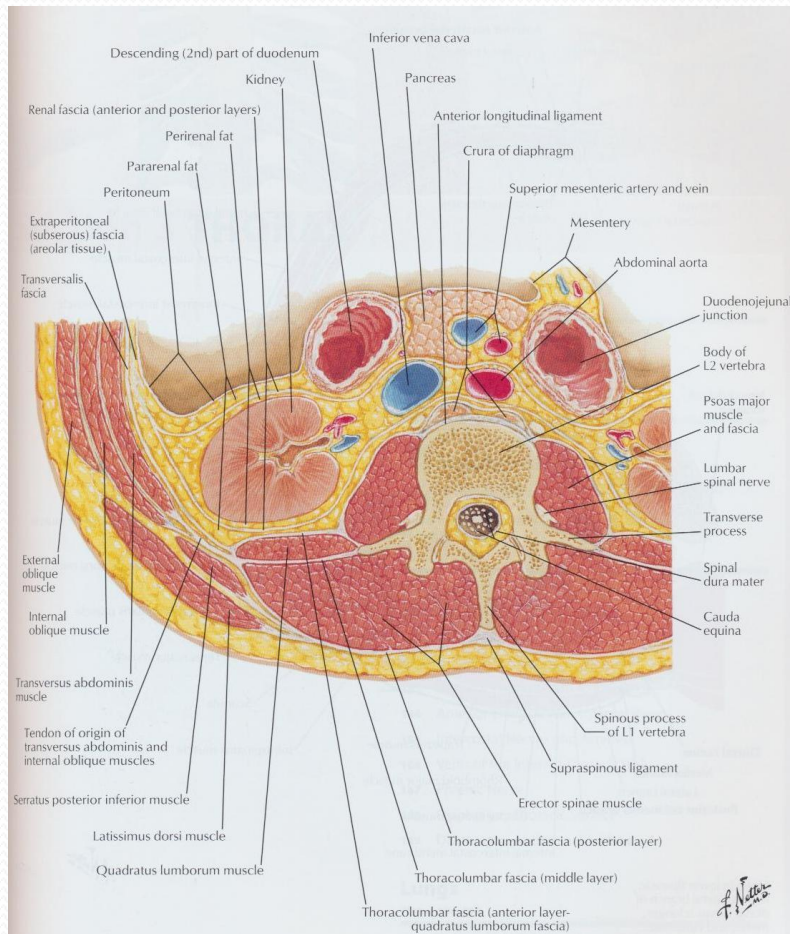








# Lateral Abdominal Wall Anatomy and location of Petit's Triangle



# Anatomy summary



- 3 Muscle layers
- Transversus Abdominis Plane (TAP) located between Internal Oblique and Transversus Abdominis Muscle
- TAP boundaries:
  - Medial**-Lateral border of Rectus Abdominis muscle.
  - Superior**- Costal margin
  - Inferior**- Iliac crest.
  - Posterior**- Poorly defined but with potential for communication with Paravertebral space?
- Sensory innervation: Ventral Rami from T6-L1



# How to perform a TAP Block



- 1) Employ a suitable technique to target the Transversus Abdominis Plane
- 2) Inject Local Anaesthetic

**Simples!**

# Regional Block pre-requisites

- Patient consultation, agreement and consent
- No contraindications e.g. Coagulopathy, Allergies, etc.
- Intravenous access
- Appropriate monitoring
- Resuscitation equipment available
- Sterile field preparation
- Needles, local anaesthetic, etc.
- Prepare for potential complications





## Identification of the Transversus Abdominis plane

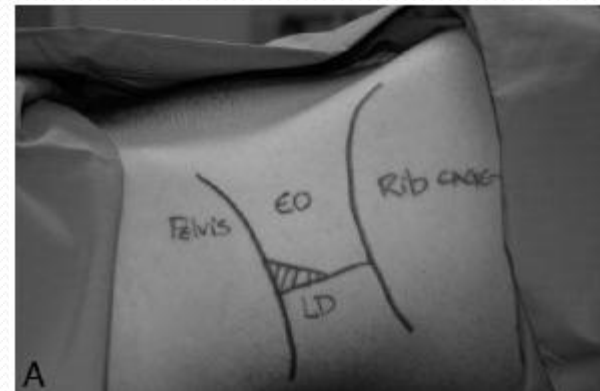
- Landmark
- Ultrasound guided
- Direct surgical placement

# Landmark Technique

**The analgesic efficacy of Transversus Abdominis Plane Block after abdominal surgery: A prospective randomised controlled trial**

John McDonnell et al.

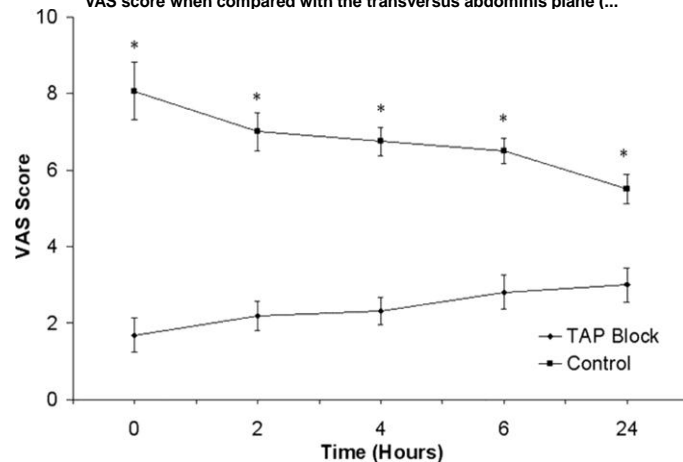
*Anesthesia and Analgesia* 2007; 104: 193-7





# The analgesic efficacy of Transversus Abdominis Plane Block after abdominal surgery: A prospective randomised controlled trial

Figure 4. Mean postoperative verbal analog scale (VAS) pain scores on movement in each group over the first 24 postoperative hours. \*Indicates significantly ( $P < 0.05$ , t-test after ANOVA) higher VAS score when compared with the transversus abdominis plane (...)



McDonnell J G et al. *Anesth Analg* 2007;104:193-197

ANESTHESIA & ANALGESIA

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Table 2. Postoperative Pain Scores and Analgesic Requirement

	Control (n = 16)	TAP block (n = 16)
Time to first request for morphine (min)	24.1 ± 6.9	157.2 ± 27.9†
Mean 24 h morphine requirement (mg)	80.44 ± 4.8	21.94 ± 2.2†
Categorical pain severity		
PACU	2.5 (2, 3)	0 (0, 1)‡
2 Hours	2 (2, 2)	0 (0, 1)‡
4 h	2 (1.5, 2)	0 (0, 1)‡
6 h	2 (1, 2)	1 (0, 1)‡
24 h	1 (1, 2)	1 (0, 1)

Ordinal data are presented as medians and interquartile ranges (given in parentheses), and continuous variables are presented as mean ± SEM.

TAP = transversus abdominis plane; PACU = postoperative anesthesia care unit.

†  $P \leq 0.01$ ; and ‡  $P \leq 0.001$  when controlled with control.

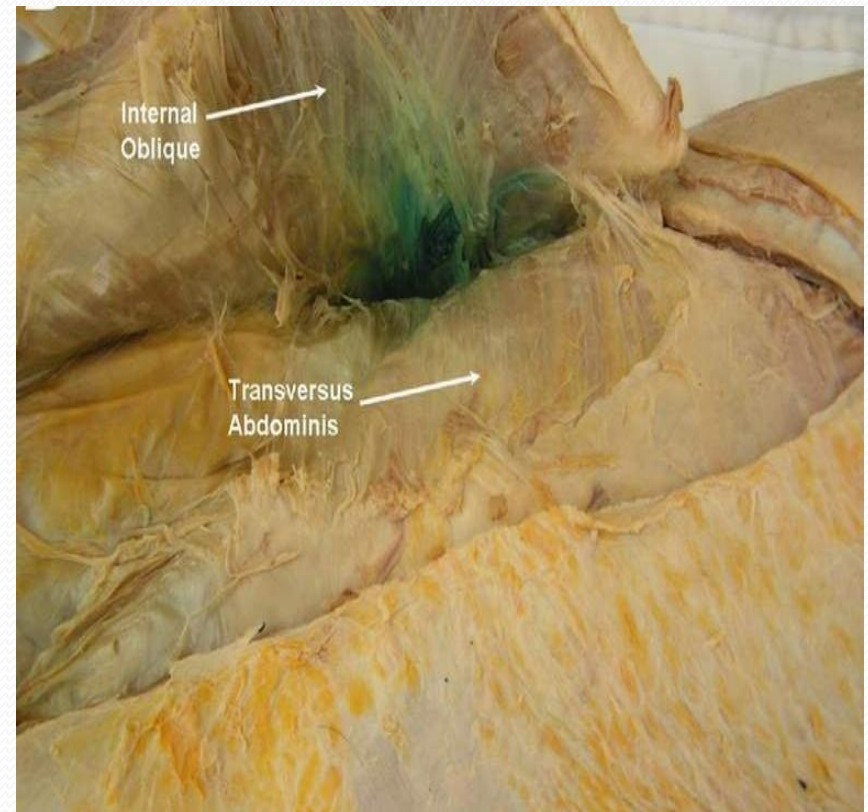
McDonnell J, et al, *Anesthesia & Analgesia* 2007; 104: 193-7

# Transversus Abdominis Plane Block. A Cadaveric and Radiological Evaluation

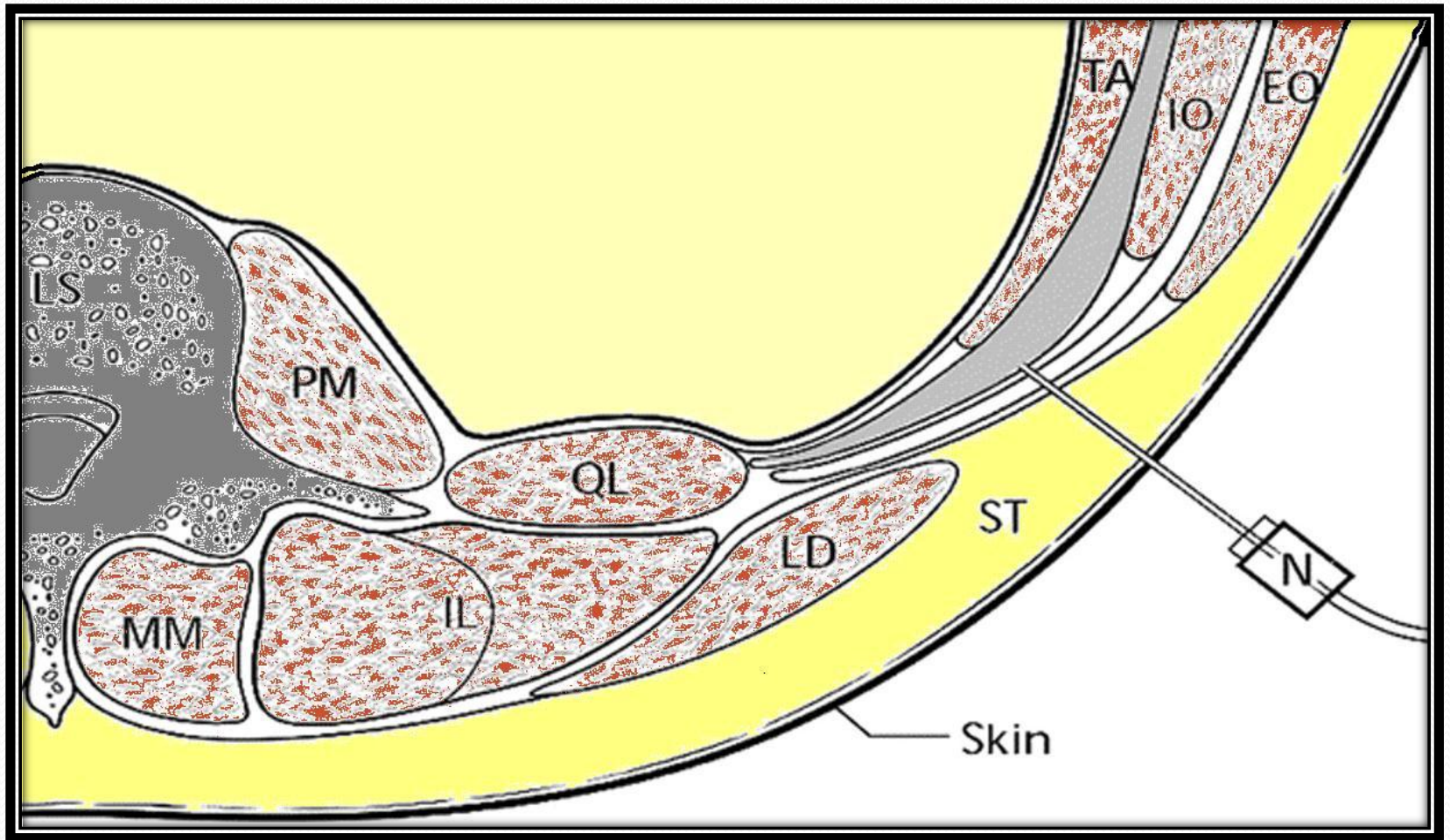
McDonnell, J. *et al.*

*RAPM 2007: 32: 399-404*

1. Landmark technique using double pop via Petit's triangle and 20ml methylene blue in cadavers prior to fixation
2. Assessment of spread in volunteers using CT and clinical mapping following injection of lidocaine/Niopam mix
3. MRI assessment of spread in volunteers using gadolinium
4. Posterior spread with tracking along nerve fibres to paravertebral space accounts for block distribution & longevity







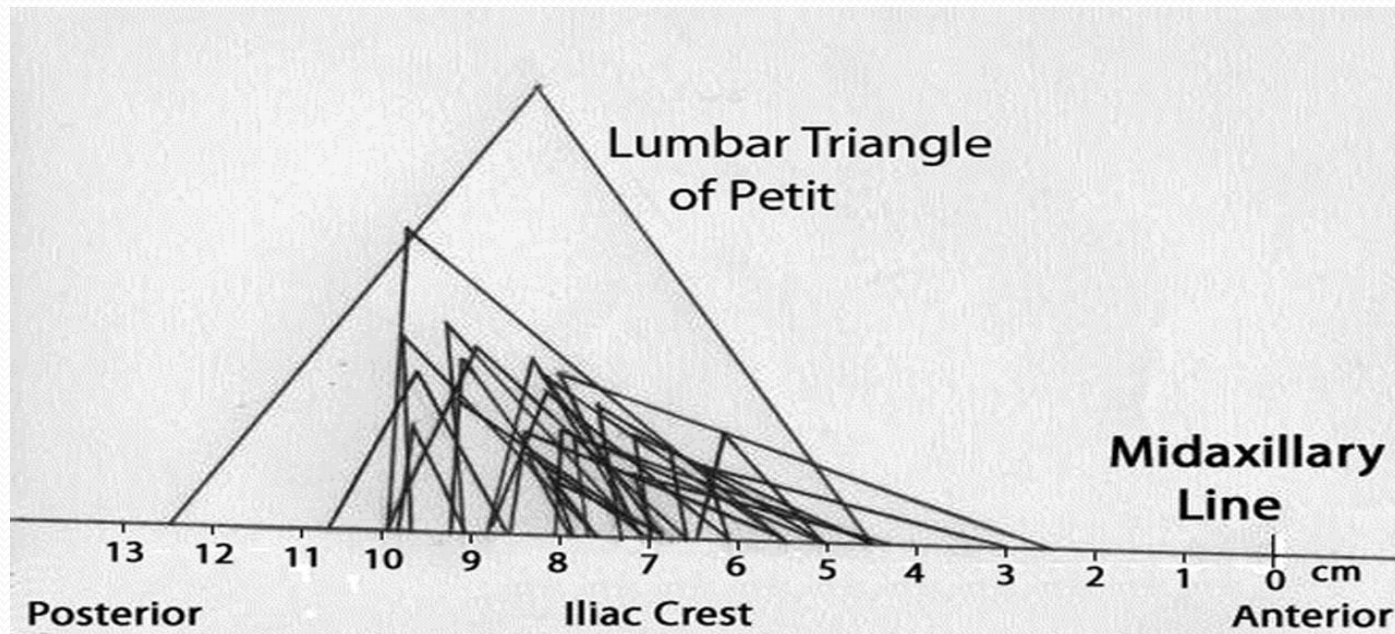
Text Books  
don't always  
agree!

Abdominal wall  
anatomy can  
vary and so can  
the position of  
Petit's triangle





**Comparison of sizes and shapes of the lumbar triangle of Petit and the distance of each posterior to the midaxillary line.**

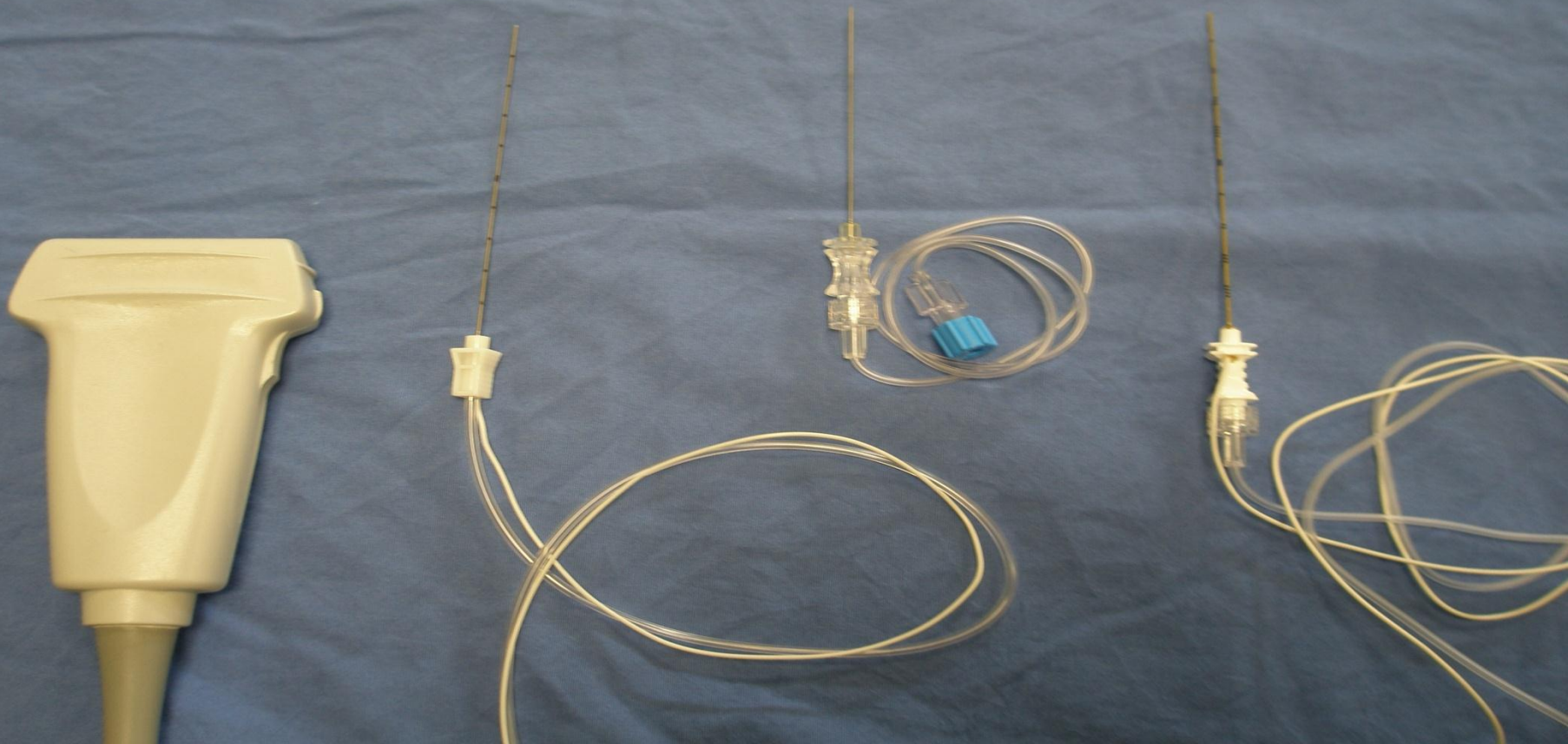


- Petit's Triangle more posterior than generally appreciated
- Size and position varies
- Average area  $3.63 \pm 1.93 \text{ cm}^2$

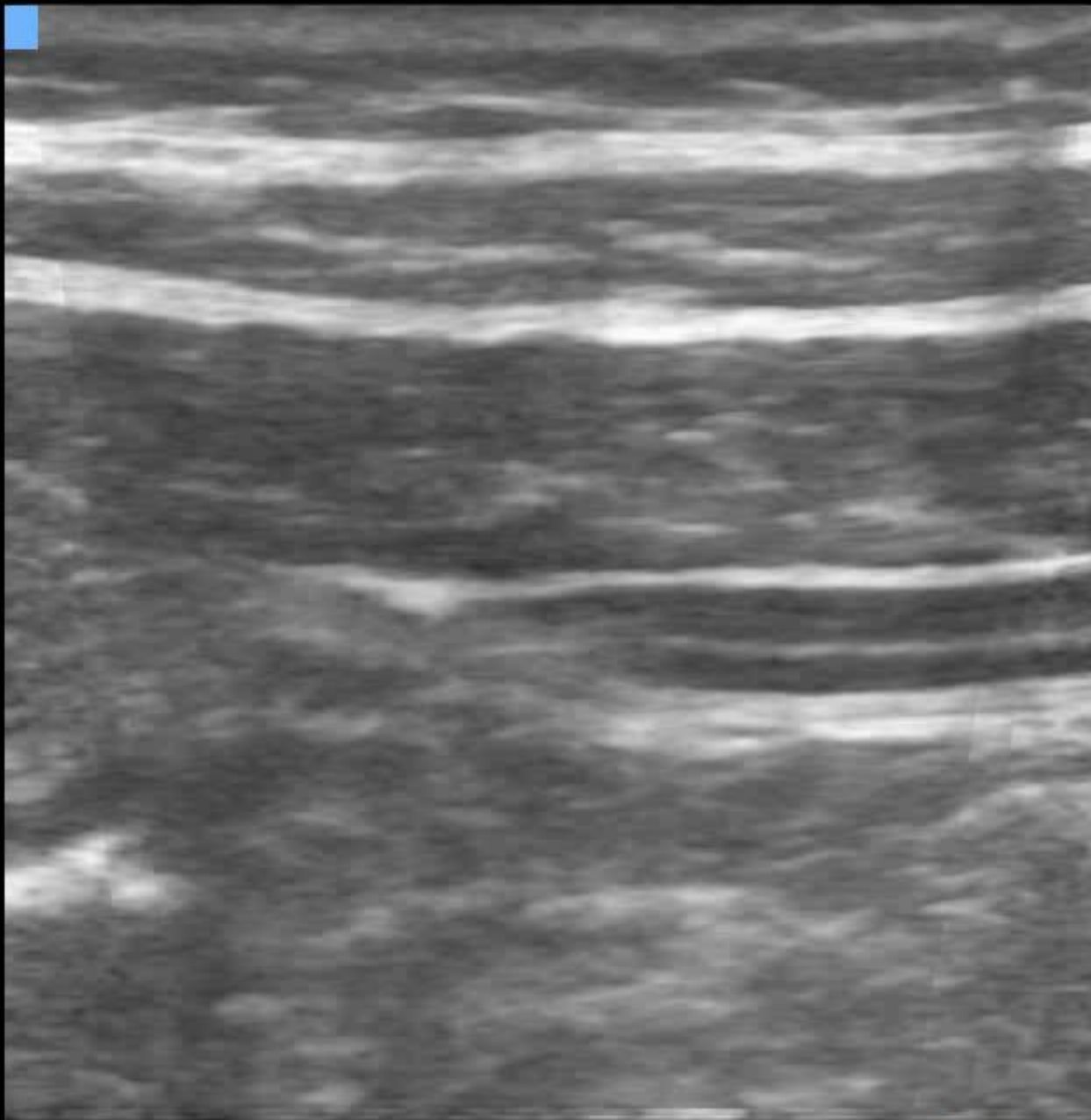




# Equipment







MI: 2.0 TI: 0.3

13 Oct 2010

10 : 25 AM



# Determination of spread of injectate after ultrasound-guided transversus abdominis plane block: a cadaveric study

T. M. N. Tran, J. J. Ivanusic, P. Hebbard , M. J. Barrington

*BJA 2009; 102: 123-7*

## Method

- Ultrasound guided technique
- Injection of 20ml aniline dye into transversus abdominis plane of fresh cadavers
- 150mm Stimuplex needle
- Abdominal wall dissection to determine extent of spread of dye

## Results

- Reliable dye spread from T10-L1 nerve roots
- No involvement of T9 nerve root

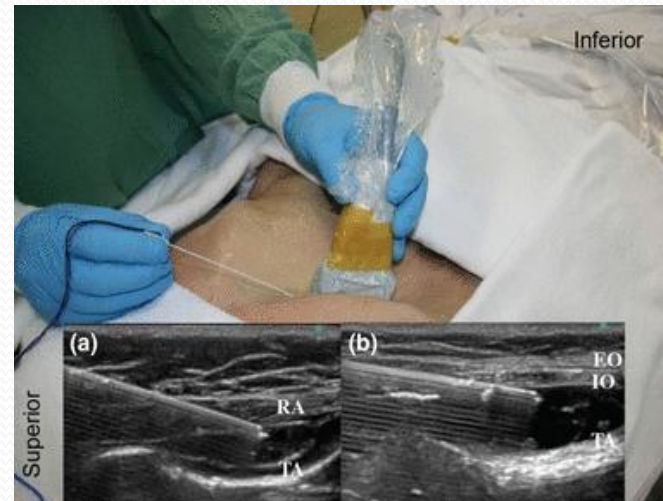
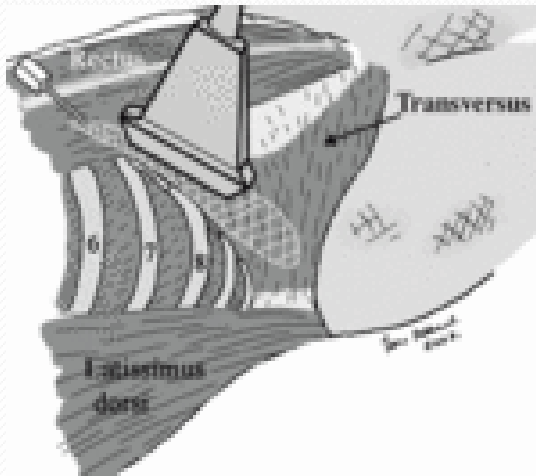
## Conclusion

- Tap block approach immediately cephalad to iliac crest favours reliable infra-umbilical analgesia only

# Spread of injectate after ultrasound-guided subcostal transversus abdominis plane block: a cadaveric study

M Barrington, J Ivanusic, W Rozen, P Hebbard

*Anaesthesia 2009; 64: 745-50*



Anterior Subcostal injections provide reliable spread to the territory supplied by T6-T9 (i.e. Supraumbilical nerves)

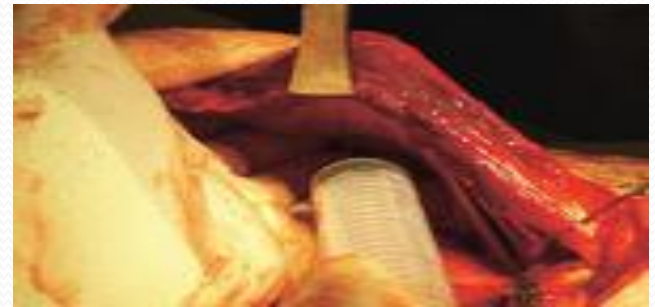
# Surgical TAP Blocks

The surgical transversus abdominis plane block-a novel approach for performing an established technique

DJ Owen, I Harrod, J Ford, M Luckas, V Gudimetla

BJOG 2011; 118: 24-27

- LSCS patients
- Spinal heavy bupivacaine + fentanyl
- Approach via peritoneal cavity
- 0.25% bupivacaine 20ml x 2
- Reduction in post-op pain scores and analgesia requirements,
- Quick, simple, safe.





# TAP Block Studies

Over 80 PubMed references

Several review articles

At least 1 meta analysis

# TAP Block studies and reports

- Appendicectomy (Niraj G et al **Analgesic efficacy of ultrasound-guided transversus abdominis plane block in patients undergoing open appendicectomy.** *BJA* 2009; 103: 468-70)
- Hernia Repair
- Urological Surgery
- General Surgery-Open (Brady R, et al. **Open transversus abdominis plane block and analgesic requirements in patients following right hemicolectomy** *Ann R Coll Surg* 2012; 94 327-30)
- General Surgery-Laparoscopic (Conahaghan P et al. **Efficacy of Transversus Abdominis Plane blocks in laparoscopic colorectal resections** *Surg Endosc.* 2010 )
- Gynaecology (Carney J, et al. **The transversus abdominis plane block provides effective postoperative analgesia in patients undergoing total abdominal hysterectomy** *Anaesthesia and Analgesia* 2008; 107: 2056-2060)

# Evidence supporting TAP blocks

- Original studies compared TAP blocks with no intervention i.e. Just controls
- Expectation that pain relief may be incomplete due to limitations of TAP Blocks
- Usually employed with multimodal analgesia adjuncts
- Reduction in pain scores and analgesic requirements in particular, significant Morphine –sparing effect
- Small numbers
- Difficult to avoid observer bias even when blinded.



# Studies Reporting no difference after TAP blocks

- Lap chole (Ortiz J, et al **Bilateral transversus abdominis plane block does not decrease postoperative pain after laparoscopic cholecystectomy when compared with local anesthetic infiltration of trocar insertion sites** *RAPM* 2012;37; 188-92.)
- Gynae Cancer surgery
- Caesarean Section

Precise details of blocks sometimes absent.

# No benefit from TAP Blocks post-LSCS

**The Transversus Abdominis Plane Block, when used as part of a multimodal regimen inclusive of intrathecal morphine does not improve analgesia after Cesarean delivery**

J Costello, A Moore, P Wieczorek, A Macarthur, M Balki, and J Carvalho

*RAPM 2009; 34:586-589*

**Does the transversus abdominis plane (TAP) block improve analgesia following subarachnoid anaesthesia with intrathecal diamorphine? A randomised double blinded control trial. (Abstract)**

E Puddy, B Edwards, I Wrench and F Roberts

*Anaesthesia 2010; 65: 95*

# Rescue Analgesia using TAP Blocks

- Wound Haematoma following LSCS (Randall Ian et al, **Transversus abdominis plane block in a patient with debilitating pain from an abdominal wall haematoma following Caesarean delivery** . *Anaesthesia & Analgesia* 2008; 106: 1928)



# Pre-requisites for ward based TAP blocks

- Patient consultation, agreement and consent
- No contraindications e.g. Coagulopathy, Allergies, etc.
- Intravenous access
- Appropriate monitoring: SpO<sub>2</sub>, NIBP
- Resuscitation equipment available
- Sterile field preparation
- Needles and local anaesthetic *for both skin infiltration and TAP blocks*
- Limit Ultrasound probe force

M/F	Age	Operation type	TAP Block at original op?	ERP	Post op day	Indication for TAP	Landmark or U/S	Drug used	Uni- or Bilateral	Result
F	87	Open Rt hemicolectomy	Yes	Yes	D1	Pain+Ileus	U/S	Bupiv 0.25%	Bilateral 20ml x 2	Sleep uninterrupted by pain. Simple analgesia thereafter
M	60	Open Bowel Resection for appendix abscess (surgery originally declined)	Yes	Yes	D1	Pain +Ileus	U/S	L- Bupiv 0.375 %	Bilateral 20ml x 2	Transition from Morphine/Ketamine to Oxycontin/Oxycodone
M	75	Lap Rt hemicolectomy	No	No	D1	Pain +Ileus	?	?	Bilateral 20ml x 2	Wound infection. No reduction in analgesia requirements
M	57	Right Hemicolectomy (122kg)	Yes	Yes	D2	OSA. Pain. High opioid requirements	Landmark	Bupiv 0.25%	Bilateral 20ml x 2	Slow recovery, Analgesia after TAPs unaltered
F	54	Completion proctectomy for Crohn's	No	No	D1	Pain at Stoma site	U/S	L- Bupiv 0.5%	Unilateral 20ml x 1	Ketamine & Morphine prn only.
F	26	Emergency LSCS (epidural top-up)	No	No	36hr	Pain at drain site	U/S	L- Bupiv 0.375 %	Bilateral 20ml x 2	Mobilised + switch to oral analgesia
M	40	Day- Case hernia	No	No	D4	Severe neuropathic pain	U/S	L- Bupiv 0.375 %	Unilateral 20 ml x 1	Immediate benefit pending surgical exploration of wound

# Published reports of TAP block rescue

- Utilisation of TAP blocks in the presence of failed or contraindicated Epidural analgesia. (NirajG Kelkar. A, **Application of the transversus abdominis plane block in the intensive care unit** *Anaesth Intensive Care*. 2009; 37: 650-2.



# TAP Blocks and ITU

- Trend towards sedation holds mandates improved analgesia
- TAP blocks may improve respiratory mechanics through pain reduction and assist weaning
- TAP blocks may assist abdominal wall procedures eg suprapubic catheterisation

Regional Anesthesia and Analgesia in Critically Ill Patients

Stundner O, Memtsoudis G,

***Regional Anesthesia and Pain Medicine 2012; 37: 537-544***

# TAP Block complications

- Liver Trauma with Landmark technique (Farooq M, Carey M, **A case of liver trauma with a blunt regional anesthesia needle while performing transversus abdominis plane block.** *RAPM* 2008; 33: 274-5)
- Liver Trauma with Ultrasound (Lancaster P, Chadwick M, **Liver trauma secondary to ultrasound-guided transversus abdominis plane block.** *BJA* 2010; 104: 509-10)
- Theoretical risk of nerve palsy (Walker G, **Transversus abdominis plane block: a note of caution?** *BJA* 2010; 104: 265)
- High observed incidence of intraperitoneal injections with landmark technique (McDermott G et al. **Should we stop doing blind transversus abdominis plane blocks?** *BJA* 2012; 108: 499-502.)

# Summary

- The Transversus Abdominis Plane (TAP) block has the capacity to provide abdominal wall analgesia
- TAP blocks can be performed using a Landmark technique, or, preferably, Ultrasound guidance. Both surgical placement and catheter based techniques have been described
- Accumulating evidence, and systematic reviews suggest TAP blocks augment postoperative analgesia and exhibit a morphine sparing effect. Currently there are no published trials comparing TAP blocks and epidural analgesia
- There may be greater scope to extend the role of TAP Blocks to include use as rescue analgesia, deployment on ITU to assist weaning from ventilation and possible applications associated with the control of chronic pain syndromes.





Thank you

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