

Ultrasound Guided Regional Anesthesia

Overview of Truncal Blocks

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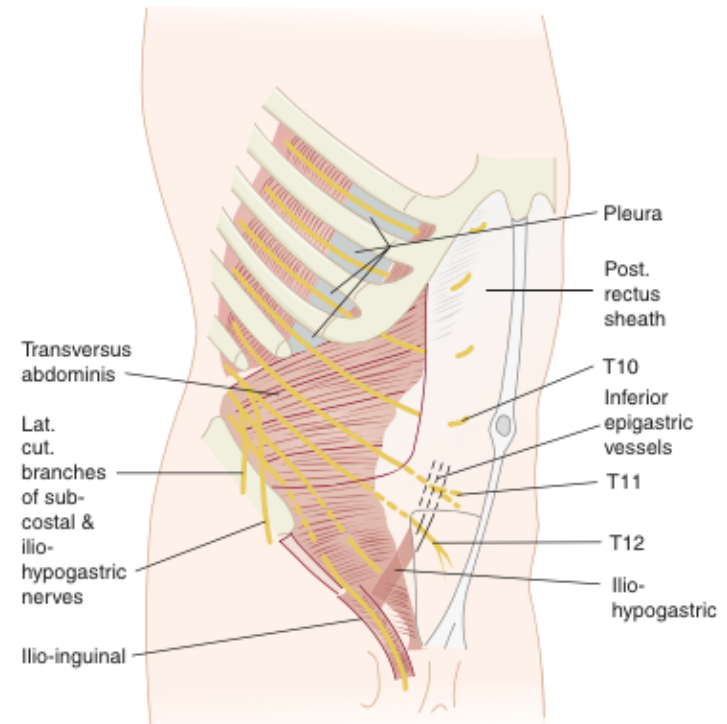
Outline

- TAP Block
- Quadratus Lumborum Block
- Paravertebral Block
- PEC I and II Block
- Serratus Plane Block

TRANSVERSUS ABDOMINIS PLANE BLOCK (TAP)

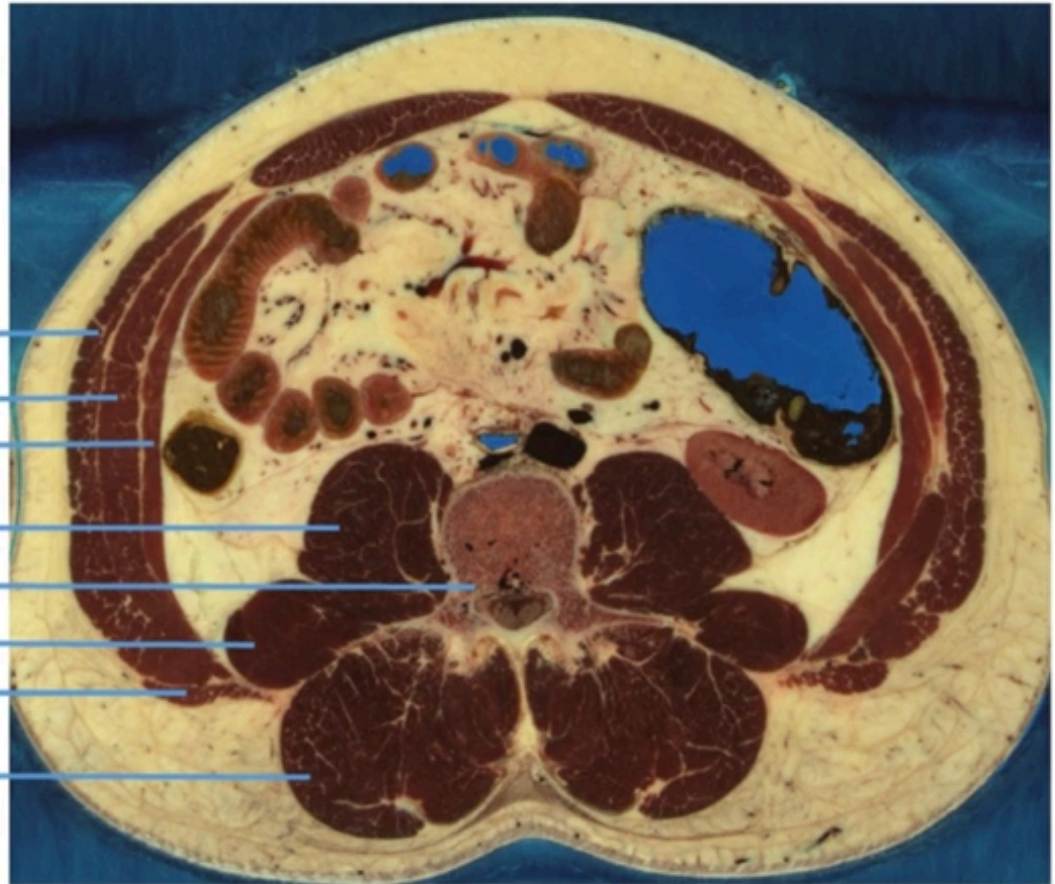
TAP Block

- Analgesia to skin, muscles, and parietal peritoneum of the anterior abdomen (T7 to L1)
- Involves local anesthetic injection into the fascial plane between the transversus abdominis muscle and the internal oblique muscle.



Cross section of Abdomen at Lumbar level

- External Oblique muscle
- Internal Oblique muscle
- Transversus Abdominis muscle
- Psoas muscle
- Vertebral body
- Quadratus Lumborum muscle
- Lattisimus dorsi
- Erector spinae muscle



TAP Block

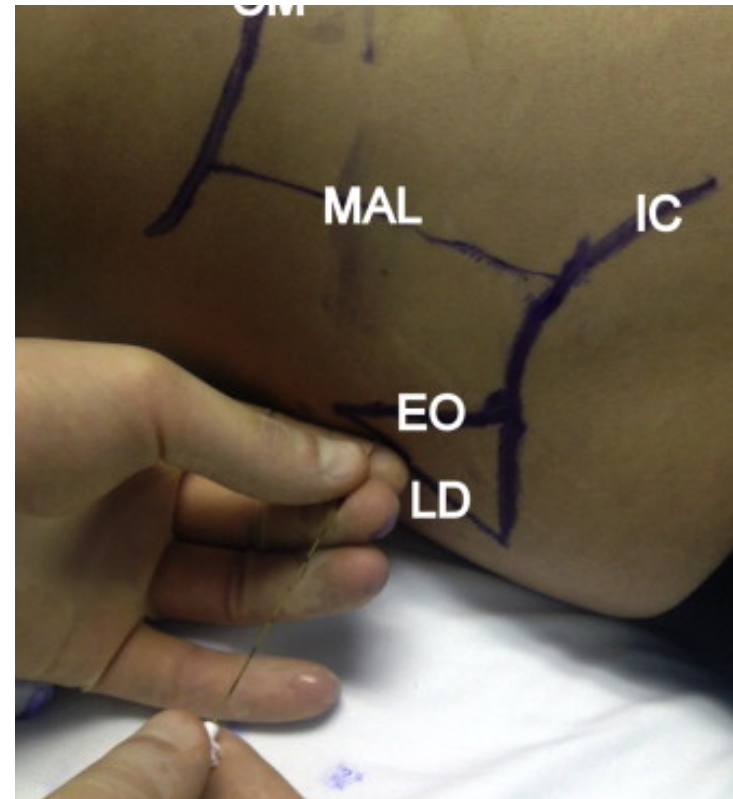
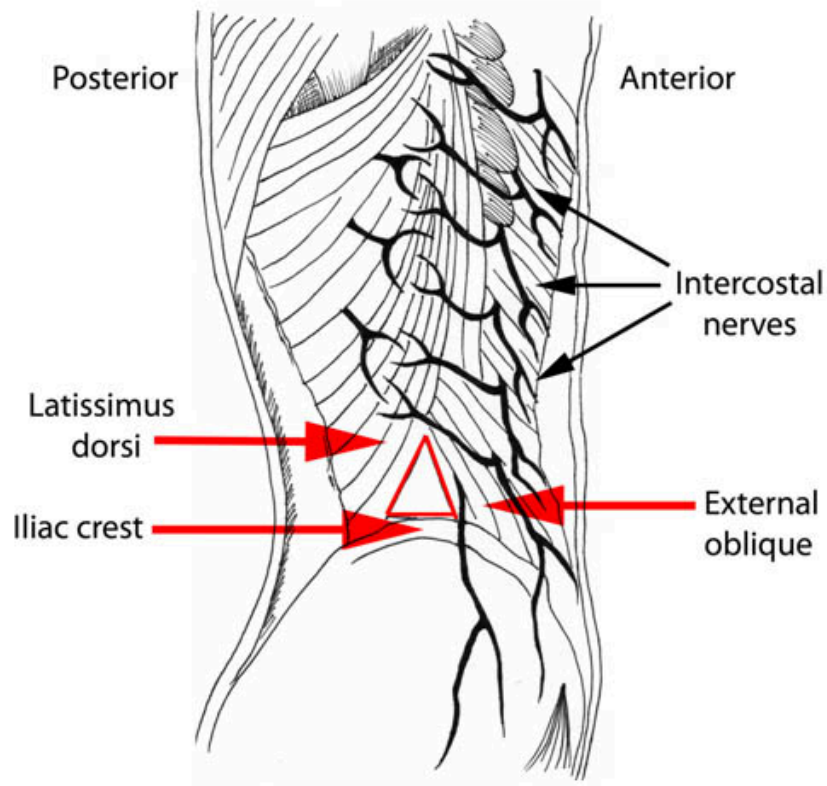
- TAP block was first introduced by Dr. Rafi in 2001 as a landmark technique through the triangle of Petit

Abdominal field block: a new approach via the lumbar triangle

I wish to describe what I believe to be a novel approach to abdominal field block. The technique, as originally described, entails multiple injections and administration of potentially toxic doses of local anaesthetic agent [1]. This new approach involves identifying the neurovascular plane of the abdominal musculature and injecting a local anaesthetic agent therein. The only area of the abdominal wall where the internal oblique muscle can be localised directly is the 'lumbar triangle of Petit' where it forms the floor of this triangle. In most people, the lumbar triangle is situated just behind the highest point of the iliac crest. Local anaesthetic agent deposited in the area of the lumbar triangle will block the lower intercostal nerves, the iliohypogastric and the ilioinguinal nerves as they traverse between sub-costal margin and the iliac crest.

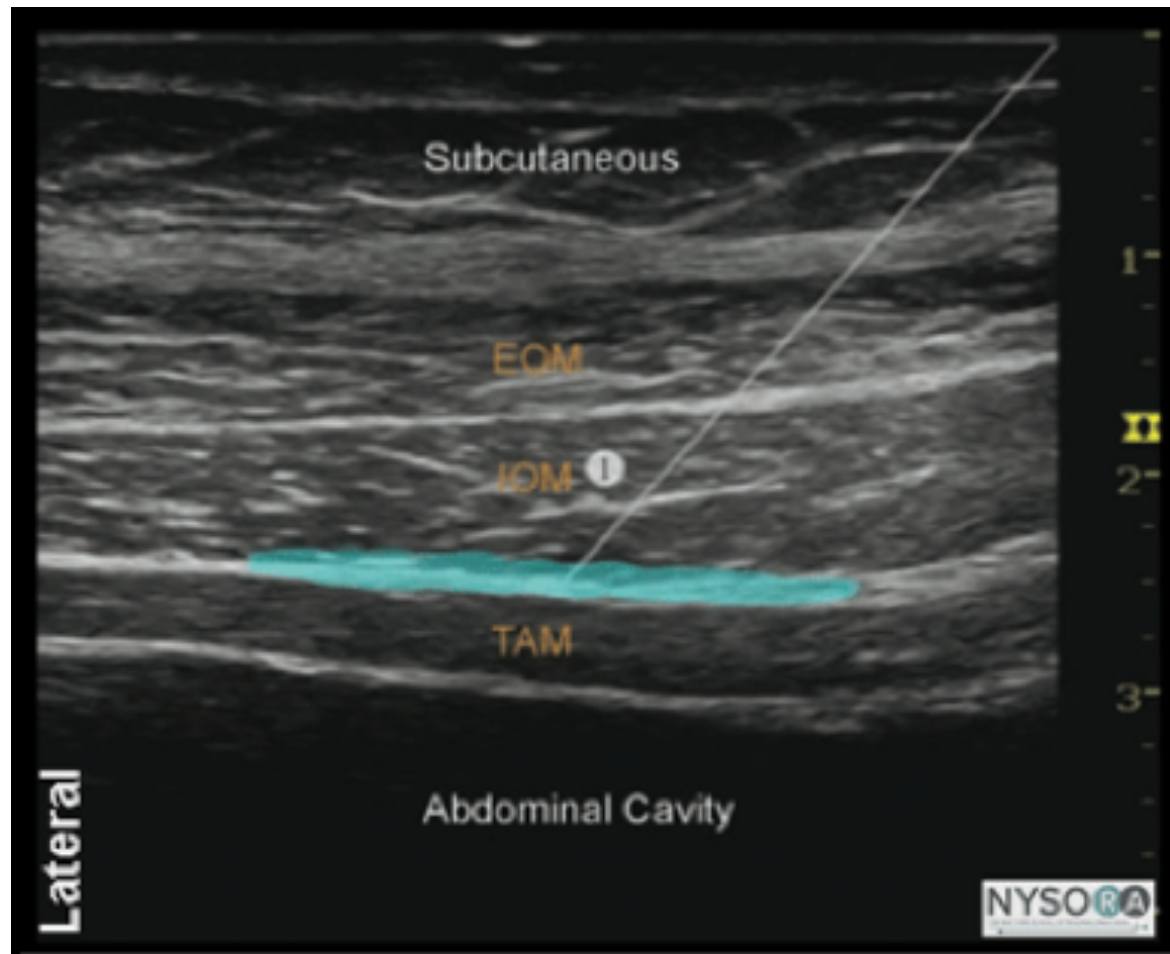


Landmark Technique



Lissauer J, Mancuso K, Merritt C, et al.: Evolution of the transversus abdominis plane block and its role in postoperative analgesia. *Best Pract Res Clin Anaesthesiol.* 2014; 28(2): 117–26

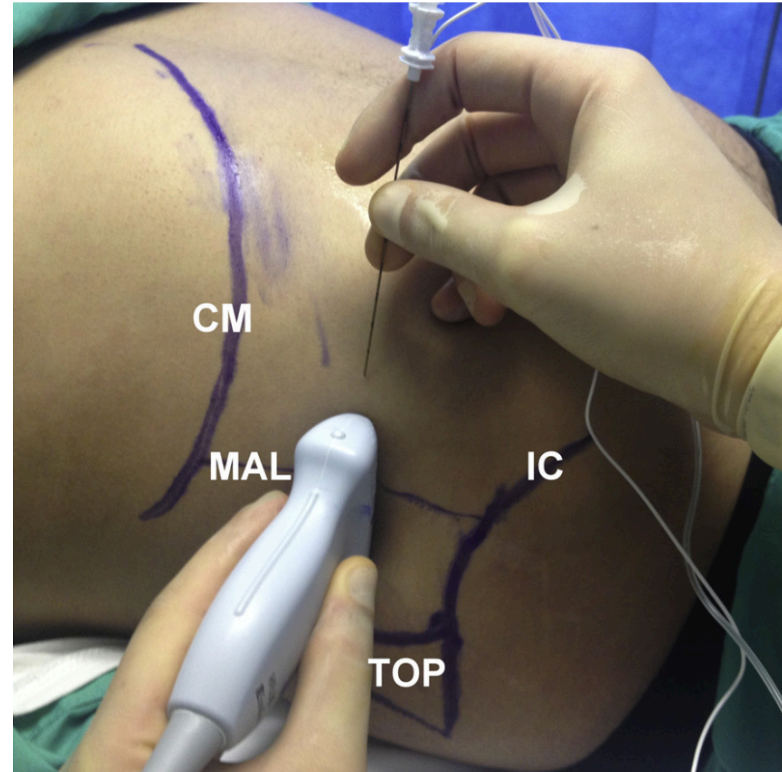
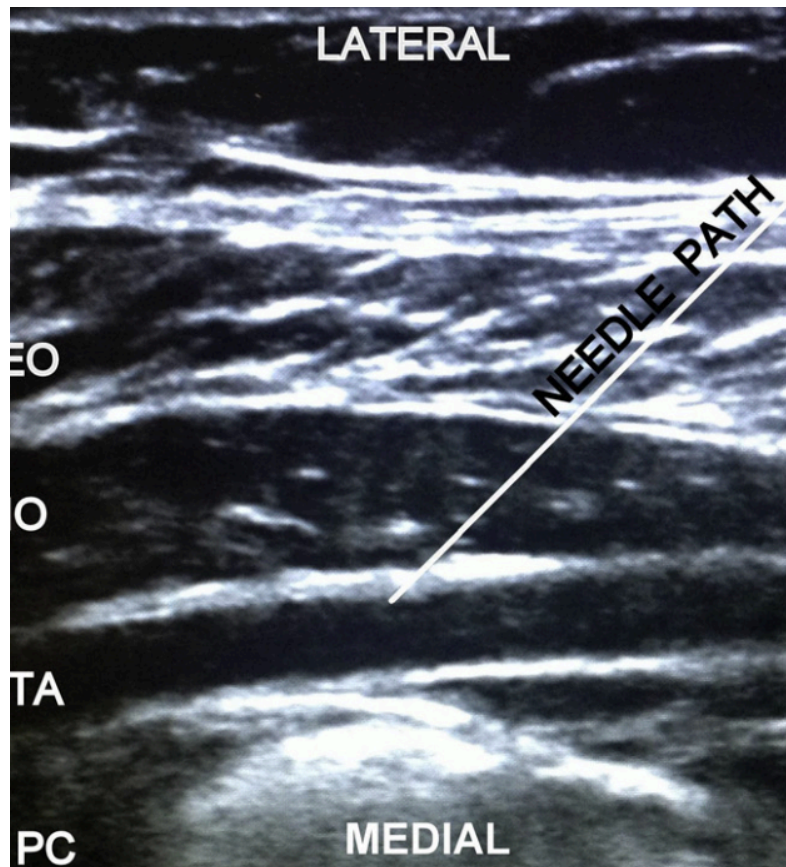
TAP Block



TAP Indications

- Postoperative analgesia abdominal surgery
- Used when epidural anesthesia is contraindicated
- Rescue block to supplement ineffective epidural analgesia

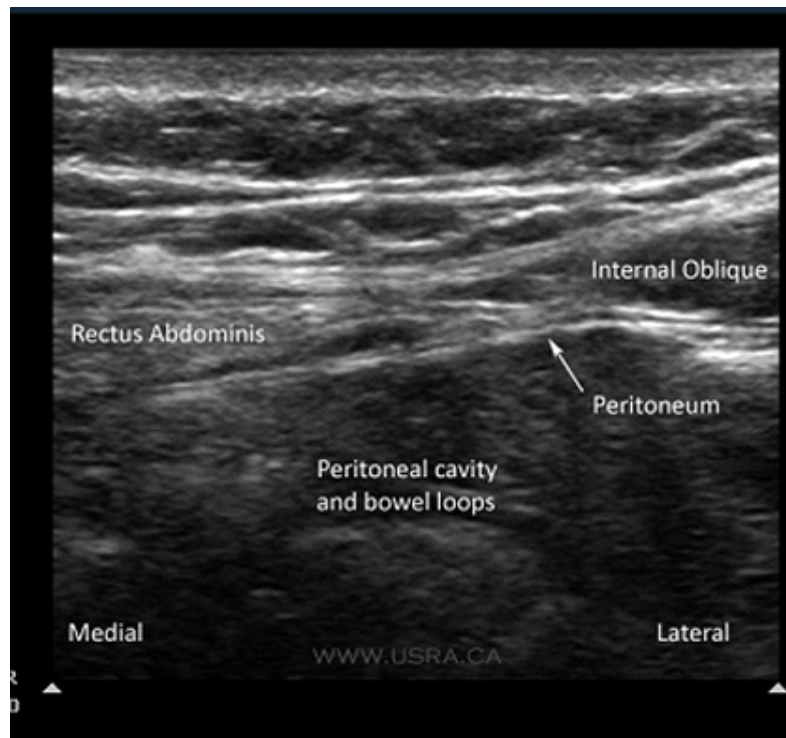
U/S Midaxillary Technique



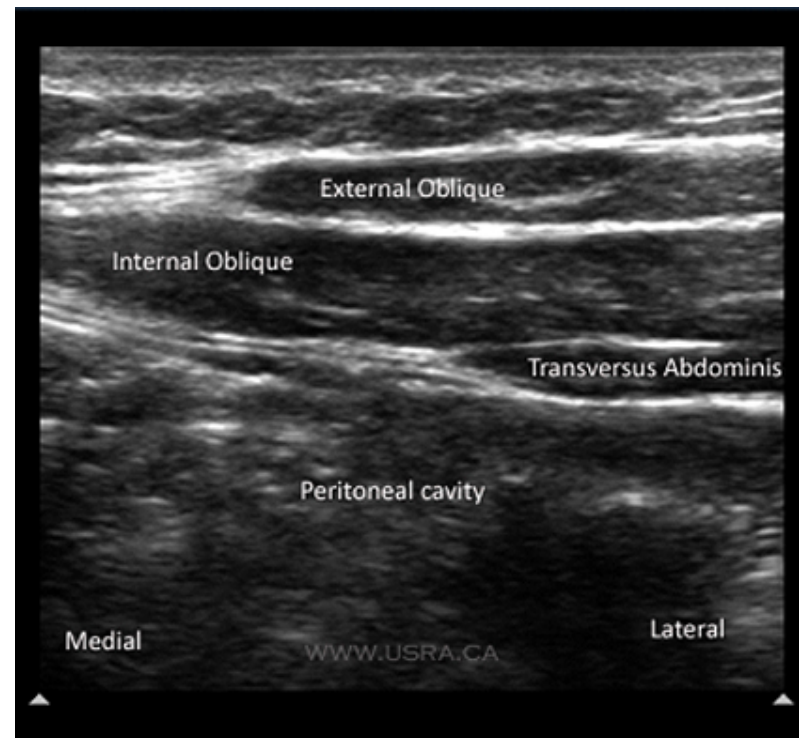
Lissauer J, Mancuso K, Merritt C, et al.: Evolution of the transversus abdominis plane block and its role in postoperative analgesia. *Best Pract Res Clin Anaesthesiol.* 2014; 28(2): 117–26

TAP Blocks

US midline over Rectus Abdominis



US sliding laterally

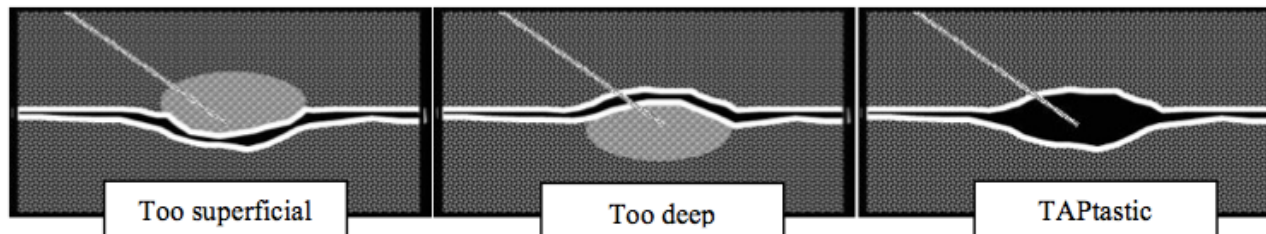
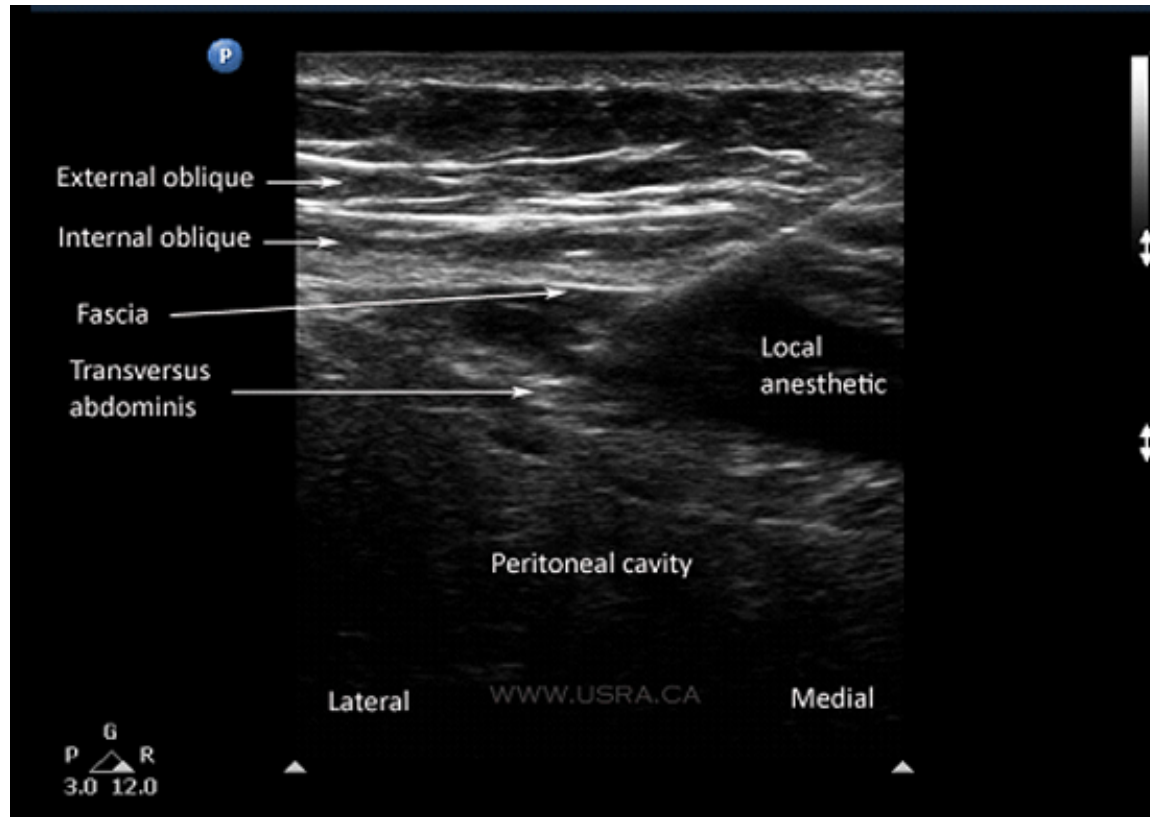


U/S Midaxillary Technique

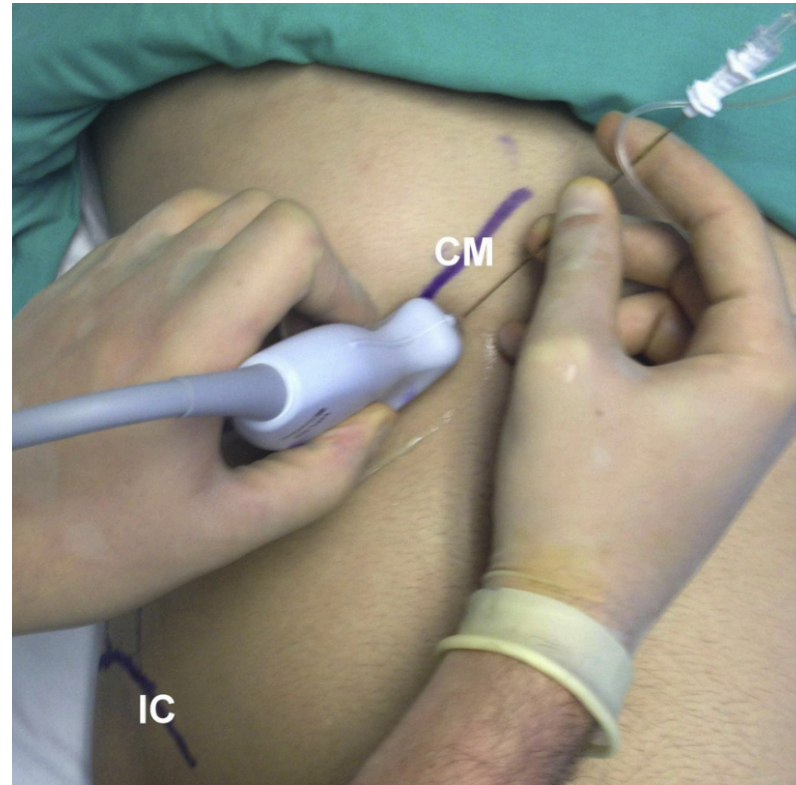
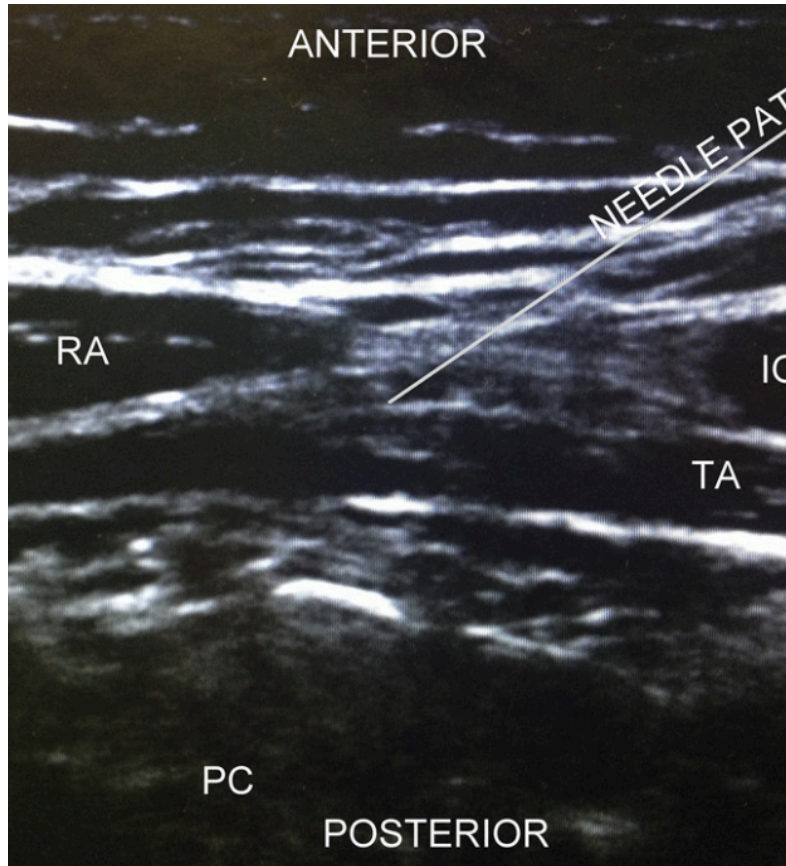
- Lateral, mid-axillary approach to TAP block has shown inferior dermatomal coverage (T10-L1) to the landmark triangle of Petit approach (T6-L1)
 - Different injection site and more anterior spread
 - TOP approach - injection site is 10cm posterior and therefore spread of local anesthetic is posterior
 - Superior analgesia due to LA spread into the paravertebral space

J. Carney, et. Al., "Studies on the spread of local anaesthetic solution in transversus abdominis plane blocks,"
Anaesthesia, vol. 66, no. 11, pp. 1023–1030, 2011

Needle Insertion/LA injection



U/S Oblique Subcostal Approach



Lissauer J, Mancuso K, Merritt C, et al.: Evolution of the transversus abdominis plane block and its role in postoperative analgesia. *Best Pract Res Clin Anaesthesiol.* 2014; 28(2): 117–26

TAP Block

- Volume, not concentration; 20-30 mL of 0.25% bupivacaine → 18–24 hours of analgesia
- Adjuvants

Low-risk analgesic block

- General risks:
 - Needle trauma
 - Local anesthetic toxicity
 - Intravascular Injection
 - Infection
 - Poor/failed block
- Specific complications:
 - Peritoneal perforation (significance is unclear)
 - Liver/Kidney/Spleen laceration
 - Bowel Perforation
 - Liver Hematoma (one case reported)
 - Femoral Block

Lissauer J, Mancuso K, Merritt C, et al.: Evolution of the transversus abdominis plane block and its role in postoperative analgesia. Best Pract Res Clin Anaesthesiol. 2014; 28(2): 117–26

QUADRATUS LUMBORUM BLOCK

History

- Blanco et al at ESRA Annual Congress in 2007
- Carney et al observed QLB spread from T5 – L1 on MRI
- Borglum et al described a transmuscular approach that resulted in an even wider sensory blockade with spread of LA cranially
- QLBs result in a wider sensory blockade compared to TAP block when performed using the **similar volume** of local anesthetic

Carney J, Finnerty O, Rauf J, Bergin D, Laffey JG, McDonnell JG. Studies on the spread of local anaesthetic solution in transversus abdominis plane blocks. *Anaesthesia* 2011;66:1023–1030.

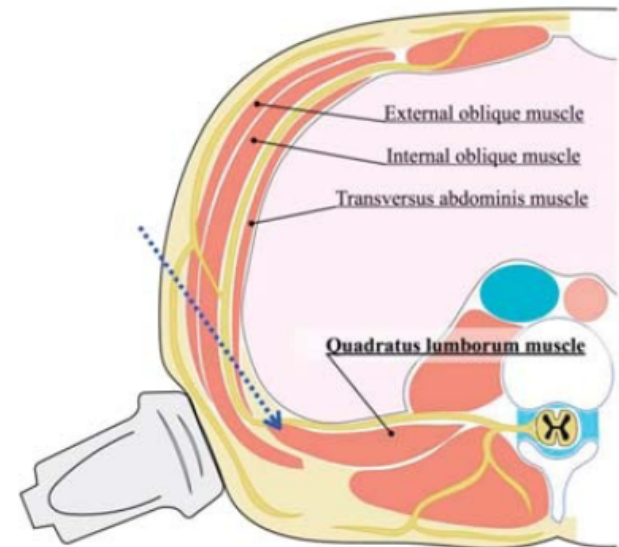
Børglum J, Jensen K, Moriggi B, Lönnqvist P, Christensen A, Sauter A. Ultrasound-guided transmuscular quadratus lumborum blockade. *Br J Anesth* 2013.

Indications

- Exploratory laparotomy, large bowel resection, ileostomy, open/laparoscopic appendectomy, and cholecystectomy
- Cesarean section, TAH, gyn onc surgery
- Open prostatectomy, renal transplant surgery, and nephrectomy
- Abdominoplasty and iliac crest bone graft

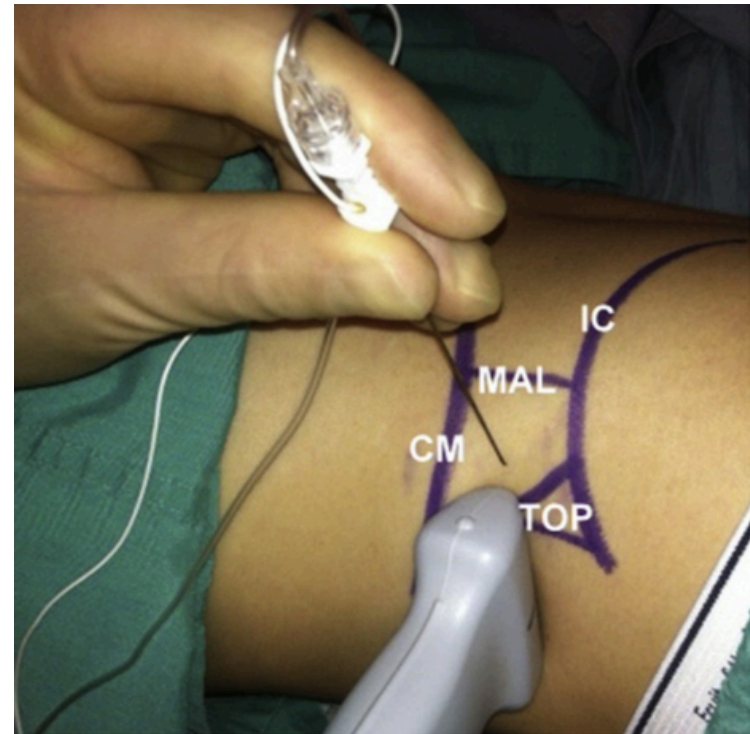
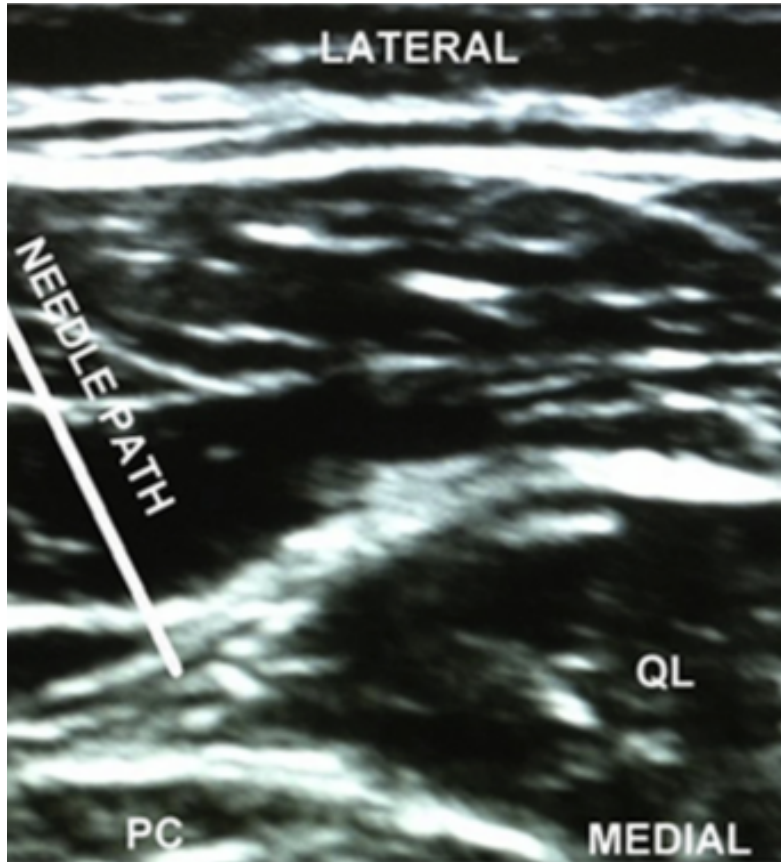
Ultrasound

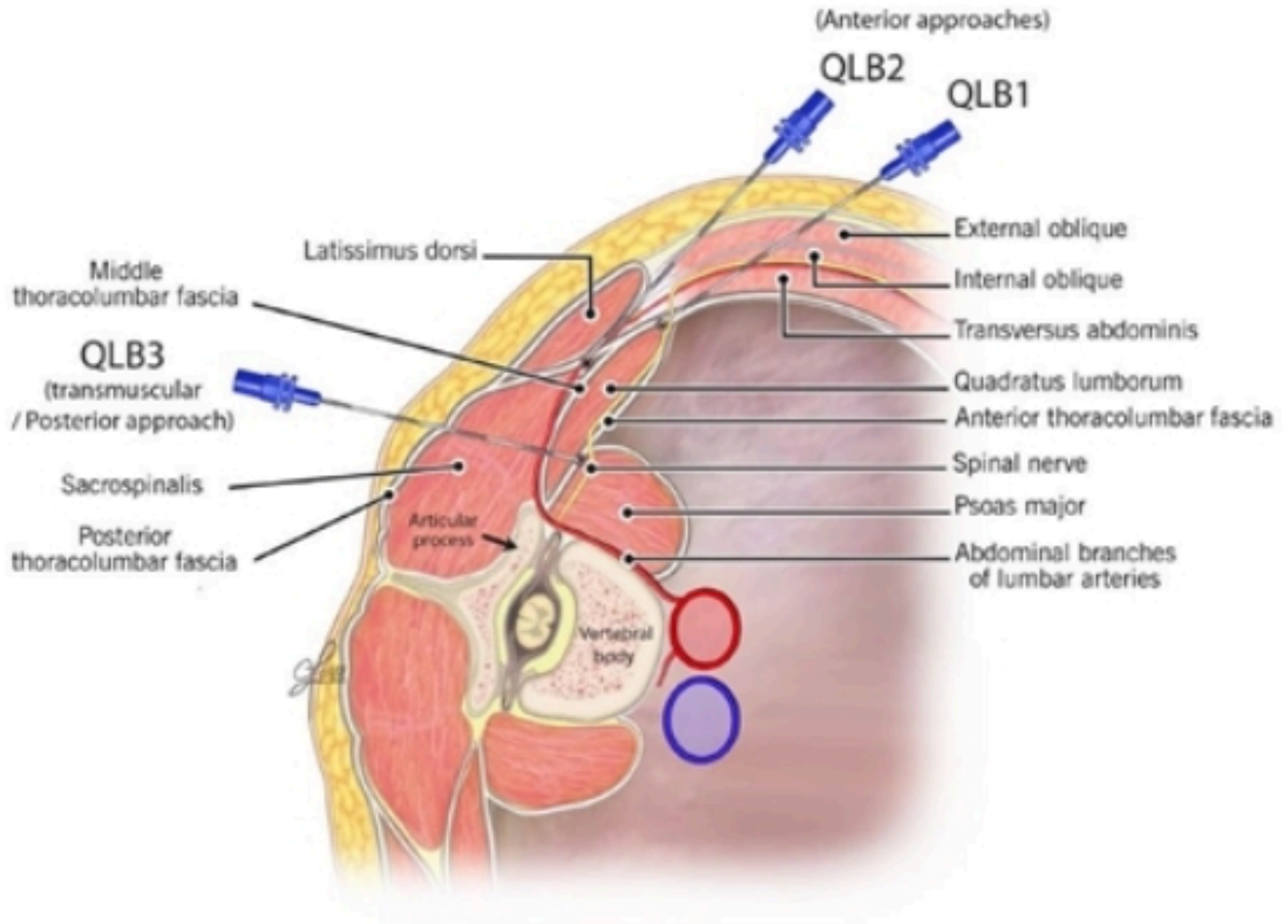
- Probe is placed posterolaterally, slightly cephalad to the iliac crest
- Visualize the 3 muscle layer of the lateral abdomen (EO, IO, TA mm.) and the QL muscle slightly cephalad to the iliac crest



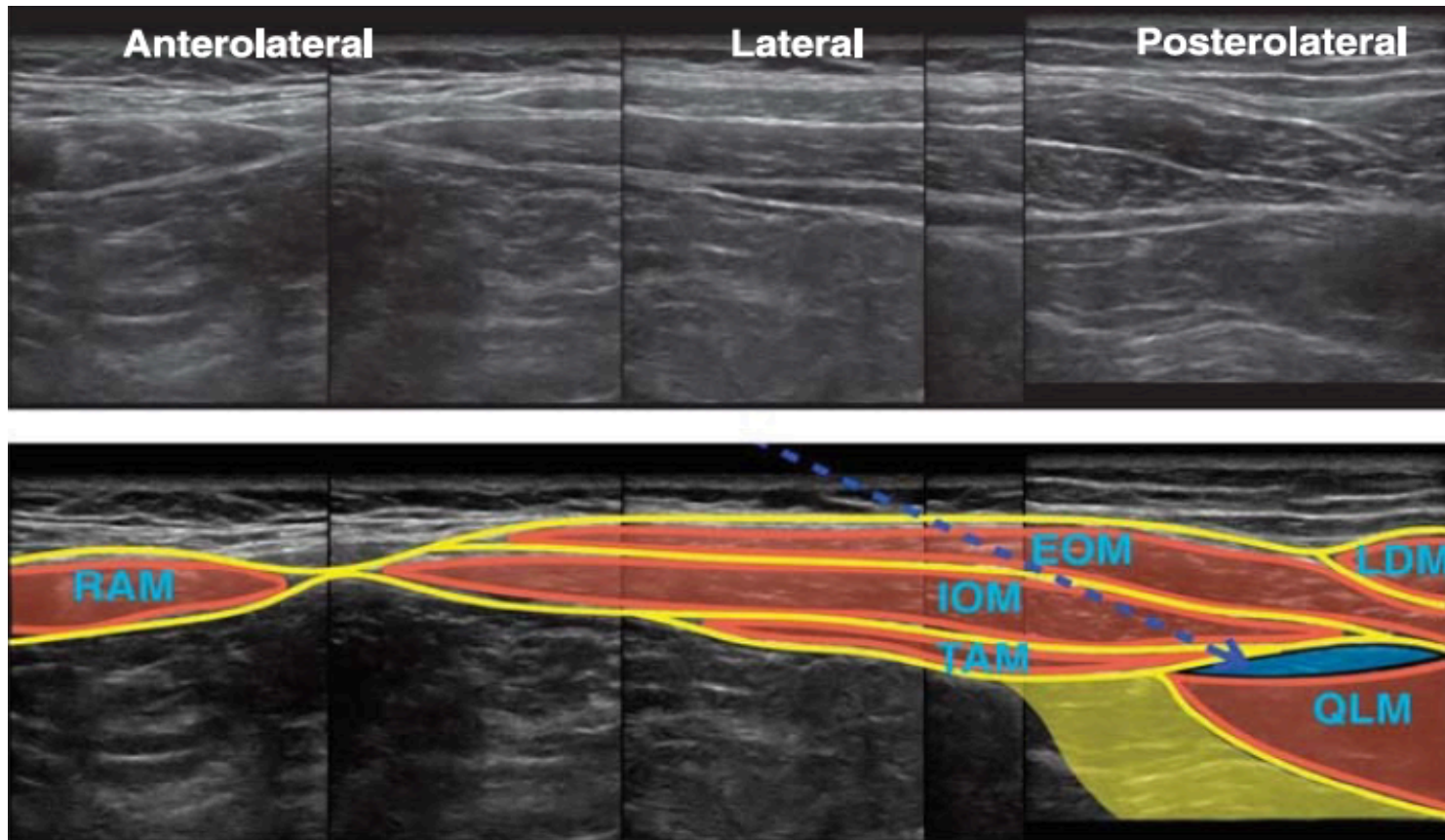
Murouchi, T, Iwasaki S, and Yamakage M. Quadratus Lumborum Block: Analgesic Effects and Chronological Ropivacaine Concentrations After Laparoscopic Surgery. Reg Anes Pain Med (2016).

QLB: Posterior U/S Technique



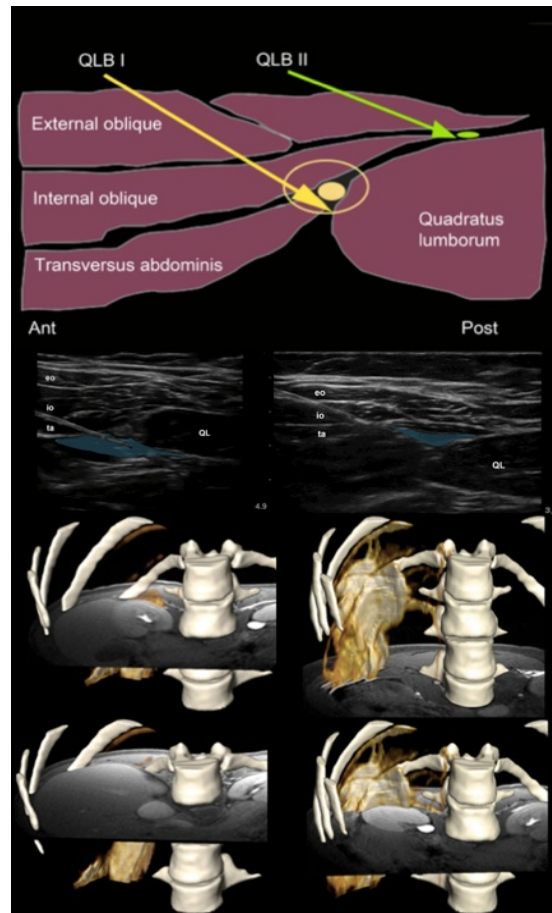


Ultrasound



Murouchi, T, Iwasaki S, and Yamakage M. Quadratus Lumborum Block: Analgesic Effects and Chronological Ropivacaine Concentrations After Laparoscopic Surgery. Reg Anes Pain Med (2016).

Ultrasound



<http://www.respond2articles.com/ANA/forums/post/1550.aspx>

QLB

- Achieves a greater spread under the transversalis fascia potentially reaching the thoracic parvertebral space with a single injection
- More sensory block compared to TAP block where classically lower segments only are covered
- Studies report greater longevity of QLB compared to TAP blocks
 - 20 – 24 hours vs. 6 – 10 hours!

QLB Complications

- LAST- Use color Doppler before needle insertion to avoid abdominal branches lumbar arteries
- Inadvertent puncture of intra-abdominal structures: peritoneum and bowels, kidney, liver, spleen
 - Perform in plane and watch spread!
- Remember that the R kidney is slightly lower and smaller than the L (therefore possibly not seen with US)

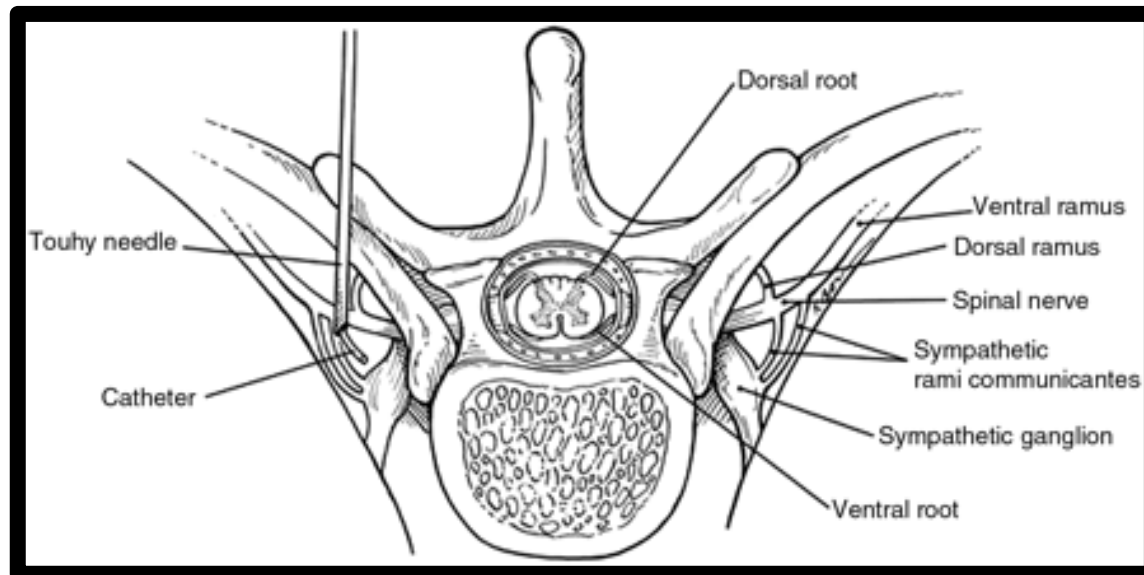
QLB

- provides somatic pain of *upper* and *lower* abdomen (vs. TAP)
- QL blocks have the potential to provide some **visceral** analgesia, because of spread to the paravertebral space

PARAVERTEBRAL BLOCK

Thoracic Paravertebral Block (TPVB)

- Thoracic Paravertebral Block is the technique of injecting local anesthetic alongside the thoracic vertebra close to where the spinal nerves emerge from the intervertebral foramen to produce **unilateral, segmental, somatic and sympathetic** nerve blockade.
- Indicated for treatment of acute and chronic unilateral pain of chest and abdomen.



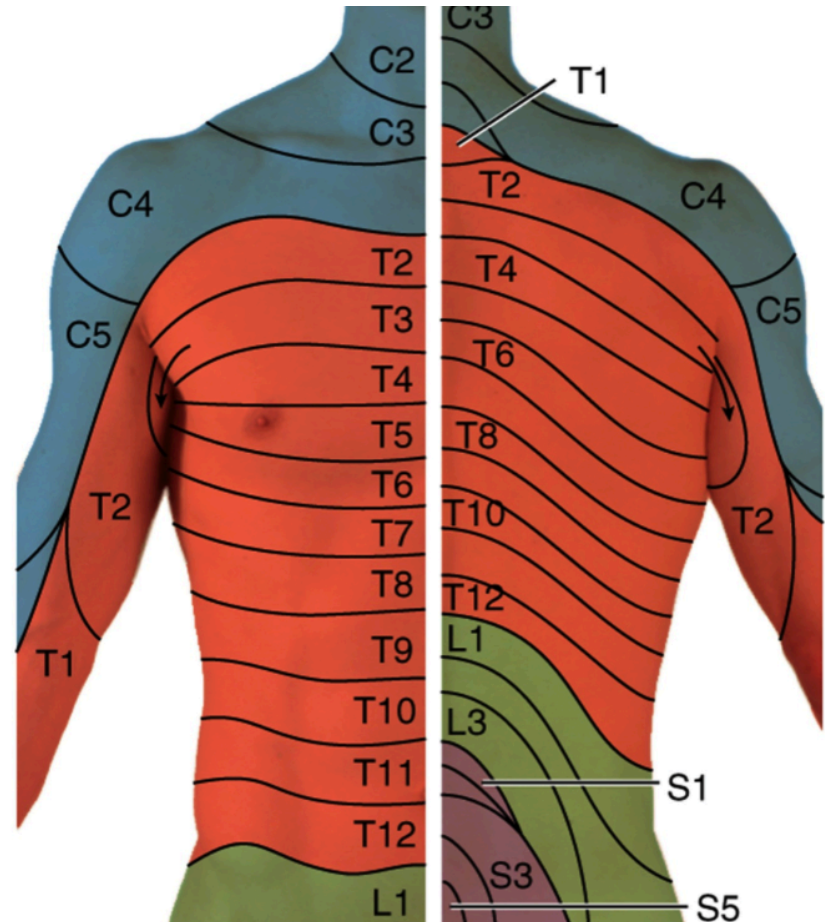
Indications for Thoracic Paravertebral Block

Unilateral surgical procedures in the thoracoabdominal region:

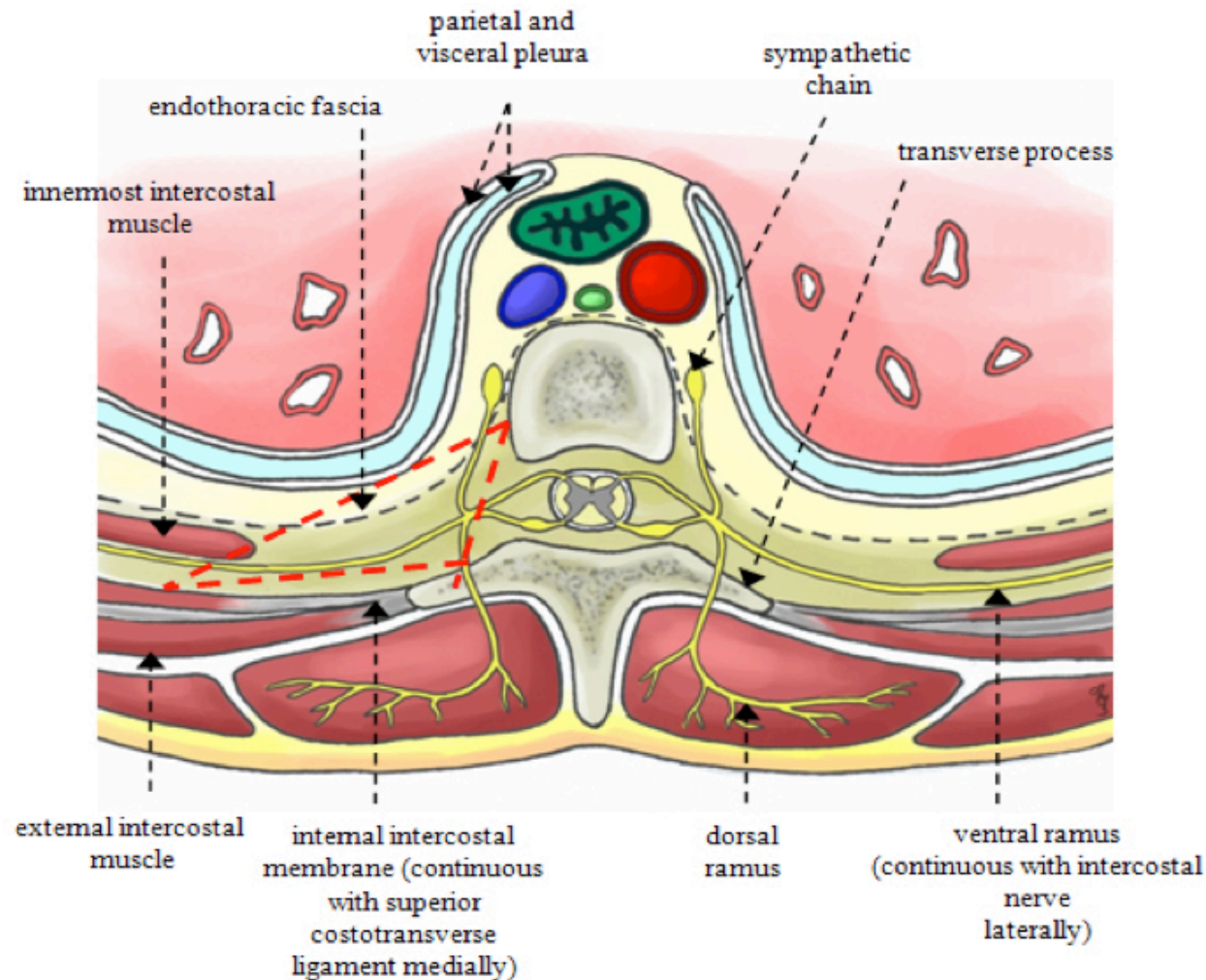
- Breast Surgery
- Thoracic surgery
- Cholecystectomy
- Renal surgery
- Appendectomy
- Inguinal hernia repair

Relief of acute or chronic pain:

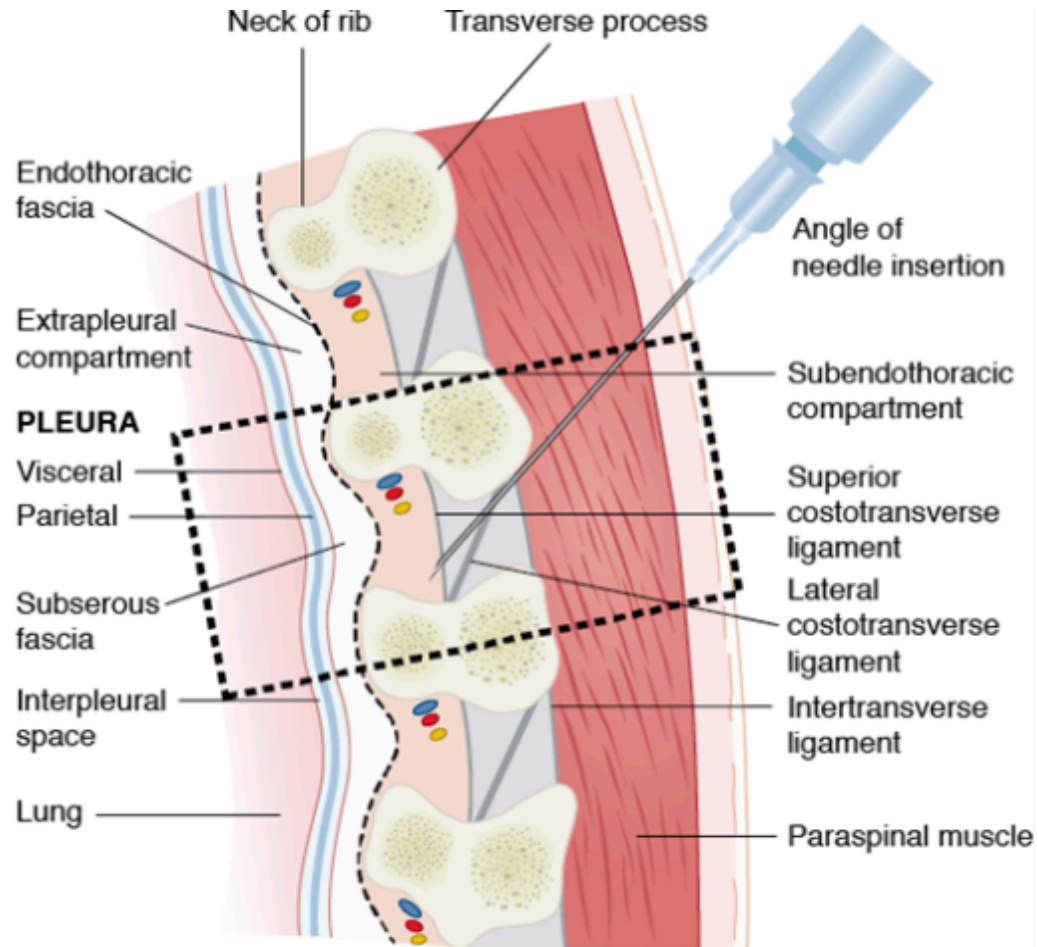
- Fractured ribs
- Liver capsule pain
- Neuropathic chest/abdominal pain
- CRPS
- Refractory angina pectoris
- Cancer pain alleviation

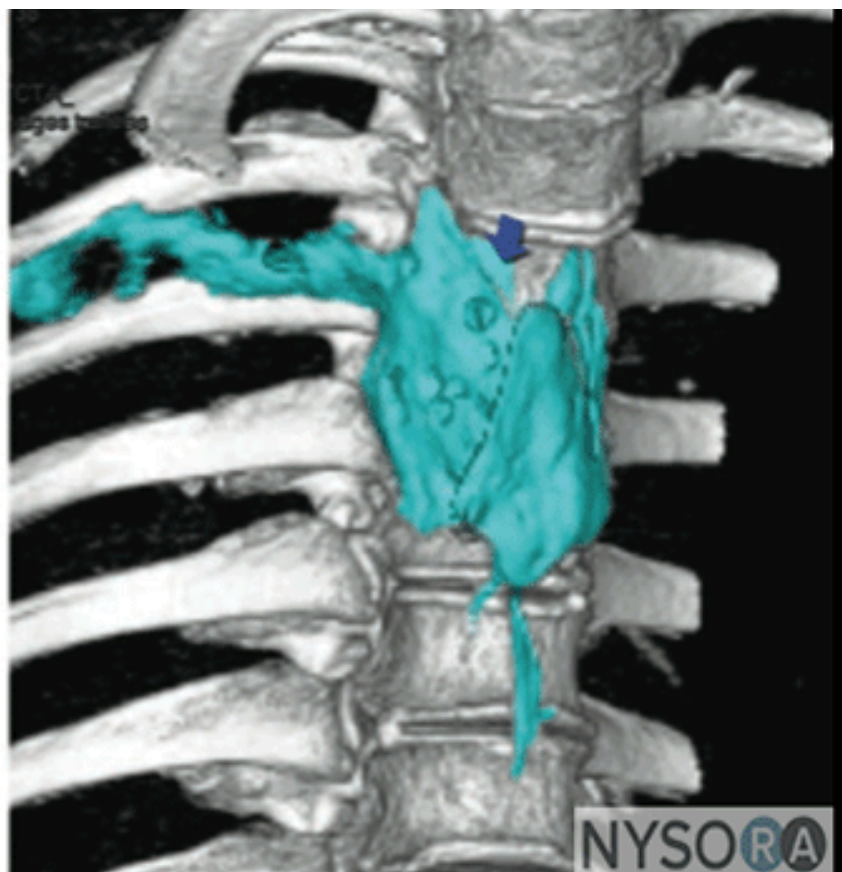
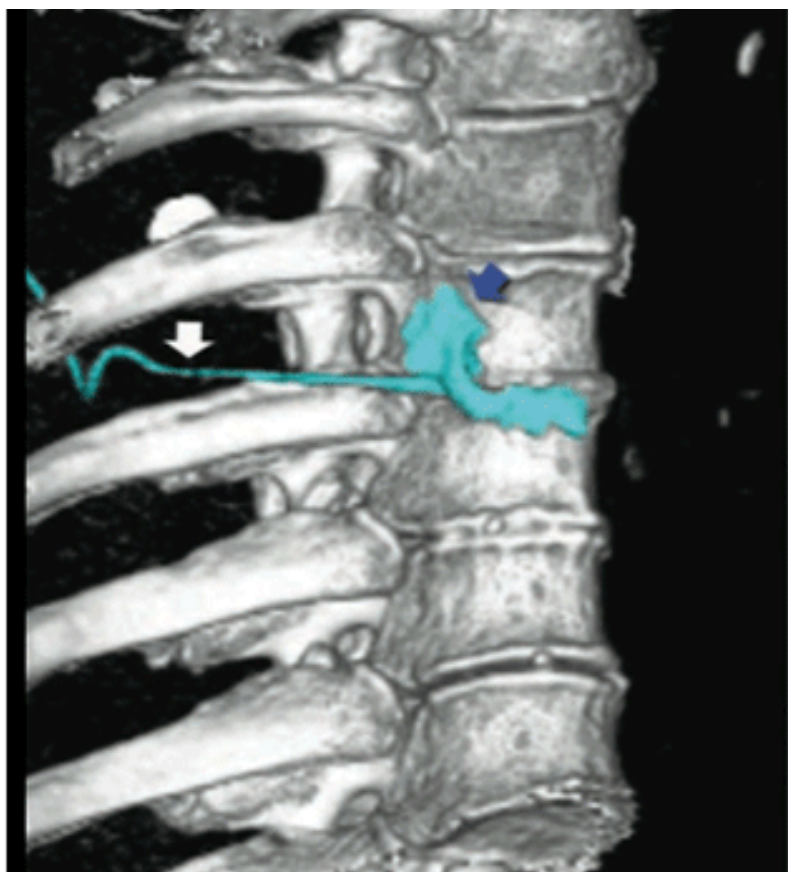


Anatomy of the Paravertebral Space



Anatomy of the Paravertebral Space





Paravertebral Block Technique



- Patient sitting - better surface anatomy and more comfortable
- 22G blunt-tip needle (single shot) or epidural set with 18G Tuohy needle (catheter technique)
- Mark skin 2.5 cm lateral to spinous process (needle insertion site)



Landmark technique

- Needle contacting the transverse process
- Loss-of-resistance to air or saline



Ultrasound Guided Paravertebral Block

- Ultrasound has been used to enhance the safety and efficacy of TPVB by determining the location and depth of the transverse process and the parietal pleura.
- Typically linear 38mm 10-5MHz probe is used or curved 60mm 5-2MHz

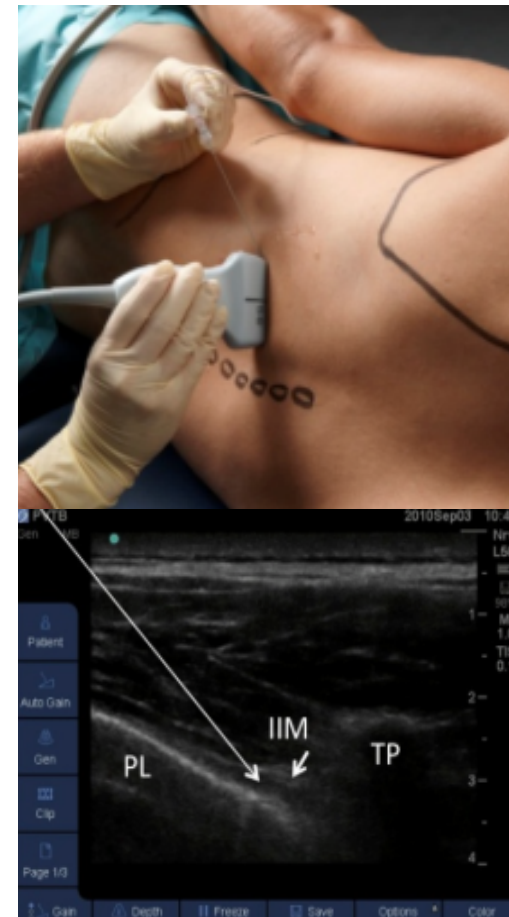


Ultrasound Guided Paravertebral Block

Paramedian Sagittal Approach

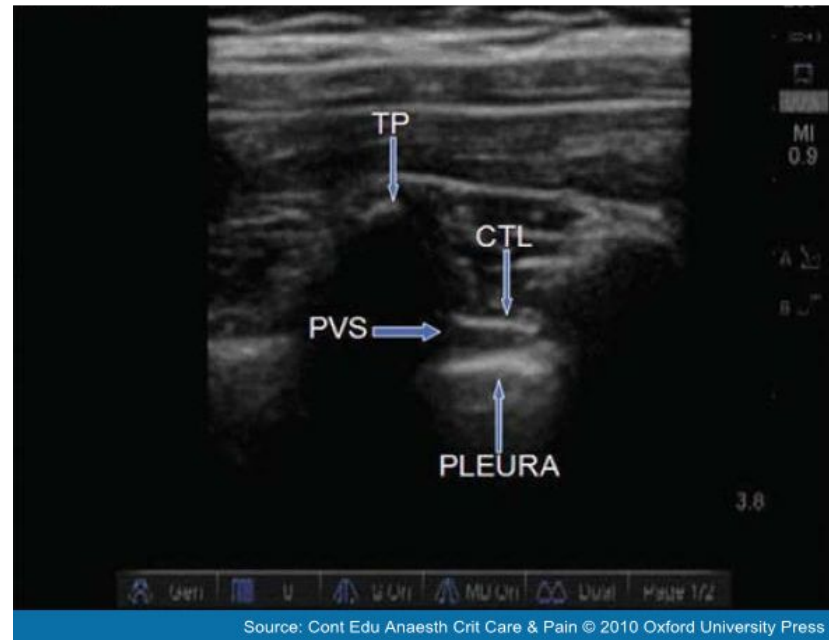


Transverse Approach

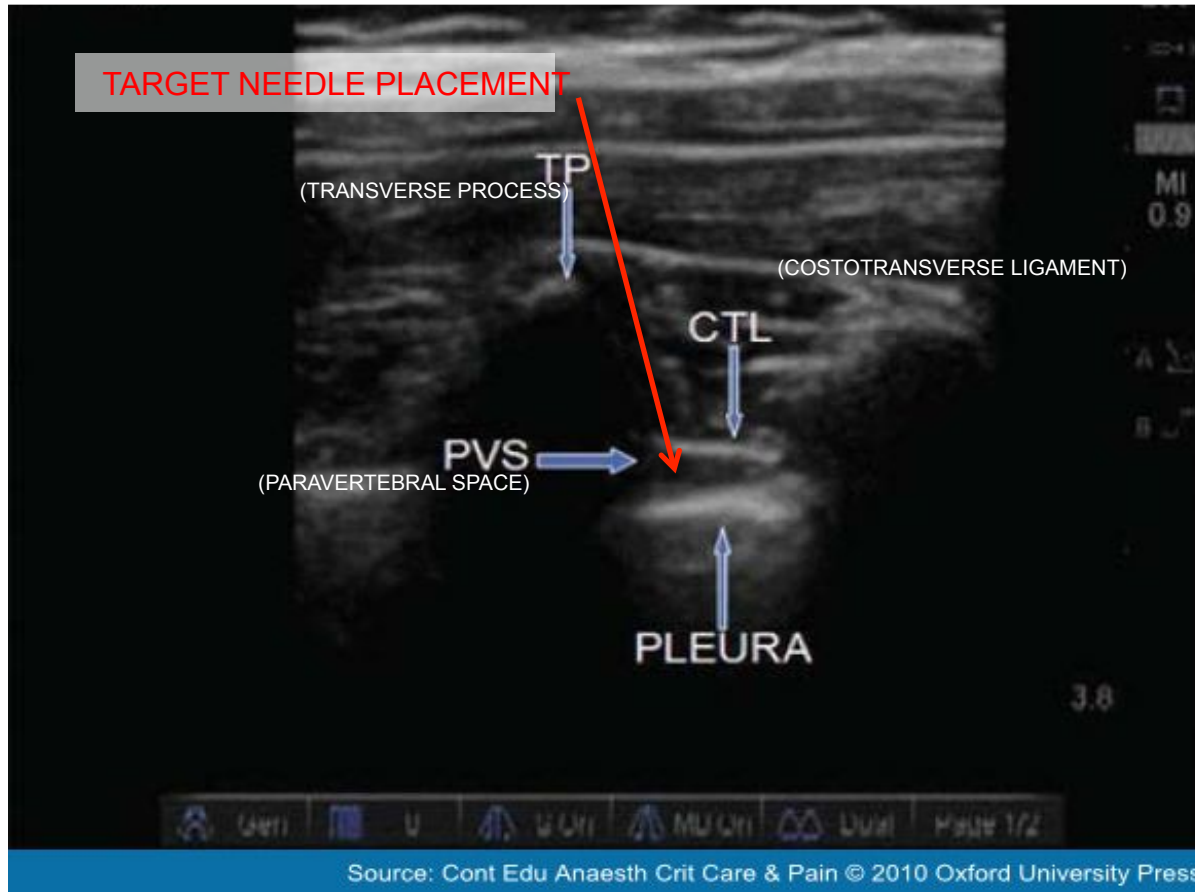


Paramedian Sagittal Technique

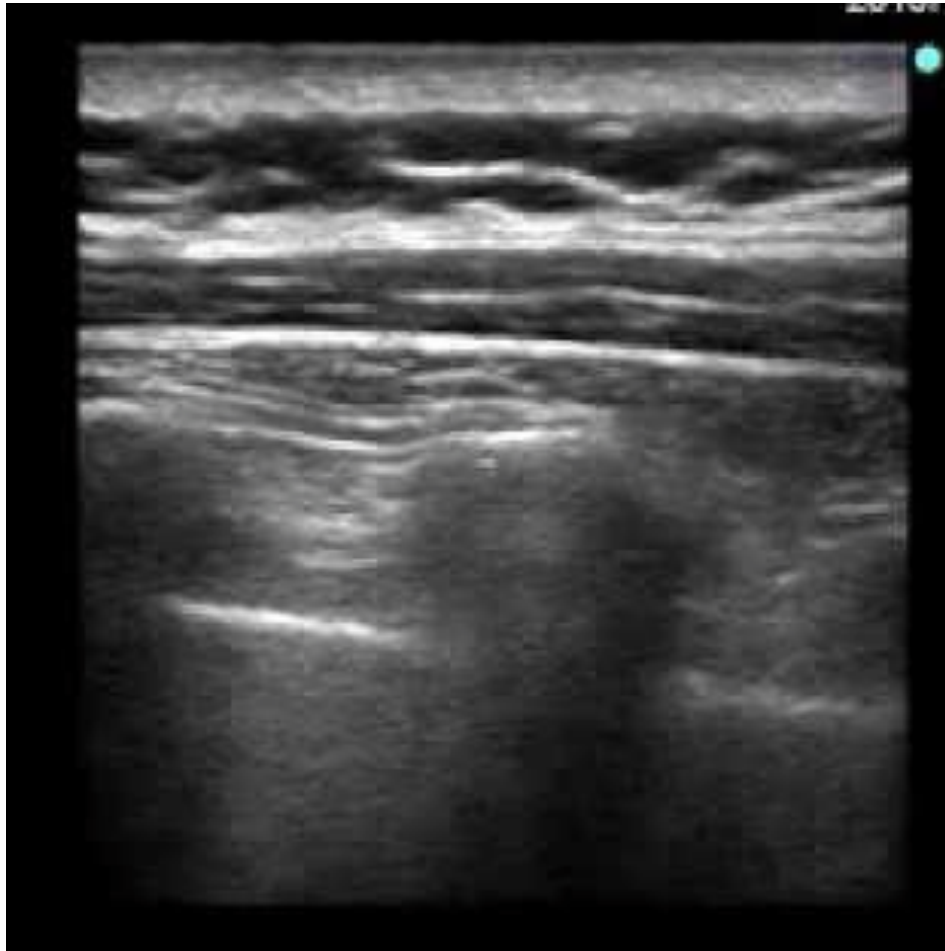
- Transducer positioned 2-3 cm lateral to the midline with orientation marker directed cranially
- Midpoint of the transducer approximately midway between two contiguous transverse processes



Paramedian Sagittal Block



Paravertebral Block – Paramedian Sagittal Oblique View



Paravertebral Block – Paramedian Sagittal Oblique – Needle Approach

In Plane

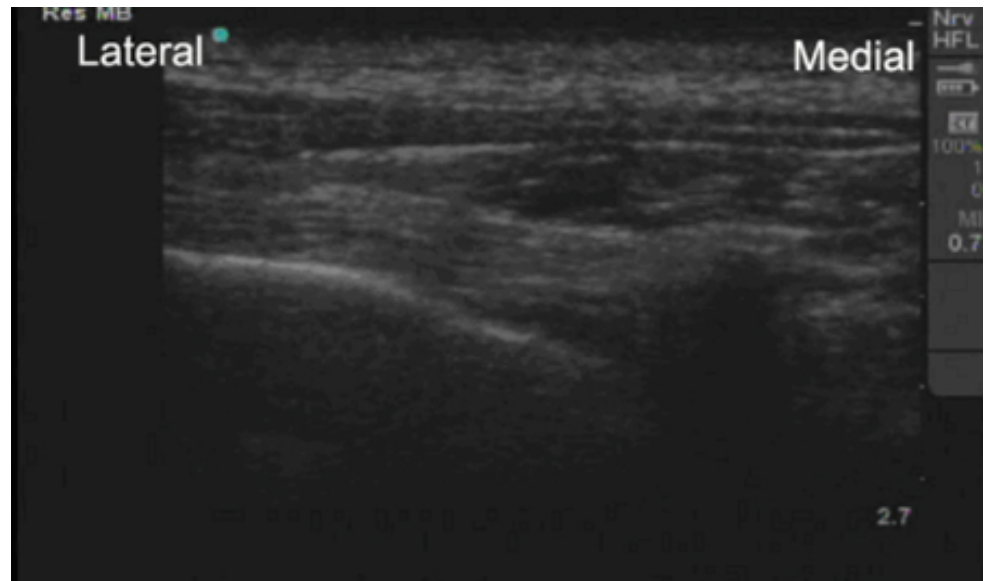
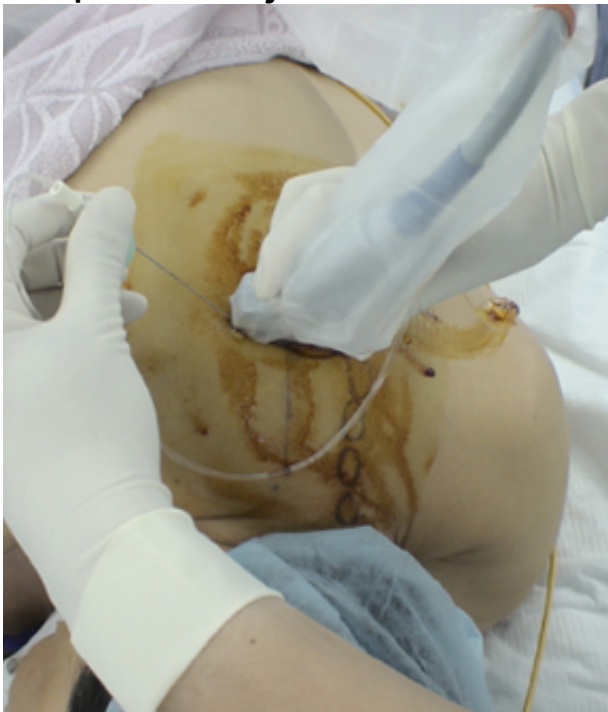


Out of Plane

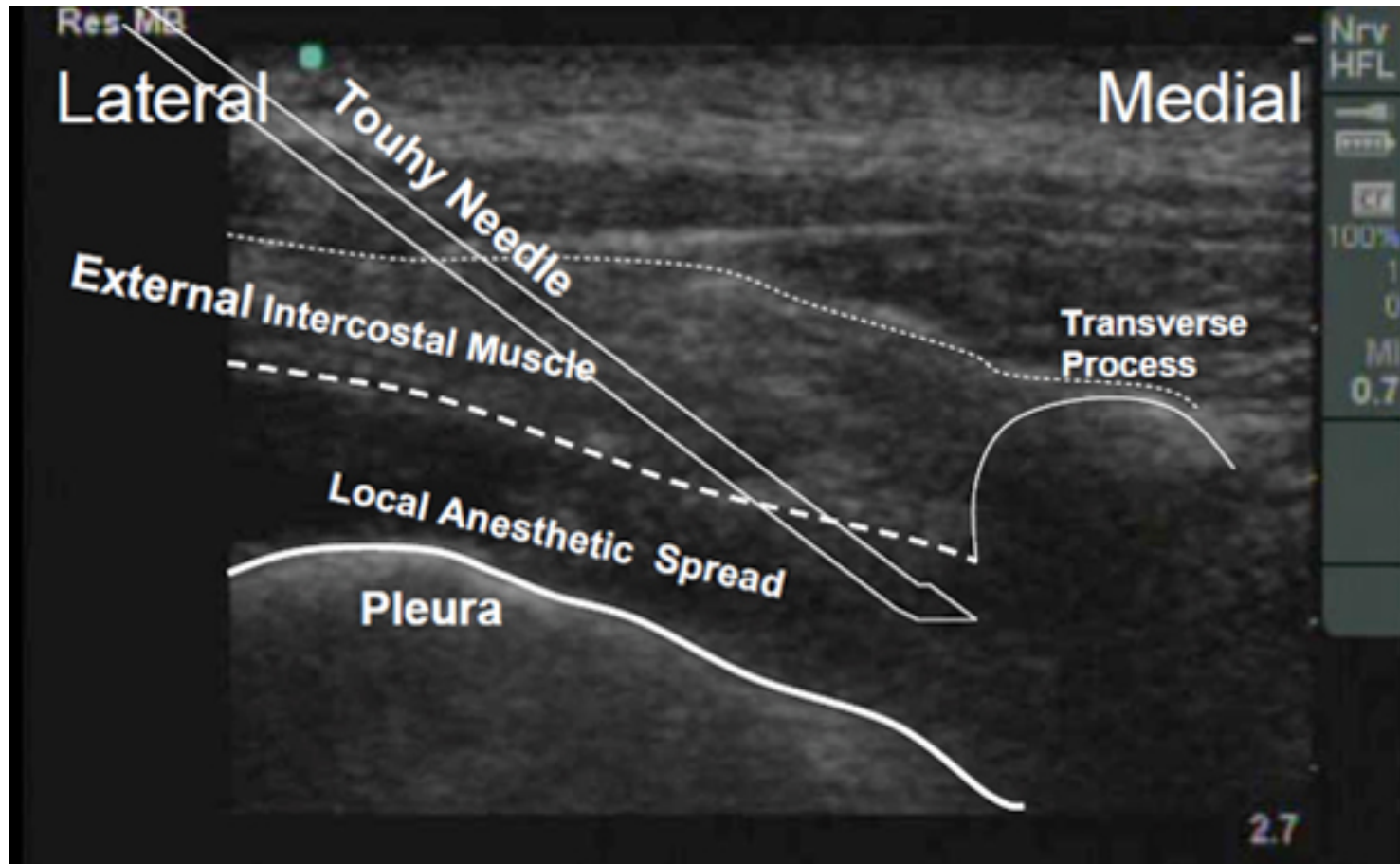


Transverse Technique

- Transducer positioned transversely, lateral to the spinous processes
- Slide transducer caudally or cranially for transverse scan between the two transverse processes
- Advanced technique for experienced practitioners – risk of intrathecal or epidural injection



Transverse Technique – in plane needle approach



Advantages of Paravertebral Block *versus* Thoracic Epidural

- Easier to perform than thoracic epidural placement and produces comparable analgesia
- Can be performed safely in anesthetized patients
- Smaller risk of neurologic complications
- Fewer instances of significant hypotension with *unilateral* paravertebral since sympathetic blockade is rarely bilateral
- No urinary retention as seen with neuraxial techniques

Contraindications

Absolute **contraindications:**

- Patient refusal
- Allergy to local anesthetic drugs
- Local infection
- Cancerous tumors of the PVS

Relative **contraindications:**

- Severe coagulopathy
- Severe respiratory disease
- Ipsilateral diaphragmatic paresis
- Severe spinal deformities

NEW!!
PECTORAL NERVES (PEC
I & II) AND SERRATUS
PLANE BLOCKS

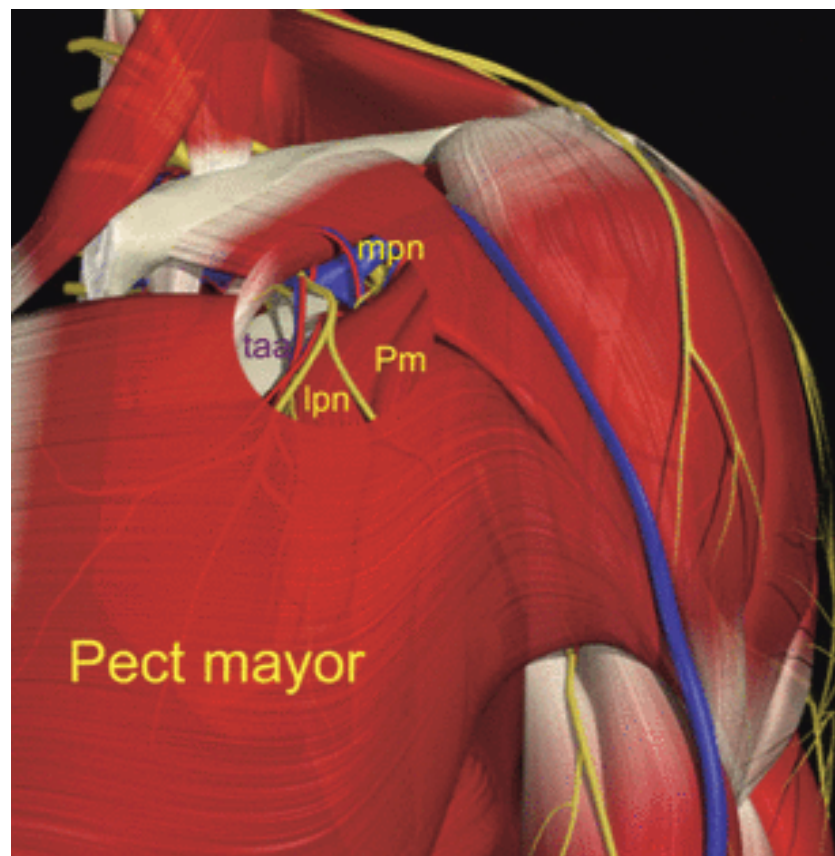
Pectoral Nerves I and II Blocks

- Alternative to Paravertebral/Epidural Analgesia
- Good analgesia during breast surgery
- Less invasive technique than TPVB and Thoracic epidurals

Bashandy et. al. "Pectoral nerves I and II blocks in multimodal analgesia for breast cancer surgery: a randomized clinical trial," Regional Anesthesia and Pain Medicine, vol. 40, no. 1, pp. 68–74, 2015

Pec I & II

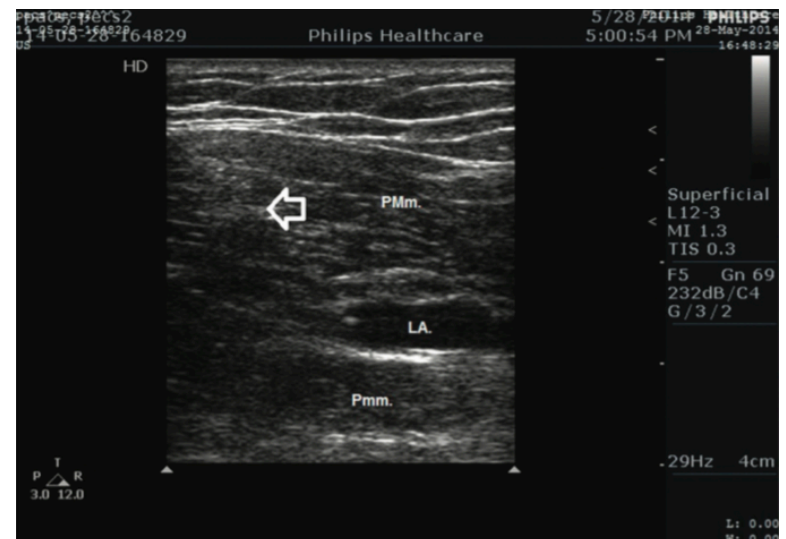
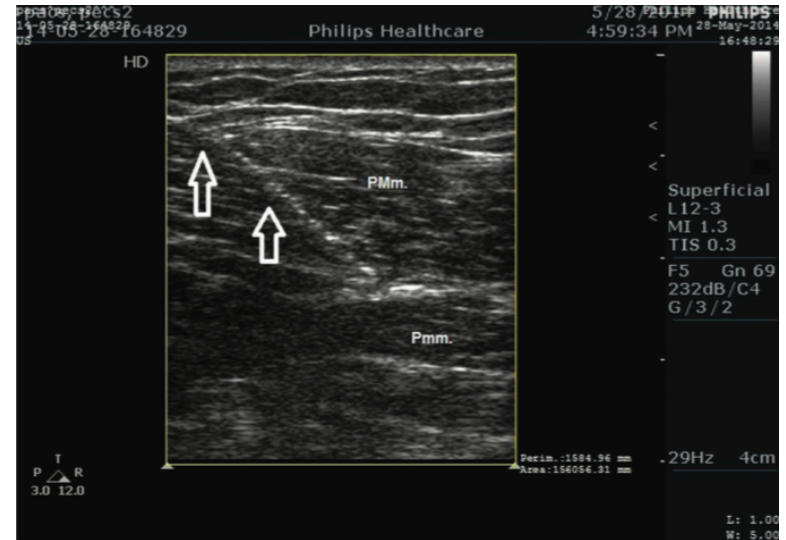
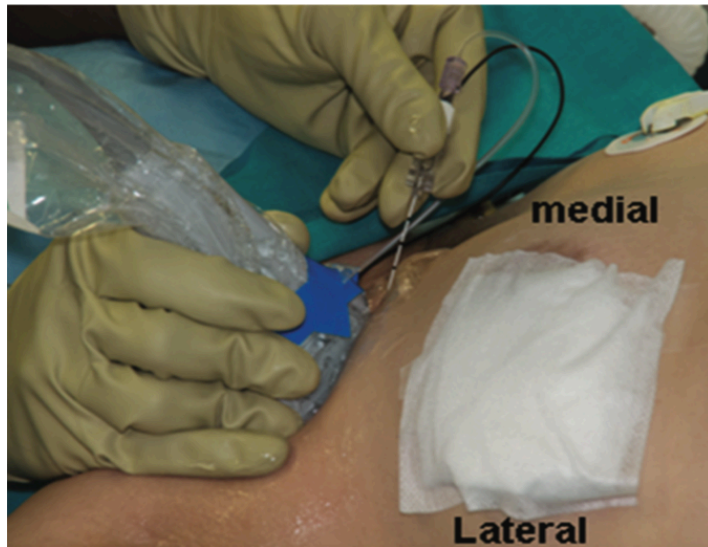
- Blocks the pectoral, intercostobrachial, third to sixth intercostals, and the long thoracic nerves.
 - PEC I – Fascial Plane between Pec Major and Minor
 - PEC II – above the Serratus at the level of the 3rd rib



Blanco, R. (2011), The 'pecs block': a novel technique for providing analgesia after breast surgery. *Anaesthesia*, 66: 847–848. doi: 10.1111/j.1365-2044.2011.06838

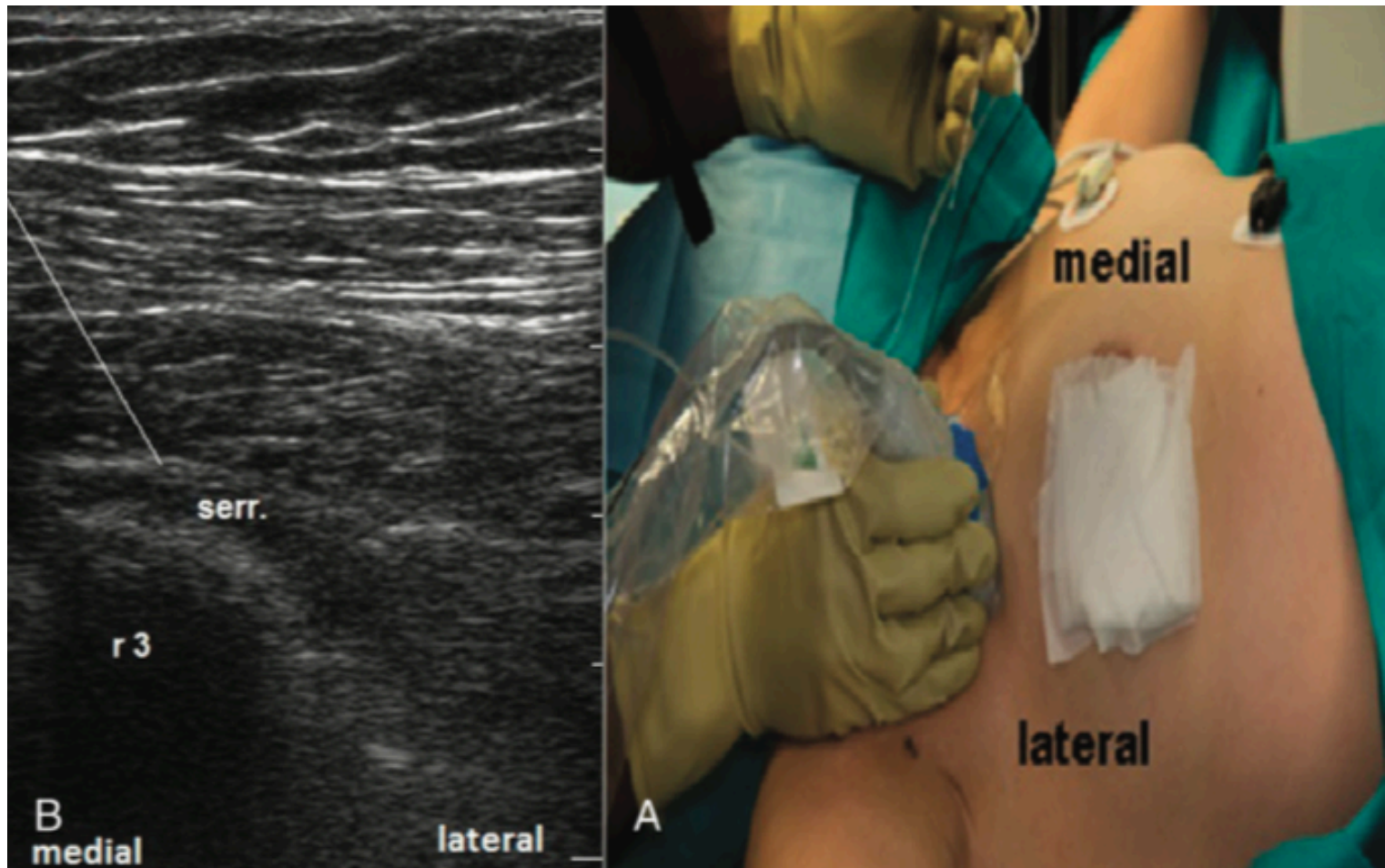


Pecs I Block



Bashandy et. al. "Pectoral nerves I and II blocks in multimodal analgesia for breast cancer surgery: a randomized clinical trial," Regional Anesthesia and Pain Medicine, vol. 40, no. 1, pp. 68-74, 2015

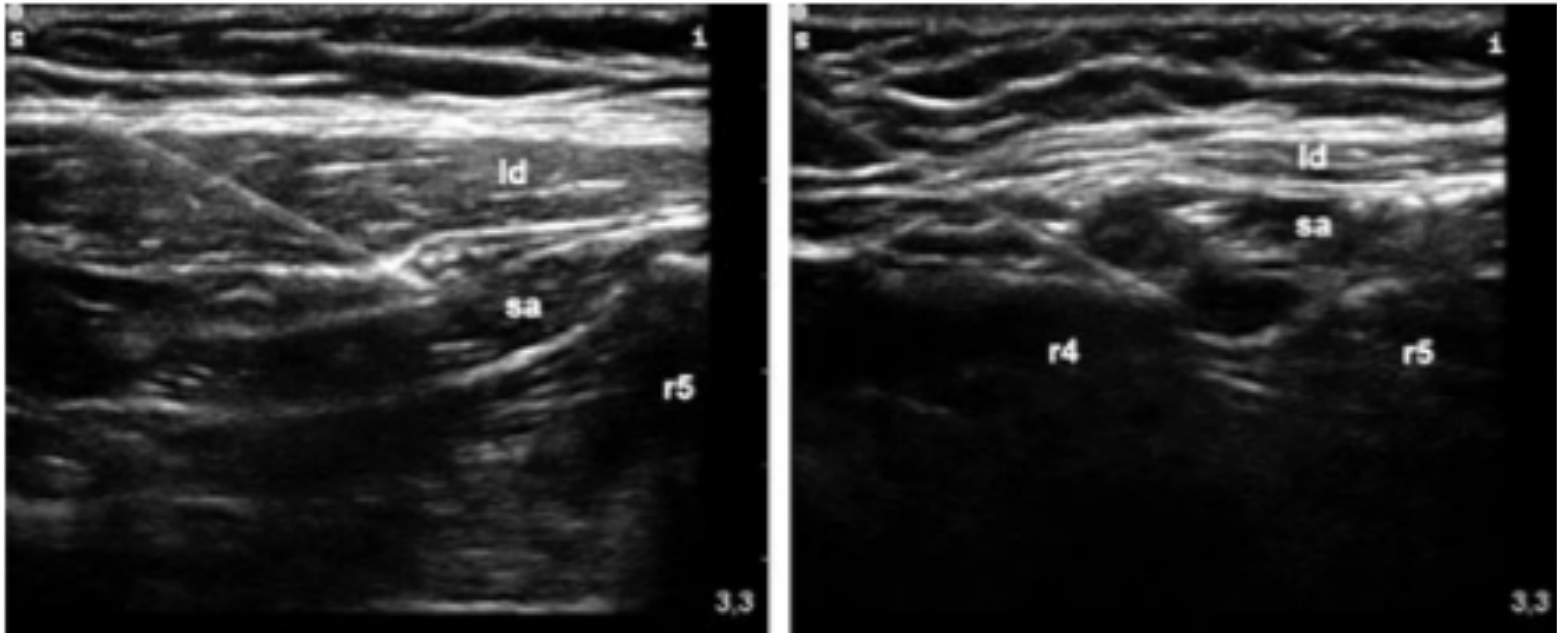
Pecs II Block



Serratus Plane Block

- Injection between latissimus dorsi and serratus anterior at the 5th rib level in the mid axillary line. This injection blocks the thoracic intercostal nerves T2-T9
- Viable alternative to paravertebral blockade and thoracic epidural analgesia for breast surgery
- Good for latissimus dorsi flap recon, rib fractures

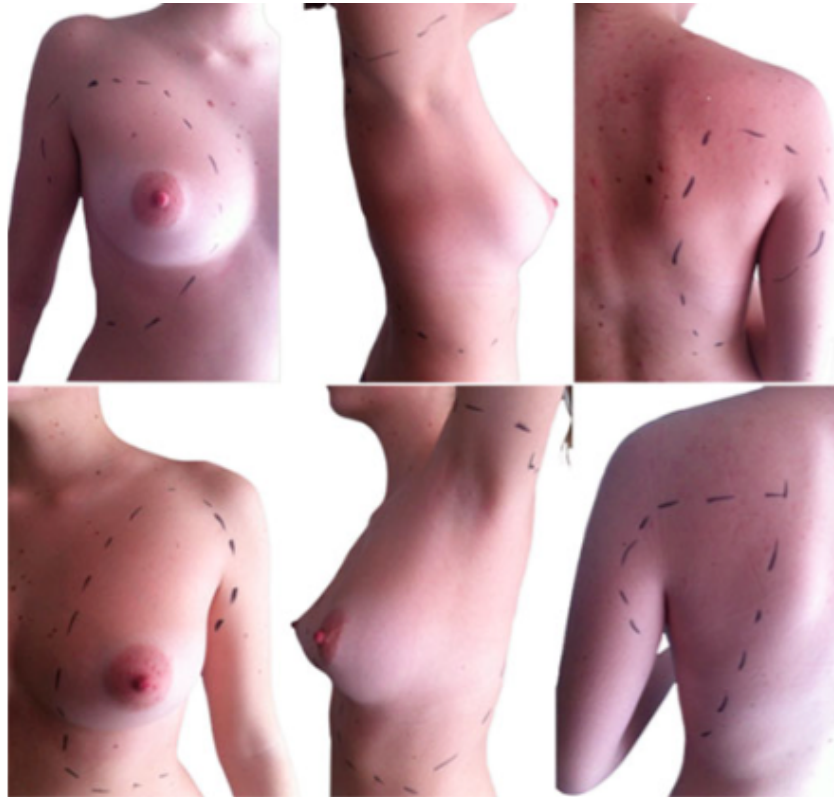
Serratus Plane Block



The latissimus dorsi muscle (ld) lies superficial to serratus anterior (sa)

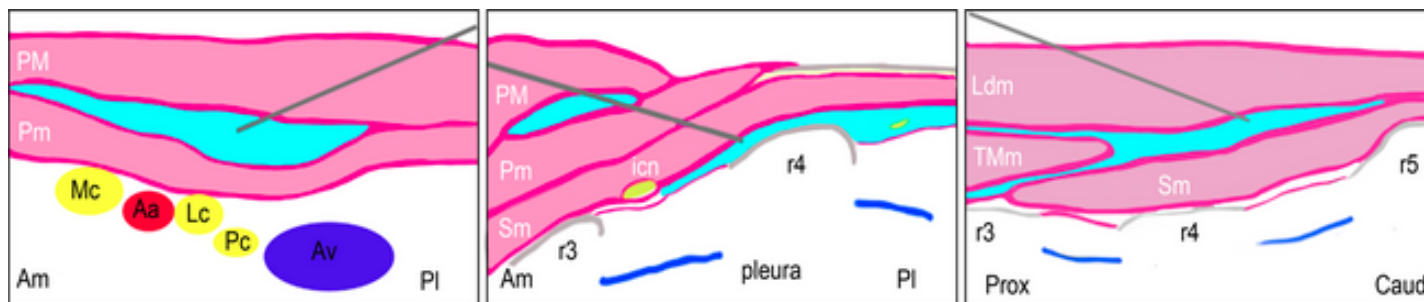
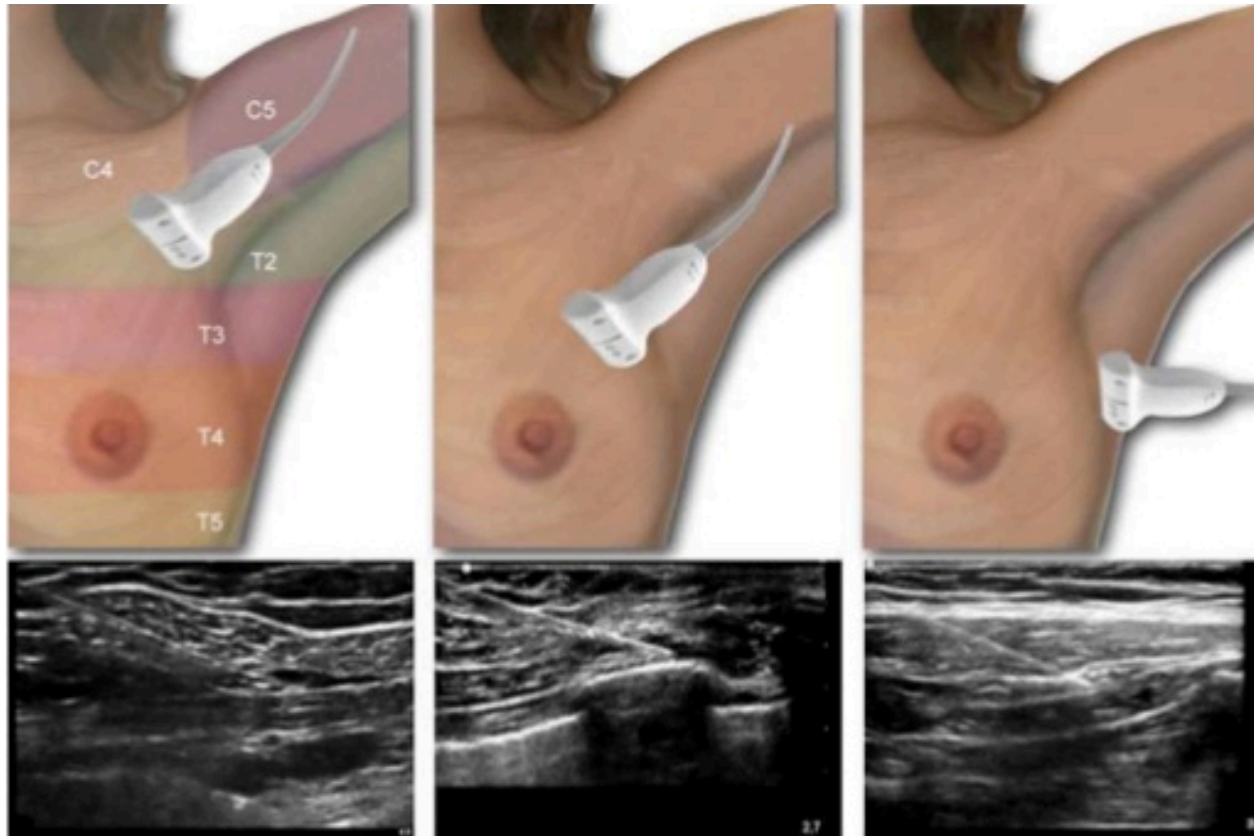
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Serratus Plane Block



Area of sensory loss following superficial (above) or deep (below) serratus plane block.

Blanco, R., Parras, T., McDonnell, J. G. and Prats-Galino, A. (2013), Serratus plane block: a novel ultrasound-guided thoracic wall nerve block. *Anaesthesia*, 68: 1107–1113. doi: 10.1111/anae.12344



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- Lissauer J, Mancuso K, Merritt C, et al.: Evolution of the transversus abdominis plane block and its role in postoperative analgesia. *Best Pract Res Clin Anaesthesiol.* 2014; 28(2): 117–26
- J. Carney, et. Al., “Studies on the spread of local anaesthetic solution in transversus abdominis plane blocks,” *Anaesthesia*, vol. 66, no. 11, pp. 1023–1030, 2011
- CHEEMA, S. P. S., ILSLEY, D., RICHARDSON, J. and SABANATHAN, S. (1995), A thermographic study of paravertebral analgesia. *Anaesthesia*, 50: 118–121. doi: 10.1111/j.1365-2044.1995.tb15092.x
- Carney J, Finnerty O, Rauf J, Bergin D, Laffey JG, McDonnell JG. Studies on the spread of local anaesthetic solution in transversus abdominis plane blocks. *Anaesthesia* 2011;66:1023–1030.
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- Murouchi, T, Iwasaki S, and Yamakage M. Quadratus Lumborum Block: Analgesic Effects and Chronological Ropivacaine Concentrations After Laparoscopic Surgery. *Reg Anes Pain Med* (2016).
- Bashandy et. al. “Pectoral nerves I and II blocks in multimodal analgesia for breast cancer surgery: a randomized clinical trial,” *Regional Anesthesia and Pain Medicine*, vol. 40, no. 1, pp. 68–74, 2015
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