

Nerve Blocks For The Masses: Loss Of Resistance (LOR) Blocks

**Global Anaesthesia Medical Education
(GAME) Initiative**



**2nd Revised Edition
New Chapters Added**

Dr Shiv Kumar Singh
The Anaesthetist

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Preface

“THE ANAESTHETIST” FACEBOOK GROUP

BUDDHA SAID, “THERE IS NO WEALTH LIKE KNOWLEDGE, AND NO POVERTY LIKE IGNORANCE”.

Facebook group “The Anaesthetist” was born on 21st Feb 2012 by the initiative of Dr Vivek Gupta and moderated by me. Over the months the group grew steadily in numbers and people were joining from all over the world but most were from the Indian Subcontinent and the Middle East. The members from the west were again mostly of eastern origin. There were some members from the European and South American countries as well, who do regularly participate in the activities. In less than a year we were more than 1000 members strong and in the last 10 years our strength has grown to more than 30,600 dedicated members from across 101 countries.

On 25th Oct 2013 we launched the logo competition. Aashish Jain was the 1st person to submit his entry and this initiated many more to participate with great enthusiasm. The creativity exhibited by the members who took part really surprised me. The competition was won by Sunny Bhasin. The logo of the society signifies the activities of an anaesthetist.

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On 24th March 2014, the group “The Anaesthetist” got registered as a society. Since then, the group has conducted numerous workshops on regional anaesthesia across India. We conceived the NBFM, nerve blocks for masses workshop that taught not only PNS guided nerve blocks but also landmark guided nerve loss of resistance (LOR) blocks to those who have no access to PNS or US. We also conduct US guided nerve blocks workshop, FARA i.e Focused Approach to Regional Anaesthesia. In 2019, we included POCUS (Point of Care US) to FARA.

The first NBFM was held in Rajkot 2015 which was followed by Nagpur in 2017 and in Hyderabad in 2020. We were lucky to conduct the NBFM Hyderabad just before COVID hit the world. This was the largest NBFM with more than 300 delegates. We also conducted our Difficult Airway Workshop (DAW) along with NBFM.

This book has been specifically produced for the members to practice blocks that can be done by anyone anywhere even in the remotest of the places. The 1st two editions are only LOR blocks but the 3rd edition shall include PNS guided blocks as well

Good Luck to all the members of The Anaesthetist

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Golden Rules Of RA

1. Always discuss the procedure with the patient, explain benefits and risks and obtain consent. Document this discussion in the notes and anaesthesia chart. Written consent is not necessary, you can state that “verbal consent obtained”
1. Always involve the surgeon in the decision making, he/she should be aware that you are planning a regional anaesthesia technique on the patient.
1. Always discuss potential complications and side-effects, document these as mentioned above in the case notes and anaesthesia chart. These can be common, not so common and rare complications.
1. Always perform the procedure in the best interest of the patient not yours.
1. Always perform the technique in an appropriate and safe setting with resuscitation equipment and drugs available.
1. Always have IV access and minimum monitoring established before performing nerve blocks
1. Always conform the side and site of surgery with the patient and consent form. Check for the marking on the side of the procedure (arrow).
1. Always aspirate and inject LA in fractionate doses (5ml aliquots)

Golden Rules Of RA

9. Always document procedure carried out, record the complications and/or problems.
9. Always fill in the critical incident when complications occur

A Pneumonic For Documenting Blocks (SPINALS)

S Safety; Side Check, IV access, Monitoring

P Position: Sitting, Lateral etc

I Infection Control; Aseptic Precautions

N Needle; 5cm Stimuplex block needle or 25G Pencil point

A Additives; Diamorphine

L LA; 0.5% Heavy Bupivacaine or 20mls of Levobupivacaine 0.25%

S Success; Good Sensory and Motor Block, T10 level

If you are good at drawing, you can also use them to depict the block and the sensory block levels

RAD App by Gurunath Murthy (<https://www.medusys.in>) allows you to maintain a log of your nerve blocks and analyse your data on day to day basis and benchmark it against national standards.

Complications Of RA

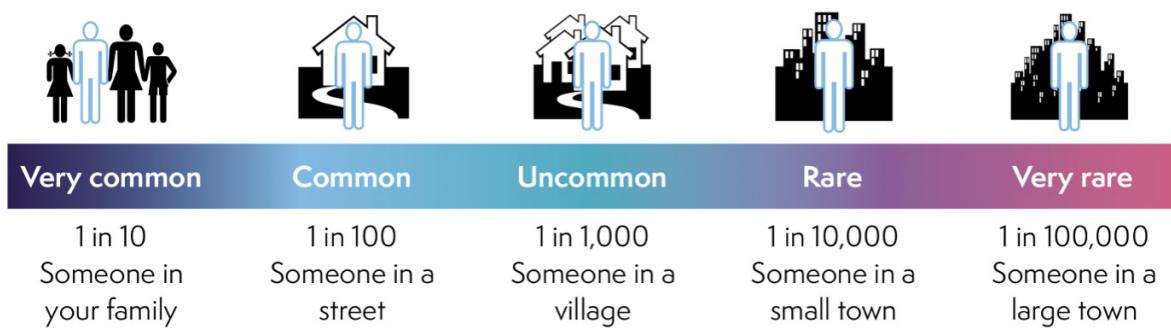
Definitions

Side effects is a reversible, non-serious, unwanted effect of a nerve block. For e.g Phrenic nerve palsy and diaphragmatic paralysis following interscalene brachial plexus block.

Complication is a potentially serious, or irreversible unwanted effect. For e.g Pneumothorax after supraclavicular block, or Intravenous injection of LA, or nerve injury.

In modern anaesthesia, serious problems are uncommon. Risk cannot be removed completely, but modern drugs, equipment and training have made anaesthesia a much safer procedure in recent years.

People vary in how they interpret words and numbers. This scale is provided to help describe the complications to patients (reference: Royal College of Anaesthetist publication, Nerve blocks for surgery on the shoulder, arm or hand , Information for patients and families)



Complications Of RA

Technical Related; these can be generic, that can happen with any nerve blocks or specific to the blocks (discussed under individual blocks)

- Bleeding and Haematoma
- Infection
- Direct nerve injury
- Pneumothorax with brachial plexus, paravertebral or intercostal nerve blocks
- Inadvertent epidural or intrathecal spread with cervical plexus, interscalene, lumbar plexus blocks

Drug Related

- Toxicity
 - Immediate-intravascular injection
 - Delayed- Absorption from vascular site/ relative overdose
- Overdose, wrong calculation of maximum dose
- Anaphylaxis
- Methaemoglobinemia (Prilocaine)

Treatment of Toxicity

1. Recognise signs of severe toxicity:

CNS Toxicity: Sudden Alteration In Mental Status, Severe Agitation Or Loss Of Consciousness, With Or Without Tonic-clonic Convulsions

CVS Toxicity: Cardiovascular Collapse: Sinus Bradycardia, Conduction Blocks, Asystole And Ventricular Tachyarrhythmias May All Occur
Local Anaesthetic (LA) Toxicity May Occur Some Time After An Initial Injection

Complications Of RA

2. Immediate Management

STOP injecting the LA

SHOUT for Help

- Maintain the airway and, if necessary, secure it with a tracheal tube
- Give 100% oxygen and ensure adequate lung ventilation (hyperventilation may help by increasing plasma pH in the presence of metabolic acidosis)
- Confirm or establish IV access
- Control seizures: give a Benzodiazepine, Thiopental or Propofol in small incremental doses
- Assess cardiovascular status throughout
- Consider drawing blood for analysis, but do not delay definitive treatment to do this

3. Treatment

In Circulatory arrest

- Start cardiopulmonary resuscitation (CPR) using standard protocols
- Manage arrhythmias using the same protocols, recognising that arrhythmias may be very refractory to treatment
- Consider the use of cardiopulmonary bypass if available

Give Intravenous lipid emulsion (see the protocol)

Complications Of RA

- Continue CPR throughout treatment with lipid emulsion
- Recovery from LA-induced cardiac arrest may take >1 h
- Propofol is not a suitable substitute for lipid emulsion
- Lidocaine should not be used as an anti-arrhythmic therapy

No signs of Circulatory Arrest

- Use conventional therapies to treat: Hypotension, bradycardia and tachyarrhythmia
- Consider Lipid Emulsion as per protocol
- Propofol is not a suitable substitute for lipid emulsion
- Lidocaine should not be used as an anti-arrhythmic therapy

4. Follow up

- Arrange safe transfer to a clinical area with appropriate equipment and suitable staff until sustained recovery is achieved
- Exclude pancreatitis by regular clinical review, including daily amylase or lipase assays for two days
- Report cases on RAD App and Discuss The Case On The Anaesthetist Facebook group for learning.

Lipid Emulsion Protocol is given in the next page

Intralipid Protocol

Immediately

Give an Initial Bolus Injection of
20% Lipid Emulsion
1.5ml/kg over 1min

And Start IV Infusion of 20%
Lipid Emulsion at
15ml/kg/hr

After 5 Mins

Give a Maximum of two repeat
boluses (same dose) if:

- Cardiovascular Stability has not
been restored or
- An Adequate Circulation
Deteriorates

Leave 5 mins Between Boluses
A Maximum of 3 boluses (including
the initial bolus) can be given

Continue Infusion At Same Rate
, But Double The Rate To
30ml/kg/hr at Any Time After 5
min If:

- Cardiovascular Stability has
not been restored or
- An Adequate Circulation
Deteriorates

Continue Infusion Until Stable
And Adequate Circulation
Restored Or Maximum Dose Of
Lipid Emulsion Given

Do Not Exceed Maximum Cumulative Dose of 12ml/Kg

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Intralipid Protocol For 70Kg Patient

Immediately

Give an Initial Bolus
Injection of 20% Lipid
Emulsion
100ml over 1min

And Start IV Infusion of
20% Lipid Emulsion at
1000ml/hr

After 5 Mins

Give a Maximum of two
repeat boluses 100mls

Continue Infusion At
Same Rate , But Double
The Rate To 2000 ml/hr
at Any Time After 5 min
If Indicated

Do Not Exceed Maximum Cumulative Dose of 840mls

Exclude Pancreatitis By Regular Clinical Review, Including
Daily Amylase Or Lipase Assays For Two Days

Introduction: Loss Of Resistance Blocks

The LOR techniques rely on using blunt or short-bevelled needles, which provide a good feedback (pops or clicks) when they pass through various fascia. There are some simple blocks that can be performed with just a needle and some local anaesthetics (LA). These blocks, if done properly, provide good analgesia for most common procedures on the abdomen and for fracture neck of femurs. These blocks include; rectus sheath (RSB), transversus abdominis plane (TAP), ilio-inguinal (IIN) and fascia iliaca compartment blocks (FICB).

The success of these blocks depends on two main things, one understanding the surgical anatomy and secondly on understanding the “cushion effect” that occurs at the skin level while using LOR needles.

It is also important to understand that these blocks provide relief only from somatic pain and multimodal analgesia (MMA) must be provided to all patients.

These are “volume blocks” and one should always use LA within its safe limits. Volume can be increased by using lower concentrations.

In this edition we describe the common blocks and techniques that can be used to provide analgesia in some of the commonly performed surgical procedures like LSCS, Appendectomy, Inguinal Hernia, Bladder surgeries, Open Prostatectomy and even for laparotomies. FICB can be used for Hip fractures, total Hip replacements, Fracture Patella, Total Knee replacement and skin grafts. We have also included newer blocks like PECs, SAP and ESP for chest wall surgeries.

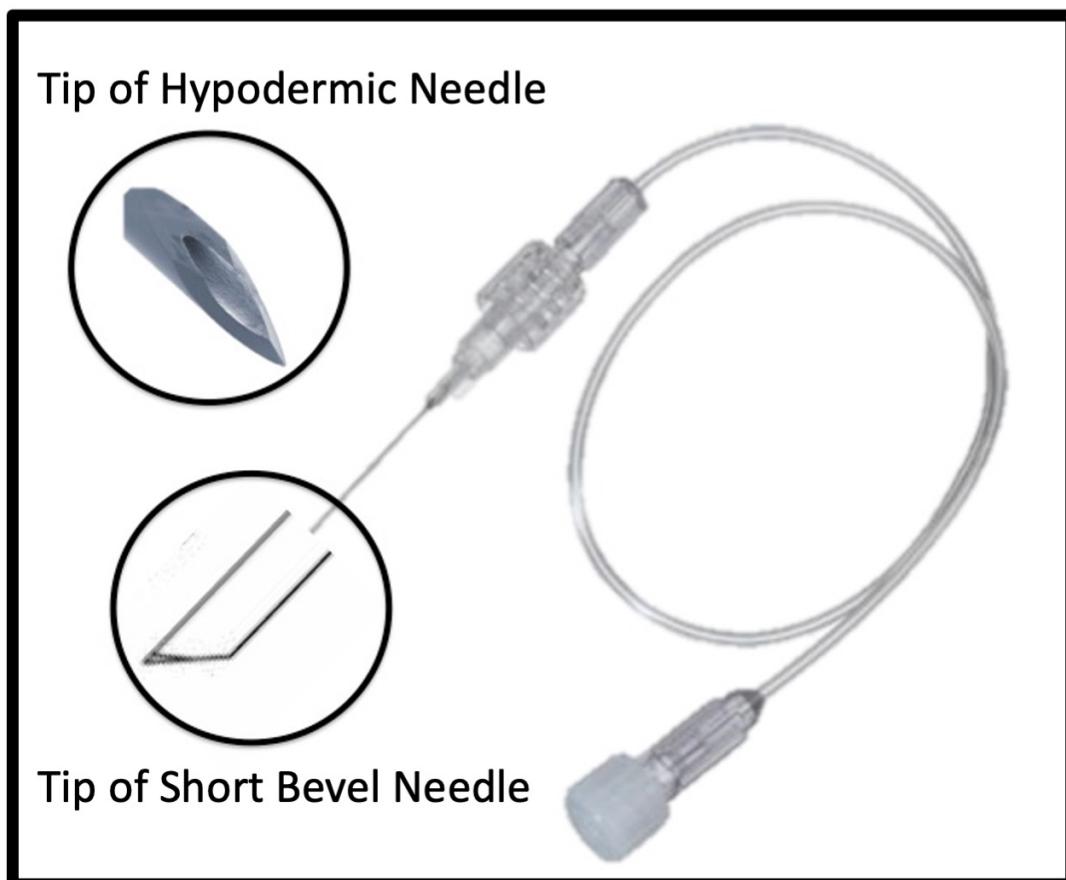
Loss Of Resistance Needles

LOR Needles

There are number of needles that can be used for LOR blocks. Some are commercially available, others that are available in the theatres can be modified for the LOR blocks.

Short Bevel Needles

Short bevelled needles are commercially available and provide very good tactile feel of the LOR (Pop) when they pass through the fascia. These needles also come with an extension tubing and hence are easy to handle and prevent displacement while injecting the LA.



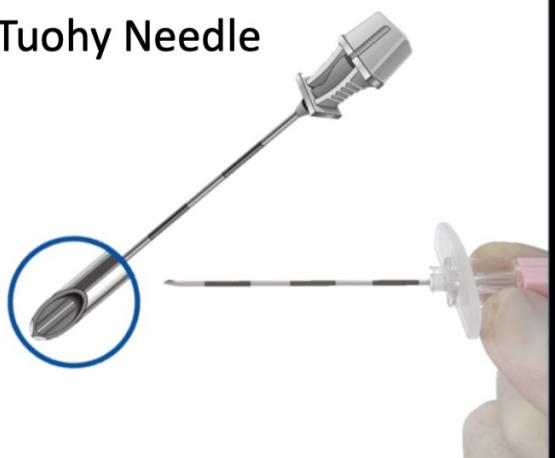
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Loss Of Resistance Needles

Needles Available In OTs That Can Be Used For LOR Blocks

Epidural (Tuohy) Needles, Blunt drawing up Needles and Pencil or Bullet point Spinal Needles can also be used successfully for these blocks. Of these the Tuohy and Drawing up needles are not only of large gauge but also lot more blunt and hence may cause more trauma to the tissue. Spinal Needles with Blunt tip (Bullet or Pencil Point) of 22 -25 G provide a good tactile feel and can be used comfortably for LOR blocks.

Tuohy Needle



Pencil Point Spinal Needles



Drawing up Needles



Blunt Tip Needle



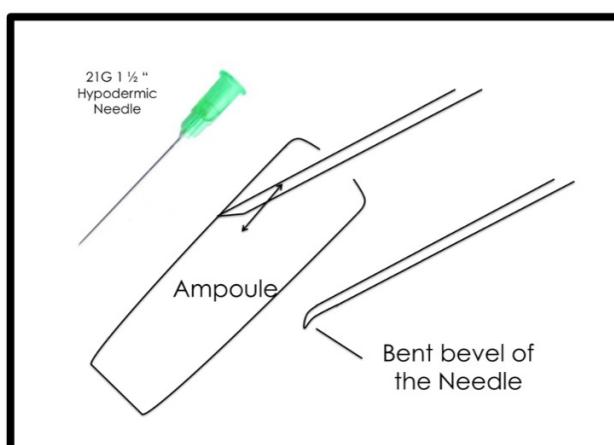
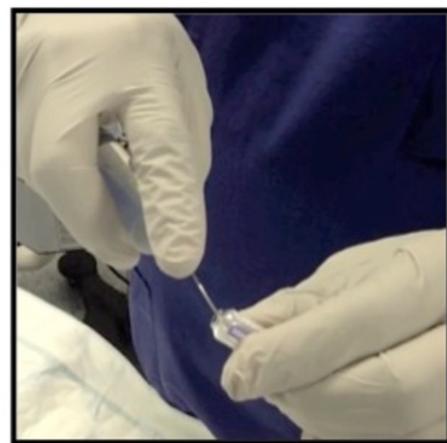
Loss Of Resistance Needles

Using A Hypodermic Needle For LOR Blocks

Hypodermic needles are sharp and are designed to pass through the skin with minimal damage or pain and hence can not be used without modification for LOR blocks.

How Do We Do That?

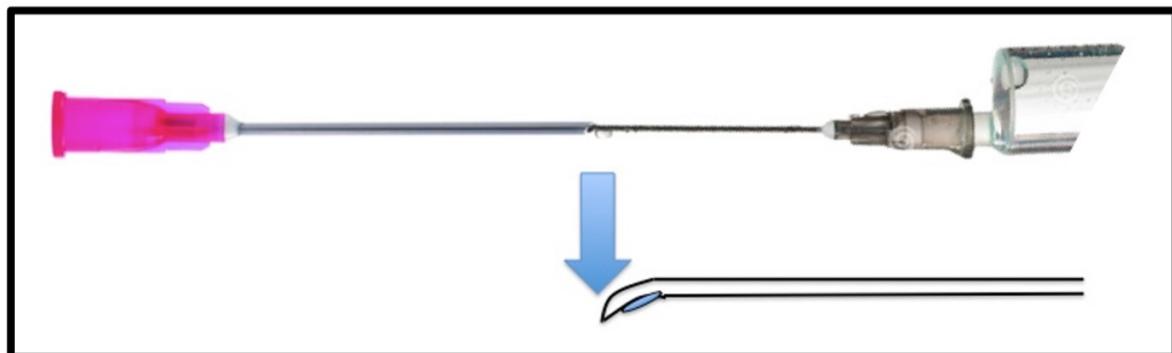
There are two common methods that we use. After attaching a green needle to a syringe and with the bevel facing inwards, scrape it against the inner wall of a sterile glass ampoule till the tip bends towards the bevel causing it to form a "Parrot Beak". Same can also be done using a sterile bowl from the surgical set.



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Loss Of Resistance Needles

The second method is using two sterile needles. The LOR needle is of a smaller gauge than the second one. The tip of the LOR needle is inserted into the larger gauge needle and is bent like a beak. The bent tip is pointing in the direction of the bevel rather than away from it.

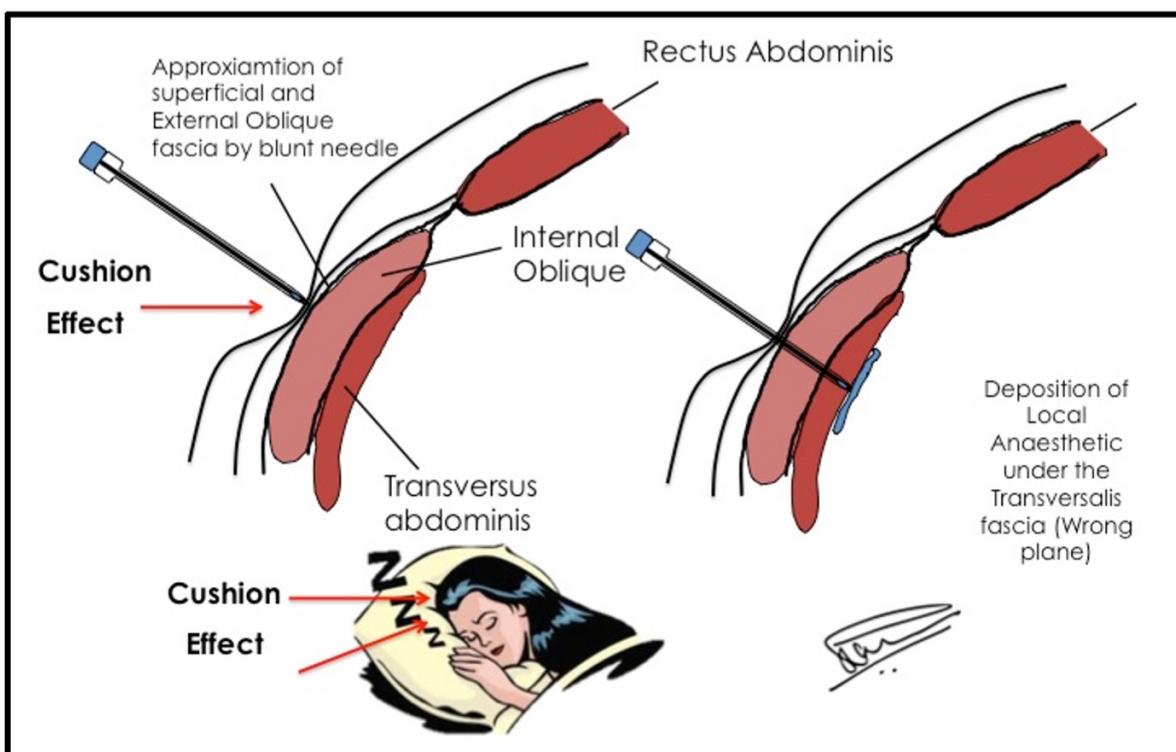


People have used other method of blunting the needle but these two techniques give better control over how much the tip can be blunted or modified so that the tissue damage is minimal when used for LOR Blocks.

Cushion Effect

LOR Needles And Cushion Effect

The needles used for the LOR are blunt or short bevelled and therefore a considerable amount of force is required for the tip of the needle to pierce the skin. This large amount of force tends to obliterate the cushion of subcutaneous fat lying under the skin, the “cushion effect” and as the skin barrier is breached, the needle passes not only through the skin but also through the subcutaneous tissues and the fascia. This may lead to feeling of “pops”/ “clicks” in a wrong/deeper planes and deposition of local anaesthetic in the wrong place with failure and some time complications (like femoral nerve block while performing hernia blocks), something which is not expected or desired.



The Cushion Effect

Cushion Effect

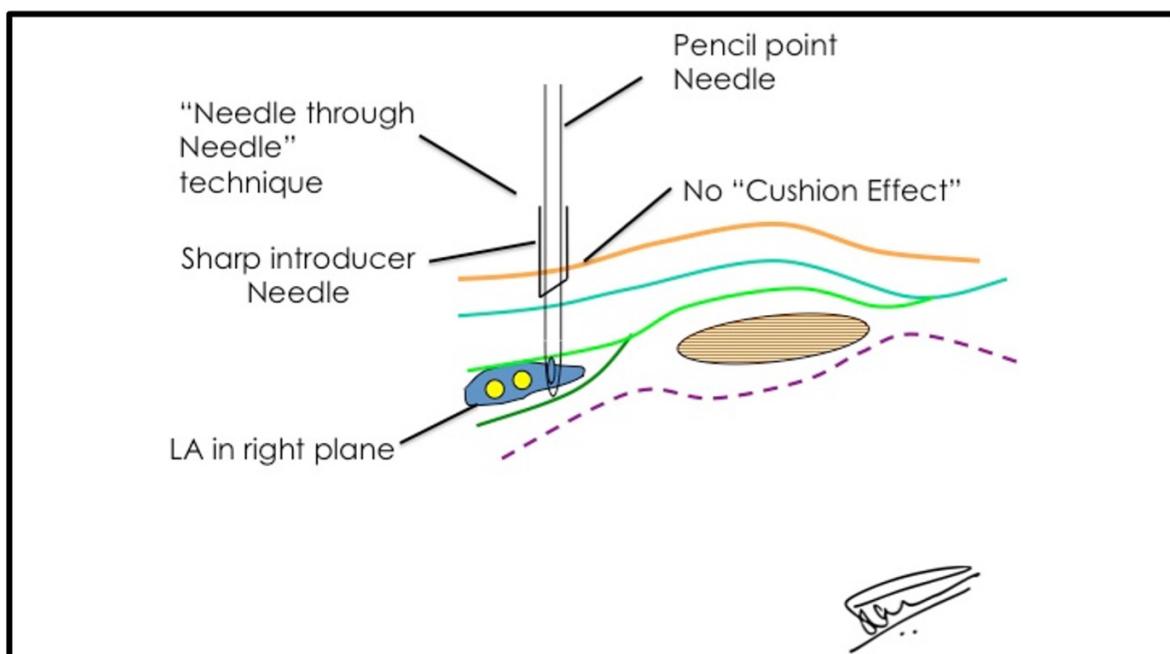
Preventing The “Cushion Effect”

There are mainly three methods in which the “Cushion Effect” can be prevented.

In the 1st method, a small nick in the skin can be made with a sharper bigger needle or a 11 no surgical blade, before introducing the LOR needle through the skin.

In the 2nd method, described by us, in an article published in Anaesthesia, we use “needle through needle” technique. In this technique the LOR needle is passed through a larger sharp needle (the introducer).

Many spinal needle kits come with an introducer that can be used along with the pencil point spinal needle. If using Quincke type, then it need to be blunted similar to hypodermic needle.



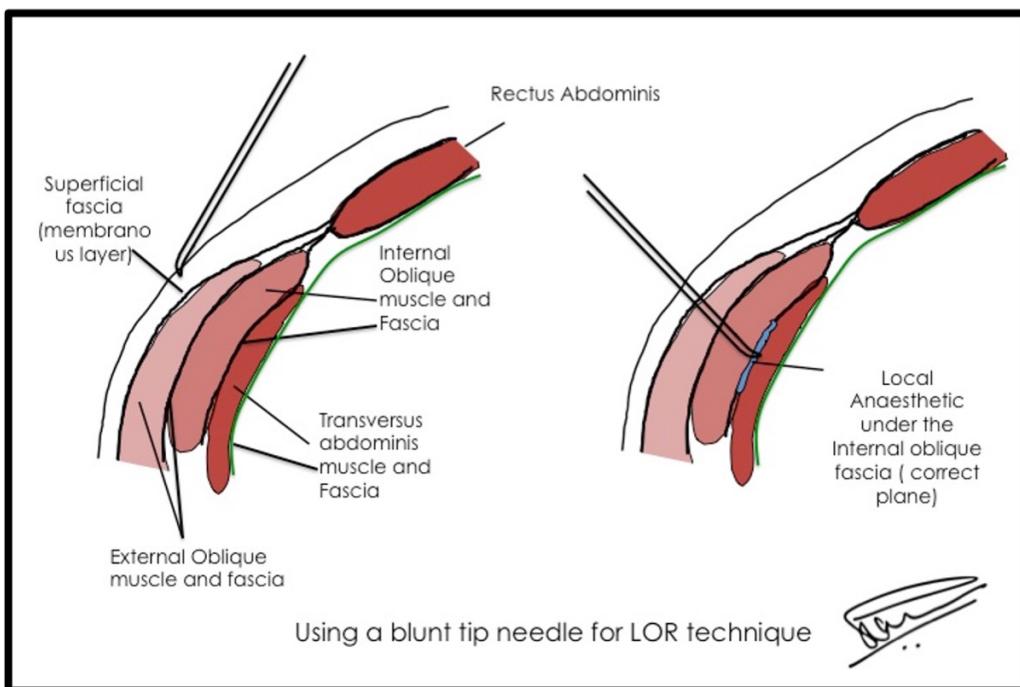
Cushion Effect

In the last or the third method, we assume that the needle has overshot due to the “cushion effect” and all we do is once the needle has pierced the skin, we withdraw the needle back till the tip of the needle is just under it and then start feeling the loss of resistance.

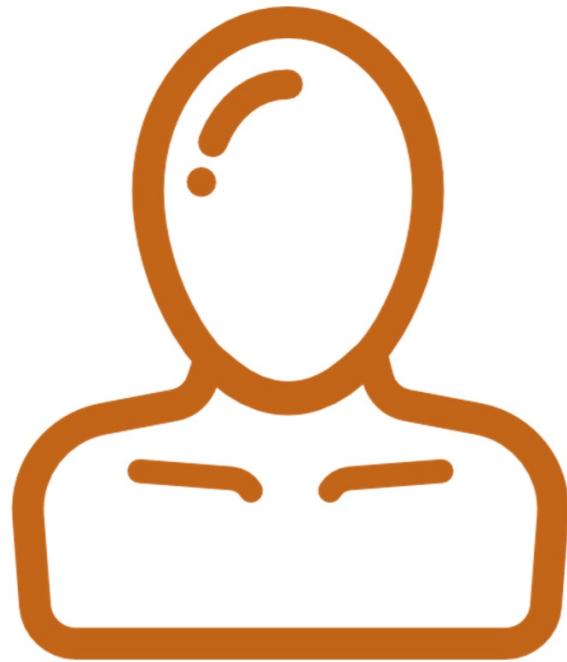
In all cases, before feeling the loss of resistance, it is always nice to feel the bounce on the fascia. Some people like to “scratch” the fascia before feeling the “pop”

Using Blunted Hypodermic Needle And Obliterating Cushion Effect

With the homemade LOR hypodermic needle it is important to know how to use it effectively. The Needle is initially kept almost parallel to the skin till the sharp end of the tip is through the skin. The angle is then changed to a complete vertical position (90° to the skin) and advanced through the tissues to feel for the “Bounce and the Pop”.



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Head And Neck Blocks

Scalp and
Cervical Plexus Blocks

ANATOMY

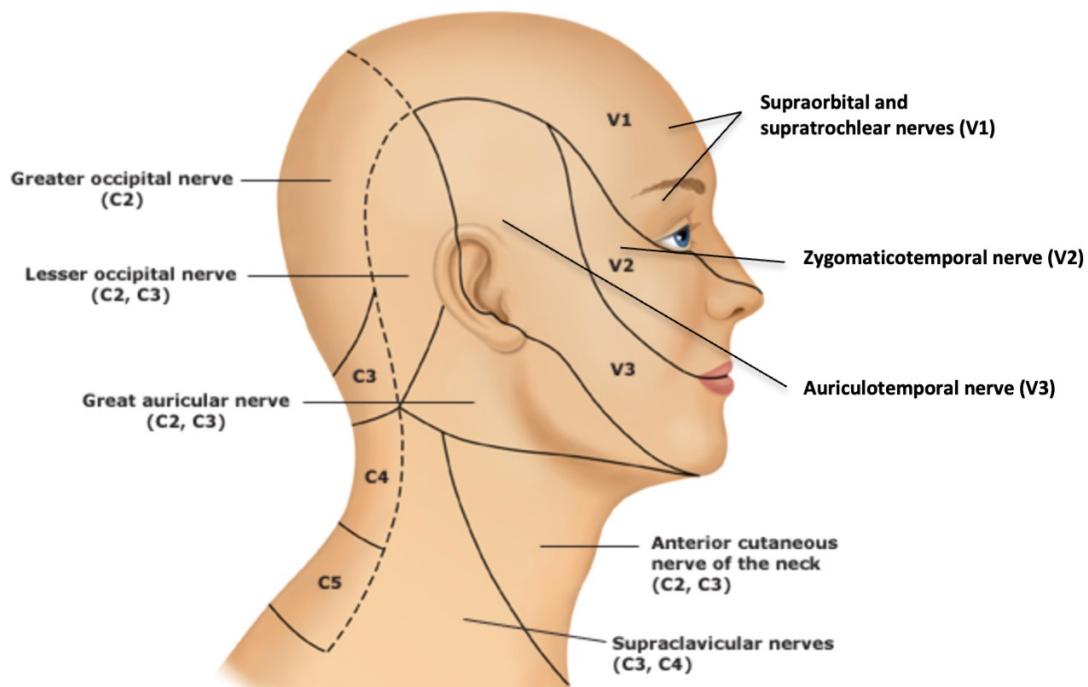
SCALP NERVES

Anterior and posterior scalp is supplied by 6 Nerves

1. Four branches of the trigeminal nerve (TN) and
2. Two branches of the cervical nerve roots C2 and C3

Four Branches of TN

- The supraorbital and supratrochlear nerves are sensory nerves that innervate the forehead and upper eyelids. They are derived from the ophthalmic division (V1) of the TN.
- The zygomaticotemporal nerve is from the maxillary division (V2) of the TN and supplies a small area lateral to the outer canthus of the eye.
- The auriculotemporal nerve is a branch of the mandibular division (V3) of the TN and provides sensation anterior and superior to the ear.



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ANATOMY

Two Branches from Cervical Plexus:

- The greater occipital nerve arises from the dorsal ramus of C2 and ascends through the posterior scalp medial to the occipital artery.
- The lesser occipital nerve originates from the ventral rami of C2 and C3 and courses upward from the posterior neck to innervate the scalp behind the ear

SCALP BLOCK: APPLICATIONS

- Awake and routine craniotomies, deep brain stimulation, stereotactic procedures, craniosynostosis repair in paediatric patients.
- Treatment of chronic pain syndromes of the head and neck.
- Blunt hemodynamic response to skull pinning.
- Reduce postoperative pain.
- Preoperative scalp block to reduce intraoperative opioid requirement, facilitate early postoperative neurologic assessment and early recovery after surgery (ERAS)

SCALP BLOCK TECHNIQUE

Six nerves are blocked on each side for complete scalp block. This block is performed with long-acting LA (eg, (Levo)Bupivacaine 0.25 or 0.5%, or Ropivacaine 0.2 or 0.5%) using a 1.5-inch, 25- or 27-gauge needle, using the following techniques

In total six nerves to block as described in the anatomy section.

SCALP BLOCK

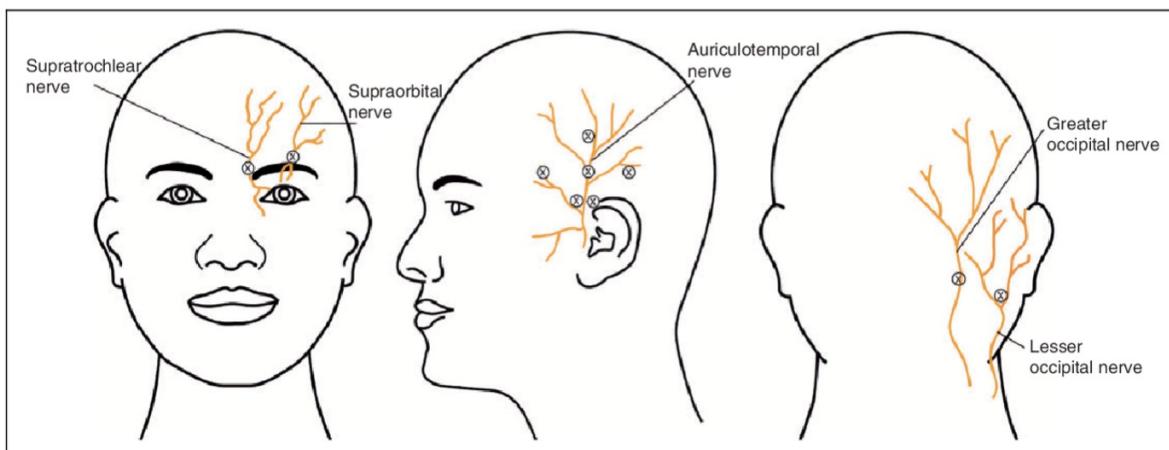
Supraorbital and supratrochlear nerve blocks

Position: Supine position

Landmark: Palpate the supraorbital notch in the medial third of the supraorbital ridge. The notch is usually located directly above the midpoint of the pupil.

Technique: Insert the needle 0.5 to 1 cm deep, perpendicular to the skin, until bone is contacted. Withdraw the needle slightly, and after negative aspiration, inject 3 mL of LA to block the supraorbital nerve. Redirect the needle medially under the skin, advance approximately 1 cm, and after negative aspiration, inject 2 to 3 mL of LA to block the supratrochlear nerve.

If paraesthesia is elicited, the needle should be repositioned prior to injection.



Auriculotemporal nerve block

It is important to minimize the chance of anesthetizing the facial nerve, which runs near the auriculotemporal artery at the level of the tragus.

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SCALP BLOCK

Landmark: Temporal artery at the level of the tragus.

Technique: Palpate the superior temporal artery 1 cm cephalad to the level of the tragus of the ear. Insert the needle perpendicular to the skin, just posterior to the temporal artery. Loss of resistance or a click can usually be felt when the needle passes through the temporalis fascia, at a depth of 1 to 2 cm. After negative aspiration, inject 2 mL of LA below the fascia and another 1 mL superficial to the fascia as the needle is withdrawn.

Zygomaticotemporal nerve block

Landmark: Zygomatic arch just lateral to the lateral canthus of the eye.

Technique: Palpate a groove along the Zygomatic arch just lateral to the lateral canthus of the eye. At that point, insert the needle perpendicular to the skin and advance until loss of resistance or a click is felt as the needle passes through the temporalis fascia. After negative aspiration, inject 1 to 2 mL of LA below the fascia.

Greater occipital nerve block

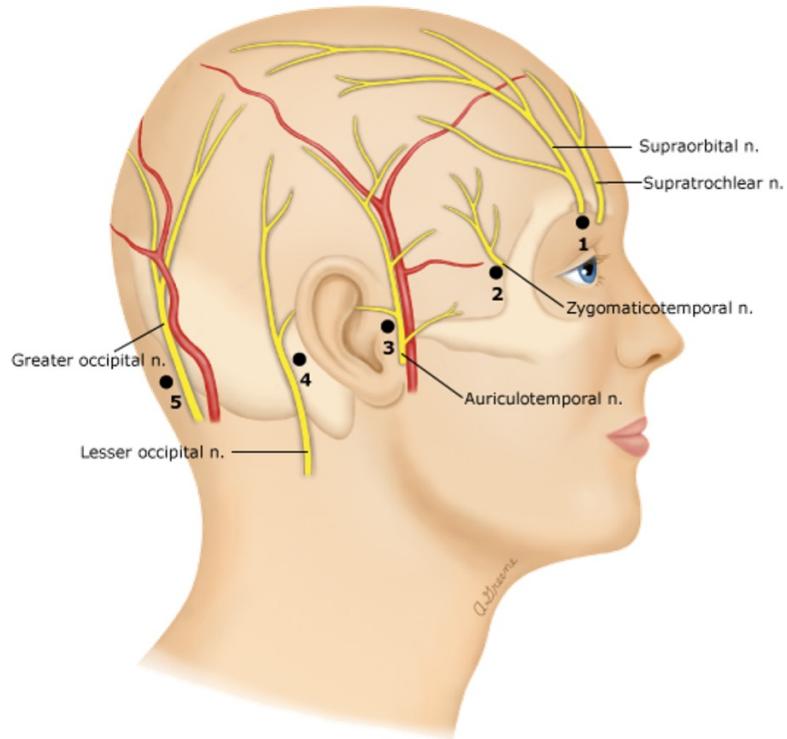
Landmark: Occipital artery midway between the occipital protuberance and the mastoid process

Technique: Palpate the occipital artery midway between the occipital protuberance and the mastoid process. Insert the needle medial to the artery and, after negative aspiration, inject 5 mL of LA.

Lesser occipital nerve block

Technique: Insert the needle 2.5 cm lateral to the injection point for the greater occipital block and, after negative aspiration, inject 5 mL of LA.

SCALP BLOCK



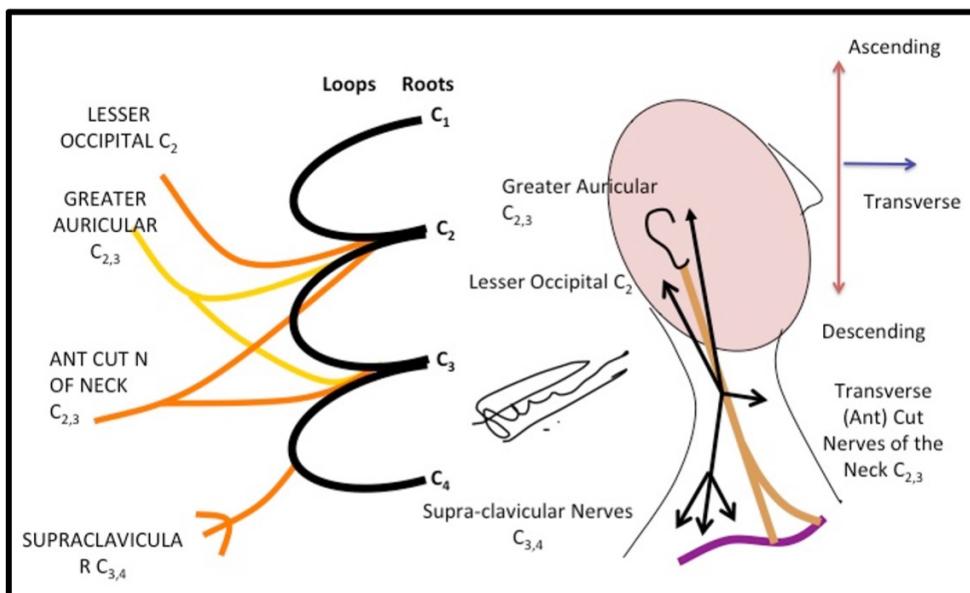
Complications of scalp block

The auriculotemporal nerve block can cause transient facial nerve paralysis. Facial nerve block should be self-limited and should resolve as the scalp block wears off, but it may complicate assessment of facial nerve trauma related to surgery.

ANATOMY

CERVICAL PLEXUS

The cervical plexus is derived from the ventral rami of C_{1-4} spinal nerves and supplies branches to the prevertebral muscles, strap muscles of the neck, and the diaphragm via the phrenic nerve. The rami (except C_1 -motor only) divide into ascending and descending branches, which form the 3 major loops of the plexus. These further divide into deep (motor) and superficial (sensory)



There are 4 major groups of branches

1. Communicating branches- to XII and X C.N and cervical sympathetic chain
2. Phrenic nerve
3. Superficial branches

Ascending

Lesser occipital n C_2

Greater auricular n $C_{2,3}$

Descending – Supraclavicular nerves $C_{3,4}$

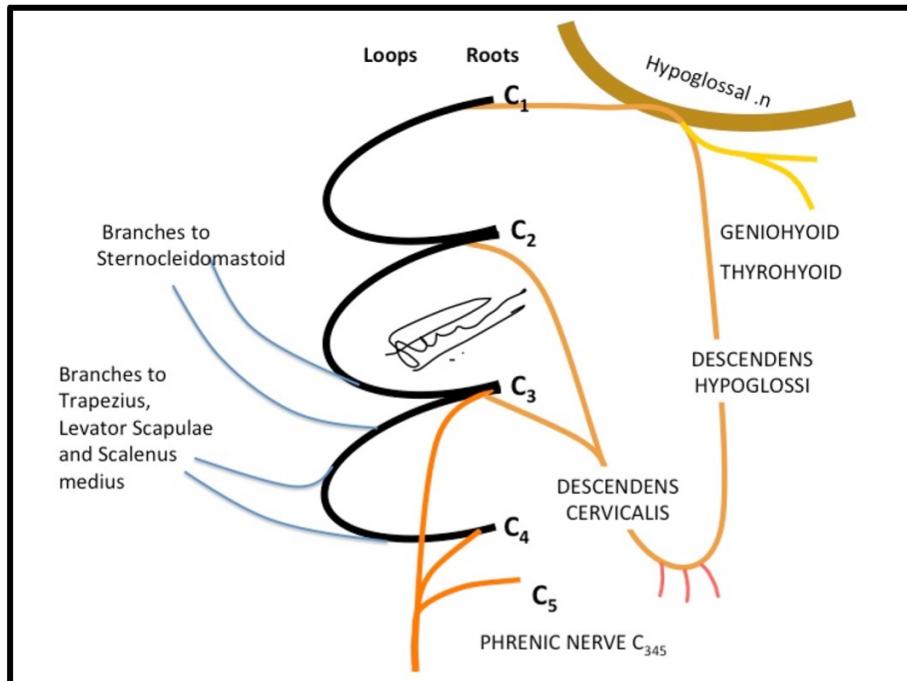
Transverse – Ant cutaneous n of the neck $C_{2,3}$

4. Deep branches – motor to the neck

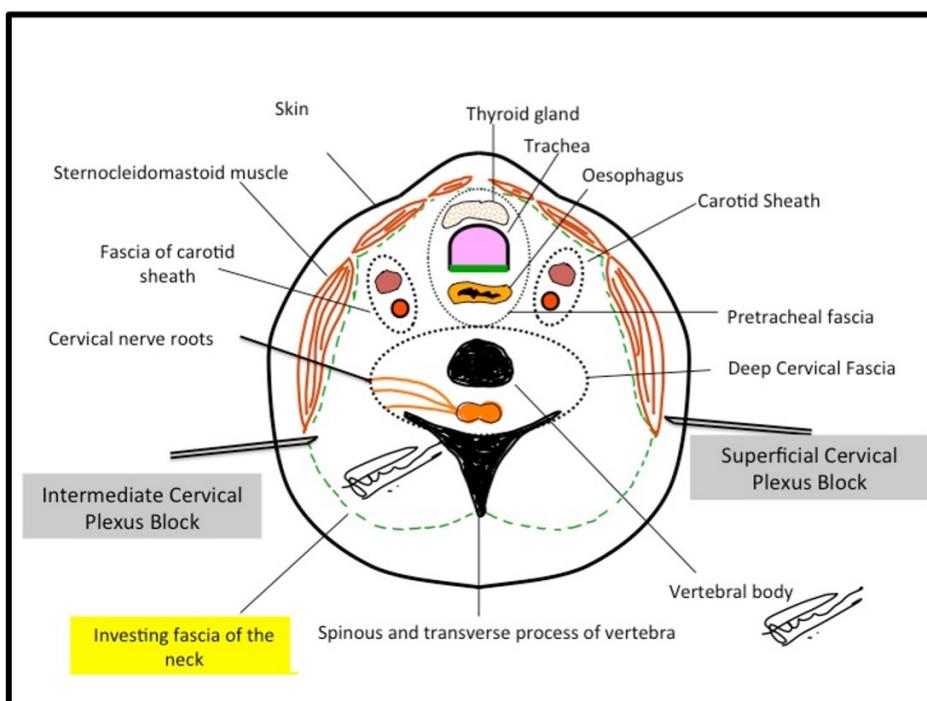
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ANATOMY

CERVICAL PLEXUS: DEEP/MOTOR BRANCHES



INVESTING FASCIA OF THE NECK AND CERVICAL PLEXUS BLOCKS



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Nerve Blocks For The Masses: Loss of Resistance blocks

CERVICAL PLEXUS BLOCK

CERVICAL PLEXUS BLOCK: APPLICATIONS

Provide anesthesia for surgical procedures in the distribution of C_2 to C_4 , including lymph node dissections, plastic repairs, and carotid endarterectomy, Central venous cannulation (IJV and Subclavian)

Bilateral blocks can be used cautiously for tracheostomy and thyroid/ Parathyroid Surgeries



CERVICAL PLEXUS BLOCK: SUPERFICIAL BRANCHES

The superficial cervical plexus is blocked at the midpoint of the posterior border of the sternocleidomastoid muscle.

A skin wheal is made at this point, and a 22-gauge, 4-cm needle is advanced, injecting 5 mL of solution along the posterior border and medial surface of the sternocleidomastoid muscle.

It is possible to block the accessory nerve with this injection, resulting in temporary ipsilateral trapezius muscle paralysis.

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CERVICAL PLEXUS BLOCK

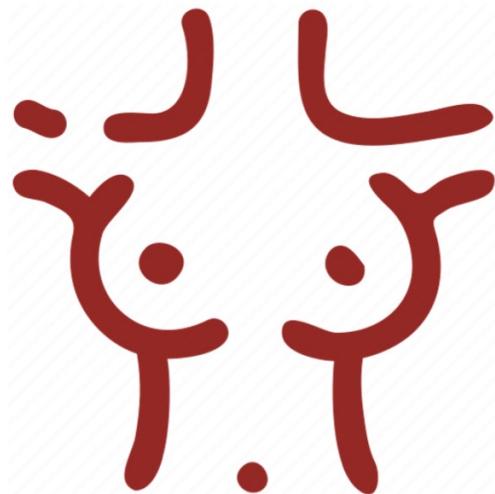
INTERMEDIATE CERVICAL PLEXUS BLOCK USING LOR TECHNIQUE

The cervical plexus both the superficial and deep (muscular) branches can be easily blocked using this simple LOR technique. The landmark for this block is same as that for superficial plexus block i.e. the midpoint of the posterior border of the sternocleidomastoid muscle.

A skin wheal is made at this point, and a 22-gauge, 4-cm needle is advanced at the midpoint of SCM keeping the needle almost perpendicular to the skin. Once the needle tip is through the skin a resistance is felt over the investing fascia of the neck, feel for a bounce and then a “pop” as the needle tip pierces the fascia. 10 - 12mls of 0.25 -0.5% of (Levo) bupivcaine is injected incrementally.



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Chest Wall Blocks

Paravertebral Block

Erector Spinae Block

PECS and SAP Blocks

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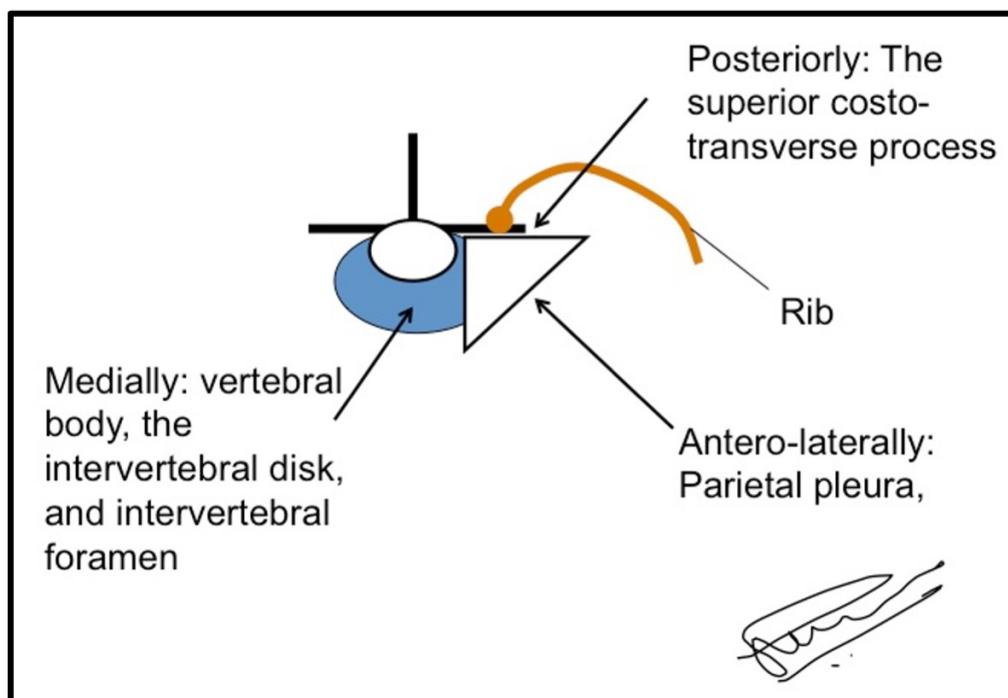
Paravertebral Space Anatomy

PARAVERTEBRAL SPACE (PVS)

Paravertebral Space (PVS) is a wedge-shaped area on either side of the vertebral column.

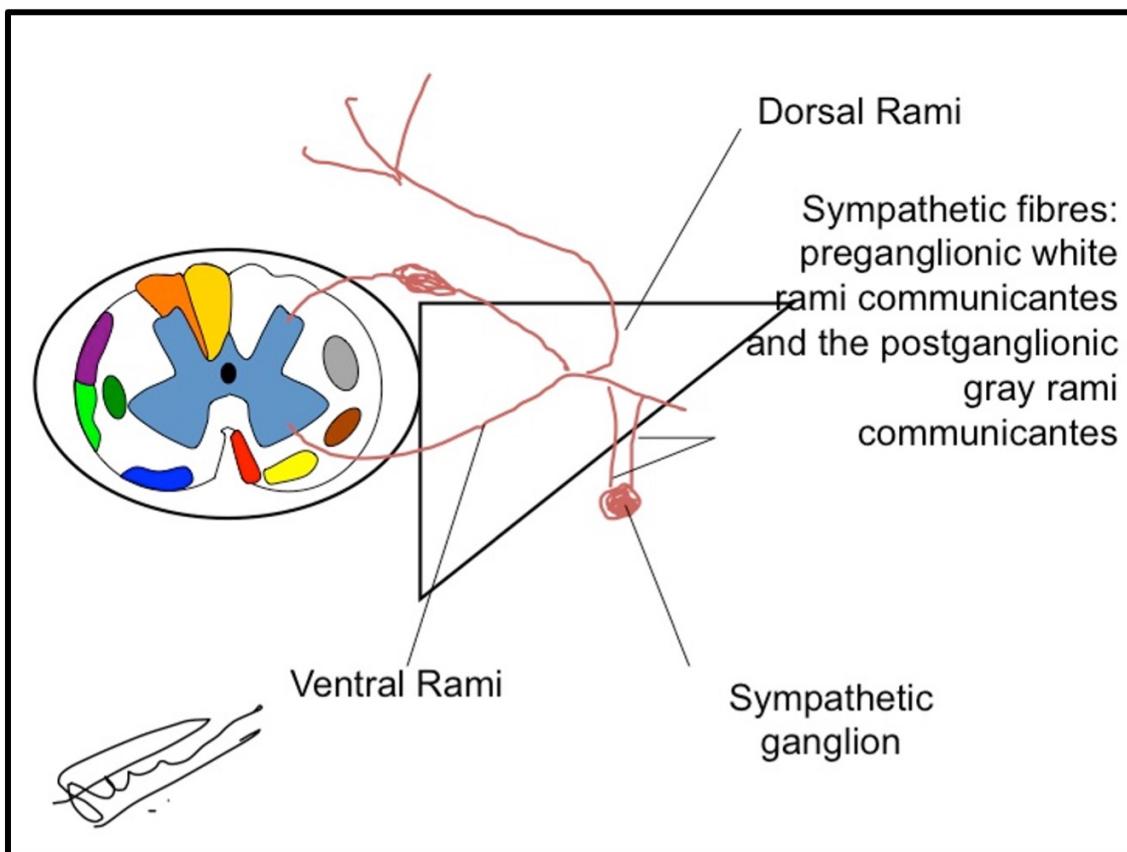
The boundaries of the PVS are:

- Antero-laterally: Parietal pleura,
- Medially: vertebral body, the intervertebral disk, and intervertebral foramen
- Posteriorly: The superior costo-transverse process
- Superior and Inferiorly: Heads of the ribs



PVS contains the spinal root that emerges from the intervertebral foramen and divides into dorsal and ventral rami. It also contains the sympathetic fibers of the ventral rami that enter the sympathetic trunk via the preganglionic white rami communicantes and the postganglionic gray rami communicantes.

Anatomy



PARAVERTEBRAL SPACE EXTENSION:

Laterally: With the intercostal space

Medially: Epidural space and the contralateral paravertebral space via the prevertebral fascia

PARAVERTEBRAL BLOCK MECHANISM

There are many mechanisms

1. Direct penetration of the local anaesthetic into the spinal nerve
2. Extension laterally along with the intercostal nerves
3. Medial extension through the intervertebral foramina

Paravertebral Block

PARAVERTEBRAL BLOCK INDICATIONS

- Mastectomy with axillary dissection: C₇-T₆
- Breast biopsy: One injection at the dermatome corresponding to the needle localization.
- Liver Surgery: T6-7 and T8-9 (multiple levels)
- Open Cholecystectomy: T5-6
- Rib Fractures: corresponding dermatome
- Renal Surgery: Nephrectomy, Renal Transplant: T8-T12 (multiple levels)
- Inguinal herniorrhaphy: T₁₀

PARAVERTEBRAL BLOCK LANDMARK AND TECHNIQUE

Entry point is 2.5 – 3.0 cms lateral to the corresponding spine.
Local Infiltration with 1-2% Lignocaine is used before the block



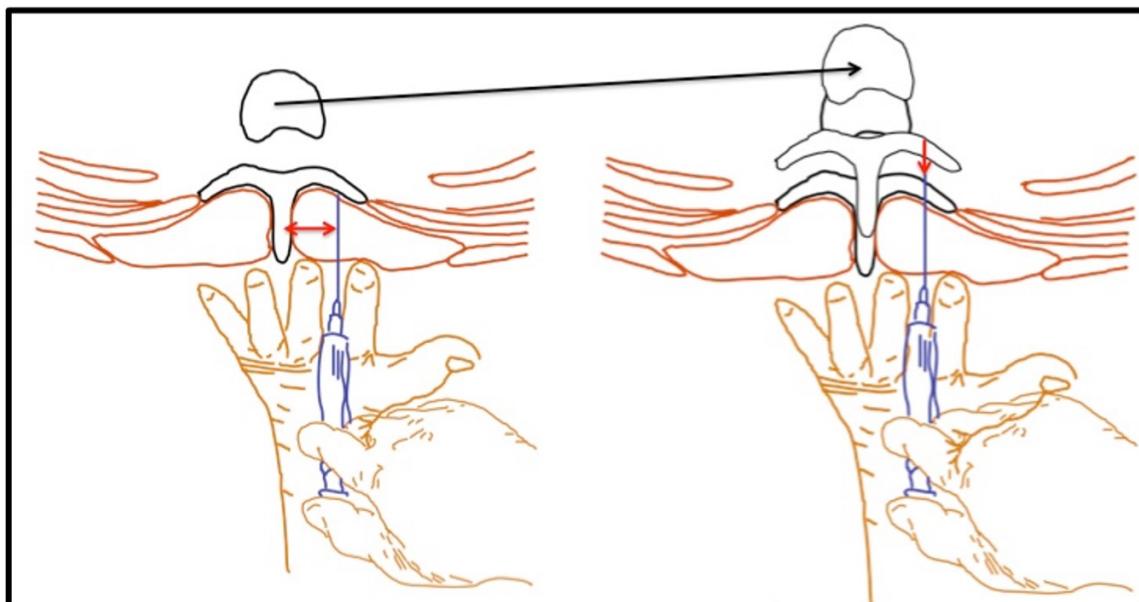
The Epidural/block needle is advanced directly perpendicular to the skin in the postero-anterior plane until it contacts with the transverse process of the corresponding vertebrae.

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Paravertebral Block



Loss of Resistance Syringe is then attached to the needle and it is “walked off” infero-laterally while advancing it by around 10 – 15 mm (1.0-1.5cm). As the costotransverse ligament is pierced and a “Pop” is felt with Loss of Resistance to Air/ Saline. PNS can also be used and motor response of intercostal muscle twitches observed. Some use a marker on the needle once they have contacted the transverse process, so that they do not exceed the 1.0-1.5cm mark. This often done to avoid entering the pleura and causing pneumothorax.

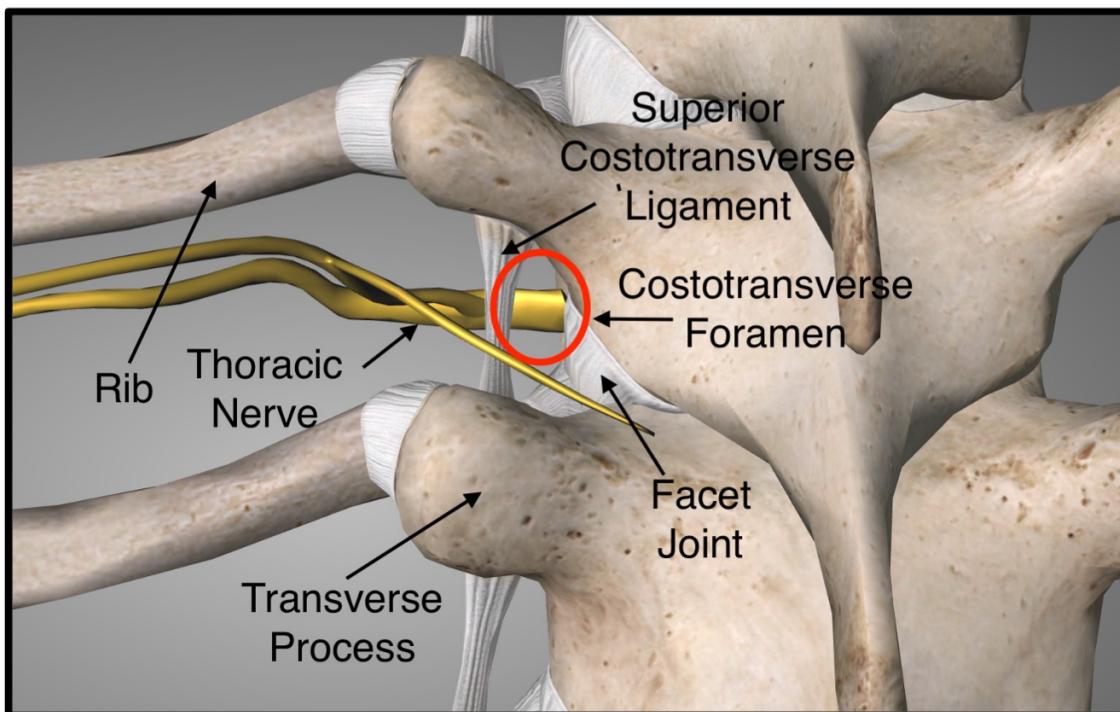


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Erector Spinae Anatomy

ERECTOR SPINAES AND THE COSTOTRANSVERSE FORAMEN

The dorsal ramus arises soon after the spinal nerve emerges from the intervertebral foramen and travels posteriorly through the costotransverse foramen to enter the erector spinae muscle. Here, it divides into lateral and medial branches, with the latter terminating in a posterior cutaneous branch that innervates the skin of the back. The ventral ramus continues laterally as the intercostal nerve, gives rise to a lateral cutaneous branch at the angle of the rib, and terminates in an anterior cutaneous branch. These branches supply the lateral and anterior chest wall, respectively.



The costotransverse foramen is a window bordered superiorly by the transverse process, inferiorly by the rib below, laterally by the superior costo-transverse ligament, and medially by the lamina and facet joint

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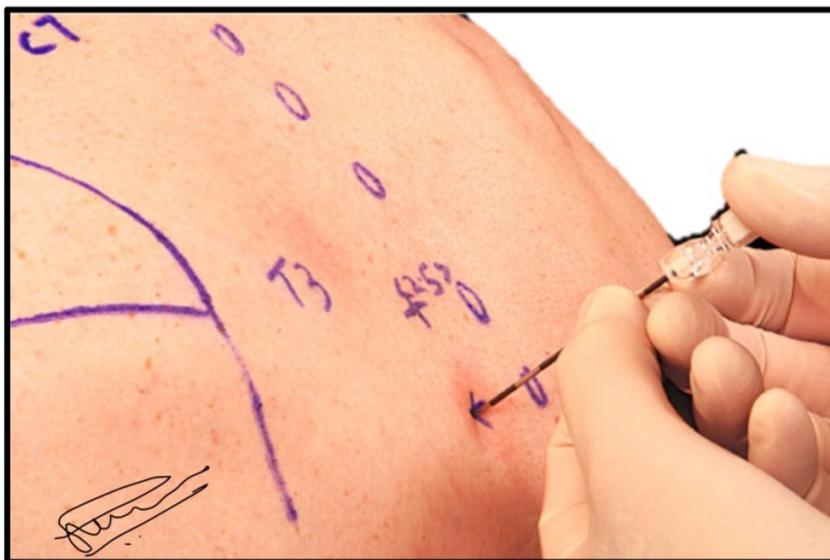
Erector Spinae Block (ESB)

INDICATIONS FOR ESB ARE SIMILAR TO PARAVERTEBRAL BLOCK

- Mastectomy with axillary dissection: C₇-T₆
- Breast biopsy: One injection at the dermatome corresponding to the needle localization.
- Liver Surgery: T6-7 and T8-9 (multiple levels)
- Open Cholecystectomy: T5-6
- Rib Fractures: corresponding dermatome
- Renal Surgery: Nephrectomy, Renal Transplant: T8-T12 (multiple levels)
- Inguinal herniorrhaphy: T₁₀

ESB LANDMARK AND TECHNIQUE

Point of entry is 2.5 – 3.0 cms lateral to the corresponding Spine. Local Infiltration with 1-2% Lignocaine is done in awake patients. This block can be safely done in patients under GA

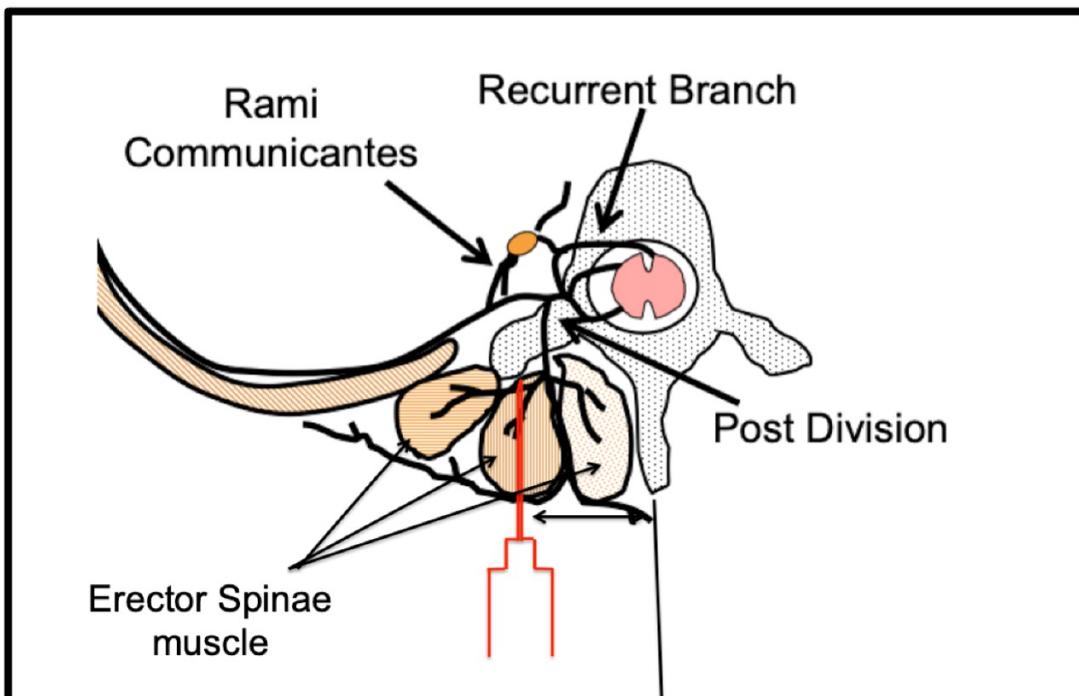


The Epidural/Block Needle is advanced directly perpendicular to the skin in the postero-anterior plane until it contacts with the transverse process of the corresponding vertebrae and withdrawn by 2-3 mm.

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Erector Spinae Block (ESB)

Unlike PVB instead of “walking off”, in the ESB, LA is injected at this level. This avoids the most dreaded complication of creating a pneumothorax. Once the needle tip hits the transverse process, you withdraw it by few mm and inject the LA. The LA is assumed to seep through the costotransverse foramen into the paravertebral space and hence act similar to paravertebral block.

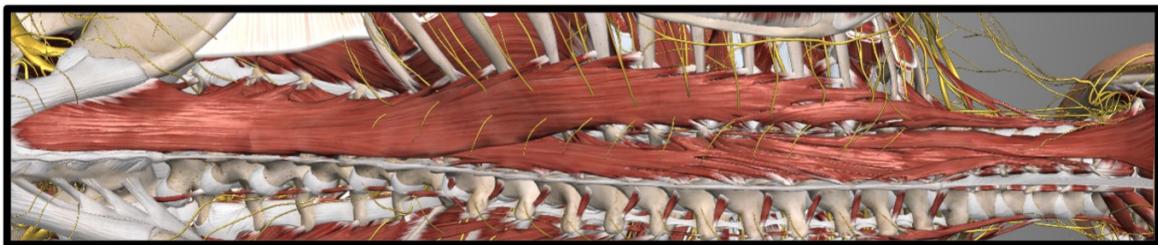


Schematic illustration of ESB: The block needle is introduced through the skin to the erector spinae muscle, so as to deposit local anesthetic closer to costotransverse foramina and the origin of the dorsal and ventral rami.

Erector Spinae Block (ESB)

LA SPREAD IN ESB

The erector spinae muscle extends along the length of the thoracolumbar spine, and thus, this plane permits extensive crano-caudal spread of local anaesthetic to cover multiple dermatome levels. For this to be possible, the injection must be performed deep to the erector spinae muscle and as close as possible to the costotransverse foramen. Too medial an injector will lead to late onset (retro-laminar block) and too laterally, the external and internal intercostal muscle will present a significant barrier to the LA spread. The transverse process serves a convenient US landmark and backstop for needle advancement, contributing to the ease and safety of the block.



Erector Spinae Muscle

Most significant advantage of this block is its simplicity and safety. The sonoanatomy is easily recognisable and allows for easy insertion of indwelling catheter, which can be used for extending the duration of analgesia if needed.

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PEC and SAP Anatomy

PECTORAL MUSCLES AND PECTORAL NERVES

The pectoralis muscles are innervated by medial and lateral pectoral nerves. The pectoral nerves are the motor nerves arising from the brachial plexus (lateral pectoral – C₅, C₆, C₇; medial pectoral – C₈, T₁).

The lateral pectoral nerves runs in between pectoralis major and pectoralis minor muscle along side the pectoral branch of thoracoacromial artery. The lateral pectoral nerve supplies the pectoralis major muscle. The lateral pectoral nerve also carries nociceptive and proprioceptive fibres.

The medial pectoral nerve is the smaller branch of the two, fans behind the pectoralis minor muscles.

PECS-I and II Blocks

Regional anesthesia techniques like Thoracic epidural analgesia (TEA), Thoracic paravertebral blocks (TPVB) and intercostal nerve blocks (ICNB) have proved to be the gold standard for chest wall surgeries and injuries, but unfortunately they are associated with major complications like total spinal, nerve injuries, pneumothorax and hypotension.

Pectoral nerve blocks are done in the interfascial planes between the pectoral muscles (PECS-I) and between Pectoral and Serratus anterior muscle (PECS-II). PECS-II is always done along with PECS-I.

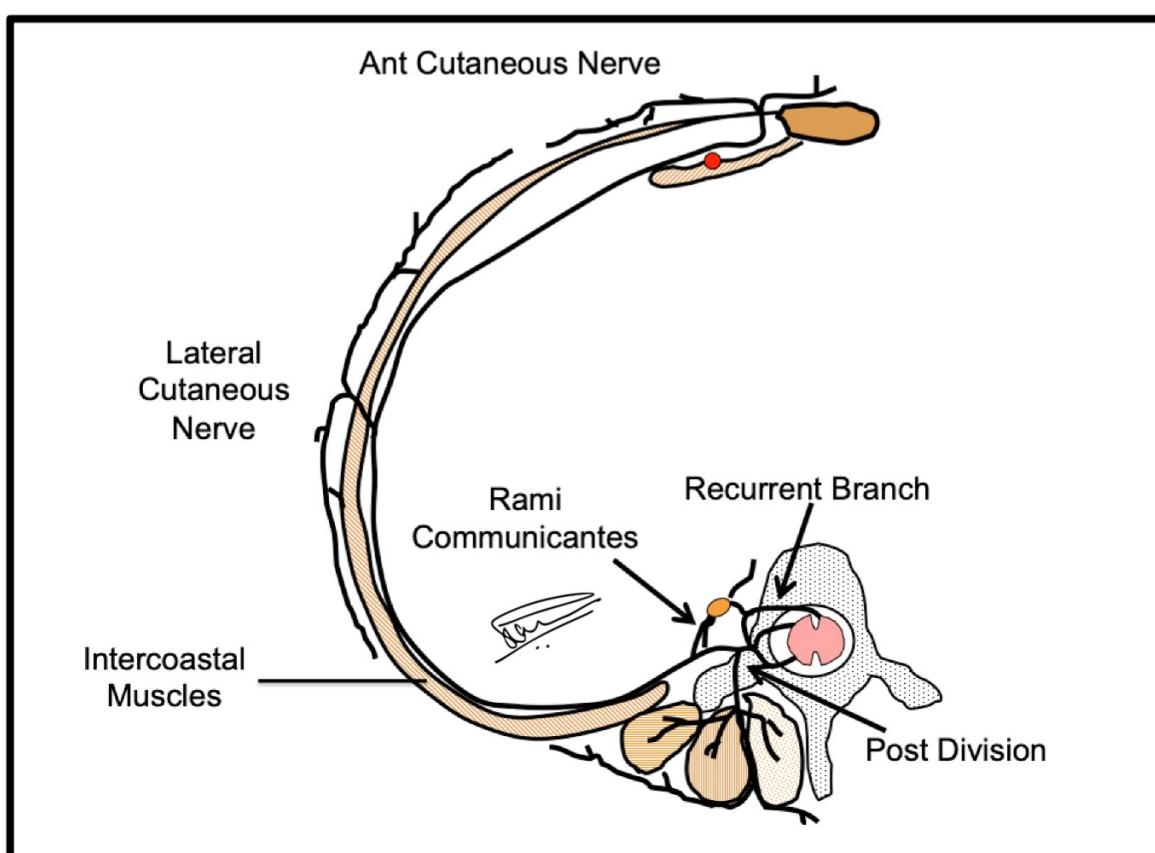
Anatomy

THE CHEST WALL NERVES

The lateral cutaneous branch of the second intercostal nerve does not divide into anterior and posterior branches and contribute to the intercostobrachialis nerve.

The anterior branches cross in front of the internal mammary artery, pierce the intercostalis interni muscle, the intercostal membranes and pectoralis major muscle to supply the breast in its medial aspect.

The long thoracic nerve or serratus anterior nerve arises from the brachial plexus (C_5 to C_7) to enter the axilla behind the rest of the brachial plexus and rest on the serratus anterior muscle at the midaxillary level



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Chest Wall Blocks (PECS and SAP)

INDICATIONS:

- Chest wall surgeries especially breast surgeries
- Wide pectoral dissections
- Upper chest injuries
- Pacemaker, cardiac resynchronization device insertions
- Insertion and removal of intercostal chest drains

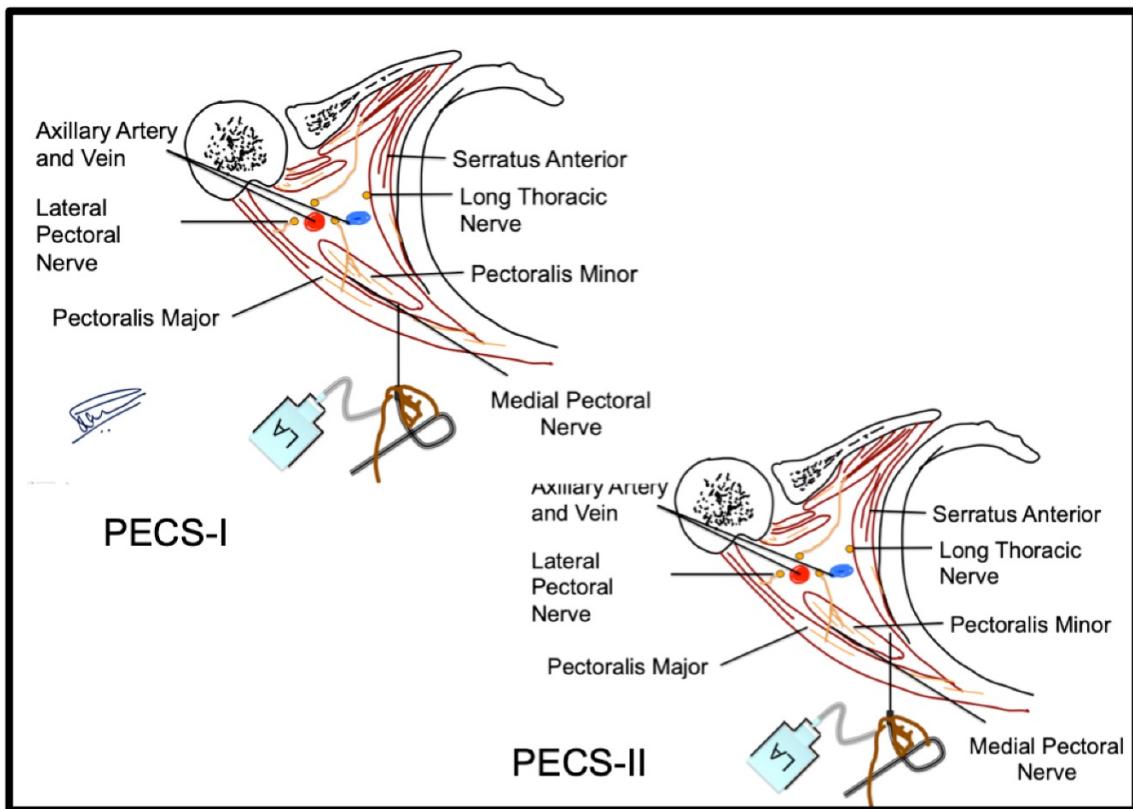
PATIENT POSITION: Supine preferably with ipsilateral arm slightly abducted

LANDMARK: Both the blocks are performed at the level of the 3rd rib mid-clavicular line.

TECHNIQUE: Once the skin barrier is breached, advance the needle and directly hit the 3rd rib. This will provide the skin to rib distance to avoid puncture of pleura/lung. Withdraw the needle till skin (tip lies just under the skin) and advance slowly to experience the first LOR of pre-pectoral fascia. Advance the needle and actively look for a ‘bounce’ of the needle on the fascia between two pectoralis muscles. Further advancement of the needle results in a second “pop” to enter the fascial plane. 10 ml of local Anaesthetic (LA) is injected here after negative aspiration. The needle is then further advanced to hit the rib. The needle is withdrawn by 1-2 mm and 20 ml of LA is injected between Pectoralis minor and Serratus Anterior.

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Chest Wall Blocks (PECS and SAP)



Nerve Blocks For The Masses: Loss of Resistance blocks

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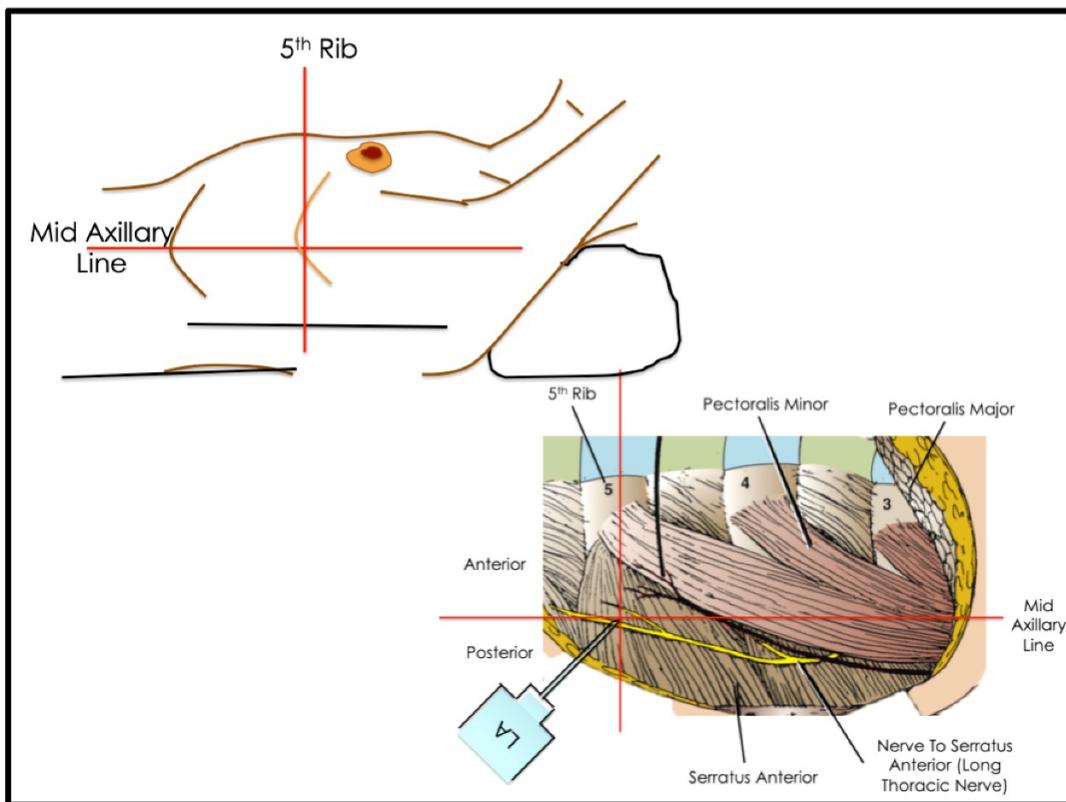
Chest Wall Block (SAP)

DESCRIPTION OF THE TECHNIQUE

Position: Lateral position with block side up and with the arm in front of the chest or supine position with ipsilateral arm fully abducted or placed across the chest, holding the shoulder of the opposite side.

Landmark: The mid-axillary line is identified and marked. The 5th rib is traced to this line and the intersection point marked. This is the point of needle insertion.

Block Technique: Following aseptic precautions, area around the landmark is infiltrated with local anaesthetic solution. Block needle is inserted at the landmark almost perpendicular to the skin till it contacts the 5th Rib. The needle is then withdrawn by 1-1.5mm and 20mls of LA injected after aspiration.



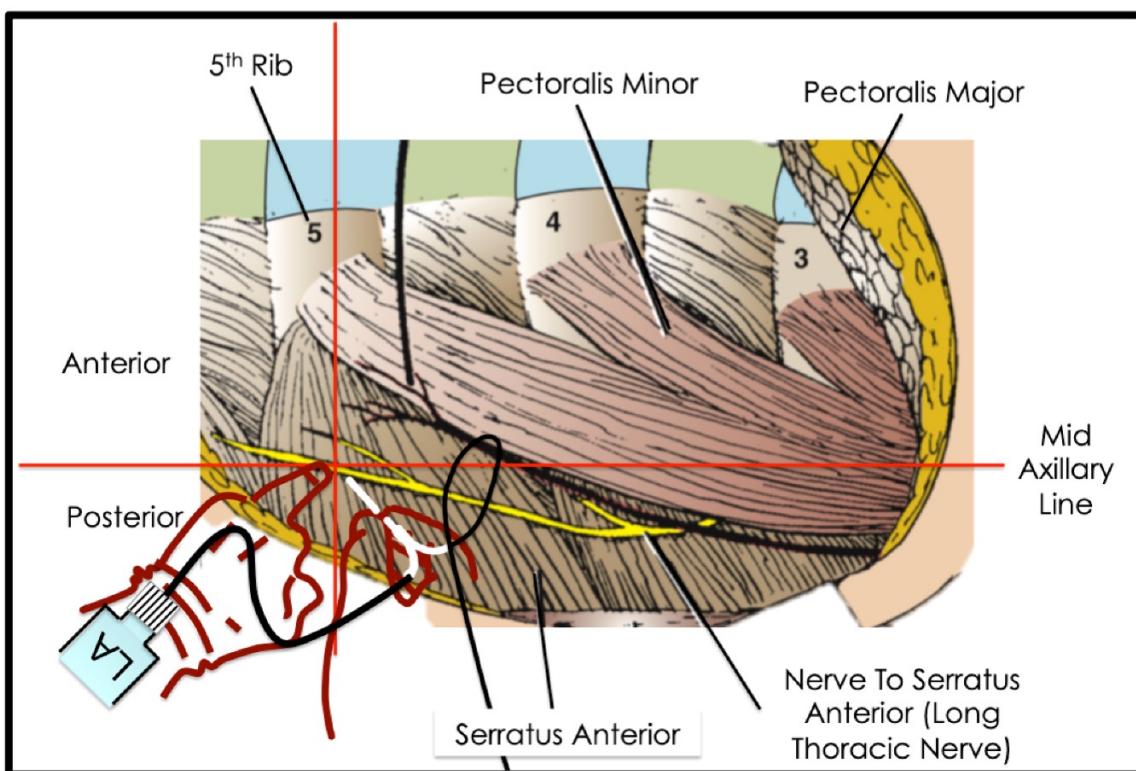
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Chest Wall Block (SAP)

SAP Block Using PNS: Peripheral nerve stimulation can also be used for this block. An initial current of 1.5mA of 0.1ms duration at 1Hz frequency is used.

The block needle is inserted at the point described and slowly advanced till the serratus anterior muscle contraction is noted, stimulation of nerve to serratus anterior (long thoracic nerve).

If no motor response is elicited, then moving the needle insertion bit posteriorly or anteriorly on the 5th Rib (Walking the Rib) help. The nerve sometimes lie bit more posterior or anterior to the mid-axillary line drawn by the anaesthetist.



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Abdominal Wall Blocks

Transversus Abdominis Plane (TAP)

Rectus Sheath (RS)

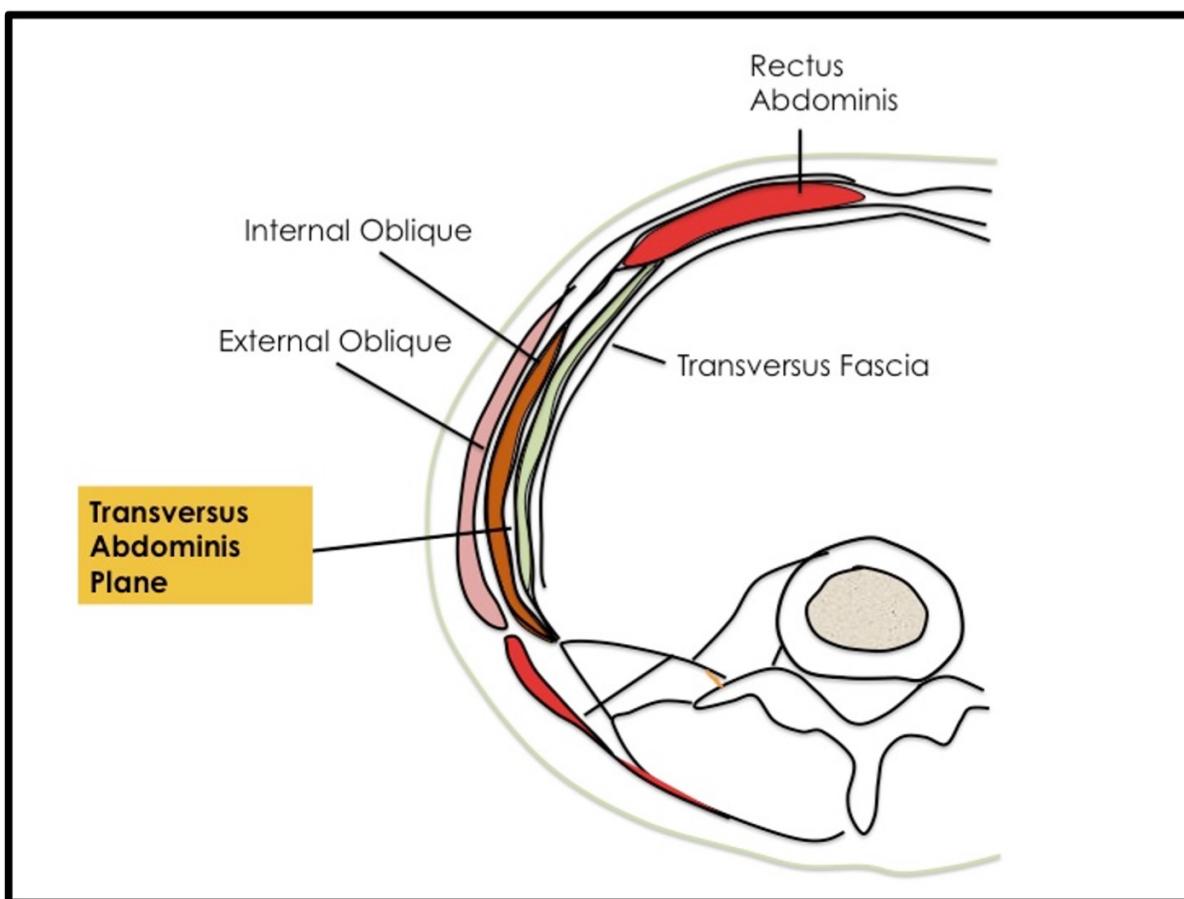
Ilio-Inguinal (II) and

Ilio-Hypogastric (IH)

Transversus Abdominis Plane Anatomy

ANATOMY OF THE TRANSVERSUS ABDOMINIS PLANE (TAP)

In the human body, on each side of the midline there are four principle muscles. Three of these are flat muscles, arranged in layers in the lateral part of the abdominal wall. External oblique is the most superficial, internal oblique lies deep to it and the deepest layer is transversus abdominis. The Transversus Abdominis Plane (TAP) lies under the Internal Oblique fascia and over the Transversus Abdominis muscle. This fascia is not adherent to the internal oblique muscle layer, and binds down the nerves on its deep surface to the transversus abdominis layer and for this reason it is easy to deposit LA over the fascia leading to failure of the block.

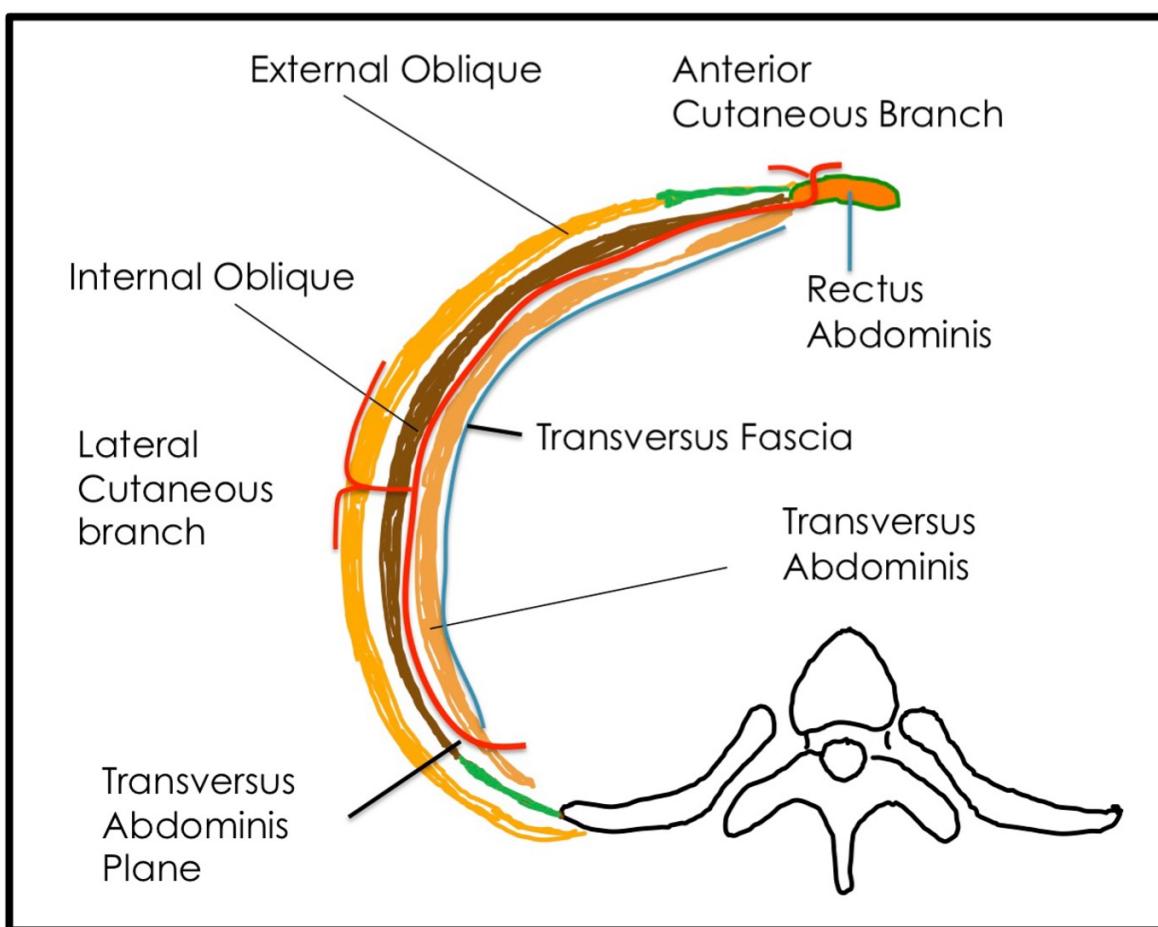


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Anatomy

ANATOMY OF THE TRANSVERSUS ABDOMINIS PLANE (TAP)

The intercostal nerves (T_{7-11}), subcostal nerves (T_{12}), ilio-inguinal and ilio-hypogastric nerves (L_1) that contribute to the innervation of the anterior abdominal wall run with their accompanying blood vessels in the transversus abdominis plane (TAP). These nerves also supply the costal parts of diaphragm, related parietal pleura and the parietal peritoneum. Most of these nerves that course through the transversus abdominis plane, give rise to the muscular and lateral cutaneous branches (Ilioinguinal nerve has no lateral cutaneous branch) and after providing motor innervation to the rectus muscle and to pyramidalis these nerves pierce the rectus sheath and end as anterior cutaneous nerves.



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LOR Blocks: TAP Block

TRANSVERSUS ABDOMINIS PLANE (TAP) BLOCK

INDICATIONS: TAP block can be used for any surgery involving the lower abdominal wall. This includes bowel surgery, caesarean section, appendicectomy, hernia repair, umbilical surgery and gynaecological surgery.

A single injection can achieve sensory block over a wide area of the abdominal wall. The block has been shown to be useful in upper abdominal surgery, but the upper extent of the block and its use in upper abdominal surgery are controversial. TAP block is particularly useful for cases when an epidural is contraindicated or refused.

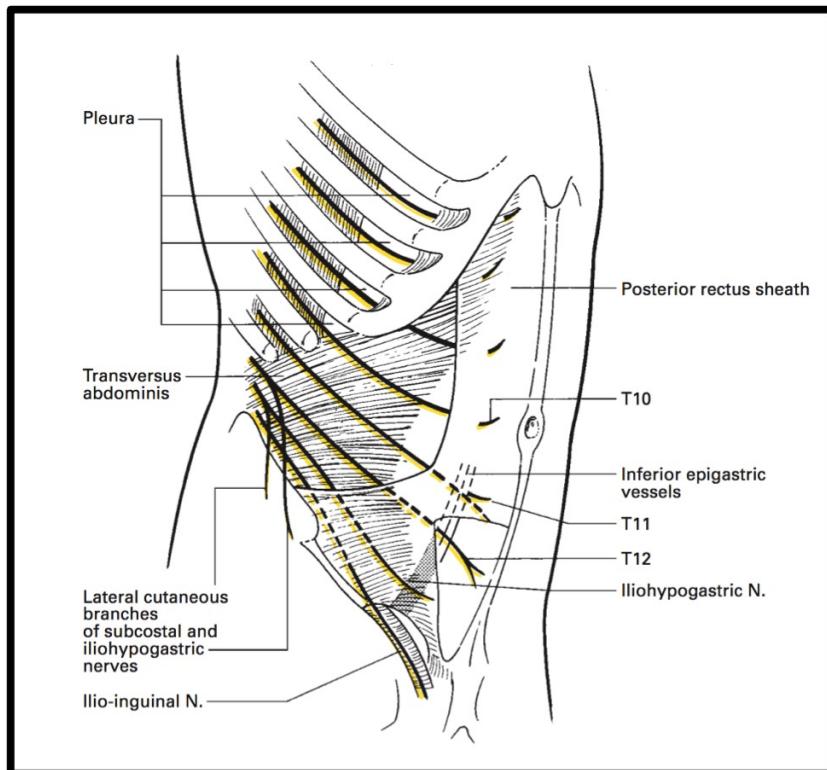
TECHNICAL DESCRIPTION: TAP block can be administered at various points between the Costal margin and the iliac crest.; classically in the “Triangle of Petit”, mid point on the mid-axillary line, just under the costal margin or just above the iliac crest.

The block can be performed unilaterally (eg. Appendicectomy, renal transplant and hernia repairs), or bilaterally when the incision crosses the midline (eg. Pfannenstiel incision and laproscopic surgeries). A single injection can be used, or a catheter inserted for several days of analgesic benefit. TAP block also has a role as rescue analgesia on awake postoperative patients who did not receive blocks prior to abdominal surgery or the analgesia technique used intra-operatively failed.

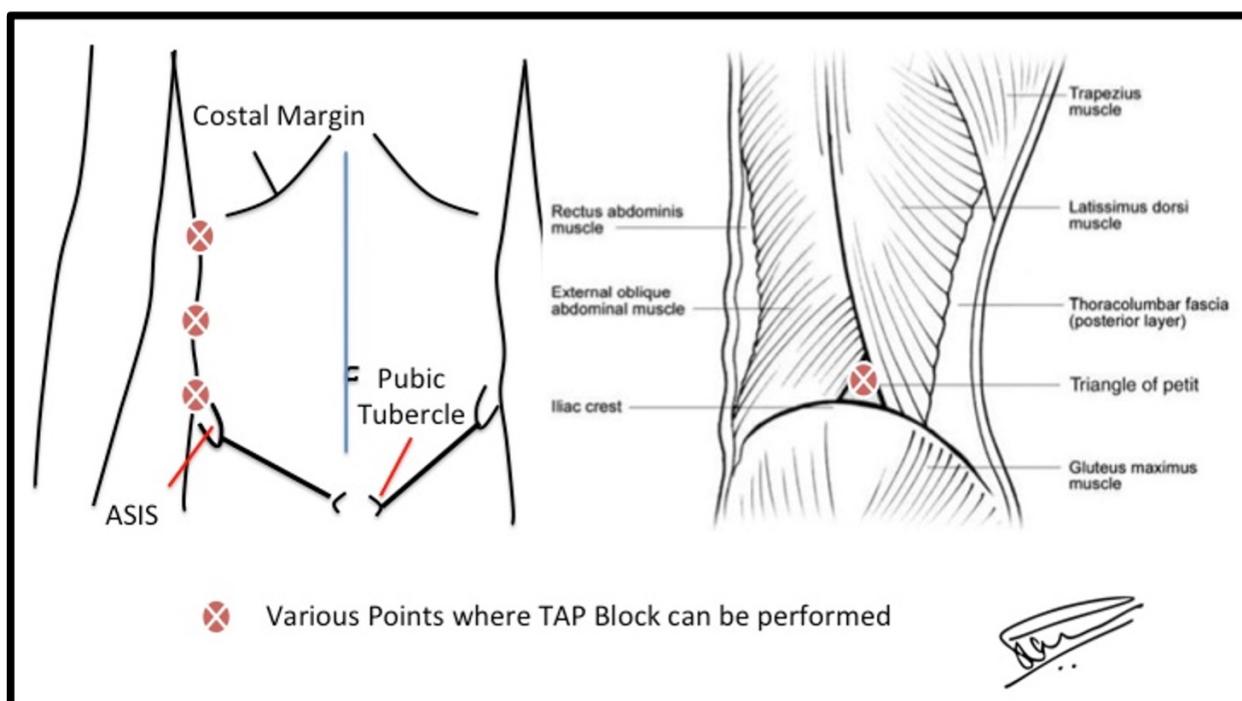
TAP block can be combined with Rectus sheath block above the umbilicus to complete analgesia for midline laparotomies.

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LOR Blocks: TAP Block



Nerves in the Transversus Abdominis Plane



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LOR Blocks: TAP Block

The aim of TAP block is to deposit large amount of local anaesthetic in the transversus abdominis plane that lies below the internal oblique muscle and above the transversus abdominis muscle.

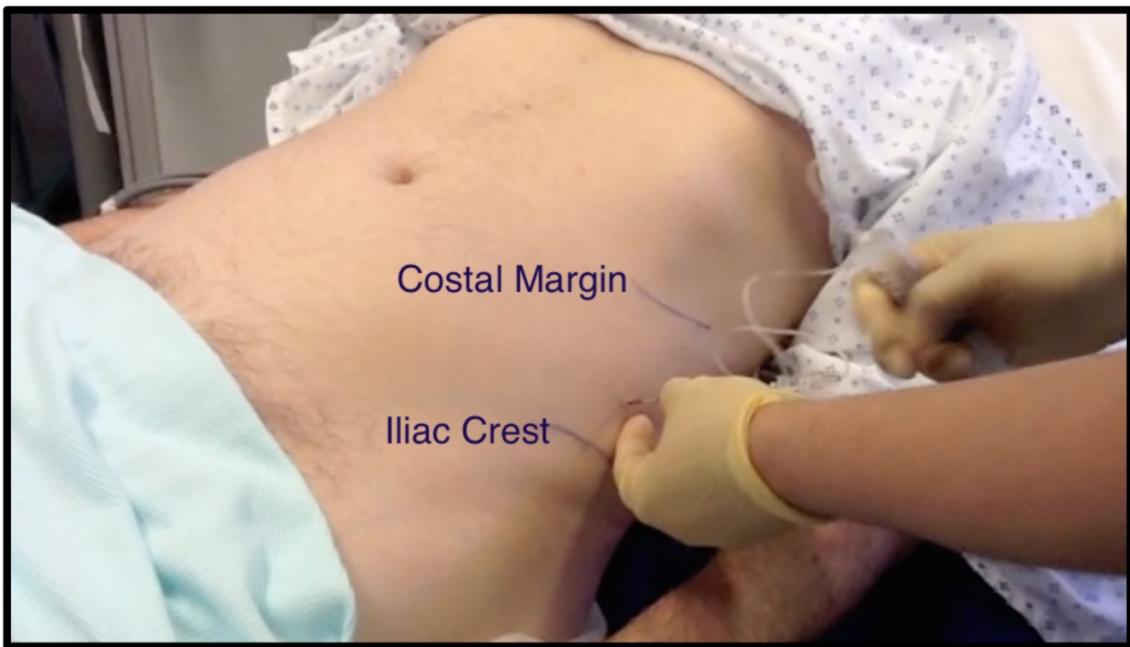
POSITION: Patient is in supine position with the ipsilateral arm on an arm board or placed across the chest. In the obese, slight tilt to the opposite side and someone holding the fat away helps.

TECHNIQUE: Even though the literatures describes the block to be performed in the so called lumbar triangle (Petit's triangle), we prefer to use the mid-axillary line and the point of injection depends on the surgery. For e.g, It is midway between the costal margin and the iliac crest when it is for upper abdominal procedures.

BOUNCE FOLLOWED BY “POP”: Once the skin is cleaned and draped, a short bevel or blunt needle is connected to a syringe with 20mls of local anaesthetic. Once the skin barrier is breached (requires a large force), the needle is withdrawn back so that the tip lies just under the skin. The needle is advanced through the external oblique and a first ‘pop’ sensation is felt when the needle enters the plane between the external oblique and internal oblique. We tend to actively look for a ‘bounce’ of the needle on the fascia before feeling the ‘pop’. Further advancement of the needle results in a second ‘pop’ after it passes through the internal oblique fascia into the TAP. At this point, after careful aspiration, 20-30mls of long-acting local anaesthetic is injected in 5 ml aliquots.

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LOR Blocks: TAP Block



The Landmarks: TAP Block

It is important that the 'pops' are distinctly felt, to the extent that people watching you should be able to see the sudden movement of the needle through the plane.

WHAT IF NO "POP" IS FELT?

Sometimes it is important to change the angle of the needle in the caudad direction to feel these clicks/pops. While using bilateral blocks it is important to keep in mind the toxic limits of the local anaesthetic as recommended by the manufacturers.

DIFFERENTIATING BETWEEN IM INJECTION Vs TA PLANE INJECTION?

Disconnect the syringe from the hub of the needle, if you are in the inter-fascial plane, you will see LA dripping. If no LA flows, you may be injecting the LA the muscle.

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LOR Blocks: Posterior TAP Block

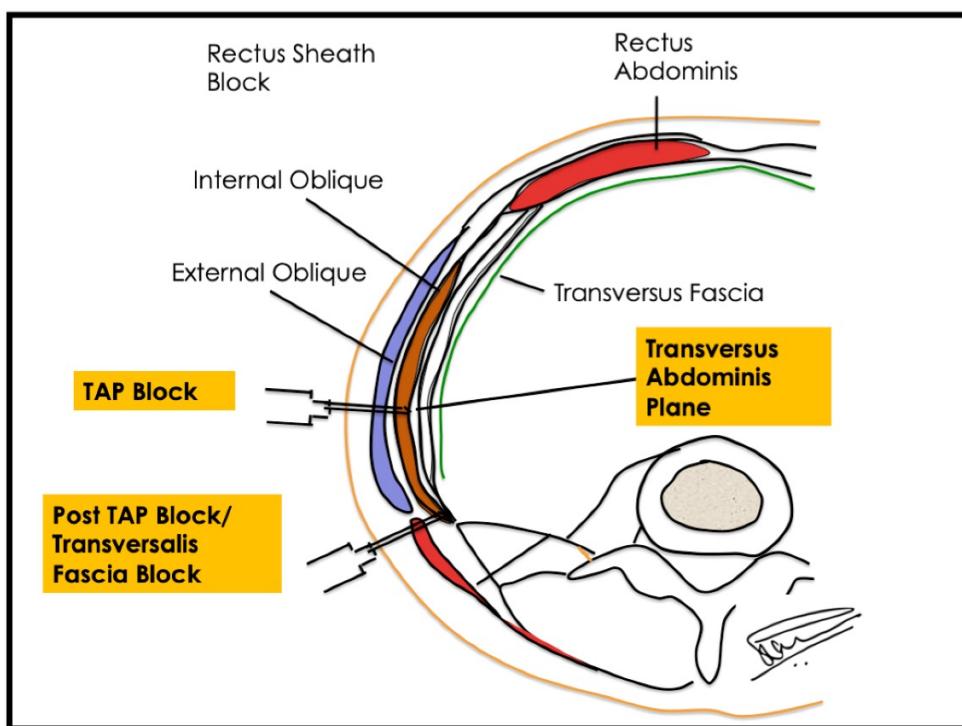
This is also known as Transversalis Fascia Block

POSITION: For this block, you need to place a sand bag under the buttocks on the same side and tilt the table slightly to the opposite side. It can also be done in the lateral position.

LANDMARK: The point of injection here is in the post axillary line just above the iliac crest.

TECHNIQUE: This block can be done both using LOR technique similar to TAP block and by using PNS and looking for abdominal muscle twitches.

ADVANTAGE: This technique allows for better spread of LA and is believed to be similar to Quadratus Lumborum block



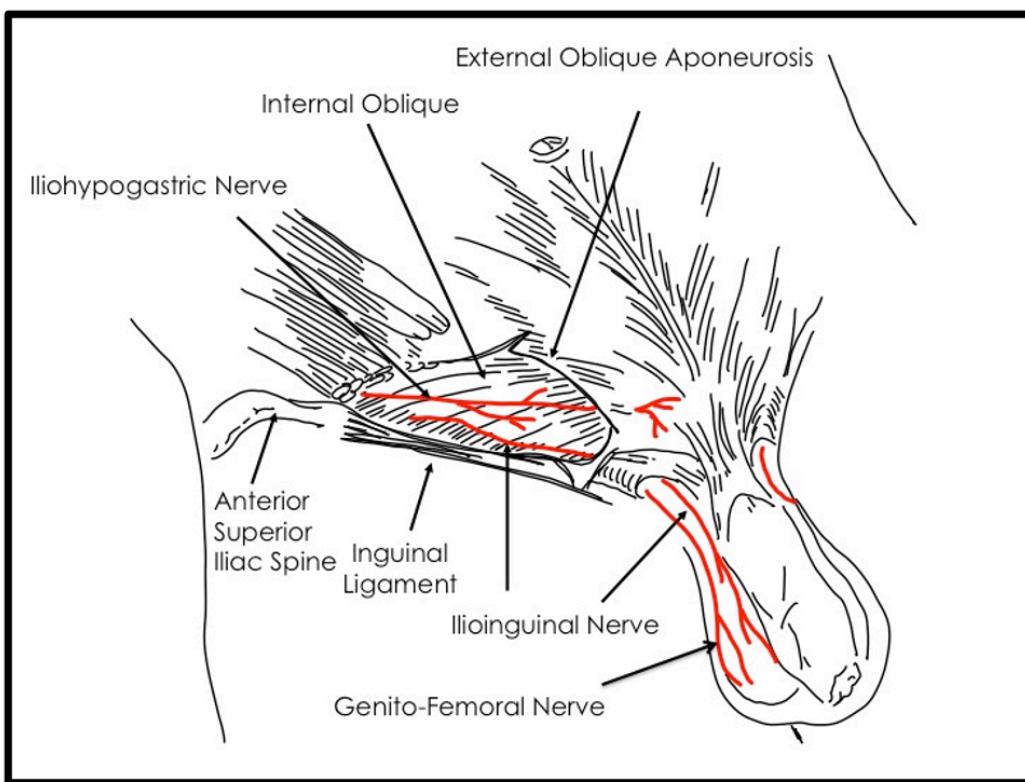
The schematic Diagram of TAP Blocks

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IIN and IHN Anatomy

THE ILOINGUINAL AND ILOHYPOGASTRIC NERVES:

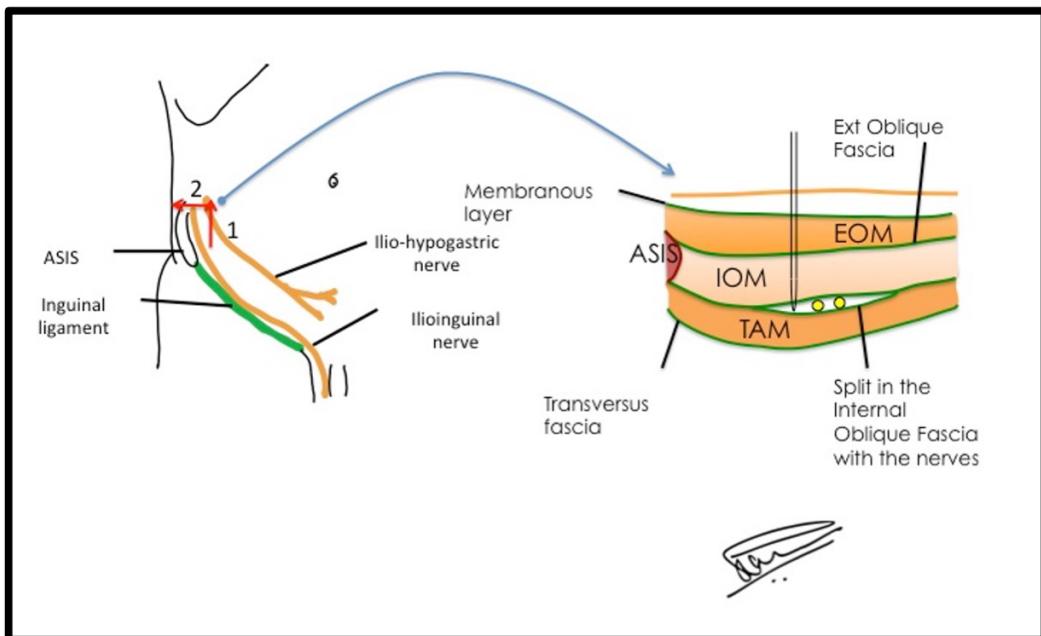
The first lumbar nerve divides into upper and lower branches, the iliohypogastric and ilioinguinal nerves. Both the Ilioinguinal (IIN) and iliohypogastric (IHN) nerves travel in the transversus abdominis plane, the later divides into two terminal branches just above the iliac crest, the lateral cutaneous branch supplies the upper lateral part of the gluteal region and the anterior cutaneous branch supplies the suprapubic region



IIN leaves the neurovascular plane by piercing internal oblique above the iliac crest. It continues between the two oblique muscles and accompanies the spermatic cord (or round ligament of the uterus) in the inguinal canal.

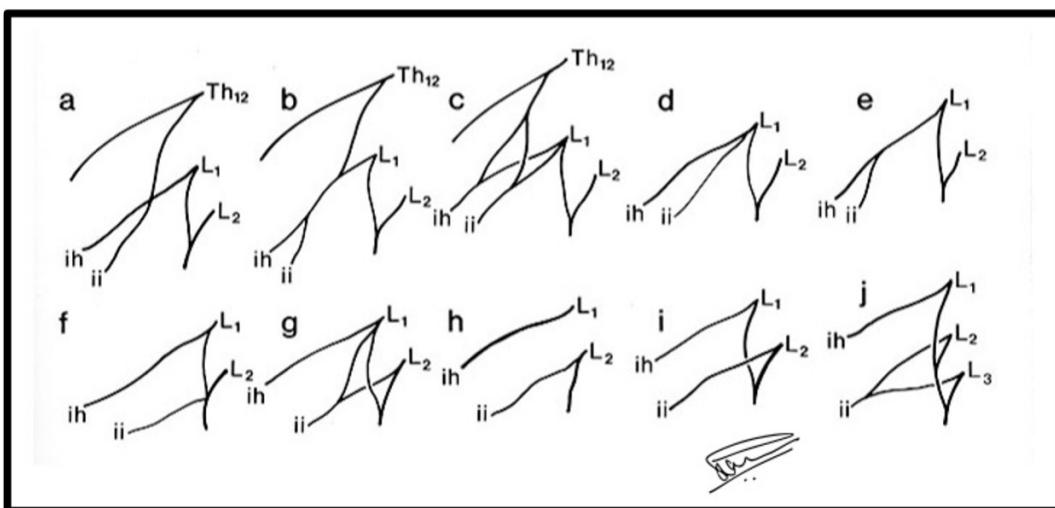
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LOR Blocks: IIN Block



The schematic Diagram of IIN Block in TA Plane

There are many anatomical variations seen with these nerves and hence it is not a bad idea to inject some LA under the EO Fascia as well. Few mls should always be injected under the subcutaneous tissue to catch the lateral cutaneous branches from the subcostal nerve.



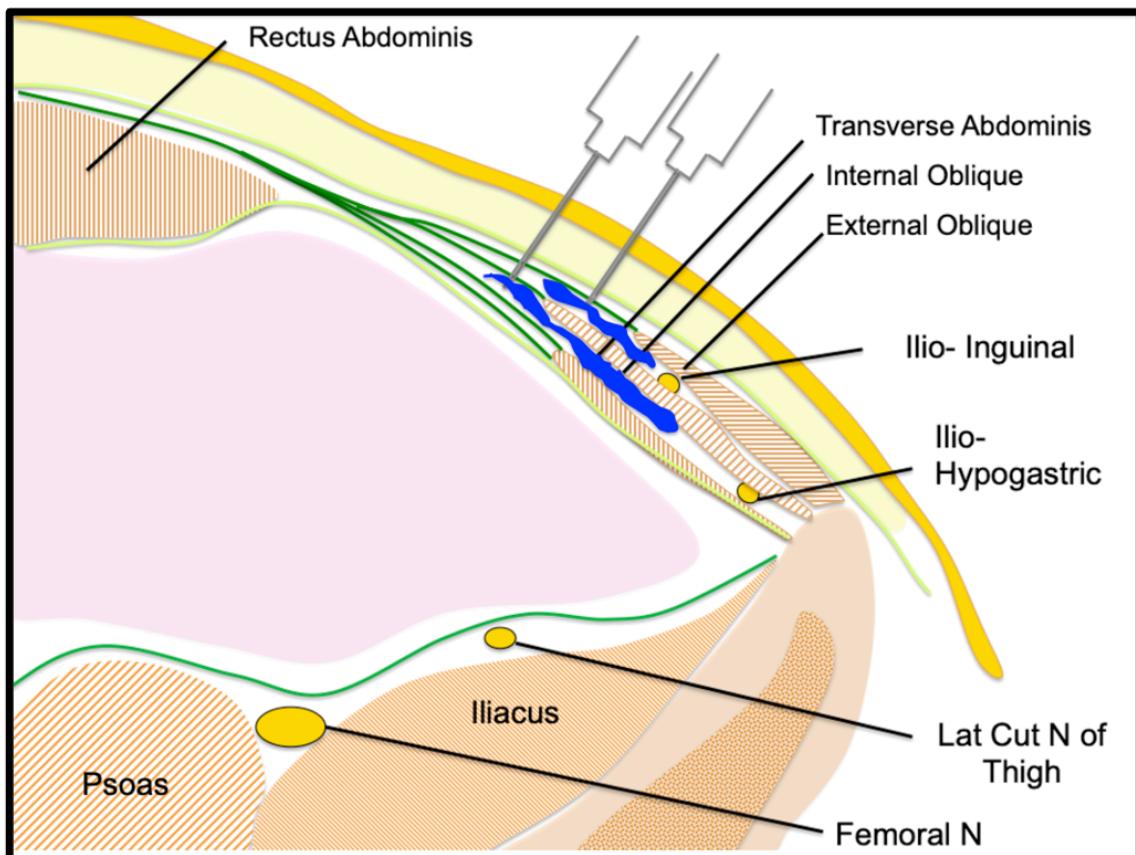
Anatomical variations in the origin of IIN and IHN

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LOR BLOCKS: IIN BLOCK

Once the needle is through the skin, as the needle is advanced an initial 'pop' sensation is felt as it penetrates the external oblique aponeurosis, around 5-10 ml of local anaesthetic is injected. The needle is then inserted deeper until a second 'pop' is felt penetrating the internal oblique, and a further 5-10 ml of local anaesthetic is injected to block the iliohypogastric nerve. A subcutaneous injection of 3-5 ml can also be made at the point of entry, to block any remaining sensory supply from the intercostals and subcostal nerve.

For completion of anaesthesia, the surgeons can inject some local into the Vas, to block the genital branch of Genitofemoral nerve.

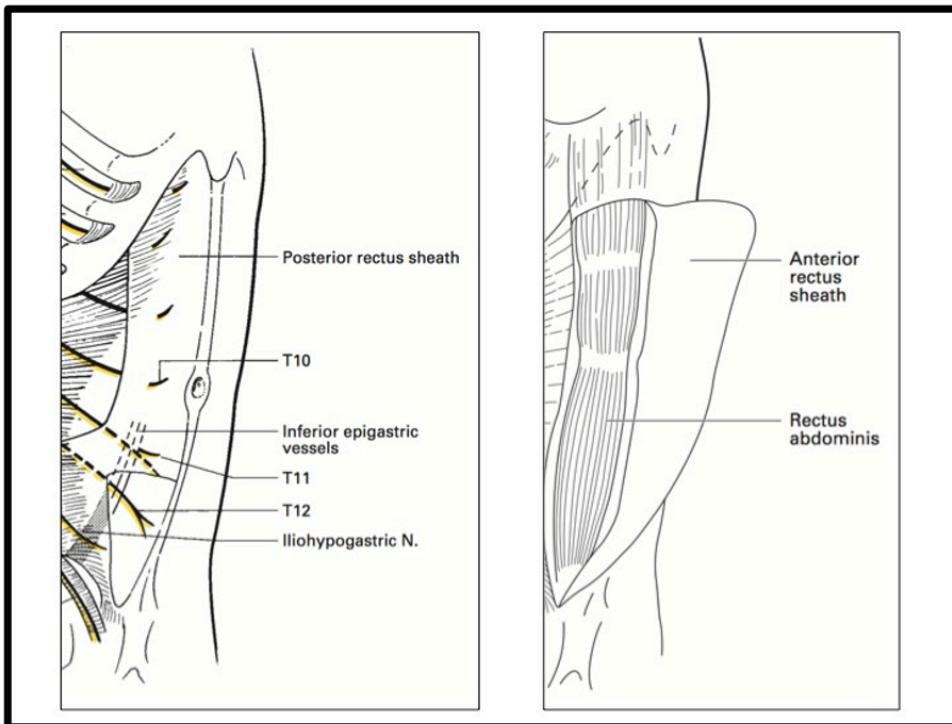


Schematic: Classical Inguinal Nerves Block

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Rectus Sheath Anatomy

The superior two thirds of the internal oblique aponeurosis splits into two layers, or laminae, at the lateral border of the rectus abdominis; one lamina passing anterior to the muscle and the other passing posterior to it. The anterior lamina joins the aponeurosis of the external oblique to form the anterior layer of the rectus sheath. The posterior lamina joins the aponeurosis of the transverse abdominal muscle to form the posterior layer of the rectus sheath.



Beginning at approximately one third of the distance from the umbilicus to the pubic crest, the aponeuroses of the three flat muscles pass anterior to the rectus abdominis to form the anterior layer of the rectus sheath, leaving only the relatively thin transversalis fascia to cover the rectus abdominis posteriorly.

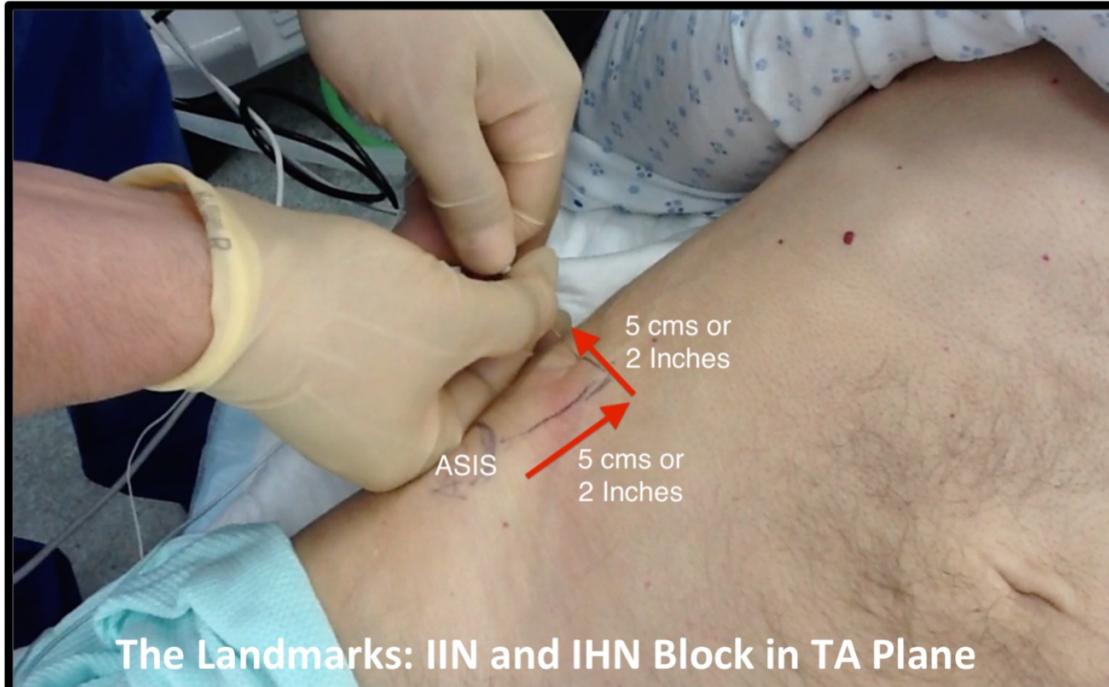
LOR BLOCKS: IIN BLOCK

ILIOINGUINAL AND ILIOHYPOGASTRIC NERVE BLOCKS IN TA PLANE

The approach we follow is based on a study by Eichenberger. Our injection point is about 5 cm cranial and 5 cm posterior to the ASIS. At this point both the iliohypogastric and the ilioinguinal nerves lie between the internal oblique and transverse abdominal muscle. This has been confirmed by cadaveric studies done as far back as 1952 and more recently in 2008.

Once the needle is through the skin, loss of resistance is felt 1st through the EO Fascia and then through the IO fascia, similar to TAP block. At this point after careful aspiration 20 mls of LA in 5 mls aliquots is injected.

Motor response in the abdominal muscles can also be elicited with PNS guided IIN blocks

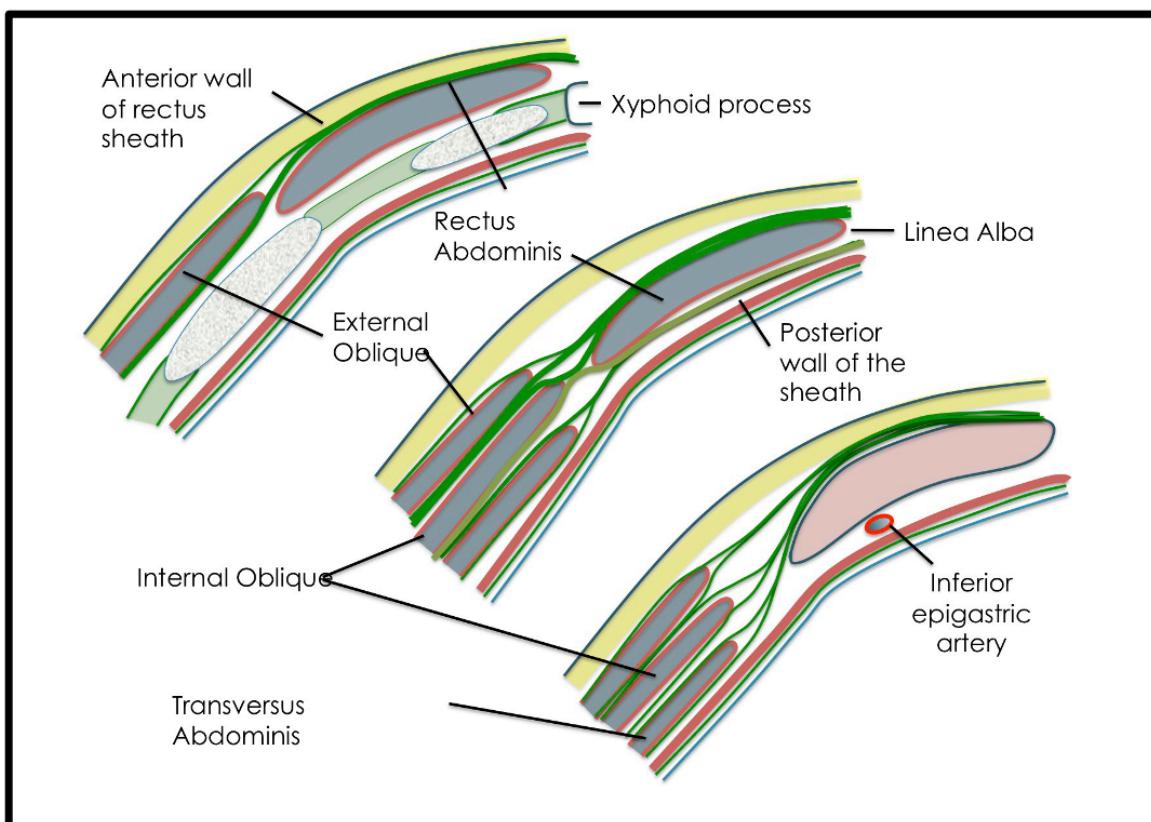


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Anatomy

RECTUS SHEATH AND RECTUS ABDOMINIS MUSCLE:

The rectus sheath is the strong, incomplete fibrous compartment of the rectus abdominis and pyramidalis muscles. Also found in the rectus sheath are the superior and inferior epigastric arteries and veins, lymphatic vessels, and distal portions of the thoracoabdominal nerves (abdominal portions of the anterior rami of spinal nerves T₇₋₁₂).



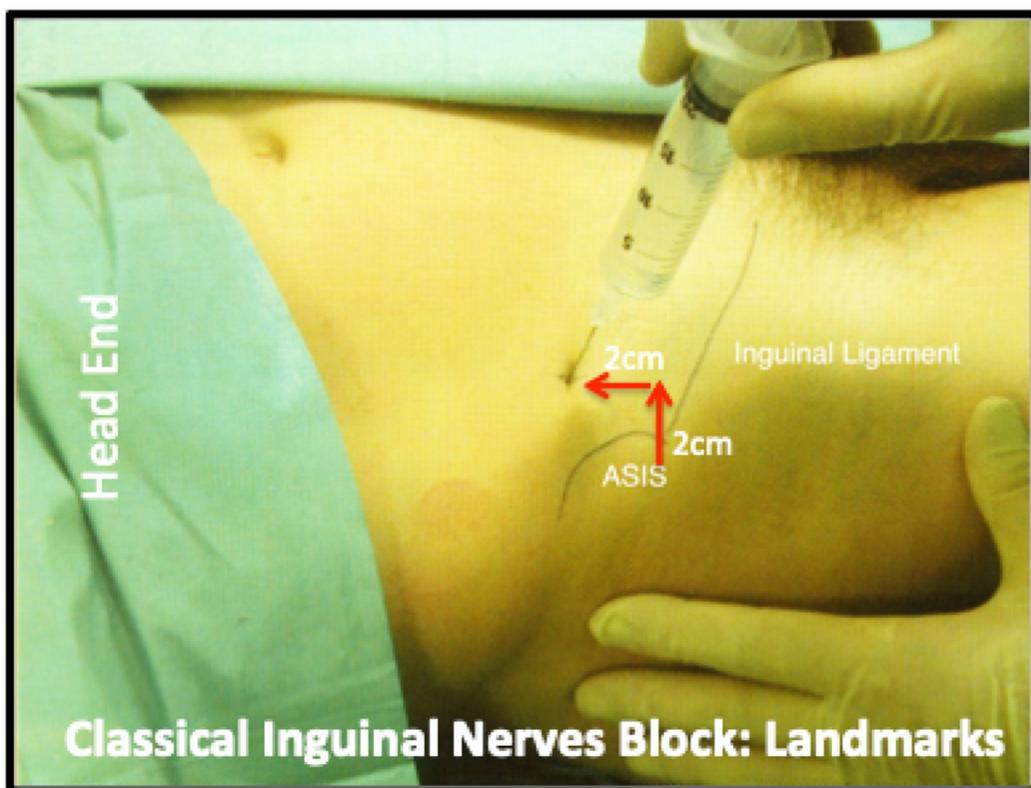
The sheath is formed by the decussation and interweaving of the aponeuroses of the flat abdominal muscles. The external oblique aponeurosis contributes to the anterior wall of the sheath throughout its length.

LOR Blocks: IIN Block

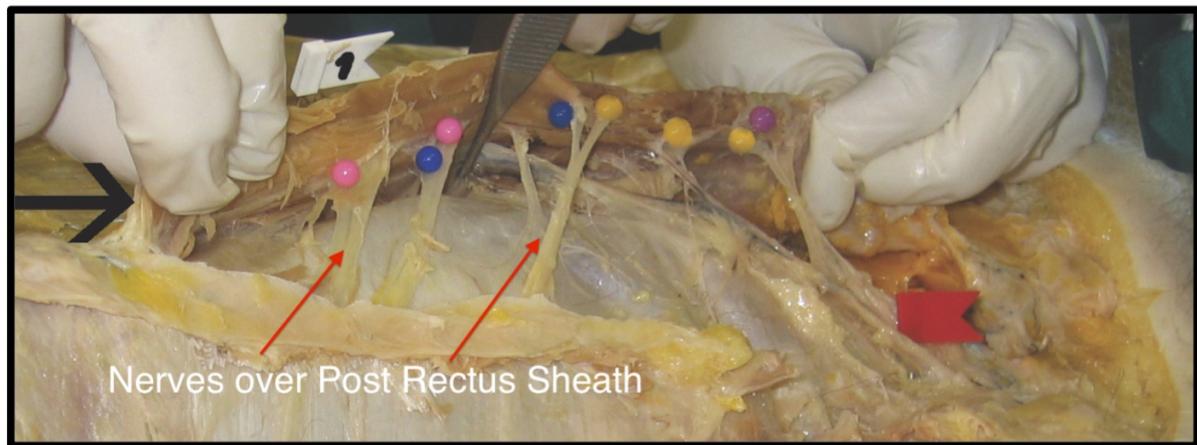
INDICATIONS:

- Inguinal herniorrhaphy and orchidopexy remain the most common indications for this block.
- Bilateral blocks have also been used for obstetrics and gynaecological procedures that utilise lower abdominal incisions (eg. Pfannenstiel incision).
- In our practice, we also use bilateral blocks, along with femoral branch of genitofemoral nerve blocks, for endovascular abdominal aneurysm repairs (EVAR).

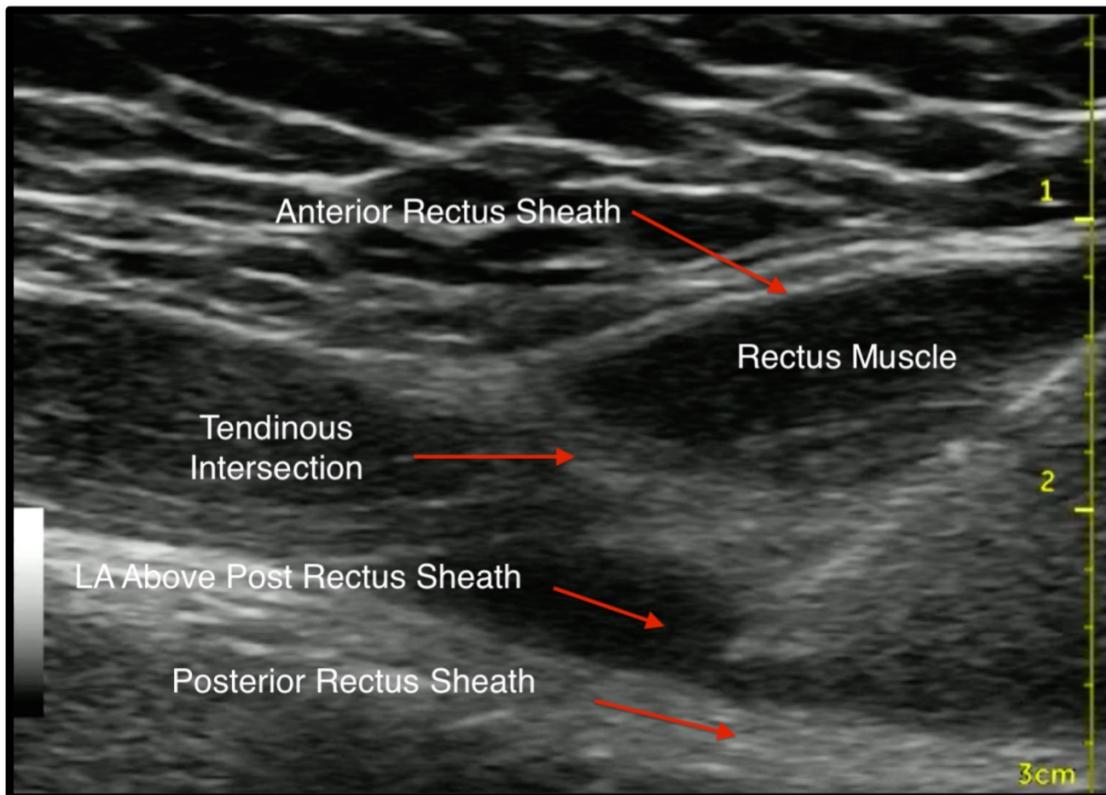
CLASSICAL IIN BLOCK TECHNIQUE: There are many approaches to this block; classical approach uses a landmark technique which blocks the nerves once they have moved into the different fascial layers. Using a short beveled or a blunt needle, an injection is made at a point 2 cm medial and 2 cm cephalad (some go 2 cm caudad) to the anterior superior iliac spine (ASIS).



LOR Blocks: Rectus Sheath Block



Nerves Under Rectus Muscle and Above Post Rectus Sheath



LA deposited under the Rectus Abdominis Muscle and
above the Post Rectus Sheath

The schematic Diagram of TAP Block

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LOR Blocks: Rectus Sheath Block

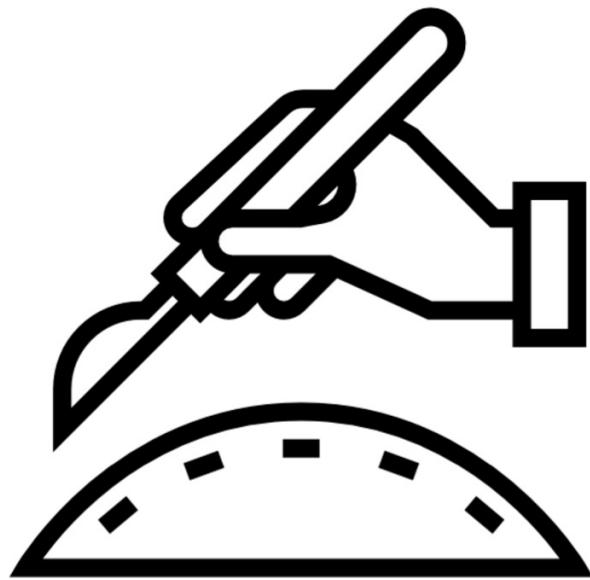
INDICATIONS: The rectus sheath block is mostly used for analgesia after umbilical or incisional hernia repairs and supra-umbilical surgical incisions. It is also used to supplement TAP block for complete analgesia following large laparotomy incision that extend from the xiphisternum to the symphysis pubis.

TECHNICAL DESCRIPTION: The aim of this technique is to block the terminal branches of the upper intercostal nerves (often missed by TAP block) which run in-between the internal oblique and transversus abdominis muscles to penetrate the posterior wall of the rectus abdominis muscle and end in an anterior cutaneous branch supplying the skin of the umbilical area.

For this block, large amount of local anaesthetic is often required as it is mostly performed bilaterally. The technique is similar to the TAP block. The point of insertion is Approximately 5 cm lateral to linea alba, midway between the xiphisternum and the umbilicus. The Rectus Abdominis muscle is wider at the top and therefore when performing this block with multiple injections (4 quadrants), it is better to be further away from midline at the top 2 injections.

TECHNIQUE: Using a short bevel or a blunt needle, once the skin barrier is breached, the needle is withdrawn and re-advanced. The needle first passes through anterior rectus sheath and then through the rectus abdominis muscle till resistance is felt over the post wall of the rectus sheath, bouncing the needle on the fascia will confirm the correct location. Once the position is confirmed, injection of 15–20 ml local anaesthetic is made in 5 ml aliquots. The procedure is repeated on the opposite side of the midline.

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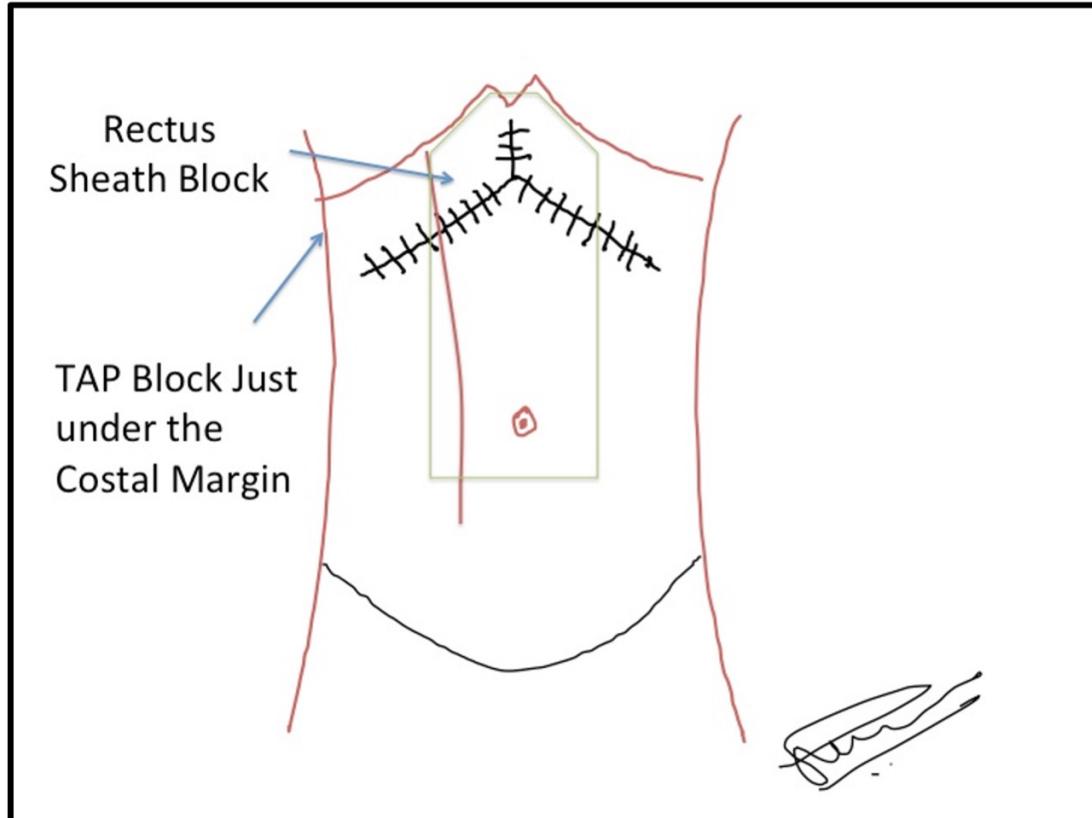


Procedure Specific Blocks for Abdominal Surgeries

LOR BLOCKS FOR SURGERIES

PANCREATIC AND MAJOR GASTRIC SURGERY

Incision: Roof Top/ Mercedes Benz Incision



Dermatomes and myotomes involved: $T_6 - T_{10}$

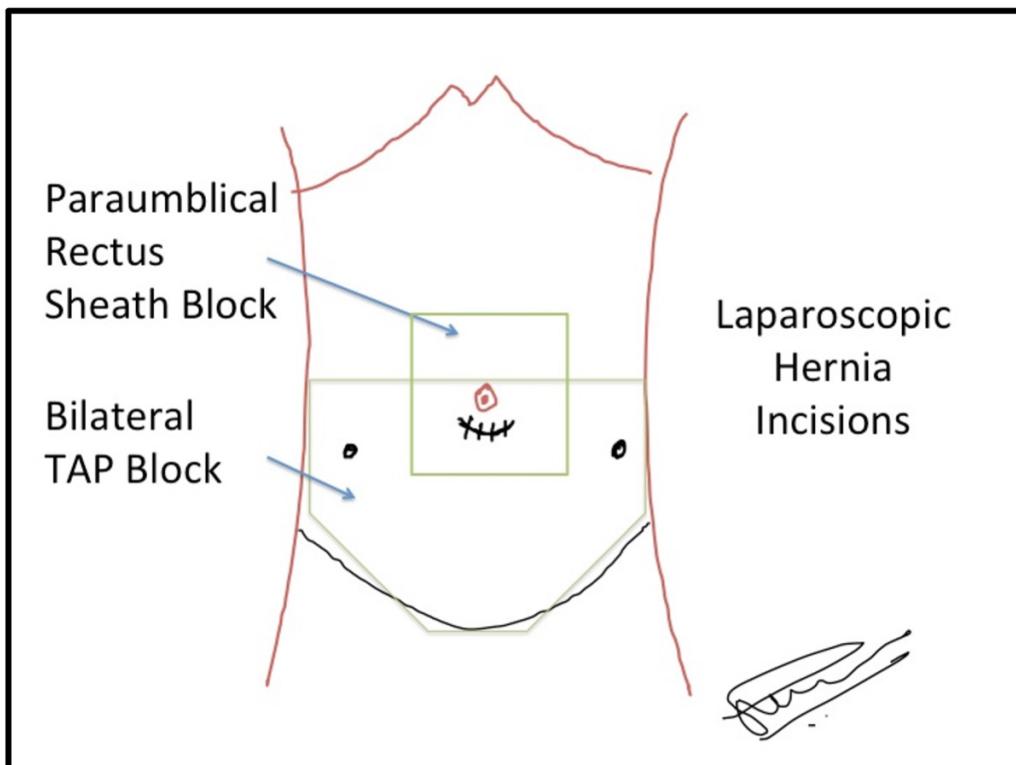
Preferred Block: Bilateral Rectus Sheath and Subcostal TAP Blocks

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LOR BLOCKS FOR SURGERIES

LAPAROSCOPIC HERNIA REPAIRS

Incision: Paraumbilical Camera Ports and Ports on either flanks



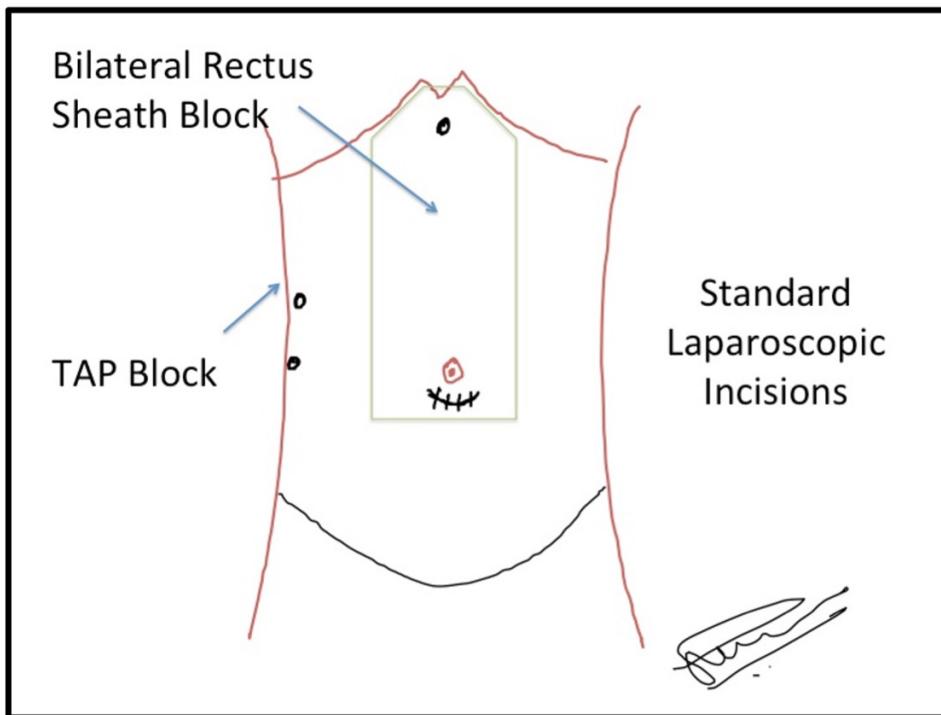
Dermatomes and myotomes involved: $T_{10} - L_1/L_2$

Preferred Block: Bilateral Paraumbilical Rectus Sheath and TAP Blocks

LOR BLOCKS FOR SURGERIES

LAPAROSCOPY CHOLECYSTECTOMY

Incision: Paraumbilical camera port and Ports at the epigastric and right flanks



Dermatomes and myotomes involved: T₆₋₁₀

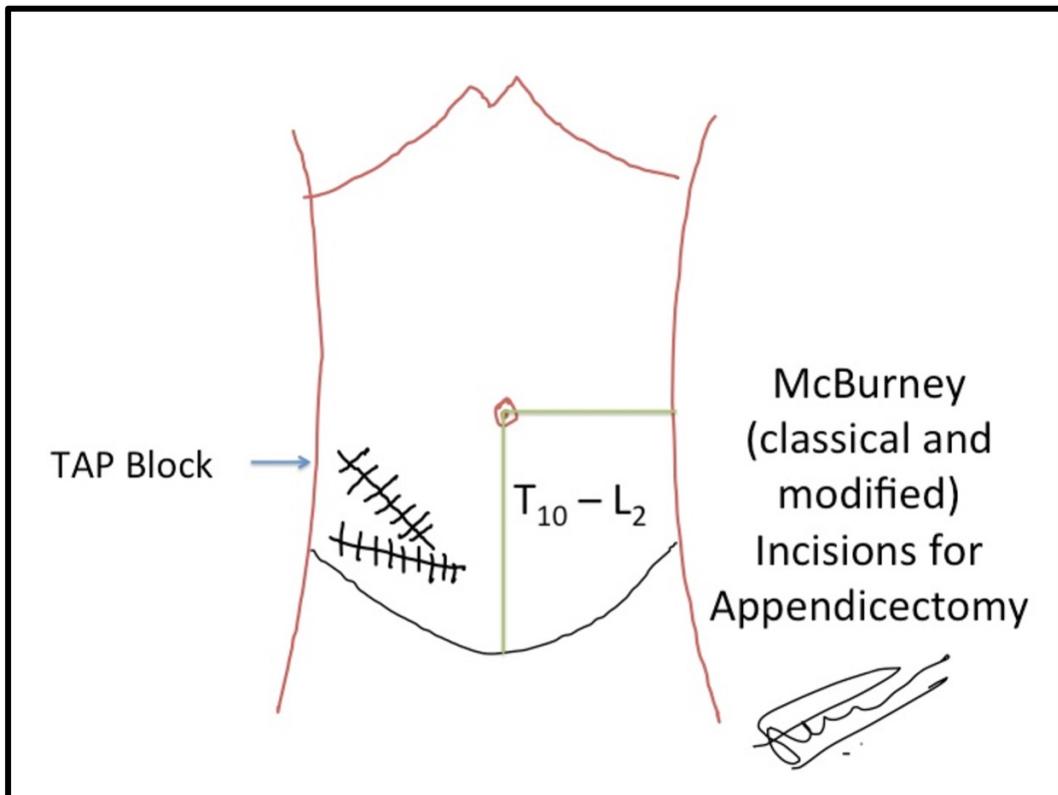
Preferred Block: Bilateral Rectus Sheath and Righted Sided TAP Block

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LOR BLOCKS FOR SURGERIES

APPENDICECTOMY

Incision: McBurney and Its Modifications



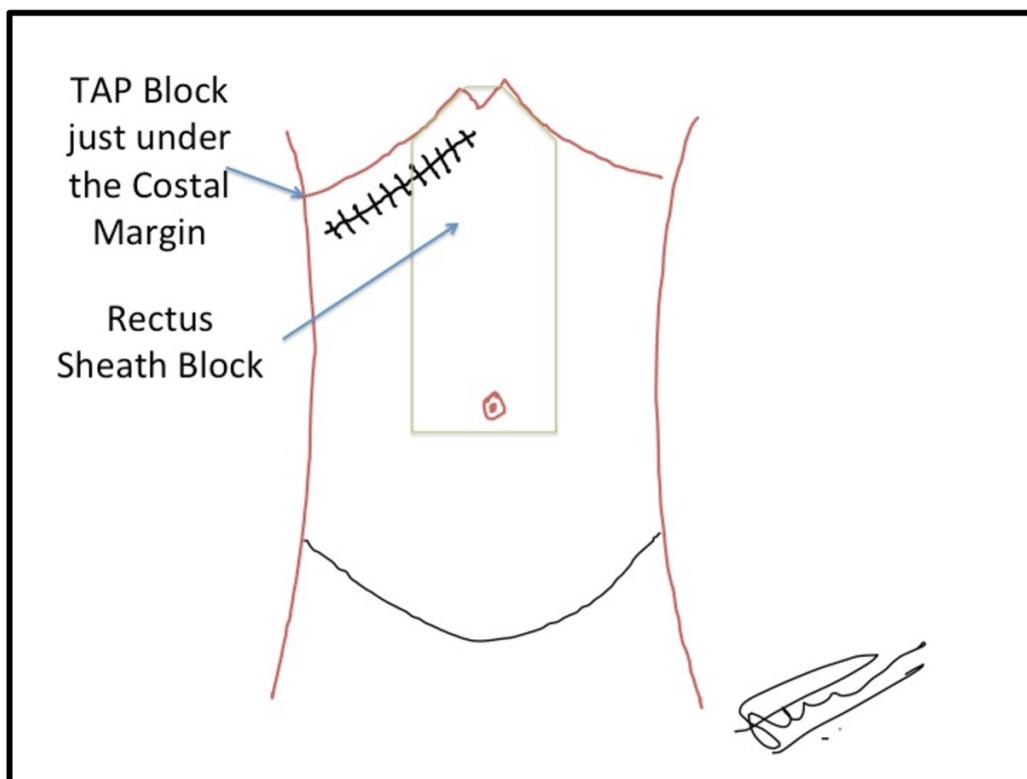
Dermatomes and myotomes involved: $T_{10} - L_1/L_2$

Preferred Block: Right sided TAP block

LOR BLOCKS FOR SURGERIES

BILIARY (OPEN CHOLECYSTECTOMY) OR HEPATIC PROCEDURES

Incision: Kocher, Left Subcostal Incision



Dermatomes and myotomes involved: $T_6 - T_8/T_{10}$

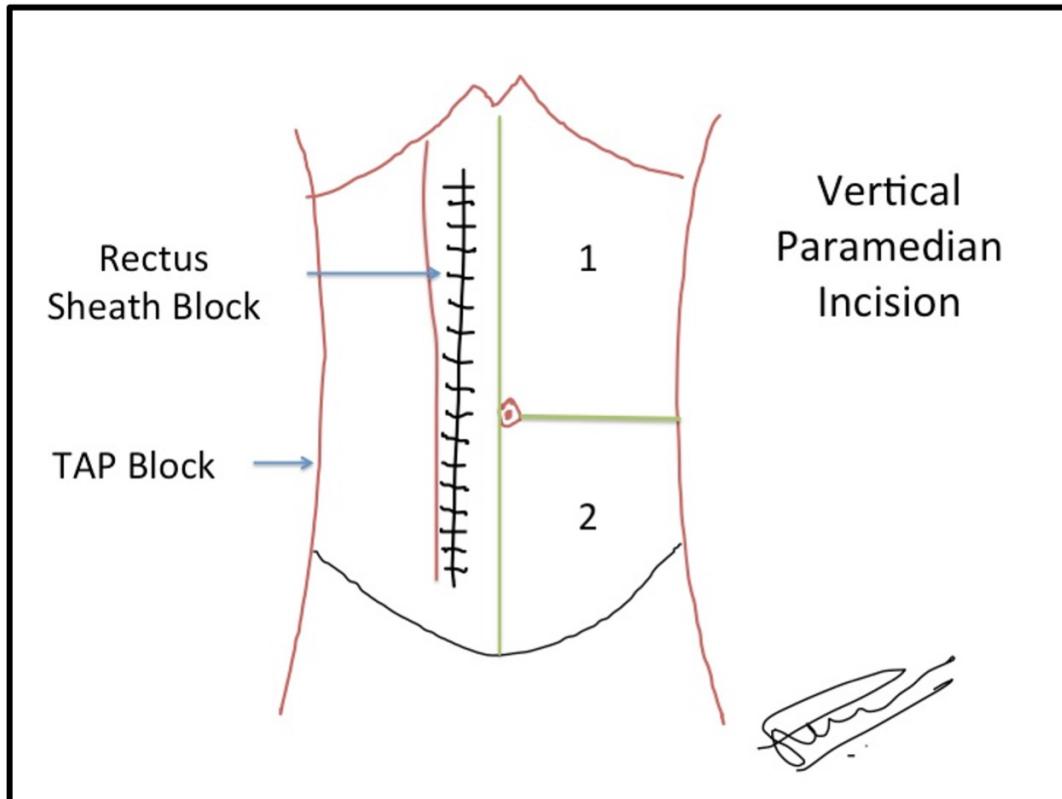
Preferred Block: Combined Right sided TAP and Rectus Sheath Block. It is preferable to give Bilateral Rectus Sheath Block as the incision may extend on to the left side. Paravertebral Block at multiple level can also be done and provide better quality analgesia.

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LOR BLOCKS FOR SURGERIES

LAPAROTOMY

Incision: Paramedian Incision



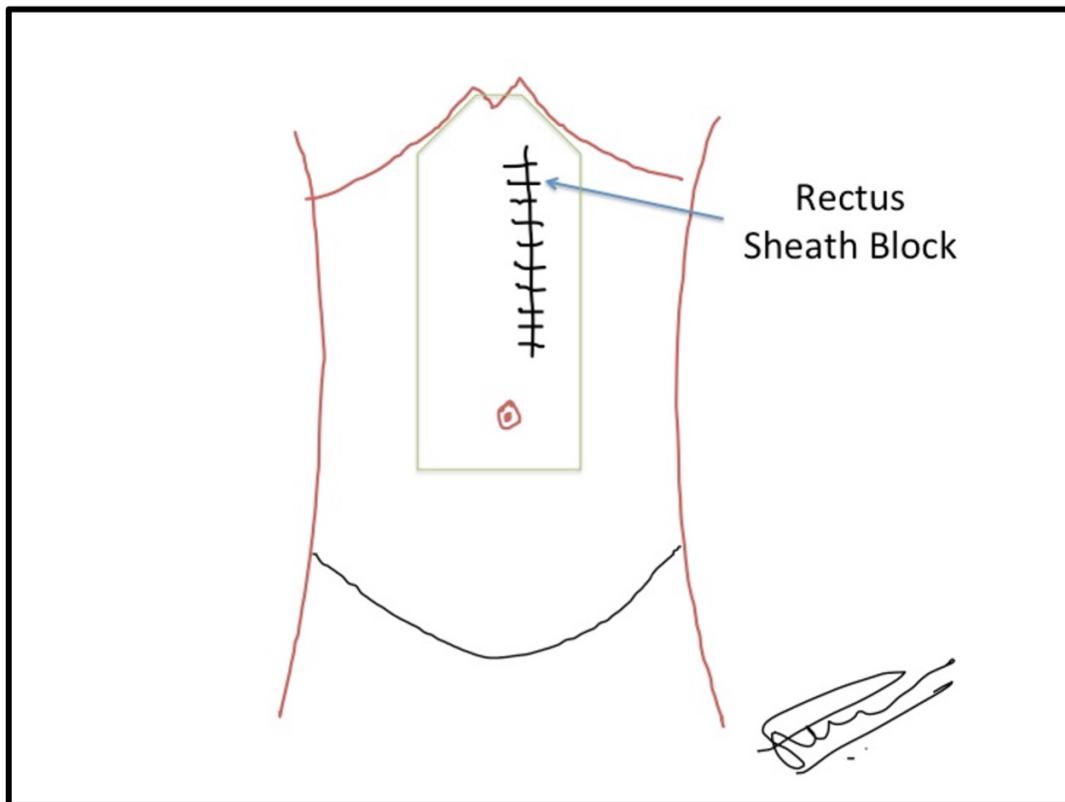
Dermatomes and myotomes involved: $T_6 - L_1/L_2$

Preferred Block: Unilateral Rectus Sheath and TAP block

LOR BLOCKS FOR SURGERIES

UPPER ABDOMINAL LAPAROTOMY (DU PERFORATION)

Incision: Vertical Upper Abdominal (Para)median Incision



Dermatomes and myotomes involved: Terminal Branches of $T_6 - T_{10}$.

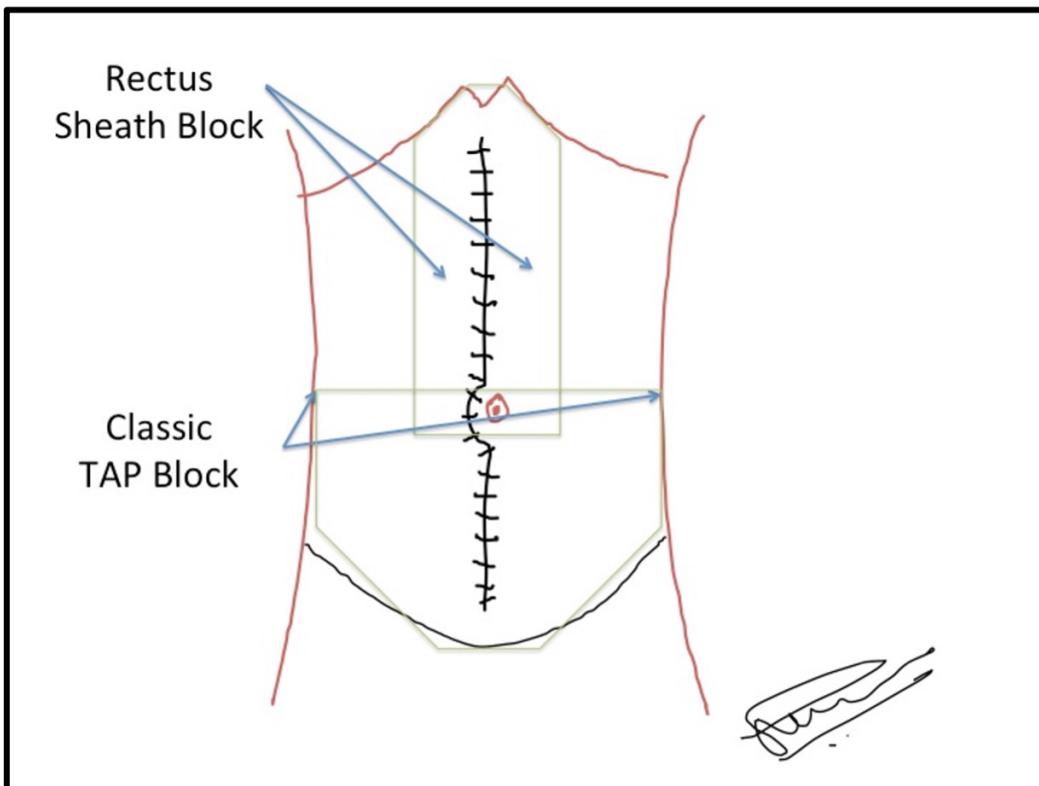
Preferred Block: Rectus Sheath Block

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LOR BLOCKS FOR SURGERIES

LAPAROTOMY

Incision: Midline



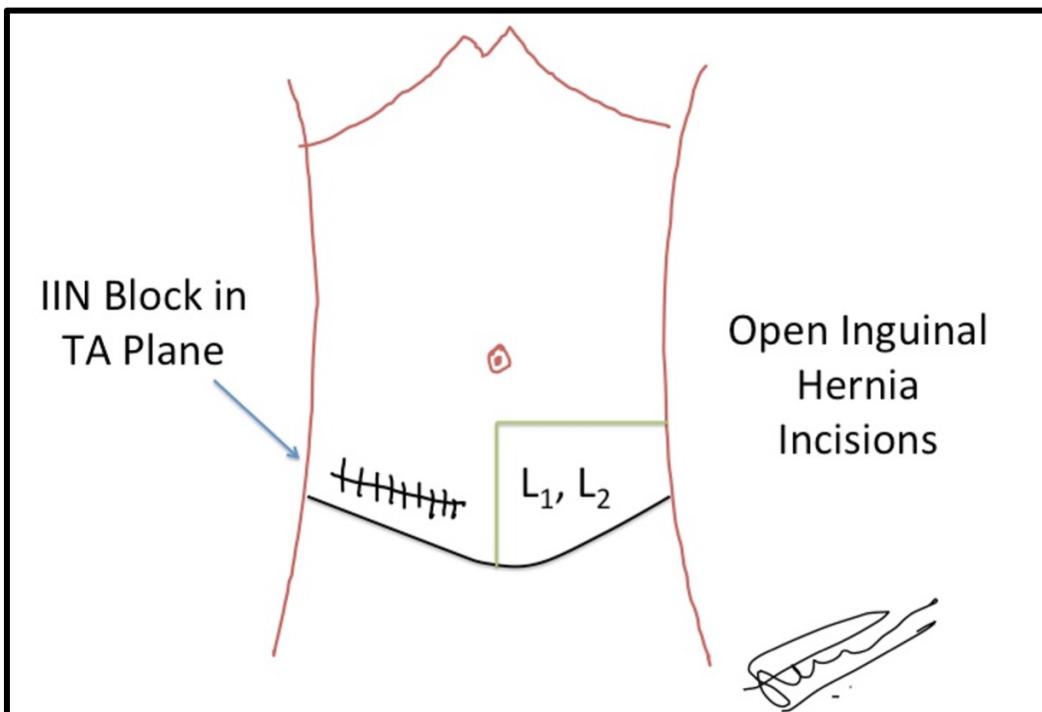
Dermatomes and myotomes involved: $T_6 - L_1/L_2$

Preferred Block: Bilateral Rectus Sheath and TAP blocks

LOR BLOCKS FOR SURGERIES

INGUINAL HERNIA REPAIR, ORCHIDOPEXY

Incision: Parallel and above the Inguinal Ligament.



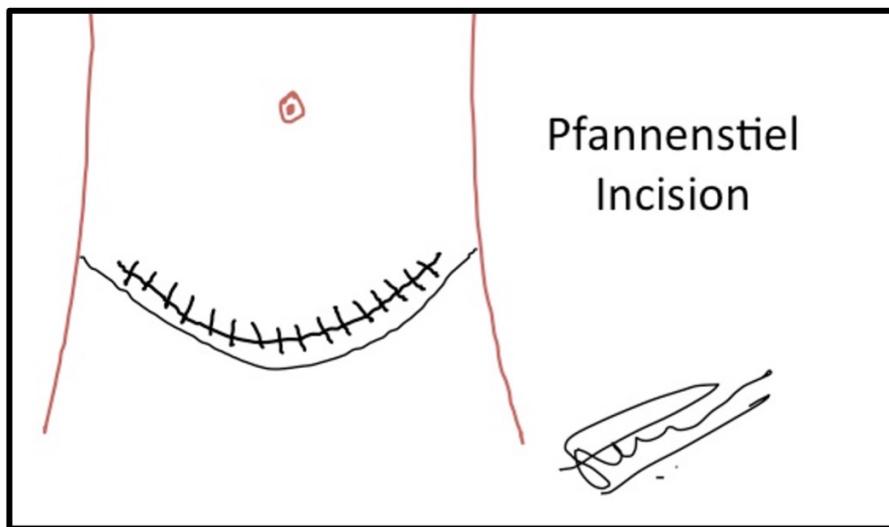
Dermatomes and myotomes involved: L₁ and L₂

Preferred Block: Ilioinguinal and Iliohypogastric block in the TA Plane. The Genital Branch of the Genitofemoral Nerve also needs to be blocked for complete analgesia.

LOR BLOCKS FOR SURGERIES

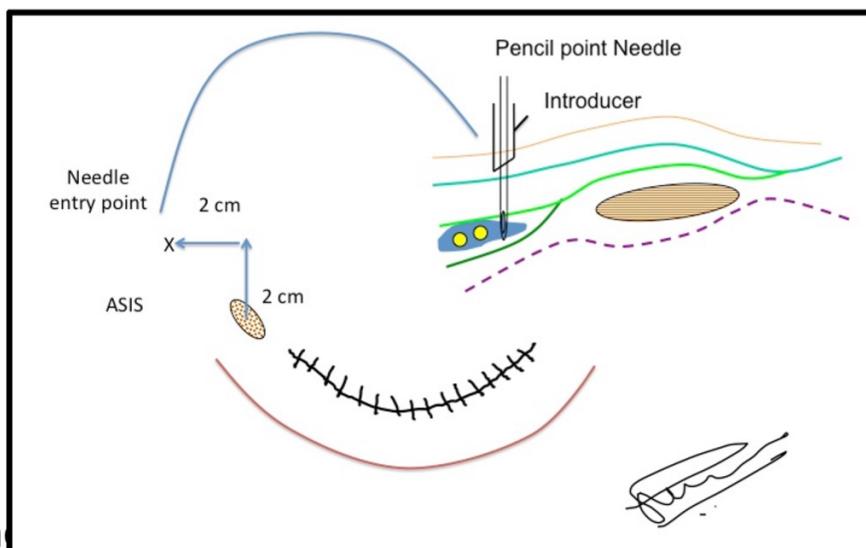
CAESAREAN SECTION, BLADDER AND PROSTATE SURGERIES

Incision: Pfannenstiel



Dermatomes and myotomes involved: L₁ and L₂

Preferred Block: Ilioinguinal and Iliohypogastric block in the TA Plane.



LA: Th

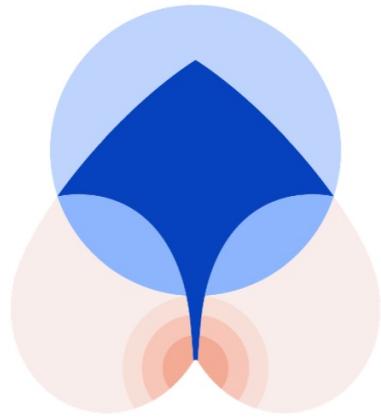
ire

minimum of 0.3 – 0.4ml/kg of LA to soak the nerves.

Ropivacaine or (Levo) Bupivacaine within its safe toxic limits can be used for these blocks.

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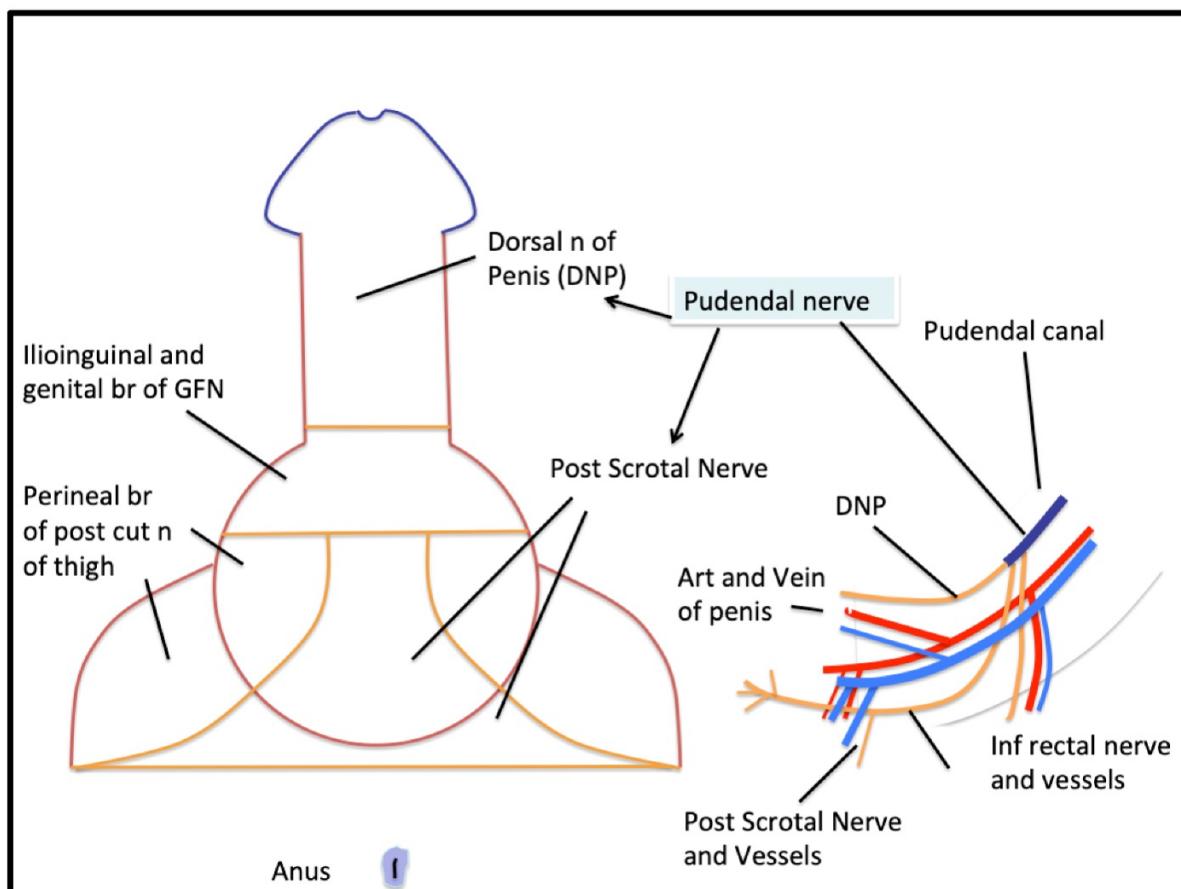
Perineal Blocks

Dorsal Nerve of Penis
Scrotal Nerve Blocks and
Peri-Anal Block

LOR Blocks: Penile Block

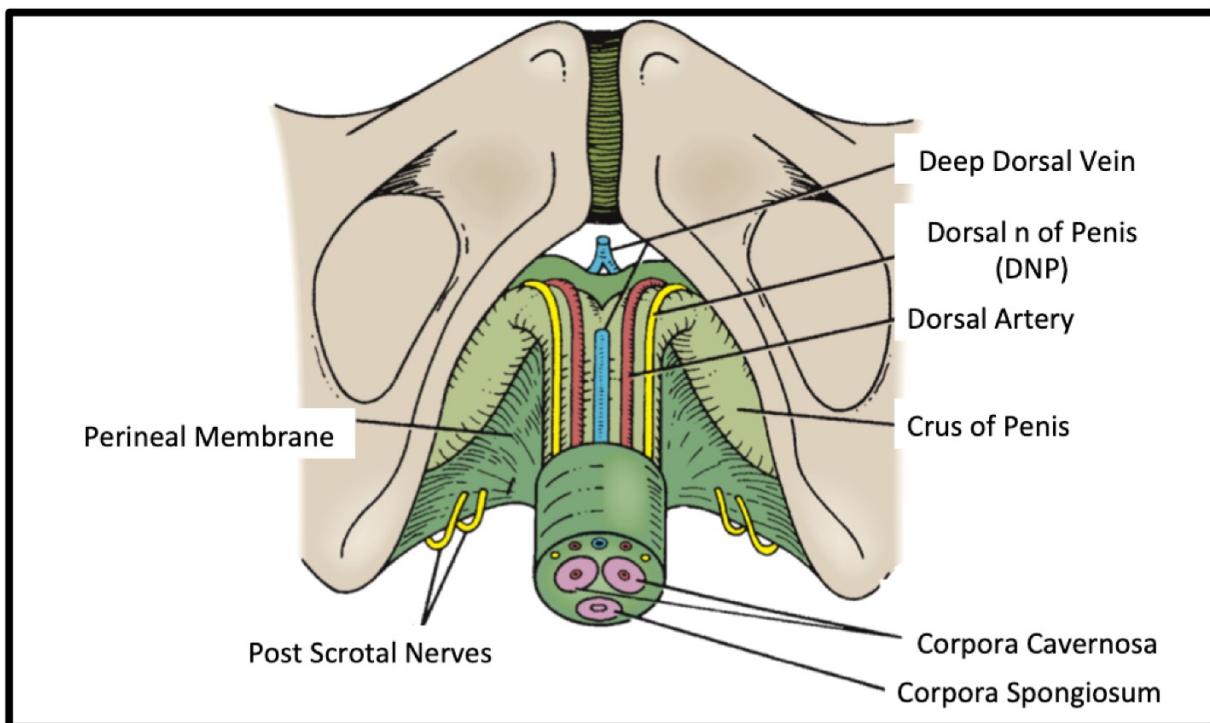
ANATOMY

The sensory nerve supply to the penis is derived from the dorsal nerve of the penis (DNP) and the ilioinguinal nerve (IIN). The muscles of the root of the penis are supplied by the perineal branch of the pudendal nerve.



Schematic of nerve supply to Penis and Scrotum: The Nerves passing through the Pudendal or Alcock Canal

LOR BLOCKS: Penile Block



DORSAL NERVE OF PENIS BLOCK

This nerve block is often performed for circumcision both in children as well as in adults.

This block is not meant for surgery on the urethra for which caudal epidural block is preferred.

DORSAL NERVE OF PENIS BLOCK: CLASSICAL APPROACH

Anatomy related to classical approach

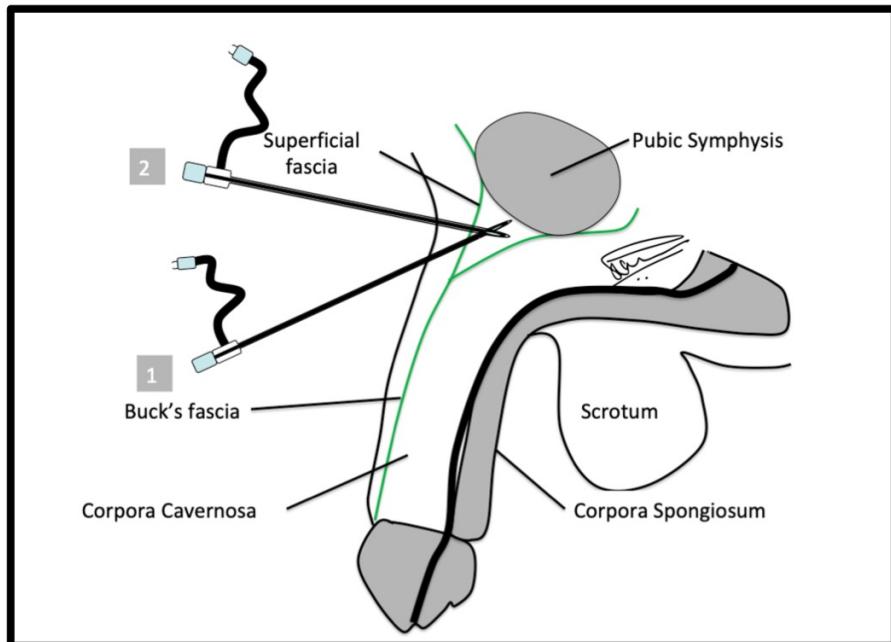
In this approach local anaesthetic is deposited in the triangular space lying deep to the fascia, bounded above by the symphysis pubis and below by the corpora cavernosa.

The fact that the fascia splits on its deep surface to form a vertical suspensory ligament of the penis which, in turn, divides to encircle the shaft of the penis.

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LOR Blocks: Penile Block

The dorsal nerves and vessels lie deep to the suspensory ligament where it divides on the corpora cavernosa and are therefore in an enclosed space.



BLOCK DESCRIPTION: CLASSICAL APPROACH

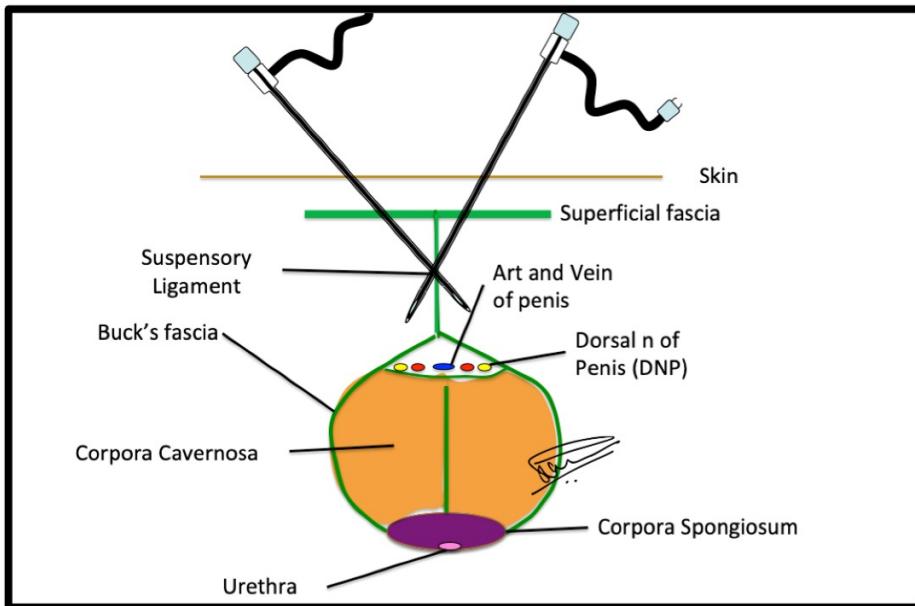
Following skin preparation and palpation of the arch of the lower border of the symphysis pubis, the base of the penis is gently pulled down, and the block needle is then inserted in the midline at a 75° angle to the plane of the skin, at the base of the penis, until bony contact is made with the symphysis pubis (No 1 in the figure).

The needle is then partially withdrawn, angled (No 2 in the figure) and re-inserted towards the right side, local anaesthetic injected after aspiration.

From the insertion point, the needle is then reinserted to the left side and the procedure repeated. Some would also inject the LA in a fan-shaped manner.

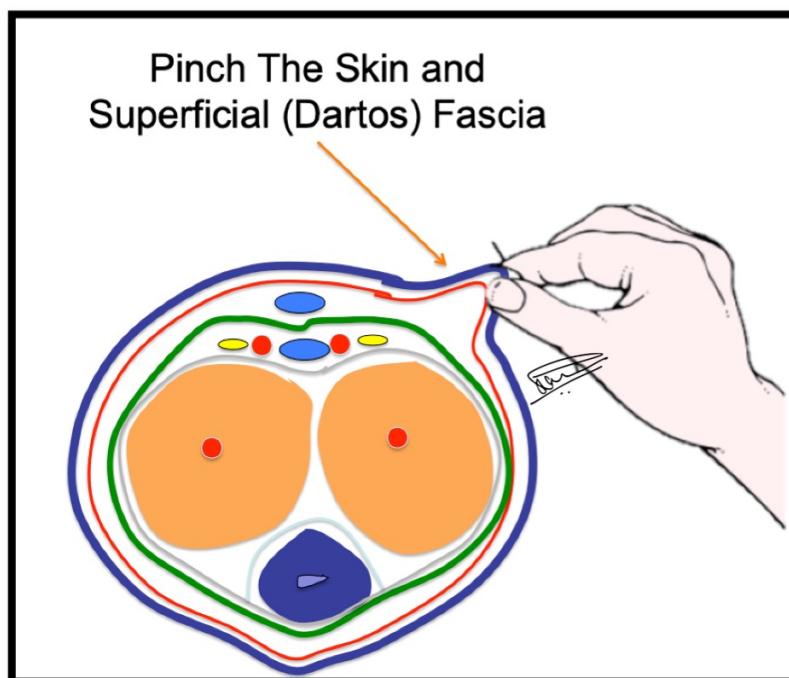
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LOR Blocks: Penile Block



BLOCK DESCRIPTION: LOSS OF RESISTANCE (LOR) TECHNIQUE

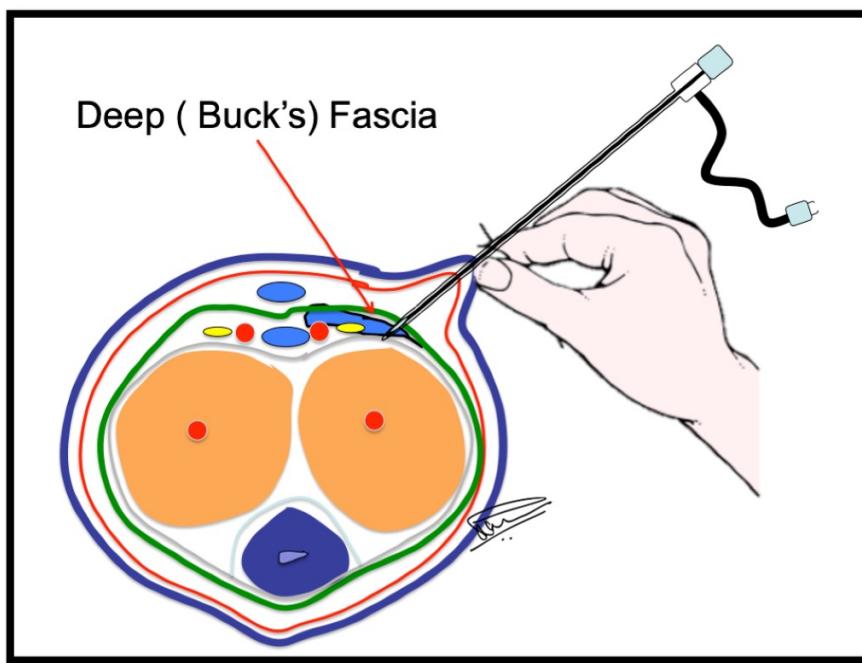
This technique relies on feeling the LOR ("pop") through the deep (Buck's) Fascia. As shown in the figure, at a point just lateral to and below the pubic tubercle, the skin is pinched at 3 and 9^o Clock position and the needle introduced through the skin.



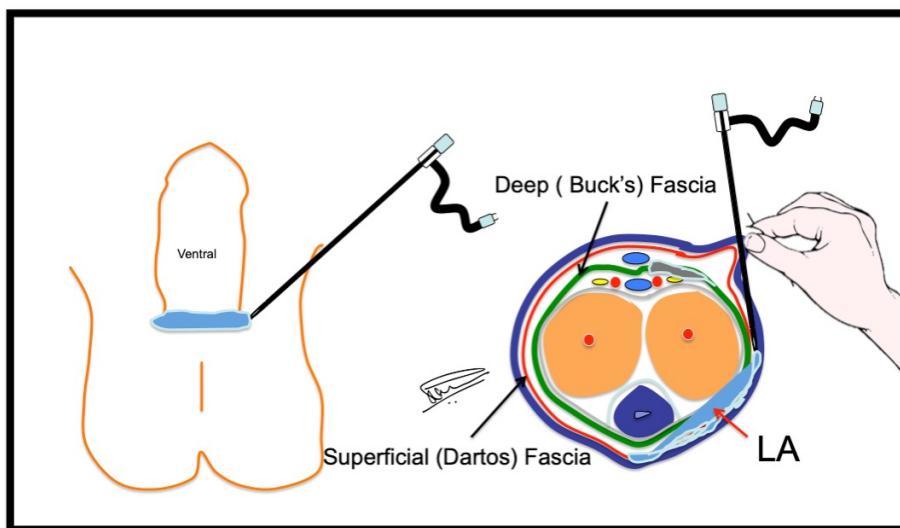
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LOR BLOCKS: PENILE BLOCK

The block needle is then advanced till a LOR ("pop") through the Buck's fascia is felt. After aspiration, LA is injected in increments of 5mls. The block is done on either side with about 7-10mls of 0.5% (levo) Bupivacaine.



To complete the anaesthesia, other branches on the ventral side can be easily blocked by LA injection under the superficial fascia at the base of the penis as shown in the figure below.

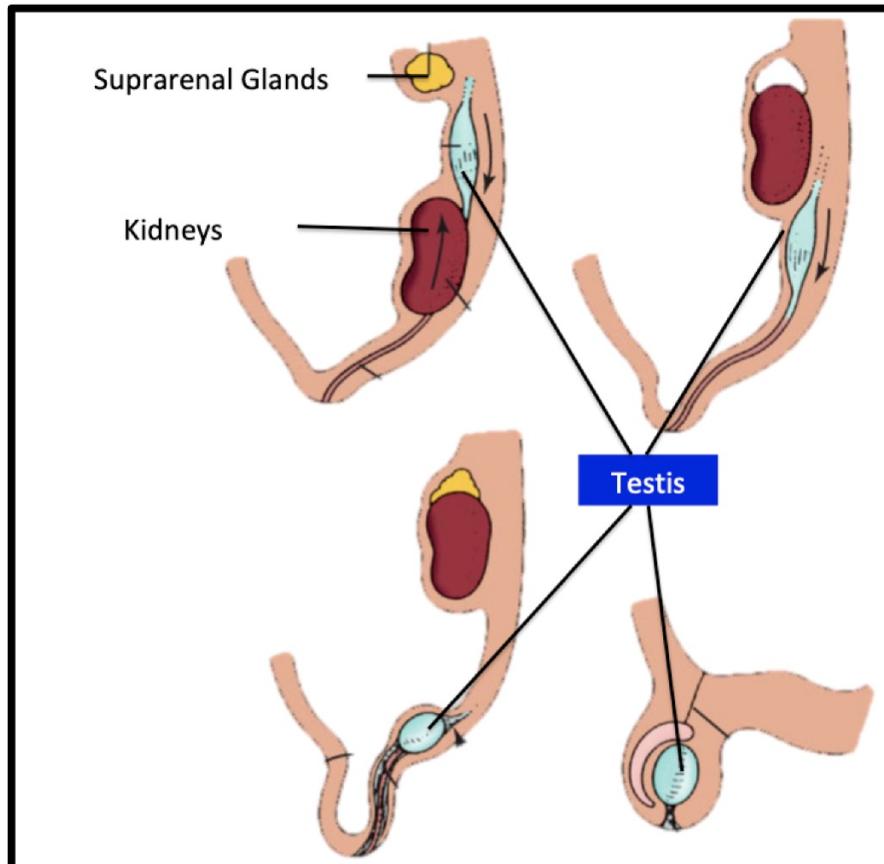


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LOR Blocks: Scrotal Nerves Block

APPLIED ANATOMY

Anesthesia of the testicle and epididymis is best understood starting from the embryological origin of the respective structures.



The testes are embryologically derived from the same level as the kidneys and, therefore, share a common level of innervation, that being the T_{10} - L_1 level for pain conduction and T_{10} - L_2 for sympathetic innervation. As the fetus matures, the testes descend into the scrotum.

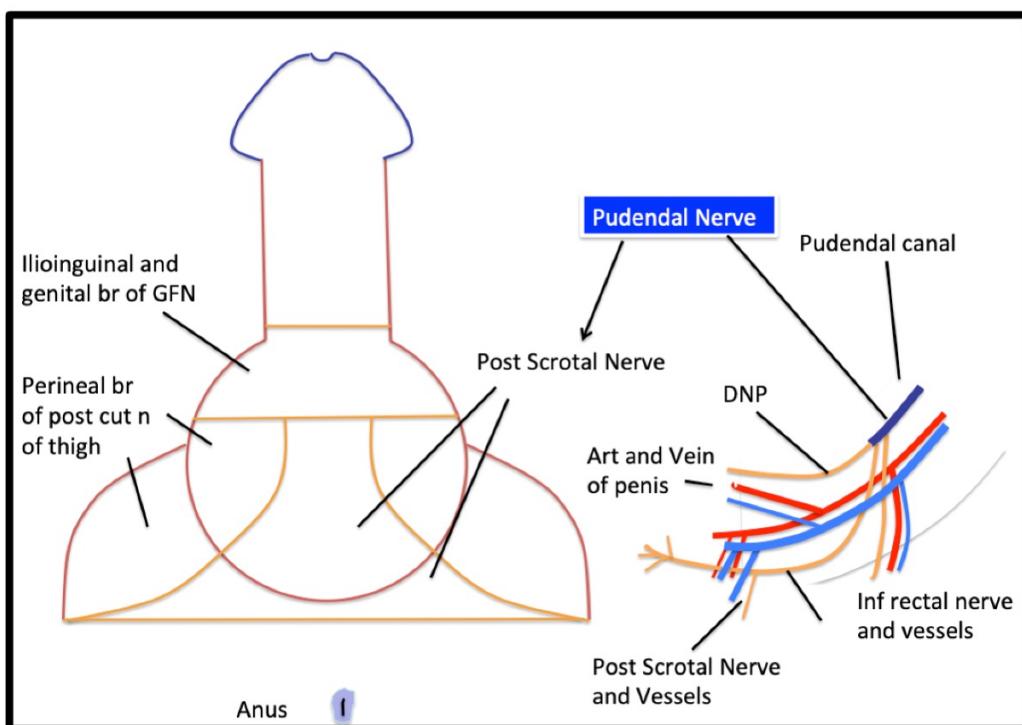
The scrotum is innervated anteriorly by the ilioinguinal and genitofemoral nerves, while the posterior portion of the scrotum is innervated by the perineal branches of the pudendal nerves

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LOR Blocks: Scrotal Nerves Block

INTERNAL CONTENT OF SCROTUM

The afferent fibers for the internal contents of the scrotum run in the spermatic cord. It is at this site that an anaesthetic nerve blockade is best approached, as the nerves are relatively superficial to the skin as they run through the spermatic cord. With a relatively noninvasive and simple technique, anaesthesia of the testicles and epididymis can be achieved.



SCROTAL SAC

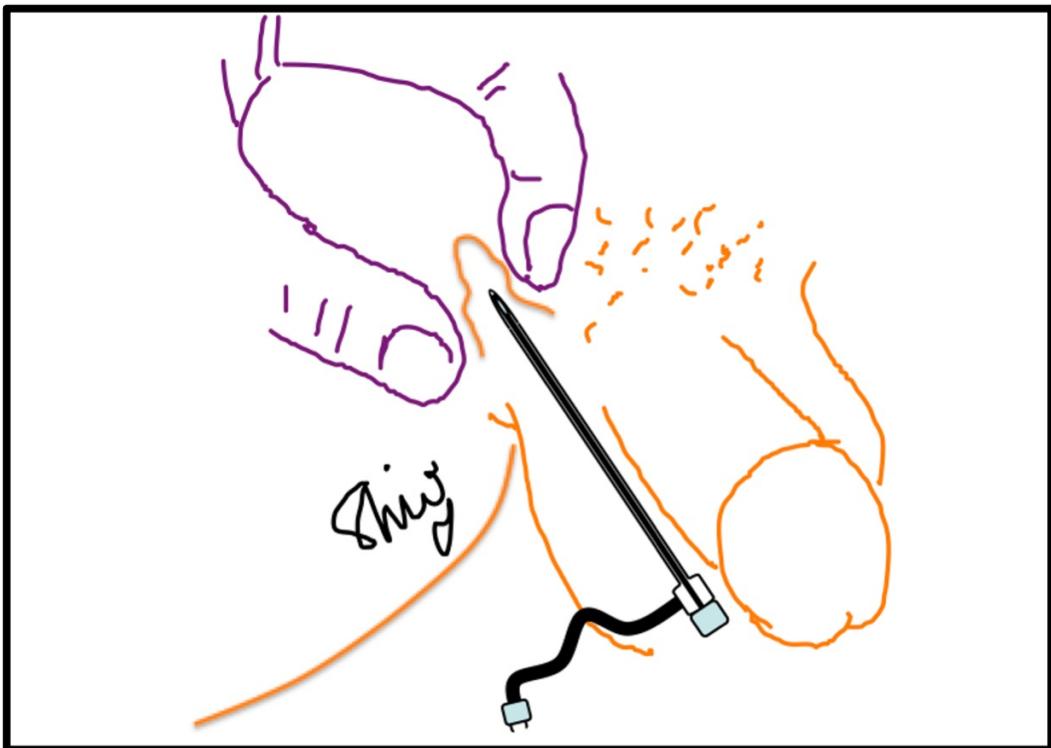
The scrotal sac include the iliohypogastric and ilioinguinal nerves and the genitofemoral nerves, along with a branch of the pudendal nerve on the posterior surface of the scrotal sac. Therefore, administration of local anesthetic to the spermatic cord itself, while establishing anaesthesia of the testicle and epididymis, does not establish anaesthesia

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LOR Blocks: Scrotal Nerves Block

INDICATIONS: Hydrocele repair, Excision of epidydymal cyst and testicular biopsies.

PATIENT POSITION: Supine and “Frog Leg Position” is useful for this block.



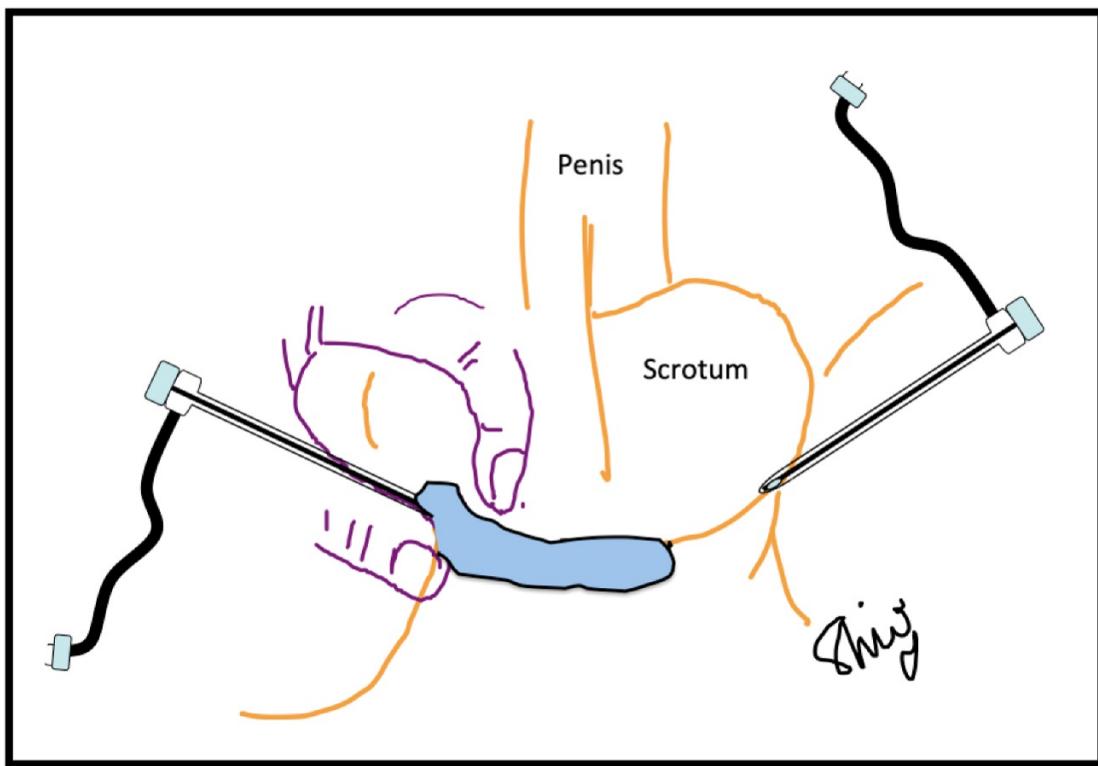
The 1st part of the block is used for blocking the iliohypogastric, ilioinguinal and the genital branch of genitofemoral nerves.

LANDMARK: Pubic Tuber, just below and lateral to it

TECHNIQUE: The spermatic cord is pinched along with the skin. The block needle is introduced through the skin and a gentle “pop” felt as the needle is advanced at an angle that is almost parallel to the skin. 5-7 mls of LA is injected on each side.

LOR Blocks: Scrotal Nerves Block

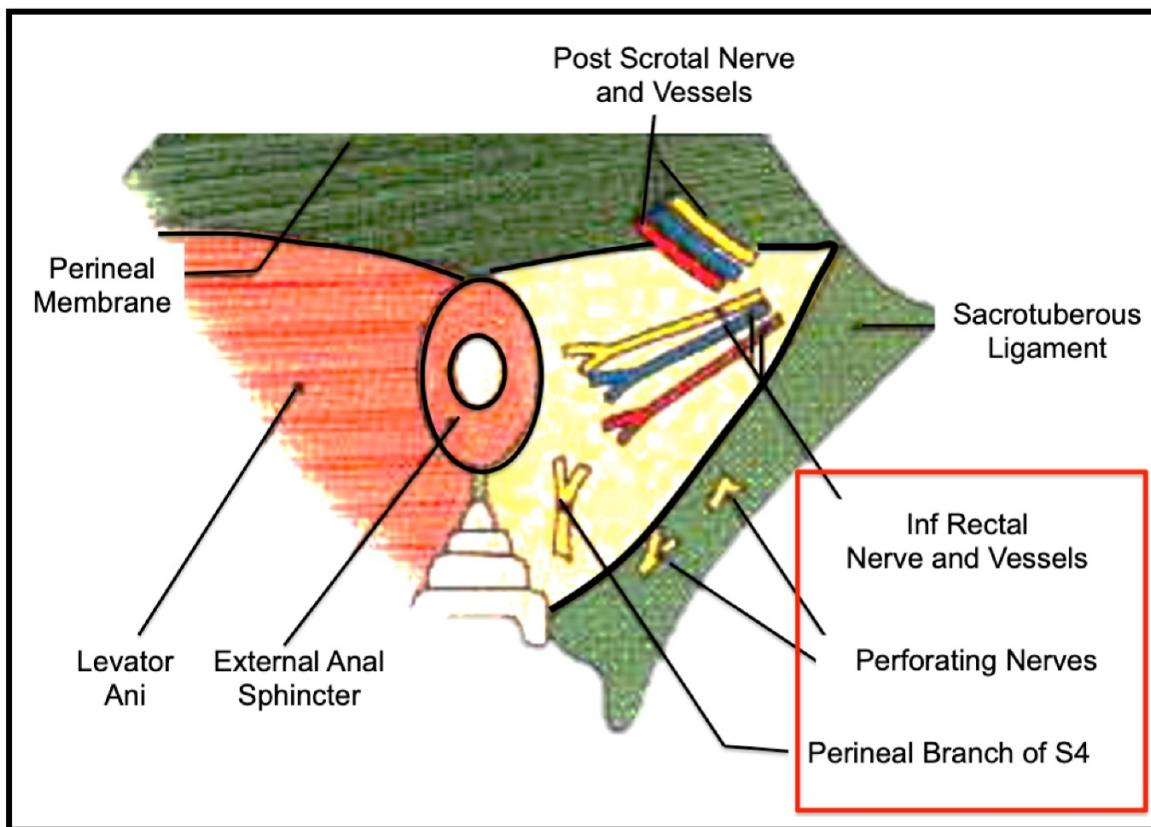
The perineal branches are blocked by injecting LA just under the superficial fascia as shown in the image below. The skin is pinched and needle introduced through the skin. The needle passes very easily in this plane. 10-15mls of LA is deposited along the needle path on both sides.



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LOR Blocks: Peri-anal Block

ANATOMY: The peri-anal area is supplied by the branches of the Pudendal nerve through the inferior rectal and hemorrhoidal (perforating) nerves. These nerves supply the sphincter ani externus and the skin around the anus. These nerves lie deep to the perianal fascia in the ischioanal fossa.



INDICATIONS FOR PERI-ANAL BLOCK:

- Haemorrhoidectomy
- Anal dilation/stretching
- Anal fissure surgery

It is important to remember that even if the surgery is on one side (for e.g. fissure may be on one side only), blocks are given on both sides.

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LOR Blocks: Peri-anal Block

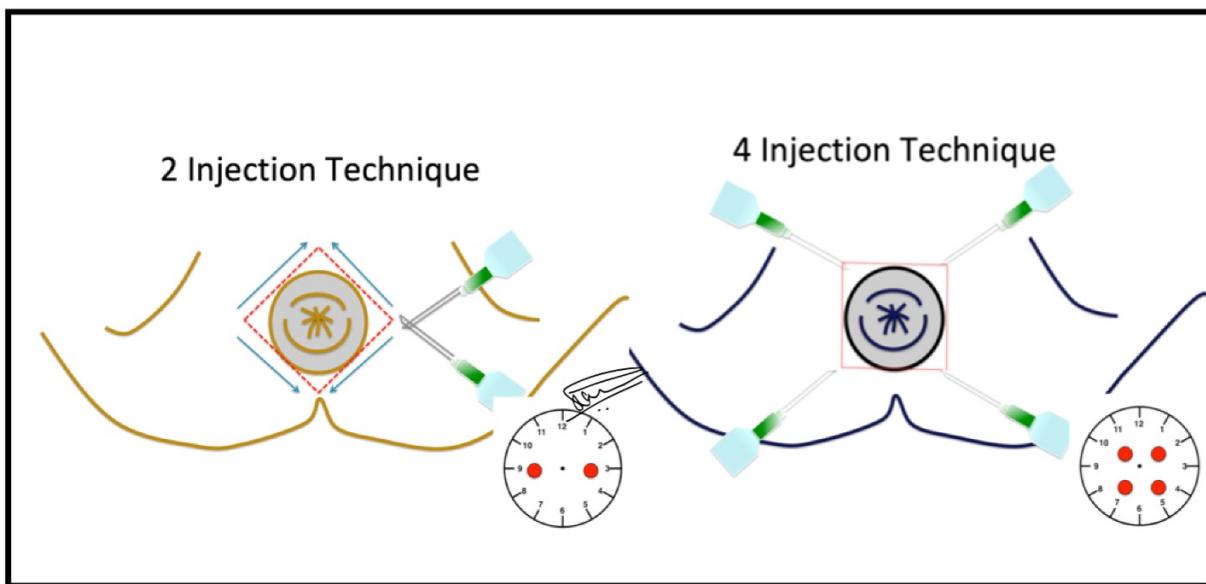
POSITION: Lithotomy position or Prone Jack knife position

PROCEDURE: Perianal block can be performed in two ways, a 2 injection technique or a 4 injection technique (see the image).

The way this block is classically described in the text is different from the loss of resistance block we have described here.

The usual description of perianal or perirectal blocks involve LA injections in 3 different planes

- 1.The rectal submucosa
- 2.The perianal tissue including the anal canal and the sphincter
- 3.The subcutaneous tissue localized under the perianal mucocutaneous junction (inferior gluteal nerves and perineal branches of minor nerves from the sacral plexus).

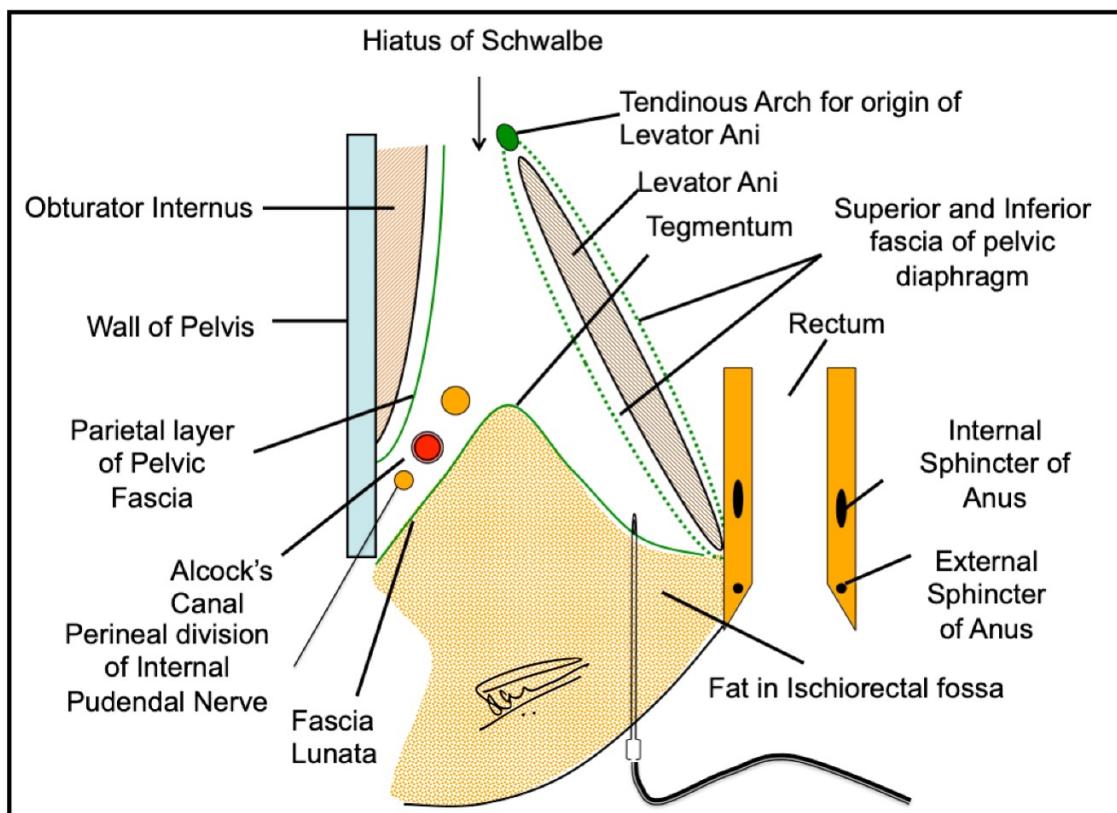


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LOR Blocks: Peri-anal Block

THE LOR TECHNIQUE: In this technique, a longer needle (50-80mm depending on patient built) is used and LA injected at 4 points (as shown in the image)

TECHNICAL DESCRIPTION: In this method, the aim is to deposit LA (5-7mls at each point) in the ischioanal fossa after piercing the fascia lunata (Perianal fascia). The

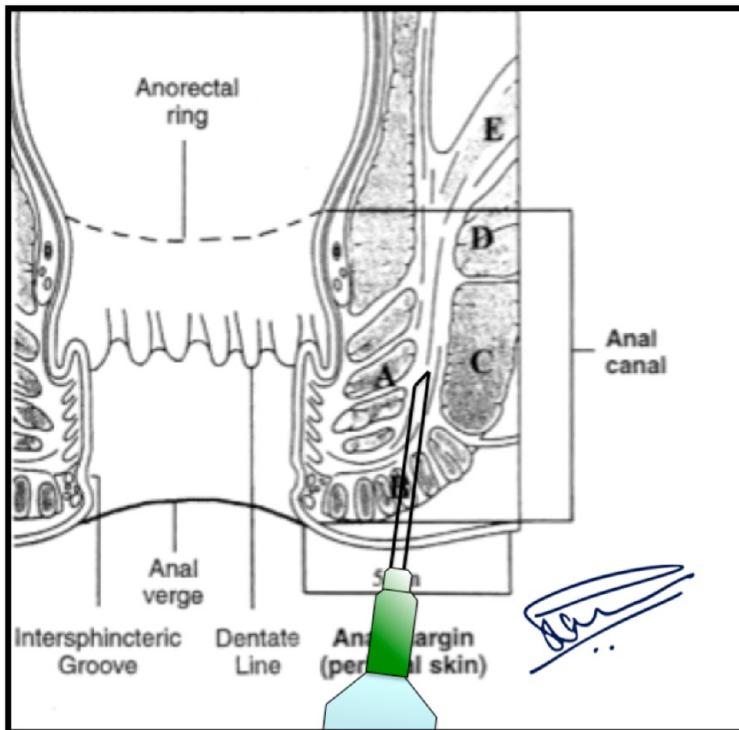


LANDMARK: 2.5 cm from the anus

TECHNIQUE: After aseptic precautions, the needle is introduced at the 4 points (2, 5, 7, 10 ° Clock)

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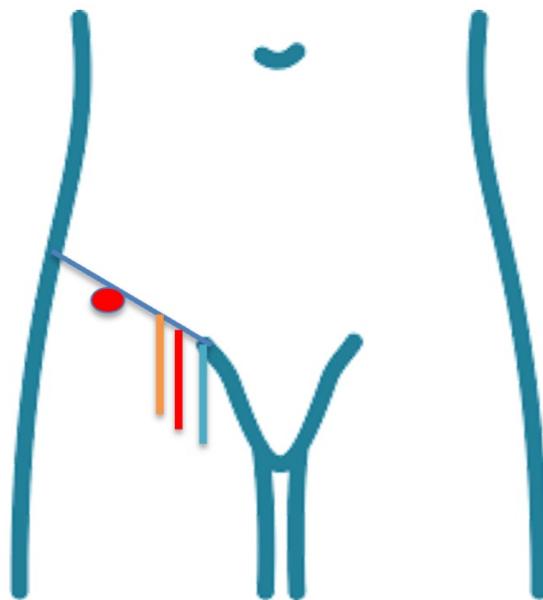
LOR Blocks:



The needle is directed slightly in the lateral direction from the point of injection. Once “pop”(LOR) is felt as the short bevel/blunt needle pierces the perianal fascia, 5-7mls of LA is deposited after aspiration. The block is repeated at all the 4 points irrespective of the side of the surgery.

Administering the block at all 4 points not only provide analgesia for the surgery, it also prevents the spasm that is often seen with the perianal surgeries.

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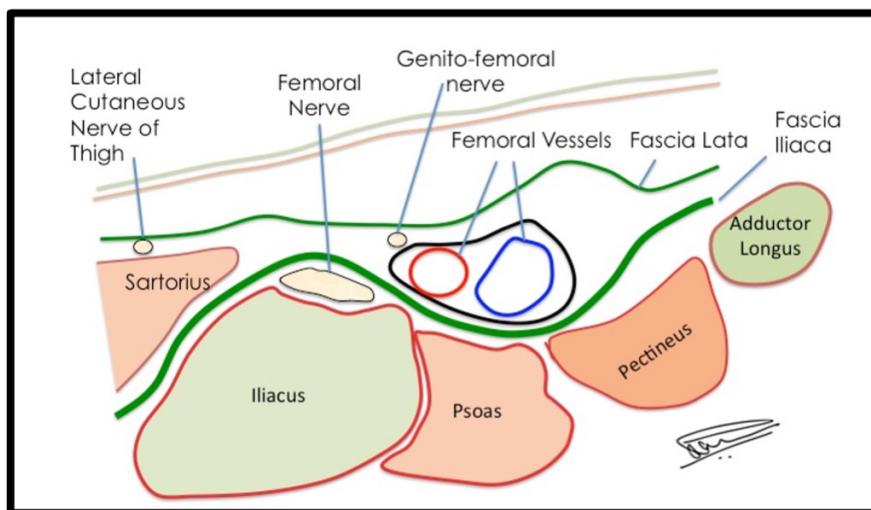
Fascia Iliaca Compartment Block (FICB)

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Anatomy

FASCIA ILIACA COMPARTMENT

The fascia iliaca compartment is a potential space with the following limits; anteriorly it is covered by the posterior surface of the fascia iliaca and posteriorly, it is limited by the anterior surface of the iliacus muscle and the psoas major muscle. Medially the compartment is continuous with the space between the quadratus lumborum muscle and its fascia. The compartment spans from the lower thoracic vertebrae to the anterior thigh.



The fascia iliaca lines the posterior abdomen and pelvis, covering psoas major and iliacus muscle and it forms the posterior wall of femoral sheath, containing the femoral vessels. In the femoral triangle it is covered by fascia lata, blending with it further distally. The fascial covering of the iliopsoas is thin superiorly, becoming significantly thicker as it reaches the level of the inguinal ligament. This thickness provides a great deal of resistance and a large "pop" as a needle tip is passed through the fascia. The femoral nerve enters the thigh beneath the inguinal ligament lying, within the fascia iliaca compartment, on iliopsoas lateral to the femoral sheath.

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LOR Blocks: FICB

FASCIA ILIACA COMPARTMENT BLOCK

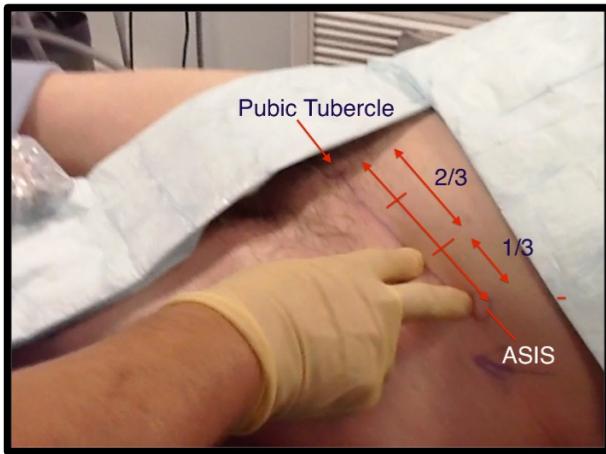
INDICATIONS: The fascia iliaca compartment block (FICB) is a simple and inexpensive method to provide peri-operative analgesia in patients with painful conditions affecting the thigh, the hip joint and/or the femur. The commonest indication for this block is analgesia for fracture neck of femurs. This block can also be used for skin grafts from the thigh, femoral and patellar fractures.

LANDMARKS: The landmarks for this block are; ASIS, the pubic tubercle and the inguinal ligament. Once the inguinal ligament is marked, it is trisected and then a point one fingerbreadth (1cm) below the junction of the medial 2/3rd and the lateral 1/3rd is marked. This is the point of the needle insertion.

TECHNIQUE: A short bevel/ blunt needle is introduced at this point and once it has pierced the skin the tip would be lying on the fascia lata, passing through this layer provides the first “pop”. Once the needle passes through the fascia lata, it is advanced further till resistance can be felt over the fascia iliaca, once the second “pop” is felt 30-40 mls of LA is deposited to fill the potential space. The fluid travels cephalad (applying distal pressure helps) beneath the fascia and contacts the nerves of the lumbar plexus, which are located there. The nerves that are mainly blocked are the femoral nerve and the lateral femoral cutaneous nerve but occasionally the obturator nerves may also be blocked.

It is important to eliminate the “cushion effect” in the elderly and this can easily be done by “Needle Through Needle” technique or by pinching the lax skin and then introducing the needle.

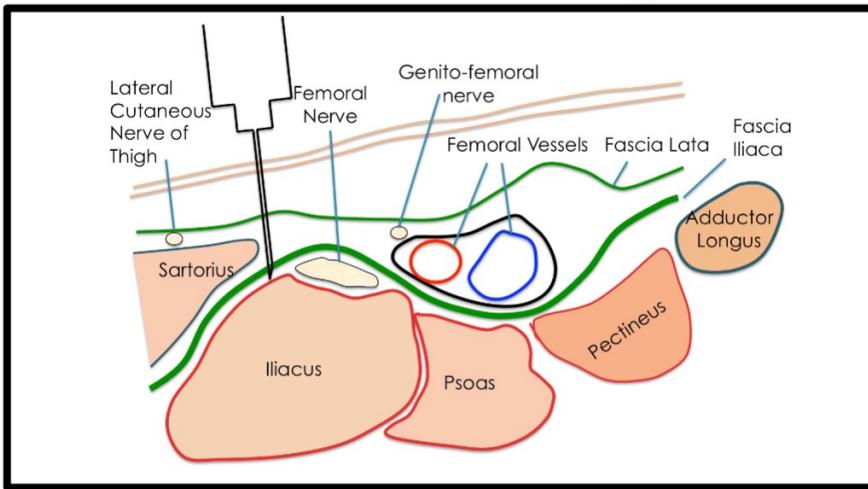
LOR BLOCKS: FICB



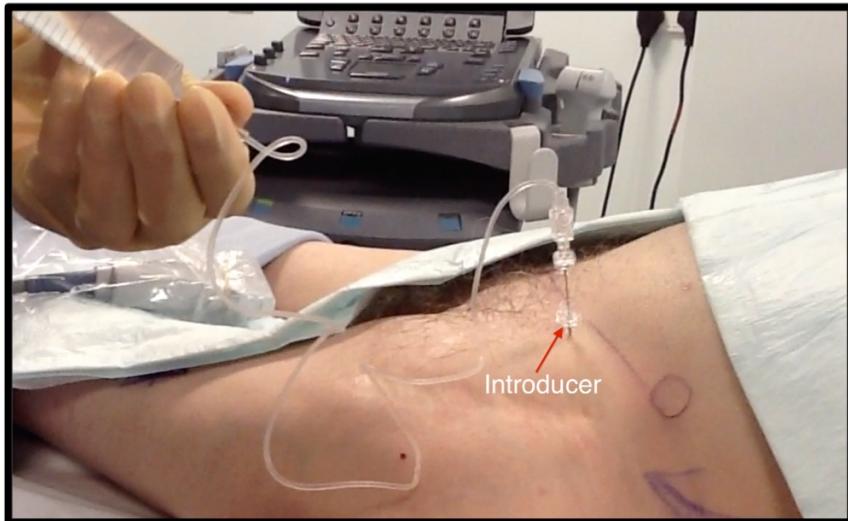
The Landmarks



Pinching the skin technique



The schematic Diagram of FICB



Needle through Needle Technique using an Introducer

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LA Spread In FICB

3-in-1 block is basically PNS guided femoral nerve block using large volume of LA, assuming that LA will spread proximally along the psoas fascia to block lateral cutaneous nerve (LCN) of thigh and obturator nerve as well.

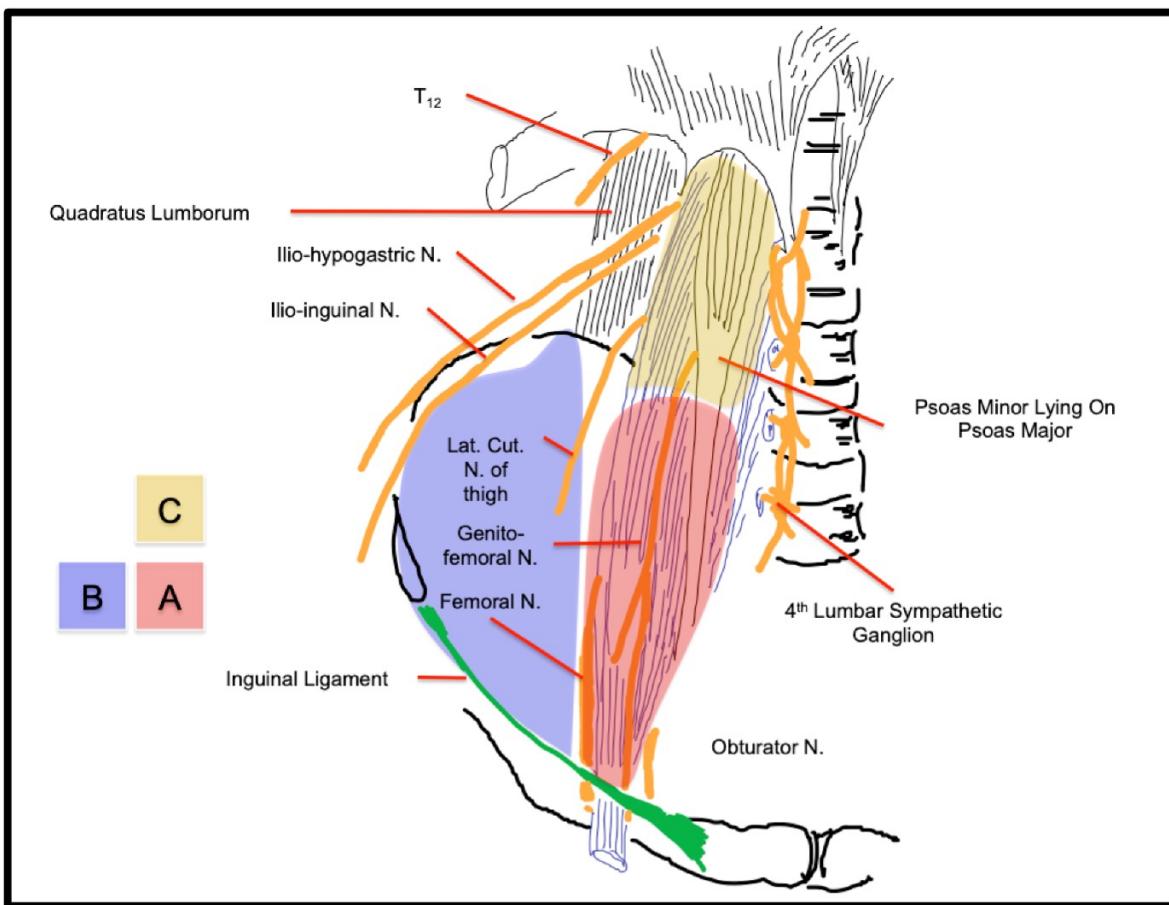
Radiographic studies have revealed that Fascia iliaca compartment block is more effective than the 3-in-1 block in producing simultaneous blockade of the LCN and Femoral nerves in adults. However, both techniques provide sensory blockade of the three lumbar plexus nerves that supply the thigh in only 35% of procedures.

Although the LA can travel sufficiently under the fascia situated between the psoas and iliacus muscles to block the femoral and LCN nerves, it does not always migrate proximally in sufficient quantities to block the obturator nerve. The genitofemoral and obturator nerves lie on the internal edge of the psoas muscle, in a different muscle plane than the femoral and LCN nerves. In some cases, the LA solution reaches these nerves after a greater delay, and with less consistency.

As shown in the figure, in most cases, the LA spreads to Zone A and B i.e LA over the Psoas and Iliacus muscle. Very rarely the LA will spread proximally to the lumbar plexus (Zone C).

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LA SPREAD IN FICB



The Zones Reached By The Spread Of Local Anaesthetic Under The Fascia Iliaca.

- A. Internal Spread Under The Psoas Muscle Fascia.
- B. External Spread Under The Iliacus Muscle Fascia.
- C. Spread To The Roots Of The Lumbar Plexus.

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Nerve Blocks For The Masses: Loss of Resistance blocks