


Ultrasound Guided Peripheral Nerve Blocks

- Bedside attending supervision required.
- Know your anatomy.
- Involve downstream consultants.
- Know your pharmacology, toxic doses, and contraindications of anesthetics.

Highland Hospital				Emergency Department		
Local Anesthetic Dosing Guide For Regional Anesthesia						
Drug	Dose (mg/kg) [DO NOT EXCEED]	50 kg (ml)	70 kg (ml)	90 kg (ml)	Max Dose	Notes
Ropivacaine 1% (10mg/ml)	3mg/kg	150mg (15ml)	210mg (21 ml)	270mg (27ml)	300mg (30ml)	Dilute 1% solution 1:1 with NS. 6-8+hr block, powerful, have intralipid!
Bupivacaine 0.5% (5mg/ml)	2 mg/kg	100mg (20ml)	140mg (28ml)	175mg (35ml)	175mg / 35 ml	greater risk of toxicity than lido. contraindicated in pregnancy.
Lidocaine 1% (10mg/ml)	4 mg/kg	200mg (20ml)	280mg (28ml)	300 mg (30ml)	300mg / 30 ml	Do not repeat within 2 hours.
Lidocaine 1% w/ epi (10mg/ml)	7 mg/kg	350mg (35ml)	490mg (49ml)	500mg (50ml)	500mg/50 ml	OK to use on face, penis, digits if no peripheral vascular disease.
Mepivacaine 1.5% (15mg/ml)	4 mg/kg	200mg (13.3ml)	280mg (18.6ml)	300 mg (20ml)	300mg/20 ml	contraindicated in pregnancy.
Chloroprocaine 3% (30mg/ml)	11mg/kg	500mg (16.6 ml)	700mg (23.3ml)	900mg (30ml)	1000mg/33ml	ultra short blocks (60-90m). pregnancy safe.
Lyons/Herring 2016						

- Obtain informed consent in patient's primary language.
- Perform time out.
- Semi-sterile procedures. Prep skin, use adhesive probe cover (sterile tegaderm), towels vs small lac drape, sterile gloves.
- Document:
 - Thorough neuromuscular exam pre-procedure.
 - Performance of block in medical record.
 - Mark extremity
 - Verbal handoff of patient and block to inpatient team.
- Linear transducer preferable. Most of the targeted structures are pretty superficial. Some are harder to recognize than others. Remember high frequency = high resolution.

General Contraindications

- Overlying infection
- Severe Bleeding Disorder
- Allergy to LA
- Preexisting nerve damage
- Each block may have its own

Complications

- Infection
- Intravascular LA
- Bleeding, hematoma
- Neuritis
- Allergic reaction to LA

- Where is the [intralipid](#)?
 - 1.5 cc/kg (approx 100 mL) bolus, followed by 0.25 cc/kg/min until stable.
 - May double or rebolus to a max total dose of 10 cc/kg

Toxicity

Generally very safe, as above dosages are intravascular

- Keep on monitor for 30 minutes
- First symptom: perioral paraesthesia
- CNS: twitches then seizures
- CVS: bradycardia, hypotension
- 'Treatment' = intralipid, just buys you time, protects from cardiac involvement
 - LA very lipophilic, basically injecting fat into blood to 'soak up'/'attract' LA



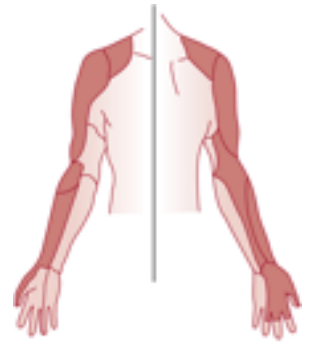
Interscalene Block

1. Indications

- i. Shoulder and upper arm anesthesia
- ii. Shoulder dislocations
- iii. Shoulder abscesses
- iv. Proximal and mid humeral fractures

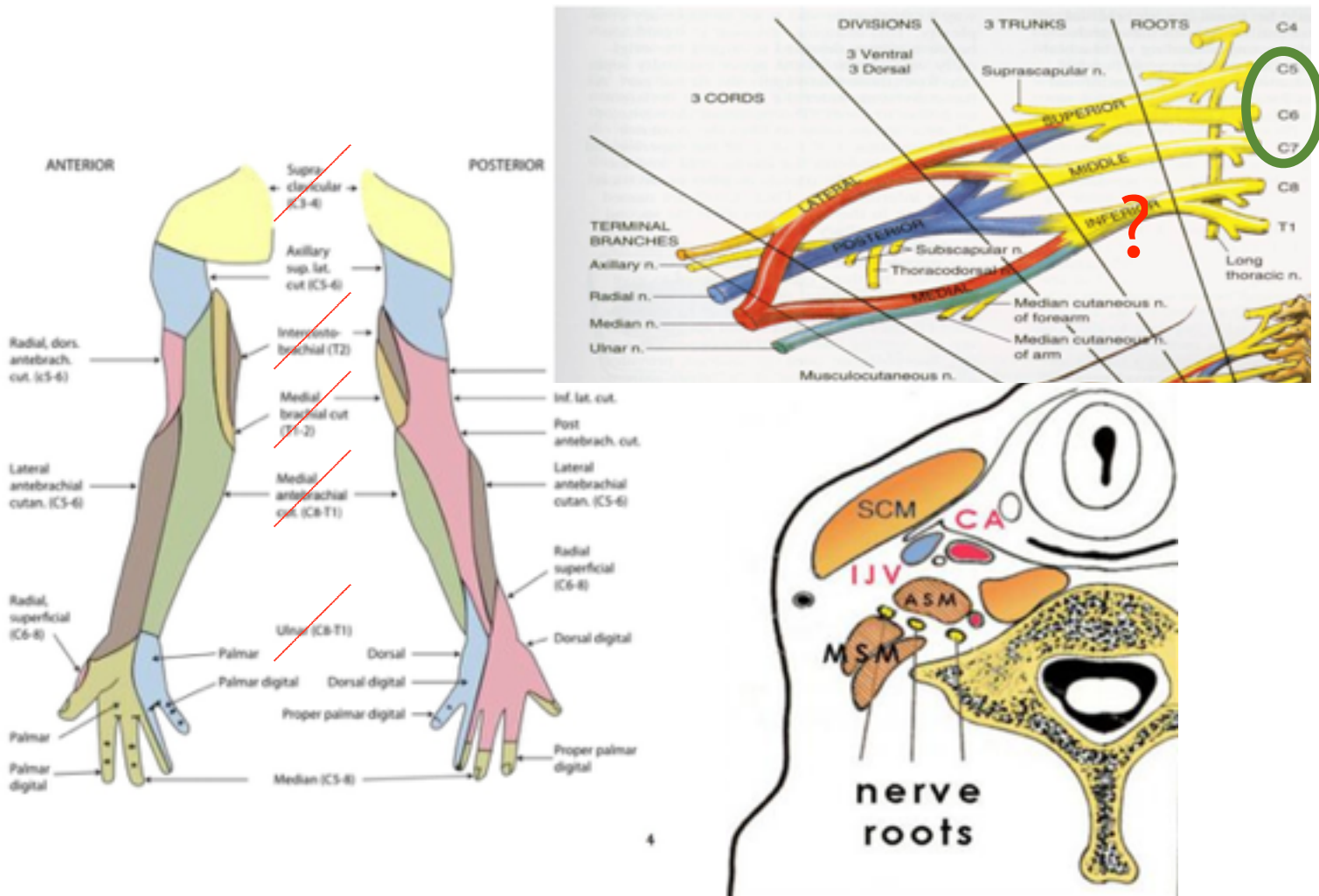
2. Contraindications/complications

- i. COPD/other respiratory issues. High risk if phrenic nerve paralyzed (phrenic nerve runs anterolateral to anterior scalene and just next to superior trunk)
- ii. Pneumothorax
- iii. Inadvertent blockade of recurrent laryngeal nerve
- iv. Vascular structure damage or injection



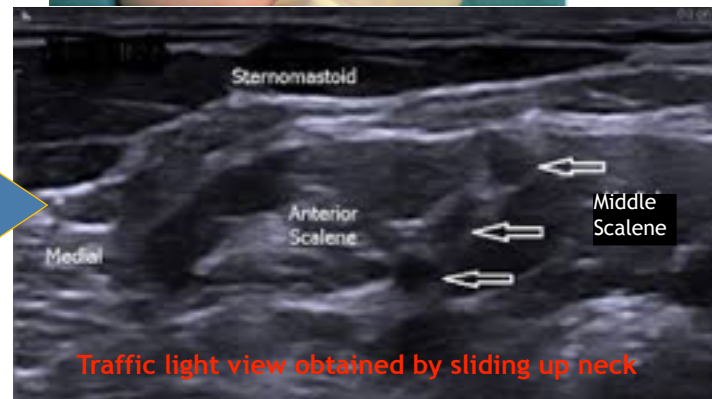
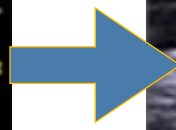
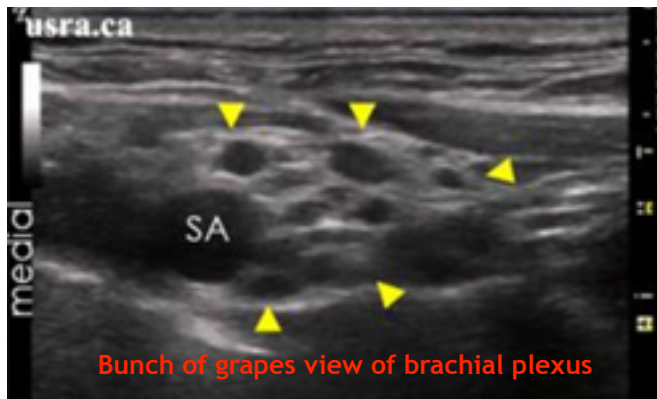
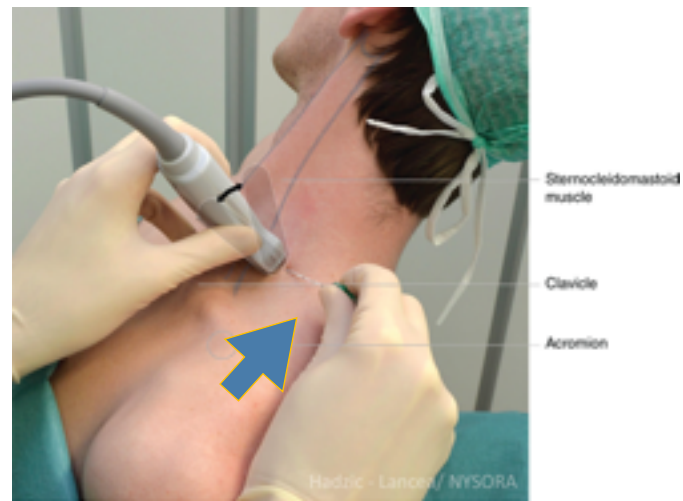
3. Clinical Anatomy

- i. Blocking at level of roots (C5-6-7)/trunks (superior-middle) of the brachial plexus
- ii. Motor and sensory to shoulder and proximal upper arm **greater than** elbow/forearm/wrist/hand - C8 and T1 are usually spared, so not great for elbow, wrist and forearm anesthesia
- iii. Block of inferior trunk is unreliable so ulnar nerve distribution is missed (C8-T1)
- iv. May miss upper shoulder (supraclavicular nerve/C3-4)
- v. May miss inner arm near axilla (intercostobrachial nerve/T2)

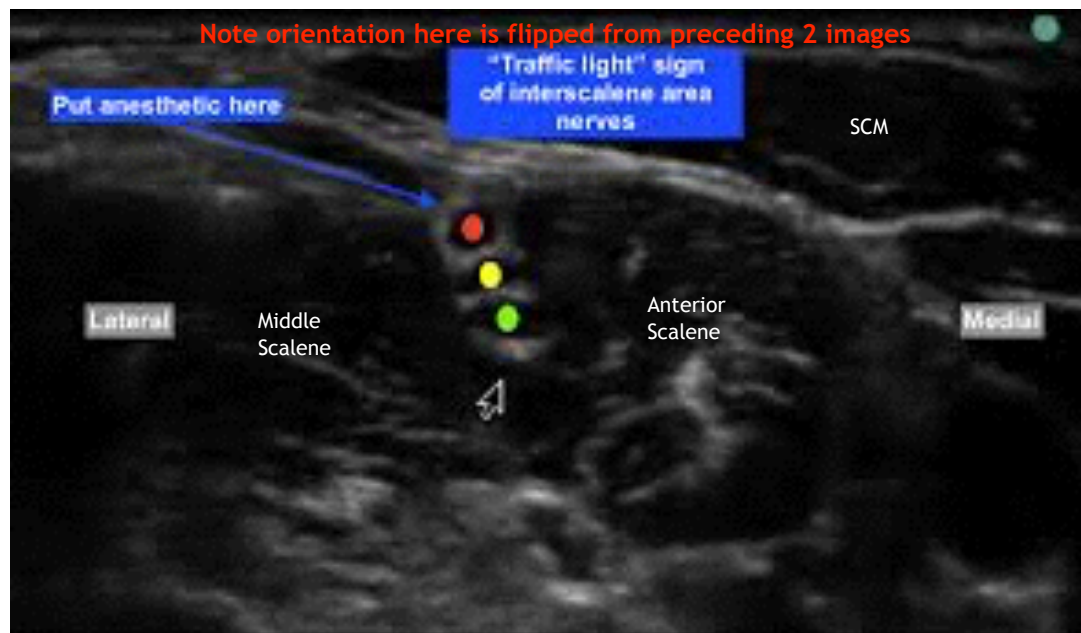


4. Ultrasound anatomy and technique

- a. Start parallel to subclavian artery. Identify the divisions of the plexus just lateral and superficial to artery as "cluster of grapes," then follow them proximally (become hypoechoic) until they form traffic light



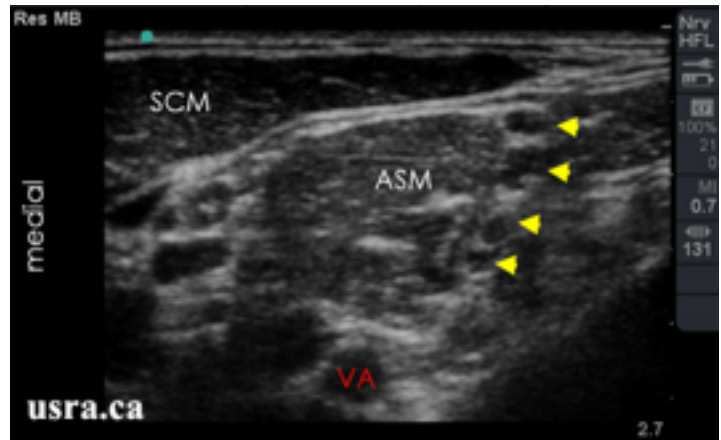
- b. Alternatively, start from cricothyroid membrane and trace laterally across IJ/carotid, past lateral border of SCM, then anterior scalene, then interscalene groove
- c. Use in-plane approach to insert needle through middle scalene in a postero-lateral to antero-medial direction toward the traffic light



- d. Volume = 10-30 cc

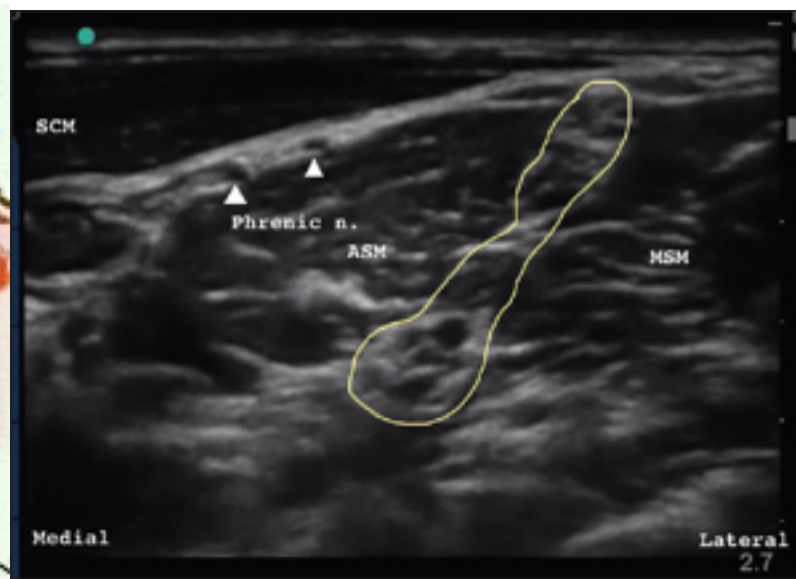
5. Clinical pearls and tips

- a. Upper trunk (C5-6) supplies suprascapular nerve that covers AC and glenohumeral joint, so make sure you get this one thoroughly
- b. Apply color Doppler before injection! Occasionally you can see C8 deep to other roots, but don't confuse with **vertebral artery**



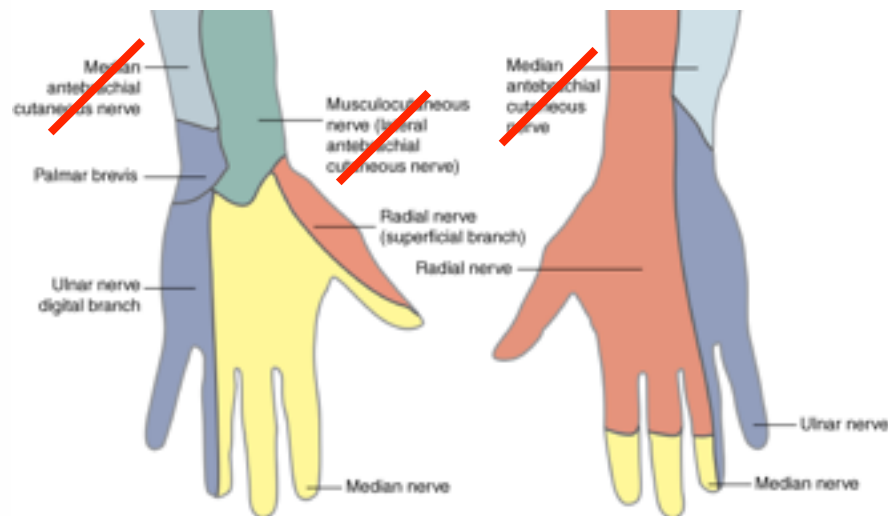
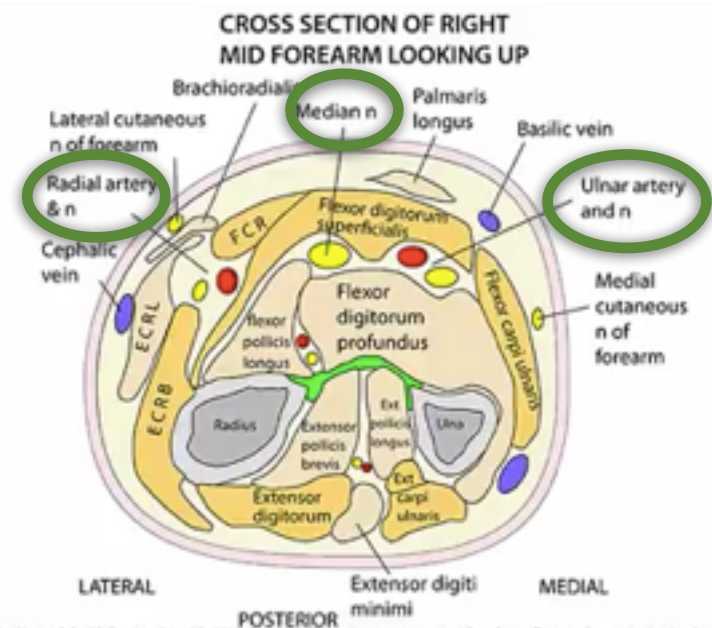
6. Further reading

- a. Urmei WF, Talts KH, Sharrock NE. One hundred percent incidence of hemidiaphragmatic paresis associated with interscalene brachial plexus anesthesia as diagnosed by ultrasonography. Anesth Analg 1991;72:498-503

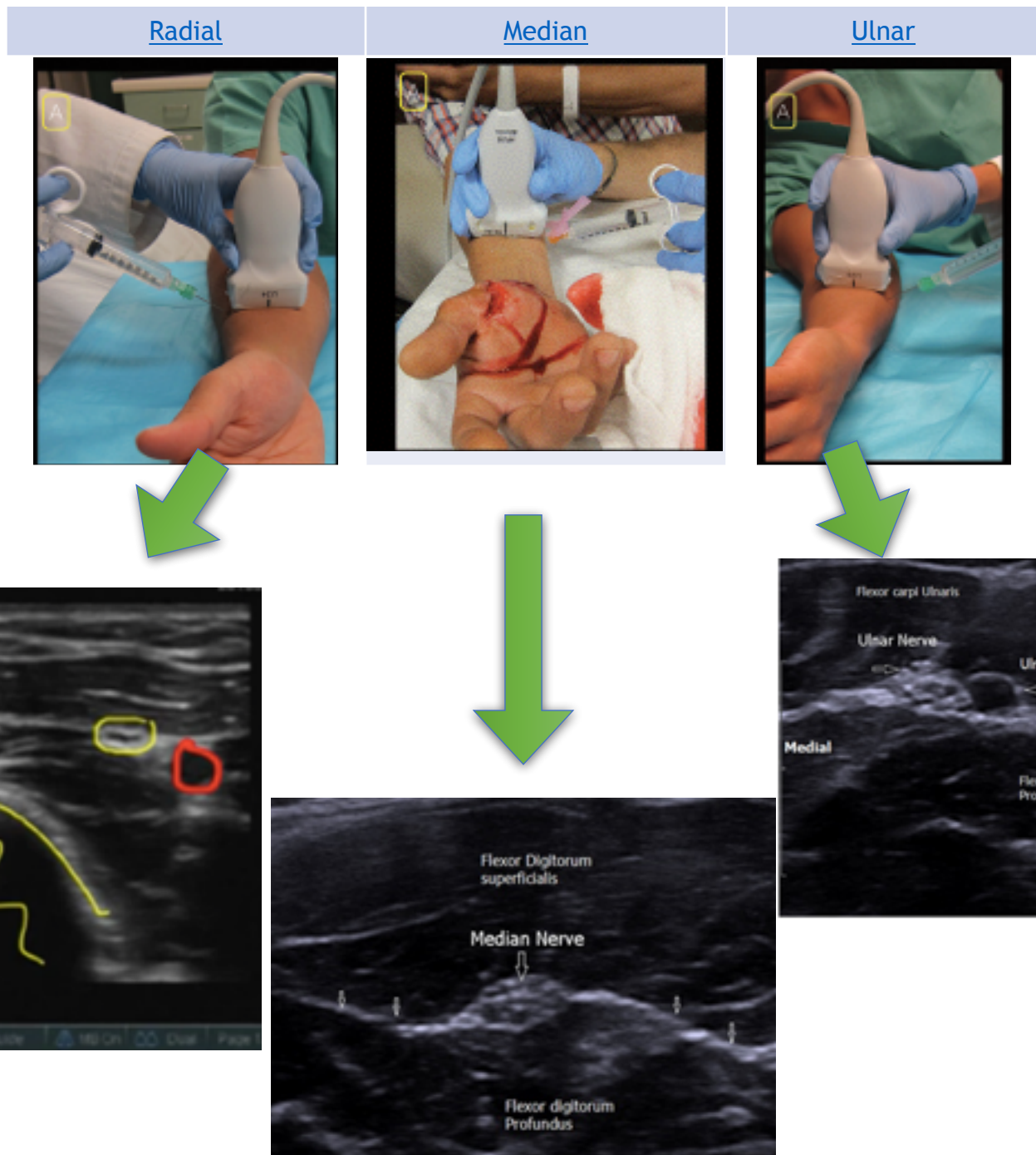


Forearm Blocks

	Radial, Median and Ulnar Blocks
Indications	Lacerations, fractures, foreign bodies of hands
What you won't get	No anesthesia to the volar forearm or wrist; incomplete anesthesia for distal radius/wrist fractures.
Complications	Infection, bleeding, arterial puncture, neuritis, carpal tunnel syndrome



NERVE	MOTOR	CLINICAL EXAM	SENSORY	CLINICAL EXAM
Radial	Wrist extensors	Extension of wrist, fingers, and thumb against resistance	Radial aspect of the dorsum of the hand, thumb, index finger, long finger, radial half of the ring finger proximal to the distal interphalangeal joints	Sensation at dorsal web space between thumb and index finger
Median	Muscles involving fine precision and pinch function of the hand, thenar muscles, index and long finger lumbricals	Opposition of the thumb to the fifth finger while watching the thenar muscles contract	Thumb, index, long, and radial side of the ring finger	Sensation at the volar tip of the index finger
Ulnar	Muscles involving grasping function, hypothenar muscles, interossei, adductor pollicis, ulnar lumbricals (two), deep head of flexor pollicis brevis	Abduction of fingers against resistance	Ulnar portion of dorsum of hand, fifth digit, and ulnar aspect of ring finger, hypothenar eminence	Sensation at the volar tip of the fifth digit



[Forearm Blocks with Point of Care Ultrasound Instructional Video](#)

- In general, identify the radial or ulnar artery at wrist and track artery/ nerve proximally into forearm.
- Median nerve is deeper and more central in forearm.
- In plane technique, use 5-7 ml LA

Fascia Iliaca Nerve Block

1. Indications

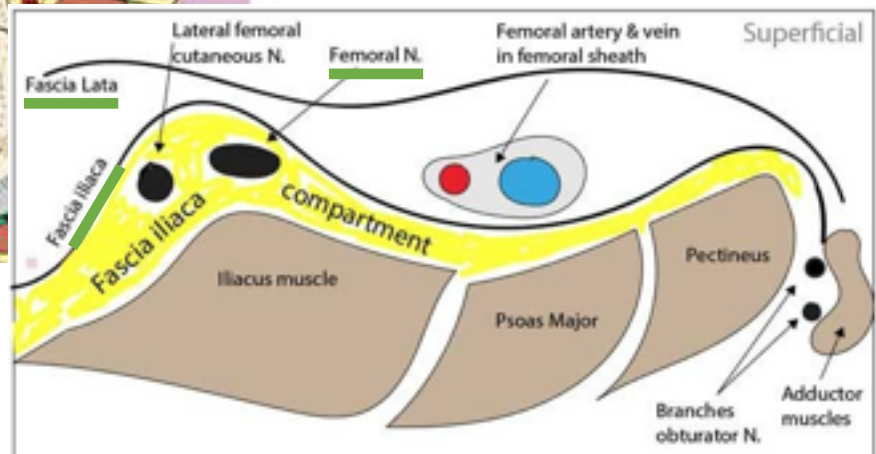
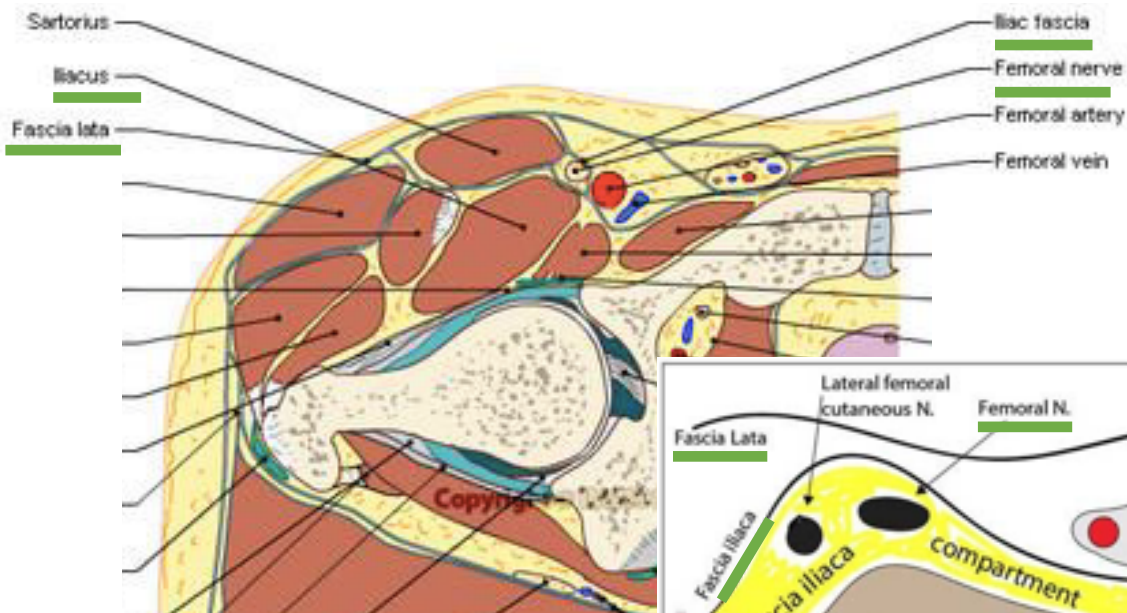
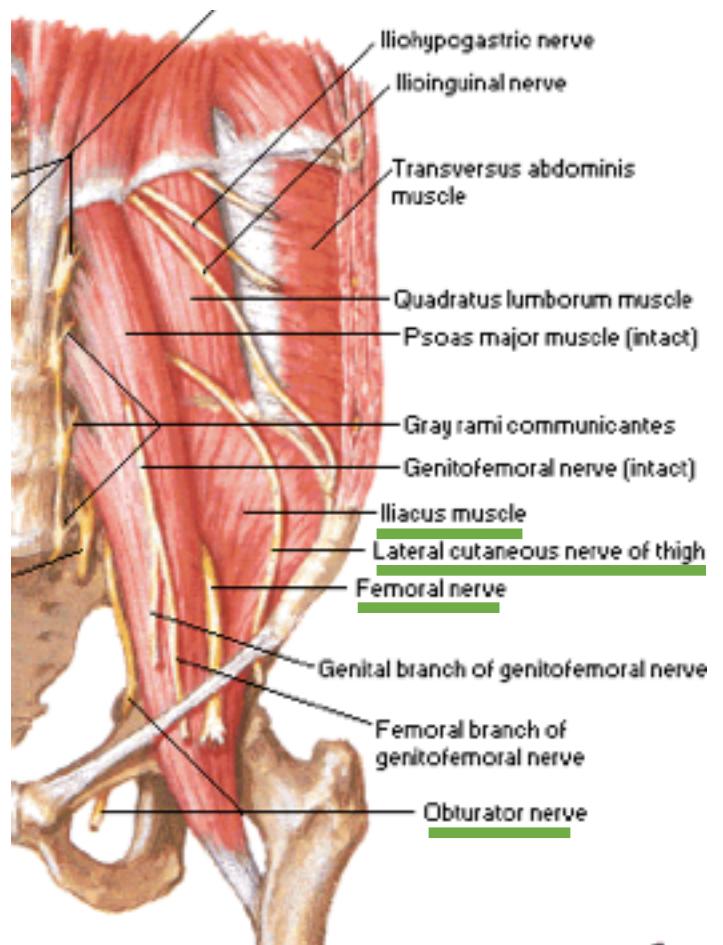
1. Hip fracture
2. Femoral neck and shaft fractures
3. Anesthetizes hip fracture, avoids neurovascular structures.

2. Contraindications

1. Inguinal hernia
2. Femoral artery graft
3. Compartment syndrome - rare in hip or mid-shaft femoral fracture; more common in lower leg and forearm. No evidence that regional anesthesia delays diagnosis.

3. Complications

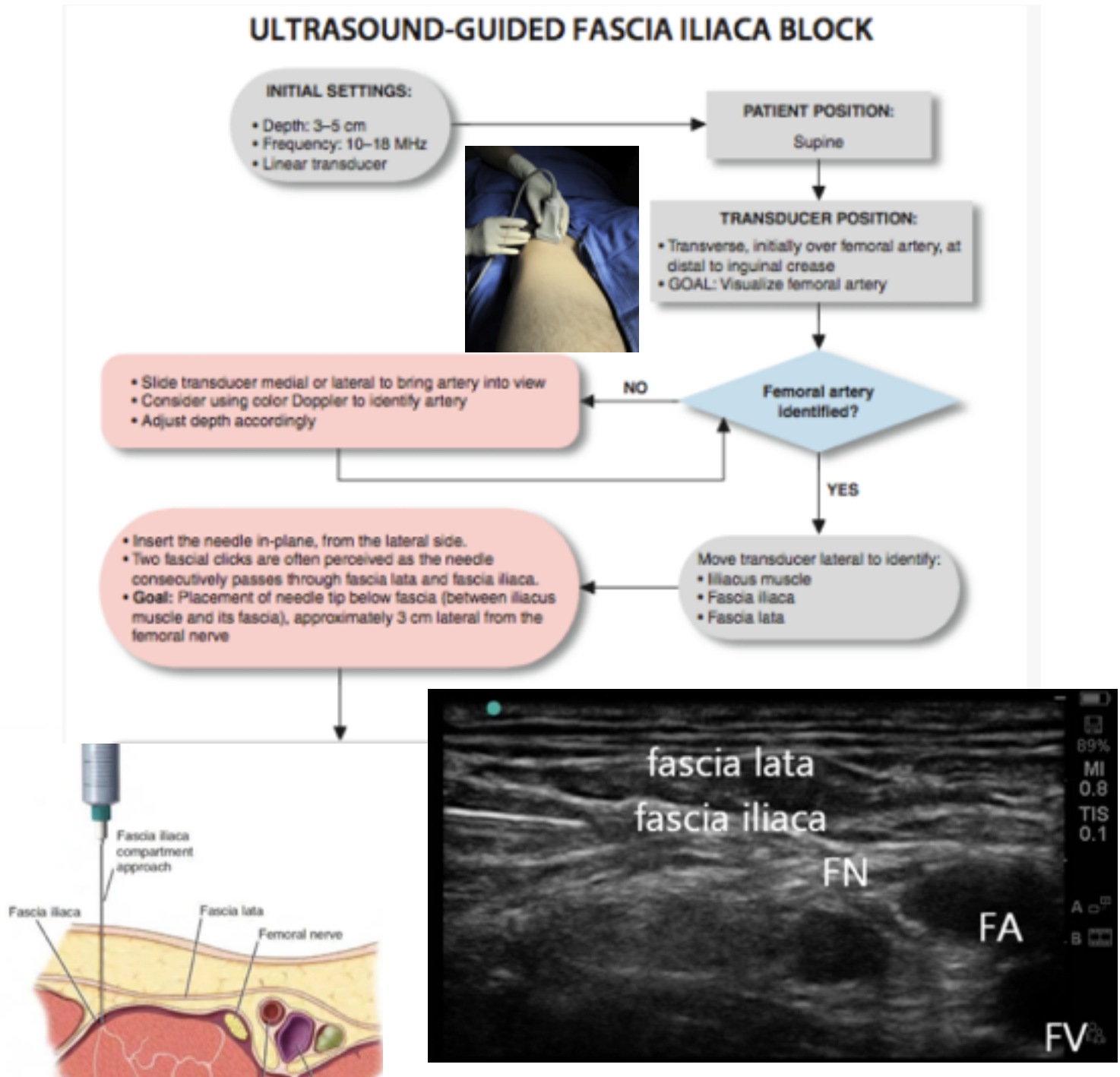
1. Femoral artery or nerve injection
2. Penetration of pelvis if using bow-tie technique
3. Puncture or damage to transverse iliac artery, which lies at center of bow-tie.

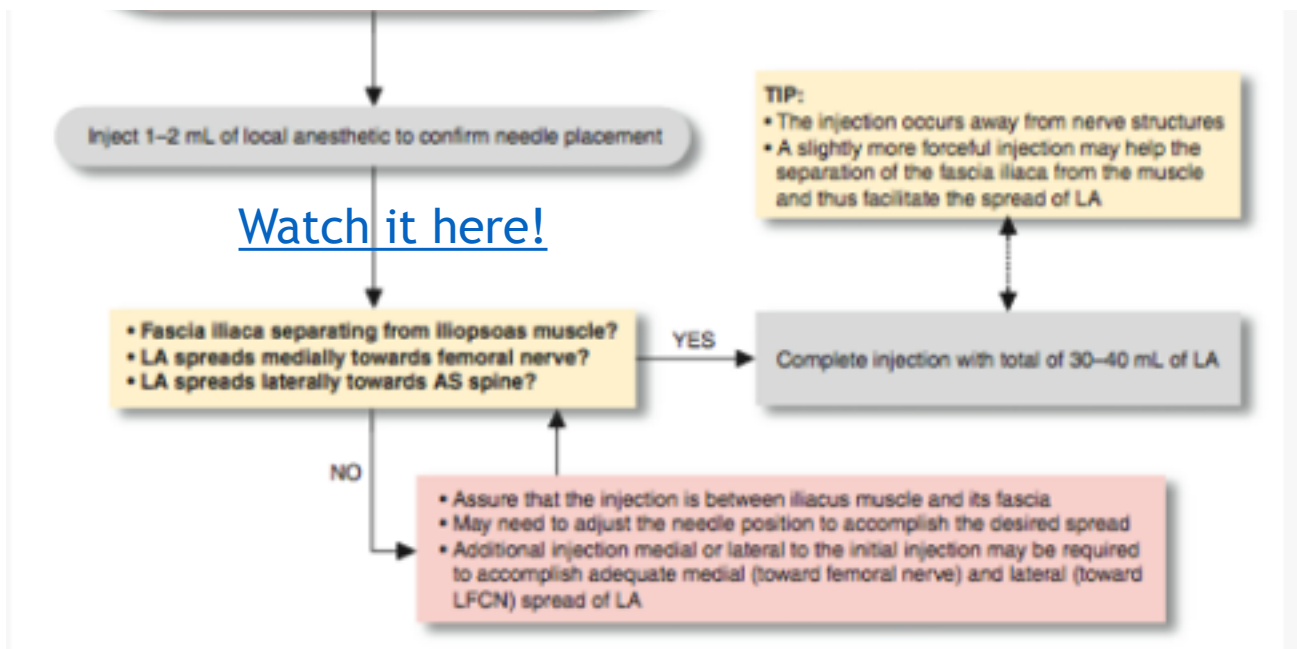


4. Clinical Anatomy

1. Sensory - hip, anterior thigh, knee
2. Femoral nerve, obturator nerve, and lateral femoral cutaneous nerve all lie within fascia iliaca compartment; targets all 3 by filling compartment with LA for complete block of hip

5. [Ultrasound Anatomy and Technique](#)





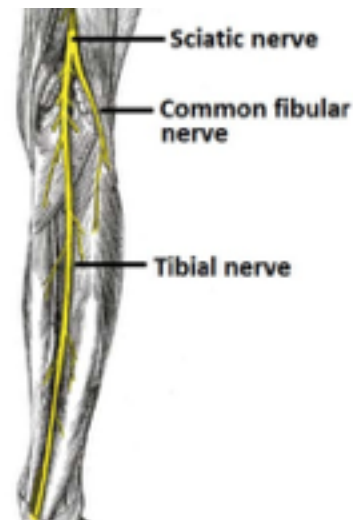
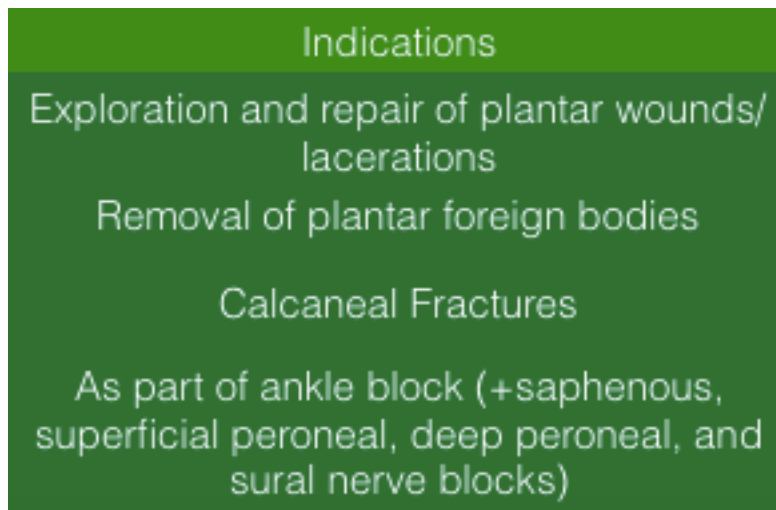
[An Aussie explains it again.](#) (Start at 31 minutes)

6. Pearls

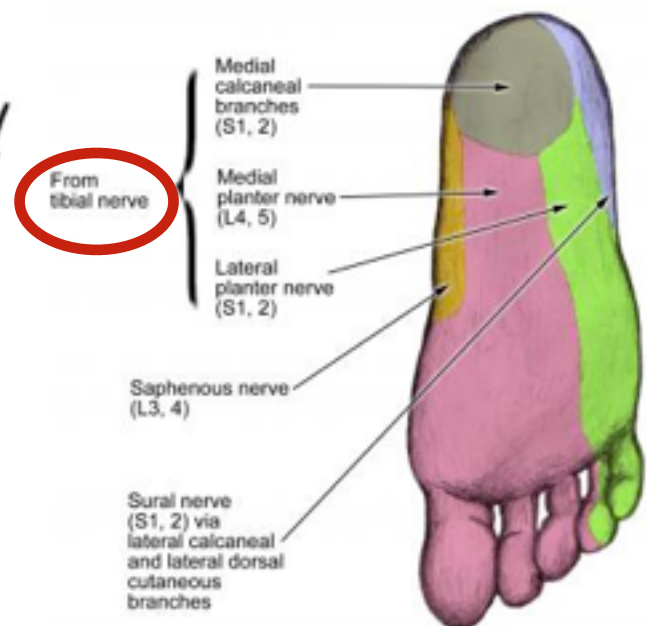
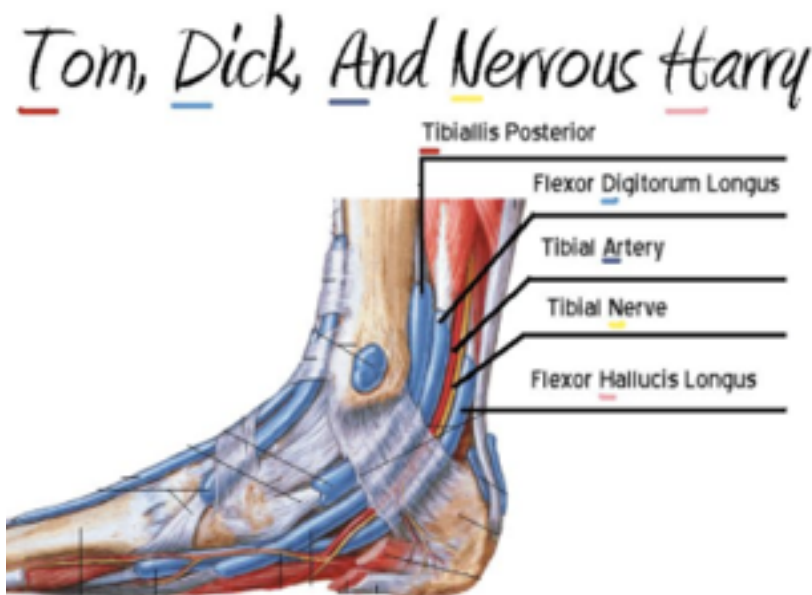
1. Requires large volume to ensure spread throughout compartment.
2. May attempt to encourage a more proximal spread by placing your hand inferior to injection site during injection and for 2 minutes after.
3. Our institutional LA of choice for this block is approx 30 mL 0.25% bupivacaine. **Toxic limit is 2 mg/kg.**
 1. Assuming 70 kg patient, max dose is 140 mg. For 0.25% bupivacaine, there are 2.5 mg/mL, so max dose would be 56 mL.
 2. Half life is approximately 2.7 hrs, but block can last from 2 to 9 hours.
4. [Alternative Bow-Tie Technique](#)

Posterior Tibial

1. Indications



2. Clinical Anatomy

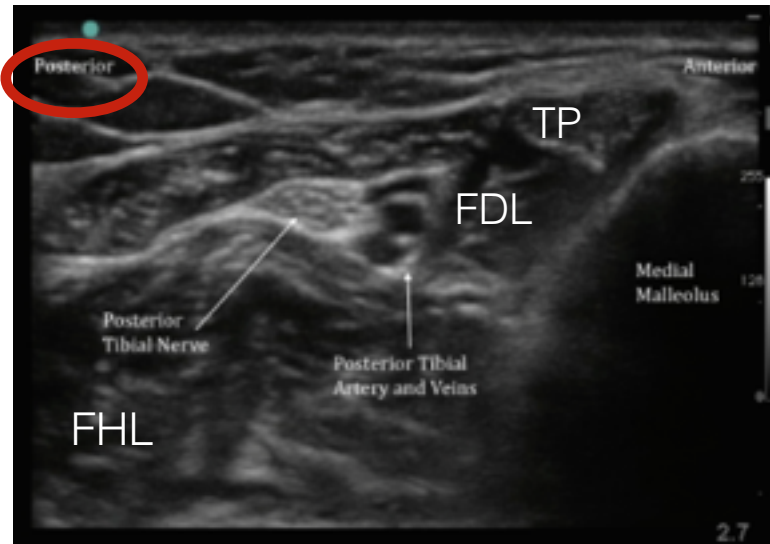


3. Ultrasound Anatomy & Technique

1. Assure appropriate positioning (consider frog leg, propping calf on a towel) to allow for good visualization of and access to posteromedial aspect of affected extremity.



2. Place linear probe in transverse orientation over medial ankle just proximal to medial malleolus.
3. Direct the tip of a 22-27g needle towards the nerve (larger needle is easier to visualize on ultrasound, but they do hurt more, so provide some subQ infiltration before advancing to block).



The goal is to infiltrate LA near and around the nerve, NOT into the nerve.

4. Watch it here



[5 Min Sono PTNB](#)
[Highland Posterior Tibial Nerve Block Instructional Video](#)
[Wolters Kluwer PTNB](#)

4. Pearls and Pitfalls

1. May insert needle from in-plane or out-of-plane technique, though if performed with in-plane technique, approach nerve from posterior aspect as to avoid vascular bundle. Mind the achilles tendon when approaching from the posterior aspect.
2. In very petite or bony ankles, there may not be enough soft tissue posterior to the medial malleolus to allow good contact of the ultrasound probe with the skin. Consider more gel or sliding up the nerve for a slightly more proximal block.

5. More goodies

1. [ED Ultrasound Guided Posterior Tibial Nerve Block for Calcaneal Fracture Analgesia](#)
2. [Full Ankle Block](#)