“Top 3” peripheral nerve blocks in emergency practice

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- 88 yo female
- comminutive right clavicle fracture
- atrial fibrillation, repetitive pulmonary thromboembolism
- Chronic respiratory insufficiency
- Anaesthesia alternatives
  - general anaesthesia
  - interscalene approach to brachial plexus blockade

Adverse effects with interscalene block

- blockade of the recurrent laryngeal nerve causing hoarseness
- blockade of the stellate ganglion causing Horner's syndrome
- increased local anesthetic spread rarely causing elements of epidural or spinal quality anesthesia
- inadvertent needle placement may lead to vasculature puncture and direct nerve injury, including reported cases of spinal cord injury; the same three in-series events: spinal anesthesia, loss of cervical spinal cord function, and radiologic evidence of severe cervical spinal cord damage

(Benumof JL. Permanent loss of cervical spinal cord function associated with interscalene block performed under general anesthesia. Anesthesiology 2000 dec 93(6): 1541-1544)

McNaught A, Shastri U, Carmichael N, et al. Br J Anaesth 2011 Jan;106(1): 124-130

Adverse effects with interscalene block

- phrenic nerve (C3-C5) paralysis occurs in nearly all patients lead to significant decline respiratory function, particularly in patients with underlying pulmonary disease
- the anatomical separation between the brachial plexus and phrenic nerve lateral to the cricoid cartilage to be as little as 2 mm

(Kessler J, Schafhalter-zoppoth I, Gray AT. Reg Anesth Pain Med 2008 Nov-dec;33(6):545-550)

Riazi S, Carmichael N, Awad I, et al. Br J Anaesth 2008 Oct;101(4):549-556
Renes SH, van Geffen GJ, Rettig HC et al. Reg Anesth Pain Med 2010 Nov-Dec;35(6):529-534
Renes SH, Rettig HC, Gielen MJ, et al. Reg Anesth Pain Med 2009 Sep-Oct;34(5):498-502

British Journal of Anaesthesia 101 (4): 549–56 (2008)
doi:10.1093/bja/aen229 Advance Access publication August 4, 2008

BJA

REGIONAL ANAESTHESIA

Effect of local anaesthetic volume (20 vs 5 ml) on the efficacy and respiratory consequences of ultrasound-guided interscalene brachial plexus block

S. Riazi[1], N. Carmichael[1], I. Awad[1], R. M. Holtby[2] and C. J. L. McCartney[1]*

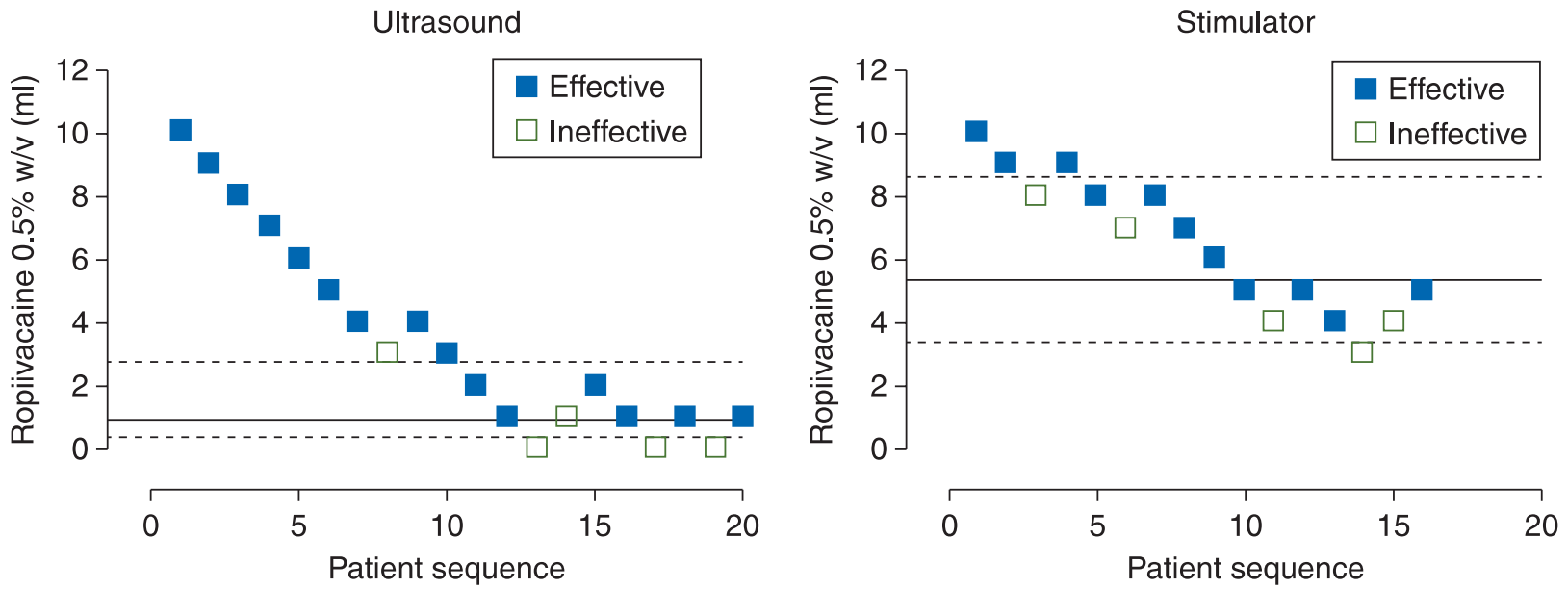
	Group I: low volume, mean (SD)	Group II: standard volume, mean (SD)	Significance
Paralysed diaphragm at 30 min post-block	9/20	20/20	$P<0.05$
Paralysed diaphragm at 60 min post-surgery	6/18	18/20	$P<0.05$
Change in FVC at 30 min post-block (litre)	−0.70 (0.70)	−1.59 (0.68)	$P<0.05$
Change in FEV1 at 30 min post-block (litre)	−0.60 (0.54)	−1.23 (0.61)	$P<0.05$
Change in PEF at 30 min post-block (litre min^{-1})	−0.83 (1.01)	−2.50 (1.61)	$P<0.05$
Oxygen saturation pre-block (%)	97.3 (0.92)	97.5 (1.58)	$P=0.3$
Oxygen saturation 30 min post-surgery (%) on air	95.8	91.7	$P=0.003$
Change in oxygen saturation	−1.50 (3.13)	−5.85 (3.78)	$P<0.0001$
Adverse outcomes	0	8 (Horner's syndrome: 3, hoarseness: 3, severe respiratory distress: 1, hiccups: 1)	$P<0.05$

British Journal of Anaesthesia **106** (1): 124–30 (2011)
Advance Access publication 8 November 2010 · doi:10.1093/bja/aeq306

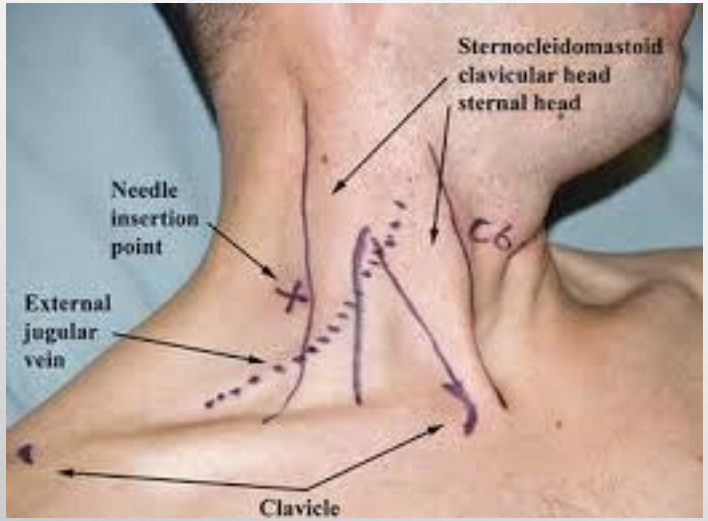
BJA

Ultrasound reduces the minimum effective local anaesthetic volume compared with peripheral nerve stimulation for interscalene block

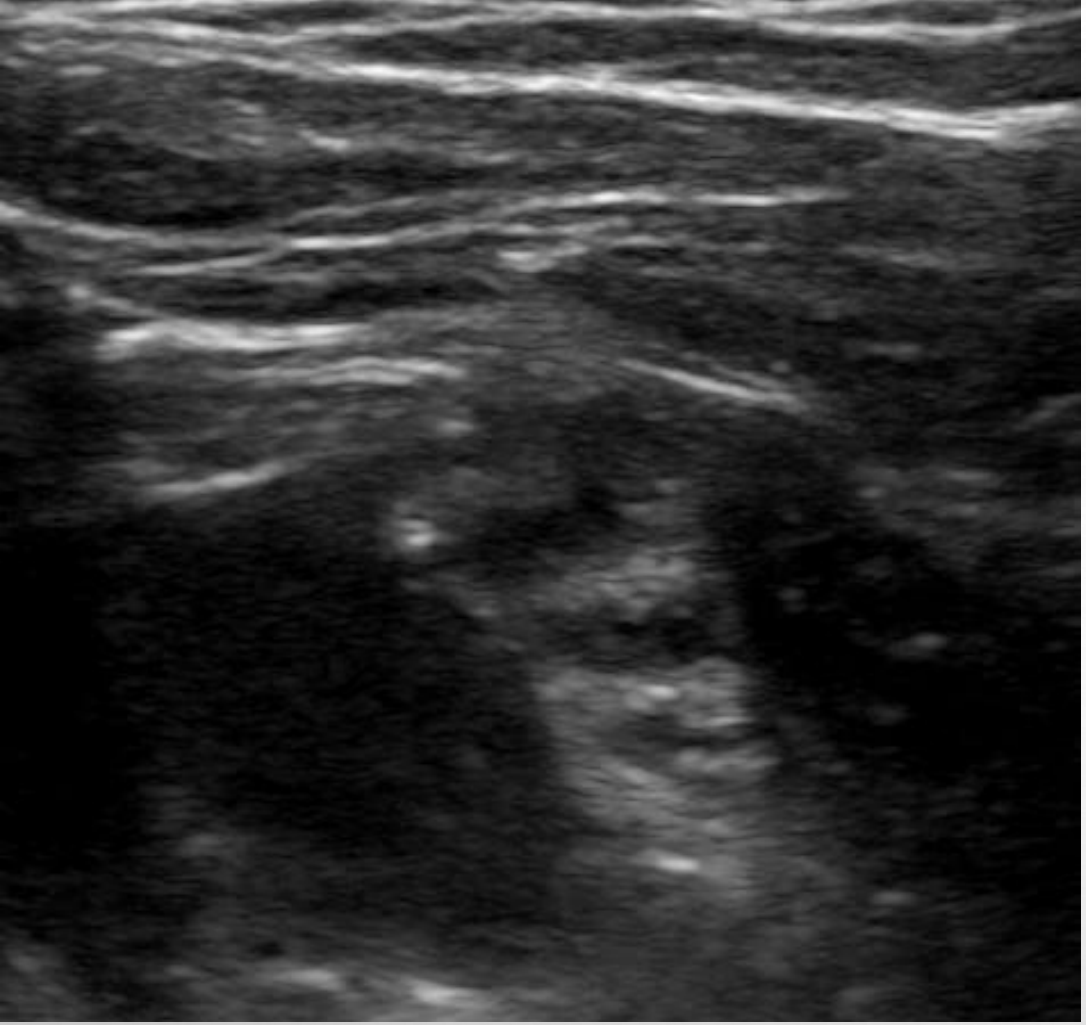
A. McNaught[1†], U. Shastri[1†], N. Carmichael[1], I. T. Awad[1], M. Columb[3], J. Cheung[1], R. M. Holtby[2] and C. J. L. McCartney[1*]

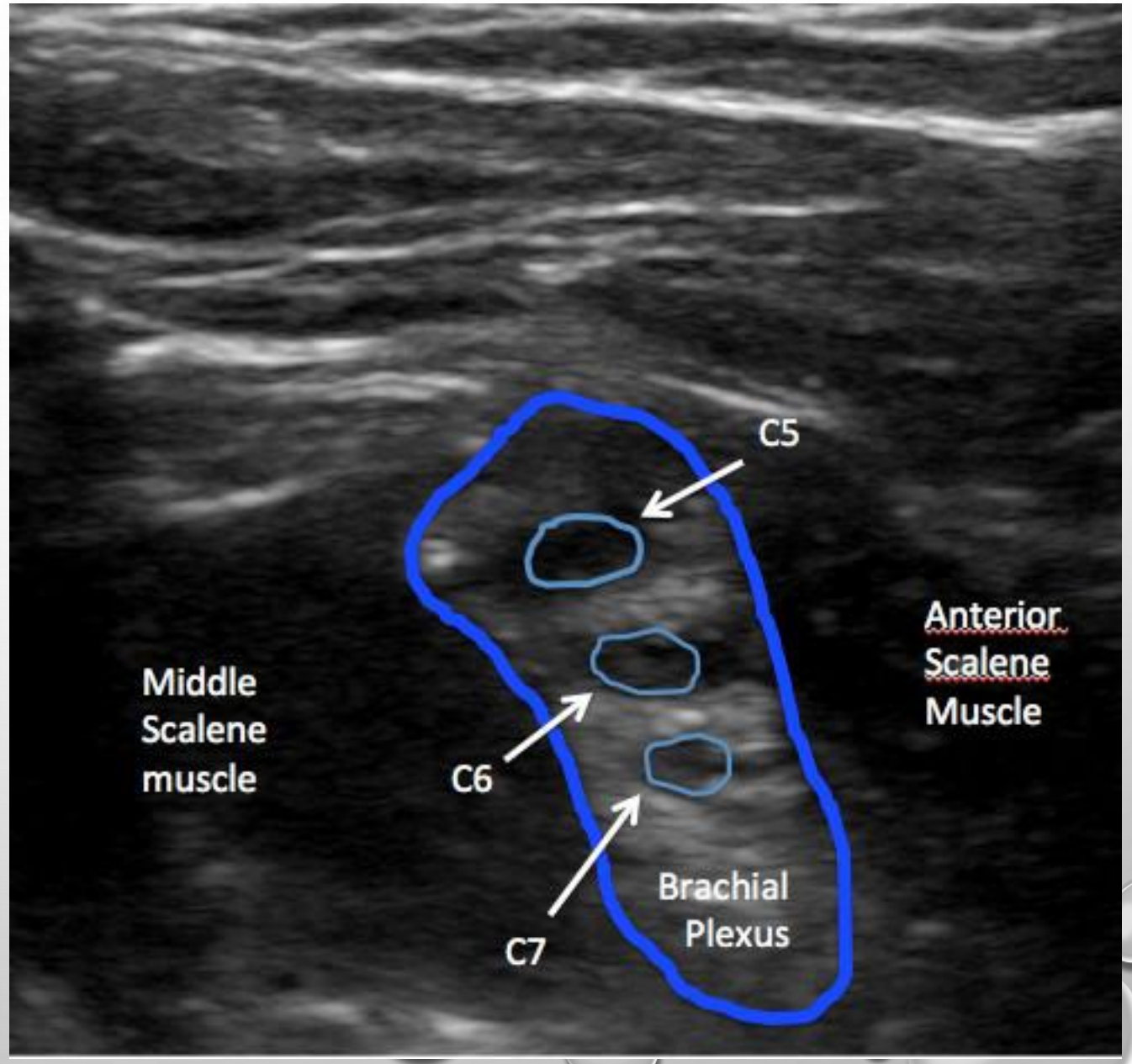


US reduces the number of attempts, LA volume, and postoperative pain when compared with NS for ISB

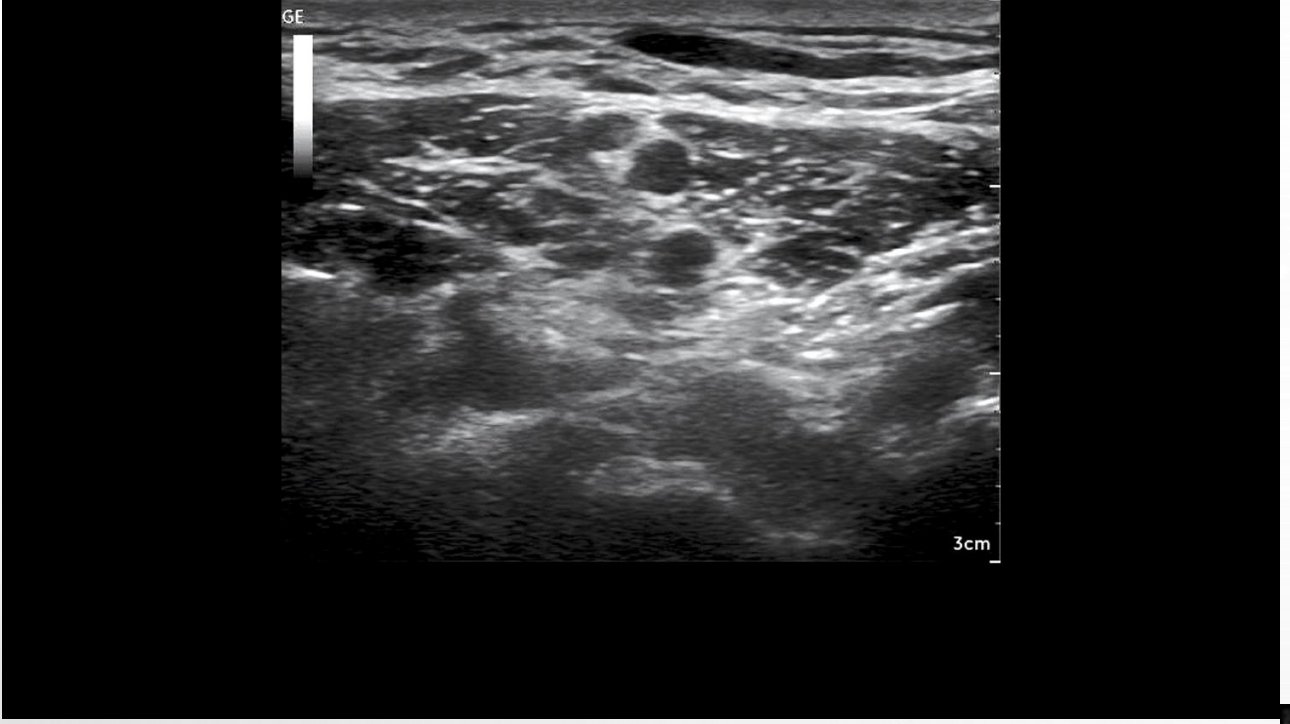

Sternocleidomastoid
clavicular head
sternal head
Needle
insertion
point
C6
External
jugular
vein
Clavicle

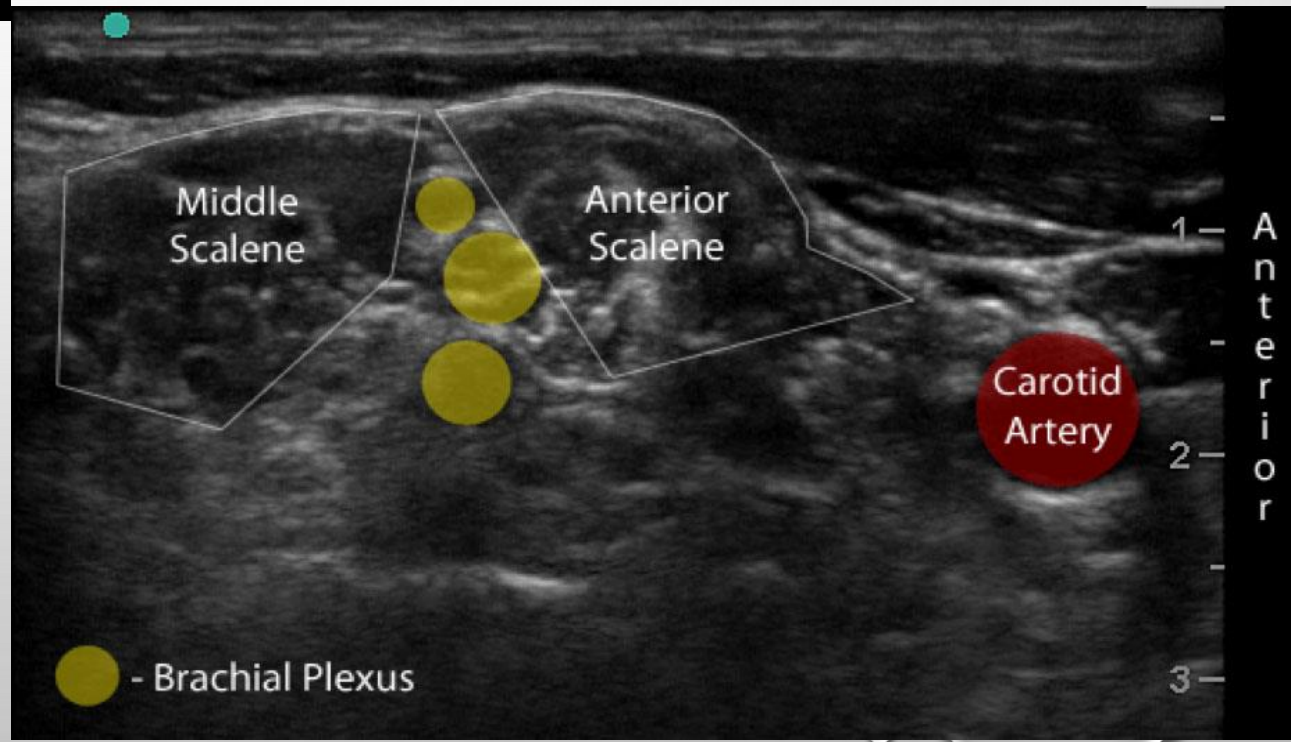

NYSORA





James C. Krakowski and Steven L. Orebaugh.
http://dx.doi.org/10.5772/56645





James C. Krakowski and Steven L. Orebaugh.
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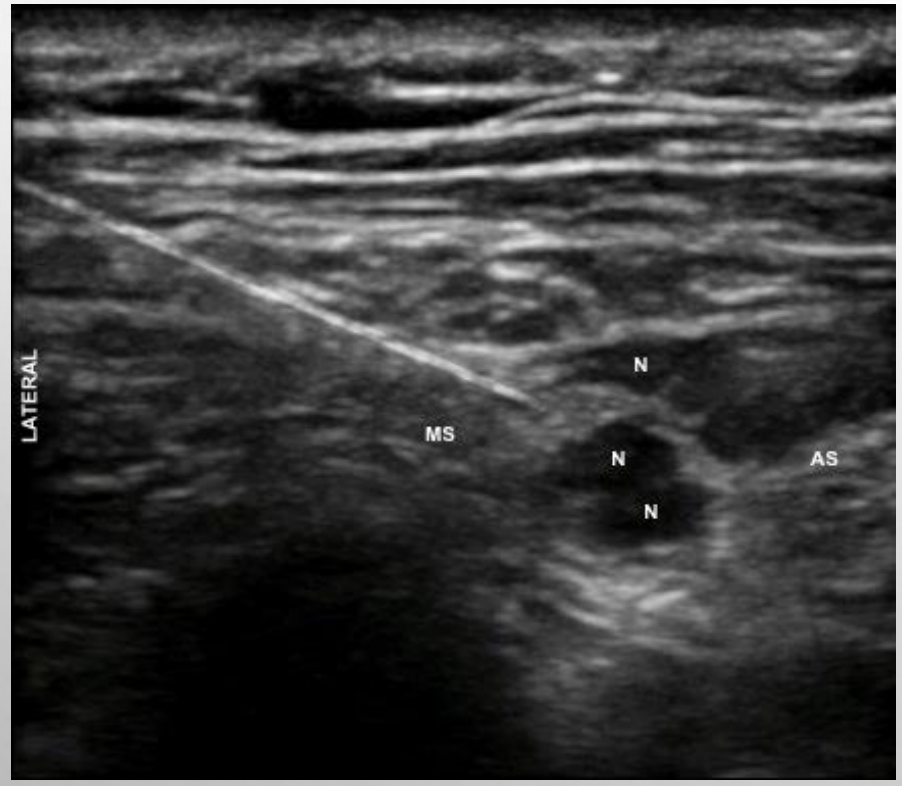
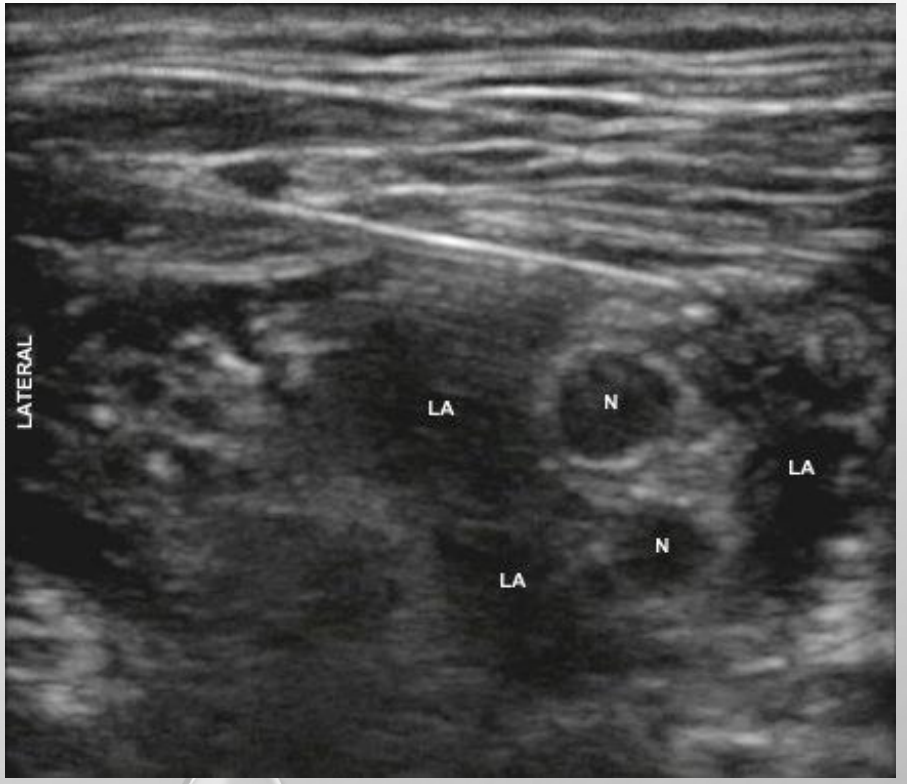




James C. Krakowski and Steven L. Orebaugh.
http://dx.doi.org/10.5772/56645

1

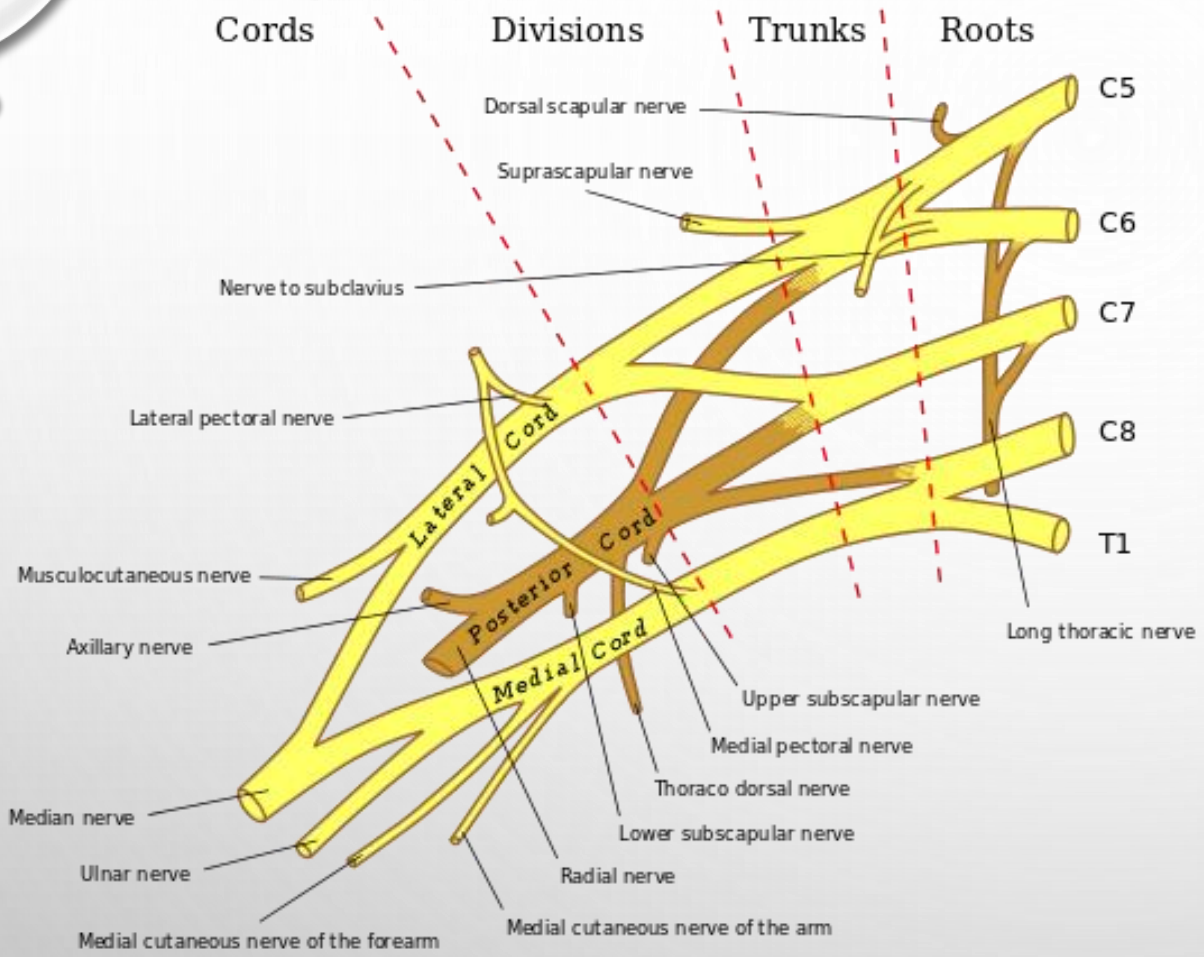
- interscalene approach to brachial plexus blockade: 4 ml of ropivacaine 0.75%
- slightly sedated during surgery
- oxygen therapy
- no respiratory complication

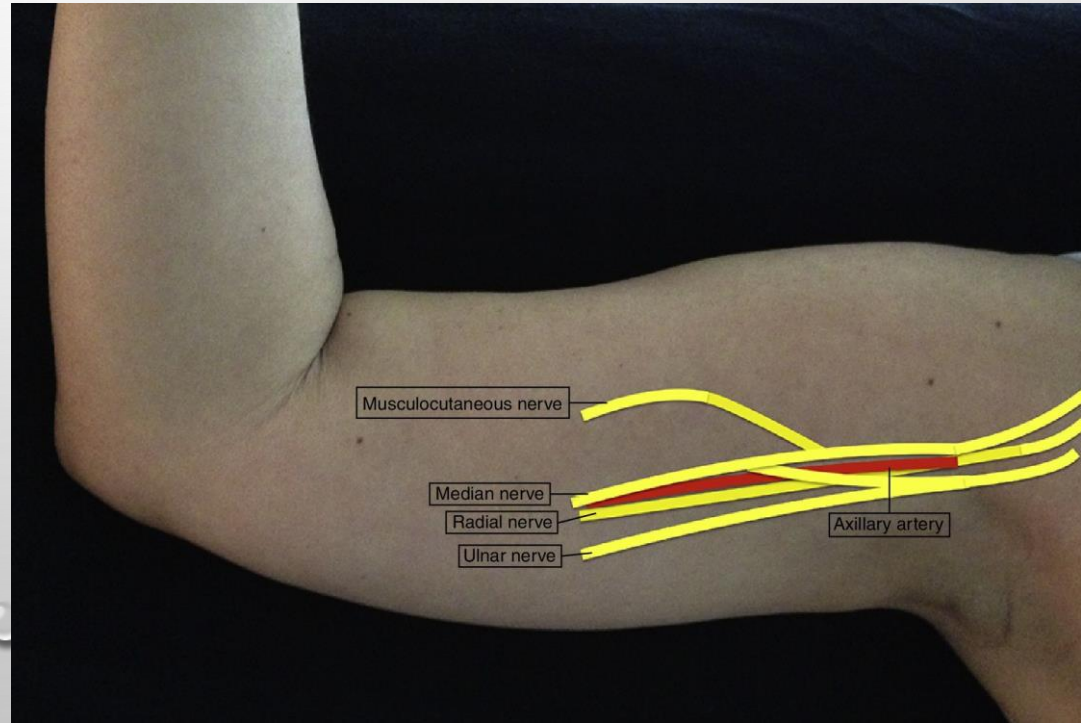
2

- 35 yo male
- Work accident
- Severe forearm crush injury, cvasiamputation of the left hand
- Obese
- No medical history
- Anaesthesia alternatives
  - general anaesthesia
  - Axillary block

2

- Anaesthesia alternatives
  - Axillary block- no ultrasound machine available
  - First failed attempt with nerve stimulator
  - general anaesthesia- difficult (impossible) intubation
  - “desperate situation”

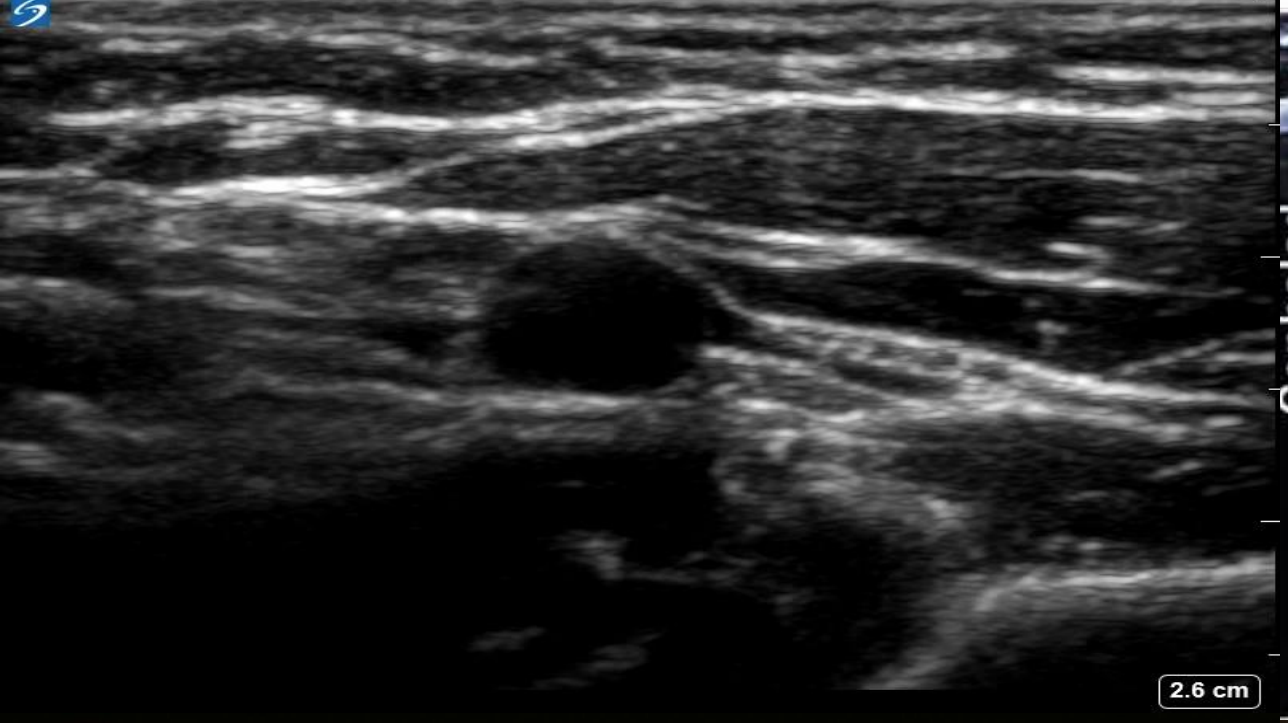


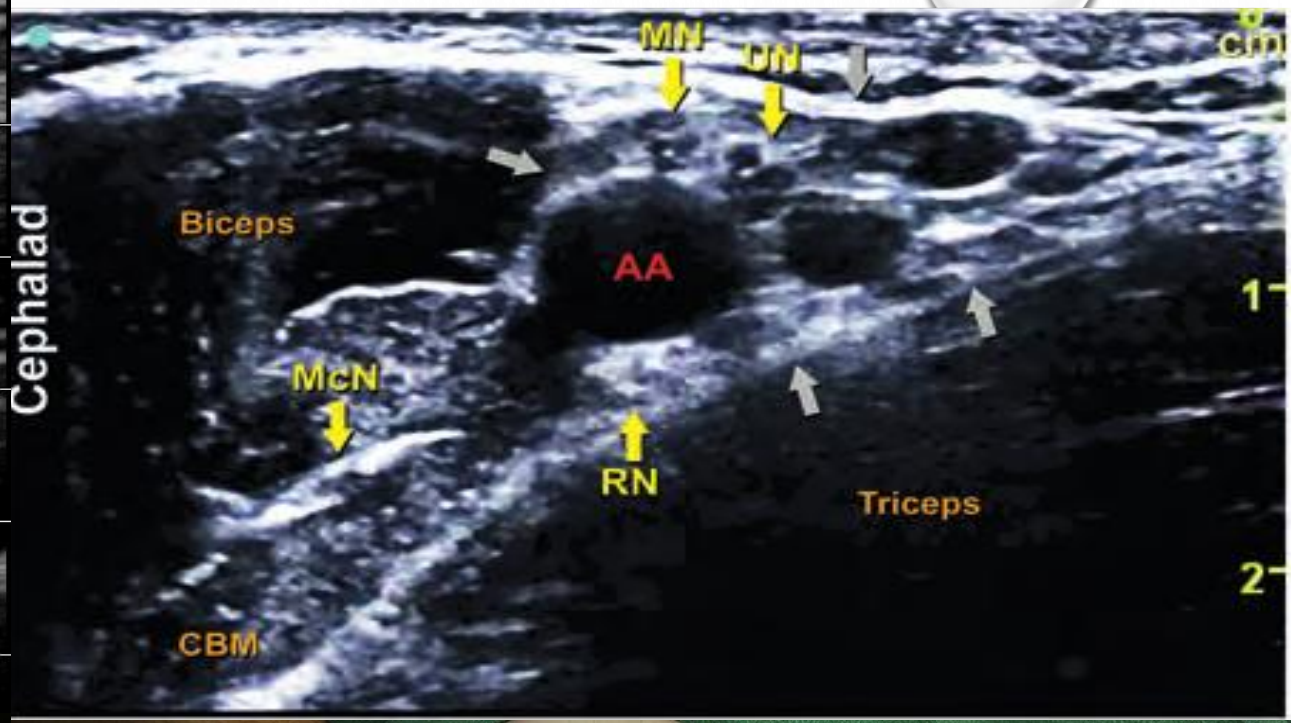


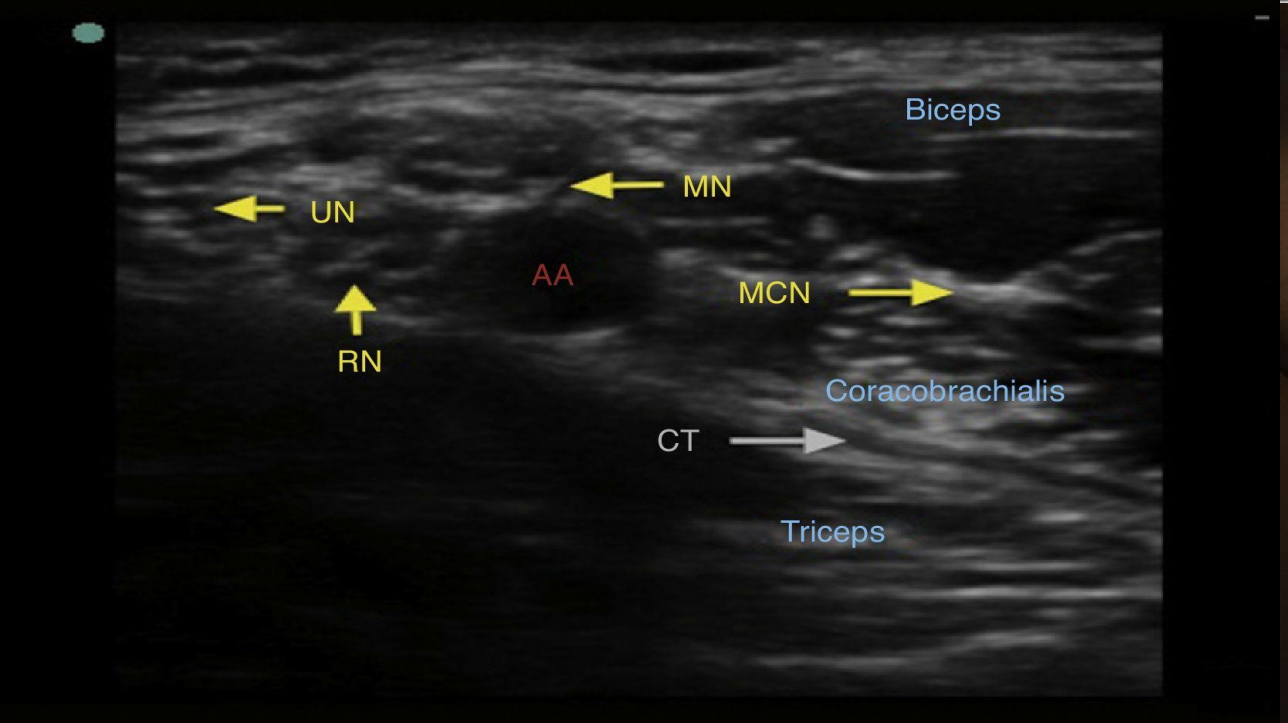
Luz María Lopera-Velásqueza, Carlos Restrepo-Garcés. Rev Colomb Anestesiol. 2016;44(1):30–35

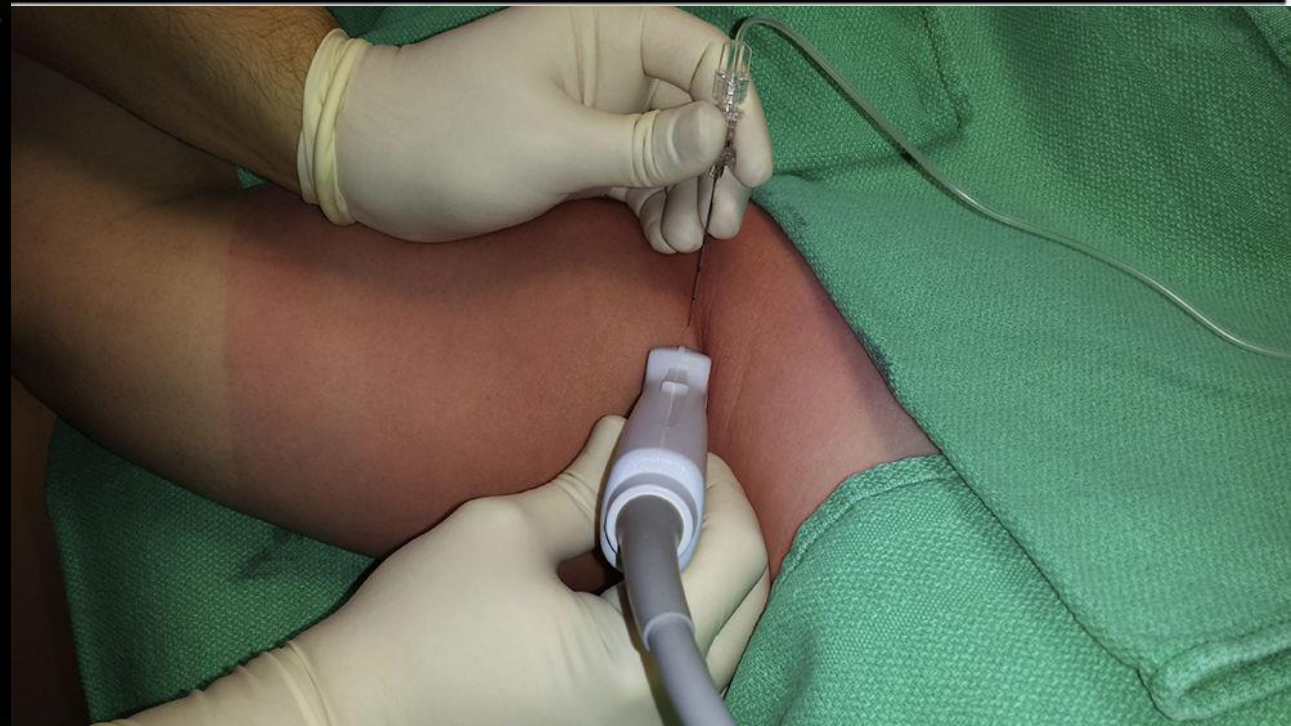
2

- second successful attempt
- mask ventilation
- Indication of good analgesia: normalized blood pressure
- 12 h operation with no complication
- axillary block- life saving procedure!
- worth the effort of learning


2.6 cm


MN
UN
Biceps
AA
Cephalad
McN
RN
Triceps
CBM
1
2


Biceps
MN
UN
AA
MCN
RN
Coracobrachialis
CT
Triceps



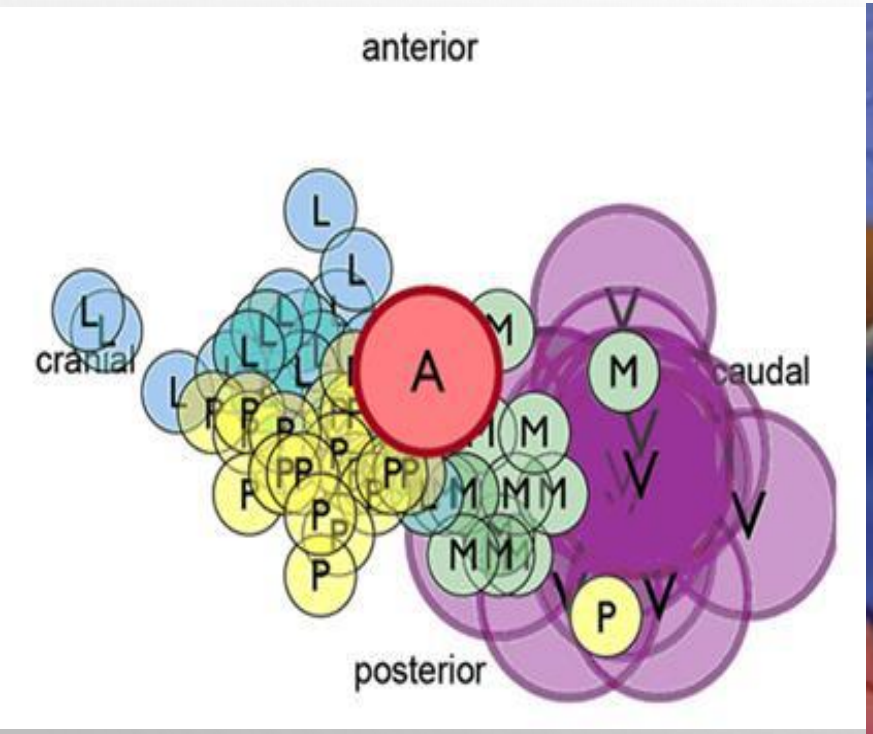
Axillary block

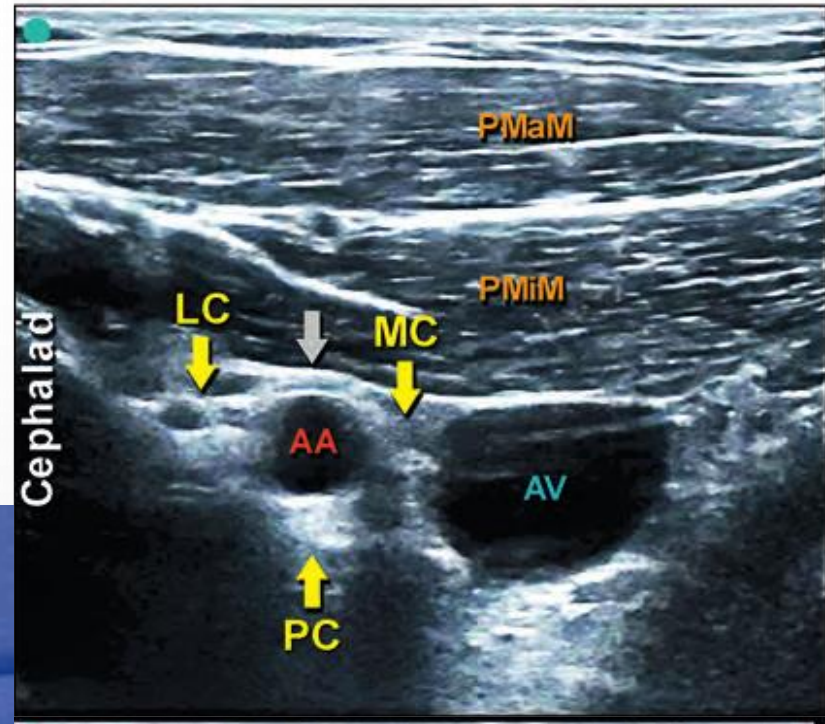
- the risk of injury to the stellate ganglion, pneumothorax or phrenic nerve palsy is practically non-existent with this block
- ultrasound does not reduce the occurrence of complications when compared to the nerve stimulator
- With nerve stimulator the failure rate is 5–30%, while the two techniques combined increase the success rate by up to 97%
- nerve stimulator: may be painful
- the axillary region is prone to catheter displacement and does not allow adequate fixation

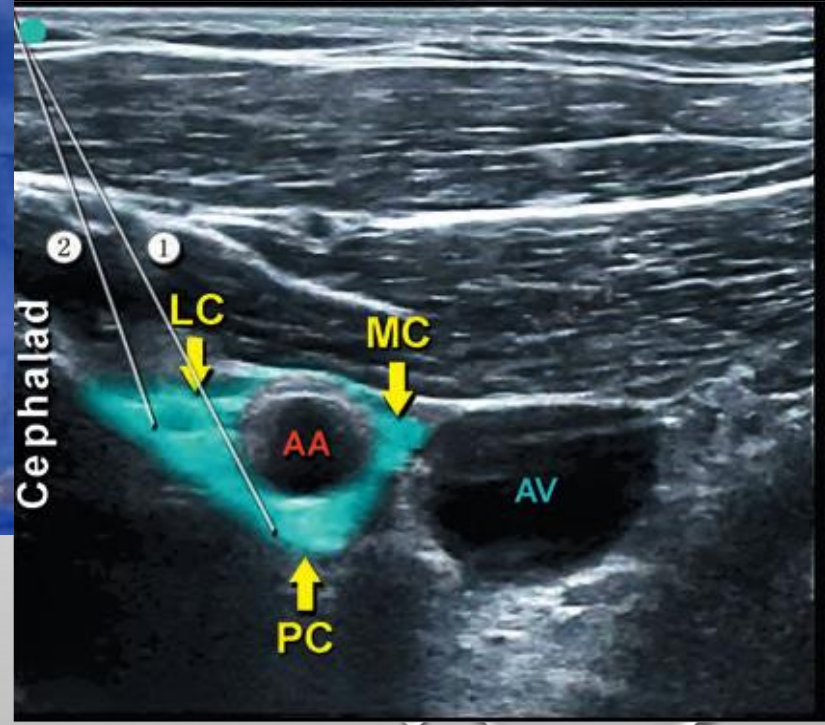
Satapathy A, Coventry DM. Axillary brachial plexus block. Anesth Res Pr. 2011;2011:1–5.
Monkowski D, Gay Larese CS. Bloqueo axilar del plexo braquial. Rev Arg Anest. 2004;62:440–4
Maga JM, Cooper L, Gebhard RE. Int Anesth Clin. 2012;50:47–55

Infraclavicular brachial plexus block

A = axillary artery**L** = lateral cord**M** = medial cord**P** = posterior cord**V** = axillary vein

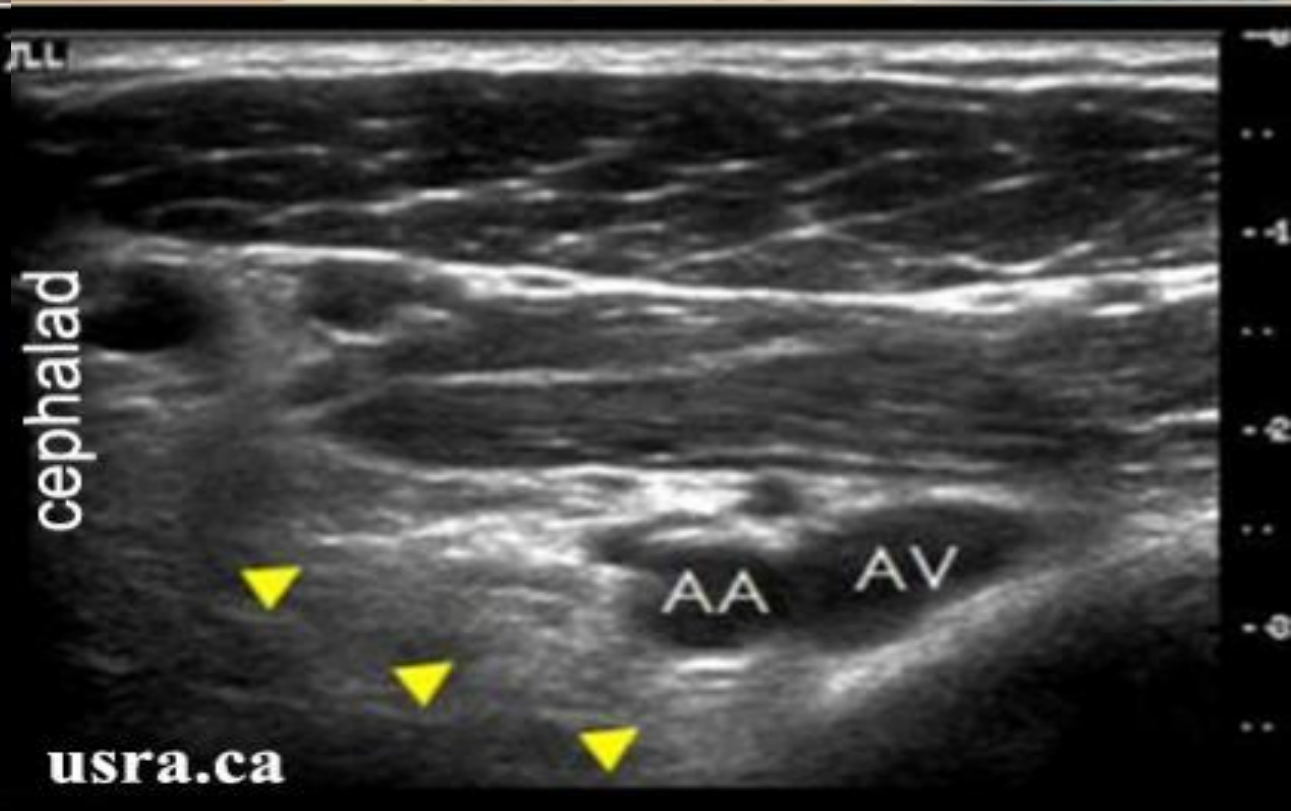






Sauter Anesth Analg 2006; (103): 1574-1576

The Arm Abduction Maneuver



Infraclavicular brachial plexus block

Indications

- Operative procedures on the distal upper arm, forearm and hand
- Analgesia

Contraindications

- Chest deformities
- Healed, but dislocated (shortened) fracture of the clavicle

Side effects / complications

- Horneŕ s syndrome
- Phrenic paresis
- Vessel puncture (cephalic vein, subclavian artery and vein)
- **Pneumothorax**

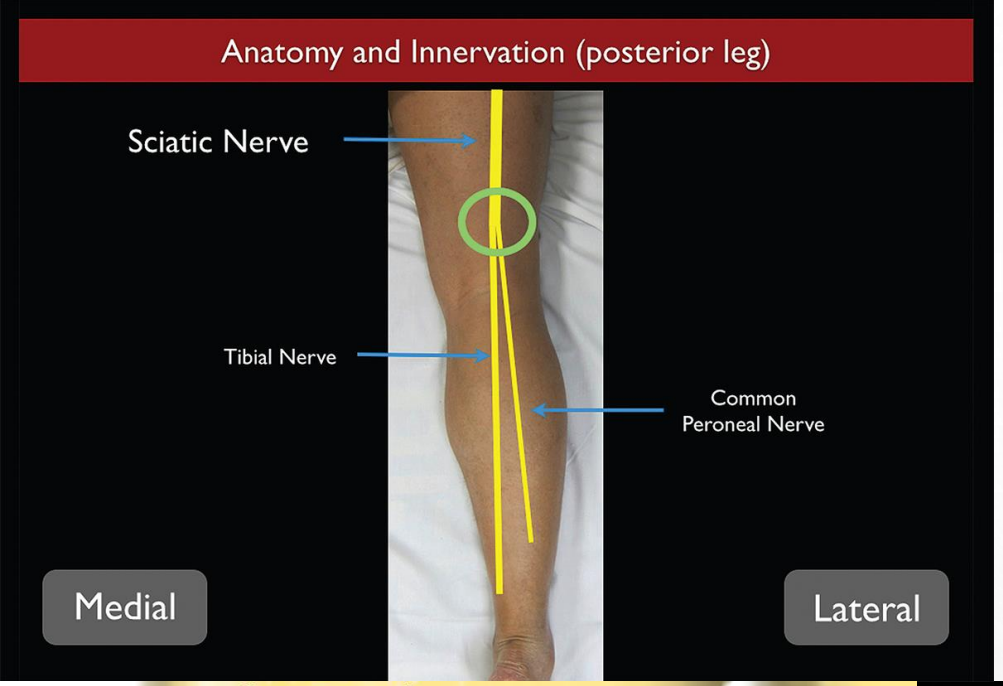
Anatomical landmarks

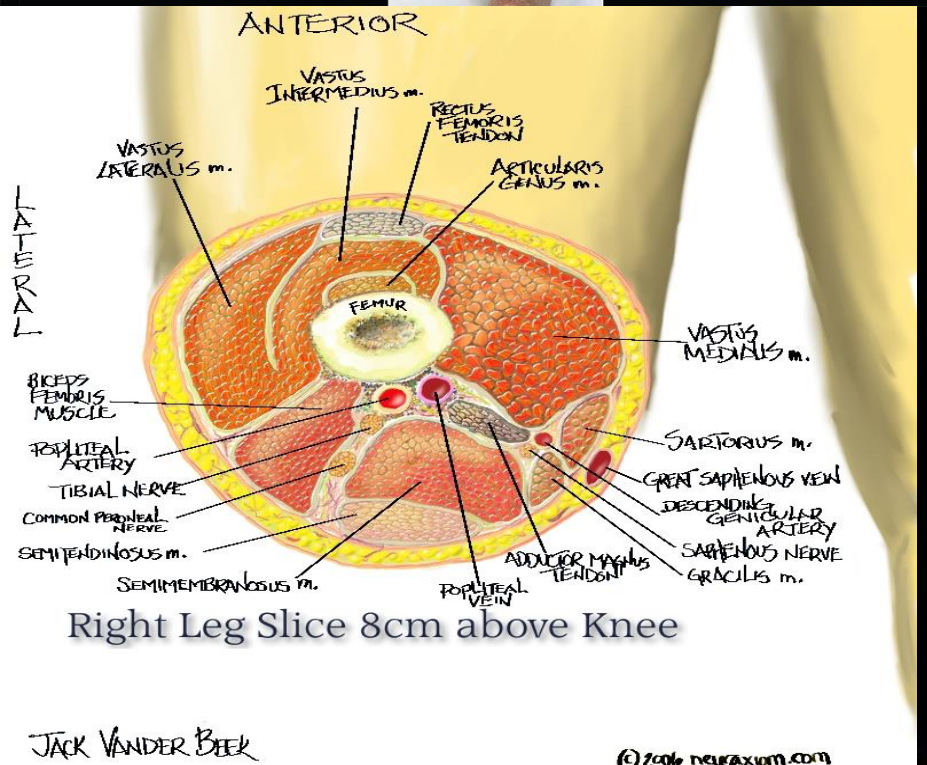
- Suprasternal notch
- Lateral edge of the acromion • Infraclavicular fossa

#3

- 68 yo female
- neglected type 2 diabetes mellitus (glycemia - 600 mg/dl)
- Right forefoot wet gangrene
- Severe sacral pressure ulcer
- Transtibial amputation
- Anaesthesia alternatives
  - General anaesthesia
  - Spinal anaesthesia
  - Combination of peripheral nerve blocks

Sciatic nerve block





Innervation

A

Common ED Indications

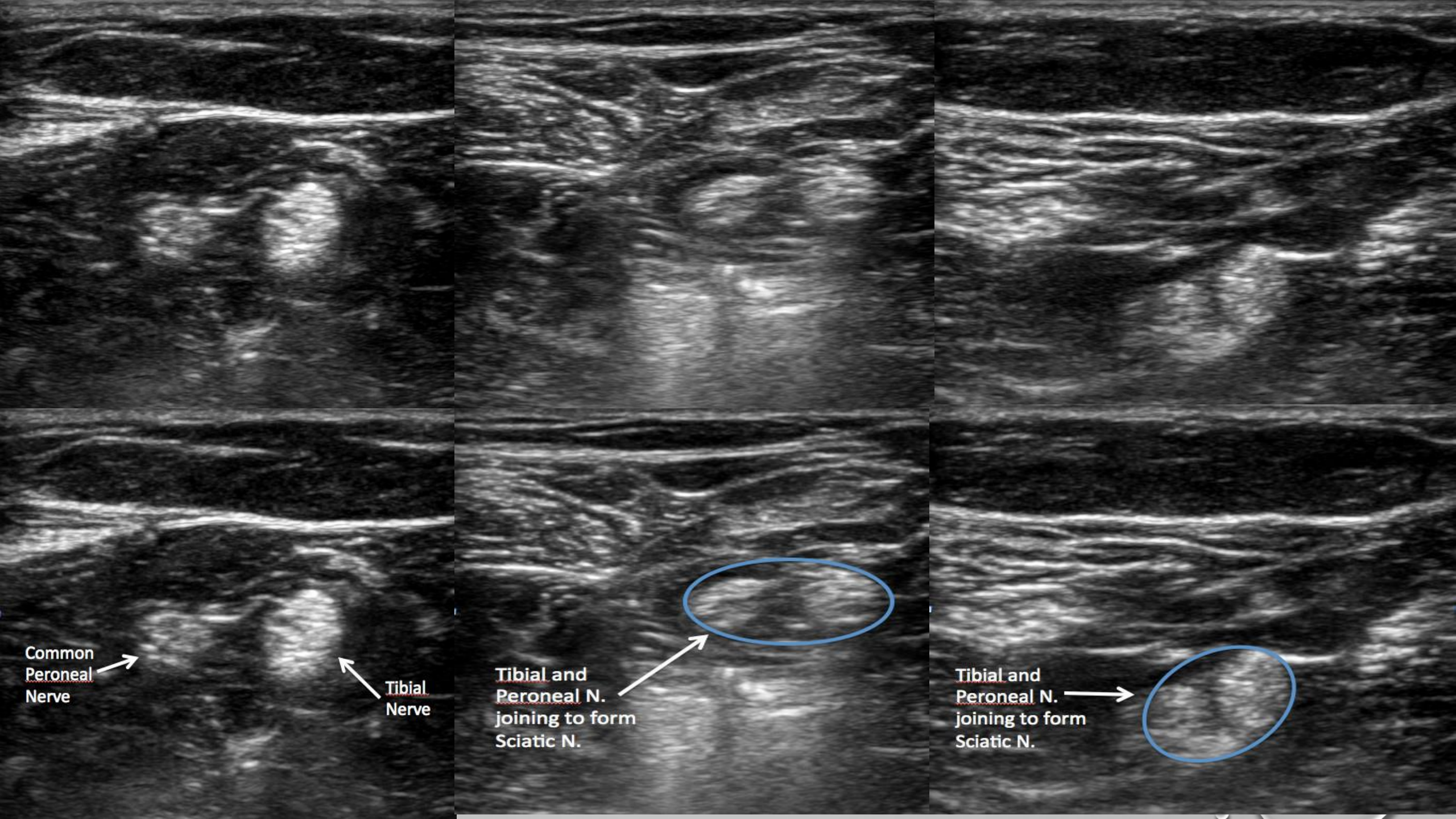
1) Analgesia for distal tibia/fibula fractures

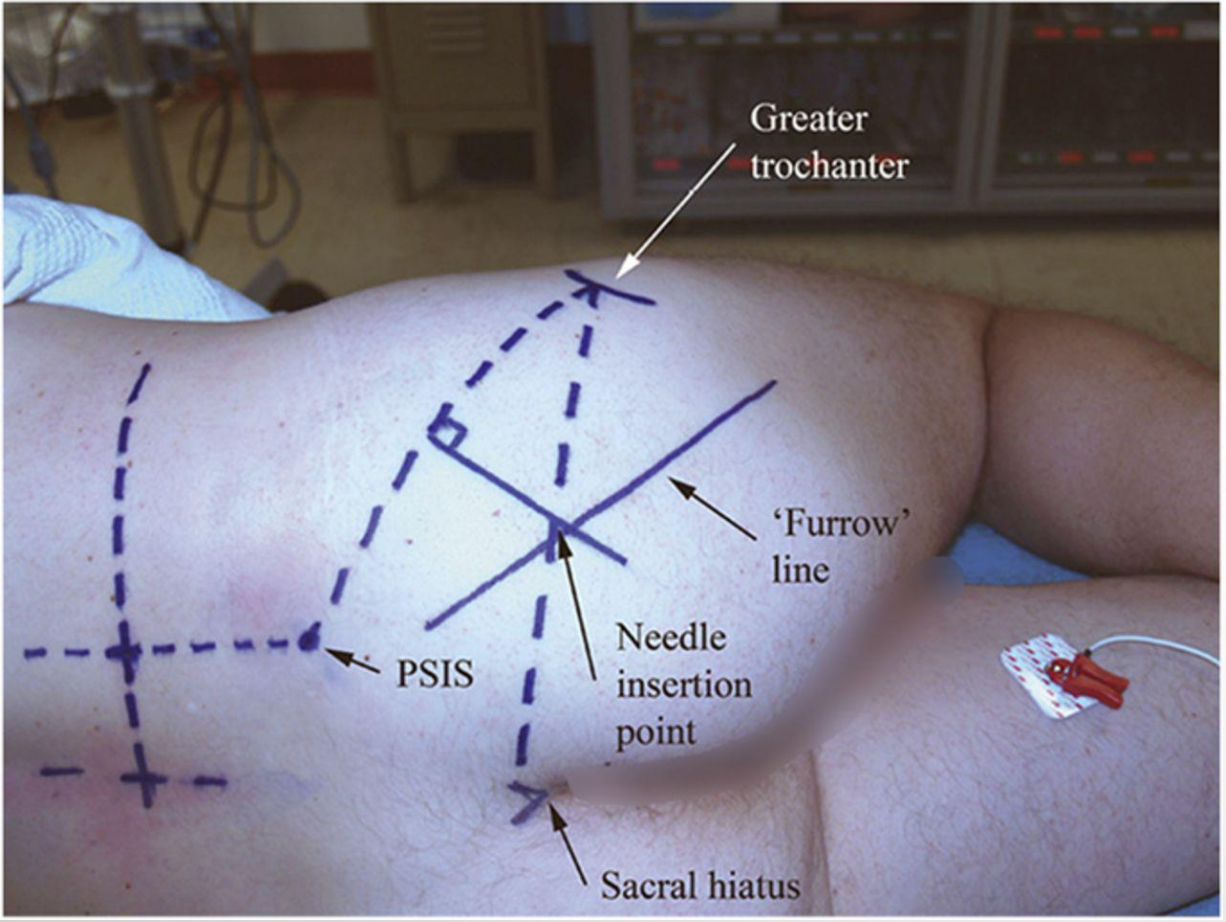
2) Analgesia for achilles tendon rupture

3) Analgesia for lower extremity burns

4) Analgesia for foot injuries

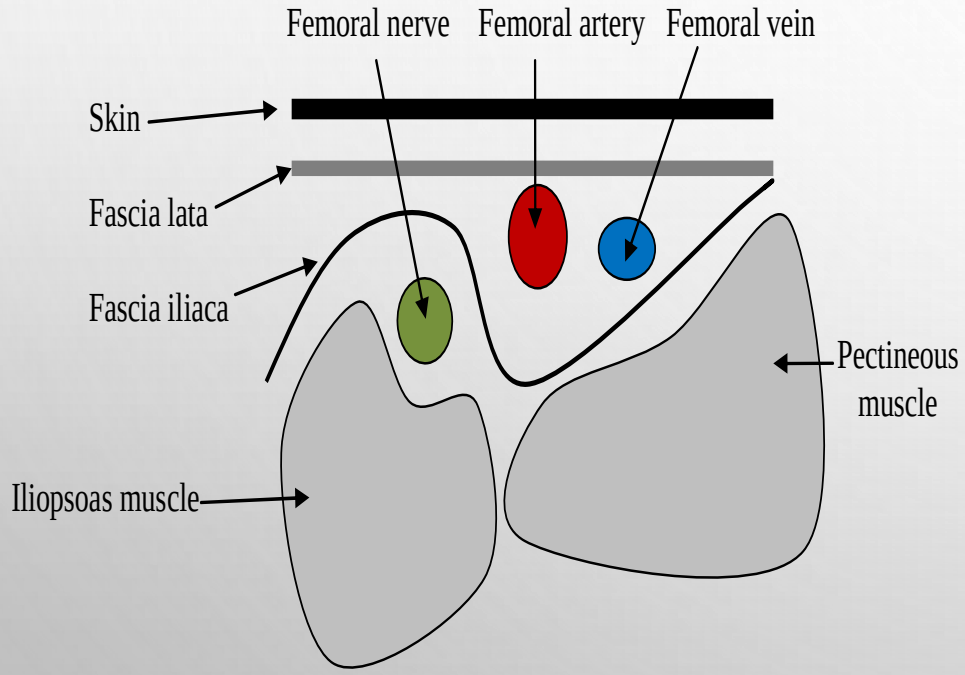
B


Common
Peroneal
Nerve
Tibial
Nerve
Tibial and
Peroneal N.
joining to form
Sciatic N.
Tibial and
Peroneal N.
joining to form
Sciatic N.



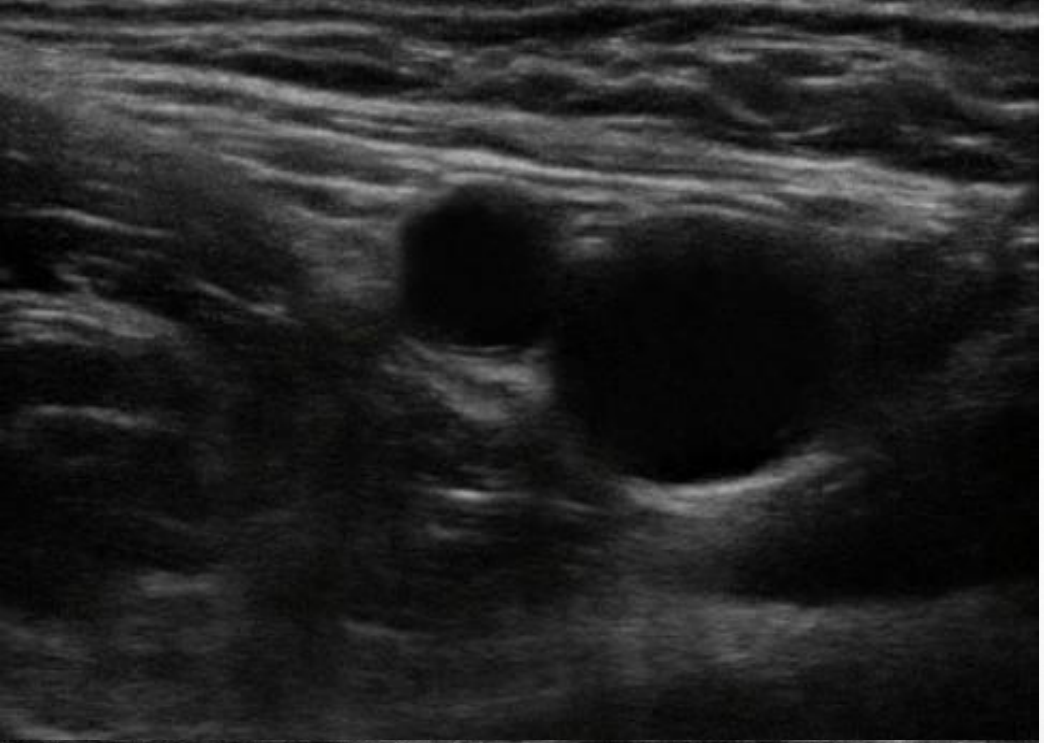
Sciatic nerve block- anatomical landmarks

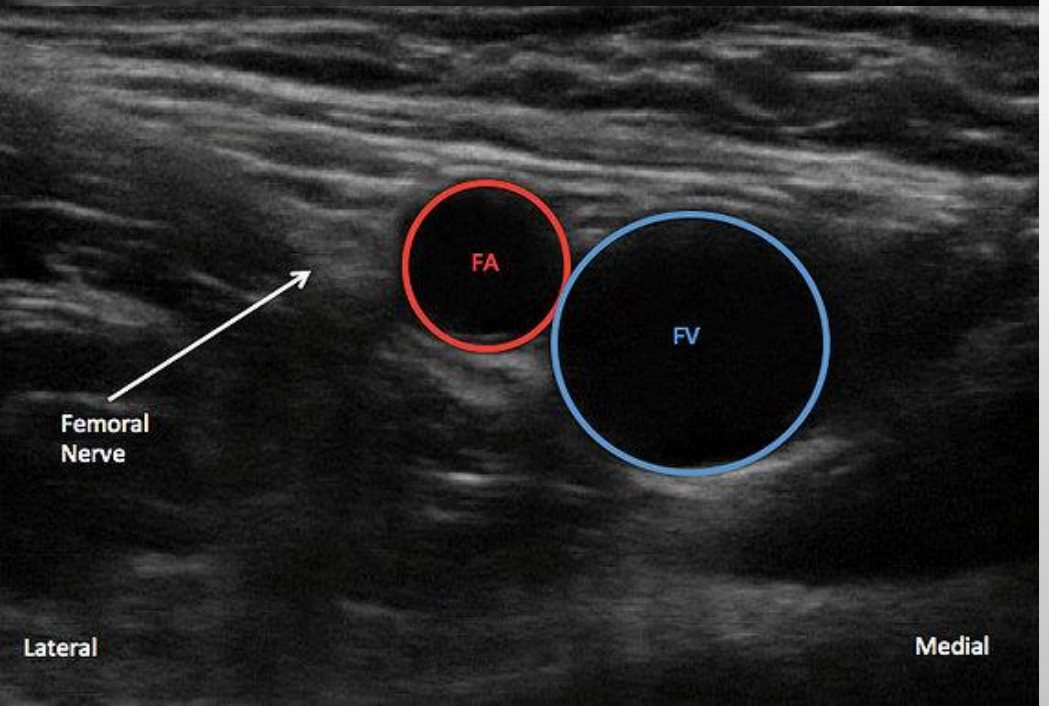
Femoral nerve block and “3-in-1” nerve block

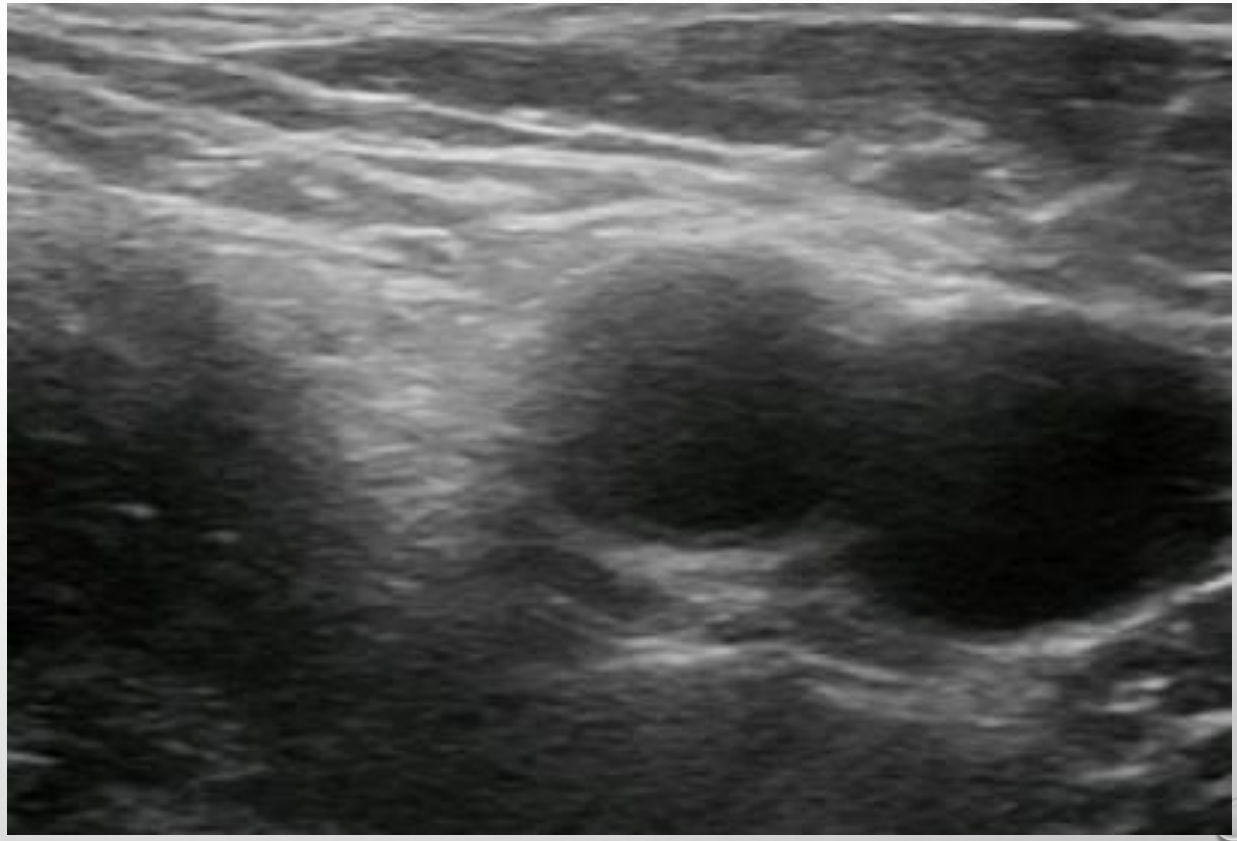


- femoral nerve
- lateral femoral cutaneous nerve- proximally than the femoral nerve, at the lateral border of the psoas muscle
- obturator nerve - at the medial border of the psoas muscle

Wedel, D.J. & Horlocker, T.T. Nerve blocks. In Miller’s Anesthesia 6th edtion. Miller, RD ed. Pages 1685-1715. Elsevier, Philadelphia, Penn. 2005




FA
FV
Femoral
Nerve
Lateral
Medial

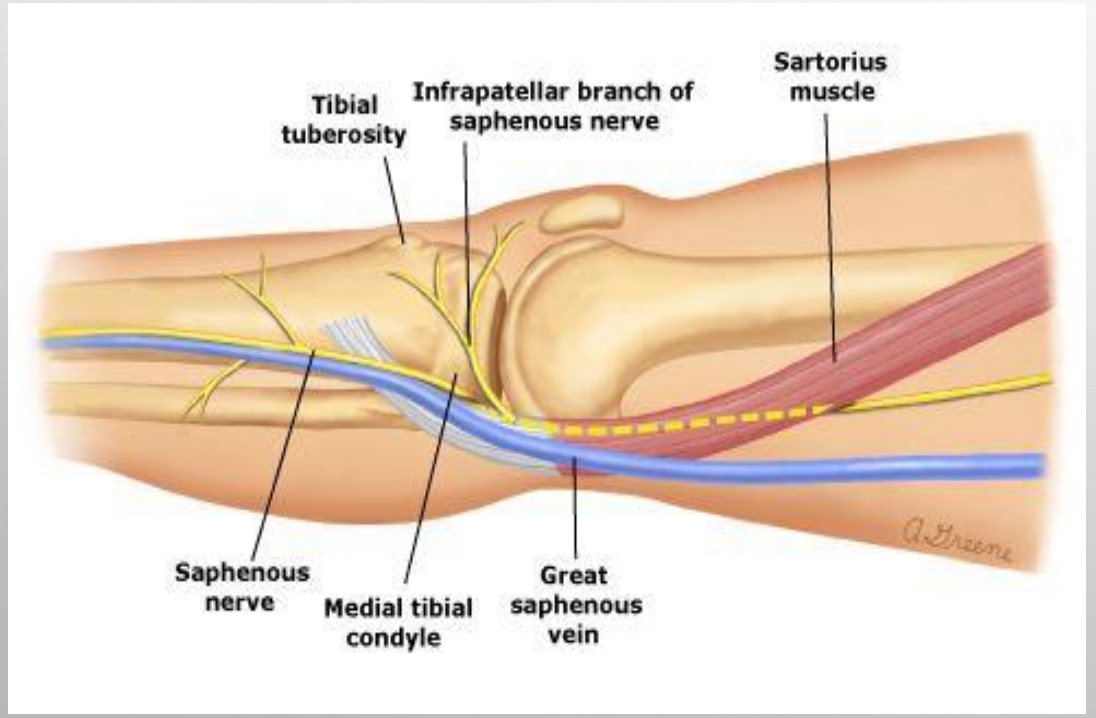


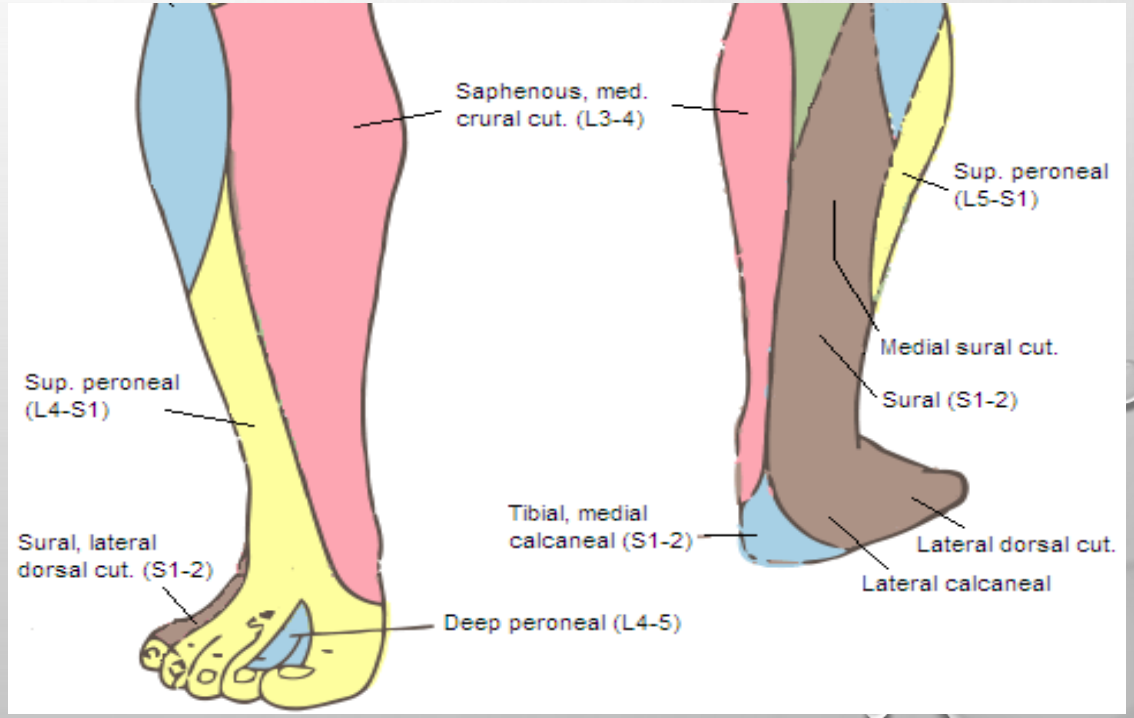

NYSORA

Saphenous nerve block

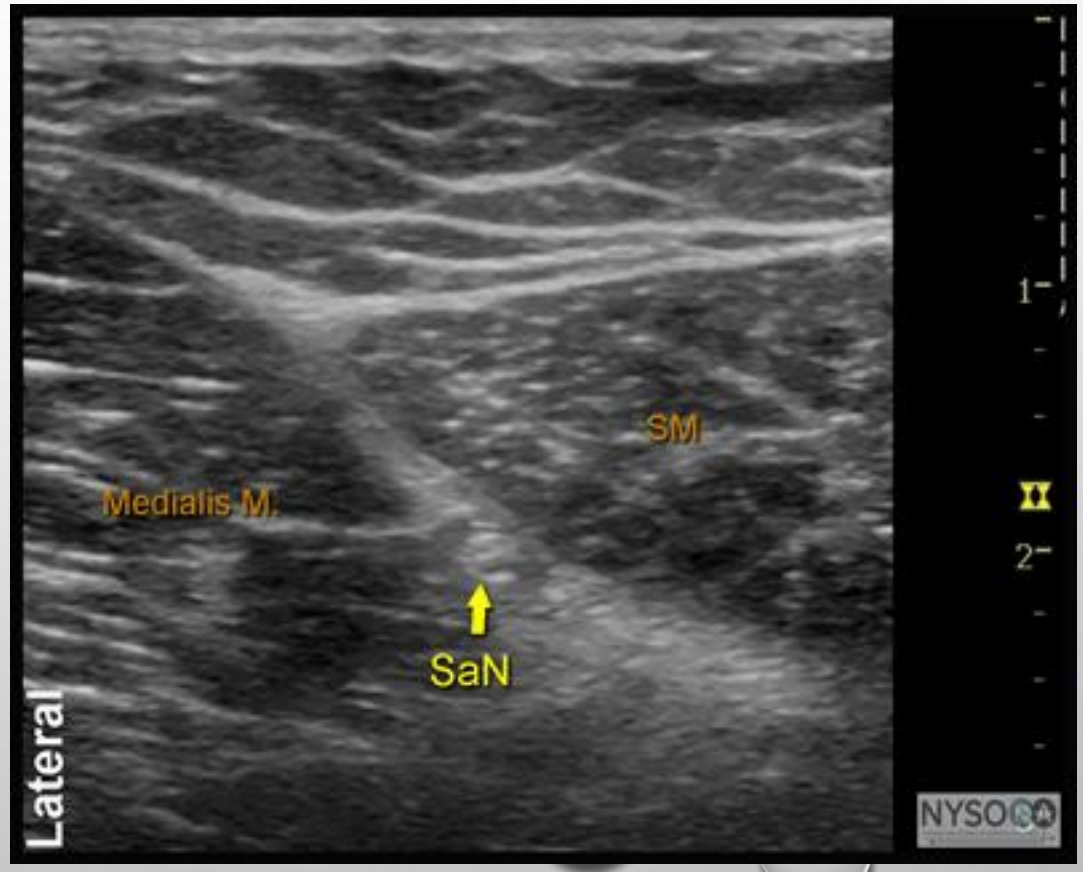
- in combination with distal sciatic nerve block for operations on the whole lower leg and foot

Anatomical landmarks: patellar crest, sartorius muscle, vastus medialis muscle





Saphenous nerve block



#3

- Anaesthesia alternatives
  - Combination of peripheral nerve blocks: sciatic, femural and saphenous nerve block
    - Sciatic- nerve stimulator (30 ml of ropivacaine 0.5%)
    - Femural- USG (8 ml of ropivacaine 0.5%)
    - Saphenous- direct injection (5 ml of ropivacaine 0.5%)
  - No perioperative complication
  - patient died after one week- systemic complications

Ultrasound guidance for peripheral nerve blockade Advantages

- preemptively scanning patient anatomy for neurovascular variations or abnormalities
- ability to directly visualize peripheral nerves and tissue planes in real-time
- the ability to reposition one's needle in assessing for adequate local anesthetic spread, fascial plane movement
- decrease the risk of vascular puncture
- a reduction in the minimum effective anesthetic volume

Abrahams MS, Aziz MF, Fu RF, Horn JL. Br J Anaesth 2009 Mar;102(3): 408-417
Casati A, Baciarello M, Di Cianni S et al. Br J Anaesth 2007 Jun;98(6):823-827

Ultrasound guidance for peripheral nerve blockade Disadvantages

- peripheral nerve anatomical variation leading to difficulty in regional pattern recognition
- inability to recognize common on-screen artifacts
- needle tip visualization
- the optimal pattern of local anesthetic deposition and distribution

Gray AT. Anesthesiology 2006 Feb;104(2):368-73
Spence BC, Beach ML, Gallagher JD, Sites BD. Anaesthesia 2011 Jun;66(6): 509-514
Brull R, Macfarlane AJ, Parrington SJ, et al. Reg Anesth Pain Med 2011 May-Jun;36(3):266-270

- Upper extremity nerve blocks: interscalene, axillary (infraclavicular)
- Lower extremity nerve blocks: femoral, sciatic, saphenous
- Lower risk
- Few complications
- “life saving maneuver”