Ultrasound-Guided Infraclavicular Block

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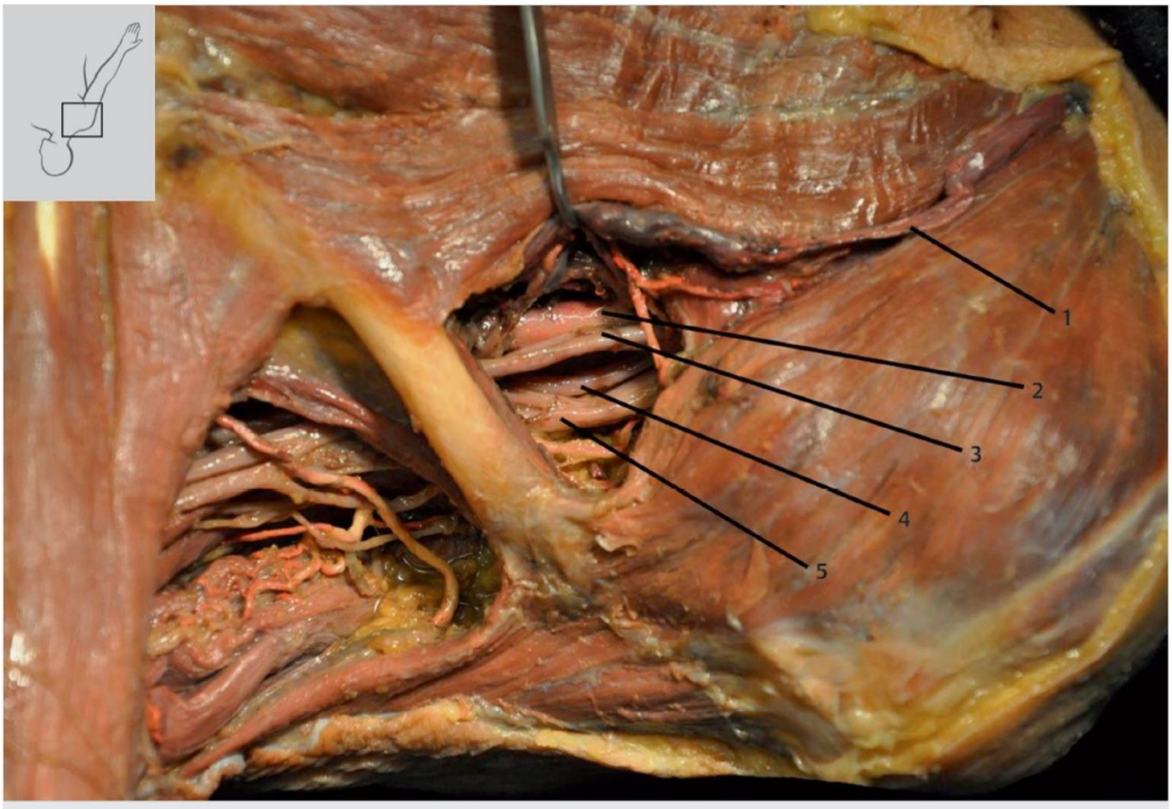
Background and indications:

Infraclavicular brachial plexus block permits anesthesia of the plexus where most of the major motor and sensory nerves to the arm are anesthetized.

Infraclavicular block is used to provide anesthesia and analgesia for procedures involving the distal arm and elbow, wrist, forearm, and hand.

practitioners injected local anesthetic into or around the individual cords.

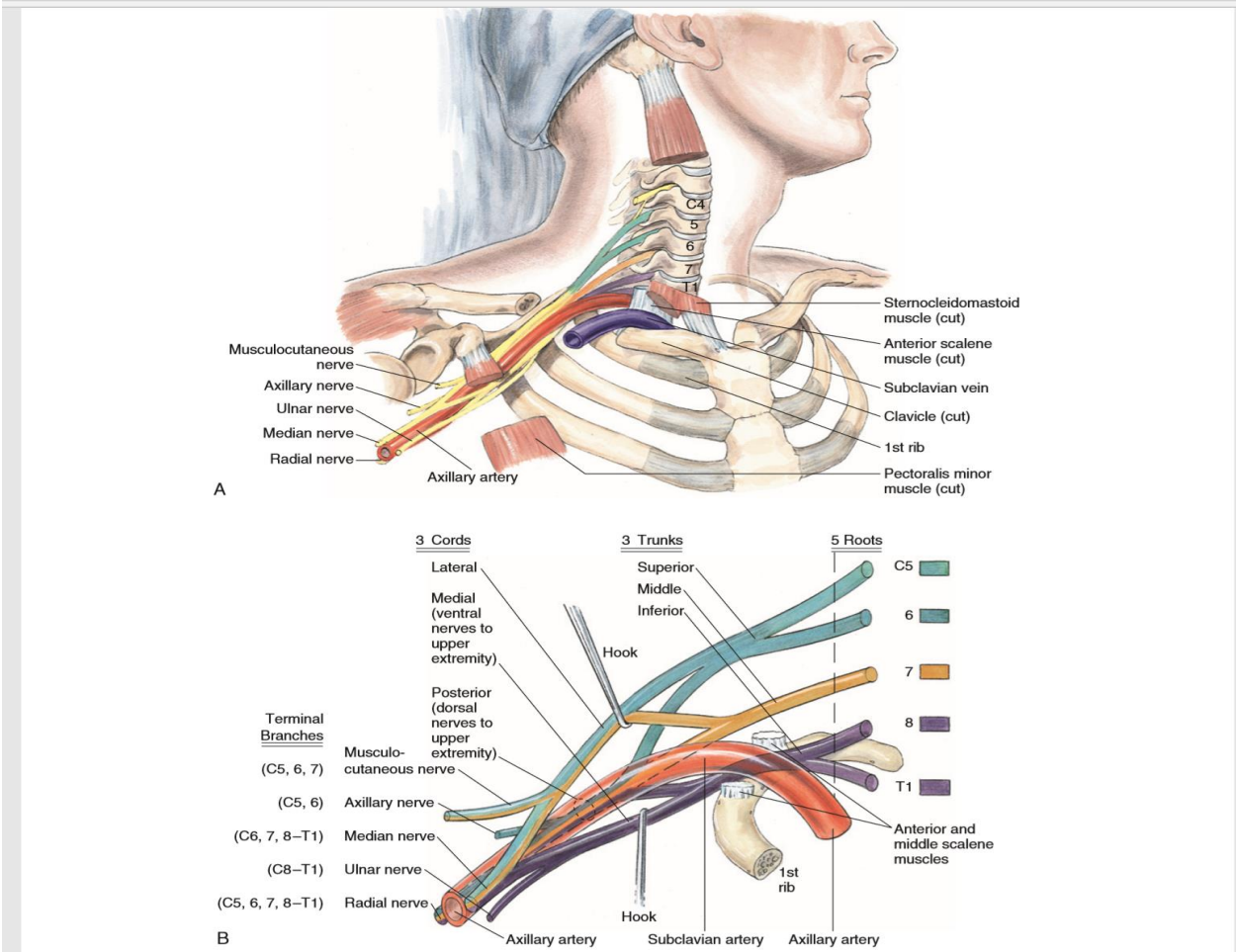
Once the visualization of local anesthetic spread around the axillary artery is achieved, a 90% success rate is usually accomplished.

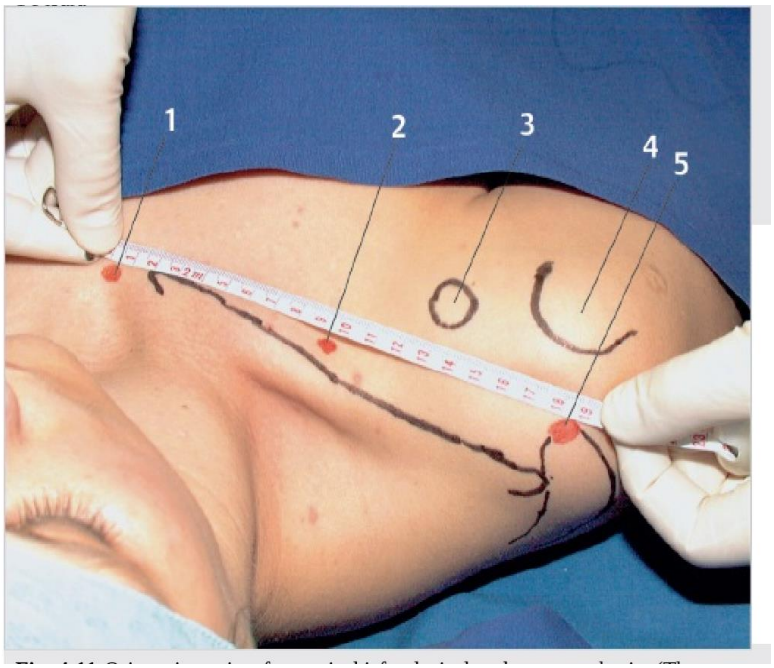


Anatomy:

- Beneath the clavicle, the cervicoaxillary canal is formed, bounded by the first rib below and the clavicle above.
- The infraclavicular fossa is formed between the pectoralis major muscle and the deltoid muscle.
- Needle insertion for infraclavicular block at this point will traverse the pectoralis major and pectoralis minor muscles en route to the plexus
- Posterior to the neurovascular bundle is the rib cage and, posteromedially, the pleura and lung.

- The cords of the brachial plexus are closely aligned with the axillary artery at the infraclavicular region and derive their names from their position with respect to the vessel: posterior, lateral, and medial
- The infraclavicular plexus lies deeper than at other sites of the brachial plexus.
- The cords of the plexus typically appear hyperechoic, or bright, in the infraclavicular region

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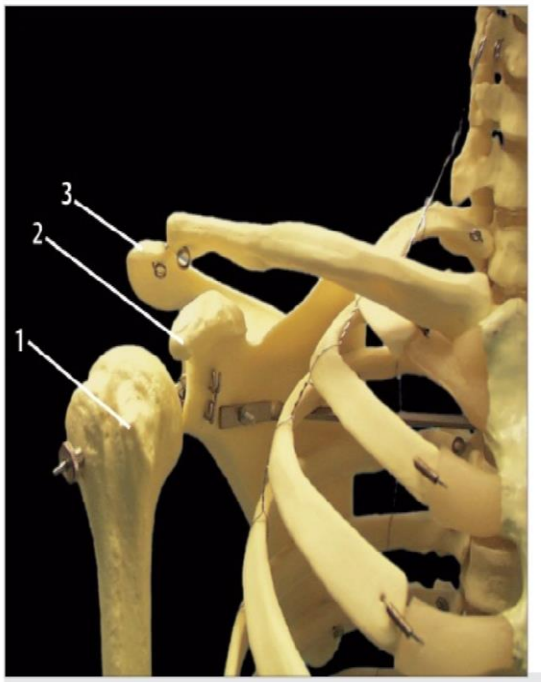
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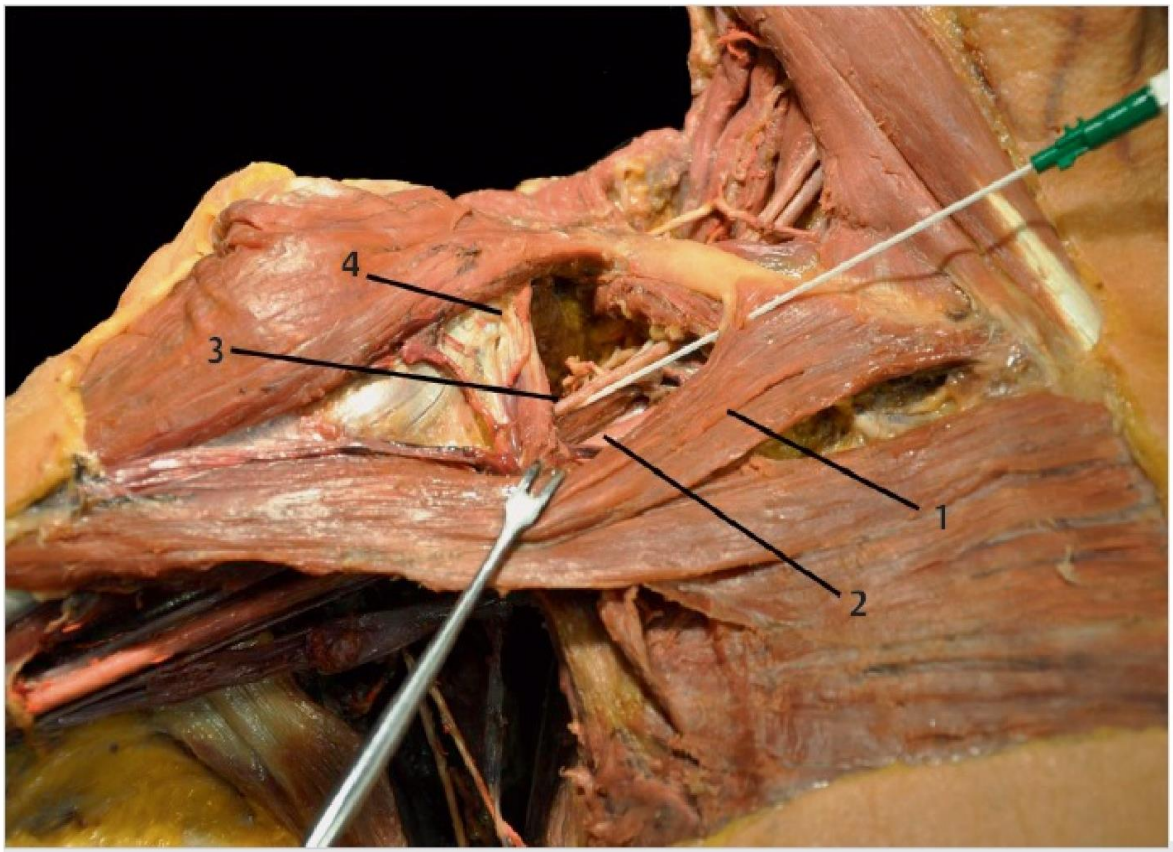
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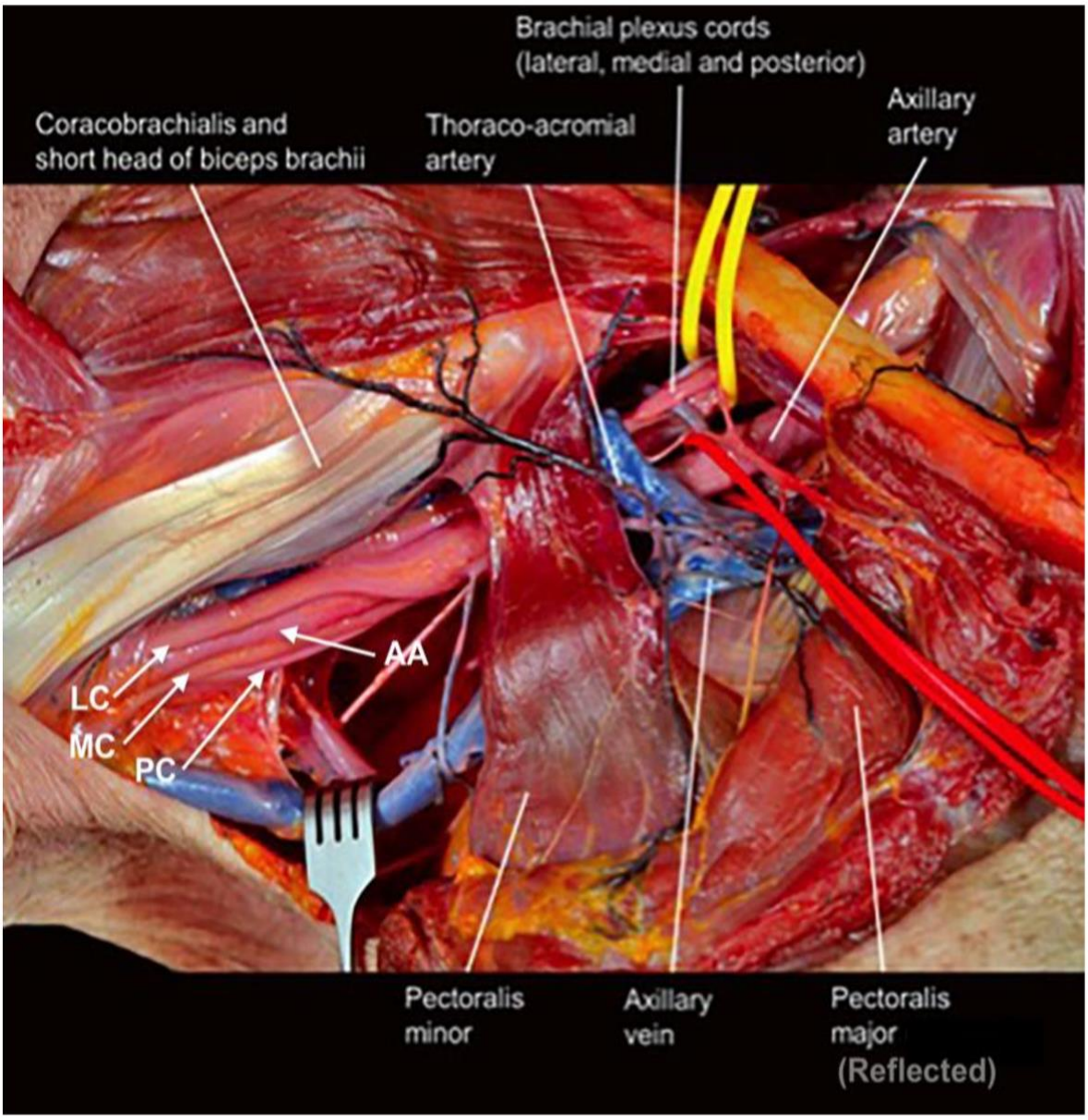
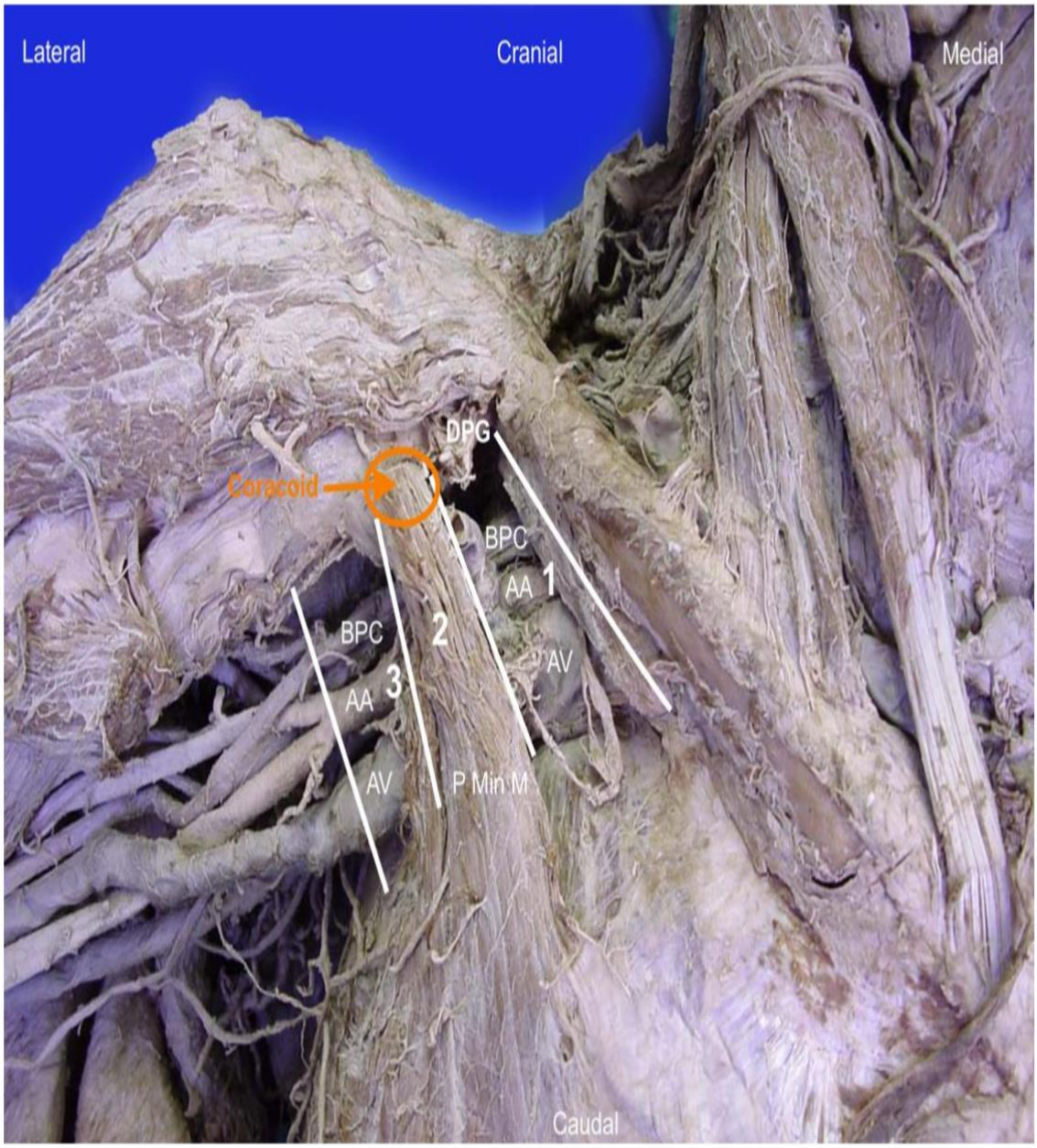
3
1
2

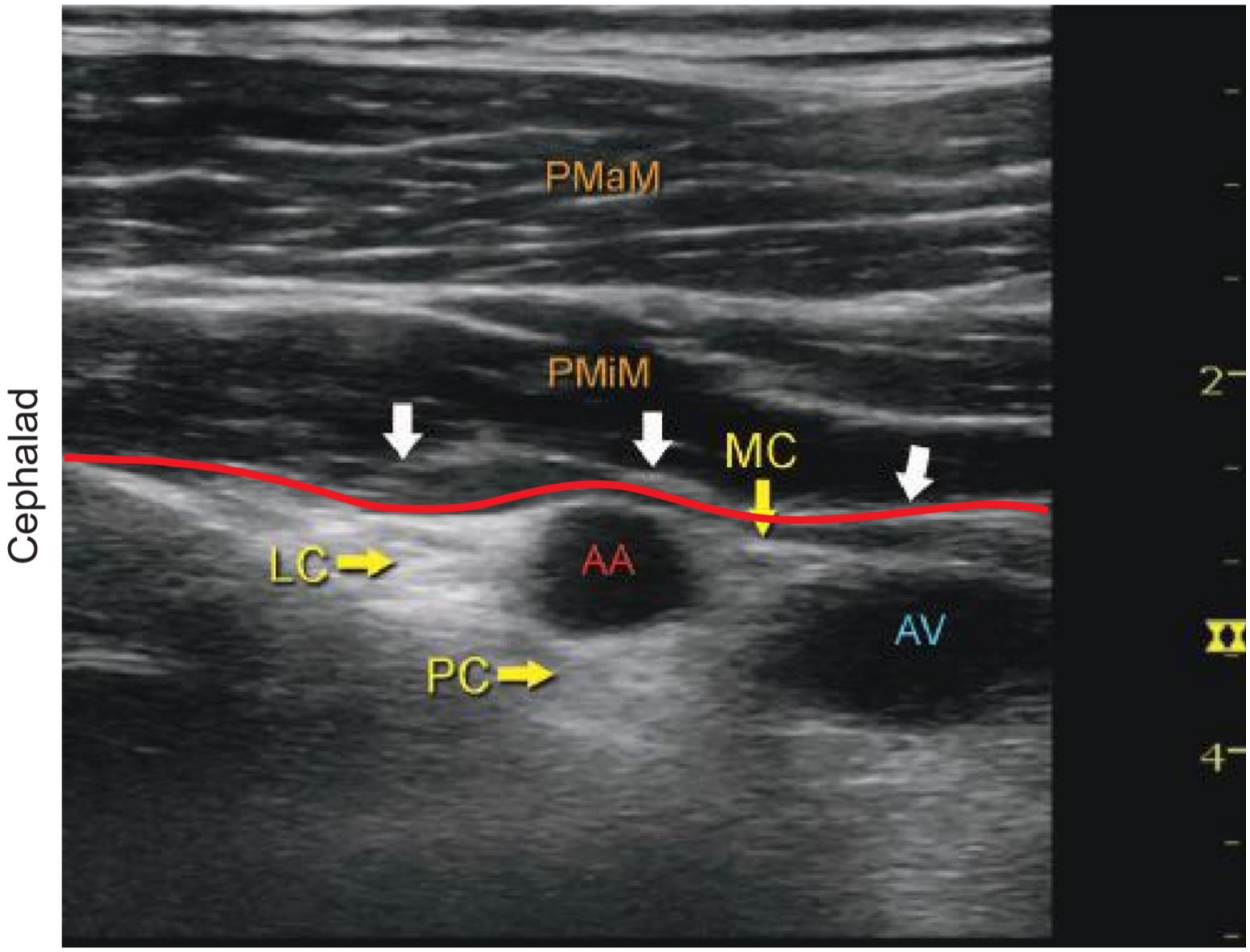

Brachial plexus cords
(lateral, medial and posterior)
Coracobrachialis and
short head of biceps brachii
Thoraco-acromial
artery
Axillary
artery
AA
LC
MC
PC
Pectoralis
minor
Axillary
vein
Pectoralis
major
(Reflected)

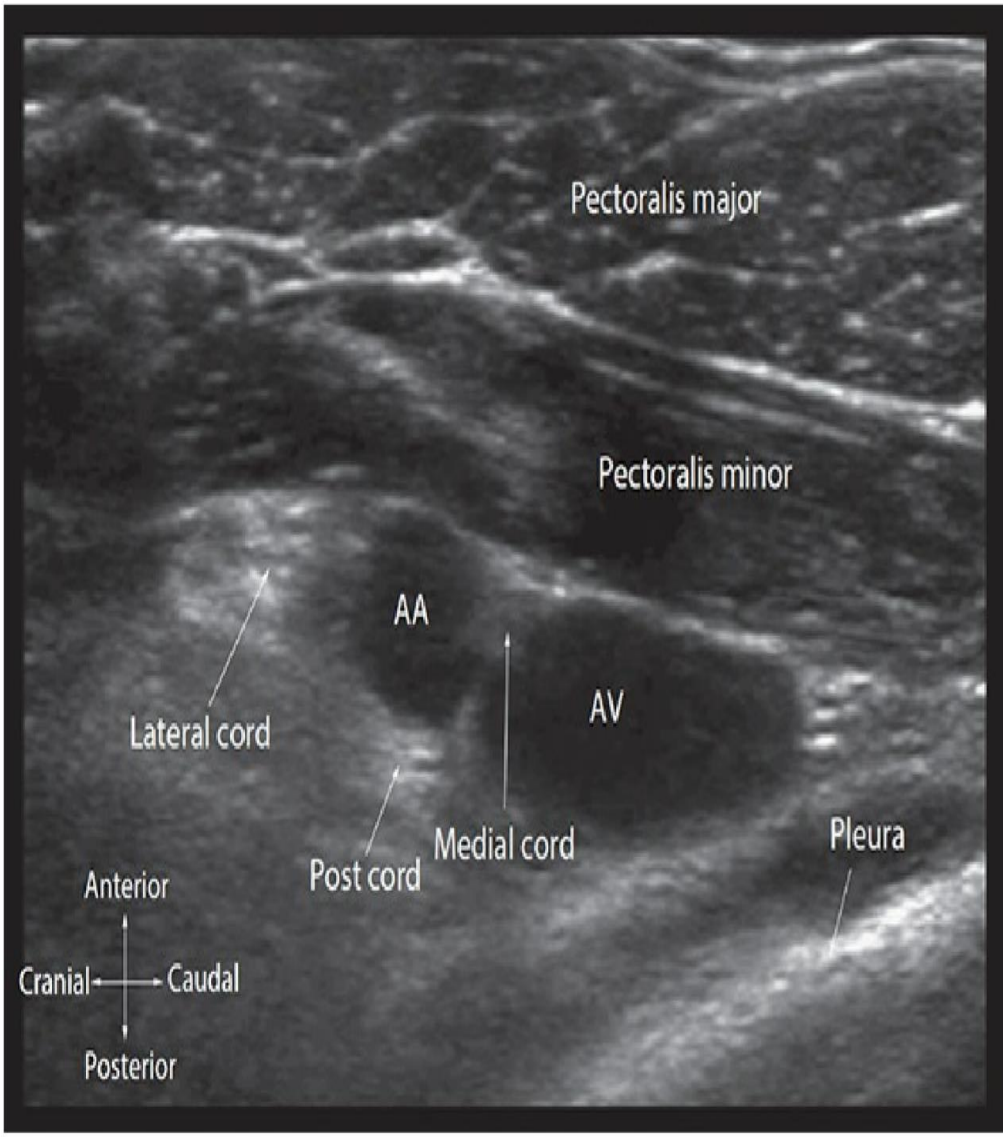


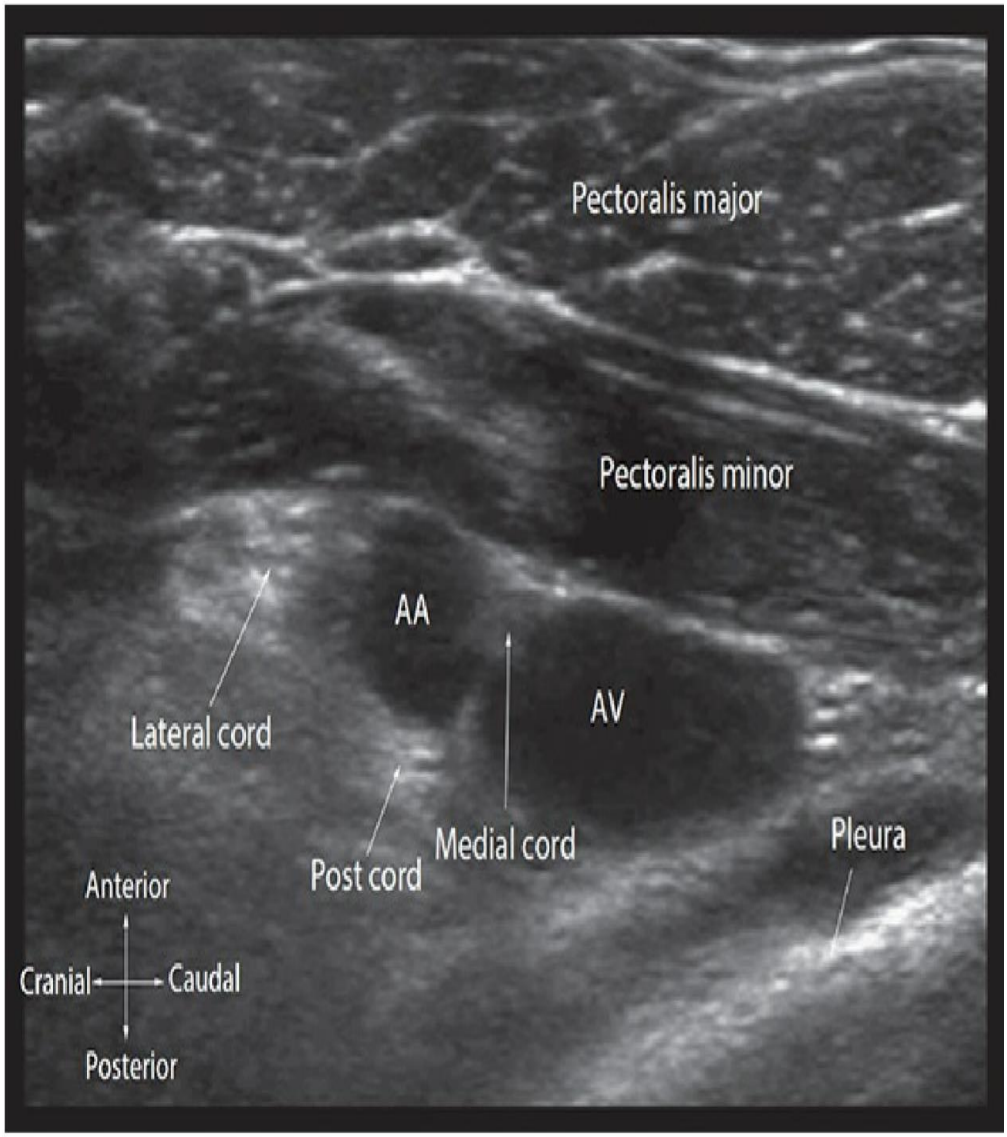
ULTRASOUND ANATOMY:

- The axillary artery can be identified deep to the pectoralis major and minor muscles
- Surrounding the artery are the three cords of the brachial plexus.

- The transducer is moved in the cephalad-caudad and medial-lateral direction until the artery is identified in cross-section.
- The axillary artery and brachial plexus are typically identified at a depth of 3–5 cm in average-size patients.

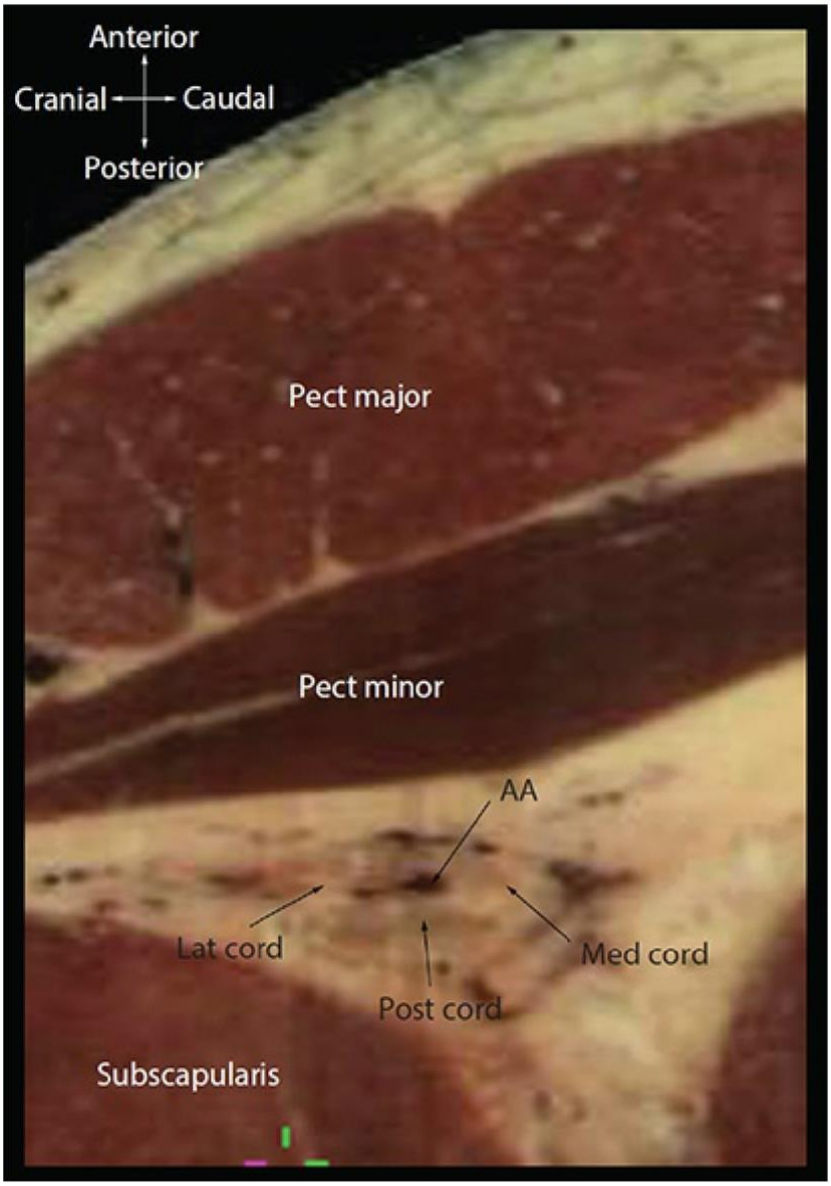


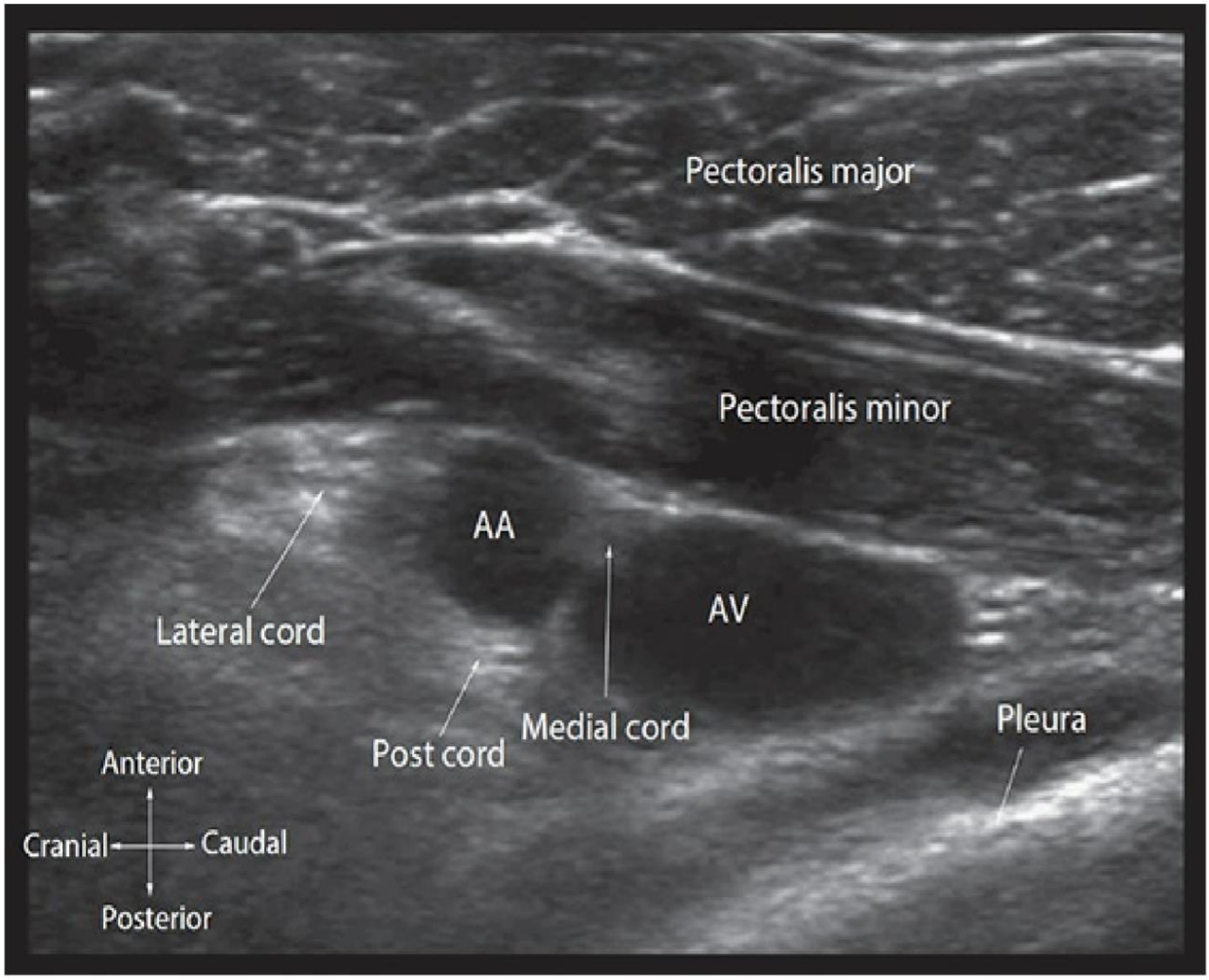

Pectoralis major
Pectoralis minor
AA
AV
Lateral cord
Medial cord
Post cord
Pleura
Anterior
Cranial
Caudal
Posterior

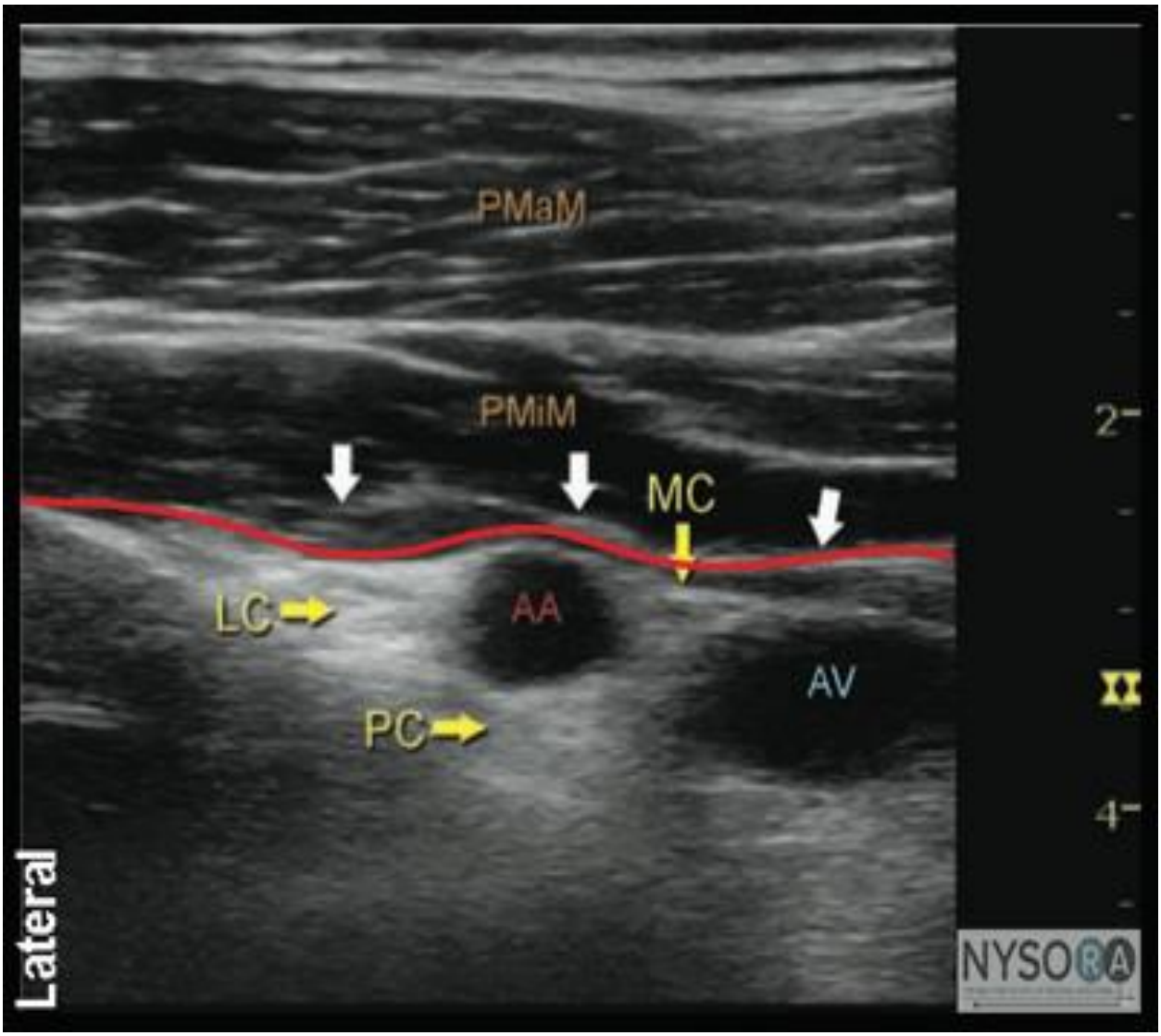


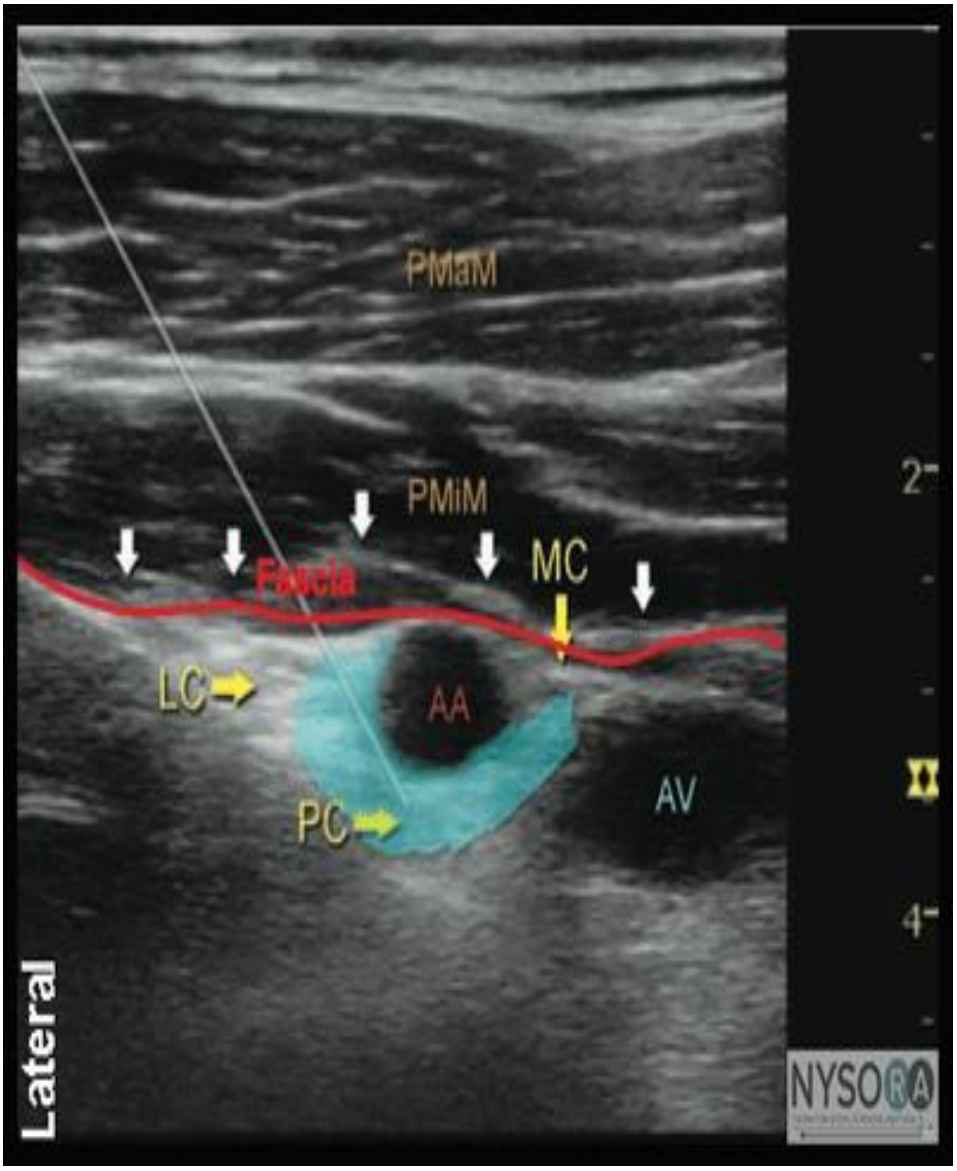
Indications:

- Anesthesia and analgesia in the distal upper arm
- Elbow,
- Forearm
- Hand


Anterior
Cranial
Caudal
Posterior
Pect major
Pect minor
AA
Lat cord
Med cord
Post cord
Subscapularis


Pectoralis major
Pectoralis minor
AA
AV
Lateral cord
Post cord
Medial cord
Pleura
Anterior
Cranial
Caudal
Posterior


PMaM
PMiM
MC
LC
AA
AV
PC
Lateral
2
4
NYSORA


PMaM
PMiM
Fascia
MC
LC
AA
AV
PC
Lateral
2
4
NYSORA

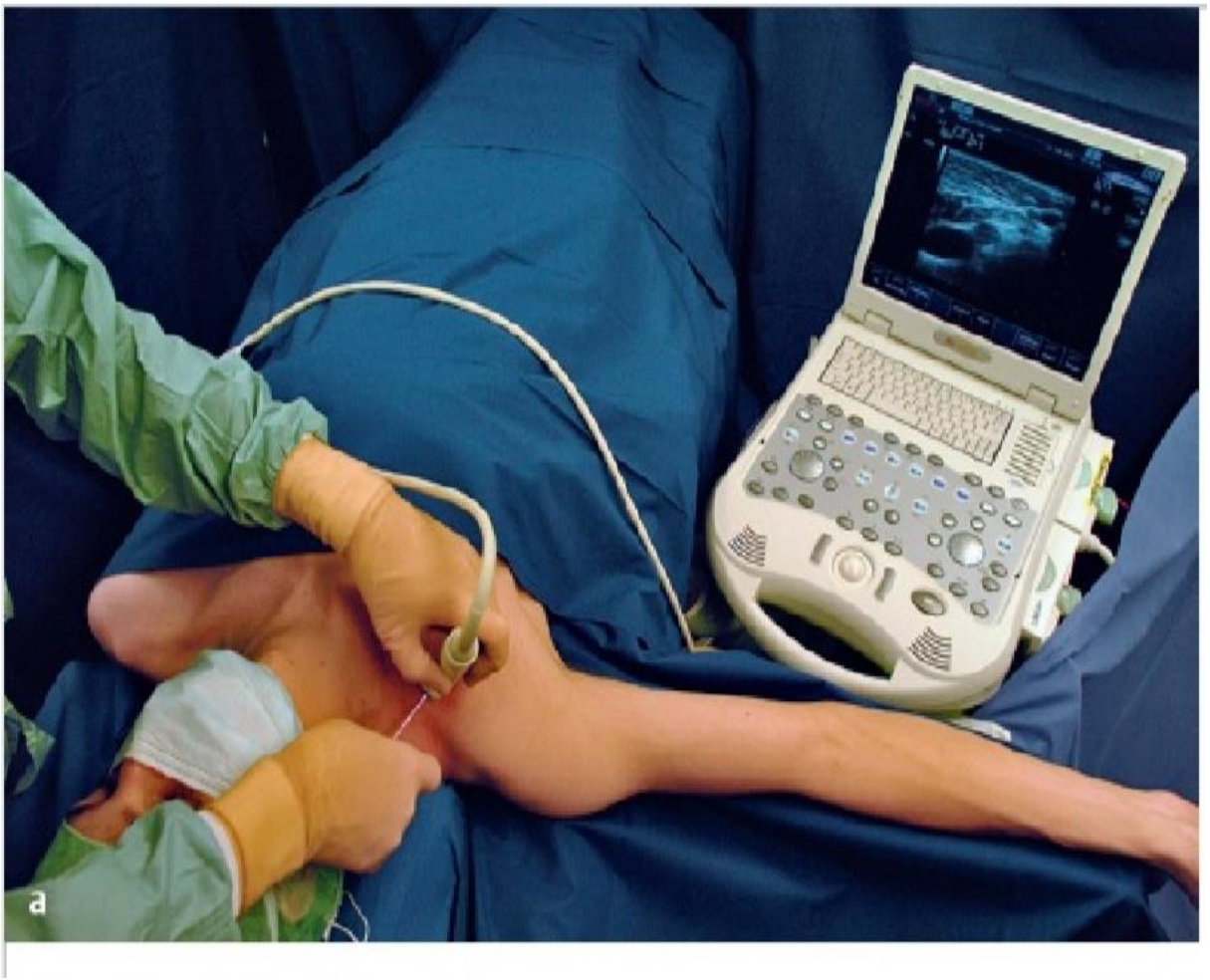
Position: Supine, head turned away, arm abducted 90 and elbow flexed

Transducer: parasagittal just medial to coracoid process, inferior to clavicle.

In-plane needle; 3-5 cm depth

Goal: LA around axillary artery in U shape (cephalad, caudad and posterior)

Volume: 20-30 mls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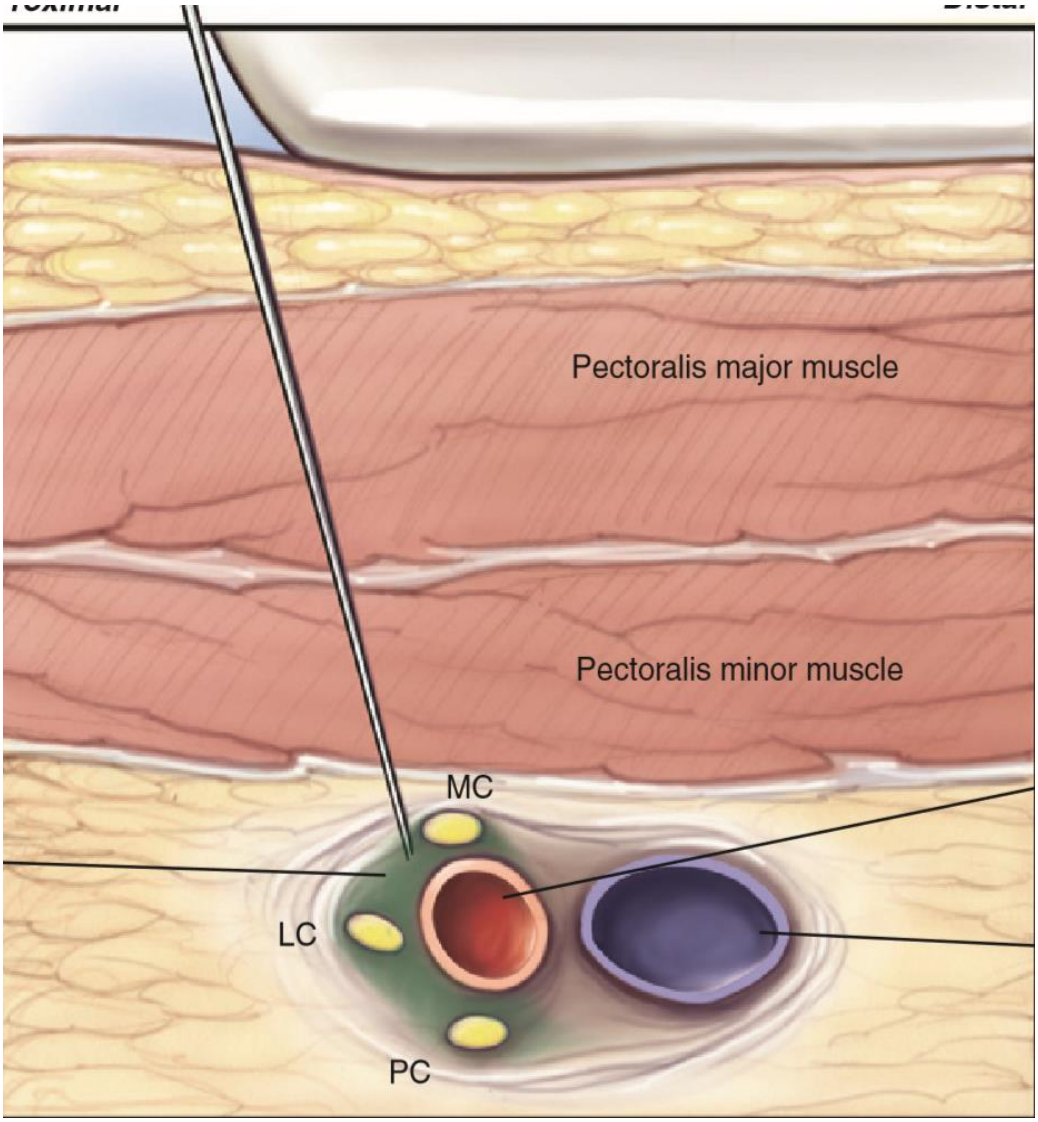
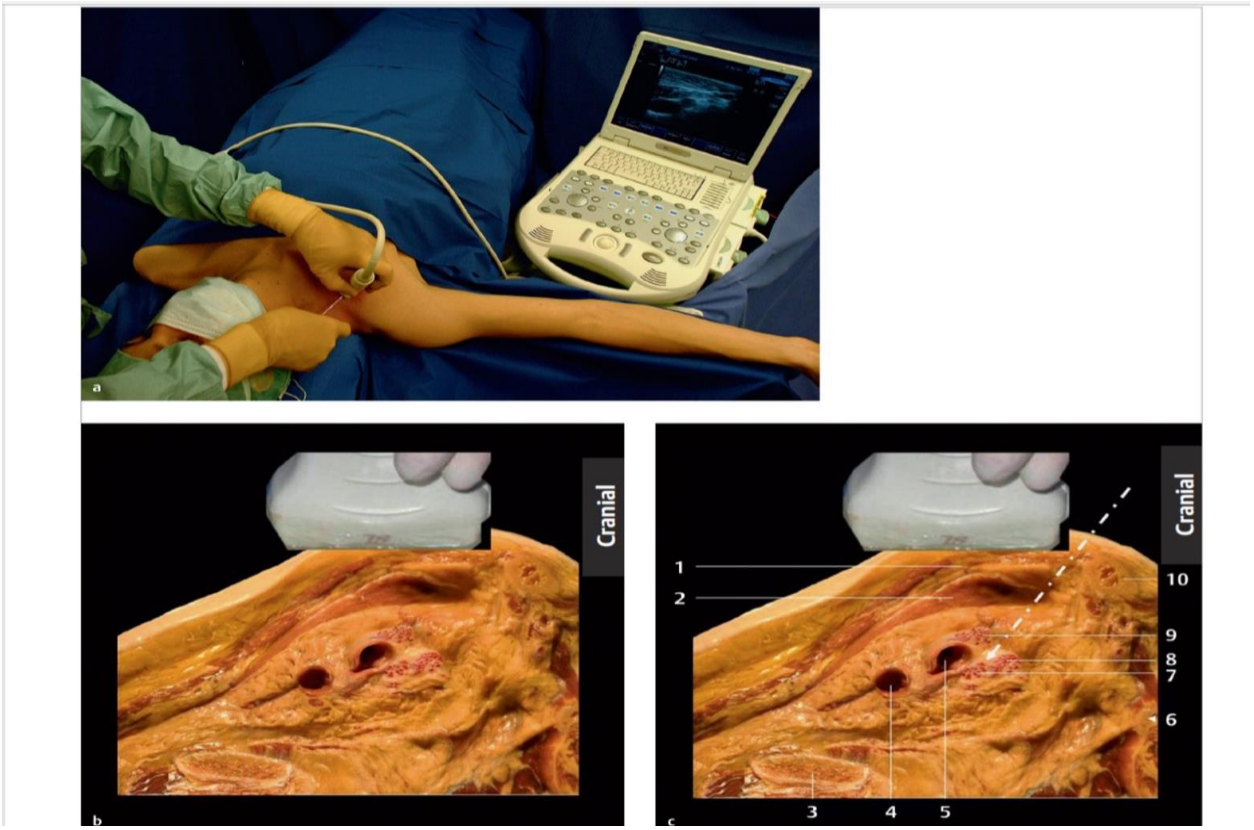
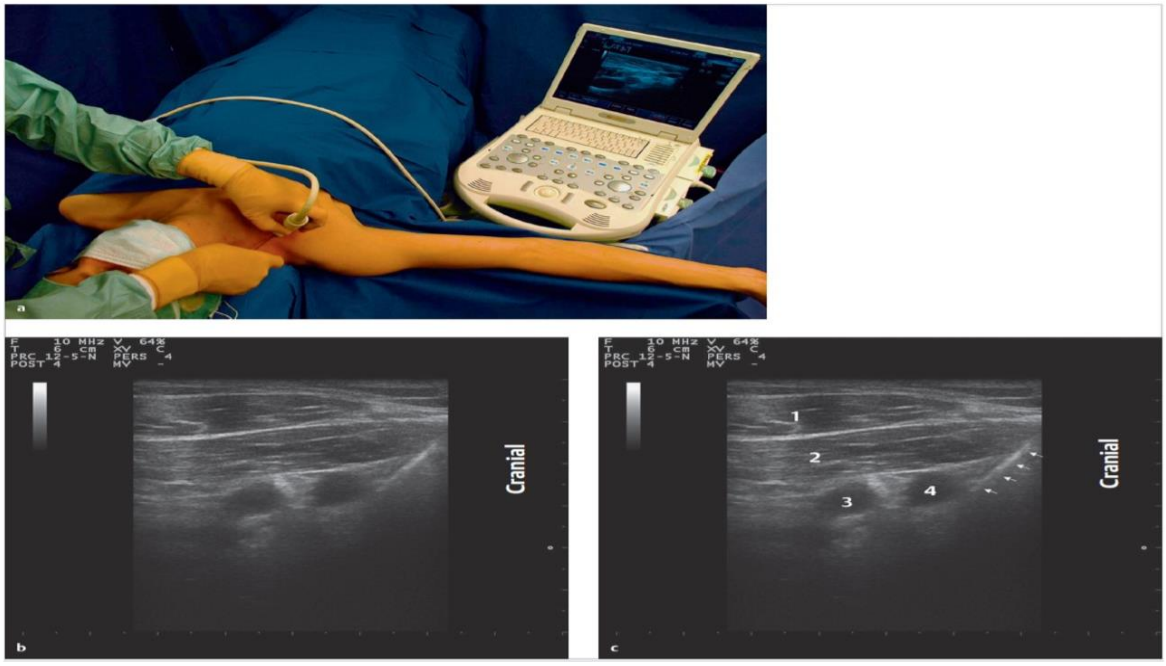

Pectoralis major muscle
Pectoralis minor muscle
MC
LC
PC



Clinical Pearls:

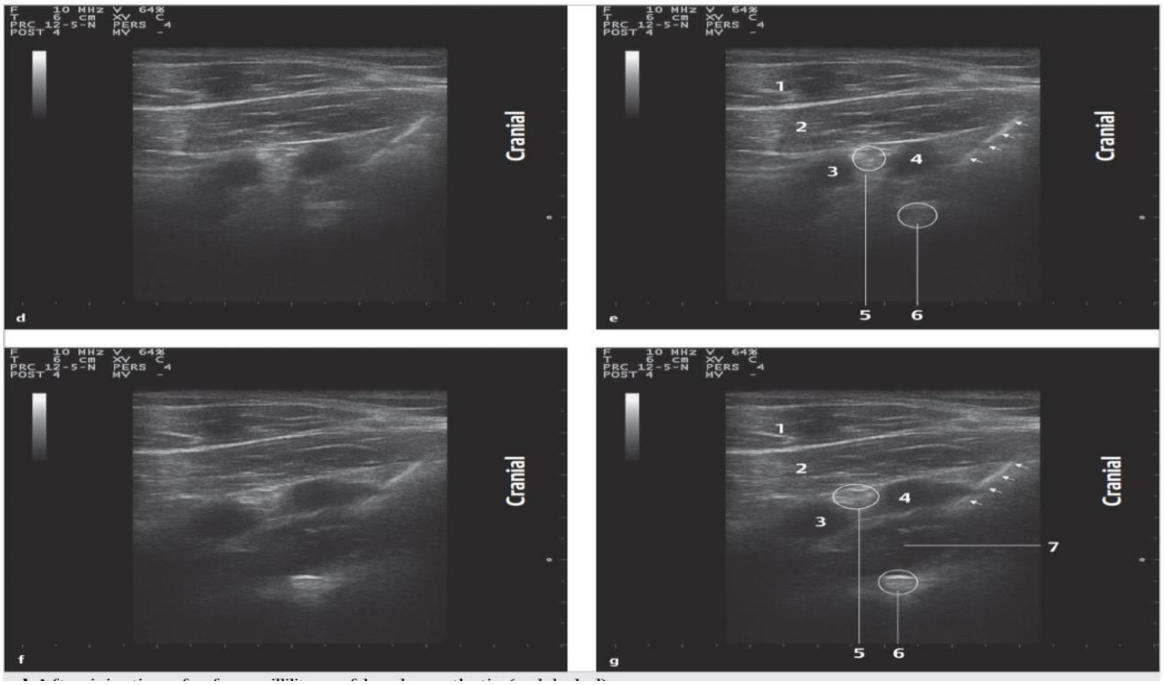
- Ultrasound visualization of the brachial plexus at the LICF is best achieved with the arm in the abducted position.
- Abduction of the arm brings the cords closer to the skin and elevates the lateral part of the clavicle, which makes more space available below the clavicle for placement of the ultrasound transducer.



Practical hints:

Abducting the arm by 90° improves visualization of the structures: The cords are bundled more and closer to the surface of the body.

Abducting the arm 110° and externally rotating the shoulder bring the brachial plexus more superfi cial and pleura anterior, thus care is required with needle insertion



Advantages	Disadvantages
Compact brachial plexus	Deeper block
Anatomic variation uncommon	Specialized equipment (small curved probe)
Stable location for catheters	
Arm positioning	
Tourniquet tolerance	

Approach:

Patient position: Supine with arm at the side or with the arm abducted and elbow flexed.

Transducer: 11 mm curved array oscillating at 8 to 10 MHz or 25 mm linear transducer oscillating at 10 MHz.

Transducer orientation: In or lateral to the deltopectoral groove with a parasagittal orientation.

Needle: 22G, 5-cm blunt tip needle.

Local anesthetic: 15 to 30 mL of 0.5% ropivacaine or 0.5% bupivacaine with epinephrine.

Technique: The patient monitors are placed, and sedation is introduced. Oxygen by face mask is

Plane advantages and disadvantages:

- IN PLANE

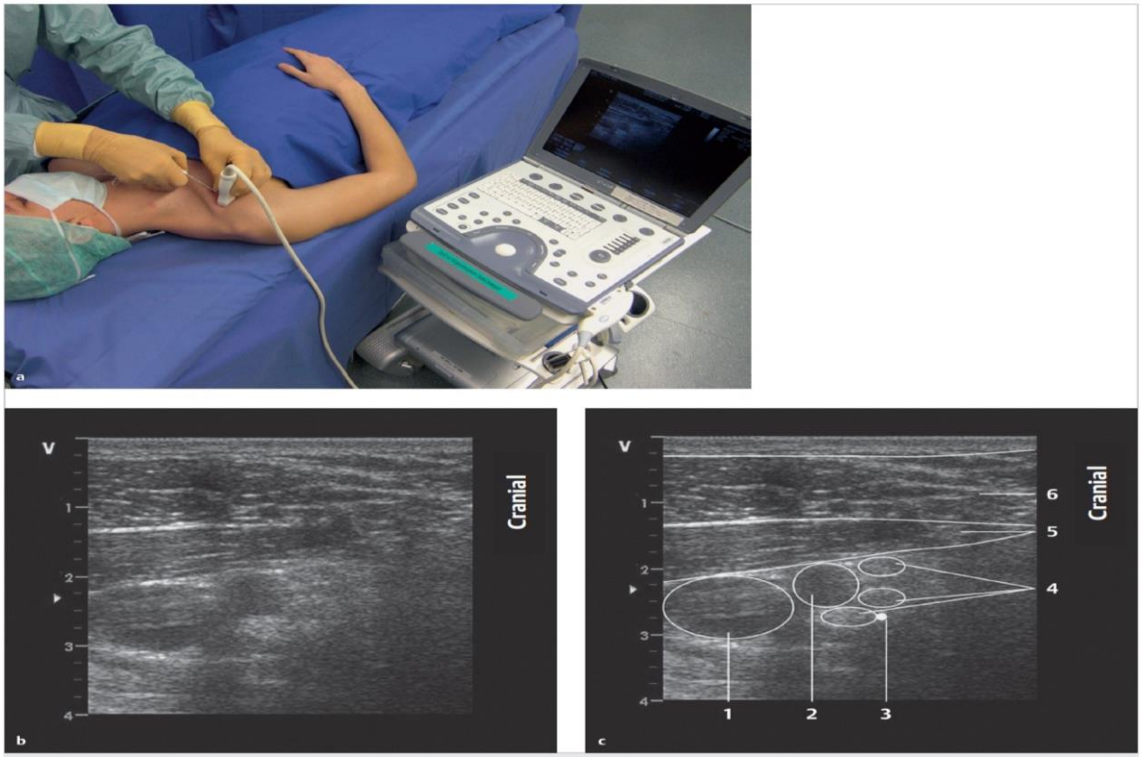
View shaft of needle

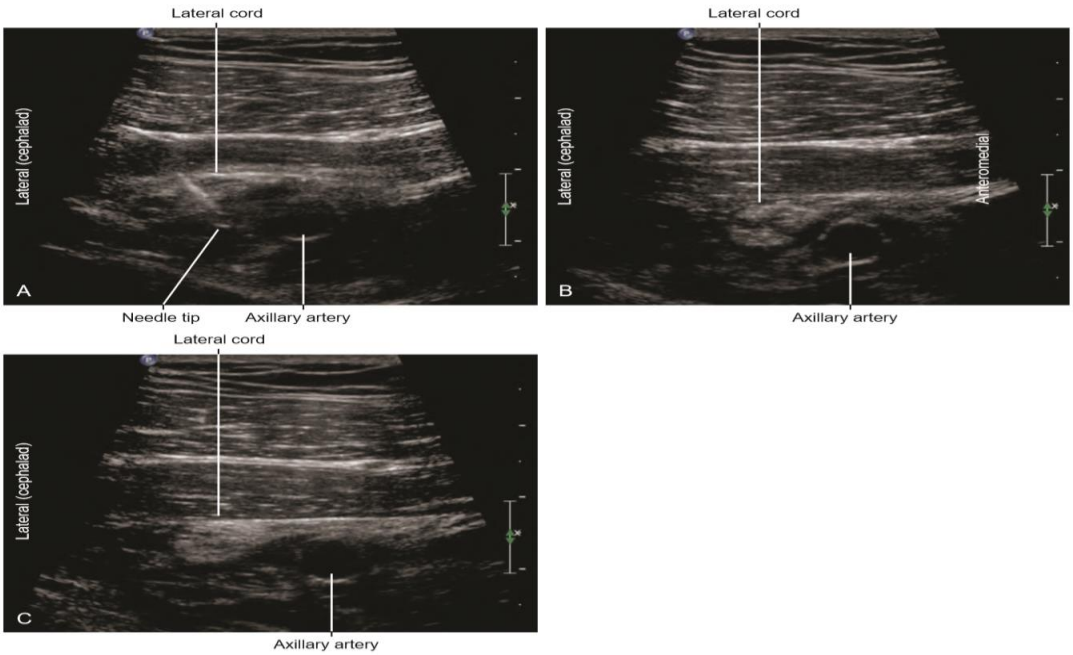
Surrounding tissues

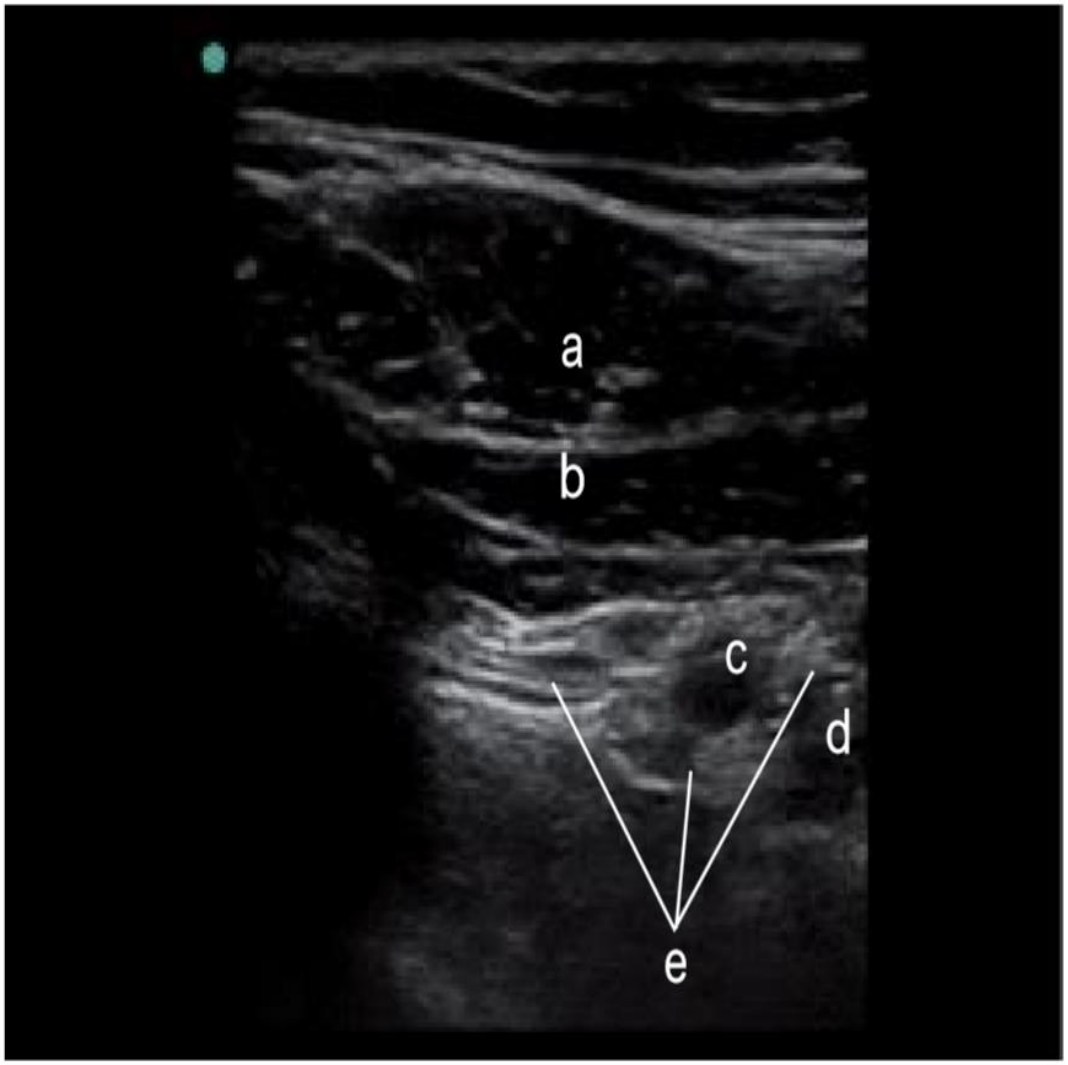
Out of plane:

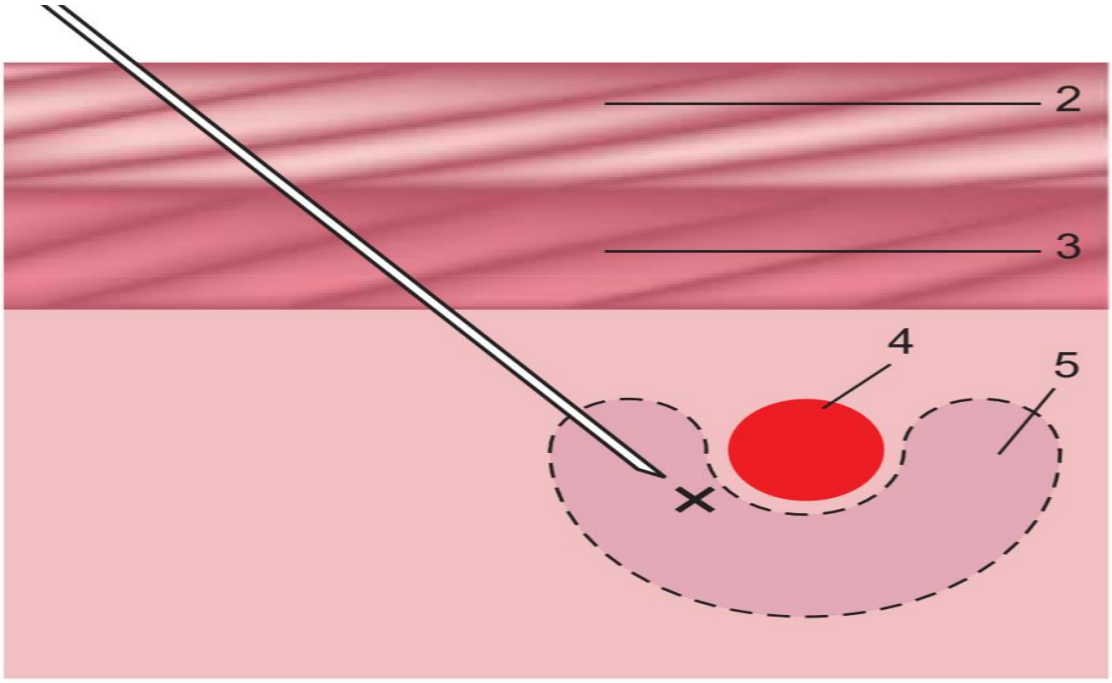
- An out-of-plane approach using the modified Raj technique is possible.
- . Placement and positioning of the transducer are the same as in the in plane approach; the axillary artery is set at the center of the image.
- . The direction of insertion is vertical to the transducer from medial to lateral.

- The angle of the needle should be relatively steep (puncture ca. 2cm medial to the transducer).
- The tip of the needle should come to a stop below the axillary artery; spread should be circular or U-shaped around the axillary artery.
- The out-of-plane technique has an increased risk of puncturing a vessel.




Lateral cord
Lateral (cephalad)
A
Needle tip
Axillary artery
Lateral cord
Lateral (cephalad)
Anteromedial
B
Axillary artery
Lateral cord
Lateral (cephalad)
C
Axillary artery


a
b
c
d
e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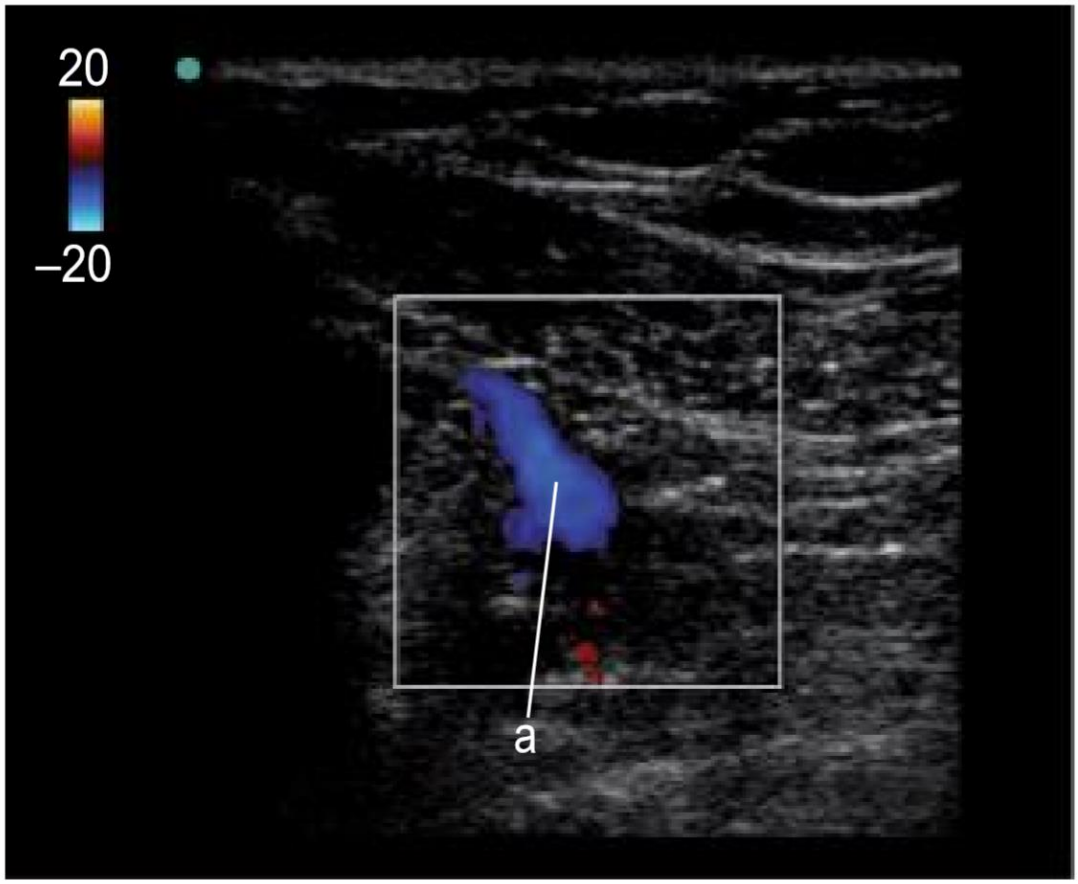
20
–20
a

Contraindications:

- Allergy to local anaesthetic
- Clinically manifest severe coagulation disorders.
- Infection or haematoma at injection site.
- Lack of experience with performing nerve block .
- Relative contraindication: neurological defects.
- Thorax deformity .
- Foreign bodies in the needle insertion area (e.g. pacemaker)
- Patient refusal.
- Contralateral phrenic nerve paresis
- Contralateral recurrent nerve paresis
- Respiratory in sufficiency
- A bilateral blockis also regarded as contraindicated due to the risk of pneumothorax.

Catheter:

- A catheter can be placed using the out of plan or in plan technique.
- The catheter should not be advanced too far (approx. 3 cm; Dhir and Ganapathy 2008).
- Experience shows the catheter can also be readily placed using the in-plane technique.
- Place the catheter in the cephaloposterior quadrant behind the subclavian artery, adjacent to the posterior cord, all three cords are in close proximity

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Fig. 4.31 Infraclavicular plexus catheter.

Complications:

- Complications associated with the infraclavicular nerve block include.
- Hematoma.
- Infection.
- Vascular puncture.
- local anesthetic toxicity.
- Horner Syndrome (An incidence between 1% and 6.9% is reported with the infraclavicular).
- Pneumothorax is avoided by maintaining the needle in the sagittal plane and avoiding medial movement. Minor dysesthesia has been noted in 2% of patients in large cohorts.

TAKE HOME MASSAGE

it is mandatory that anesthetic not be injected within the nerve. No pressure is required for these blocks.

they should not be painful. Pain and increased resistance to injection may be warning signs of intraneural injection.

nerve blocks require significant hand– eye coordination.

Position the patient, ultrasound machine, and operator in a comfortable position. The operator should be able to view the ultrasound image easily, and his or her hands should be in a position of comfort and stability. Aspiration prior to injection is wise with any procedure; this is even more important given the larger volumes of anesthetic employed for regional blocks (up to 20 or more mL for large nerves). Most importantly, motor blockade is common with regional nerve blocks; be sure to pad sensitive areas (such as the hip) to avoid injury or ulcer formation in the setting of a numb and immobilized extremity