

Superficial (and Intermediate) Cervical Plexus Block

Indications:

-**Tympanomastoid surgery.** When combined with the auricular branch of the vagus ('nerve of Arnold') by infiltrating subcutaneously into the medial side of the tragus), obviates the need for opiates.

-**Pinnaplasty or Otoplasty**

-**Lymph node** excision (within the anterior and posterior triangles of the neck)

-**Clavicular** surgery or fractures (may require intermediate cervical plexus block and its combination with interscalene block, see below)

-**Central Venous Catheters:** Renal replacement therapy central venous catheters, tunnelled **central venous catheters and portacaths** inserted into the subclavian or jugular veins (may require combination with 'Pecs 1' block for component of pain below the clavicle)

-**Tracheostomy** (see below discussion on safety profile of performing bilateral blocks and risks of respiratory distress due to phrenic nerve or recurrent laryngeal nerve block)

-More commonly in adults: **thyroid** (again, bilateral) and **carotid surgery**

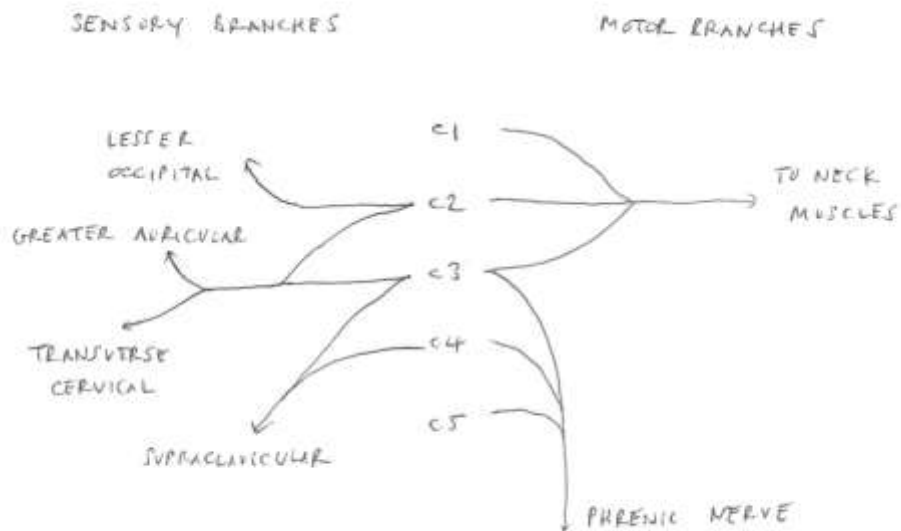
Contraindications:

-local sepsis or rash

Anatomy:

The cervical plexus arises from C1-C4 mixed spinal nerves (fig. 1):

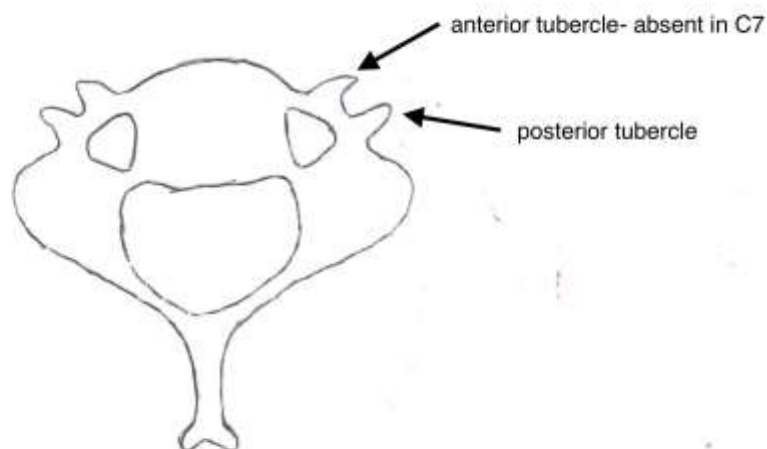
Fig. 1: CERVICAL PLEXUS SIMPLIFIED SCHEMATIC



Somatic sensory branches:

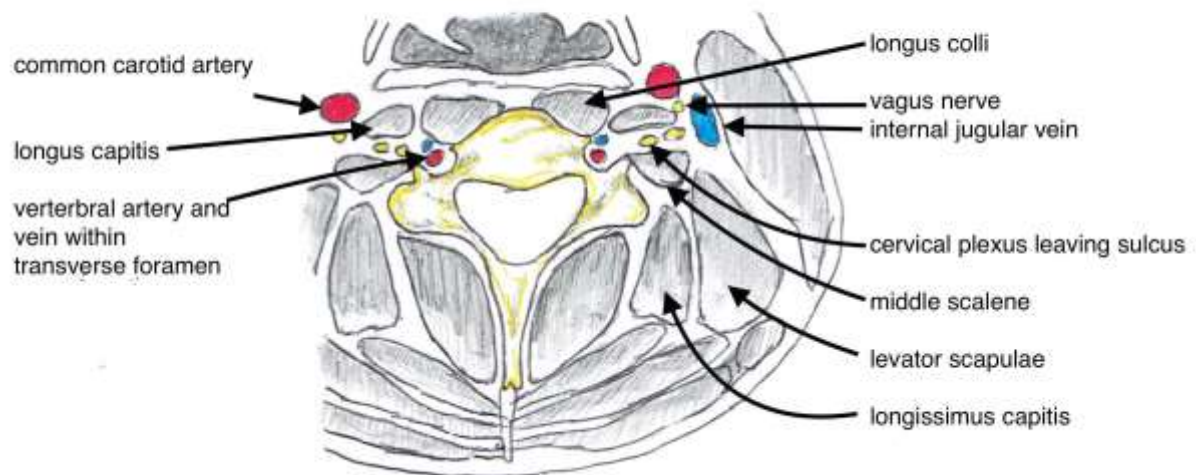
-arise from C2-C4 as the mixed spinal nerves leave the sulcus between the anterior and posterior tubercles of the transverse process (note C7 does not have an anterior tubercle or bifid spinous process):

Fig. 2: CERVICAL VERTEBRA



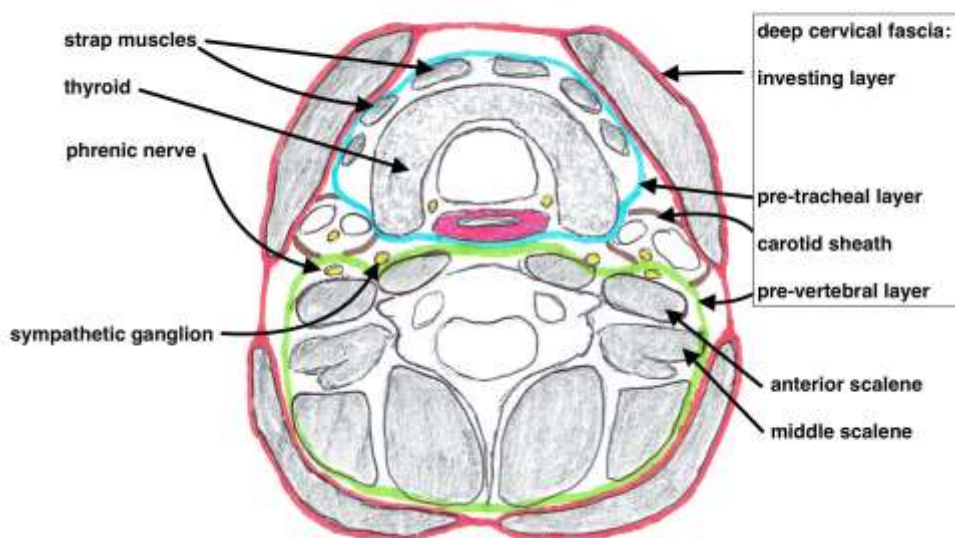
-pass between longus capitis and middle scalene perforating the prevertebral fascia. Note at C4 level the anterior scalene has largely disappeared having taken the bulk of its vertebral bony origin lower down. The bulkiest of the scalene muscles is the middle scalene and remains in view at this level:

Figure 3: FOCUS OF C4 CROSS SECTION OF THE NECK



-then pass behind the internal jugular vein out into the potential space between the investing layer of deep fascia ensheathing the sternocleidomastoid, and the prevertebral layer of deep fascia covering levator scapulae (fig. 4 schematic of deep fascial planes).

Figure 4: C7 CROSS SECTION OF THE NECK SHOWING FASCIAL PLANES



-then perforate the investing layer to become subcutaneous.

Thus, the true superficial cervical plexus is that that emerges in the **subcutaneous plane** from the midpoint of the sternocleidomastoid at the level of the upper margin of the thyroid cartilage.

Some older descriptions of the superficial cervical plexus block actually describe what is more recently described as the **'intermediate cervical plexus block'** (the portion of the plexus passing between the 'investing' and the 'prevertebral' layers of deep cervical fascia)¹. Scrutinising the literature reveals that some of the studies that investigated superficial cervical plexus blocks were in fact performing intermediate cervical plexus blocks. The interpretation below takes this factor into account.

Blockade of the intermediate plexus could conceivably lead to degrees of phrenic nerve (in its course anterior to the anterior scalene muscle slightly lower down in the neck) or recurrent laryngeal nerve block - (see fig 5) and potentially, degrees of interscalene brachial plexus block (in its course, again, slightly lower down in the neck-see fig 4) particularly with larger volumes and higher concentrations. Neither complication appears to manifest clinically or cause patient compromise in a large meta-analysis of over 2000 superficial and intermediate cervical plexus blocks in adults². No such similar study has looked at the paediatric population.

The safety profile of performing bilateral intermediate cervical plexus blocks (vs unilateral) may be more difficult to delineate. There are a series of publications in the last 20 years of small numbers of ASA1-2 patients (20-100 patients) having bilateral intermediate or deep cervical plexus blocks with 0.25% to 0.5% bupivacaine or ropivacaine at no more than 0.1ml/kg with no incidence of features suggestive of respiratory compromise^{3,4,5,6,7,8}. In Pandit's meta-analysis (over 10,000 deep to superficial blocks), in which unilateral vs bilateral is not specified there was a incidence of 0.03% of respiratory distress (all from deep, not intermediate or superficial blocks) whereby intubation and conversion to general anaesthesia had to be undertaken for presumed phrenic or recurrent laryngeal nerve block². Bilateral intermediate blocks seem likely to be safe in experienced hands, in patients with reasonable respiratory reserve, at low volume (0.05ml/kg to 0.1ml/kg) carefully placed between the investing and prevertebral fascias, in a more lateral and superficial location (ie avoiding hydrodissecting all the way toward the carotid sheath- see ultrasound schematic). Lower concentrations of local anaesthetics may also contribute toward safety.

The intermediate block may be more successful, as compared with the true superficial block, in providing more profound analgesia or anaesthesia of the neck particularly for deep structures such as the carotid artery, and deeper muscles that may have an autonomic sympathetic or 'visceral' distribution of pain. There is a body of evidence that intermediate cervical plexus blocks, and possibly superficial cervical plexus blocks are at least equivalent

(if not better, with lower rates of conversion to GA) to deep blocks, and both are significantly safer^{2,9,10,11}. The literature is almost exclusively amongst the adult population.

The skin overlying the clavicle is innervated by the supraclavicular branches of the SCP from its medial end all the way to the acromion although there is likely a degree of crossover with the upper and middle trunks of the brachial plexus toward its lateral end¹².

Clavicular bony pain (both medially and laterally) may require a combination of superficial or intermediate cervical plexus block with interscalene brachial plexus block (that can be targeted toward C5/6 roots higher in the interscalene groove) due to its contribution to bony innervation¹².

Technique:

Patient semi- recumbent

Patient looking to opposite side

Heading resting on pillow (consider sliding the pillow so it is out of the way of your hand doing the needling)

50mm block needle primed

Linear probe set to higher frequencies

Clean area and estimate midpoint of sternocleidomastoid muscle.

Start deep to identify surrounding structures then focus up to the area of interest. See the bulk of the sternocleidomastoid muscle tailing off to its posterolateral margin.

Look specifically for vascular structures: carotid, jugular and vertebral vessels (use doppler if needed)

If you see the brachial plexus and bulky scalenes muscle you are too low- scan up to the level of the thyroid prominence or higher. You can even count up the transverse processes of the cervical vertebra from C7 to C4 (see ultrasound schematic below).

In plane needle entering from lateral.

For true superficial cervical plexus (skin sensory block only): infiltrate subcutaneously at lateral margin of sternocleidomastoid

For intermediate cervical plexus: advance needle tip through 'investing' deep fascia (the 'pop' described in the landmark technique) and slide into position underneath sternocleidomastoid muscle keeping an eye on vessels eg internal jugular vein medially.

Aspirate. If no blood, inject local anaesthetic hydrodissecting the plane between the sternocleidomastoid and levator scapulae muscles and their deep cervical fascias (investing and pre-vertebral).

Volume: 0.1 ml/kg, no more than 0.3ml/kg.

Potential complications:

Intravascular injection and its sequelae

If intermediate cervical plexus block, as per interscalene block (although the incidence of serious complications of such blocks in the literature seems close to zero):

- intravascular injection
- phrenic nerve block (sensation of breathlessness)
- interscalene brachial plexus block
- horner's syndrome (blurred vision, eyelid droop)
- recurrent laryngeal nerve block (hoarse voice)

Top tips:

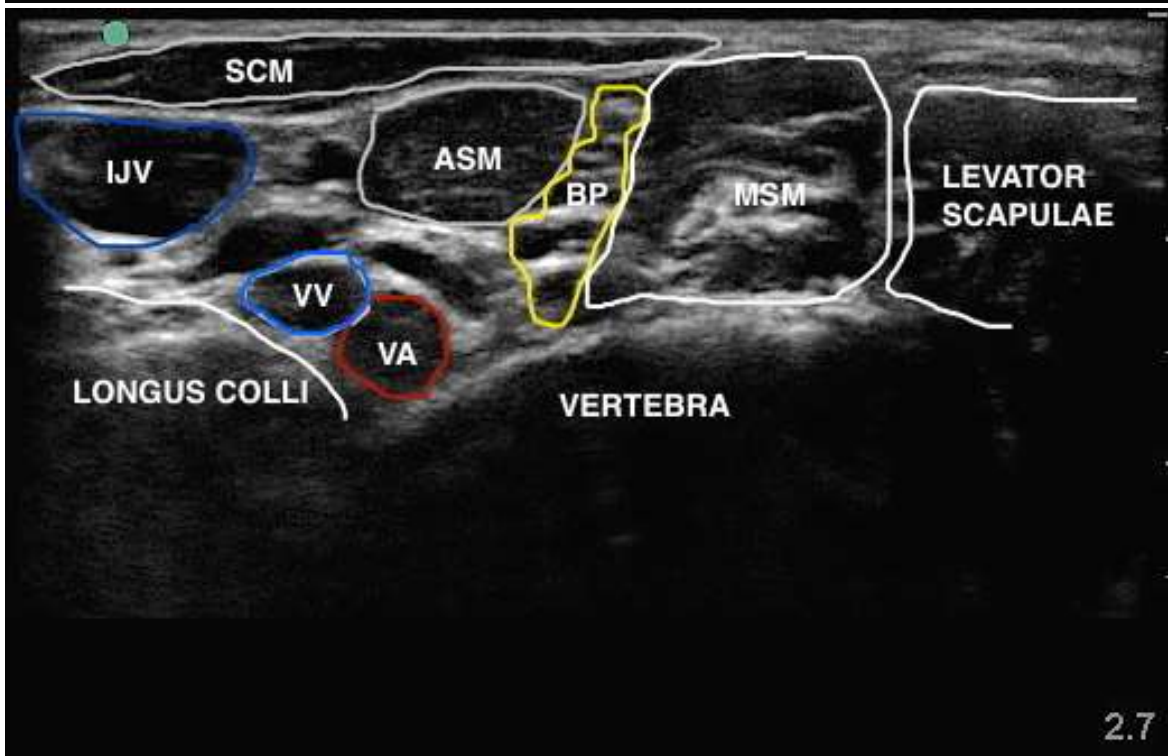
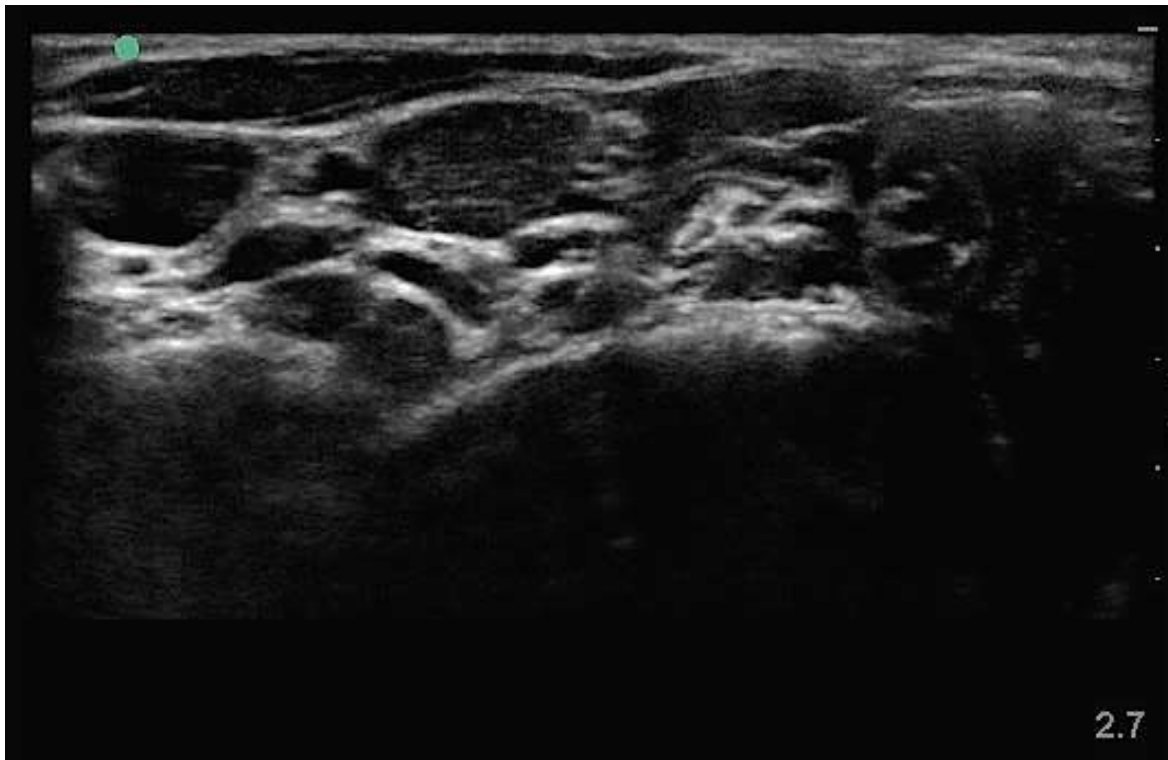
In smaller children and infants, the sternocleidomastoid muscle is underdeveloped and thin. Care needs to be taken to carefully orientate oneself to recognise the anatomy.

Note the external jugular vein may cross the field: adjusting pressure with the probe may help identify such vessels.

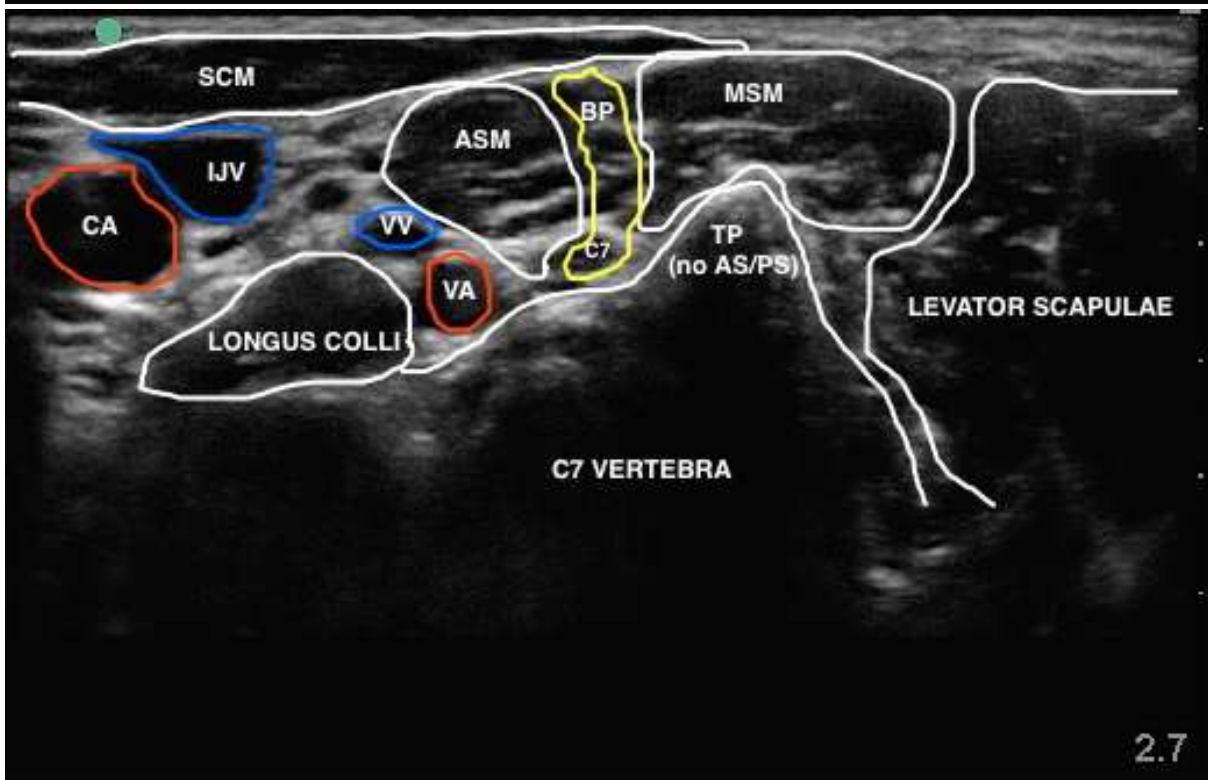
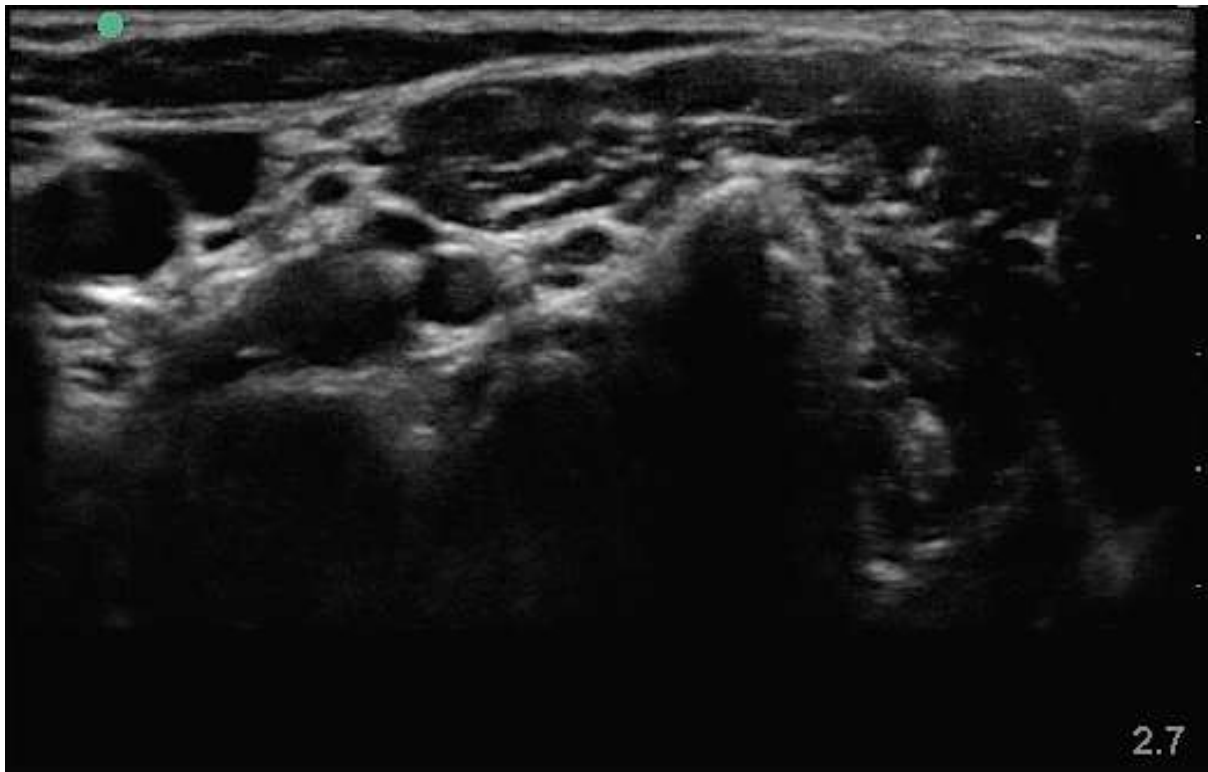
Ultrasound Schematic Sequence:

Scanning from C7/T1 level up to C4: the level of Superficial Cervical Plexus blockade): SCM Sternocleidomastoid, IJV Internal Jugular Vein, CA Carotid Artery, VA and VV Vertebral Artery and Vein, ASM Anterior Scalene Muscle, MSM Middle Scalene Muscle, AT Anterior Tubercle, PT Posterior Tubercle, BP Brachial Plexus

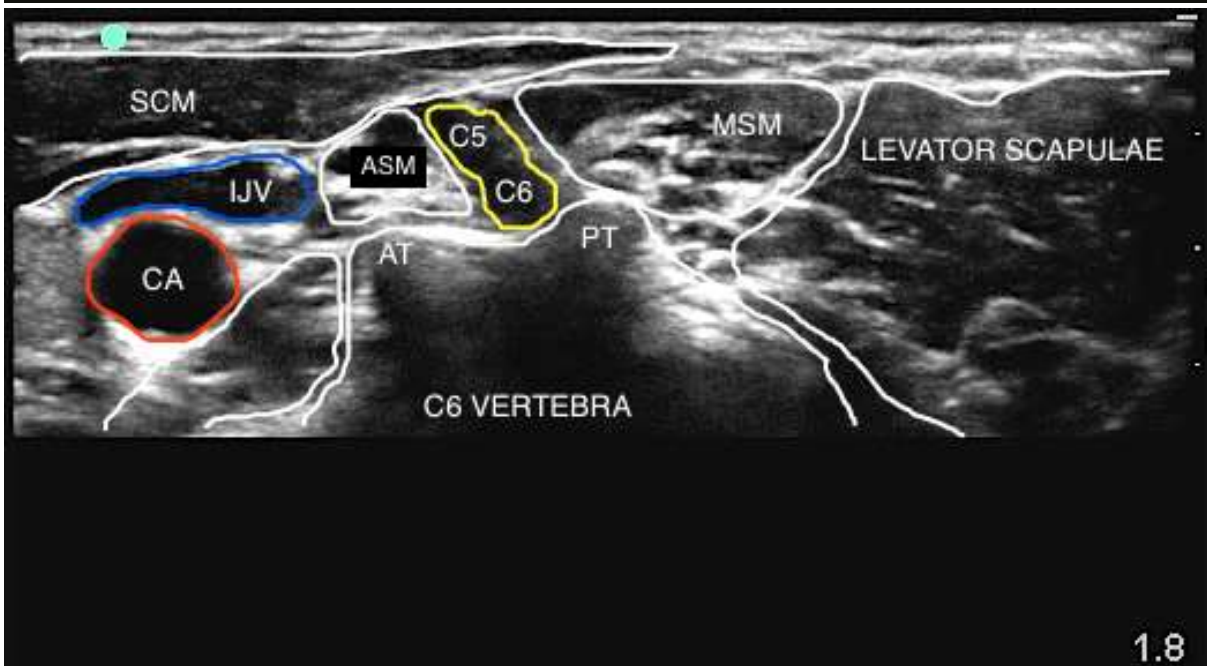
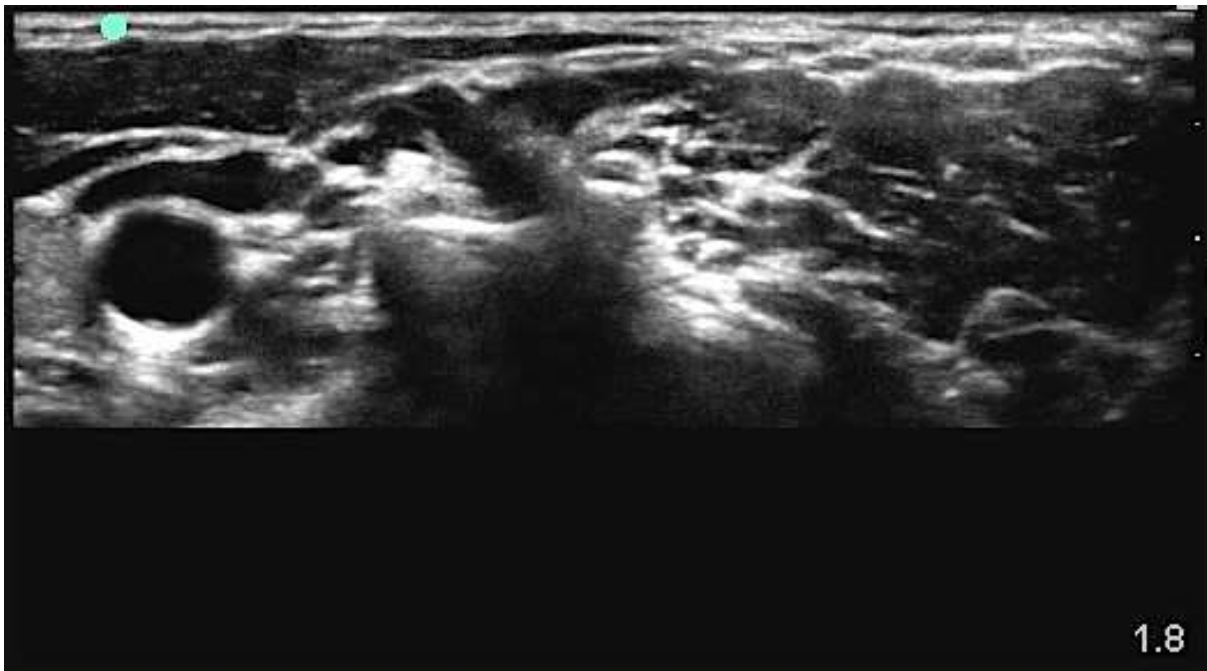
Scan low in the neck at level of C7/T1 showing the interscalene brachial plexus:



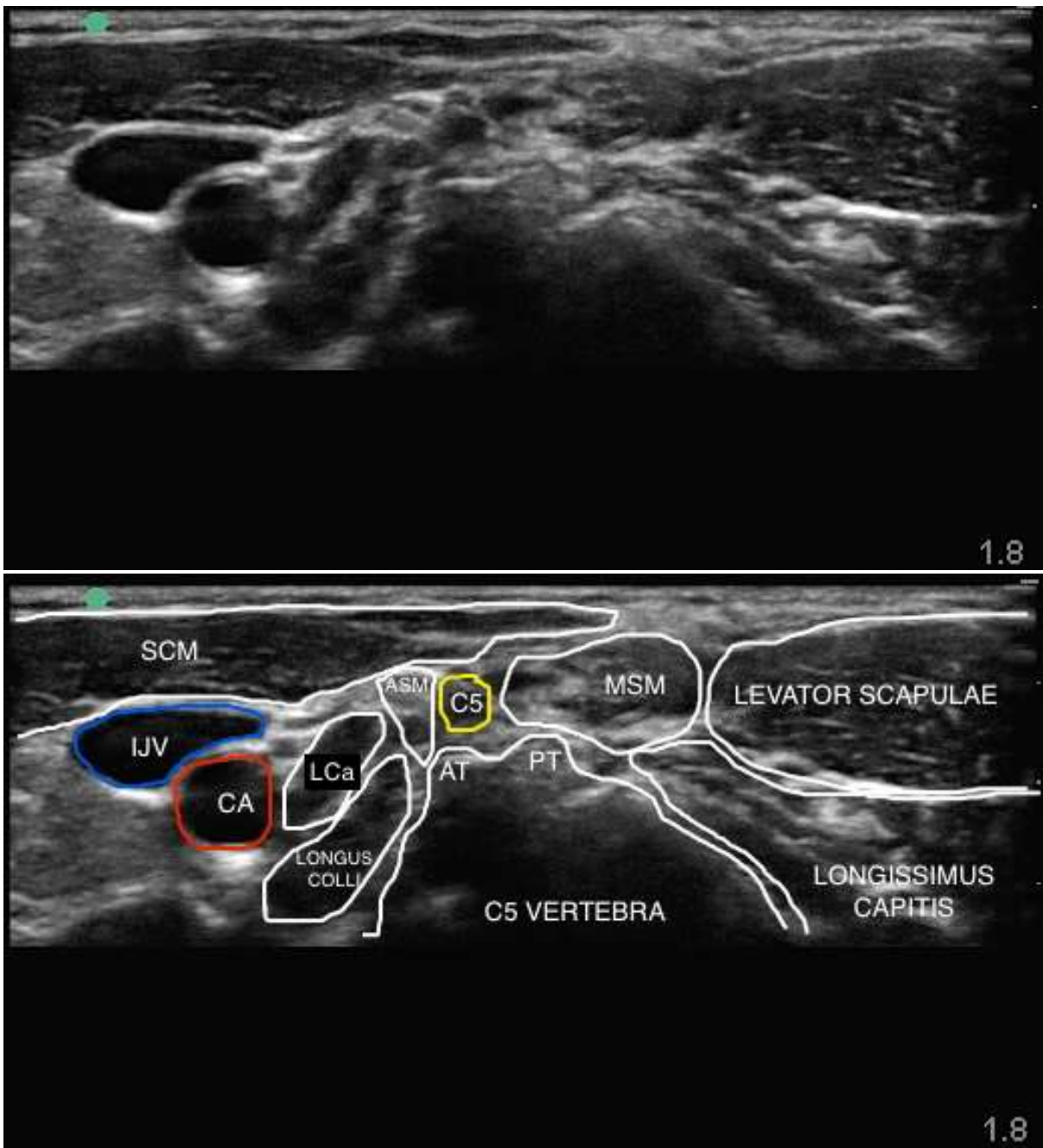
Scan at C7 showing C7 root dropping into the intervertebral foramen and the morphology of the transverse process, lacking the anterior tubercle, as compared with the more cranial cervical levels:



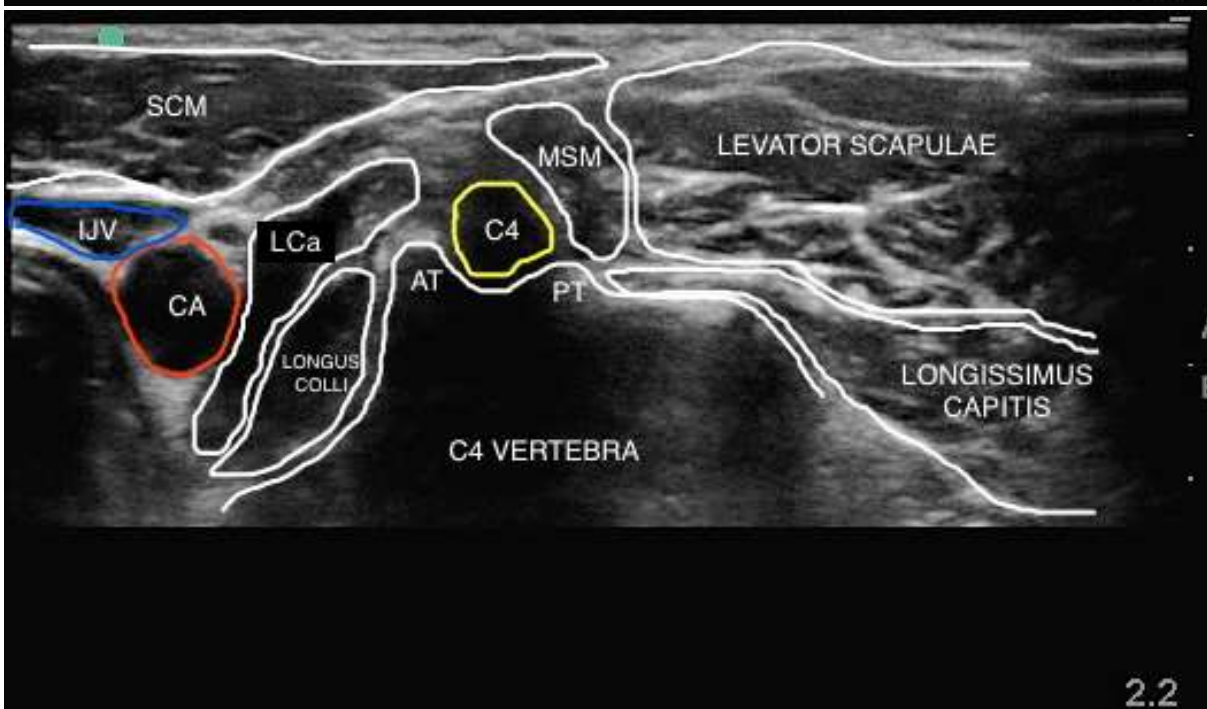
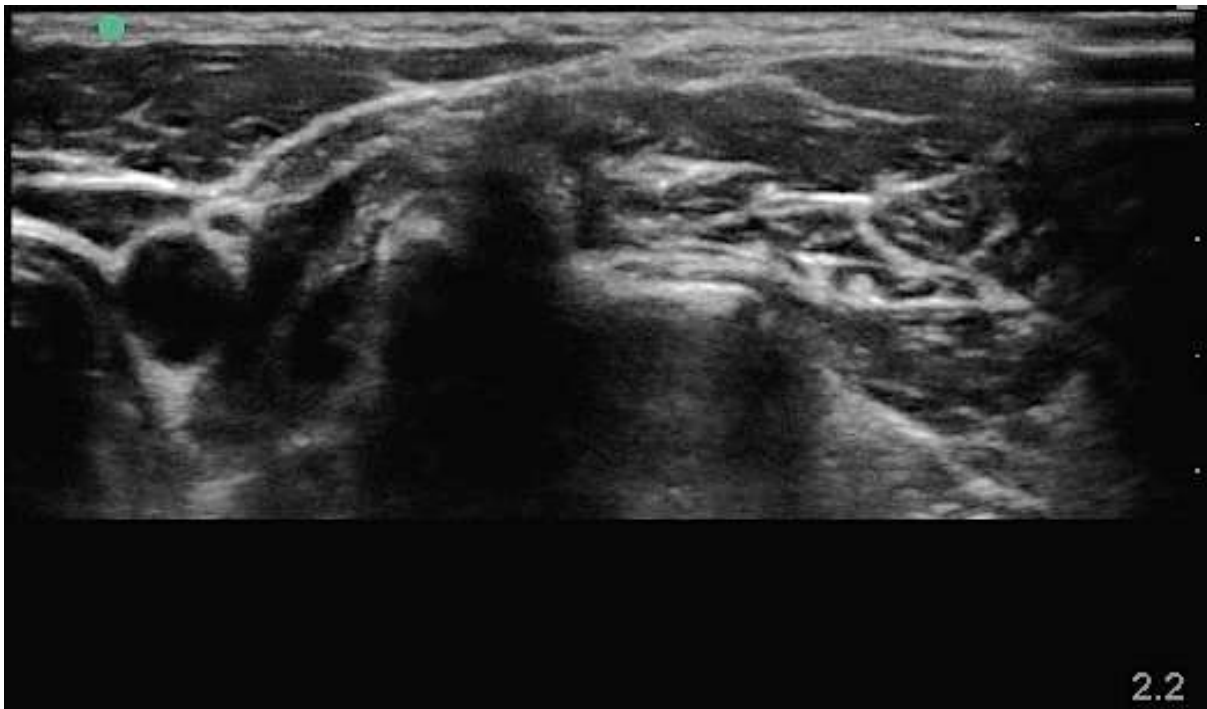
Scan at C6 showing the appearance of the anterior and posterior tubercles with C6 root dropping into the intervening sulcus:



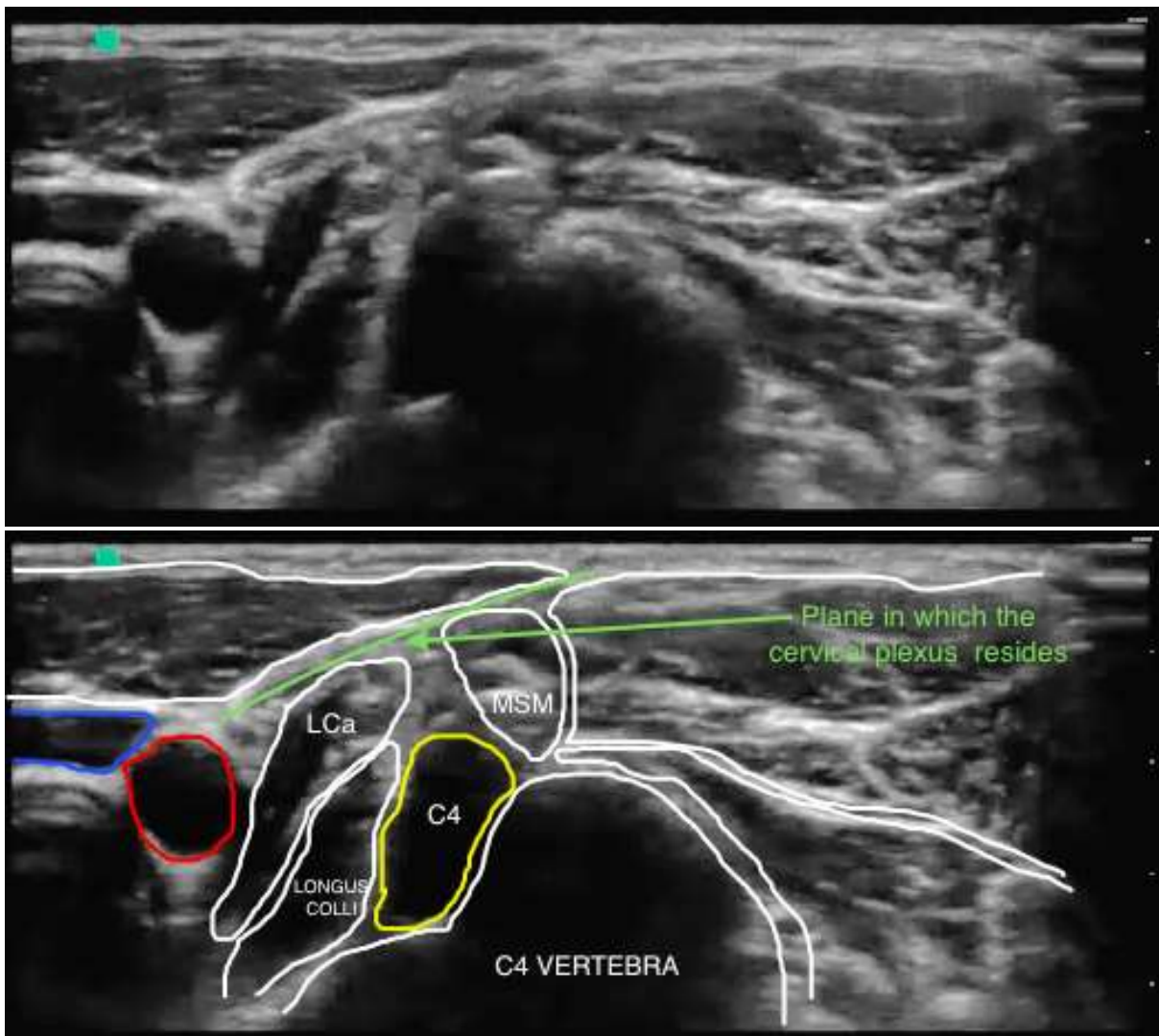
Scan at C5 showing C5 root dropping into its corresponding sulcus. The scalene muscles appear smaller as they tail off into their tendinous attachments to the upper cervical transverse processes. The longissimus and longus capitis (LCa) also appear:



Scan at C4 showing C4 root dropping into the sulcus as the bodies of the scalene muscles tail off into their attachments becoming difficult to discern:

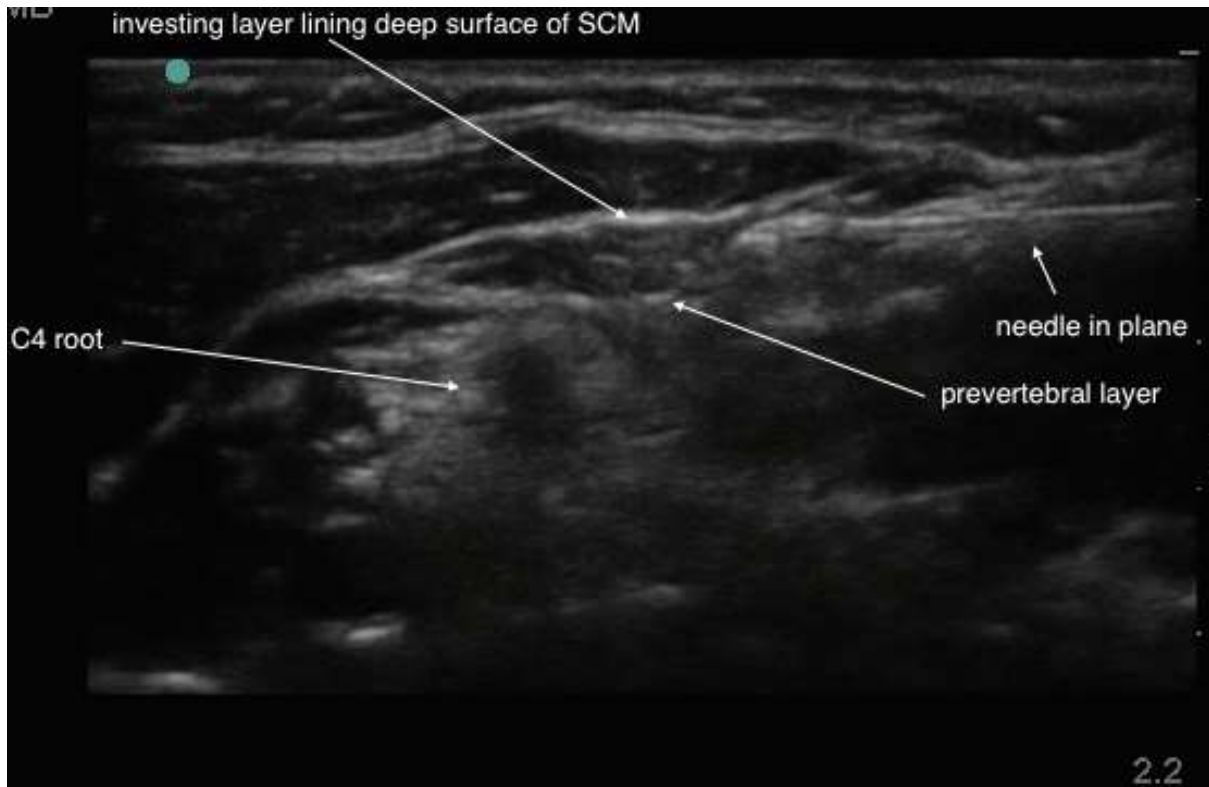


Scan at C4 as the C4 root disappears from the view into the intervertebral foramen. This is a suitable position for the Superficial Cervical Plexus Block. Infiltrate in the plane shown by hydrodissecting toward the carotid artery to generate the 'Intermediate Cervical Plexus block':

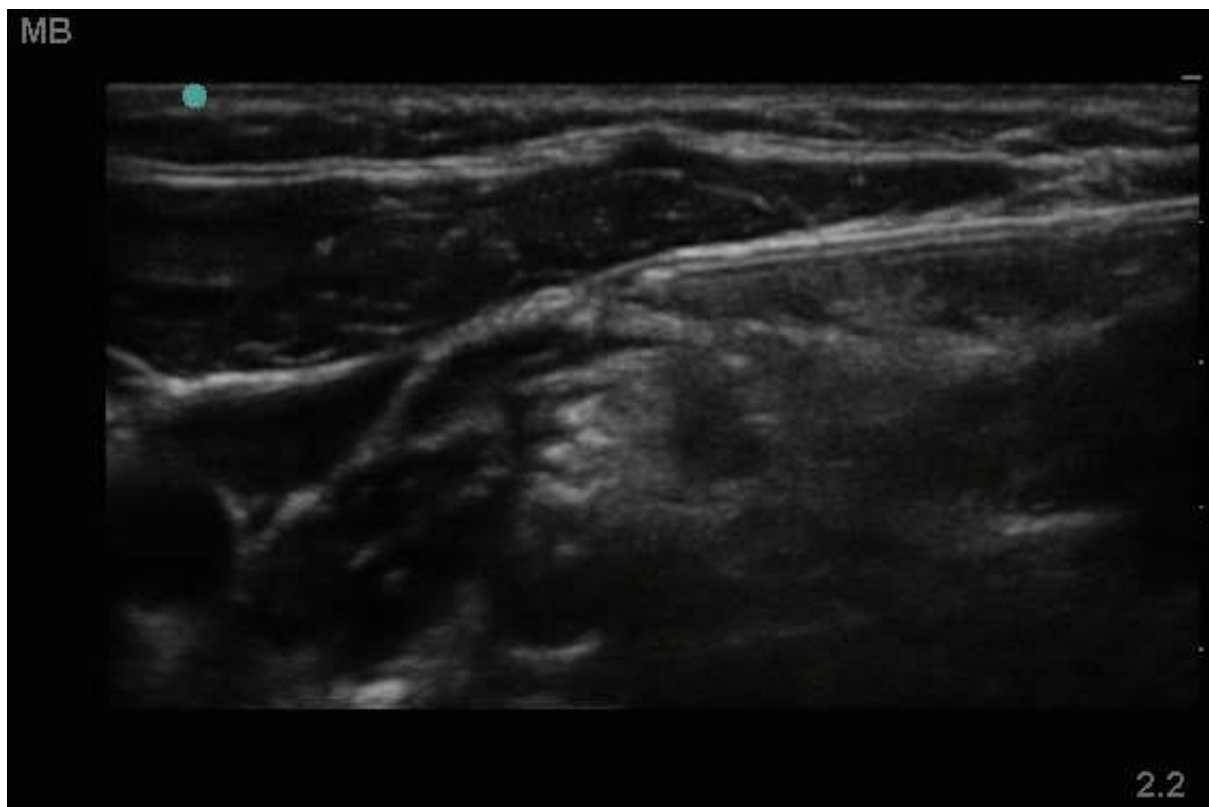


Ultrasound Sequence of in plane needling and local anaesthetic deposition:

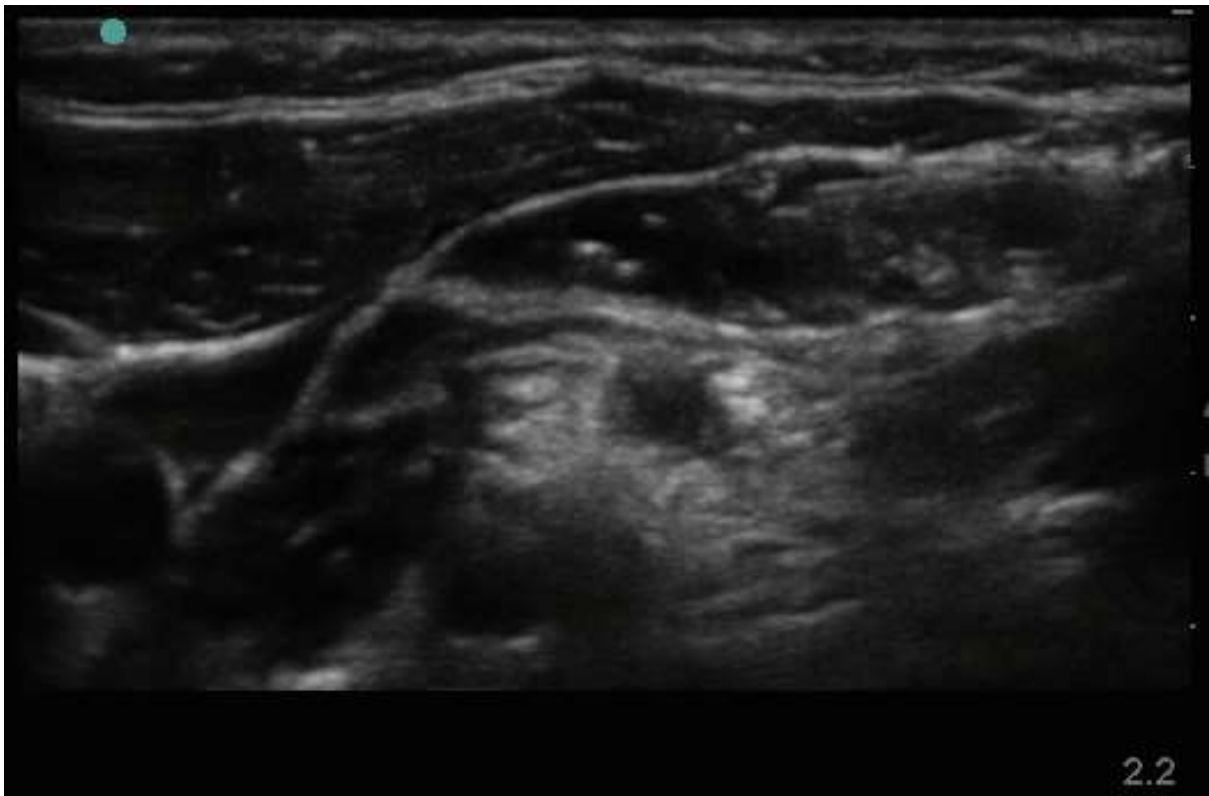
Needle advanced under SCM through investing layer of fascia:



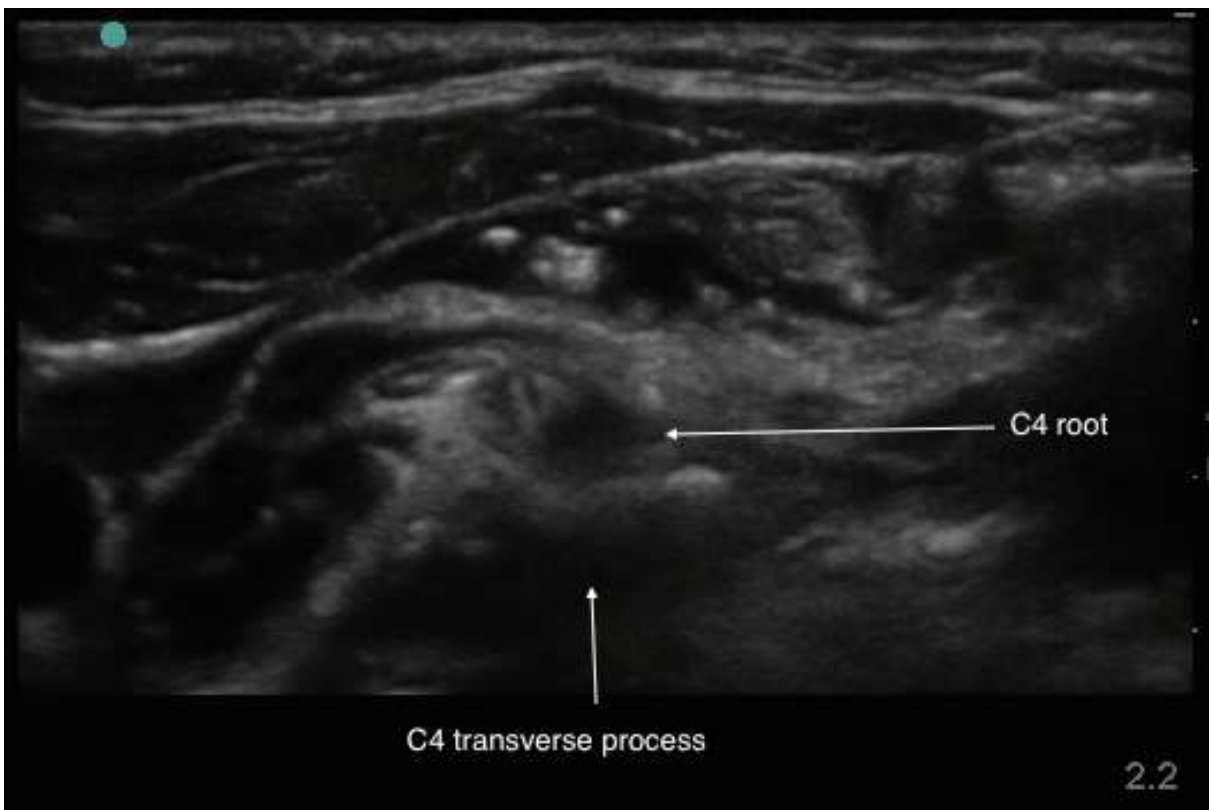
Needle Advanced under SCM:



Prevertebral fascia displaced down away from investing fascia as local injected:



Pool of local anaesthesia left between fascias. Identify the other structures seen in schematic sequence:



Bibliography:

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