Nerve blocks in head and neck

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Blocks Discussed

- Blocks for Cataract Surgery
  - Retro bulbar Block
  - Peri bulbar Block
- Airway Blocks
- Trigeminal Nerve Block
- Stellate Ganglion Block
- Cervical Plexus Block

The Anaesthetic solution

Components

- **Lignocaine 2%**
  - rapid onset of action
  - effect will usually last for an hour.
- **Bupivacaine 0.5%**
  - lasts for three hours or even longer;
  - useful for prolonged procedures.

- **Hyaluronidase**
  - increase the effectiveness – facilitates spread of anaesthetic through tissues.
- **Adrenaline**
  - slows absorption of anaesthetic agents into the systemic circulation.
  - provide a longer duration of action
  - reduce the risk of systemic toxic effects.
  - used in a concentration of 1:100,000

Preparing the solution

- Adrenaline
  - add 0.1 ml from a vial of 1:1,000 adrenaline to 10 ml of the anaesthetic solution (to get 1:100,000).

Basic Steps

- Introduce.
- Explain the procedure and reassure the patient.
- Check the patient's identity and procedure details
- Record base line vital signs.
- Check that resuscitation equipment and medication is available to deal with a systemic complication, should one occur.

Nerve Blocks For Cataract Surgery

Sensory

- The trigeminal nerve via ophthalmic, maxillary, and mandibular Divisions - sensory innervation of eye and adnexa

- The sensory fibres via ophthalmic division
  - exception portion of the lower lid - carried by the maxillary division.

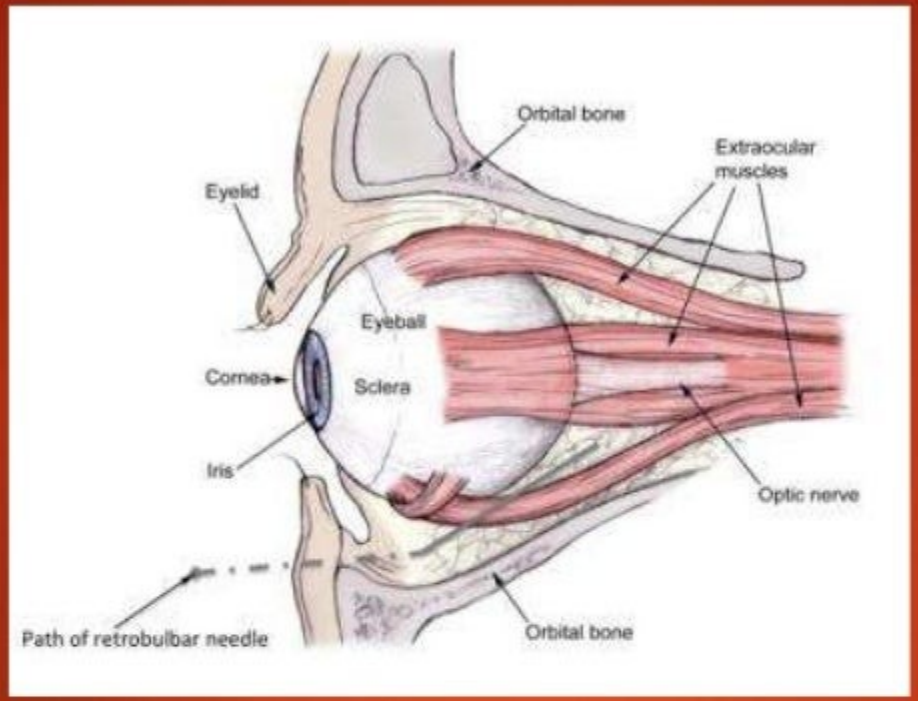
- Blocking the sensory fibres provides **anaesthesia** so that no pain is felt.

Motor

- oculomotor (III), trochlear (IV), and abducens (VI) - motor supply of the extraocular muscles and levator palpebrae superioris
- Paralysing these muscles - **akinesia** so that the eye does not move
- orbicularis oculi - responsible for the gentle and forcible closure of the eye - facial nerve (VII).
- Blocking - provide better surgical exposure and reduces the risk of forcing out the ocular contents if the patient tries to close his eyelids forcibly after the surgeon opens the globe.

ANATOMY

- The anteroposterior diameter of the globe - 24.15 mm (range: 21.7 to 28.75 mm).
- The axial length of myopic eyes are at the upper end of this range. This increases the risk of globe perforation, especially with a retrobulbar block.
- length of bony orbit - 40 to 45 mm.
- At its closest distance to the bony orbit, the globe is
  - 4 mm from the roof,
  - 4.5 mm from the lateral wall,
  - 6.5 mm from the medial wall,
  - 6.8 mm from the floor.



- **Retrobulbar space** lies inside the extraocular muscle cone, behind the globe.
- anterior orbit in the lower outer (inferotemporal) and upper outer (superotemporal) quadrants - Relatively avascular.
- **The superonasal quadrant** - highly vascular

Choosing The Technique

- **RETRO BULBAR BLOCK**
  - more efficient in producing anaesthesia and akinesia , has a faster onset of action.
  - carries higher risk of rare, yet serious, complications, such as globe perforation, retrobulbar haemorrhage, and injection of the anaesthetic into the cerebrospinal fluid (CSF).
  - A retrobulbar block should be avoided if the axial length of the eye is greater than 27 mm.

- **Peribulbar block**
  - The probability of complications is reduced
  - this technique is slower and less efficient,
  - higher risk of potential chemosis
  - puts more pressure on the eye

General Considerations

- Lie the patient flat in a safe and comfortable way, with head supported.
- Ask the patient to look straight ahead (not upwards or nasally); hold the patient's hand in front of his or her eye and ask him or her to look at it.
- Withdraw the plunger of the needle slightly before injecting the anaesthetic to make sure that you have not entered a blood vessel (blood) or the dural sheaths (CSF).
- Assess the efficiency of the anaesthesia by asking the patient to look in the four cardinal positions of gaze.

RETRO BULBAR BLOCK

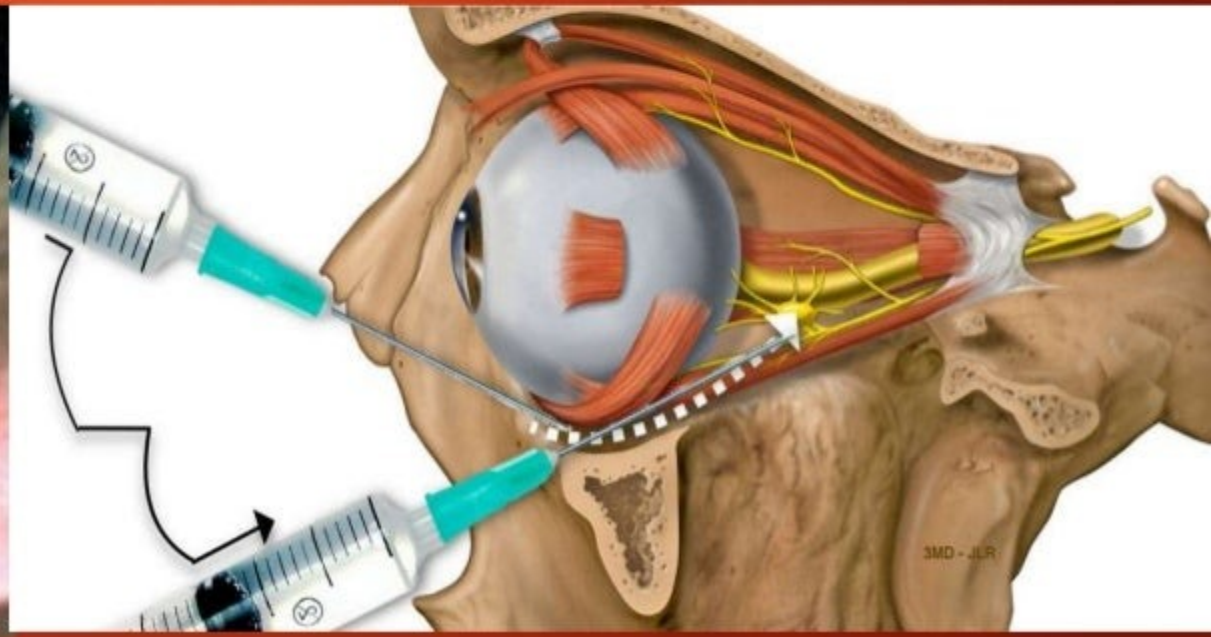
- Prepare the injection: 2 to 3.5 ml of the anaesthetic solution in a syringe with a sharp 23-gauge 24 mm needle.The needle should not have an acute bevel.
- Feel the lower orbital rim

- pass the needle through the skin or the conjunctiva at the junction of its lateral (outer) and middle thirds.
- The bevel of the needle should be pointing upwards.
- The needle should be passed straight back below the eye for 15 mm
- it should be parallel to the floor of the orbit and angled down
- the resistance is felt as you pass through the orbital septum.



- Change the direction of the needle so that the tip is pointing upwards and inwards towards the back of the skull.
- Feel the resistance as the needle passes through the muscle cone.
- The needle should be advanced not more than 24 mm from the skin in total





- Inject slowly and look for dilation of the pupil and drooping of the upper lid.
- Close the eyelids gently,
- cover with a pad
- apply firm, gentle pressure for 5 to 10 minutes.

Retrobulbar Anesthesia

Peri bulbar (periconal) block

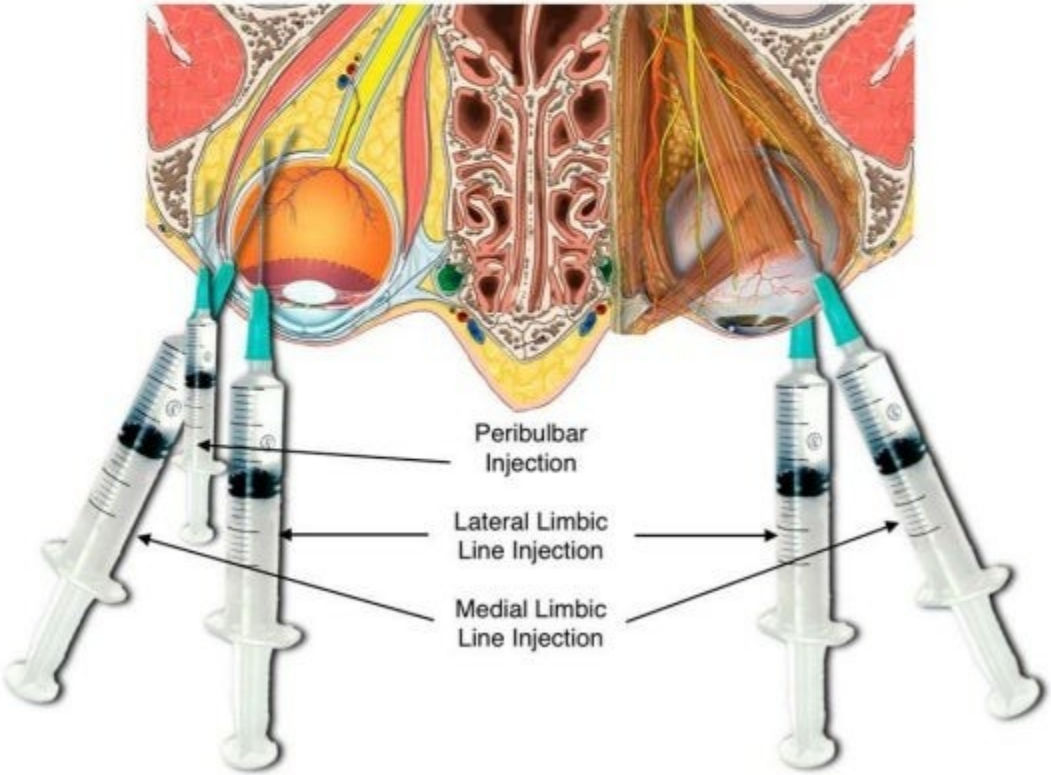
- This block consists of two injections - inferotemporally and between the caruncle and medial canthus
- Expose the lower fornix by pulling the lower lid down gently
- Instil one drop of topical anaesthetic eye drops.
- Insert the needle through the fornix below the lateral limbus.
- Pass it backwards and laterally for not more than 24 mm. Always keep it away from the globe by directing it slightly downwards.



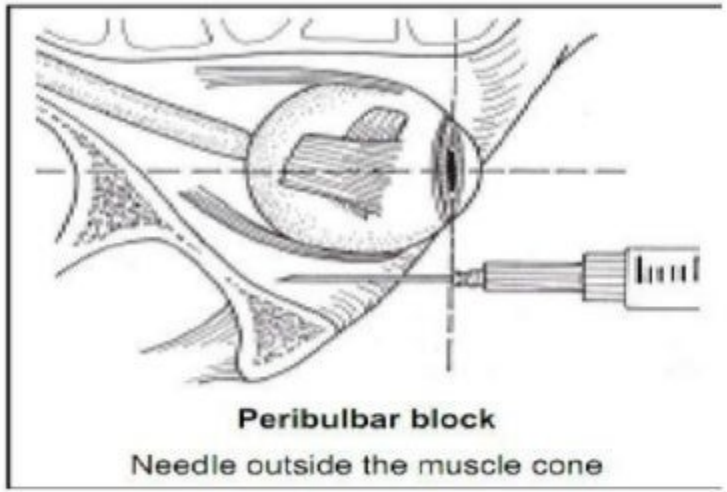
- Inject at the level of the equator
- 3 shots - 1 ml immediately posterior to the orbicularis oculi, 1 ml just anterior to the equator, and 2 ml after the needle is advanced past the globe.
- The second injection - given between the caruncle and the medial canthus, then passed back and slightly medially (away from the globe) for about 24 mm, to inject 3 to 4 ml of the anaesthetic. Injecting directly through the caruncle can cause significant bleeding.







Techniques of peribulbar block



Peribulbar block

Needle outside the muscle cone

Airway regional Anesthesia

Introduction

- **Difficult airways arise from multiple causes:**

1. *small mouth*
2. *Receding jaw*
3. *Reduced mouth opening due to radiation therapy*
4. *Jaw fracture*
5. *Previous head and neck surgery*
6. *Difficulty in neck extension due to prior cervical fusion or advanced osteoarthritis*
7. *Neck extension is contraindicated in patients with unstable cervical spines due to fx., rheumatoid arthritis, Down syndrome, etc.*
8. *Patients who cannot be intubated using direct laryngoscopy due to anatomical variations, even though their airway exam appears normal.*

- In these situations flexible fiberoptic bronchoscope is a commonly chosen method

Innervation of the Airway

- The airway is divided into:

1. Nasal cavities
2. Oral cavities
3. Pharynx (consisting of the naso-, oro-, and hypopharynx)
4. Larynx
5. Trachea

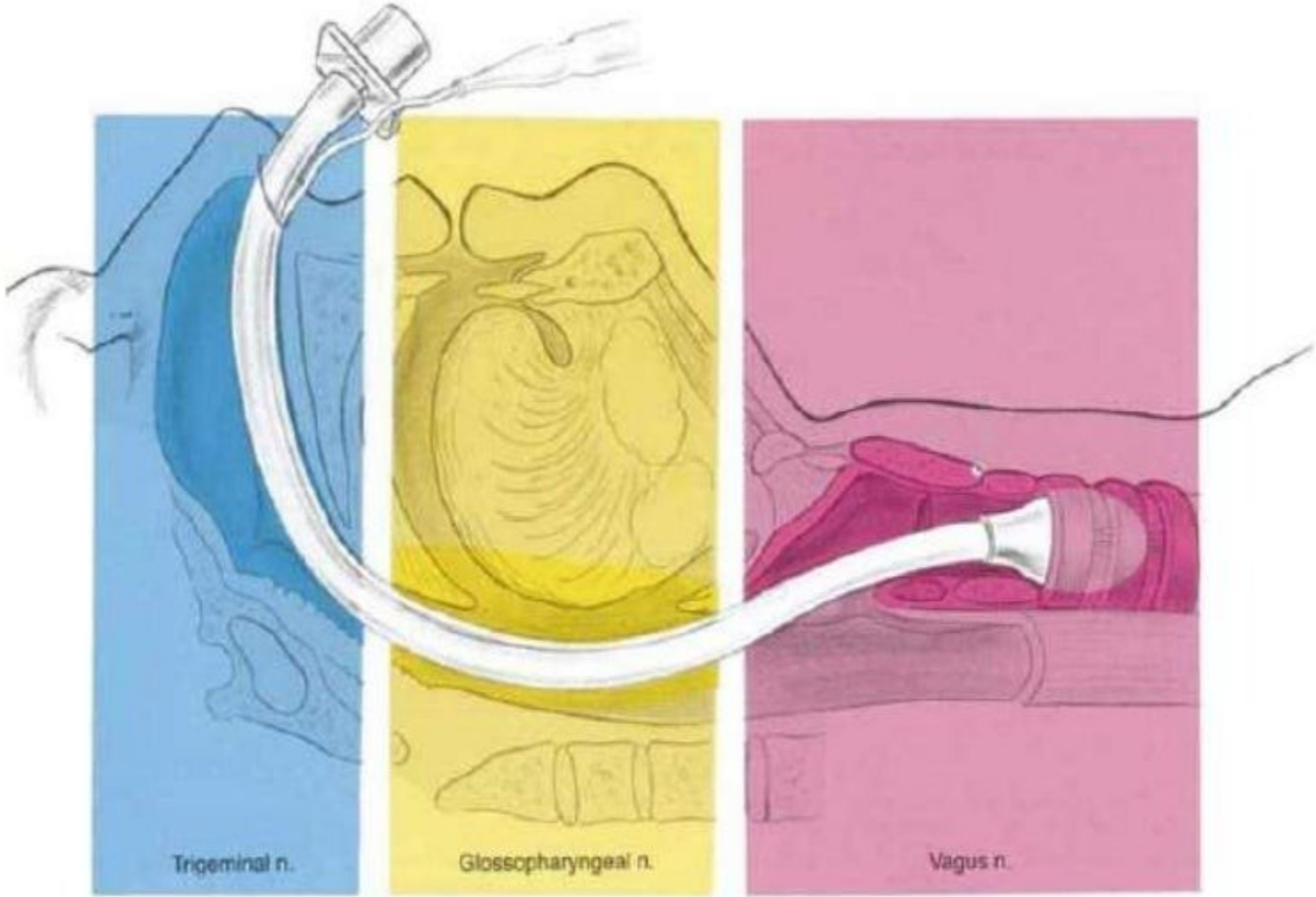


Fig 1. The innervation of the upper airway. (Reprinted with permission.[32])

Innervation of the Airway – ***Nose***

- The nasal cavity - branches of the ***trigeminal nerve***.

a. *Ant. Parts of the nasal cavity and the septum – ant. ethmoidal nerve (a br. of the ophthalmic nerve)*

b. *The remaining parts of the nasal cavity and the septum – br. of the maxillary nerve, including lateral posterior superior, inferior posterior, and nasopalatine nerves.*

Innervation of the Airway – ***pharynx***

- *Mainly innervated by* ***glossopharyngeal nerve***

a. Visceral fibers – posterior third of the tongue, the fauces and tonsillae, epiglottis

b. Special visceral sensation – posterior third of the tongue and soft palate

c. Sympathetic fibers – derived form the carotid plexus and the cervical sympathetic trunk

d. Efferent motor fibers – innervate the stylopharyngeus muscle and join the pharyngeal plexus.

Innervation of the Airway – ***larynx***

- The ***superior laryngeal nerve*** dividing into internal and external branch.

a. internal br. – *through a foramen in the thyrohyoid membrane and provides visceral sensory and secretomotor innervation to the larynx above the true cords.*

b. external br. – *supplies with motor fibers of the cricothyroid muscle.*

Innervation of the Airway – ***larynx***

- ***Recurrent laryngeal nerve***

a. providing both structures with fibers for visceral sensation, motor and secretomotor innervation, and sympathetic branches.

b. it enters the larynx by passing the lower border of the inferior constrictor m. of pharnyx.

c. it supplies all muscle of the larynx except cricothyroid and conveys visceral sensation to the cords and infraglottic regions.

d. it is the motor nerve of all intrinsic muscles of the larynx except the cricothyroid muscle.

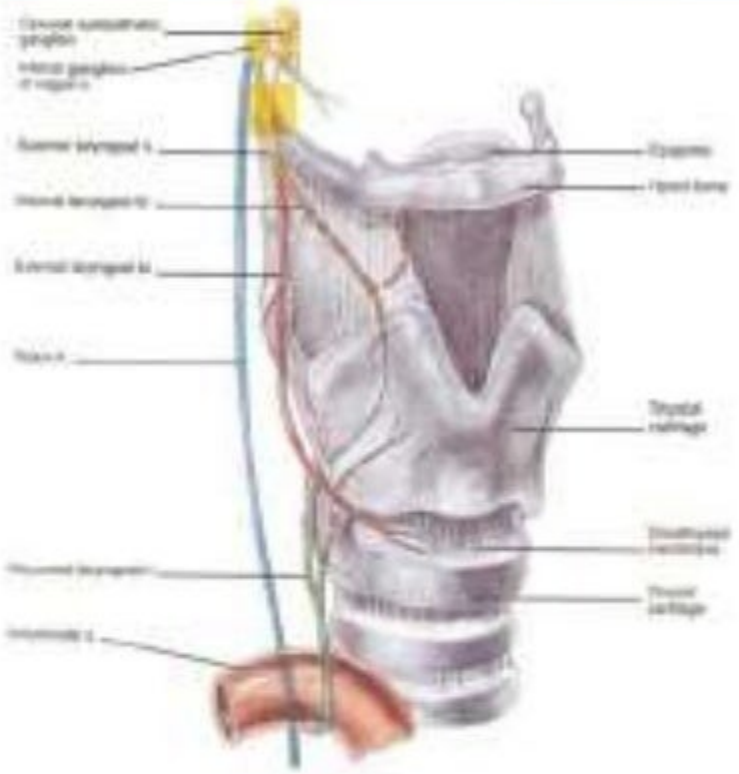


Fig 2. The vagus nerve and its branches in the larynx. (Reprinted with permission.[32])

The airway reflexes

- The aforementioned nerves participate in several brainstem-mediated reflex arcs.

1. gag reflex – *triggered by mechanical and chemical stimulation of areas innervated by the glosso-pharyngeal nerve, and the efferent motor arc is provided by the vagus nerve and its branches to the pharynx and larynx.*
2. glottic closure reflex – *elicited by selective stimulation of the superior laryngeal nerve, and efferent arc is the recurrent laryngeal nerve.– exaggeration of this reflex is called* ***laryngospasm.***
3. cough – *the cough receptors located in the larynx and trachea receive afferent and efferent fibers form the vagus nerve.*

Topical anesthesia

- Spraying
- Direct application

Topical anesthesia: direct application

- If nasal intubation is planned, 2 methods of applying local anesthetics are popular:

1. Cotton-tipped swabs soaked in either lidocaine or cocaine placed superiorly and posteriorly in the nasopharynx - block the branches of the ethmoidal and trigeminal nerves.
2. Coating a nasal airway with viscous lidocaine mixed with a vasoconstrctor.

Topical anesthesia: direct application

- Gargling – *not often cover the larynx or trachea adequately.*
- Aspiration – *a simple, safe, and effective method of anesthetizing the upper airway.*

Nerve blocks

- more difficult to perform
- carry a higher risk of complications
- The common complications are:
  - bleeding,
  - nerve damage,
  - intra-vascular injection.

Nerve blocks

- 3 blocks used for upper airway anesthesia:

1.glossopharyngeal block – for oropharnyx.

2.superior laryngeal block – larynx above the cords.

3.translaryngeal block – larynx and trachea below the cords.

Glossopharyngeal block

- facilitates endotracheal intubation by blocking the gag reflex associated with direct laryngoscopy and facilitates passage of a nasotracheal tube through the posterior pharynx.
- Provide Sensory innervation to the posterior third of the tongue, the vallecula, the anterior surface of the epiglottis (lingual branch), the walls of the pharynx (pharyngeal branch), and the tonsils (tonsillar branch).
- blockade of this nerve bilaterally would result in anesthesia of those structures

- either intraoral or extraoral (peristyloid) approach
- Both approaches involve deposition of local anesthetic in close proximity to the carotid artery, and careful aspiration before injection is essential.

intraoral approach

- the mouth is opened and the tongue is anesthetized with topical anesthetic.
- A 22-gaugue needle is used to place 5 mL of local anesthetic solution submucosally at the caudal aspect of the posterior tonsillar pillar (palatopharyngeal fold)



Peristyloid approach

- Patient is placed supine
- A line is drawn between the angle of the mandible and the mastoid process.
- the styloid process is palpated just posterior to the angle of the jaw along this line
- a short, small-gauge needle is seated against the styloid process.

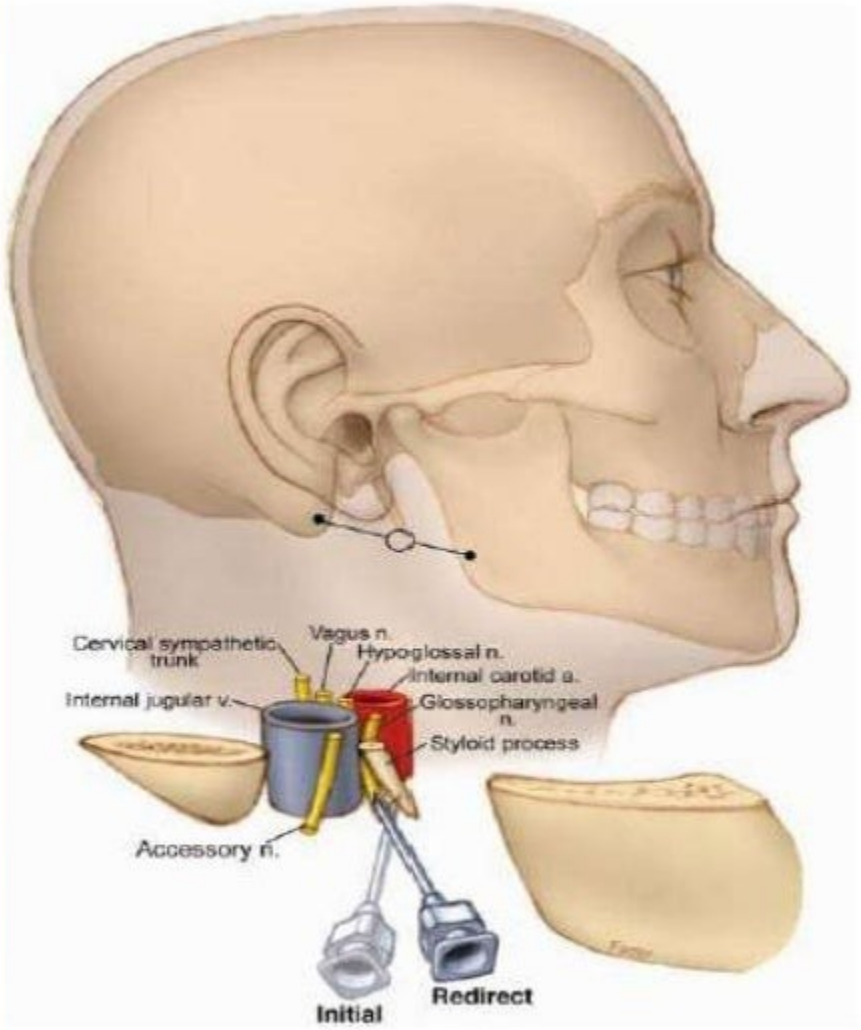


Fig 6. Peristyloid approach to the glossopharyngeal nerve. (Adapted and reprinted with permission.[28])

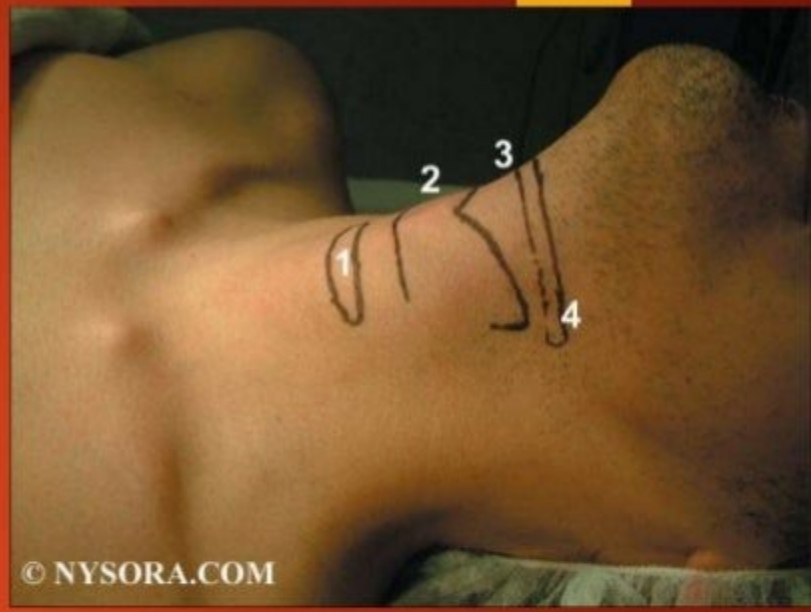
- The needle is then withdrawn slightly and directed posteriorly off the styloid process.
- As soon as bony contact is lost, 5-7 mL of local anesthetic solution are injected after careful aspiration for blood.

- essential to ablate deep pressure symptoms from the tongue base during direct laryngoscopy.
- significant absorption of local anesthetic can be expected in this region.
- The addition of epinephrine to the local anesthetic solution helps to vasoconstrict the blood vessels in the region, reducing absorption as well as assisting in the diagnosis of intravascular injection by heart rate monitoring.
- contraindicated in patients with coagulopathies or anticoagulation.

Superior Laryngeal Nerve Block

- The internal branch of the superior laryngeal nerve (a branch of the vagus nerve)
  - sensory innervation to the base of the tongue,
  - posterior surface of the epiglottis,
  - aryepiglottic fold,
  - arytenoids.

- superior laryngeal nerve block involves bilateral injections at the level of the greater cornu of the hyoid bone.
- The patient is placed supine with the head extended as much as possible.
- The cornu of the hyoid bone is located below the angle of the mandible.
- It is easily identified (particularly in men) by palpating outward from the thyroid notch along the upper border of the thyroid cartilage until the greater cornu is encountered just superior to its posterolateral margin



(1) Cricoid cartilage;
(2) thyroid cartilage;
(3) hyoid bone;
(4) cornu of the hyoid bone.

- Nondominant hand is used to displace the hyoid bone with contralateral pressure, bringing the ipsilateral cornu and the internal branch of the superior laryngeal nerve toward the anesthesiologist.
- The anesthesiologist can then appreciate the pulsation of the carotid artery being displaced deep to the palpating finger tip

- 25-gauge needle is inserted in an anteroinferomedial direction until the lateral aspect of the greater cornu is contacted.
- If the needle is then walked downward toward the midline (1-2 mm) off the inferior border of the greater cornu, the thyrohyoid membrane is pierced and the internal branch alone is blocked.
- If the needle is retracted slightly after contacting the hyoid, both the internal and external branches of the superior laryngeal nerve are blocked.
- The syringe is aspirated and local anaesthetic injected.



- If aspiration results in air, the needle tip is likely in the
- If blood is encountered, the needle may have encountered a blood vessel.
- Given the proximity of the carotid artery, it is advisable to withdraw the needle, reassess the landmarks, and reattempt the procedure.

- Two milliliters of local anesthetic should reliably bathe the internal branch of the superior laryngeal nerve, given its proximity to the hyoid bone. If this volume is injected outside the thyrohyoidmembrane, it is likely to block the external branch of the superior laryngeal nerve as well. Isolated external superior laryngeal nerve branch blockade may result in cricothyroid muscle weakness, which eliminates its function as an airway dilator.(17) The motor input of the recurrent laryngeal nerve is spared, however, and therefore does not result in clinically significant change in laryngeal inlet diameters.(18)

- The superior laryngeal nerve can also be approached in the pre-epiglottic space.
- The pre-epiglottic space is accessed at a point 2 cm lateral to the thyroid notch.
- The needle is advanced 1-1.5 cm superoposteriorly to pierce the thyrohyoid membrane, and the nerve can be injected.
- Alternatively, using the thyroid cornu as a landmark and walking the needle superoanteromedially can accomplish this block.

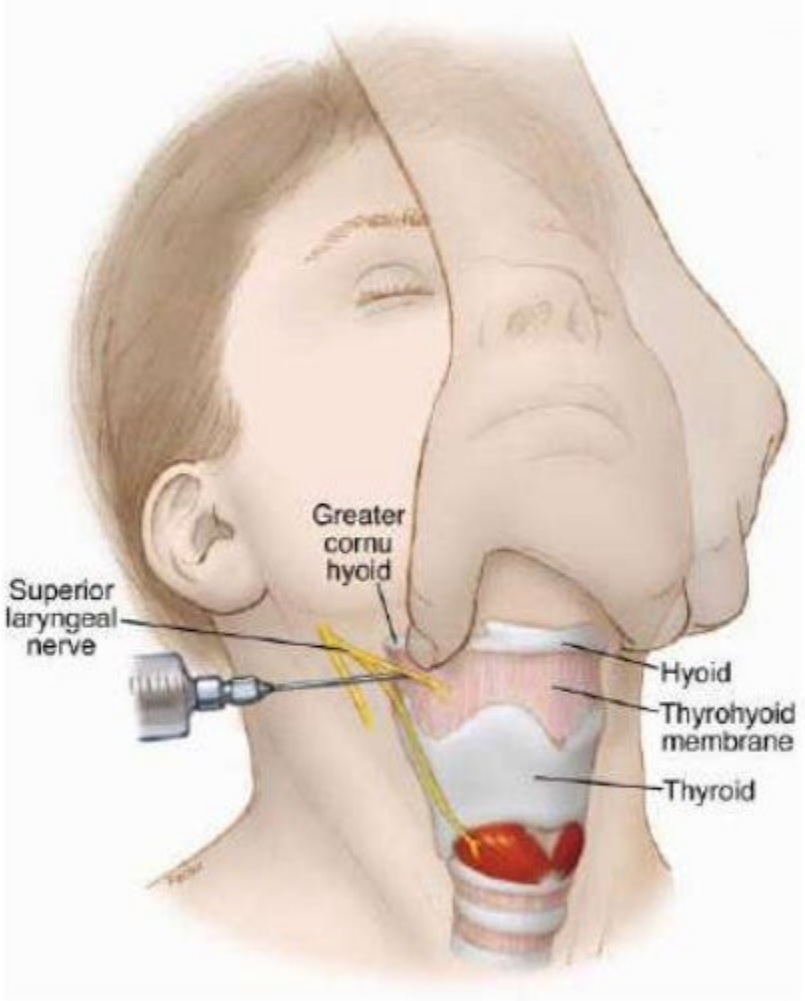


Fig 7. Superior laryngeal nerve block. (Adapted and reprinted with permission.[29])

Recurrent Laryngeal Nerve Block

- Provides sensory innervation to the vocal folds and the trachea.
- Blockade provide comfort and prevent coughing while the endotracheal tube is being passed between the vocal cords.

Transtracheal block.

- The cricothyroid membrane is located in the midline of the neck.
- located by palpating the thyroid prominence and proceeding in a caudad direction.
- spongy fibromuscular band between the thyroid and cricoid cartilages



- a 22- or 20-gauge needle on a 10-mL syringe is passed perpendicular to the axis of the trachea and pierces the membrane.
- While the needle is being advanced, the syringe is continuously aspirated.
- The needle is advanced until air is freely aspirated, signifying that the needle is now in the larynx



- Instillation of local anesthetic at this point invariably results in coughing.
- Through coughing, the local anesthetic is dispersed, diffusely blocking the sensory nerve endings of the recurrent laryngeal nerve.
- Motor function remains completely unaffected.
- a larger-gauge needle used - more rapid delivery of local anesthetic reduces the risk of needle-induced trauma due to coughing.

- Direct blockade of the recurrent laryngeal nerve is contraindicated.
- It may result in the upper airway obstruction
  - the recurrent laryngeal nerve provides motor innervation for all the muscles of the larynx except the cricothyroid.
- Unilateral blockade typically manifests only as transient hoarseness.

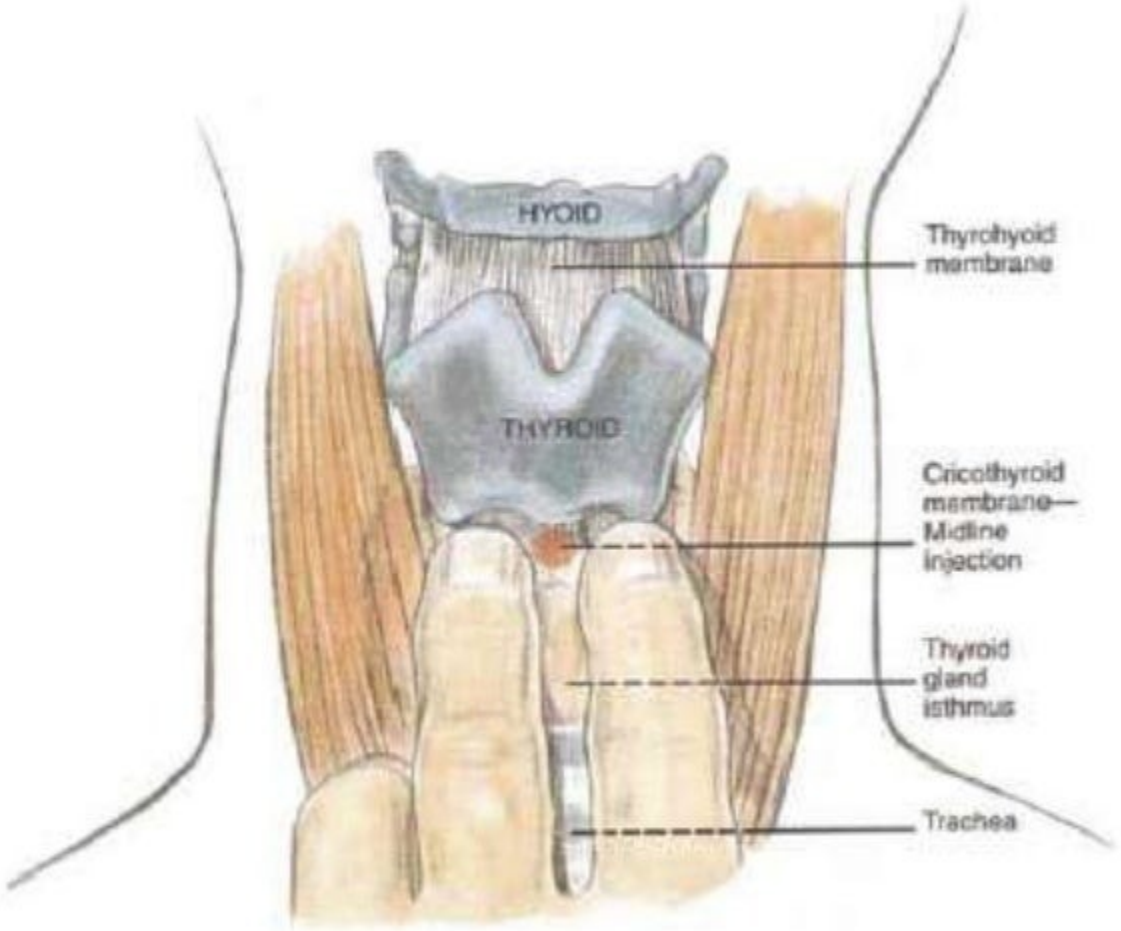
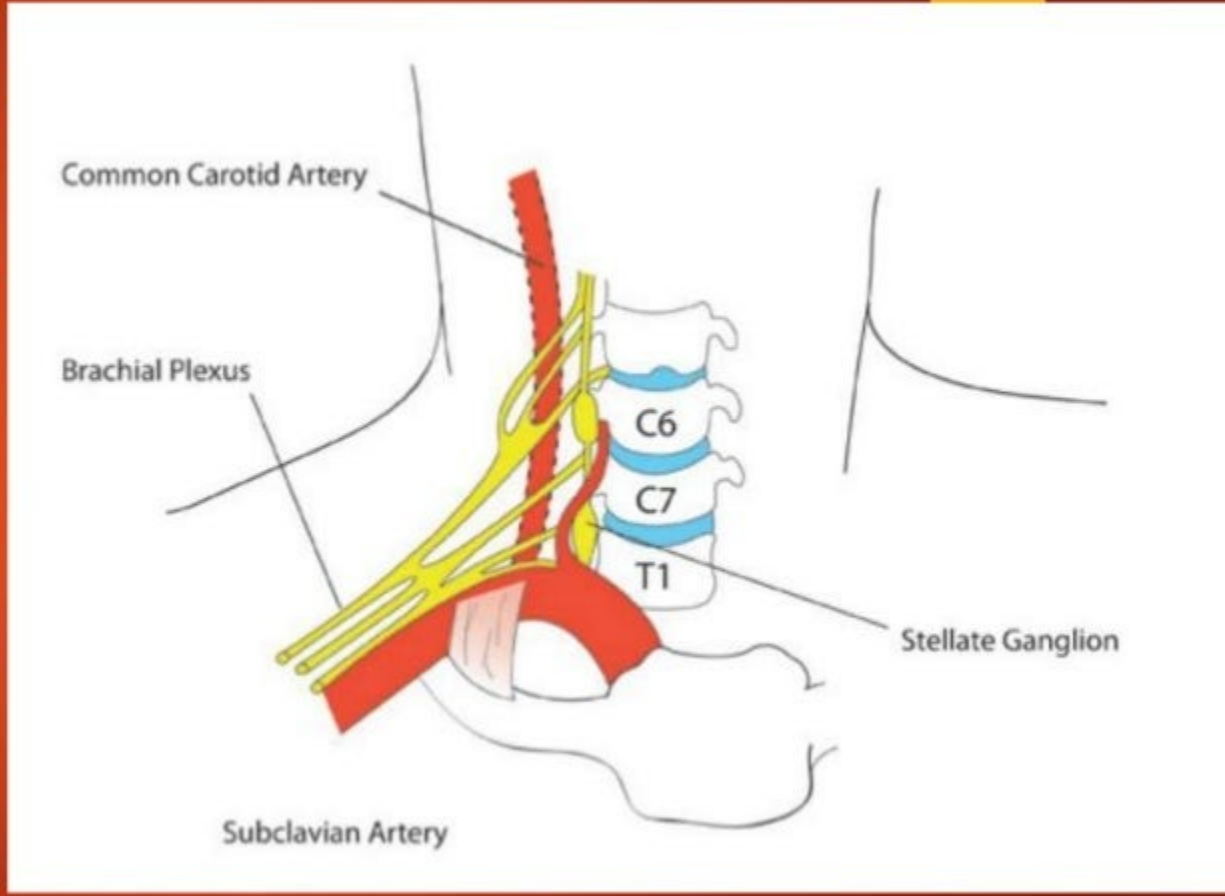


Fig 8. Translaryngeal block. (Reprinted with permission.[31])

STELLATE GANGLION BLOCK

- sympathetic ganglion situated on either side of the root of the neck.
- formed on each side of the neck by the fusion of the inferior cervical ganglion with the first, and occasionally second, thoracic ganglion.
- Supplied by efferent sympathetic fibres from the ipsilateral sympathetic chain (which lies inferiorly), along with the first and second thoracic segmental anterior rami.



INDICATIONS

- CHRONIC PAIN CONDITIONS
  - CRPS 1 and 2
  - Herpes zoster affecting the face and neck
  - Refractory chest pain or Angina
  - Phantom limb pain
- VASCULAR DISORDERS OF UPPER LIMB
  - Raynaud's phenomenon
  - Obliterative vascular disease
  - Vasospasm
  - Scleroderma
  - Trauma
  - Embolic phenomenon
  - Frost bites

CONTRAINDICATIONS

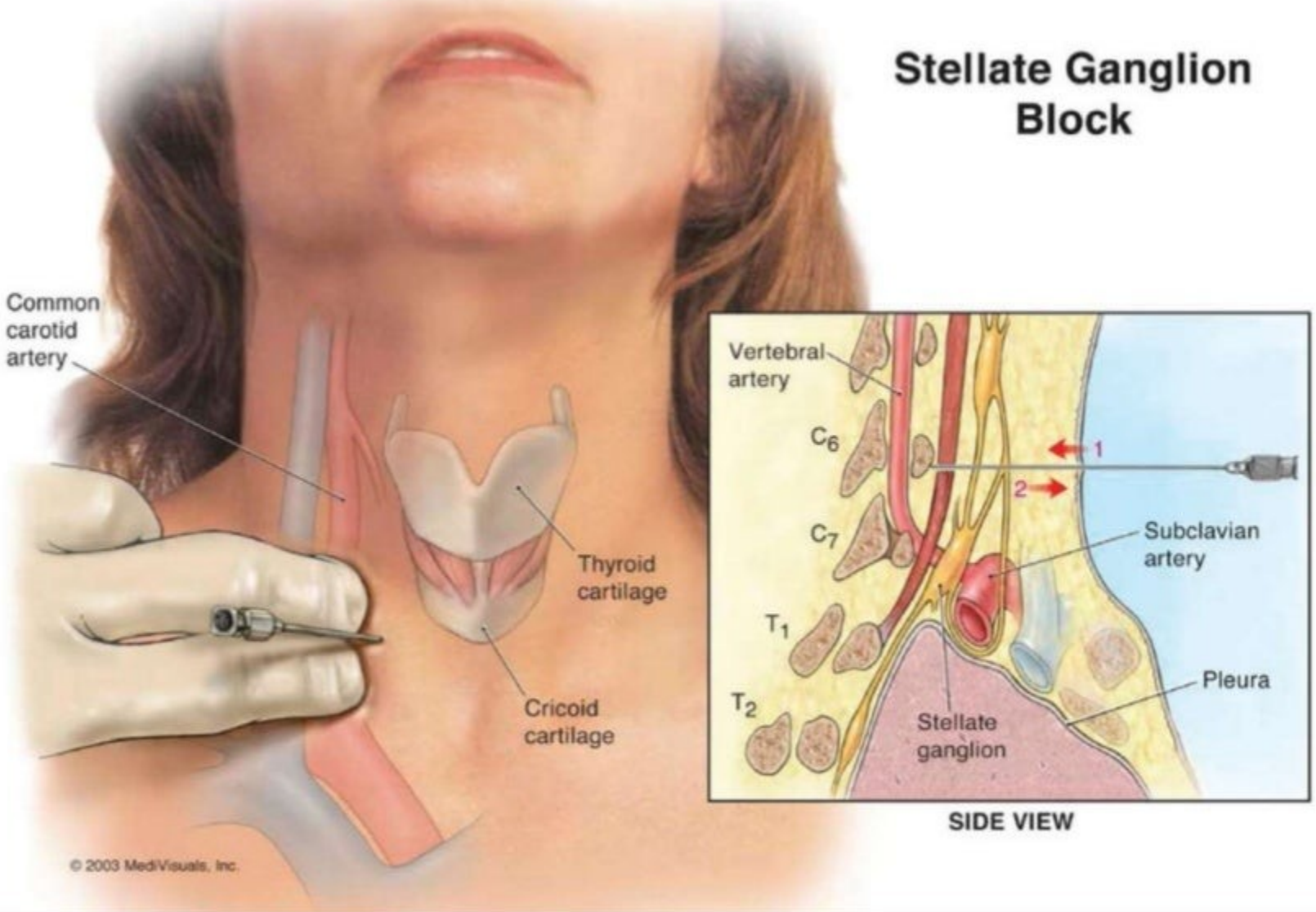
- Recent myocardial infarction
- Anti-coagulated patients or those with coagulopathy
- Glaucoma
- Pre-existing contralateral phrenic nerve palsy (may precipitate respiratory distress)

TECHNIQUES

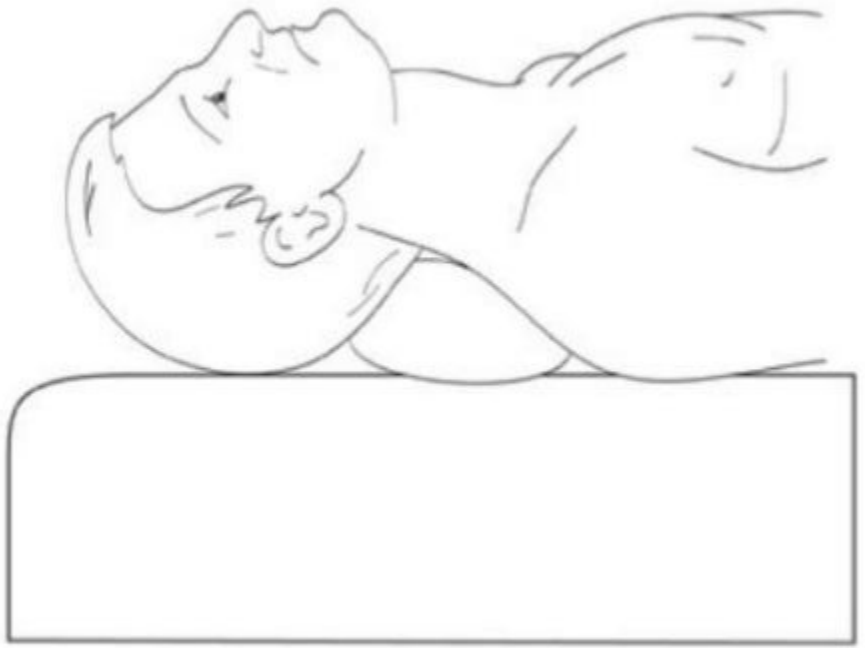
Land Mark Technique

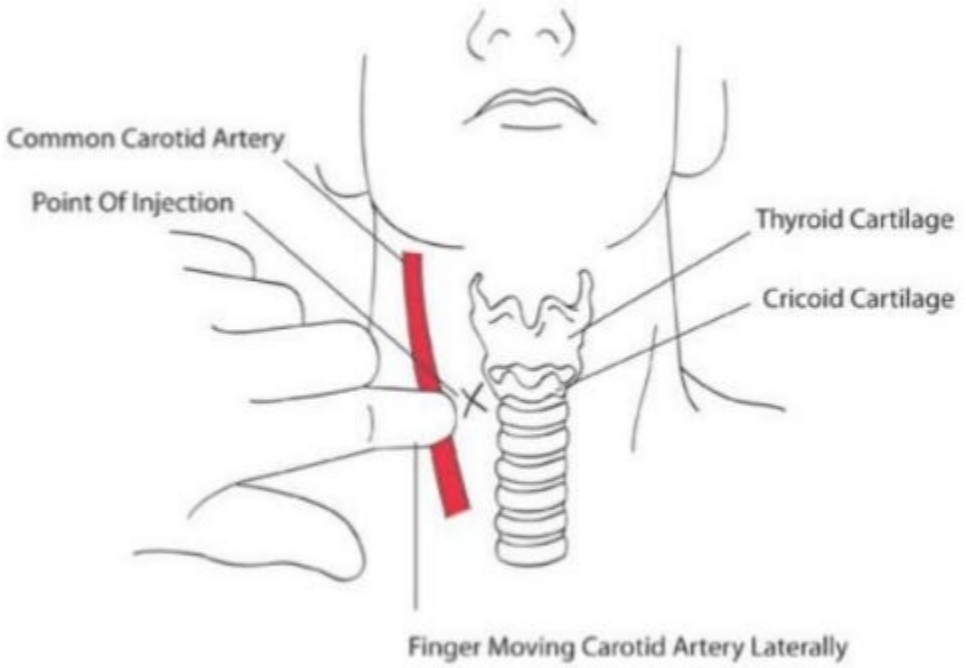
- The patient is in a supine position with slight extension of the neck.
- The head is turned to the opposite side.
- The needle is introduced between the trachea and the carotid sheath at the level of the cricoid cartilage and Chassaignac's tubercle (C6) to avoid any potential injury to the pleura.
- The sternocleidomastoid muscle and carotid artery are pushed laterally while simultaneously palpating the Chassaignac's tubercle.
- **Chassaignac tubercle** - the anterior tubercle of the transverse process of the sixth cervical vertebra, against which the carotid artery may be compressed by the finger

Stellate Ganglion Block



- The skin and subcutaneous tissue are pressed firmly onto the tubercle, the needle is directed medially and inferiorly towards the body of C6, to hit it and then withdrawn by 1-2mm to rest outside the longus colli muscle.
- Inject Local Anaesthetic after a small test dose and repeated negative aspiration for blood to rule out intravascular placement of the needle.




Common Carotid Artery
Point Of Injection
Thyroid Cartilage
Cricoid Cartilage
Finger Moving Carotid Artery Laterally

Fluroscopy Assisted

- The anatomical landmarks are used to guide the approach and direction of the needle and then fluoroscopy is used to confirm its position.
- Radioopaque contrast is injected and the spread is visualised using anteroposterior and lateral views.
- Injection into the longus colli muscle - inability of the contrast medium to spread in-between the tissue planes
- instantaneous disappearance - presence of the needle in a vessel

CT Guided

- The patient is supine with chin turned away from the injection site.
- The head of the first rib, adjacent vertebral artery and vein are identified and spinal needle is directed onto the head of the first rib, as close to the vertebral body as possible.

Ultra Sound Guided

- supine position with slight extension of the neck.
- the transducer is placed on the neck at the level of C6
- At this level, the carotid artery, internal jugular vein, thyroid gland, trachea, longus colli muscle, root of C6, and transverse process of C6 are identified.
- the transducer is then gently pressed between the carotid artery and trachea -retract the carotid artery laterally and to position the transducer close to the longus colli
- Using an in-plane approach, 25-gauge long-bevel needle is inserted paratracheally toward the middle of the longus colli,
- The endpoint for injection is the ultrasound image demonstrating the tip of needle penetrating the prevertebral fascia in the longus colli.
- Following a negative aspiration test for blood or CSF, local anaesthetic is injected and visualized spreading in real time.

COMPLICATIONS

Horners syndrome :

- Caused by sympathetic blockade produce features on the ipsilateral side of the face :
  - drooping of the eyelid (ptosis)
  - constriction of the pupil (meiosis)
  - decreased sweating of the face on the same side (anhydrosis)
  - redness of the conjunctiva of the eye
  - impression of an apparently sunken eyeball (enophthalmos)
- Although it may be considered a complication, the presence of Horner's syndrome is a confirmatory sign of successful stellate ganglion blockade.

Misplaced needle puncturing important adjacent structures

- Vascular (which may lead to local haematoma or haemothorax)
  - Carotid artery puncture
  - Internal jugular vein puncture
  - Inferior thyroid artery (serpentine artery) puncture during ultrasound guided approach
- Neurological
  - Vagus nerve injury
  - Brachial plexus root injury
- Others
  - Pulmonary injury, pneumothorax
  - Chylothorax (thoracic duct injury)
  - esophageal perforation

Inadvertent spread of local anaesthetic

- Intravascular injection into Carotid artery, Vertebral artery, Internal jugular vein or Inferior thyroid artery
- Neuraxial/brachial plexus spread
- Localised spread
- Hoarseness due to recurrent laryngeal nerve injury
- Elevated hemidiaphragm from phrenic nerve blockade

Local anaesthetic toxicity

Infection

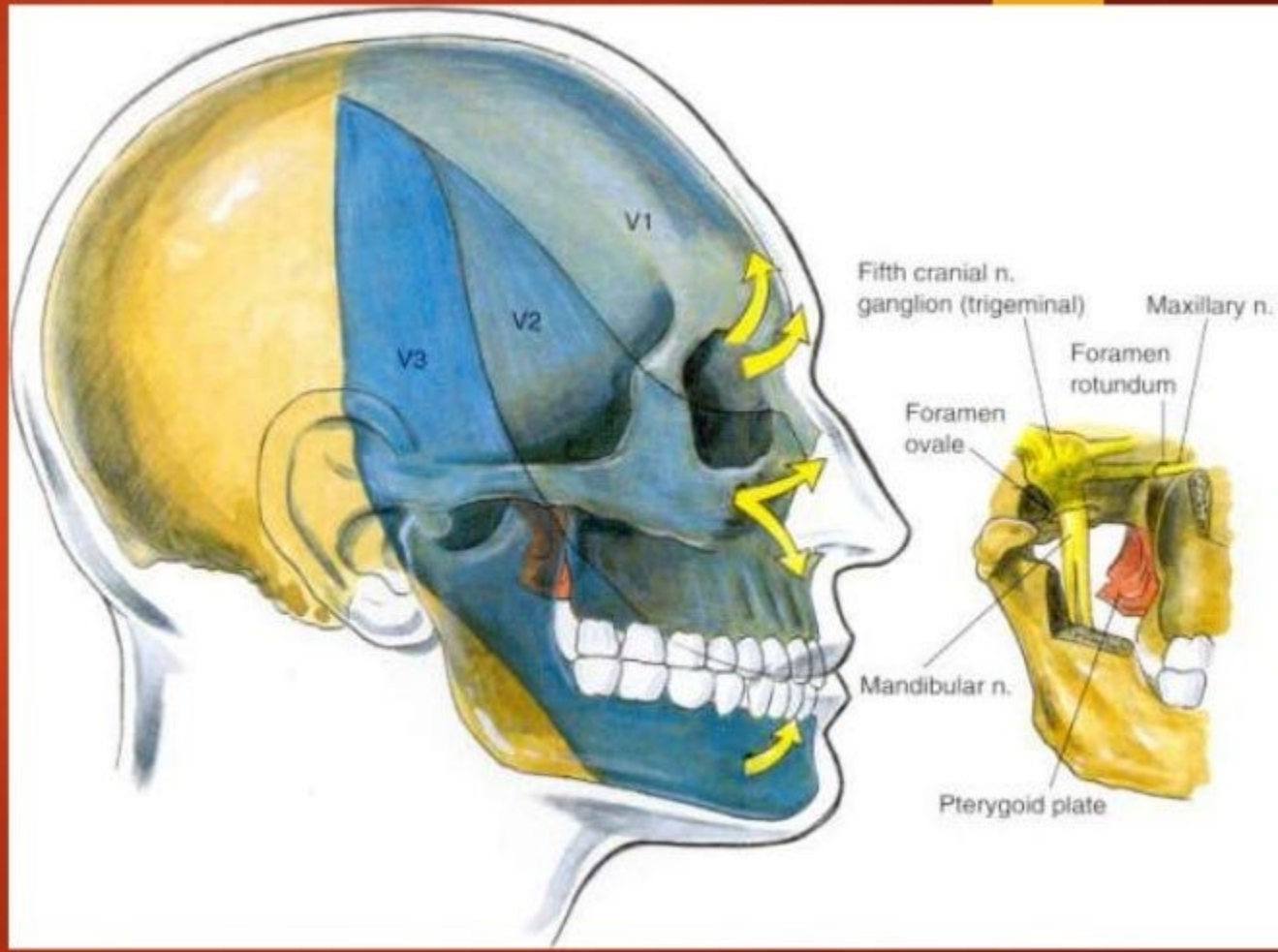
- Soft tissue abscess
- Meningitis
- Osteitis

TRIGEMINAL GANGLION BLOCK

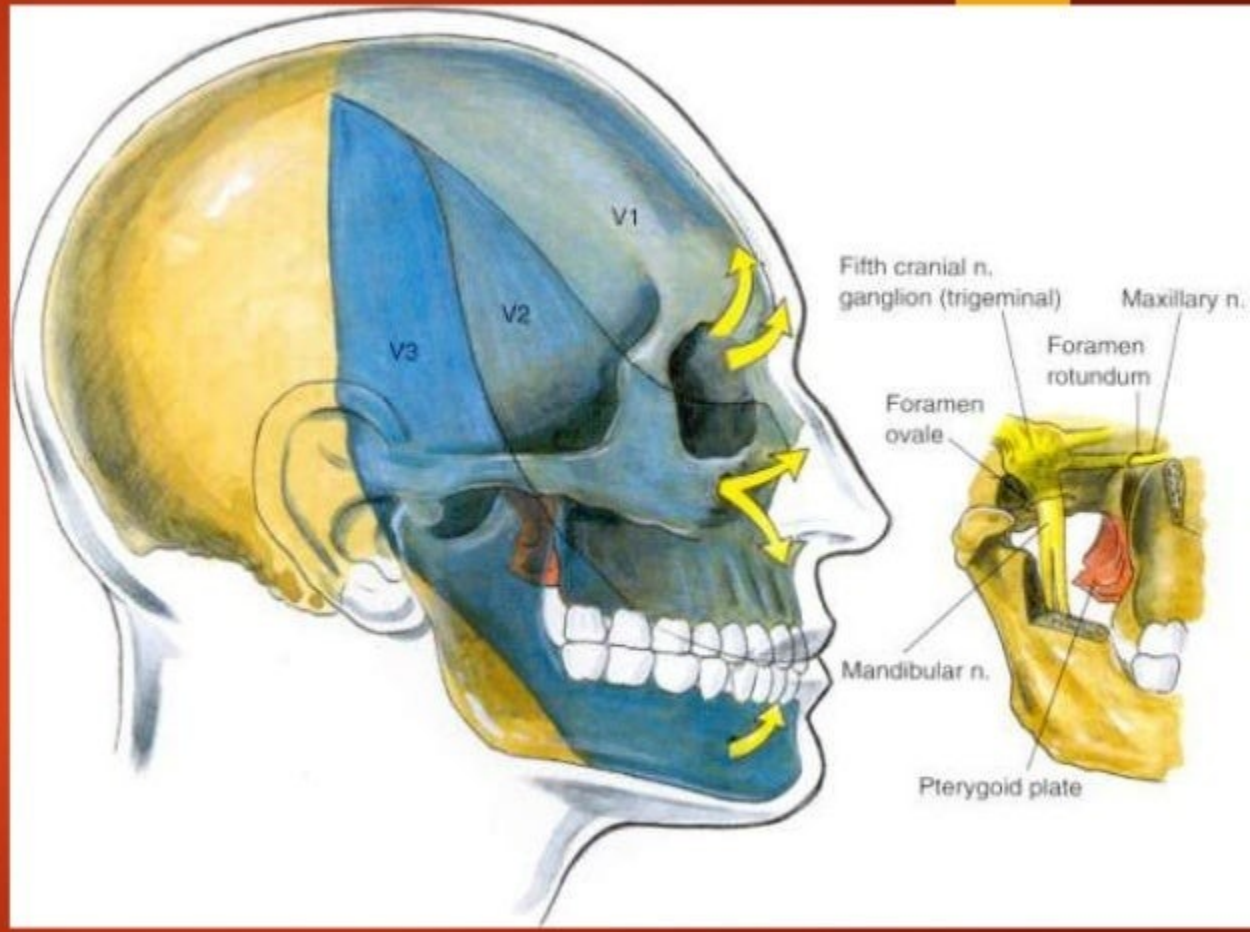
- principal use is as a diagnostic block before trigeminal neurolysis in patients with facial neuralgias.
- Current practice patterns virtually guarantee that patients undergoing this block are experiencing facial neuralgias.
- Patients with severe underlying cardiopulmonary disease who require more than minor facial surgery May be given local anesthetic trigeminal ganglion blocks.

ANATOMY

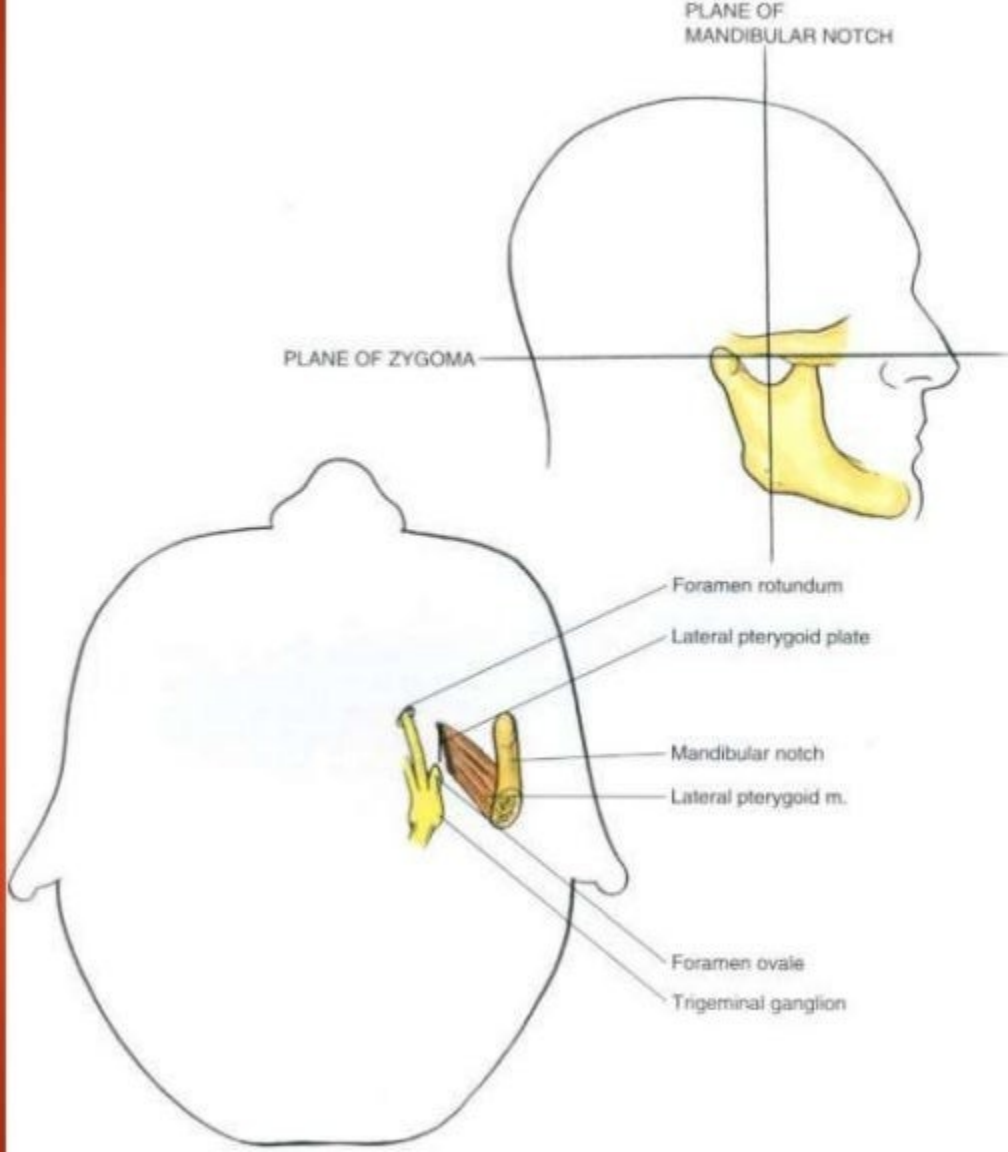
- The trigeminal ganglion is located intracranially and measures approximately 1 × 2 cm.
- Lies lateral to the internal carotid artery and cavernous sinus and slightly posterior and superior to the foramen ovale, through which the mandibular nerve leaves the cranium.

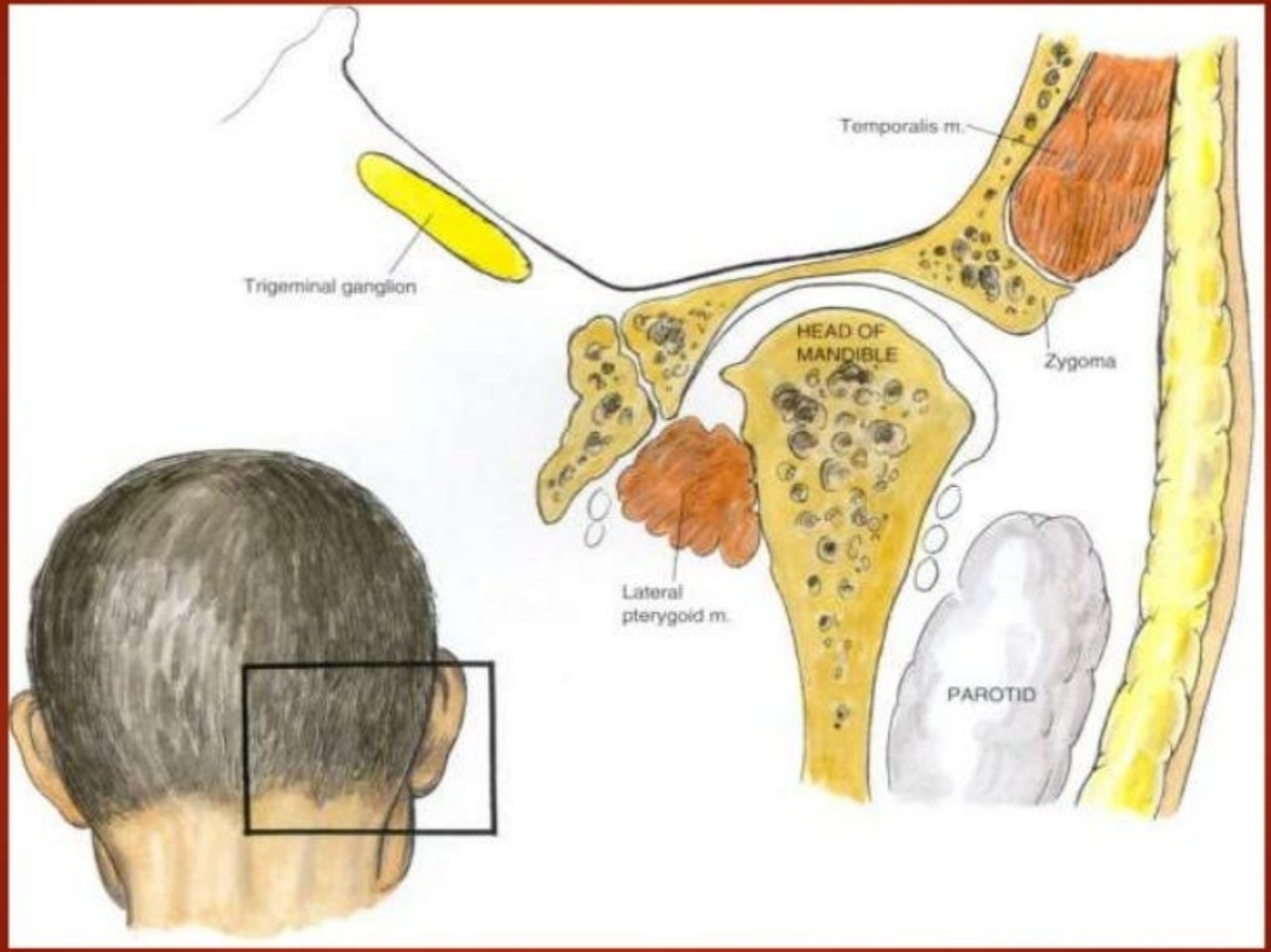


- From the trigeminal ganglion, the fifth cranial nerve divides into the ophthalmic, maxillary, and mandibular nerves.
- These nerves provide sensation to the region of the eye and forehead, upper jaw (mid-face), and lower jaw, respectively
- The mandibular division carries motor fibers to the muscles of mastication, but otherwise these nerves are wholly sensory



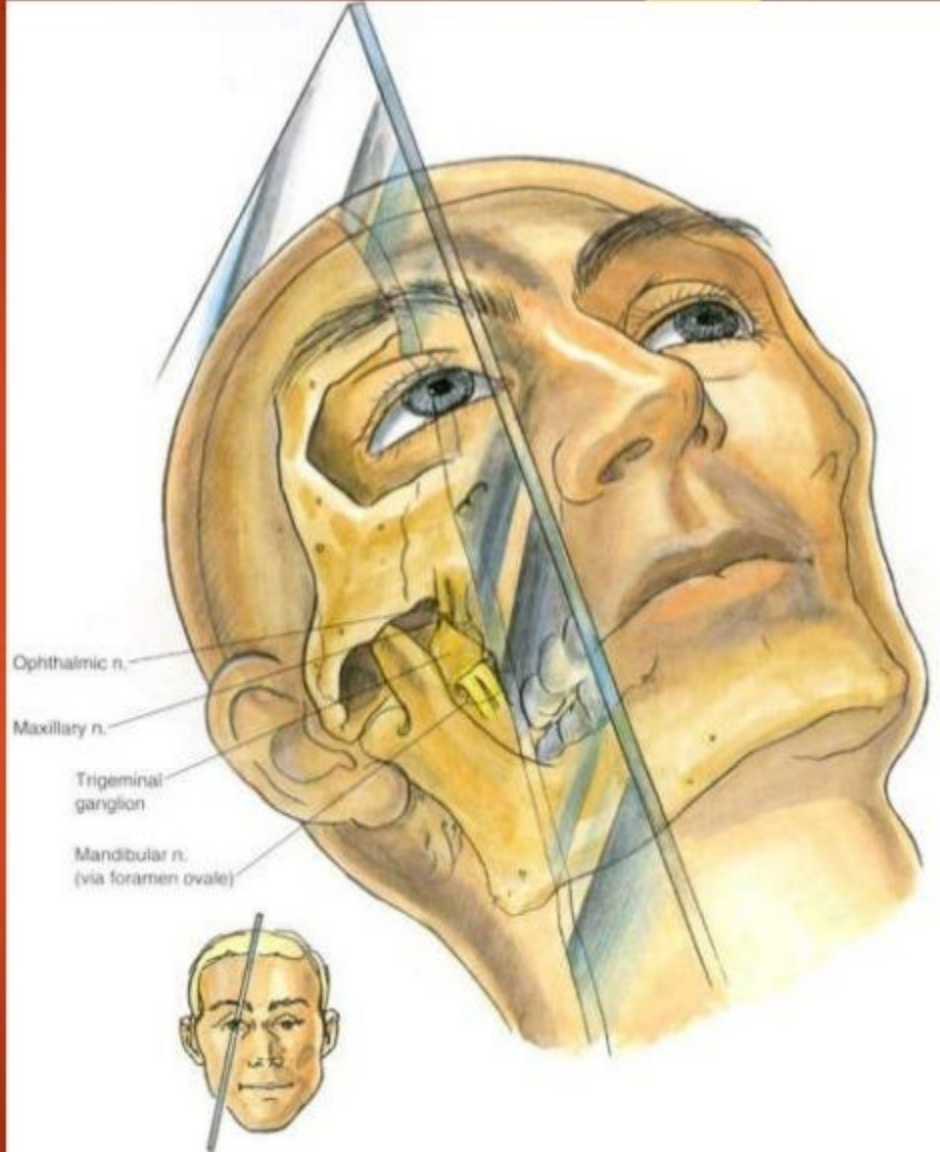
- The trigeminal ganglion is partially contained within a reflection of dura mater (Meckel's cave).
- The foramen ovale is approximately in the horizontal plane of the zygoma and in the frontal plane approximately at the level of the mandibular notch.
- The foramen ovale is slightly less than 1 cm in diameter and is situated immediately dorsolateral to the pterygoid process.




Temporalis m.
Trigeminal ganglion
HEAD OF MANDIBLE
Zygoma
Lateral pterygoid m.
PAROTID

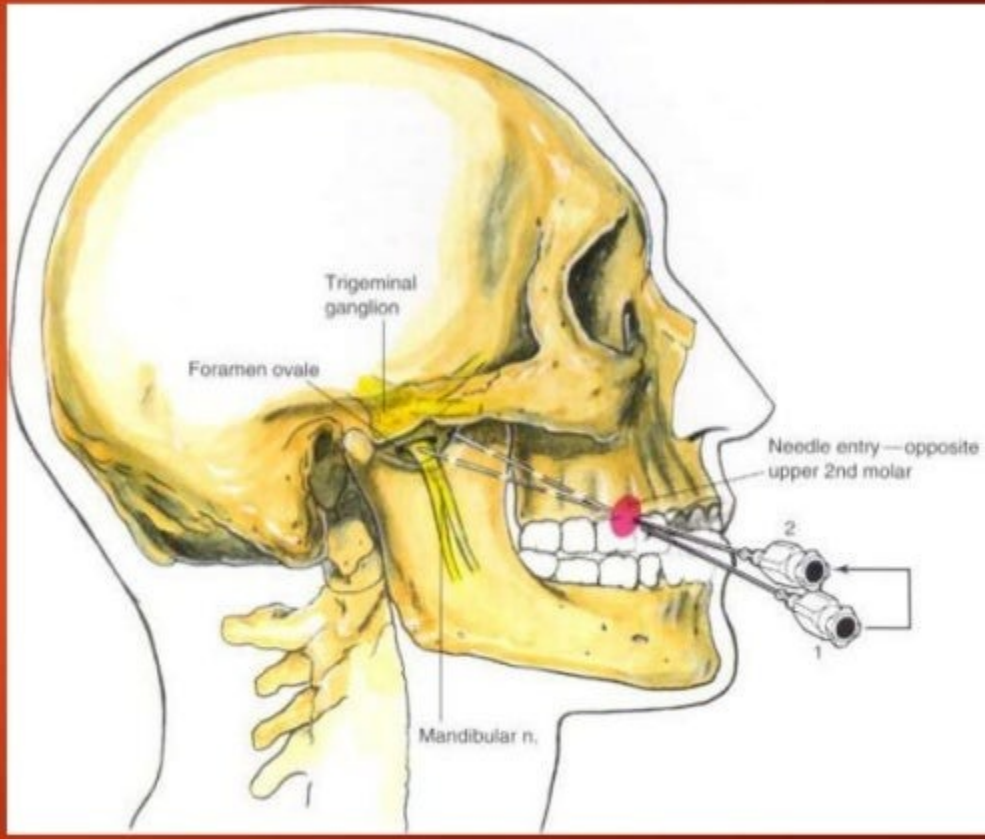
POSITION

- Patients are placed in a supine position and asked to fix their gaze straight ahead, as if they were looking off into the distance.
- The anesthesiologist should be positioned at the patient's side, slightly below the level of the shoulder

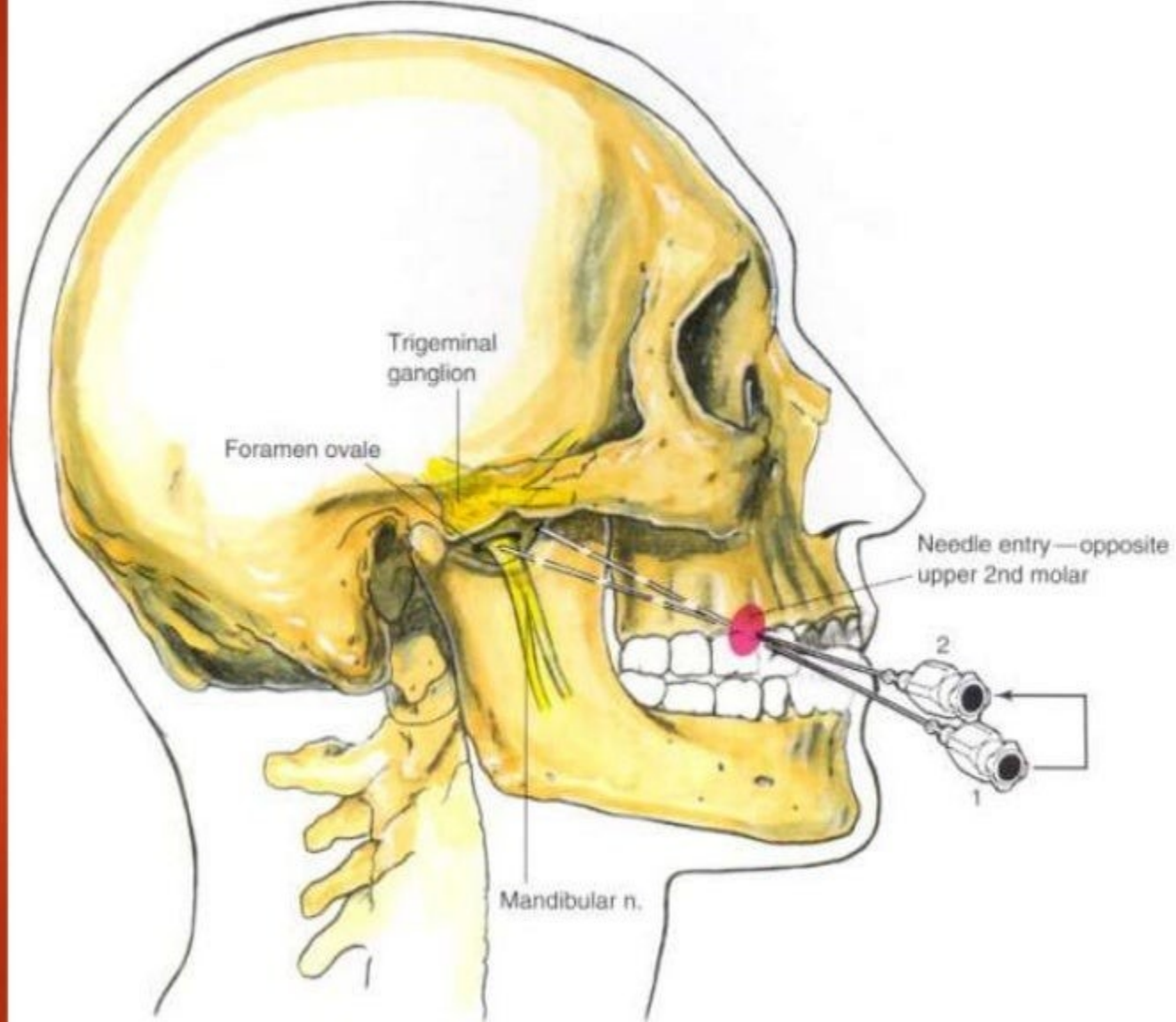


Needle Puncture

- Ask the patient to clench the teeth
- A skin wheal is raised immediately medial to the masseter muscle.
- It most often occurs approximately 3 cm lateral to the corner of the mouth.
- A needle is inserted through this site
- The plane of insertion should be in line with the pupil,



- This allows the needle tip to contact the infratemporal surface of the greater wing of the sphenoid bone, immediately anterior to the foramen ovale.
- This occurs at a depth of 4.5 to 6 cm.
- Once the needle is firmly positioned against this infratemporal region, it is withdrawn and redirected in a stepwise manner until it enters the foramen ovale at a depth of approximately 6 to 7 cm, or 1 to 1.5 cm past the needle length required to contact the bone initially.



- Once foramen is entered, a mandibular paresthesia is often elicited.
- By advancing the needle slightly, one may also elicit paresthesias in the distribution of the ophthalmic or maxillary nerves.
- These additional paresthesias should be sought to verify a peri ganglion position of the needle tip.
- If the only paresthesia obtained is in the mandibular distribution, the needle tip may not have entered the foramen ovale but may be inferior to it while it abuts the mandibular nerve.
- The needle should be carefully aspirated to check for cerebrospinal fluid (CSF) because the ganglion's posterior two thirds is enveloped in the dural reflection (Meckel's cave).

Potential Problems

- Subarachnoid injection of local anesthetic is possible - close anatomic relation between the trigeminal ganglion and the dural reflection, or Meckel's cave.
- The needle passes through highly vascular regions - hematoma formation

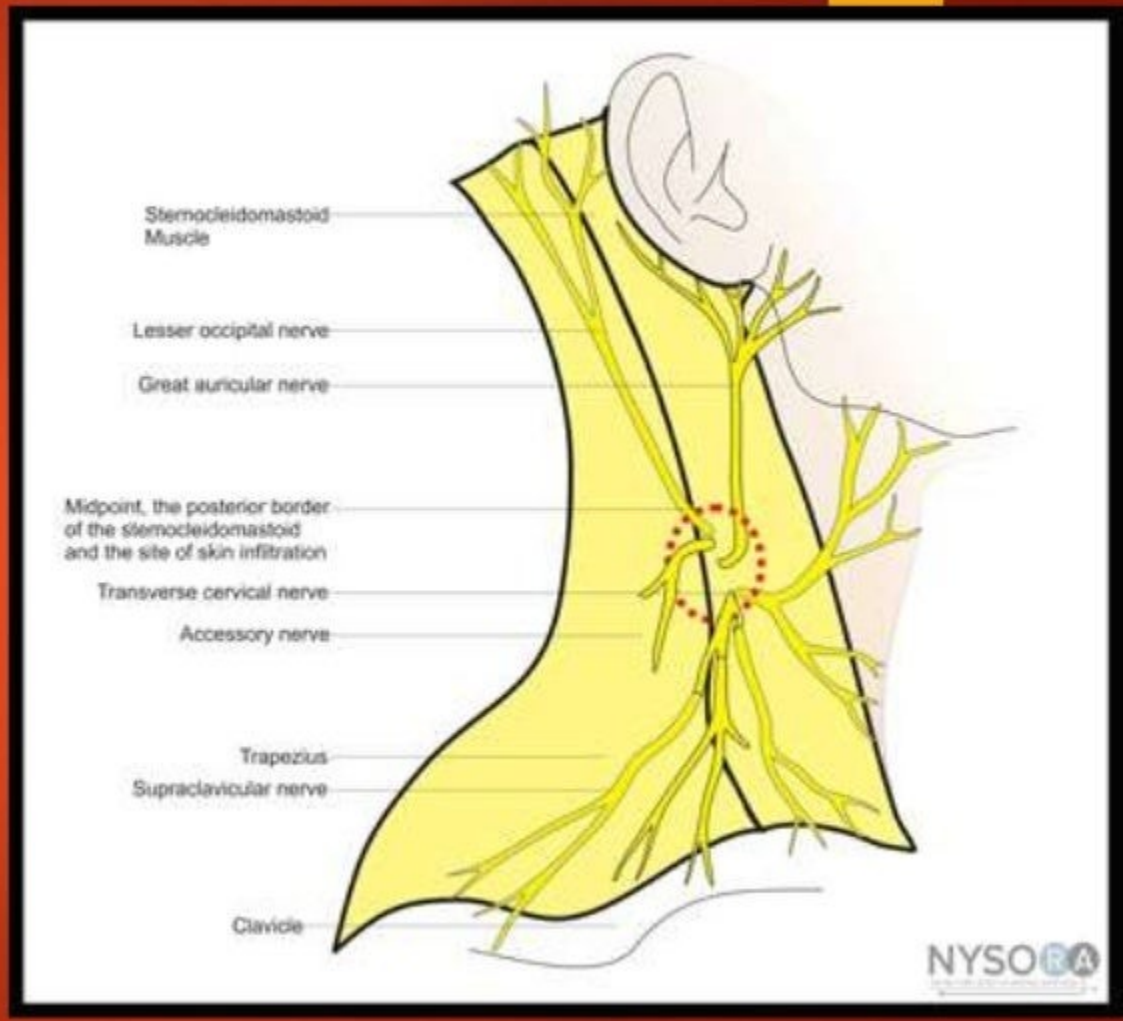
Cervical Plexus Block

- Cervical plexus block can be performed using two different methods.
  - Deep cervical plexus block - a paravertebral block of the C2-4 spinal nerves (roots) as they emerge from the foramina of their respective vertebrae.
  - Superficial cervical plexus block - a subcutaneous blockade of the distinct nerves of the anterolateral neck.

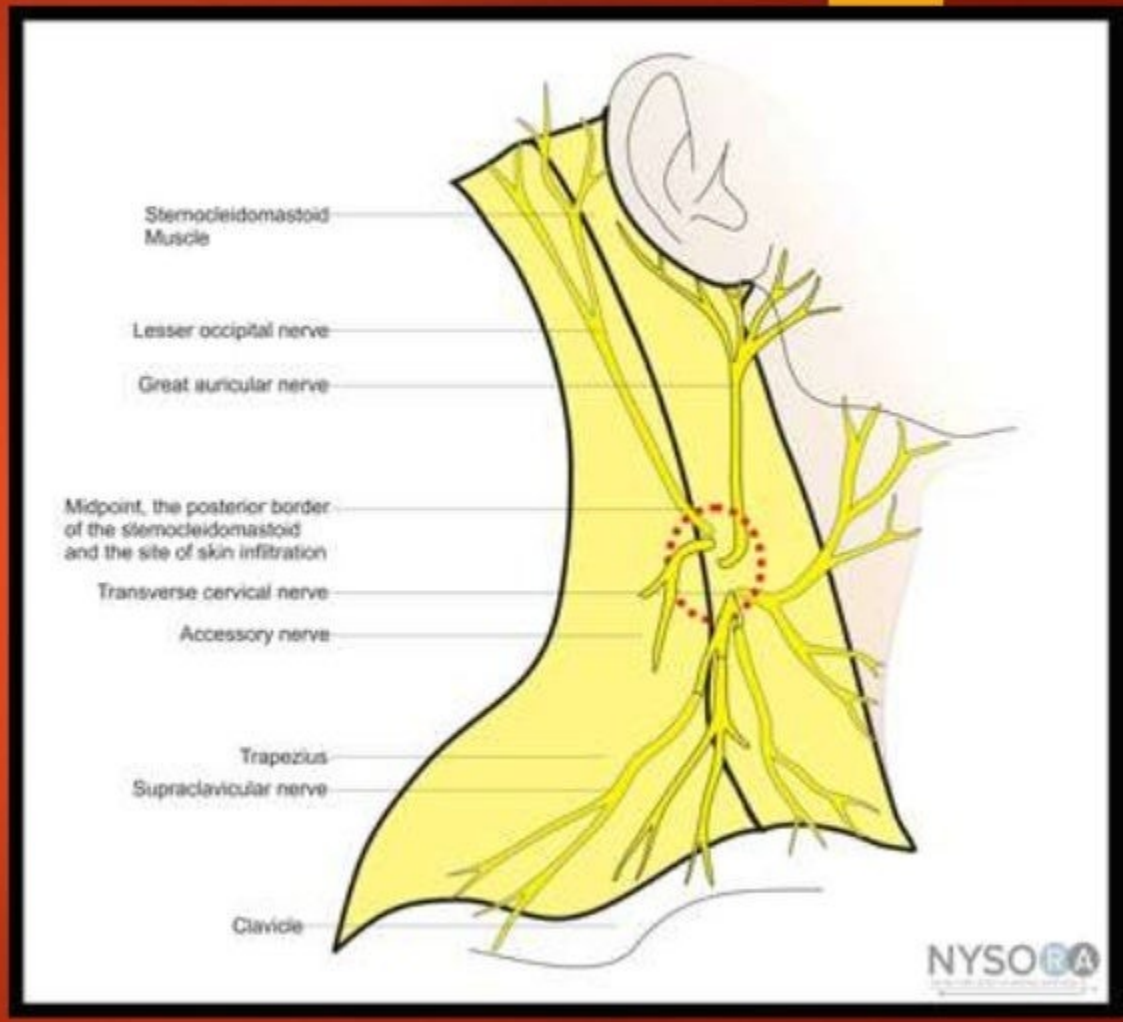
- Use - carotid endarterectomy and excision of cervical lymph nodes.
- The cervical plexus is anesthetized also when a large volume of local anesthetic is used for an inter scalene brachial plexus block.
- Local anesthetic escapes the interscalane groove and layers out underneath the deep cervical fascia where the branches of the cervical plexus are located.
- The sensory distribution for the deep and superficial blocks is similar for neck surgery, so there is a trend toward favoring the superficial approach.
- potentially greater risk for complications associated with the deep block
  - vertebral artery puncture, systemic toxicity, nerve root injury, and neuraxial spread of local anesthetic.

ANATOMY

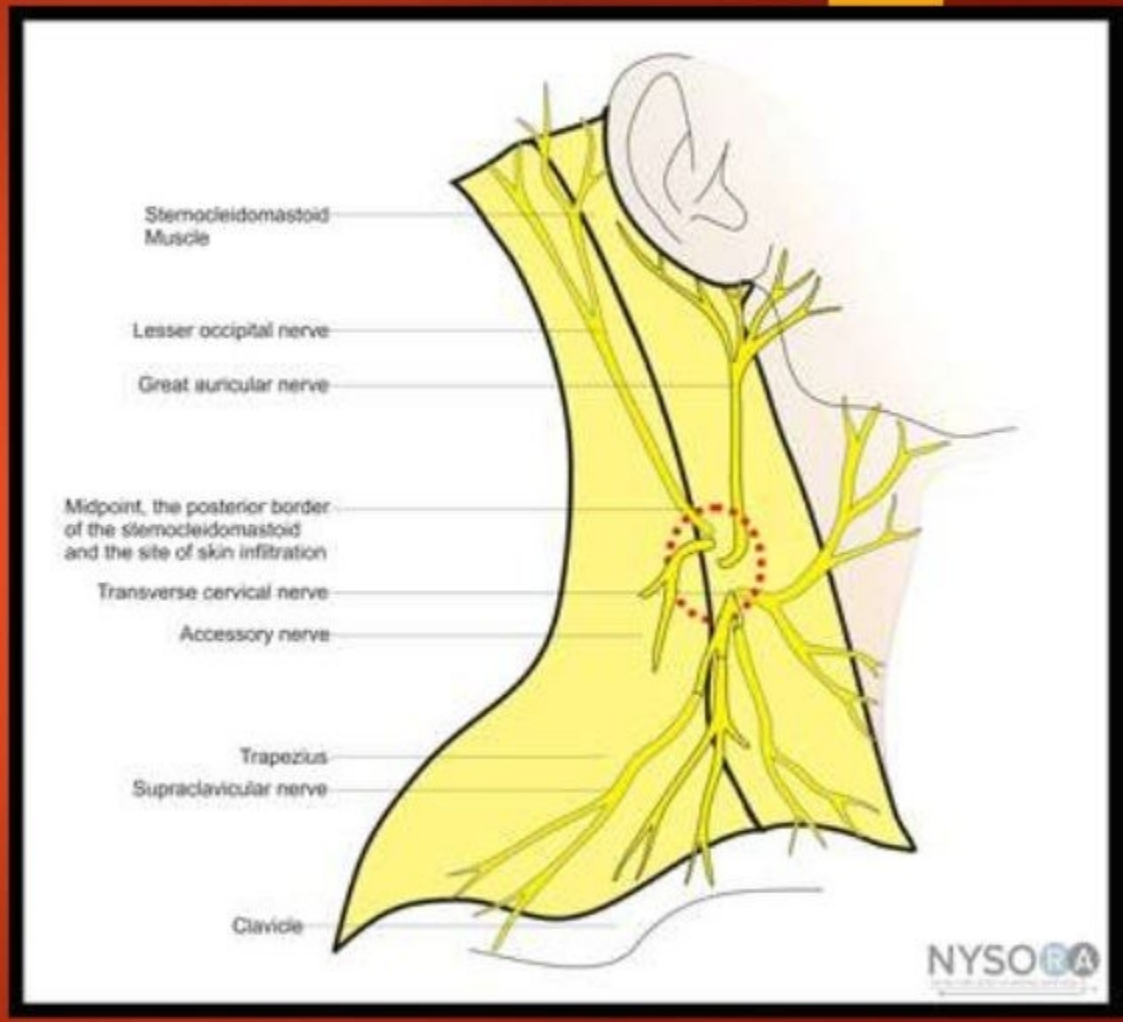
- The cervical plexus is formed by the anterior rami of the four upper cervical nerves.
- Lies lateral to the tips of the transverse processes in the plane just behind the sternocleidomastoid muscle.
- four cutaneous branches, all of which are innervated by roots C2-4.
- emerge from the posterior border of the sternocleidomastoid muscle at approximately its midpoint, supply the skin of the anterolateral neck.



- The second, third, and fourth cervical nerves send a branch each to the spinal accessory nerve or directly into the deep surface of the trapezius to supply sensory fibers to this muscle.
- The fourth cervical – send branch downward to join the fifth cervical nerve and participates in formation of the brachial plexus.

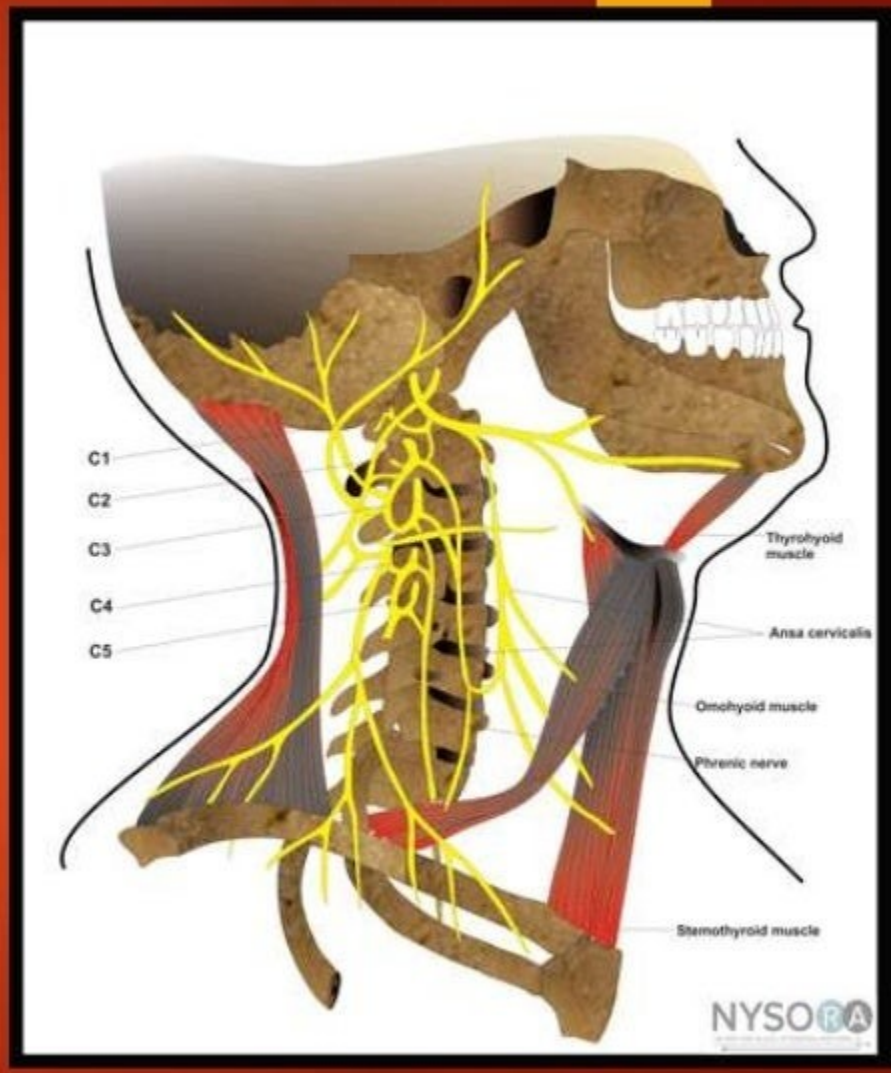


- The motor component of the cervical plexus - looped ansa cervicalis (C1-C3), from which the nerves to the anterior neck muscles originate, and branches from individual roots to posterolateral neck musculature.
- The C1 spinal nerve (the sub occipital nerve) is strictly a motor nerve, and is not blocked with either tech- nique.
- One other significant muscle innervated by roots of the cervical plexus includes the diaphragm (phrenic nerve, C3,4,5).

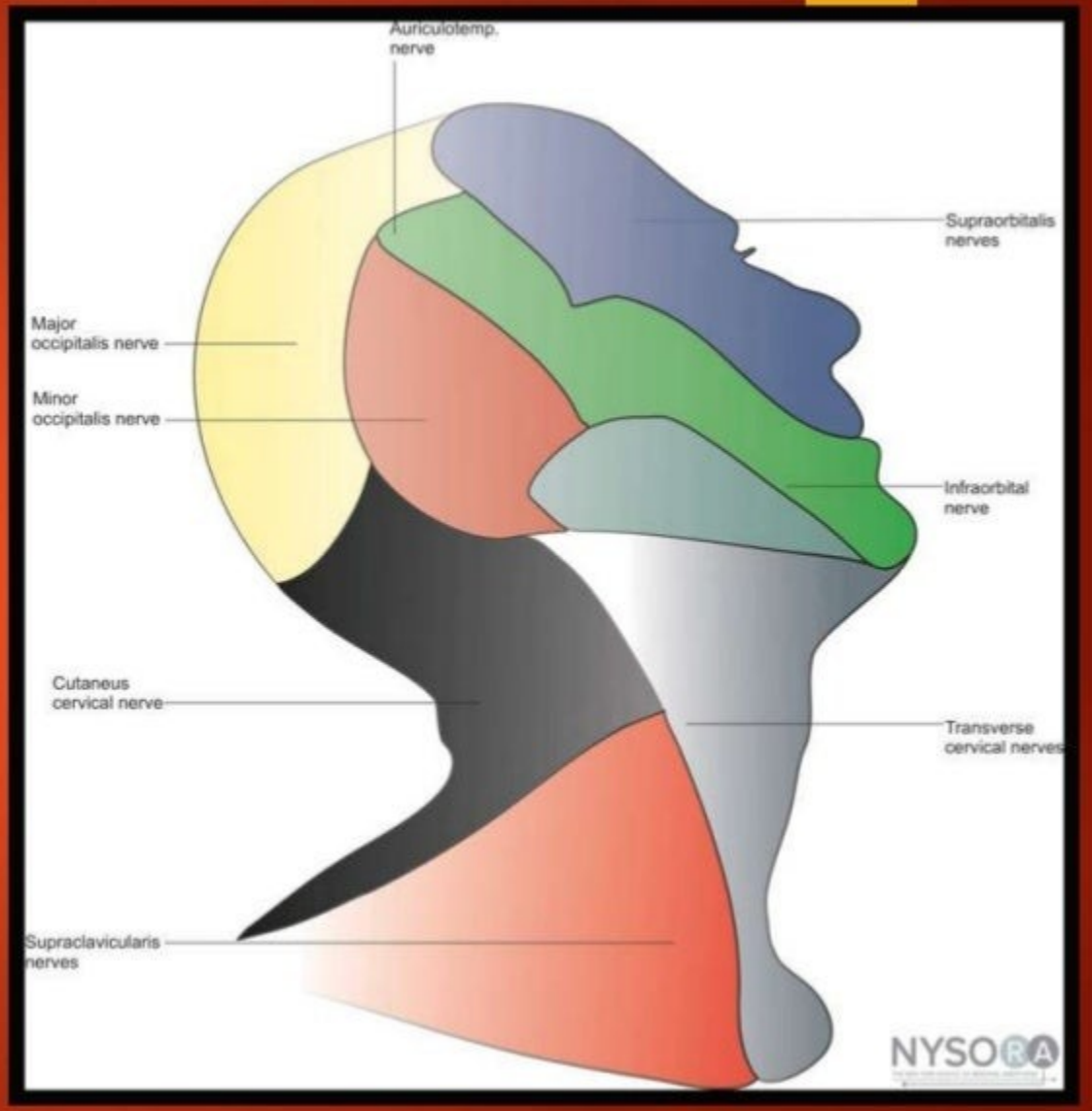


Distribution of Blockade

- Cutaneous innervation of cervical plexus blocks includes the skin of the anterolateral neck and the ante- and retroauricular areas.
- the deep cervical block anesthetizes three of the four strap muscles of the neck, geniohyoid, the prevertebral muscles, sternocleidomastoid, levator scapulae, the scalenes, trapezius, and the diaphragm (via blockade of the phrenic nerve



- Cutaneous innervation of both the deep and the superficial cervical plexus blocks includes the skin of the anterolateral neck and the ante- and retroauricular areas.
- In addition, the deep cervical block anesthetizes three of the four strap muscles of the neck, geniohyoid, the prevertebral muscles, sternocleidomastoid, levator scapulae, the scalenes, trapezius, and the diaphragm (via blockade of the phrenic nerve



Superficial Cervical Plexus Block

Landmarks and Patient Positioning

- The patient is in a supine or semi-sitting position with the head facing away from the side to be blocked.
- the primary landmarks for performing this block:
  - 1. Mastoid process
  - 2. Clavicular head of the sternocleidomastoid
  - 3. The midpoint of the posterior border of the sternocleidomastoid



- *Surface landmarks for superficial cervical plexus block.*
- *White dot: insertion of the clavicular head of the sternocleidomastoid muscle.*
- *Blue dot: Mastoid process.*
- *Uncolored circle: Transverse process of C6 vertebrate.*
- *Red dot: Needle insertion site at the midpoint between C6 and mastoid process behind the posterior border of the sternocleidomastoid muscle*



The sternocleidomastoid muscle can be better differentiated from the deeper neck structures by asking the patient to raise their head off the table.

Technique



- The needle is inserted along the posterior border of the sternocleidomastoid, and three injections of local anesthetic are injected behind the posterior border of the sternocleidomastoid muscle subcutaneously, perpendicularly, cephalad, and caudad in a 'fan' fashion

- The onset time for this block is 10 to 15 minutes.

- Excessive sedation should be avoided before and during head and neck procedures because airway management, when necessary, can prove difficult because access to the head and neck is shared with the surgeon.

- Due to the complex arrangement of the sensory innervation of the neck and the cross-coverage from the contralateral side, the anesthesia achieved with a cervical plexus block is rarely complete.

- *Palpation technique to determine location of the transverse process of C6. The head is rotated away from the palpated side while the palpated fingers explore for the most lateral bony prominence, often in the vicinity of the external jugular vein.*



- *Palpation technique to determine the posterior border of the sternocleidomastoid muscle. With the head of the patient rotated away from the palpation side, the patient is asked to lift his or her head off of the bed to accentuate the sternocleidomastoid muscle.*

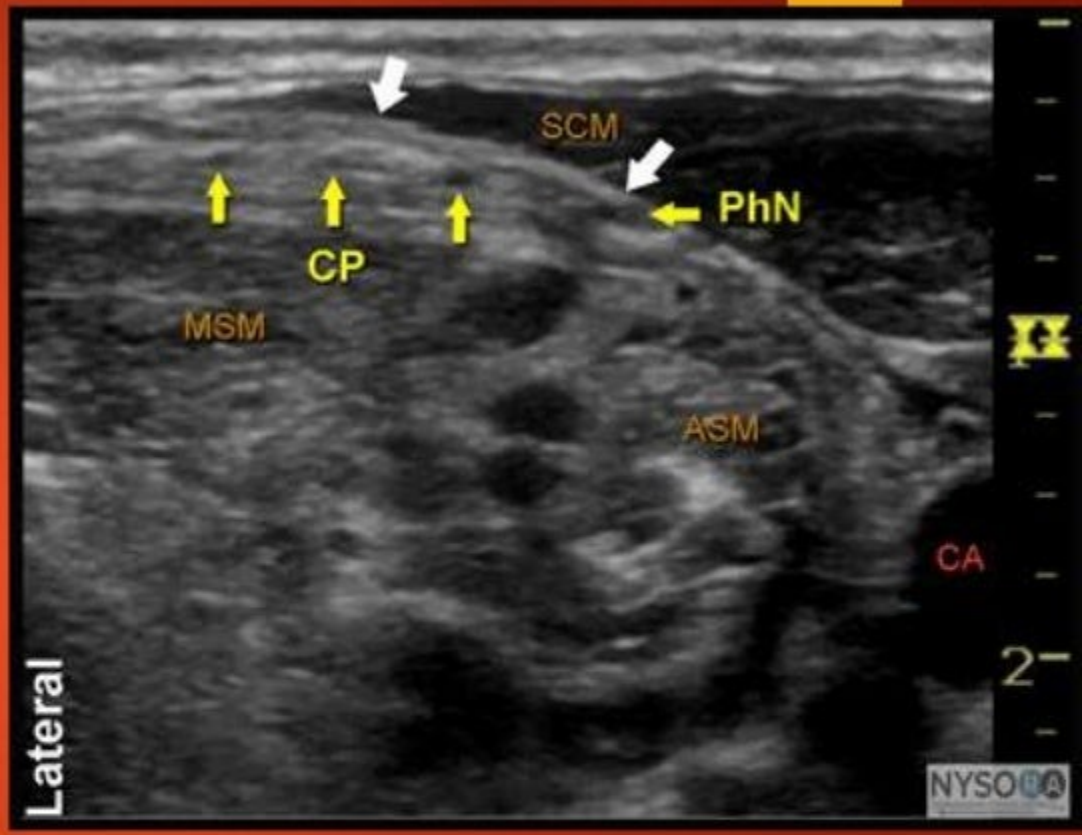


Ultra Sound Guided Technique

- The plexus can be visualized as a small collection of hypoechoic nodules (honeycomb appearance or hypo-echoic [dark] oval structures) immediately deep or lateral to the posterior border of the SCM



- Occasionally, the greater auricular nerve is visualized on the superficial surface of the SCM muscle as a small, round hypoechoic structure.
- The SCM is separated from the brachial plexus and the scalene muscles by the prevertebral fascia, which can be seen as a hyperechoic linear structure.
- The superficial cervical plexus lies posterior to the SCM muscle, and immediately underneath the prevertebral fascia overlying the interscalene groove.



(CP) emerging behind the prevertebral fascia that covers the middle (MSM) and anterior (ASM) scalene muscles, and posterior to the sternocleidomastoid muscle (SCM). White arrows, Prevertebral Fascia; CA, carotid artery; PhN, phrenic nerve.

Land Marks and Patient positioning

- This block is typically performed in the supine or semi-sitting position, with the head turned slightly away from the side to be blocked
- The patient's neck and upper chest should be exposed so that the relative length and position of the SCM can be assessed.



Goal

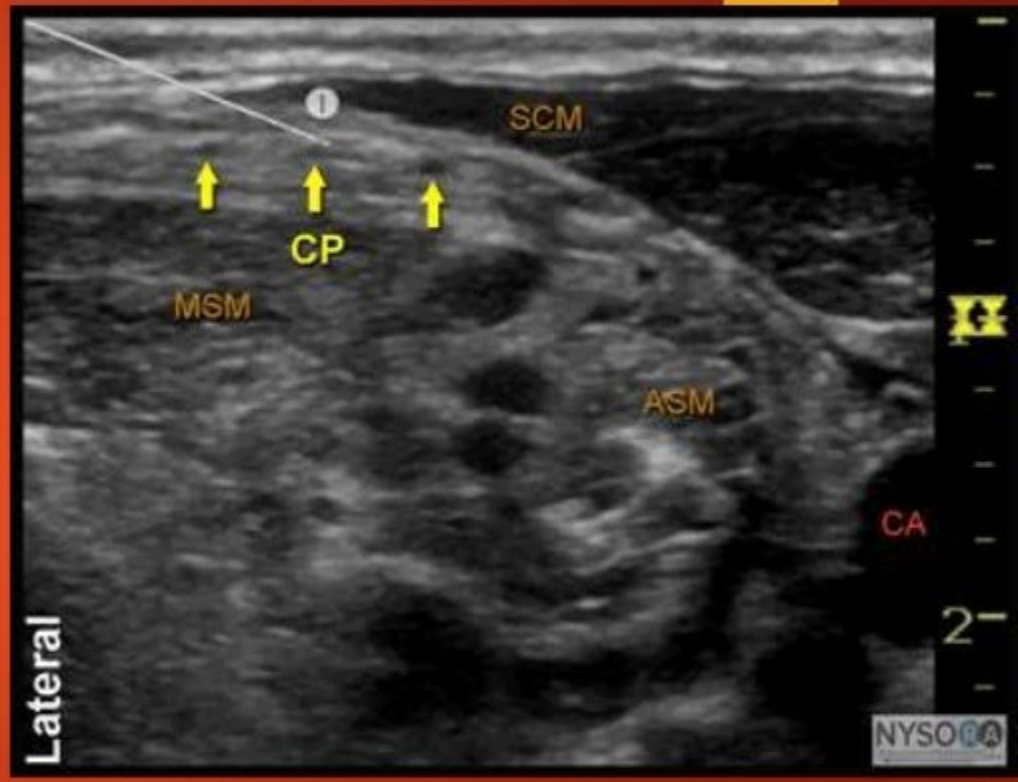
- The goal is to place the needle tip immediately adjacent to the superficial cervial plexus.
- If it is not easily visualized, the local anesthetic can be deposited in the plane immediately deep to the SCM: and underneath the prevertebral fascia.

Technique

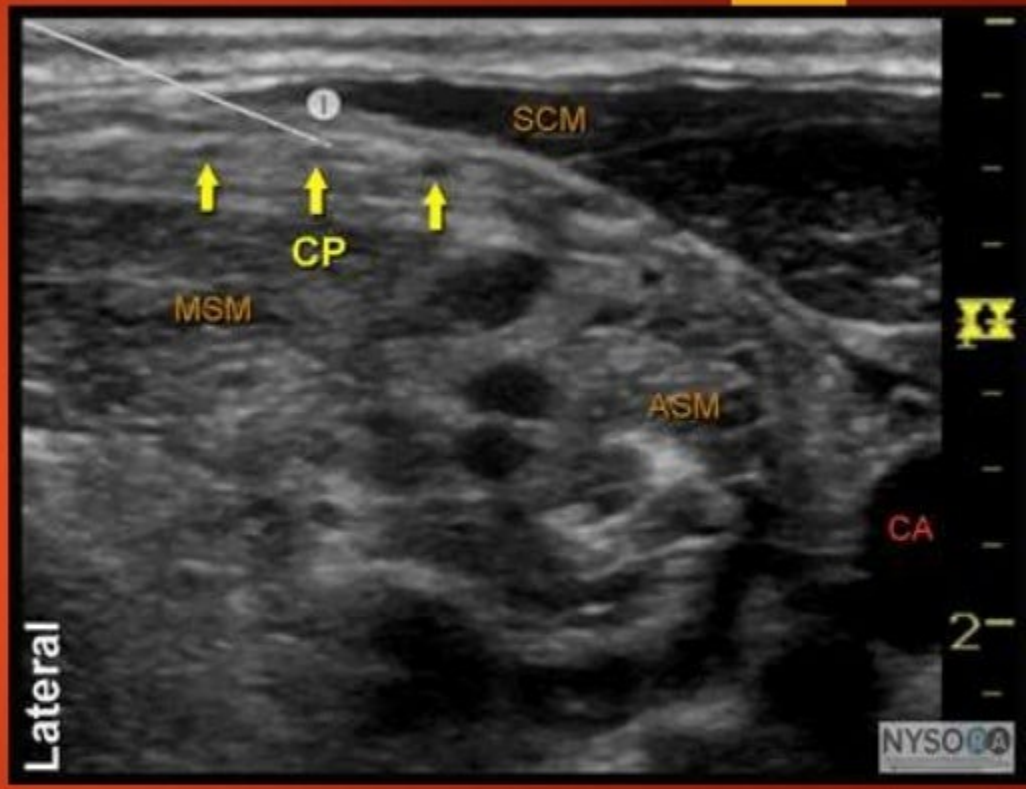
- The transducer is placed on the lateral neck, overlying the SCM at the level of its midpoint (approximately the level of the cricoid cartilage).
- Once the SCM is identified, the transducer is moved posteriorly until the tapering posterior edge is positioned in the middle of the screen.
- At this point, an attempt should be made to identify the brachial plexus and/or the interscalene groove between the anterior and middle scalene muscles.
- The plexus is visible as a small collection of hypoechoic nodules (honeycomb appearance) immediately underneath the prevertebral fascia that overlies the interscalene groove

- Once identified, the needle is passed through the skin, platysma and prevertebral fascia, and the tip placed adjacent to the plexus.

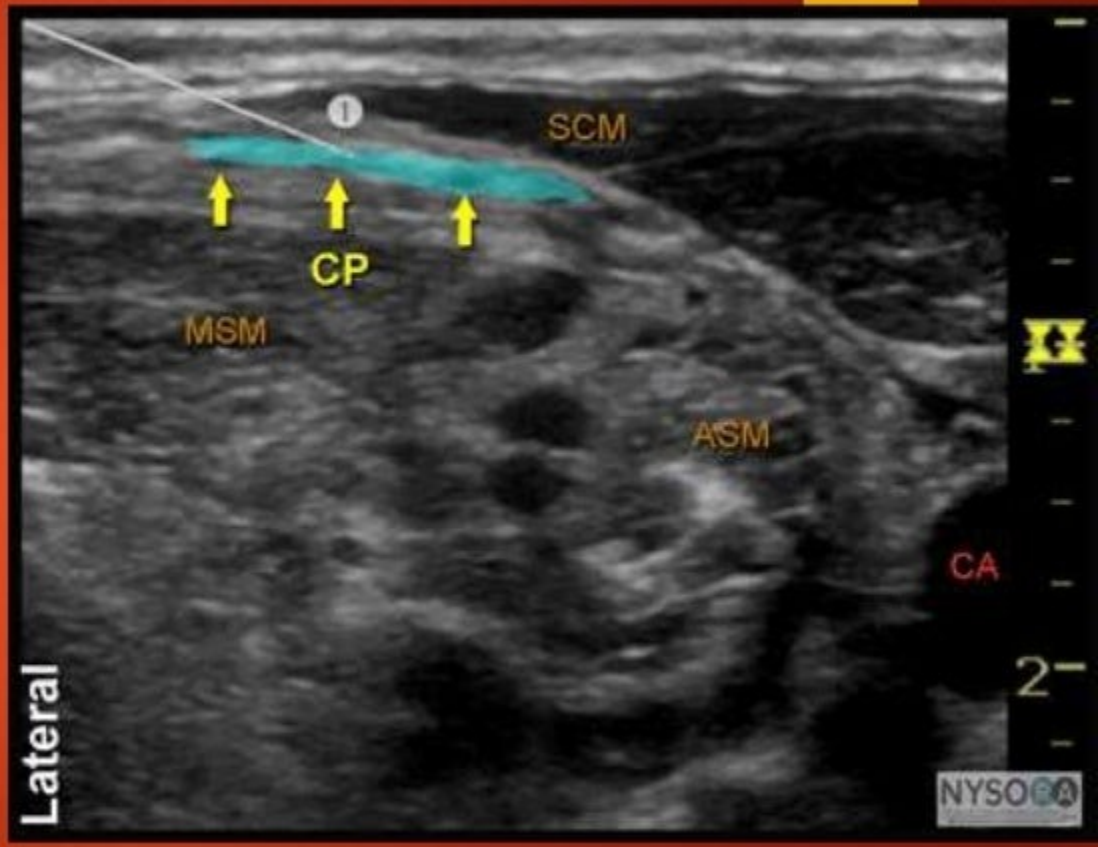
- Following negative aspiration, local anesthetic is injected to envelop the plexus.



- *Needle path and position to block the superficial cervical plexus (CP), transverse view.*
- *The needle is seen positioned underneath the lateral border of the sternocleidomastoid muscle (SCM) and underneath the prevertebral fascia with the transducer in a transverse position.*
- *ASM, anterior scalene muscle;*
- *CA, carotid artery;*
- *MSM, middle scalene muscle.*



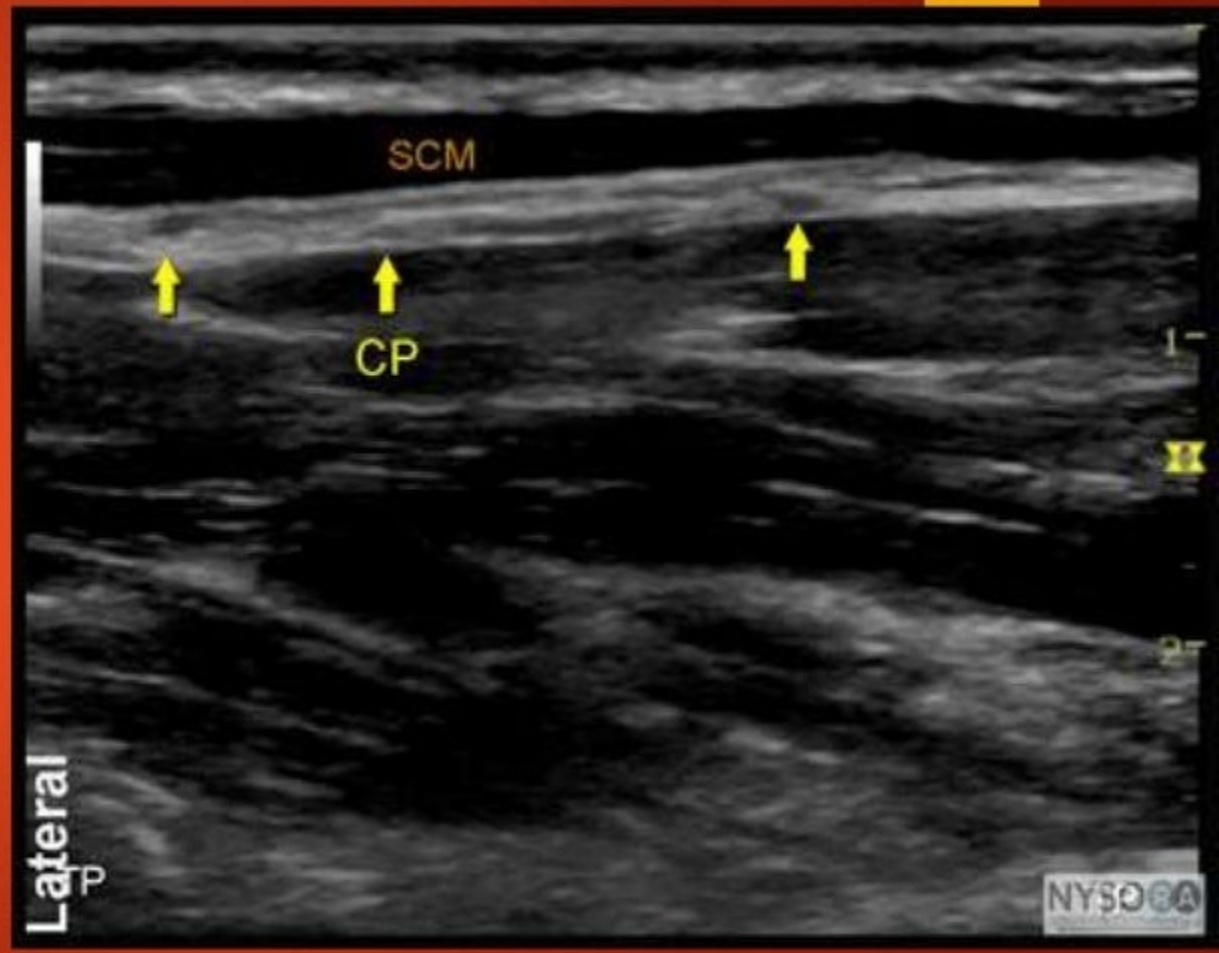
- *Desired distribution of the local anesthetic (area shaded in blue) to block the superficial cervical plexus.*
- *ASM, anterior scalene muscle;*
- *CA, carotid artery;*
- *CP, cervical plexus;*
- *MSM, middle scalene muscle;*
- *SCM, sternocleidomastoid muscle*



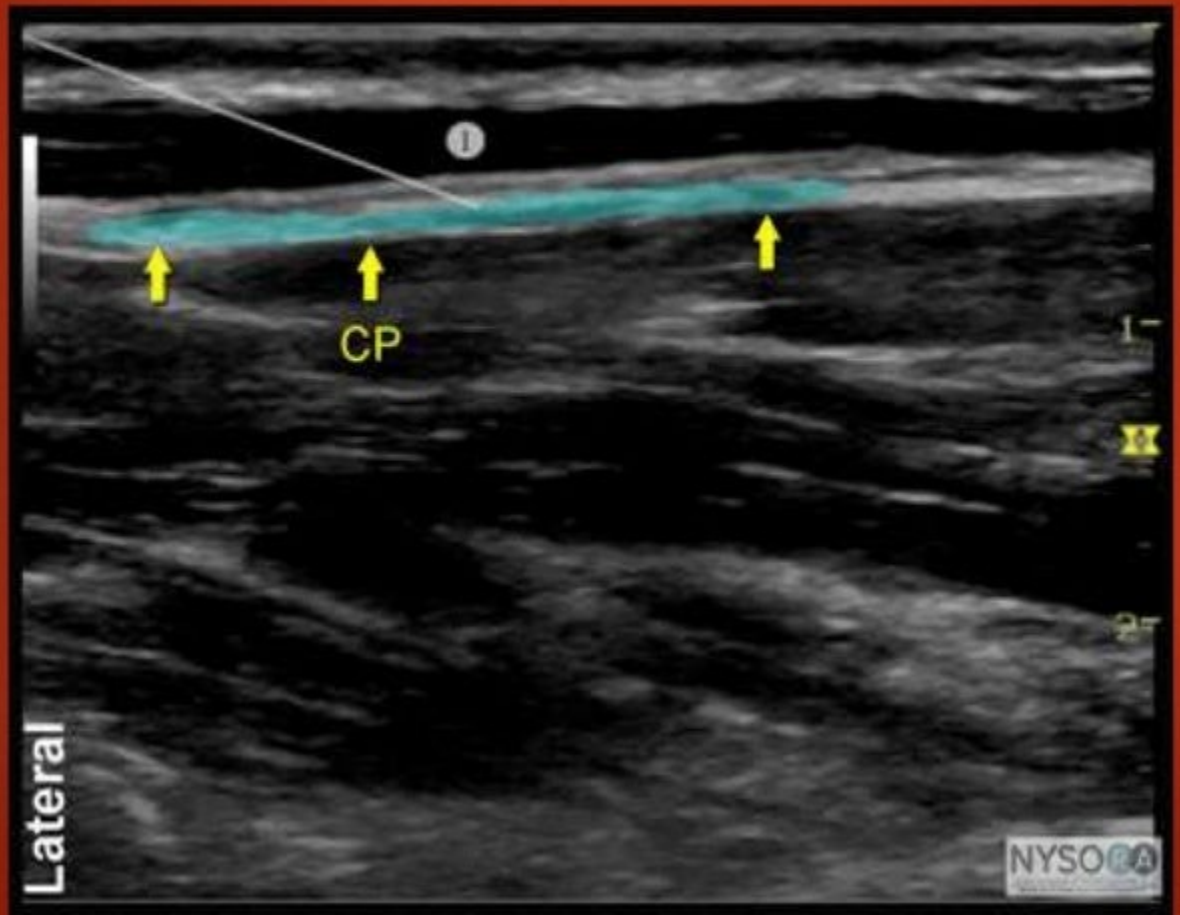
- If the plexus is not visualized, an alternative sub sternocleidomastoid approach can be used.
- the needle is passed behind the SCM and the tip is directed to lie in the space between the SCM and the prevertebral fascia, close to the posterior border of the SCM.



- *Longitudinal view of the superficial cervical plexus (CP) underneath the lateral border of the sterno-cleidomastoid muscle (SCM).*



- Local anesthetic is administered and should be visualized layering out between the SCM and the underlying prevertebral fascia



- If injection of the local anesthetic does not appear to result in an appropriate spread, additional needle repositioning and injections may be necessary.
- Because the superficial cervical plexus is made up of purely sensory nerves, high concentrations of local anesthetic are usually not required

Deep Cervical Plexus Block

Landmarks and Patient Positioning

- The patient is in the same position as for the superficial cervical plexus block. The three landmarks for a deep cervical plexus block are similar to those for the superficial cervical plexus block:
- 1. Mastoid process
- 2. Chassaignac tubercle (transverse process of C6
- 3. Posterior border of the sternocleidomastoid muscle



- *The landmarks for the deep cervical plexus block.*
- *White circle indicates the transverse process of C6*
- *The pen is outlining the transverse process of C4*



- To estimate the line of needle insertion overlying the transverse processes, the mastoid process and the transverse process of C6 are identified and marked.
- The latter is easily palpated behind the clavicular head of the sternocleidomastoid muscle just below the level of the cricoid cartilage.
- Next, a line is drawn connecting the mastoid process to the C6 transverse process.
- The palpating hand is best positioned just behind the posterior border of the sternocleidomastoid muscle.
- Once this line is drawn, the insertion sites over C2 through C4 are labeled as follows:
  - C2: 2 cm caudad to the mastoid process,
  - C3: 4 cm caudad to the mastoid process, and
  - C4: 6 cm caudad to the mastoid process

- Local anesthetic is infiltrated subcutaneously along the line estimating the position of the transverse processes.
- A needle is connected via flexible tubing to a syringe containing local anesthetic.

- The needle is inserted between the palpating fingers and advanced at an angle perpendicular to the skin plane.
- The needle should never be oriented cephalad.
- A slightly caudal orientation of the needle is important to prevent inadvertent insertion of the needle toward the cervical spinal cord.
- The needle is advanced slowly until the transverse process is contacted.
- At this point, the needle is withdrawn 1 to 2 mm and firmly stabilized, and 4 to 5 mL of local anesthetic is injected after a negative aspiration test for blood.
- The needle is removed, and the entire procedure is repeated at consecutive levels.



- *Needle insertion for the deep cervical plexus block.*
- *The needle is inserted between fingers palpating individual transverse processes*



Troubleshooting Deep Cervical Plexus Blocks

- When insertion of the needle does not result in contact with the transverse process within 2 cm, the following maneuvers are used:
- 1. While avoiding skin movement, keep the palpating hand in the same position and the skin between the fingers stretched.
- 2. Withdraw the needle to the skin, redirect it 15° inferiorly, and repeat the procedure.
- 3. Withdraw the needle to the skin, reinsert it 1 cm caudal, and repeat the procedure.

Complications of cervical plexus blocks and strategies to avoid them

Infection	• Low risk. • A strict aseptic technique should be used.
Hematoma	• Avoid multiple needle insertions, particularly in patients on anticoagulant therapy. • Keep a 5-min steady pressure on the site if a blood vessel is inadvertently punctured.
Phrenic nerve blockade	• Phrenic nerve blockade (diaphragmatic paresis) is expected with a deep cervical plexus block • A bilateral deep cervical block may be contraindicated in patients with symptomatic respiratory disease • Blockade of the phrenic nerve does not occur following a superficial cervical plexus block.
Local anesthetic toxicity	• Central nervous system toxicity is the most common complication of the cervical plexus block. • This complication occurs because of the rich vascularity of the neck (vertebral and carotid artery vessels); the toxicity usually results from the inadvertent intravascular injection rather than absorption of local anesthetic. • Frequent aspiration for blood should be performed during the injection.
Nerve injury	• Local anesthetic should never be injected against excessive resistance (pressure) or when the patient complains of severe pain on injection.
Spinal anesthesia	• This complication may occur with injection of a large volume of local anesthetic inside the dural sleeve surrounding the nerves of the cervical plexus. • Avoidance of high volumes and high pressure during injection are the best measures to avoid this complication. • It should be noted that negative results from an aspiration test for cerebrospinal fluid do not rule out the possibility of intrathecal spread of local anesthetic.

