SUPERFICIAL STRUCTURES IN THE NECK

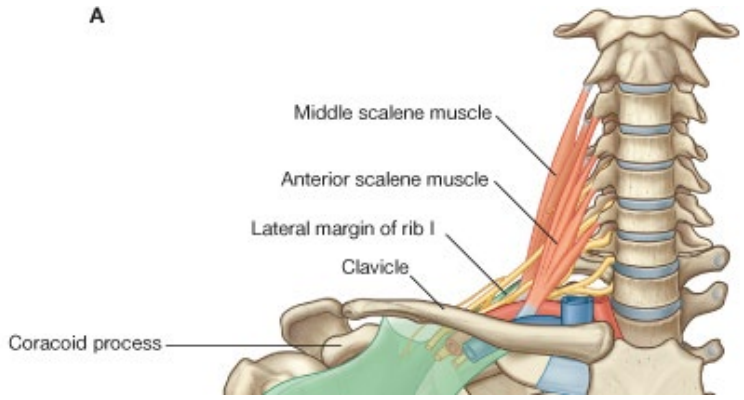
- C1 pair of spinal nerves leave *above* the first cervical vertebra – between the vertebra and the base of the skull.
- Remaining 7 cervical spinal nerves leave the vertebral column through their corresponding foramina.
- After leaving interverterbral foramina, spinal nerve immediately divides into:
    - **Dorsal ramus**
    - **Ventral ramus**
- Dorsal ramus:
    - Skin at back of neck
    - Extensor muscles of neck

- Ventral rami:
    - C1-C4: form the **cervical plexus**
    - C5-C8 + T1: **brachial plexus**

- Transverse process of the cervical vertebrae have:
    - Foramina transversarium
    - Anterior and posterior tubercles
- Cervical ventral rami pass out in gutter between the anterior and posterior tubercles

Scalene muscles:
- Run from cervical verterbae → ribs 1 & rib 2
- Scalene muscles lie either side of the vertebral column
- Arise from the <u>tubercles of the transverse processes</u>
    - **Scalenus anterior:** from *anterior tubercles*
    - **Scalenus medius:** from *posterior tubercles*
    - **Scalenus posterior:** from *posterior tubercles*
- Levator scapulae also arises from posterior tubercle.

- Ventral rami Δ emerge into the neck <u>between scalenus anterior & scalenus medius</u>

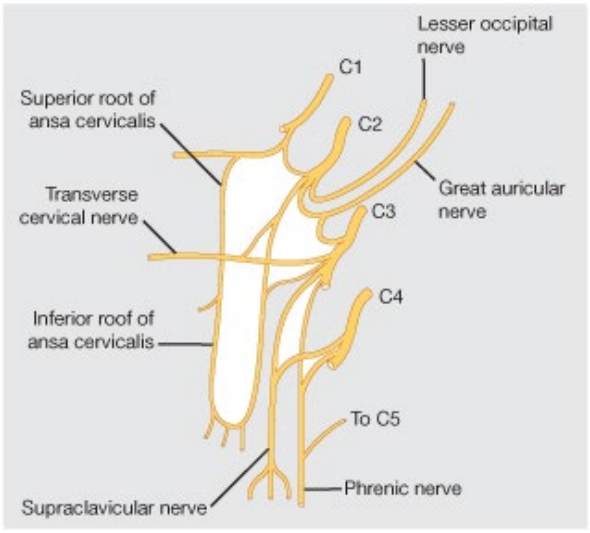


CERVICAL PLEXUS:
- C1-C4 <u>ventral rami</u>
- Supplies:
    - Muscles of neck
    - Skin on side + front of neck

- A few fibres of C1 ventral rami 'hitch-hike' along hypoglossal nerve (XII)
- Travel in front of the neck as **superior root of ansa cervicalis** & **thyrohyoid nerve**

- Fibres from C2 & C3 form a separate **inferior root of the ansa cervicalis**

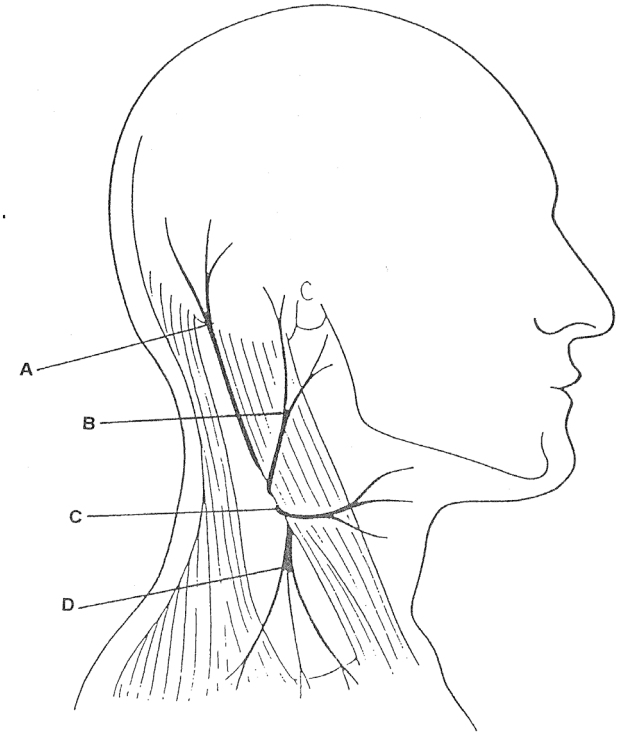
- The superior and inferior root of the ansa join to form a loop, from which fine branches supply the muscles at the front of the neck
- Ansa cervicalis lies in the carotid subtriangle of the anterior triangle of the neck

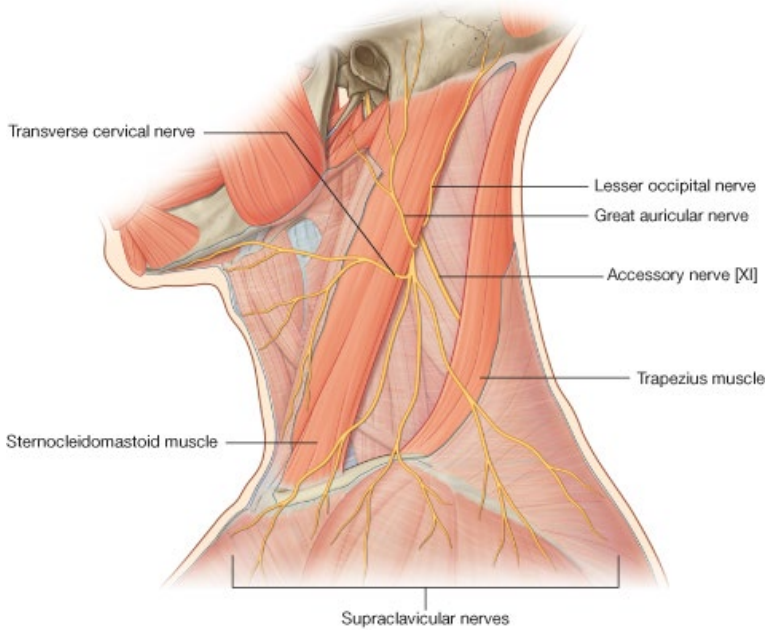


- The **phrenic nerve** is a muscular branch of **C4**
- Recieves a few additional fibres from C3 and C5
- Supplies the diaphragm, which was originally a muscle of the neck, before it descended into thorax.
- Passes from C3, C4 + C5 → **anterior surface of scalenus anterior** (*deep* to prevertebral fascia)
- → crosses obliquely in front of subclavian artery
- → passes through superior aperture of the thorax
- Δ broken neck above C4 is fatal – causes paralysis of diaphragm.

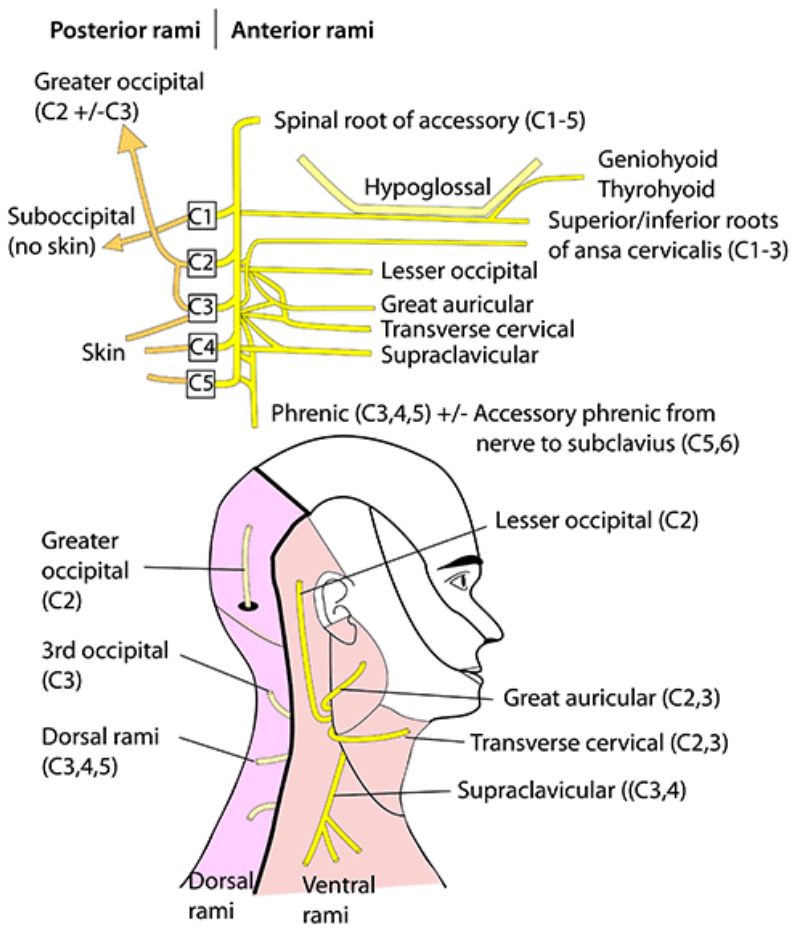
- **Cutaneous branches** of the cervical plexus emerge at the side of the neck
- → radiate into the skin from **posterior surface of sternocleidomastoid muscle**
- From top to bottom clockwise, these cutaneous nerve branches are named:
    - **Lesser occipital**
    - **Great auricular**
    - **Transverse cervical**
    - **Supraclavicular**

- **Lets Go To School**





CERVICAL PLEXUS



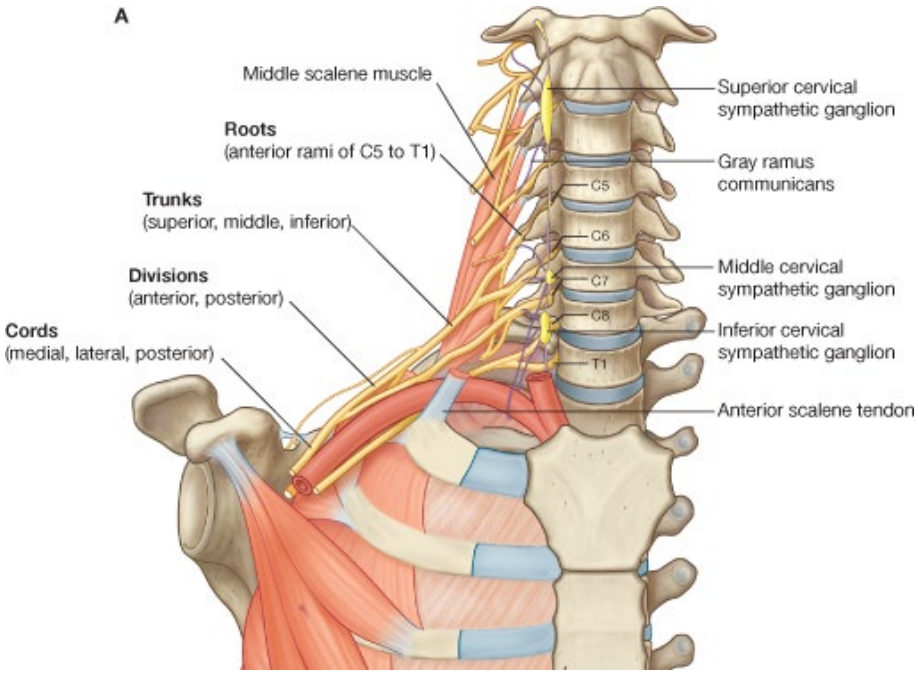
Great auricular nerve should not be confused with:

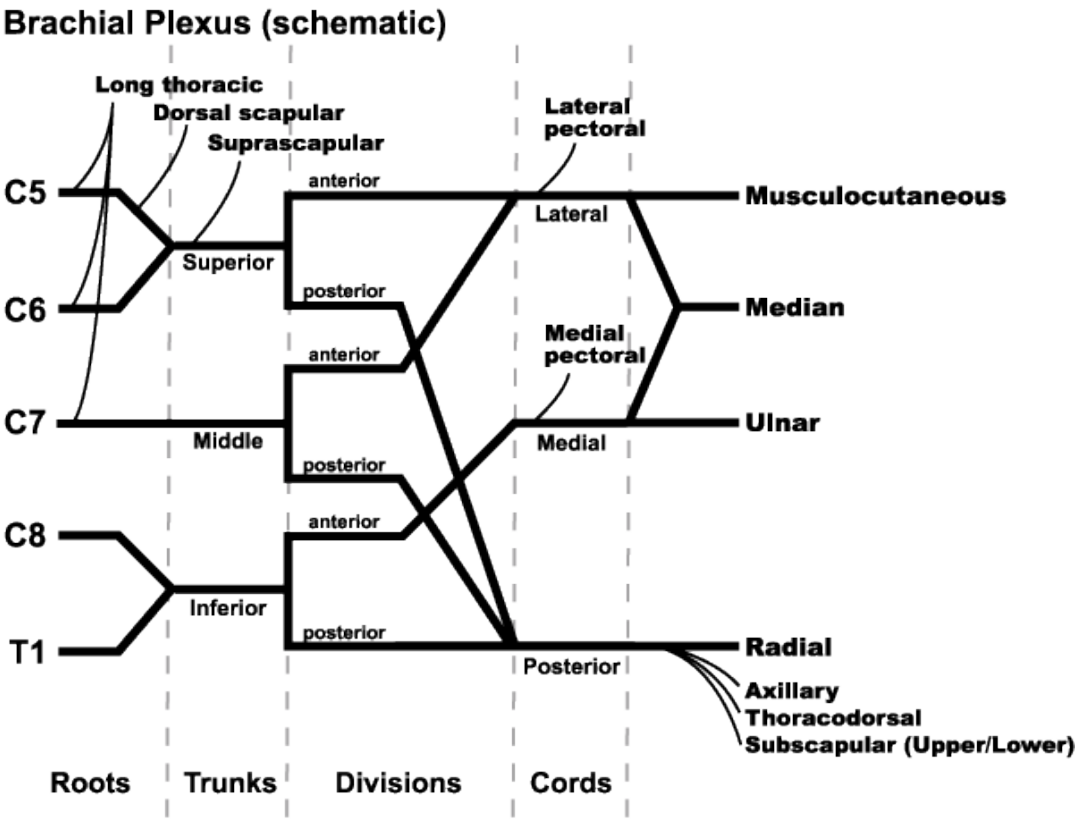
- Posterior auricular branch of facial (VII)-motor to occipitalis
- Auriculotemporal branch of mandibular (Vc) sensory to hairy temple

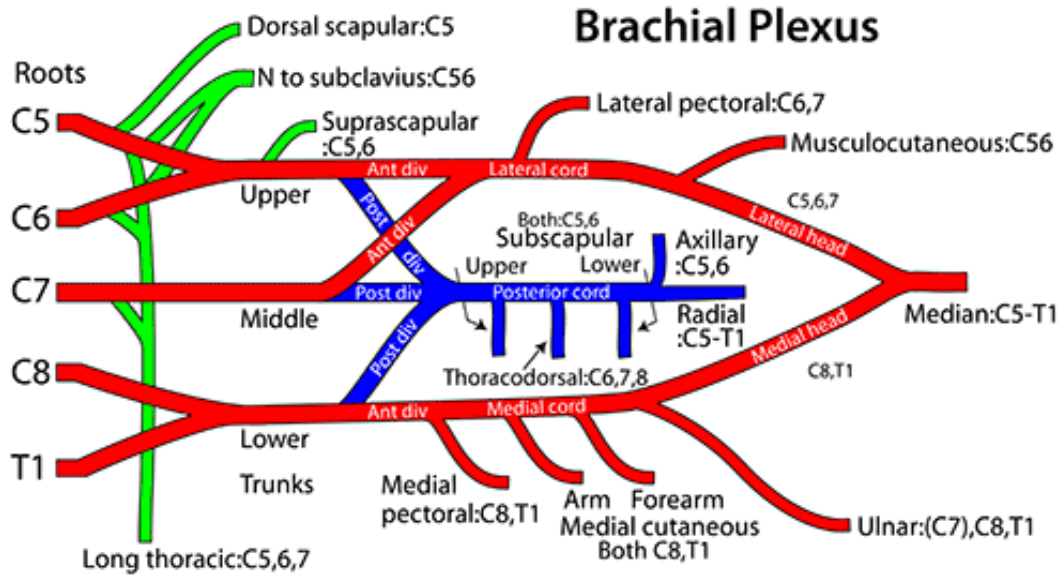
BRACHIAL PLEXUS:

- C5-C8 + T1 ventral rami
- Emerge low in neck between scalenus anterior and medius.

- Trunks are quickly formed:
    - C5 + C6: **upper** trunk
    - C7: **middle** trunk
    - C8 + T1: **lower** trunk
- Trunks stream over the first rib with the subclavian artery → upper limb





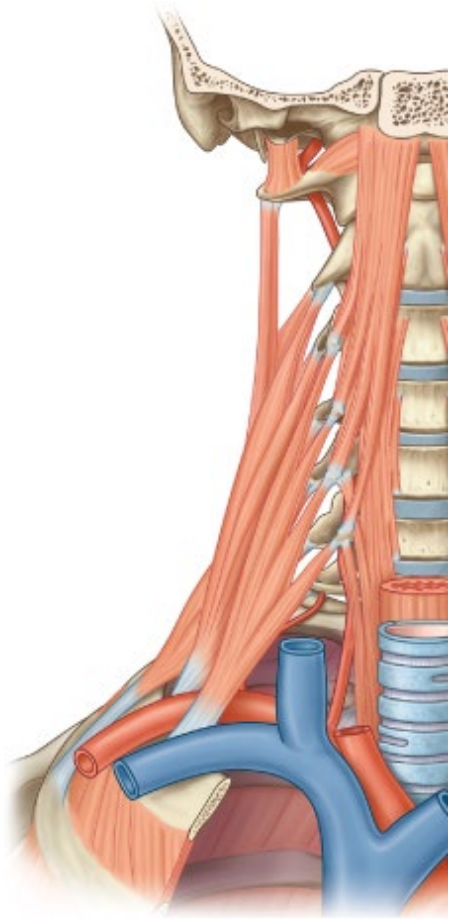


Note that there is usually some C7 in the ulnar nerve that gets there via a connection from the lateral cord or median nerve beyond the brachial plexus

- **Prevertebral fascia covers:**
  - Prevertebral muscles
  - Scalene muscles
- Prevertebral fascia Δ covers the triangular gap between scalenus anterior & medius
- Δ on emerging from interverterbral foramina, the cervical ventral rami lie deep to this fascia

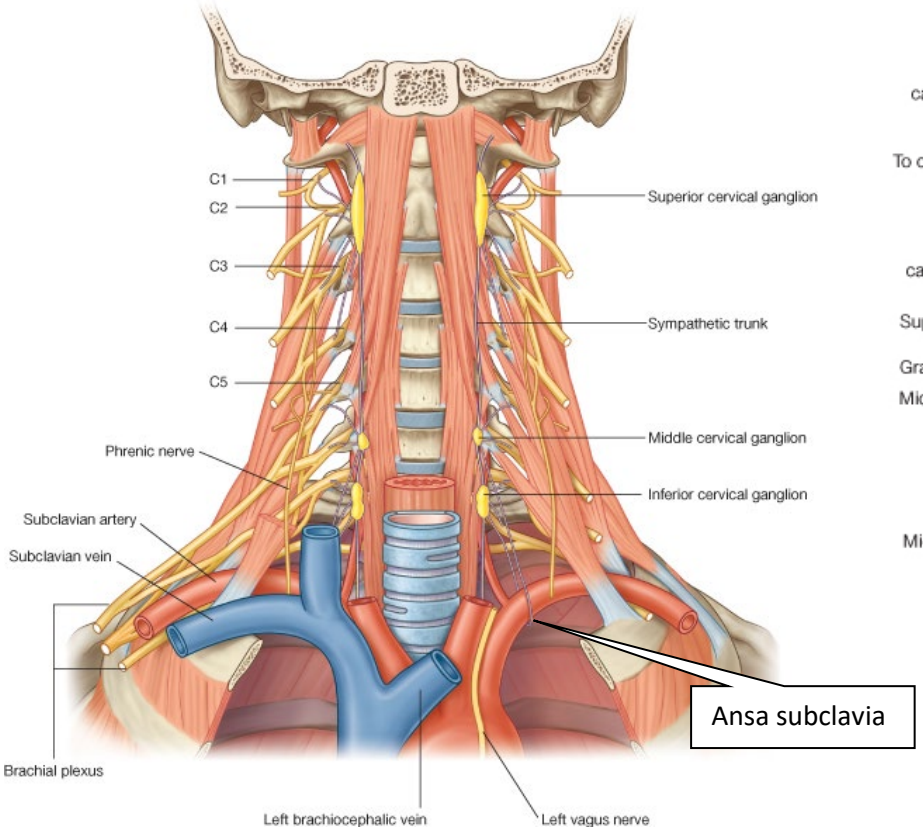
- The ventral rami Δ pierce the prevertebral fascia to reach the structures they supply

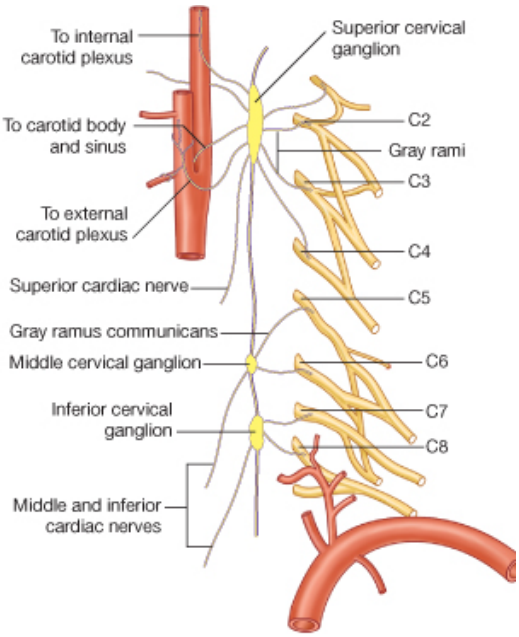
- In the root of the neck:
    - The brachial plexus & subclavian artery pierce the fascia
    - The subclavian artery carries with it a sheath of the prevertebral fascia into the arm – the **axillary sheath**
    - The subclavian vein passes over the 1st rib *in front of scalenus anterior* Δ does not pierce the fascia.



CERVICAL SYMPATHETIC TRUNK:

- Travels from base of scull → superior aperture of thorax → thoracic part of trunk
- All the preganglionic sympathetic neurons in the cervical sympathetic trunk have ascended from the thoracic region (remember symp. outflow is thoracolumbar – no outflow @ cervical level).
- The preganglionics ascend to one of **3 cervical ganglion**:
    - **Superior cervical sympathetic ganglion**
    - **Middle " "**
    - **Inferior " "**
- Often the inferior ganglion is fused with the first thoracic ganglion
- This forms a large **cervicothoracic ganglion** (aka **stellate ganglion**)
- Cervicothoracic ganglion lies on the neck of the first rib





- Postganglionic fibres arise in all 3 ganglion
- Many postganglionics then travel along blood vessels to reach their destinations.

- Fibres from **superior ganglion**: travel with ***internal & external carotids***
- Fibres from **middle ganglion**: travel with ***inferior thyroid arteries***
- Fibres from **inferior ganglion**: travel along ***vertebral artery***

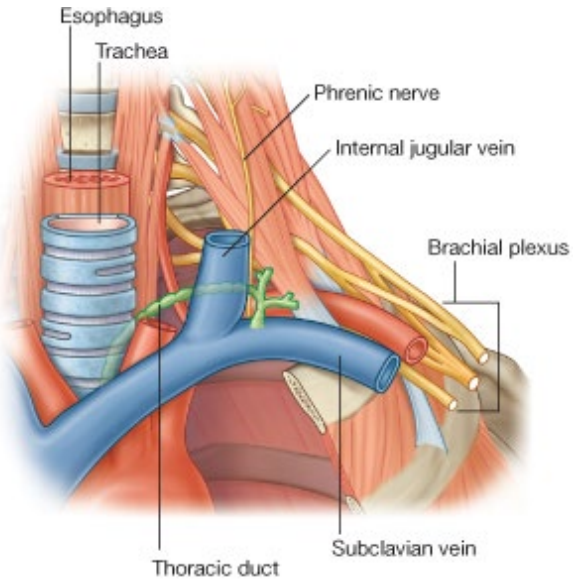
- Each ganglion gives a few postganglionic sympathetic fibres which descend over the prevertebral fascia → cardiac plexus → heart
- These are **cardiac branches**

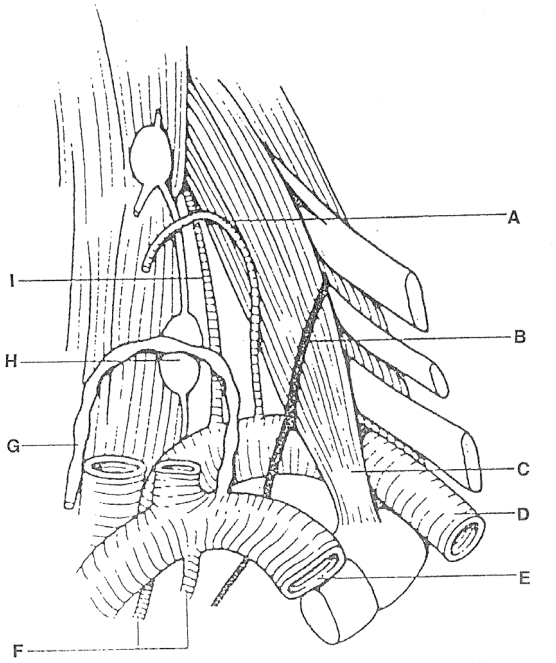
- Some postganglionic sympathetic fibres pass from ganglion → cervical ventral rami
- These sympathetic fibres are then distributed with the ventral rami → skin of neck & upper limb.

- **Ansa subclavius** is a slender branch of postganglionic fibres from middle ganglion
- Loops around subclavian artery
- Rejoins the inferior cervical ganglion
- *Gives sympathetic fibres to the subclavian artery* destined for the upper limb.

THORACIC DUCT:

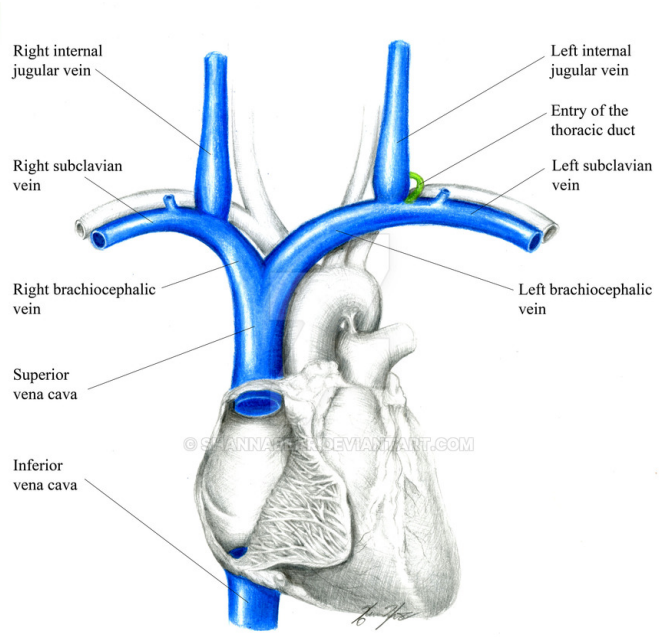
- On the LHS
- Ascends thorax behind the oesophagus, on top of the prevertebral fascia.
- In the root of the neck it <u>arches forwards</u> to enter venous system at <u>junction between left subclavian vein & left jugular vein</u>.



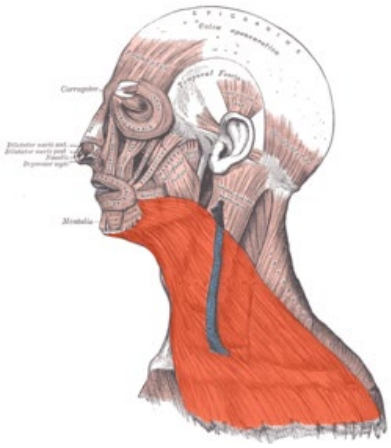


Scalenus anterior attaches to the first rib between the subclavian vein and subclavian artery. The thoracic duct arches over and drains into the junction between the internal jugular vein and the subclavian vein here in the root of the neck.

A Inferior thyroid artery
B Phrenic nerve
C Scalenus anterior
D Subclavian artery
E Subclavian vein
F Internal thoracic vessels
G Thoracic duct
H Stellate ganglion
I Vertebral artery



MUSCULOFASCIAL COVERINGS IN THE NECK



- **Platysma muscle**
  - Thin sheet of muscle found *in* the subcutaneous fat of the neck
  - It is really a muscle of facial expression
  - Fibres arise from deep fascia & skin on front of chest & shoulder
  - → sweep upwards over front and sides of neck
  - Insert into:
    - Deep fascia of neck
    - Deep fascia of lower face
    - Lower border of mandible
  - Supplied by **facial nerve (VII)** – like all muscles of facial expression

Deep to the subcutaneous fat:

- Deep to the subcutaneous fat & platysma muscle in the neck are 2 muscles:
  - **Sternocleidomastoid**
  - **Trapezius**

Sternocleidomastoid:

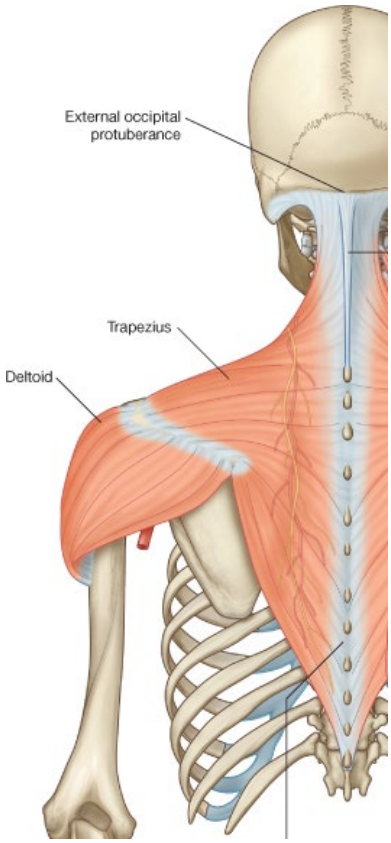
- Arises from:
  - Front of manubrium – round tendon
  - Medial 1/3 of clavicle – flat muscular sheet
- The 2 sets of fibres fuse on their ascent
- Insert into:
  - Mastoid process (of skull)
  - Lateral part of superior nuchal line (back of occipital bone)
- Deep surface of sternocleidomastoid is pierced by ***spinal part*** **of accessory nerve (XI)** (cranial part has joined the vagus nerve).
- Spinal part of accessory nerve (XI) supplies the motor neurons to the muscle

- *Action:*
  - One sternocleidomastoid acting alone:

        - ➢ lateral flexion of the head, and draws the head down on that side
        - ➢ Rotates head on cervical column – head is turned upwards and to opposite side.
    - Both sternocleidomastoids acting together:
        - ➢ Flex cervical column and head forwards.

Trapezius:

- Only anterior edge can be seen from the front
- Muscle best seen from side & back
- Origin:
    - Middle of superior nuchal line
    - Spines of <u>cervical</u> & <u>thoracic</u> vertebrae
- Sweep round to insert into:
    - Spine of scapula
    - Acromion
    - Lateral 1/3 of clavicle
- Supplied by the **accessory nerve (XI)**
- Action: shrug shoulders

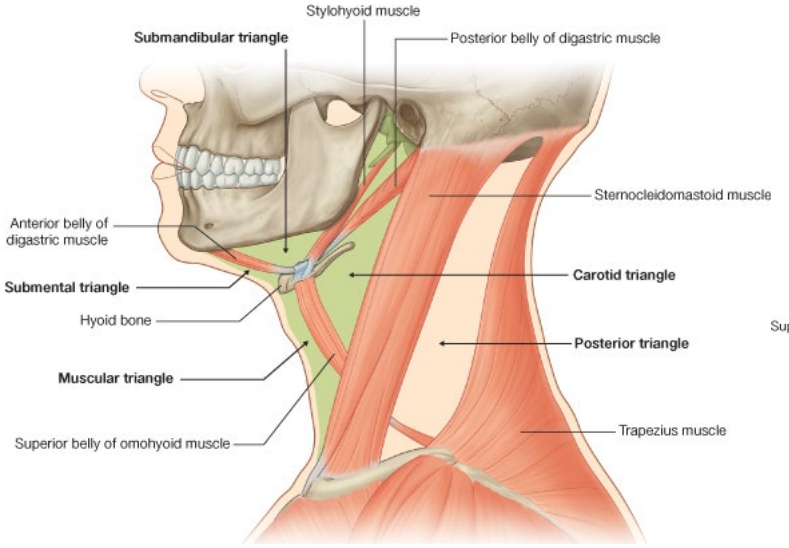


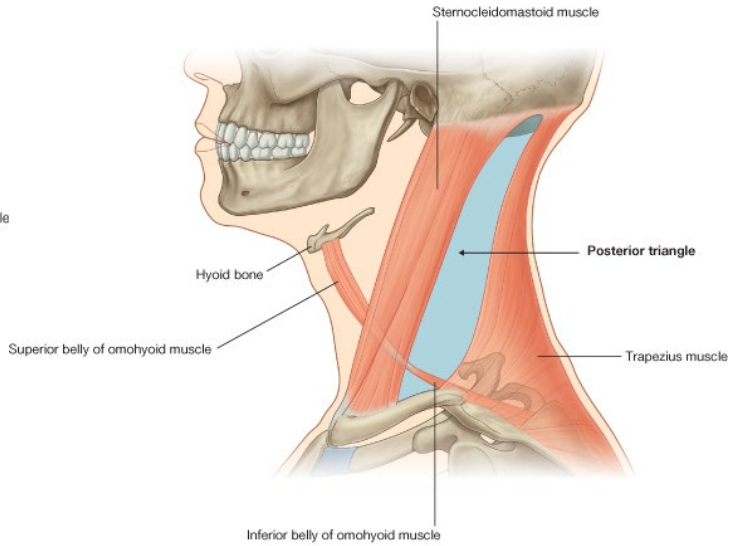
- The sternocleidomastoid and trapezius form 2 triangles:
    - **Anterior triangle**
    - **Posterior triangle**

- **Anterior triangle:**
    - Base is at the top – formed by <u>lower border of the mandible</u>

- **Posterior triangle:**
    - Base at the bottom – formed by <u>*middle* 1/3 of clavicle</u>

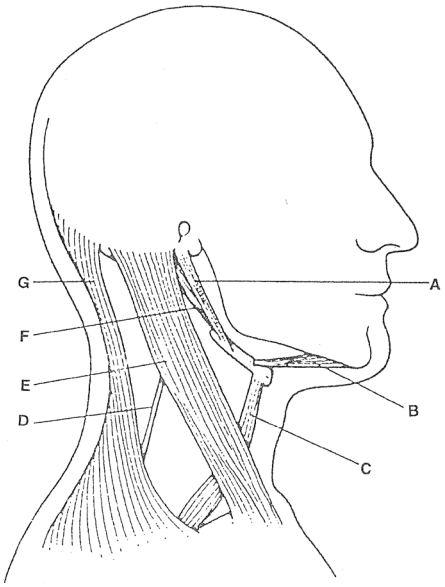
- The triangles are covered over with **investing cervical fascia**





- The most important structure in the posterior triangle is the **accessory nerve (XI)**
- Enters the deep surface of the sternocleidomastoid, close to the mastoid process
- Then leaves sternocleidomastoid 1/3 of the way down its posterior surface
- Nerve then travels obliquely downwards & backwards across the posterior triangle
- Enters trapezius muscle 1/3 way up its anterior border
- As it crosses the posterior triangle, the accessory nerve runs in the investing fascia of the neck.

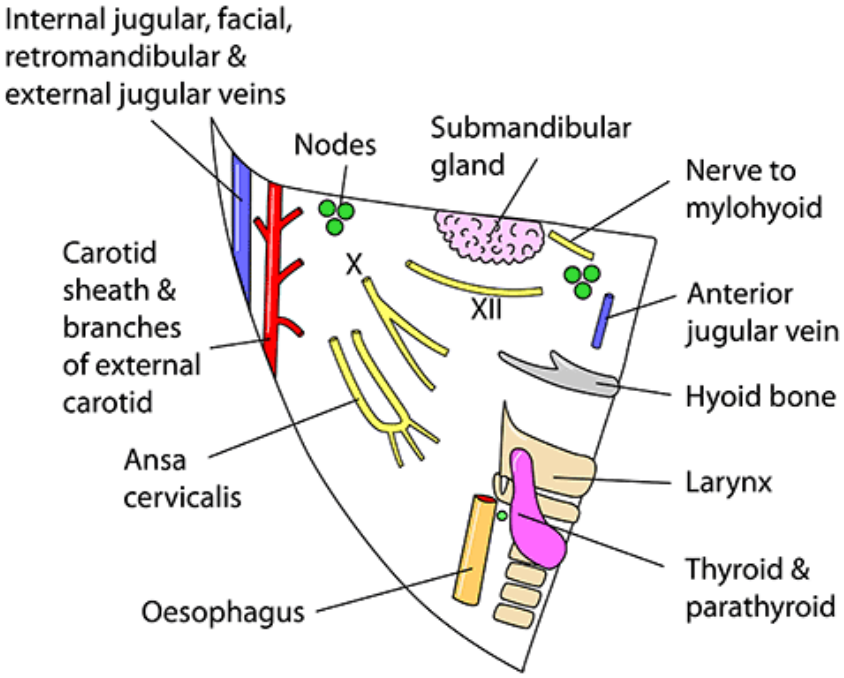
- This deep fascia is <u>complete</u> around the neck
- It invests the neck, from mandible above to clavicle below
- Encloses sternocleidomastoid & trapezius muscle, and wraps around back of neck to enclose extensor muscles of neck.
- In the midline below the fascia splits into 2 layers that are attached to the front and back of the manubrium – creating **<u>suprasternal space</u>**
- Suprasternal space contains fatty tissue and a vein passing through it from side to side.

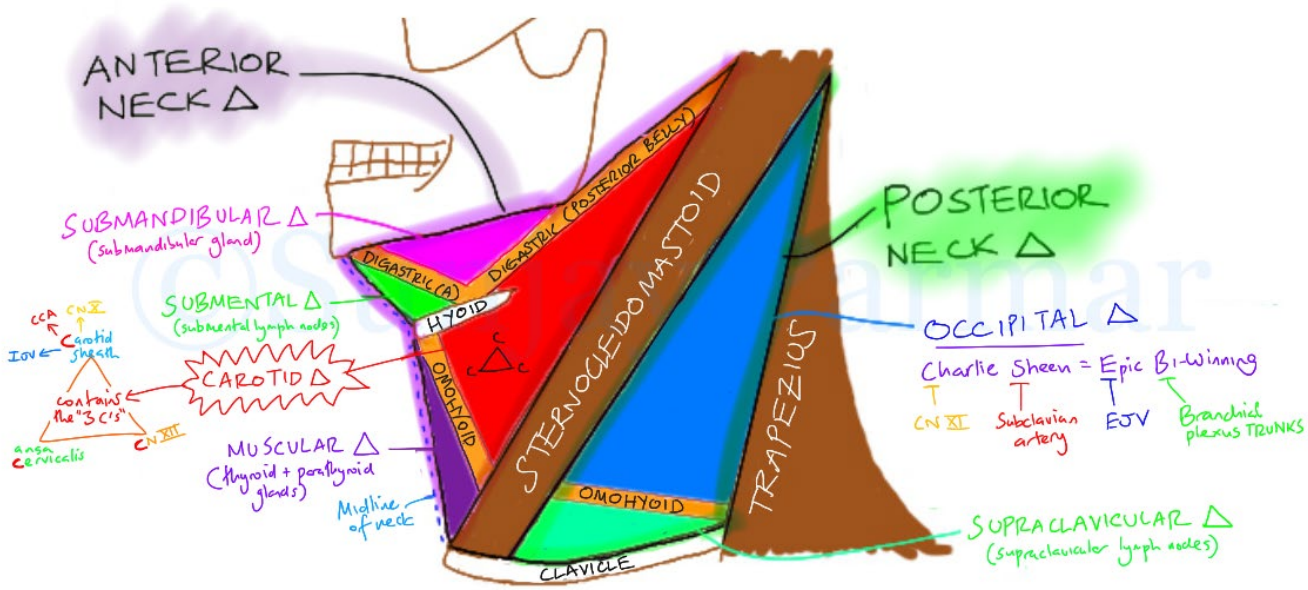


The posterior triangle is bounded by the anterior border of trapezius and the posterior border of the sternocleidomastoid. The anterior triangle lies anterior to the anterior borders of the sternocleidomastoid muscles in the anterior midline of the neck.

A Stylohyoid muscle
B Anterior belly of digastric
C Omohyoid
D Accessory nerve
E Sternocleidomastoid
F Posterior belly of digastric
G Trapezius

RIGHT ANTERIOR TRIANGLE OF NECK
DIAGRAM OF CONTENTS





STRAP MUSCLES:

- Removal of the investing fascia and sternocleidomastoid reveal several strap-like muscles underneath.
    - 3 lie in either side of the midline in the front of the neck

    - 2 run across the sides of the neck
- These muscles lie:
    - Below the hyoid bone
    - Infront of the laryngeal cartilages & thyroid gland
- They are responsible for moving the pharynx
- Innervated by **ansa cervicalis**

- **Sternohyoid muscle**
    - Passes from back of the manubrium → hyoid

Deeper:
- **Sternothyroid muscle**
    - Back of manubrium → oblique line of thyroid cartilage

- **Thyrohyoid muscle**
    - Oblique line of thyroid cartilage → lower border of hyoid

- Nerve supply to these muscles is from the upper cervical ventral rami which form the ansa cervicalis (C1,C2, C3)
- A small nerve fibre from C1, separate to the ansa, also innervates the **thyrohyoid** and **geniohyoid muscle**.

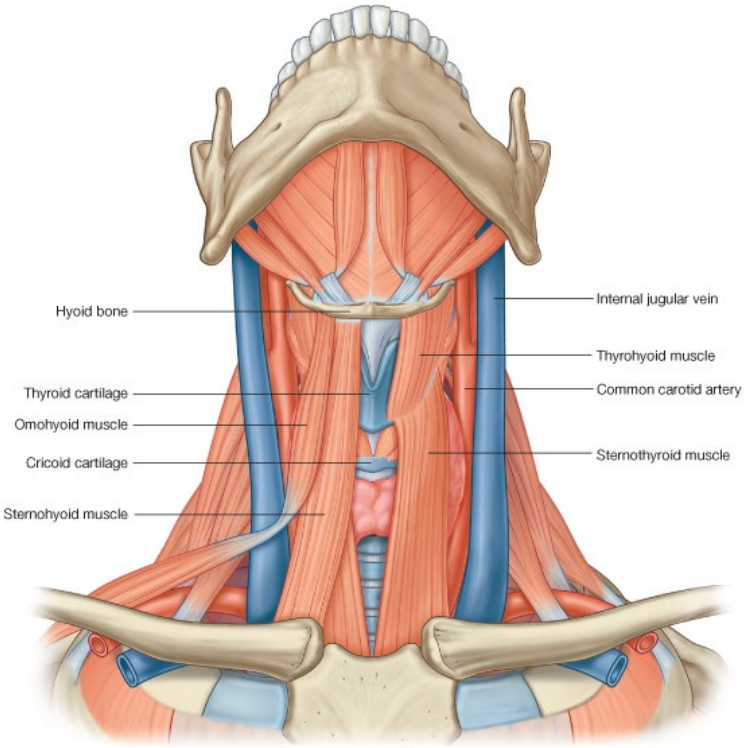
- The strap muscles act on the hyoid bone and larynx.
- Hyoid:
    - Depress the hyoid
    - With the muscles on the floor of the mouth, can fix the hyoid – producing a stable boney base on which the tongue can move.
- Larynx – actions seen whilst swallowing:
    1. Thyrohyoid elevates the thyroid cartilage towards hyoid
    2. Sternothyroid depresses the larynx

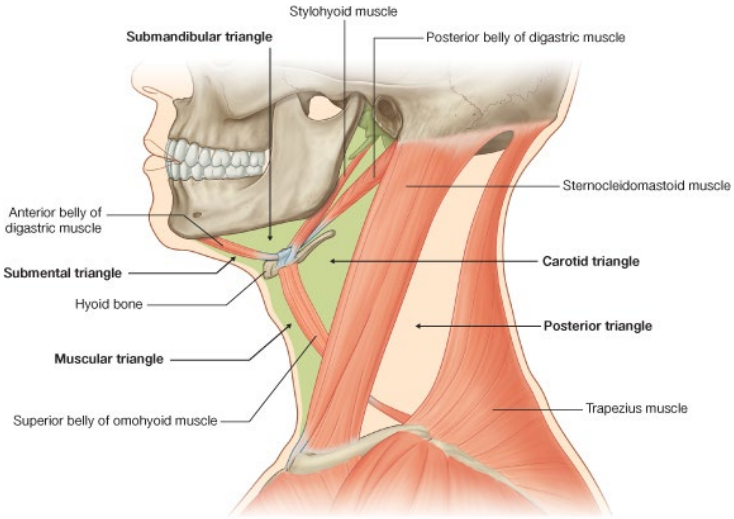
- Both the **digastric muscle** and the **omohyoid muscle** consist of 2 bellies
- The 2 bellies are joined in the middle by a small **intermediate tendon**
- Tendon slides through a fibrous fascial sling.
- **Digastric:**
    - Anterior belly from bottom of **mandible** (chin)
        - Supplied by branch of the mandibular division of trigeminal (V_{iii})
    - Posterior belly from **mastoid process**
        - Supplied by the facial nerve (VII)
    - Fibrous sling is attached to the hyoid
    - Intermediate tendon is surrounded by a fibrous sheath.
    - Action of digastric depends on whether the hyoid bone is fixed.
    - *Unfixed:* raises the hyoid
    - *Fixed:* opens mouth by lowering mandible

    - Nerve supplying anterior belly of digastric also supplies **mylohyoid muscle**

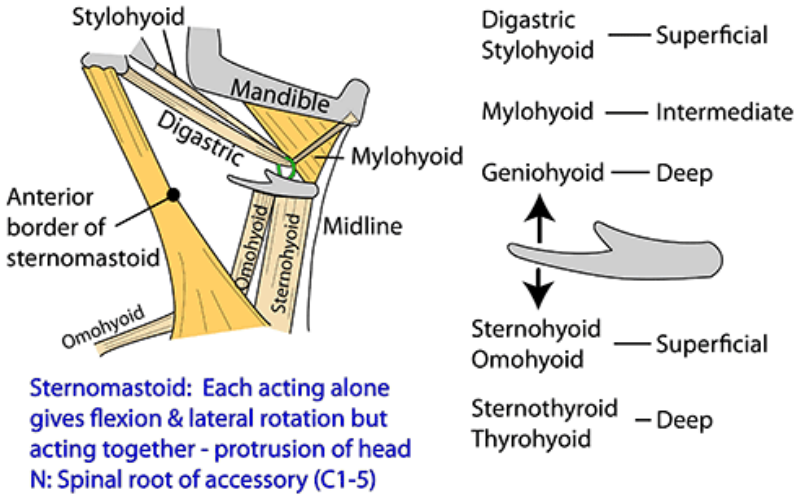
- **Omohyoid:**
    - Superior belly: inferior border of **hyoid**
    - Inferior belly: upper border of **scapula**
    - Fibrous sling is attached to fascia on deep surface of sternocleidomastoid

- Has the same action and innervation as the strap muscles (ansa cervicalis)



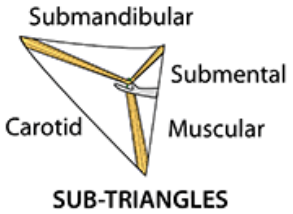


ANTERIOR TRIANGLE OF NECK
SUPRAHYOID AND STRAP MUSCLES

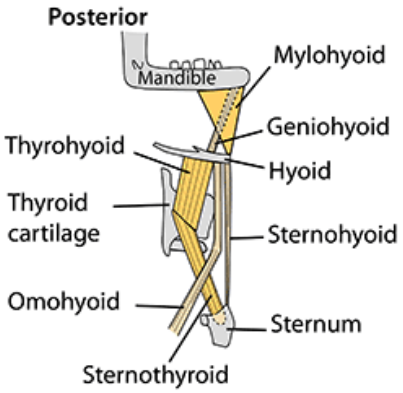


Sternomastoid: Each acting alone gives flexion & lateral rotation but acting together - protrusion of head
N: Spinal root of accessory (C1-5)

MUSCLES
Lie between pretracheal & investing fasciae. Supplied by anterior rami of C1-3, ansa cervicalis, facial nerve & nerve to mylohyoid (Vc)



SUB-TRIANGLES



LYMPH NODES IN THE NECK

- Lie in close relationshop with jugular vein and digastric & omohyoid muscles
- LNs above the digastric belong to the floor of the mouth.

- Deep group of cervical LNs is strung along the **internal jugular vein & carotid sheath**
- Recieves lymph from superficial group of regional LNs in neck.

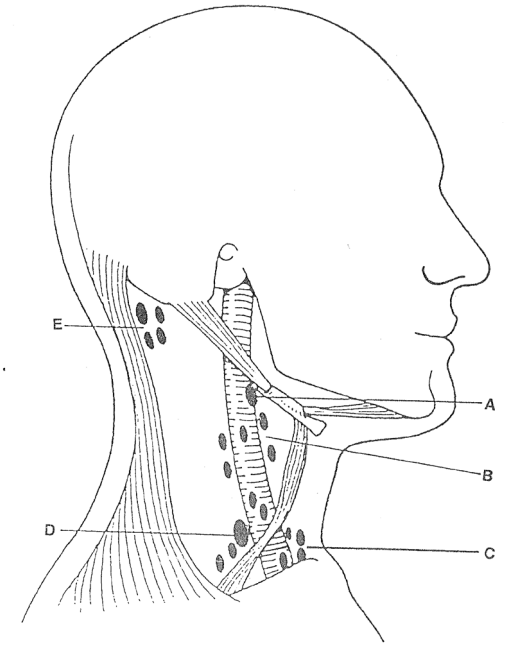
- Regional LNs are divided into 4 groups:
  - **Posterior LNs:** behind the internal jugular vein
  - **Anterior LNs:** in front of the internal jugular vein
  - These 2 groups are then split into **superior** & **inferior LNs**

- One LN, the **jugulodigastric node** lies in the angle between the digastric and the jugular vein.
- Tonsil & back of tongue drain lymph into the jugulodigastric LN.
- Becomes painful and enlarged during tonsilitis
- Part of the anterosuperior group.

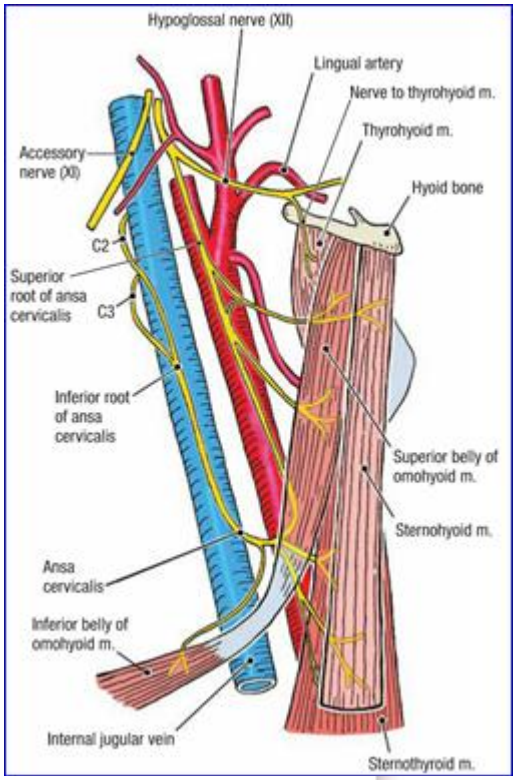
- The anterinferior group lie just above the clavicle and are normally called the **supraclavicular nodes**.

- Drain some of the trunk and upper limb - Δ cancer of the breast can form secondary deposits in supraclavicular node.
- Carcinoma of stomach can also give secondary deposit in supraclavicular node

- **Jugulo-omohyoid node** is a node of the posteroinferior group.



A deep chain of lymph nodes lies along the internal jugular vein and carotid sheath. More superficial regional nodes are found posterior to this and anterior to this chain, but eventually all drain into them.



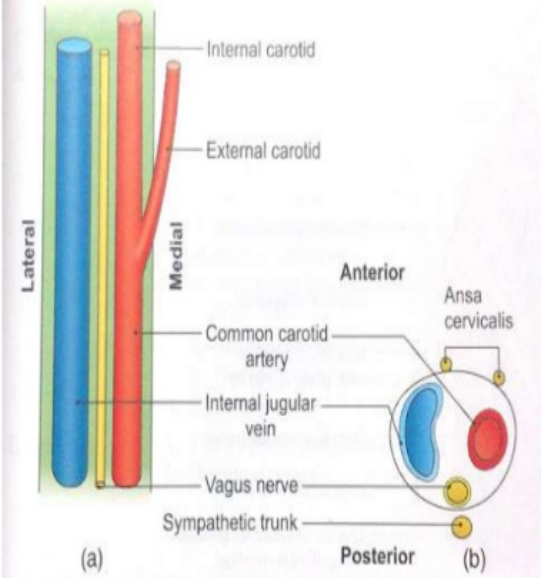
CONTENT

Internal jugular vein laterally, colmmon carotid artery (in the lower part) & internal carotid artery (in the upper part) medially, vagus nerve in b/w them in a posterior plane

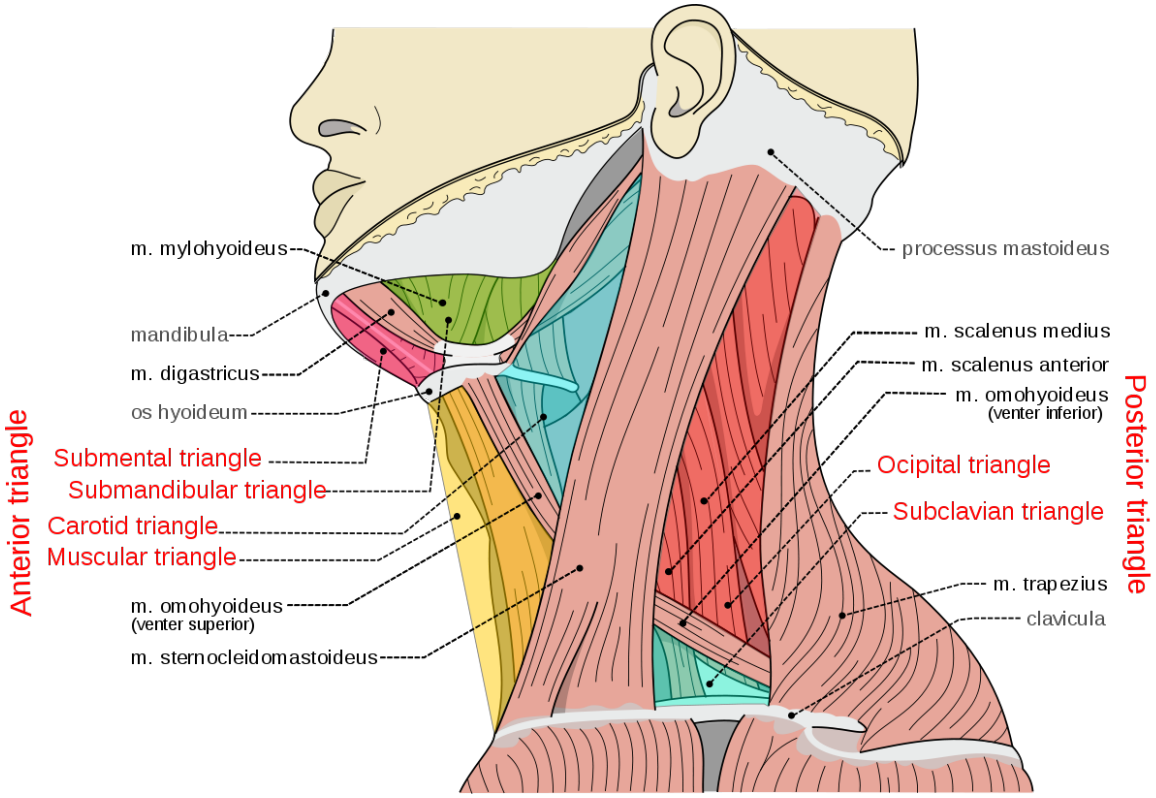
Relations-

Anteriorly- ansa cervicalis

Posteriorly – sympathetic trunk



Figs 3.8a and b: Right carotid sheath with its contents: (a) Surface view, and (b) sectional view



CUTANEOUS NERVES AND SUPERFICIAL VEINS IN NECK:

Superficial venous drainage of the face:

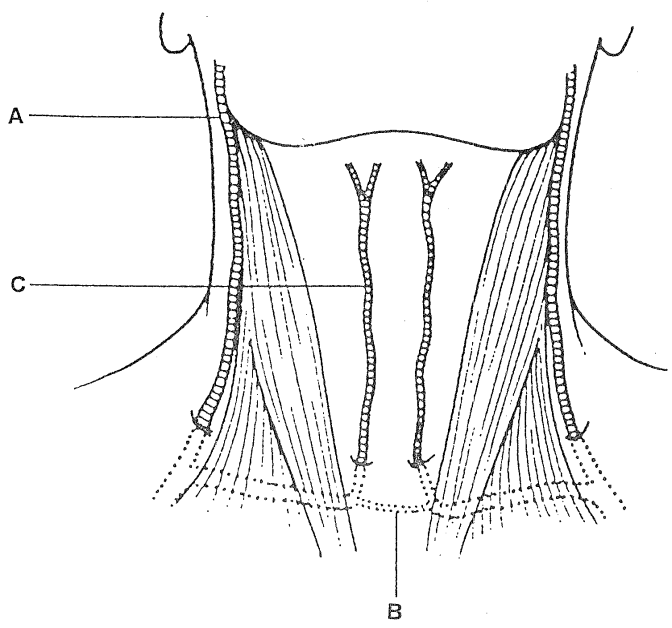
- **Retromandibular vein** & **posterior auricular vein** drain the <u>lower facial region & temple</u>.
- <u>Deep to the parotid gland</u> (i.e. not within it) the retromandibular vein divides into anterior and posterior branches
- The *posterior branch* joins the posterior auricular vein → **external jugular vein**
- The *anterior branch* joins the **facial vein → enters the IJV**

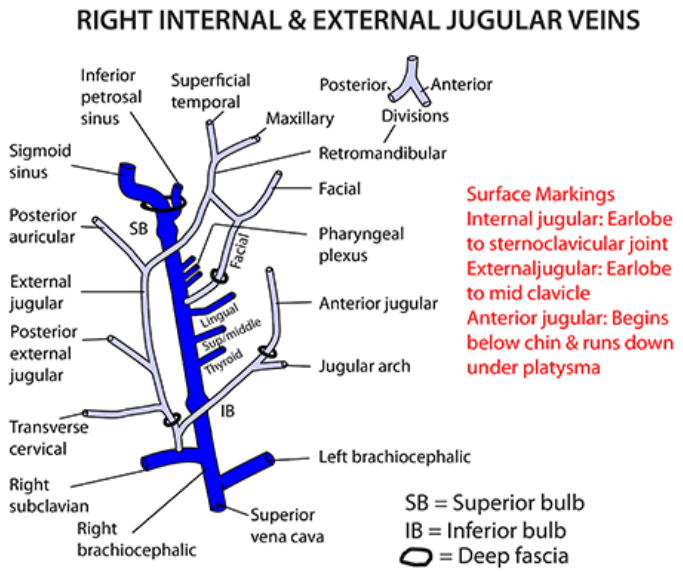
- **External jugular vein** travels through <u>subcutaneous</u> tissue of neck on the surface of the sternocleidomastoid.
- Pierces the investing deep cervical fascia at the base of the posterior triangle
- Travels deeply to drain into the subclavian vein.

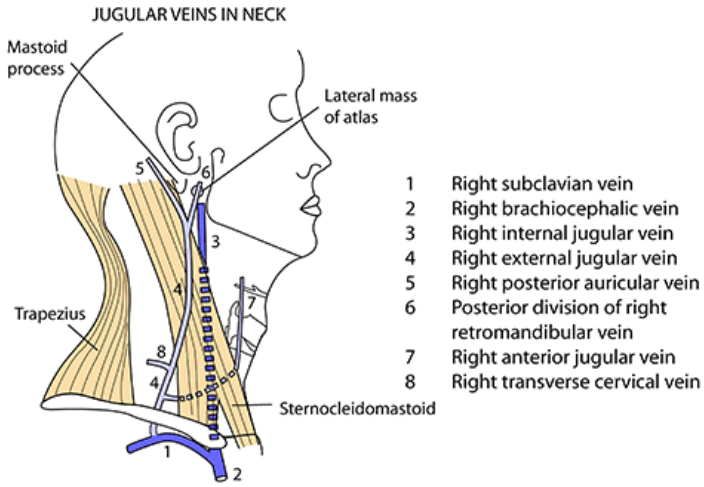
- **Facial vein** pierces the cervical fascia to enter the internal jugular vein.

- **2 anterior jugular veins** drain:
    - Superficial structures of floor of mouth
    - Front of the neck
- Anterior jugular veins drain down and pierce the investing fascia of the anterior triangle, just above the manubrium.
- Enter the **suprasternal fascial space**.
- In this space the 2 anterior jugular veins are joined across the midline by the **<u>jugular venous arch</u>**
- The suprasternal space and jugular arch are encountered during exposure of the thyroid and upper trachea during surgery.
- The jugular venous arch is often quite large

- The anterior jugular veins themselves continue laterally, deep to sternocleidomastoid
- Join the external jugular veins which have already pierced the deep fascia.







Cutaneous nerves:

- Already described the cutaneous nerves of the cervical ventral rami
- Appear subcutaneously along the posterior border of the sternocleidomastoid.
- Radiate like spokes of a wheel into the tissues of the neck.

- **Lesser occipital nerve**:
    - Skin over the back of the ear
    - Skin of scalp behind the ear

- **Great auricular nerve:**
    - Skin over front and back of ear

- **Transverse cervical nerve:**
    - Skin on the front and side of the neck

- **Supraclavicular nerve:**
    - Passes down over clavicle as <u>medial, intermediate & lateral nerves</u> to supply the front of the chest.
    - Can be palpated as they pass over the clavicle.

APPLIED ANATOMY OF THE NECK

- **Goitre** is an enlarged thyroid gland
    - Can expand down through the thoracic inlet
    - Unable to rise any higher in the neck than the oblique line of the thyroid cartilage – due to thyrohyoid muscle attachment

- The thyroid is tied down to the trachea by pretracheal fascia, so it moves up and down when swallowing
- **Thyroglossal cysts** can occur anywhere along the developmental path of migration of the thyroid gland
- Common cause of <u>fluctuant midline swelling</u> in the neck.

- **LNs** are often enlarged in the neck, possibly due to:
    - Tonsillitis
    - TB
    - Carcinoma
- The deep lymph nodes surround the internal jugular vein in the neck – can be felt at the anterior border of the sternocleidomastoid.
- Ring of smaller LNs lies around the neck like a collar from the occipital region → submandibular region & submental region.

- **Branchial cysts** result during development
- Rapidly growing 2nd arch overlaps the lower pharyngeal arches
- Then the ectoderm of the 2nd arch fails to fuse higher up – fuses only with the lowermost arches.
- Leaves a cervical sinus with ectodermal walls – slowly fill with fluid
- Present as a descrete swelling in the neck during childhood.
- Branchial cysts are located:
    - Producing from anterior border of sternocleidomastoid
    - Just below angle of the mandible

- **Tracheostomy** is an elective procedure performed to:
    - Reduce dead space in the airway of a weak patient
    - Facilitate prolonged artificial ventilation of a patient.

1. Transverse incision is made through skin & platysma- midway between the cricoid cartilage & suprasternal notch.
2. Strap muscles are retracted to each side, and ithmus of the thyroid is located.
3. Isthmus is highly vascualar Δ it is clamped, ligatured & divided
4. Trachea is opened below first cartilage ring, and flapped down inferiorly, where the free edge is then sown to the skin.