



ANATOMY OF NECK

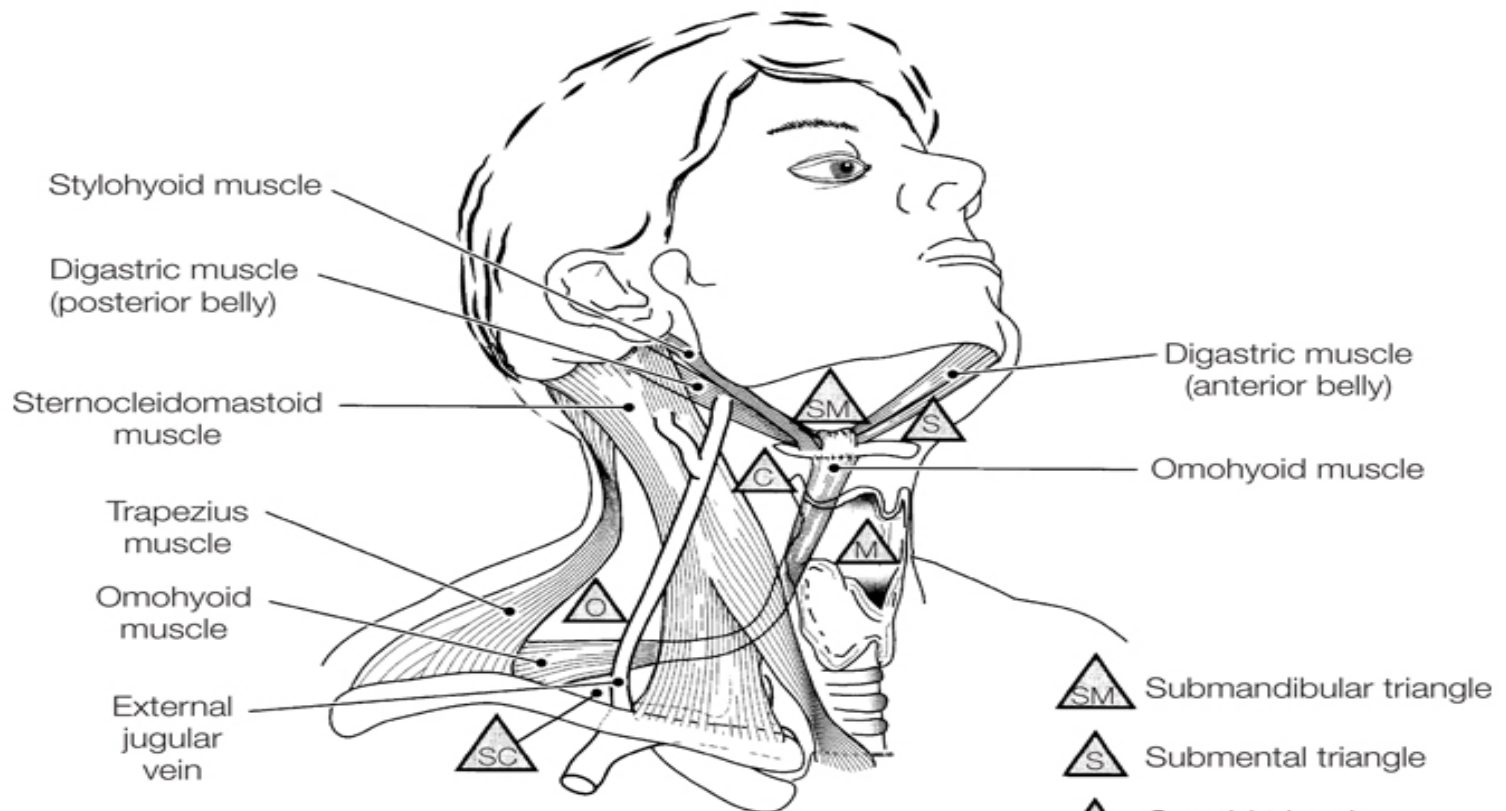
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Development

- The skin of the neck is derived from cervical dermatomes which arise from the second to the sixth cervical segments.
- The sternocleidomastoid, strap muscles and trapezius originate from cervical myotomes.

Branchial arch derivatives







Arch	Muscles	Nerves	Skeletal structures
First	Mylohyoid, digastric	V I	mandible
Second	Stylohyoid, digastric, platysma	7	Styloid process, hyoid
Third	stylopharyngeus	9	Hyoid, epiglottis
Fourth & sixth	Cricothyroid, constrictors of pharynx, intrinsic muscles of larynx	10	Laryngeal cartilages



Note the posterior triangle only extends to the posterior border of the sternomastoid muscle

- Occipital triangle } = Posterior triangle
- + Subclavian triangle }

- Submental triangle } = Anterior triangle
- + Submandibular triangle }
- + Carotid triangle }
- + Muscular triangle }

-  Submandibular triangle
-  Submental triangle
-  Carotid triangle
-  Muscular triangle
-  Occipital triangle
-  Subclavian triangle

Anterior triangle :

- The boundaries of this triangle are sternocleidomastoid, the inferior ramus of the mandible and the midline.
- Contents
 - Muscles – diaphragm, stylohyoid, mylohyoid, sup belly of omohyoid, strap muscles.
 - Vessels – external carotid branches (except post auricular), internal & anterior jugular vein & tributaries.
 - Nerves – internal & external laryngeal, nerve to mylohyoid, hypoglossal nerve.
 - Viscera – thyroid & larynx, submental & sub mandibular glands.
 - Other – jugular chain of lymph nodes



Submental triangle

- The boundaries are the anterior belly of the digastric, midline and hyoid bone.
- contains lymph nodes and the submental salivary gland.

Sub mandibular triangle

- The boundaries are the inferior margin of the mandible and the anterior and posterior bellies of the digastric muscle.
- The deep boundary consists of the stylohyoid and mylohyoid muscles.
- Contains the submandibular salivary gland, deep fascia, lymph nodes, anterior facial vein, facial artery and the marginal mandibular branch of the facial nerve



Carotid triangle

- The boundaries are the anterior border sternocleidomastoid, posterior belly digastric and the superior belly of omohyoid.
- It contains the upper carotid sheath and lymph nodes.



Muscular triangle

- The boundaries are the lower anterior border sternocleidomastoid, anterior belly omohyoid, the hyoid bone and the midline.
- Contains the lower carotid sheath, the infrahyoid strap muscles, upper aero digestive tract, the thyroid and parathyroid glands.

Posterior triangle

- The posterior triangle can be divided into two by the omohyoid, which forms the lateral neck triangle and the subclavian triangle.
- Contents
 - Muscles – omohyoid
 - Vessels – occipital, transverse cervical, suprascapular, subclavian arteries & transverse cervical, suprascapular external jugular veins.
 - Nerves – cervical & branchial plexus
 - Other – lymph nodes

Lateral neck triangle

- The boundaries are the posterior border of the sternocleidomastoid, the anterior border of the trapezius and the superior border of the inferior belly of the omohyoid muscle.
- Contains the cervical plexus, fibrofatty tissue, lymph nodes and the accessory nerve.



Subclavian triangle

- The boundaries are the lower border of the inferior belly of omohyoid, the clavicle and the posterior border sternocleidomastoid.
- Contents are fibrofatty tissue, the scalene muscles, the brachial plexus and the subclavian vessels, including the thyrocervical trunk.
- Also included are Sibson's suprapleural fascia and the pleura.



FASCIAL LAYERS

- Superficial cervical fascia
- Deep fascia –
 - superficial layer
 - middle or visceral layer
 - deep layer

Superficial cervical fascia

- This is a thin layer that invests the platysma muscle.
- It is closely associated with adipose tissue.
- This fascia is penetrated by the blood vessels that supply the neck skin.
- The subplatysmal flap therefore protects the blood supply to the skin.

Deep cervical fascia

- **Superficial or investing layer :**
- This arises from the ligamentum nuchae and the spinous processes of the cervical vertebrae and invests the entire neck.
- It splits to enclose the trapezius, the omohyoid, sternocleidomastoid, the strap muscles and the parotid gland.
- Attachments –

Superiorly to the external occipital protuberance, the superior nuchal lines, the mastoid tip and the zygomatic arch.

Anteriorly this is attached to the hyoid.

Inferiorly attached to the acromium, the clavicle and the sternum

Middle or visceral layer

- Derived from the superior layer of the deep cervical fascia
- Passes deep to the strap muscles and encircles the trachea, thyroid and the oesophagus.
- Movement of the hyoid and strap muscles during swallowing elevates the fascia so that thyroid lumps characteristically move on deglutition.


Deep or prevertebral layer


- Arises from the ligamentum nuchae and the spinous processes of the cervical vertebrae.
- It splits to enclose the postvertebral muscles, passes laterally around the scalene muscles and then forms a layer over the vertebrae.
- It forms the floor of the posterior triangles and allows the pharynx to glide during deglutition.



Neck spaces

- Knowledge of potential neck spaces is important in the understanding of the spread of infection and tumours in the neck.
- Contain only loose areolar fascia.

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- Submental
 - Sub mandibular
 - Peri tonsillar
 - Para pharyngeal
 - Retro pharyngeal
 - Pre tracheal
 - Pre vertebral

- 
- **Sub mental space** - a midline space that lies between the anterior bellies of the digastric muscles.
 - **Submandibular space** - superficial boundary is the submandibular gland and digastric muscle, the deep boundary is the mylohyoid muscle.
 - Communicates with the floor of mouth around the posterior border of the mylohyoid.



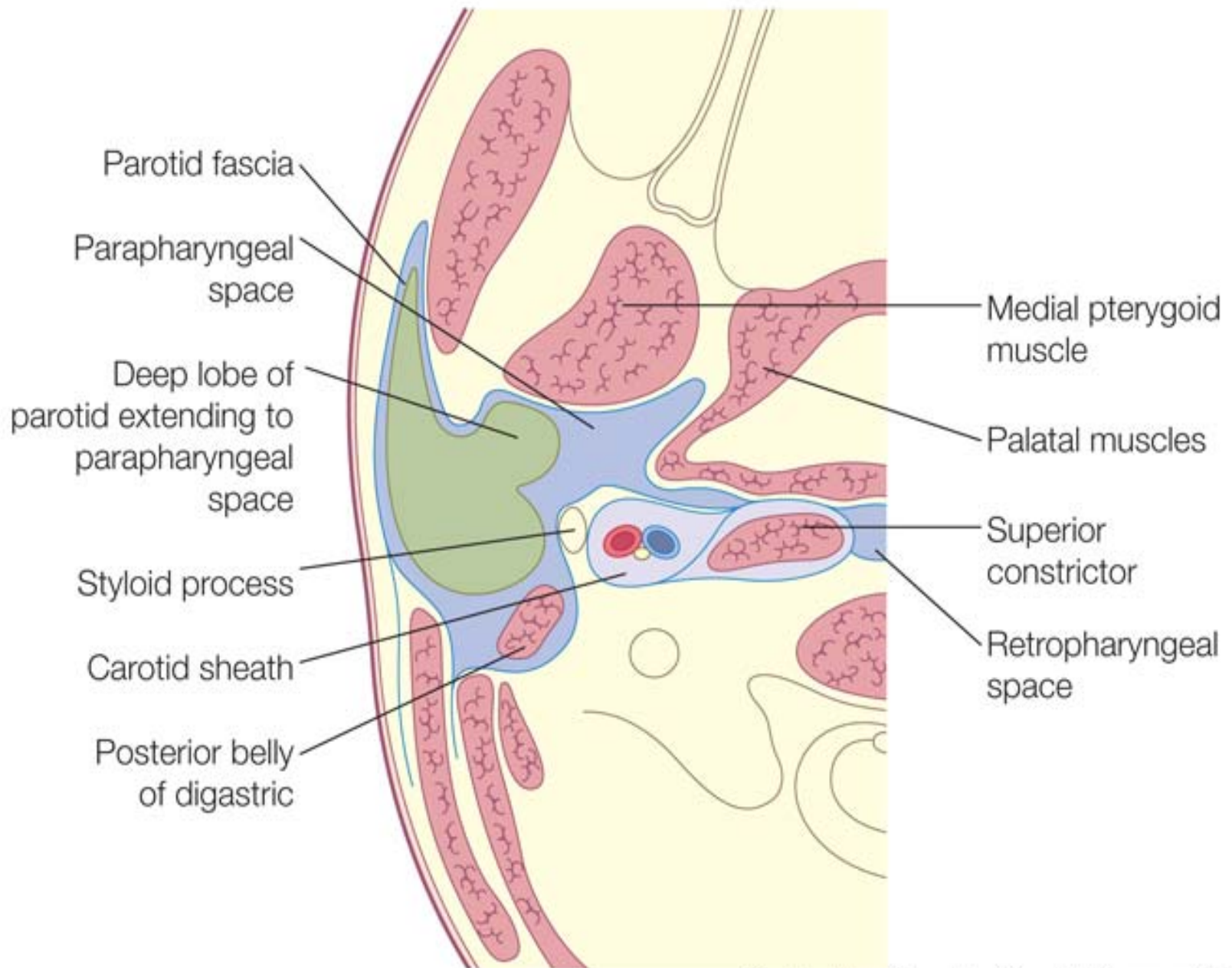
- **Peritonsillar space**

- This lies between the tonsil and superior constrictor.

- It communicates through the fibres of the superior constrictor with retropharyngeal and parapharyngeal spaces.

Parapharyngeal space

- This space is the most complex and clinically most important space.
- It is shaped like an inverted pyramid, the top of which is the base of skull and the inferior part is the greater cornu of the hyoid bone.
- Bounded medially by the superior constrictor and laterally by the pterygoid muscles, the mandible and deep lobe of the parotid gland.
- Divided by the styloid process and its attachments into the prestyloid and poststyloid spaces.
- The prestyloid space contains ectopic salivary tissue, while the poststyloid contains carotid arteries, internal jugular vein, cranial nerves 9-12, cervical sympathetic chain and lymph nodes.



Retropharyngeal space

- This sits between the two parapharyngeal spaces and is continuous with both.
- Its superior boundary is the skull base, while the anterior boundary is the musculature of the pharynx.
- The posterior limit is the prevertebral fascia and the contents are only lymph nodes.
- It continues inferiorly behind the oesophagus and eventually communicates with the posterior mediastinum.



Pre tracheal space

- This lies anterior and lateral to the thyroid cartilage and deep to the strap muscles.
- It contains the delphian node and communicates with the superior mediastinum.

Pre vertebral space

- This is the potential space that lies between the cervical vertebrae and anterior longitudinal ligament posteriorly and the prevertebral fascia anteriorly.
- It extends down to the third thoracic vertebra where the fascia is bound to the vertebra.
- The prevertebral fascia is thin and infections in this space can rupture directly through into the posterior mediastinum.

Muscles

- **Sternocleidomastoid :**
- attachments - inferior attachment is onto the sternum and clavicle, The superior attachment is to the lateral aspect of the mastoid tip, as well as the lateral half of the superior nuchal line.
- The motor nerve supply is the spinal accessory motor and the anterior rami of *C234 segments provides sensory and proprioceptive function.*
- Actions - tilts the head to the shoulder on the same side, rotates the head to the opposite side and assists longus coli in neck flexion.

Trapezius

- Has wide origin from the medial third of the superior nuchal line, the ligamentum nuchae down to the seventh cervical vertebra, and all the spinous processes and interspinal ligaments down to the 12th thoracic vertebra.
- The superior fibres insert into the clavicle and acromium and the inferior fibres from the thoracic vertebrae insert into the spine of the scapular.
- Action of this muscle is to rotate the scapular so that the glenoid fossa points up. The trapezius is the major antigravity muscle of the shoulder girdle.
- The motor nerve supply is the spinal part of the accessory nerve from roots C1 to C6.
- *Proprioceptive* information occurs via branches from the cervical plexus, some motor fibres also innervate the trapezius through the cervical plexus.



omohyoid

- The proximal attachment is to the hyoid bone just lateral to the attachment of sternohyoid.
- It is a useful landmark for the internal jugular vein.
- The nerve supply is the ansa cervicalis.
- The function of this muscle is obscure.

Digastric

- It arises from the digastric ridge, which is on the medial aspect of the mastoid tip.
- The posterior belly runs anteroinferiorly and becomes a tendon, which runs through a sling that is attached to the lesser cornu of the hyoid.
- The anterior belly then runs anterosuperiorly to insert into the digastric fossa on the inner surface of the mandible.
- The posterior belly is supplied by the facial nerve, and the anterior belly receives a branch from the nerve to mylohyoid, from the mandibular division of the trigeminal nerve, reflecting its first and second branchial arch embryology.
- It elevates the hyoid during swallowing and assists the lateral pterygoid in opening the mouth.

Strap muscles

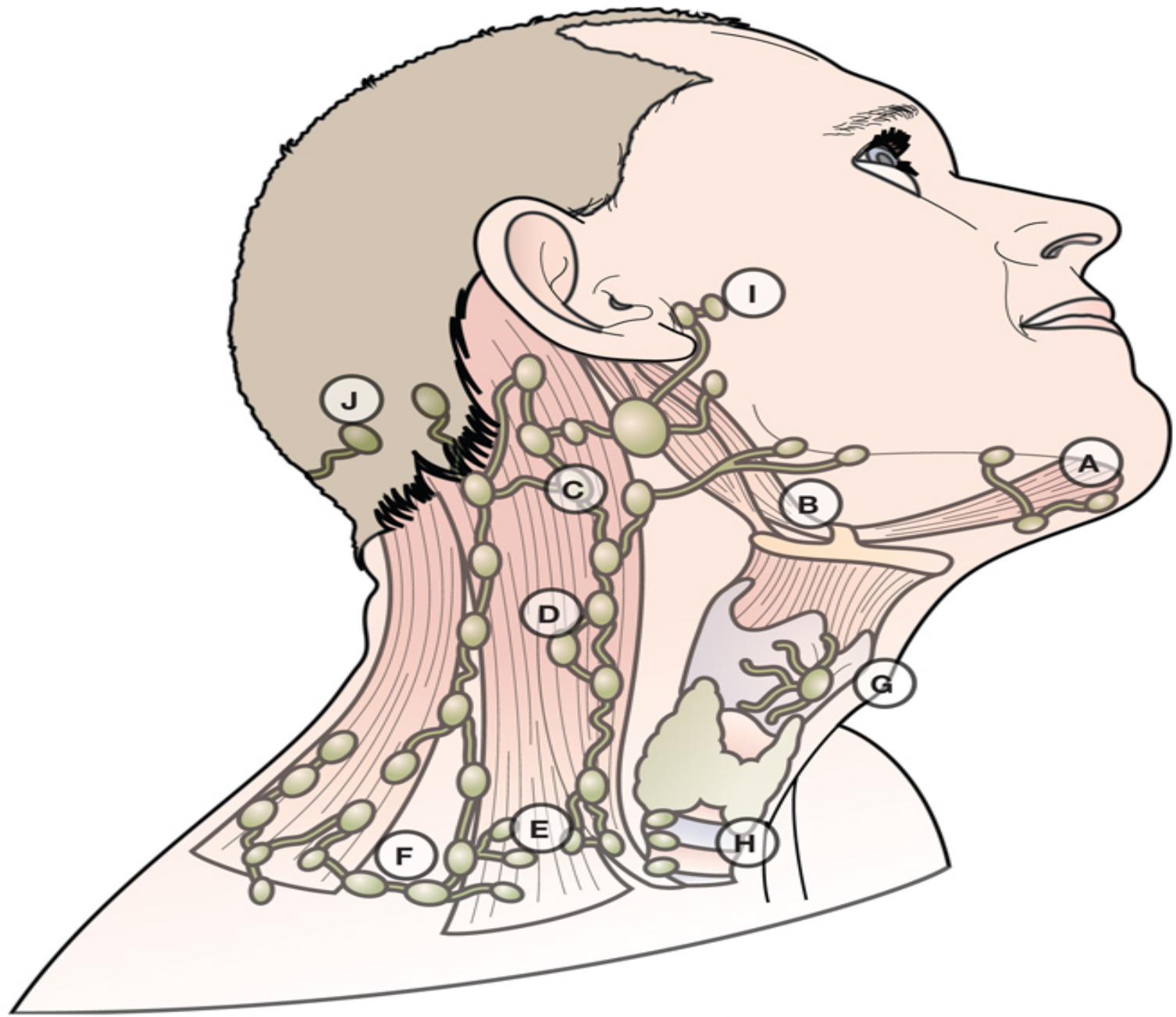
- This group of muscles comprises the sternohyoid, omohyoid, thyrohyoid and sternothyroid muscles.
- They move the larynx and depress the mandible.
- They are supplied segmentally from C1, 2 and 3 via the ansa cervicalis.
- The strap muscles are retracted to access the trachea and thyroid gland and also form the anterior boundaries of the neck levels.



Cervical lymphatics

- Superficial
- Deep

- Superficial - The superficial perforate the cervical fascia and drain into the deep.



Deep nodes

- **Submental group**

- These nodes are situated in the midline, inferior to the mandible and between the anterior bellies of the digastric muscles. They drain the anterior floor of the mouth.


- **Submandibular**


- These nodes are divided into six groups.
- They are preglandular, prevascular, retrovascular, retroglandular, intraglandular and deep nodes.
- These nodes can best be described as those related to the submandibular gland and those related to the facial vessels.



- **Jugular chain –**

- Eighty percent of lymph nodes in the neck are closely associated with the internal jugular vein.
- The lymphatic channels are found within the loose areolar tissue that exists around the internal jugular vein and within the carotid sheath.
- The nodes occur anterior posterior and lateral to the vein.
- The most superior segment of the vein extends from the skull base to the level of the carotid bifurcation.
- They are the first echelon node for the drainage of the posterior faucial region, especially the palatine tonsil.
(jugulodigastric).

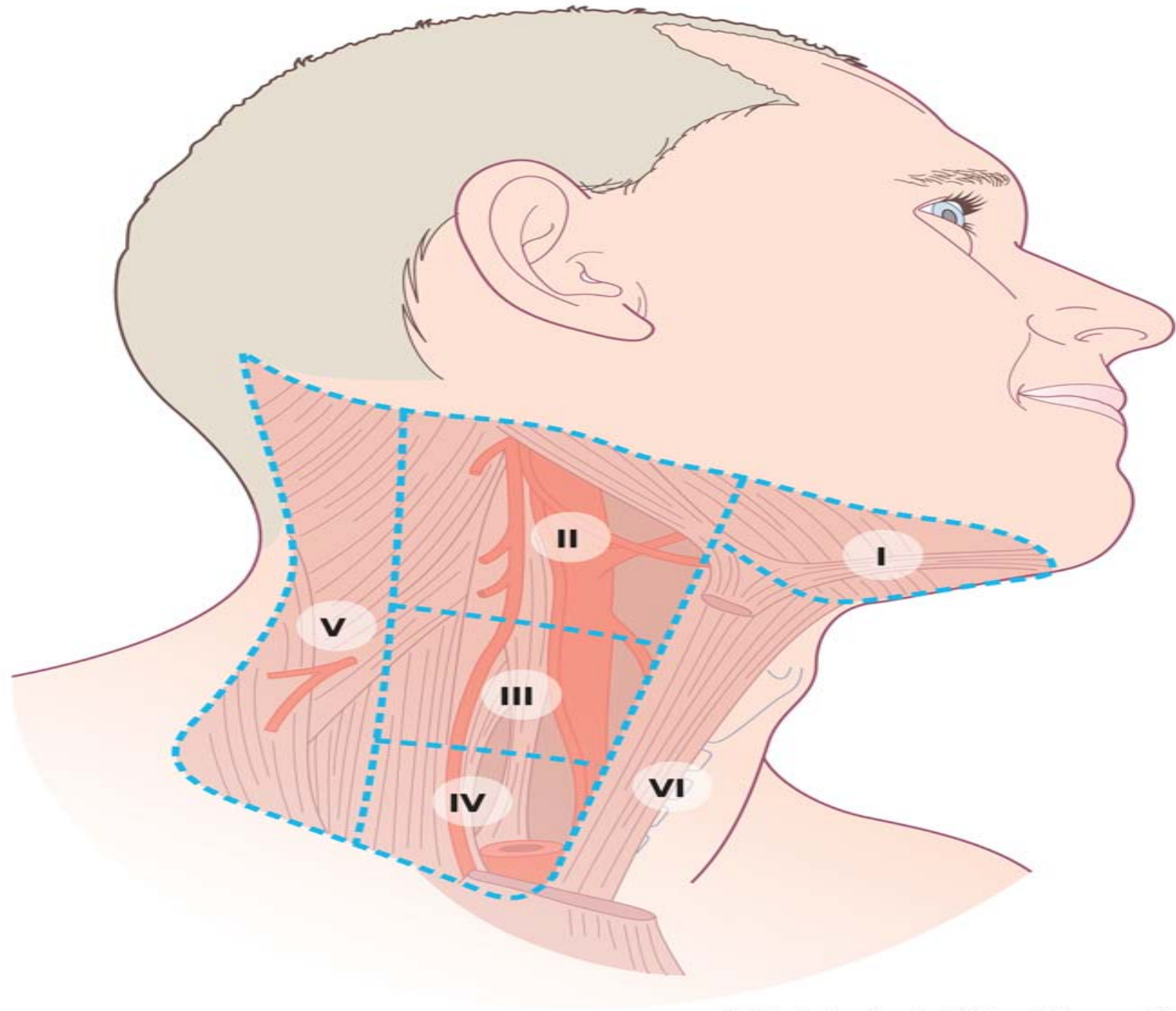
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- The middle jugular nodes are found between the carotid bifurcation and the level at which the omohyoid tendon crosses the internal jugular vein.
 - They are first echelon nodes for the larynx midhypopharynx and upper thyroid gland.

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- The lower jugular nodes are those between the tendon of omohyoid and down to the thoracic inlet.
 - They form an important confluence between the mediastinal node group, the axillary group and the neck.
 - This communication can be a reason why neck nodes may appear secondary to disease outside the neck.



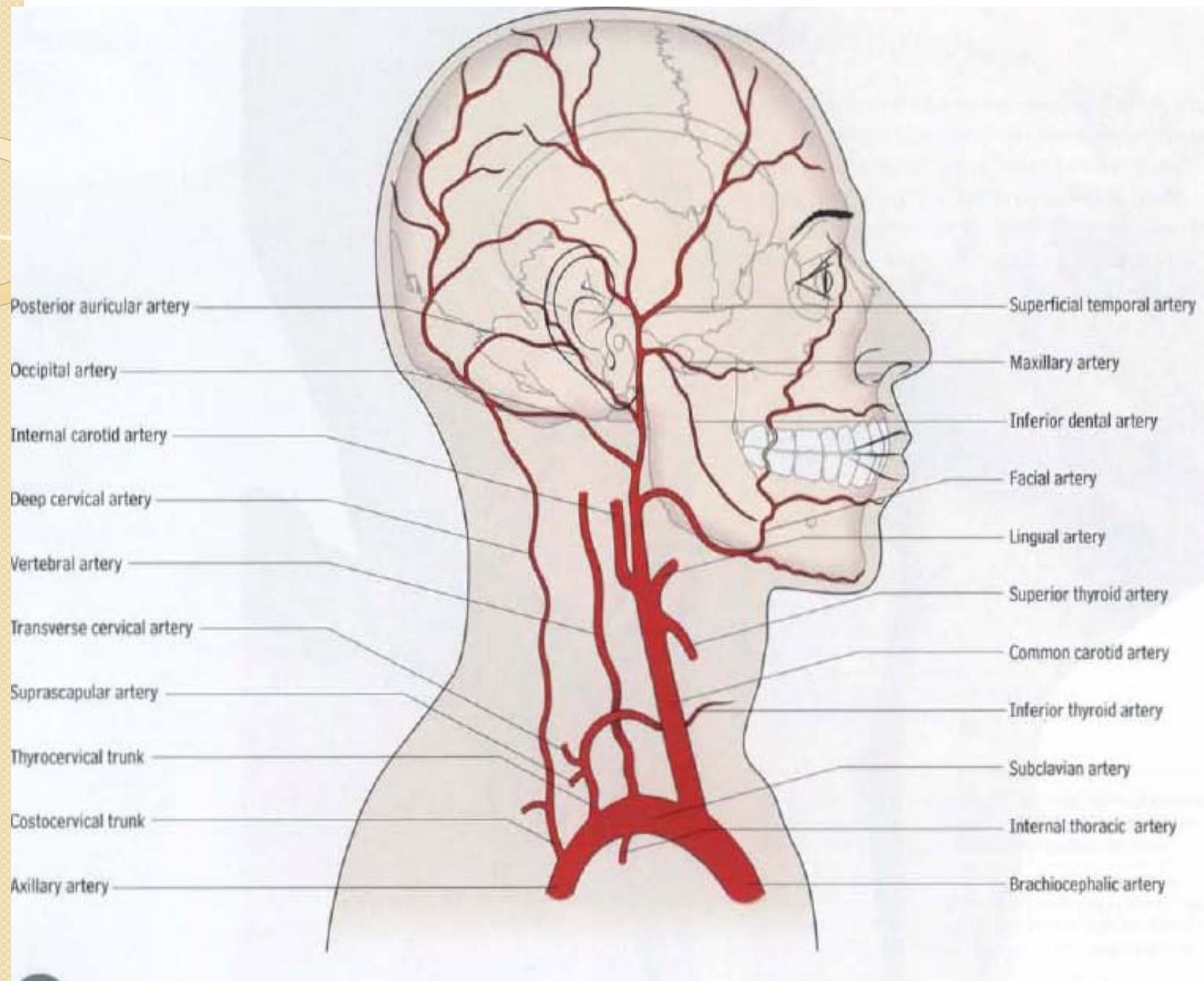
Posterior nodes

- The posterior triangle contains lymph nodes that are arranged into two groups: those that are found along the accessory nerve and those related to the thyrocervical vessels.
- The nodes along the accessory are the first echelon for the nasopharynx and second echelon for the areas drained by the anterior neck nodes are related to the thyrocervical vessels



Major blood vessels

- **Common Carotid artery**
- This arises from the brachiocephalic artery on the right and the arch of the aorta on the left.
- It usually has no branches, but may give off the vertebral, superior thyroid, laryngeal branches of the superior thyroid, the ascending pharyngeal, inferior thyroid or the occipital artery.
- The important relations are the internal jugular vein where it runs medial and deep, while the vagus nerve runs between the two in the carotid sheath.
- The sympathetic trunk runs deep to the sheath.



Internal & external carotid artery

- Both of these originate at the common carotid bifurcation artery.
- This division is usually at the level of the hyoid bone, although it may be higher but rarely lower.
- The internal carotid runs from the upper border of thyroid cartilage to the carotid canal in petrous temporal bone passing deep to the posterior belly of the digastric muscle.
- It is normally straight and unbranched, though in 15 percent of cases it may be coiled or kinked.

Relations

- The internal jugular vein lies anterolateral through almost the entire course of the internal carotid.
- Posteriorly lies the superior cervical sympathetic ganglion, the sympathetic chain and superior laryngeal nerve.
- Medially lies the wall of pharynx, with loose connective tissue, pharyngeal veins, ascending pharyngeal artery and the superior laryngeal nerve.
- The sternocleidomastoid is anterolateral throughout its course.
- The other important lateral relations of the internal carotid artery are the hypoglossal nerve, the superior root of the ansa cervicalis, as well as the lingual and facial veins.

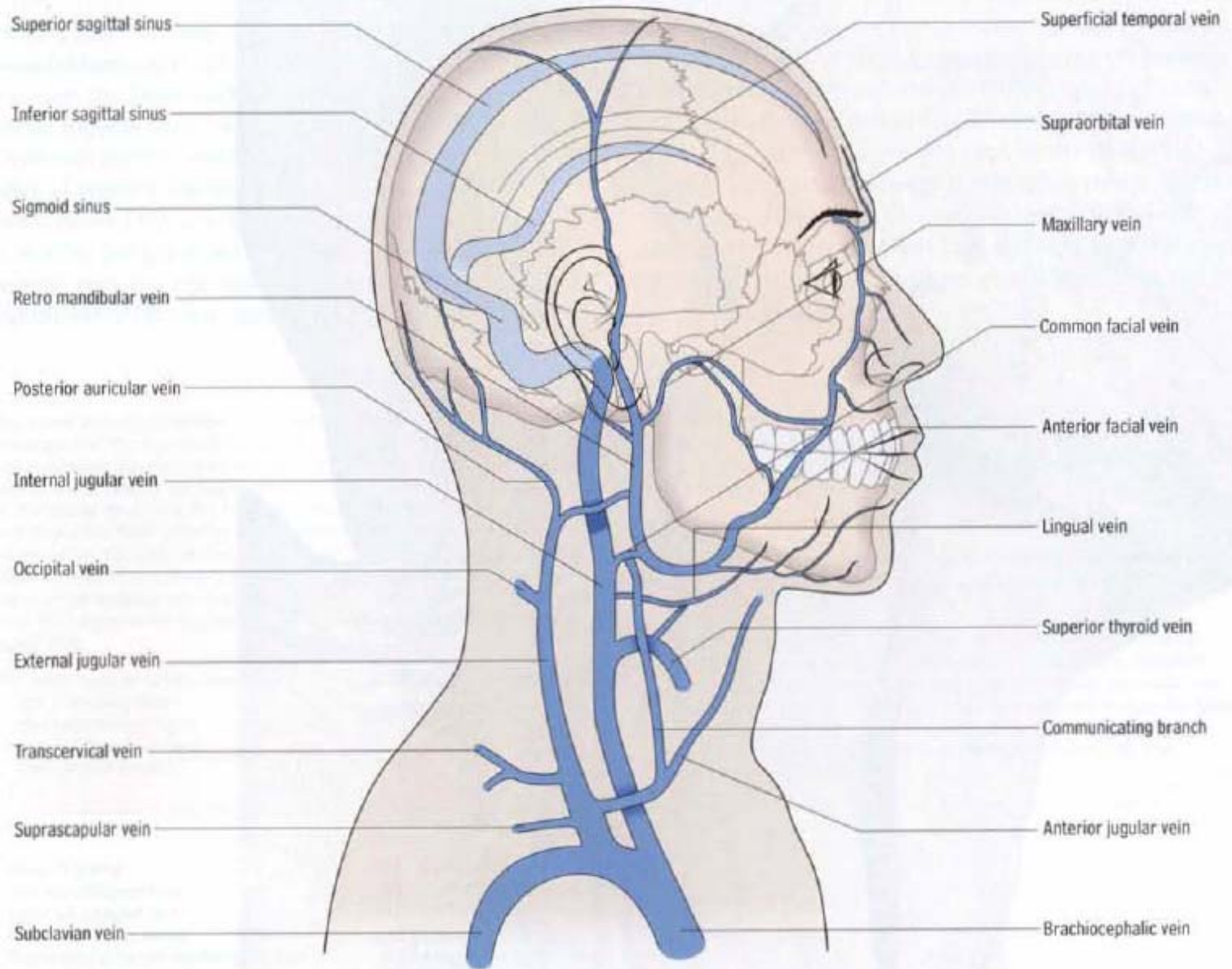
External carotid artery

- It courses in a straight line from the greater cornu of the hyoid to a point between the mastoid and ascending ramus of the mandible.
- They supply the deep face, the nose and scalp.
- Before entering the deep surface of the parotid gland, the artery gives off six branches.
- From the anterior surface - the superior thyroid, lingual and facial arteries, which supply the thyroid, tongue, superficial face and nose.
- The deep branch - ascending pharyngeal. It supplies the hypopharynx and oropharynx, skull base and posterior fossa dura through perforating branches.
- The posterior branches - occipital, posterior auricular. Along with the superior thyroid branches, they supply the sternocleidomastoid and contribute to the external ear and occiput.



Internal Jugular Vein

- The internal jugular vein is a continuation of the sigmoid sinus.
- It exits the skull in the posterior compartment of the jugular foramen.
- The vein runs in the carotid sheath and joins the subclavian vein to form the brachiocephalic vein at the sternal end of the clavicle.
- Tributaries - inferior petrosal vein, facial, lingual, pharyngeal, superior and middle thyroid veins.



Relations

- The posterior relations - prevertebral muscles, the transverse process of atlas, the phrenic nerve and the thyrocervical trunk.
- The medial relations - vagus nerve, common and internal carotid arteries while the sternocleidomastoid lies superficially along its entire course.



External Jugular Vein

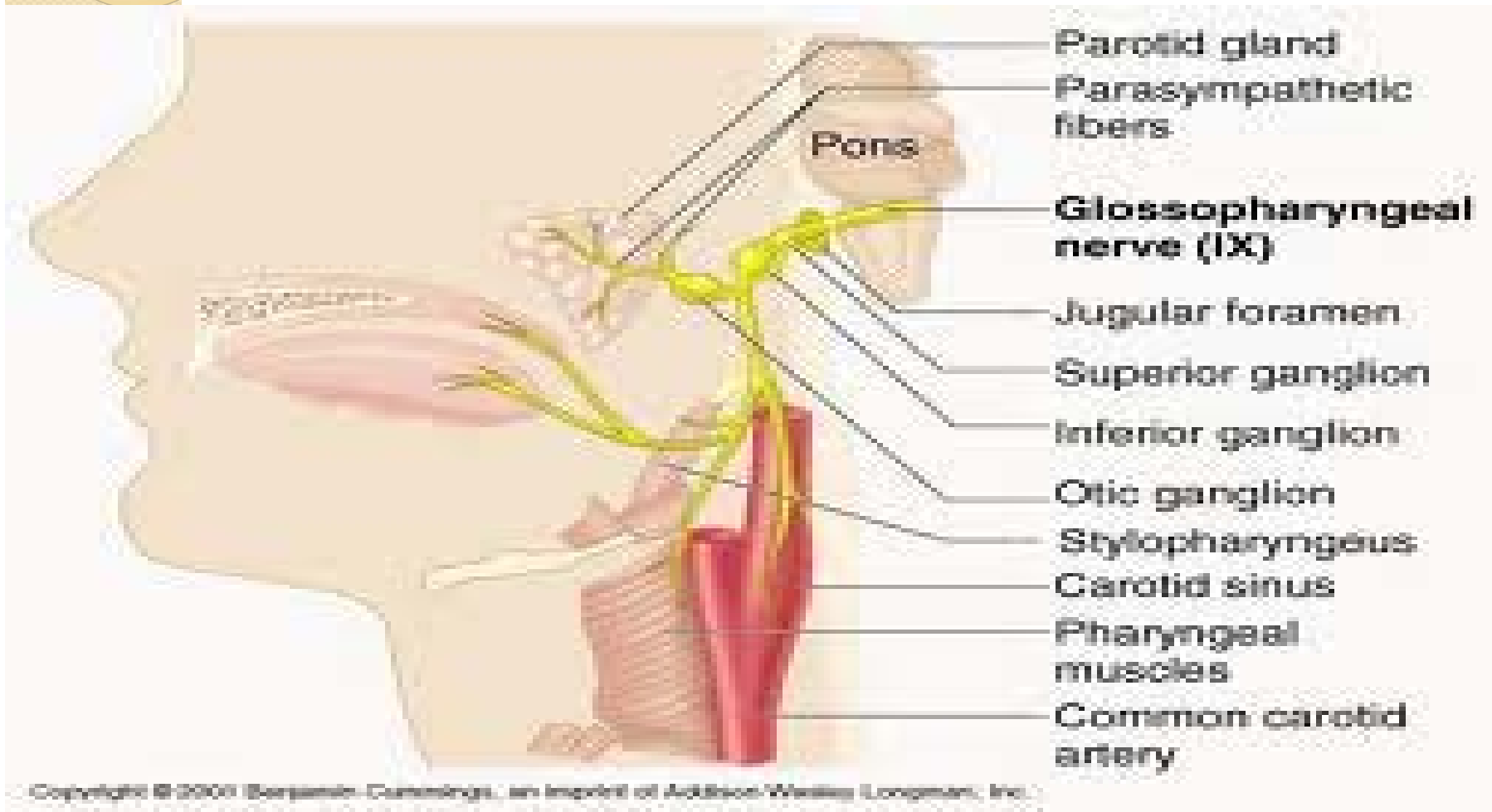
- This vein along with the posterior external jugular vein and the anterior jugular vein forms a variable superficial system of veins, which drains blood from the face and scalp.
- The external jugular vein has a node, the external jugular node, which drains the parotid gland and is important in malignancy.



Nerves

GLASSOPHARYNGEAL NERVE

- Nerve of third branchial arch.

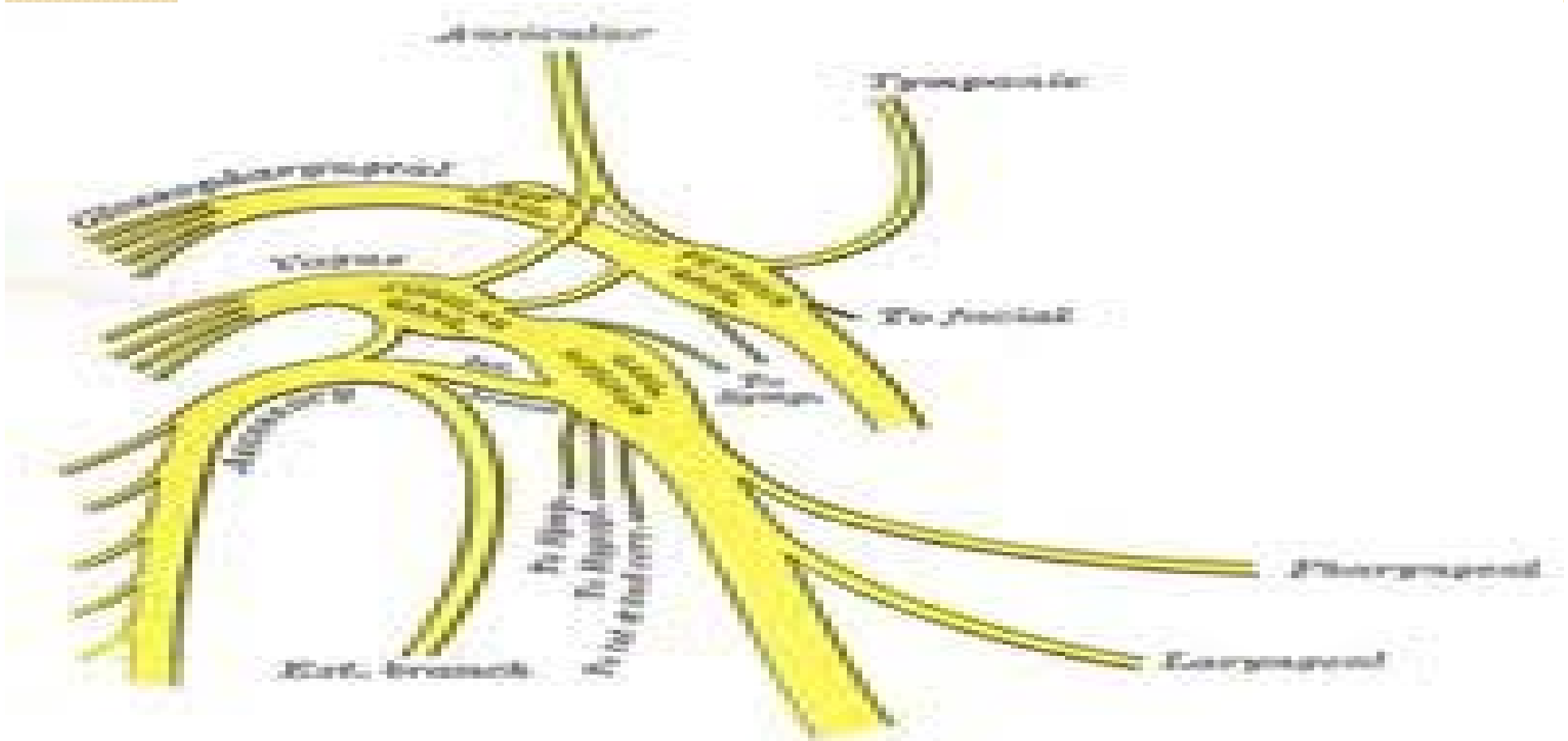


BRANCHES & DISTRIBUTION

- **Tympanic nerve** - forms tympanic plexus & supply ME,ET, mastoid antrum & air cells. Lesser petrosal nerve – preganglionic secretomotor fibers to parotid
- **Carotid branch** - to ICA & supply carotid sinus & carotid body
- **Pharyngeal branch** – forms pharyngeal plexus along with vagus & sympathetic, distributed over mucosa of pharynx
- **Muscular branch** – to stylopharyngeus
- **Tonsillar branch** – to tonsil, join to lesser palatine nerve to form plexus from which fibers are distributed to soft palate & to palatoglossal arches
- **Lingual branch** – taste & general sensation posterior one third of tongue including circumvallate papillae.

VAGUS NERVE

- Vagus = (vague) , extensive course



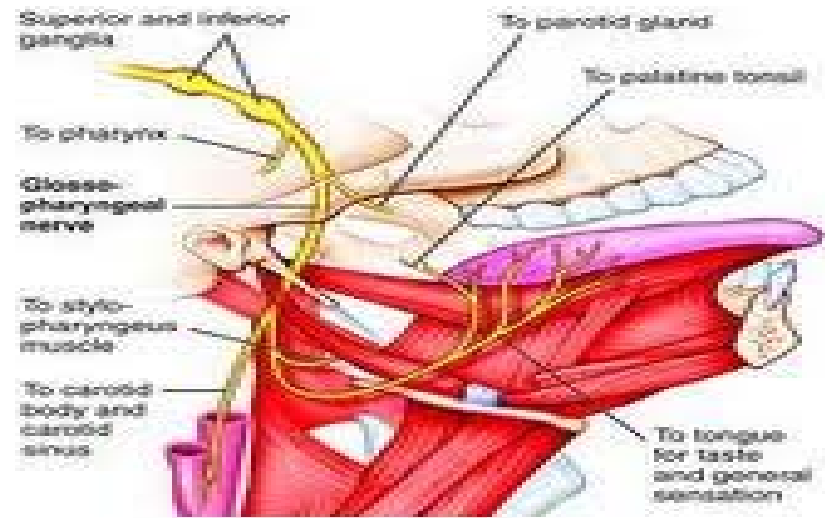
Two ganglia

- **Superior ganglion –**

1. Rounded , lies in jugular foramen .
2. Gives meningeal & auricular branches .
3. Connected to IX , XI , & superior cervical ganglion of sympathetic chain .

- **Inferior ganglion –**

1. Cylindrical , lies near base of skull
2. Gives pharyngeal , carotid , superior laryngeal branches .
3. Connected to XII , superior cervical ganglion , & the loop betn first & second cervical nerve

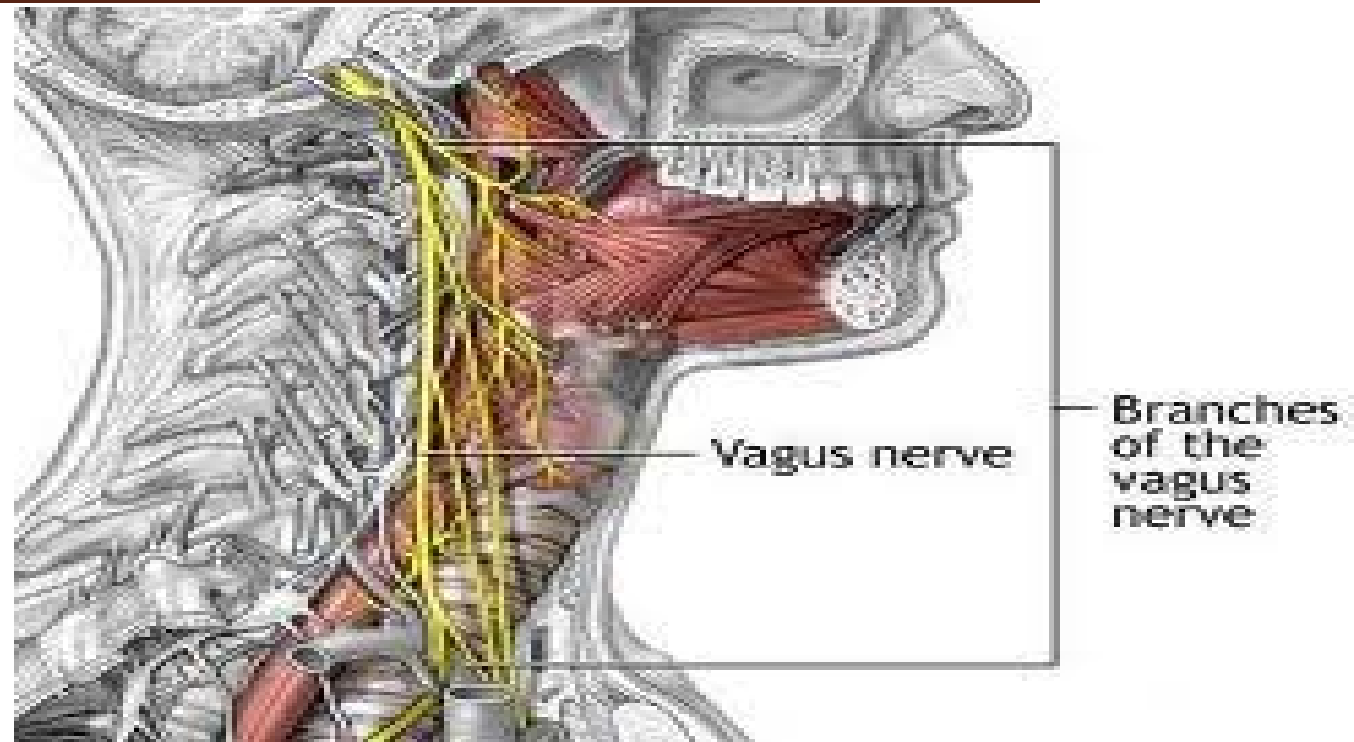


BRANCHES IN HEAD & NECK

- In jugular foramen :

1. Meningeal – supplies dura of posterior cranial fossa & fibers derived from sympathetic & upper cervical nerves
2. Auricular – supplying concha & root of auricle, posterior half of EAC, outer surface of TM

BRANCHES IN HEAD & NECK



- **In neck :**
 1. Pharyngeal – contains chiefly the fibers of cranial root of accessory nerve. Forms pharyngeal plexus distributing to the muscles of pharynx & soft palate (except tensor veli palatini)
 2. Carotid – supply carotid body & sinus.

Cont..

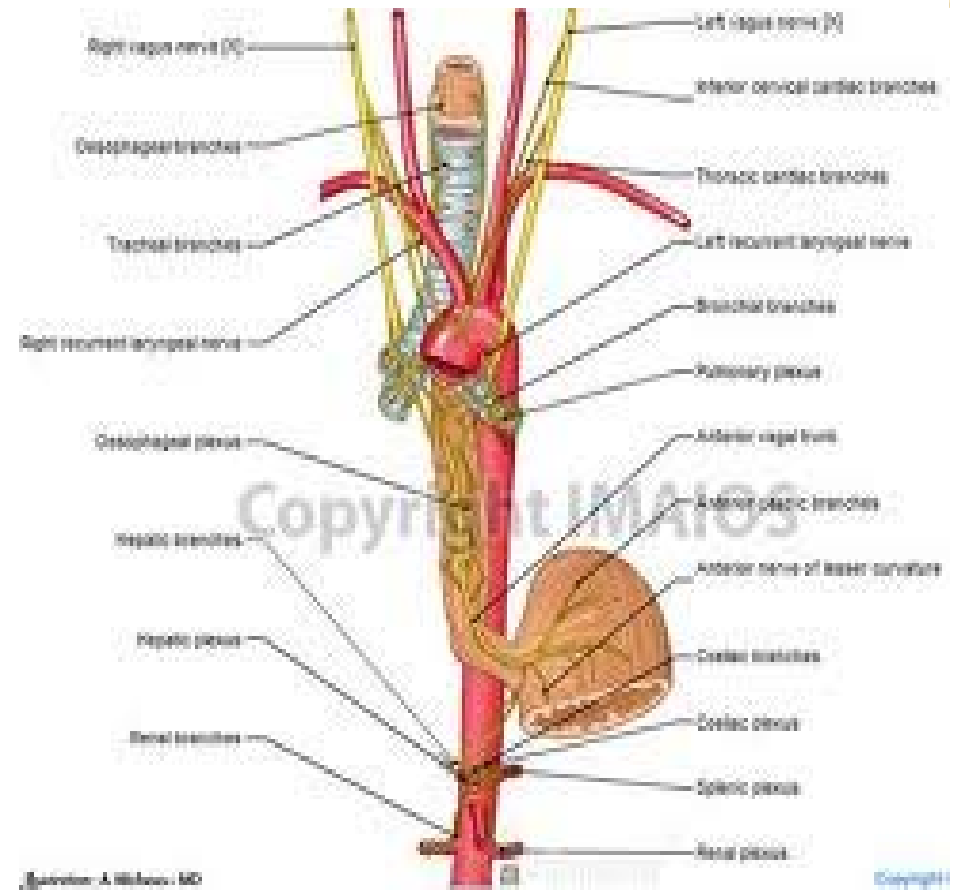
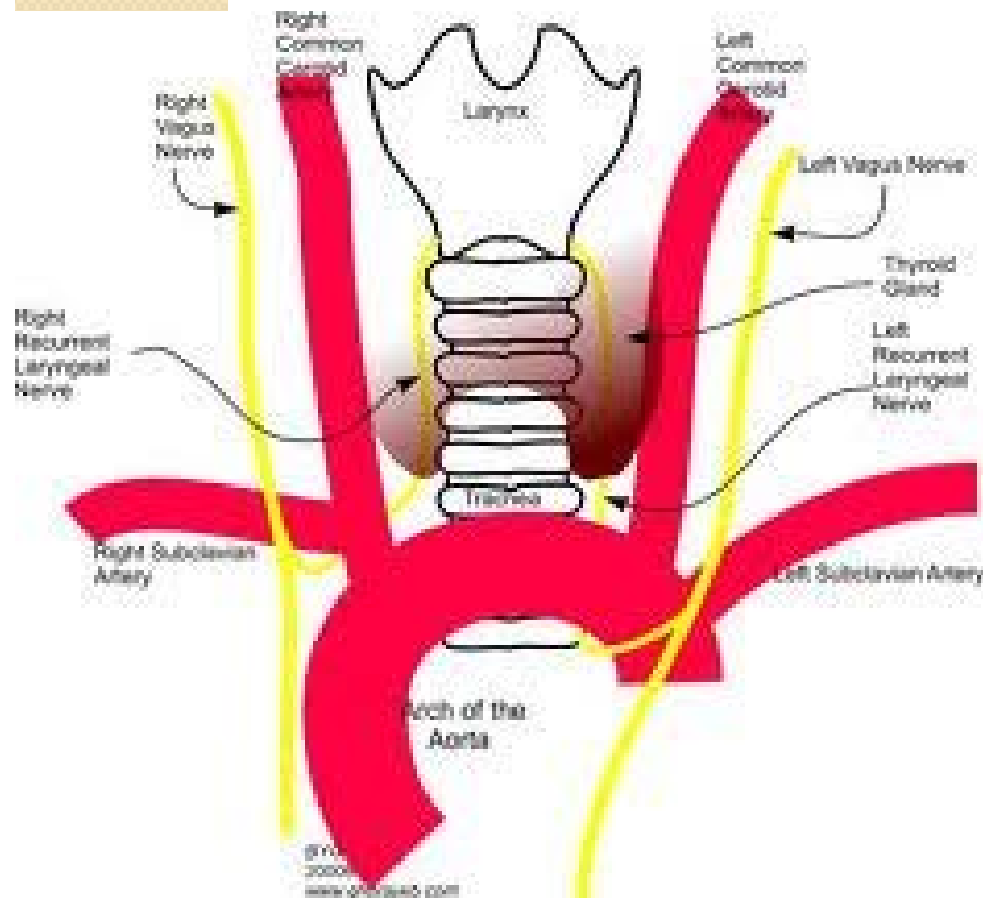
3 . **Superior laryngeal** – runs downwards & forwards on superior constrictor deep to ICA , reaches middle constrictor & divides into external & internal laryngeal nerves.

External – thin , accompanies superior thyroid artery , pierces the inferior constrictor & ends by supplying the cricothyroid muscle , also gives branches to the inferior constrictor & to pharyngeal plexus

Internal – thick , passes downwards & forwards, pierces the thyrohyoid membrane & enters the larynx, supplies the mucous membrane of larynx upto the level of vocal folds.

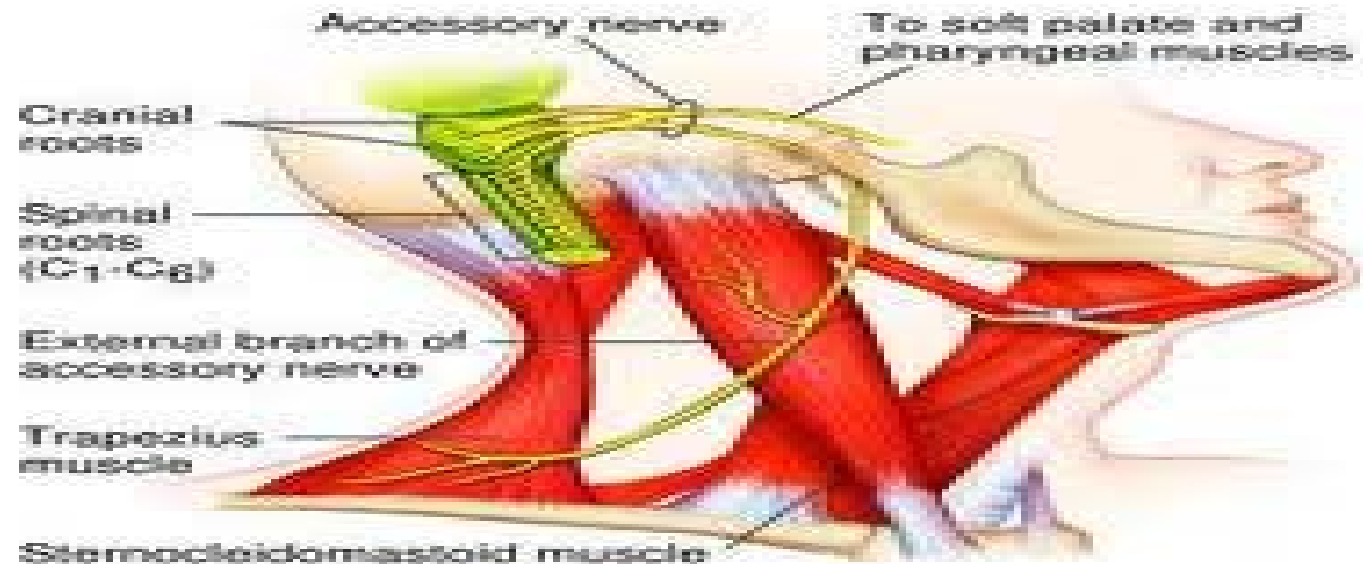
4. Recurrent laryngeal nerve –

supplies all intrinsic muscles of larynx except cricothyroid , sensory nerve to larynx below the level of vocal cords, cardiac branches to deep cardiac plexus , branches to trachea & esophagus , inferior constrictor



ACCESSORY NERVE

- Has two roots – cranial & spinal
- Cranial root is accessory to vagus & is distributed through the branches of it
- Spinal root has more independent course.





Supplies –

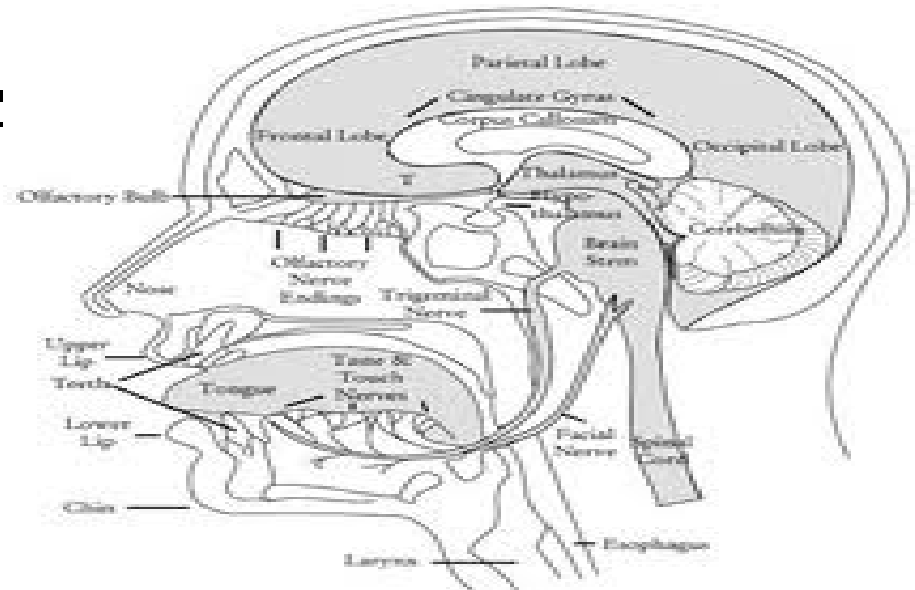
I. Sternocleidomastoid

II. Trapezius

III. Cervical nerves – proprioceptive to muscles

HYPOGLOSSAL NERVE

- Course & distribution -



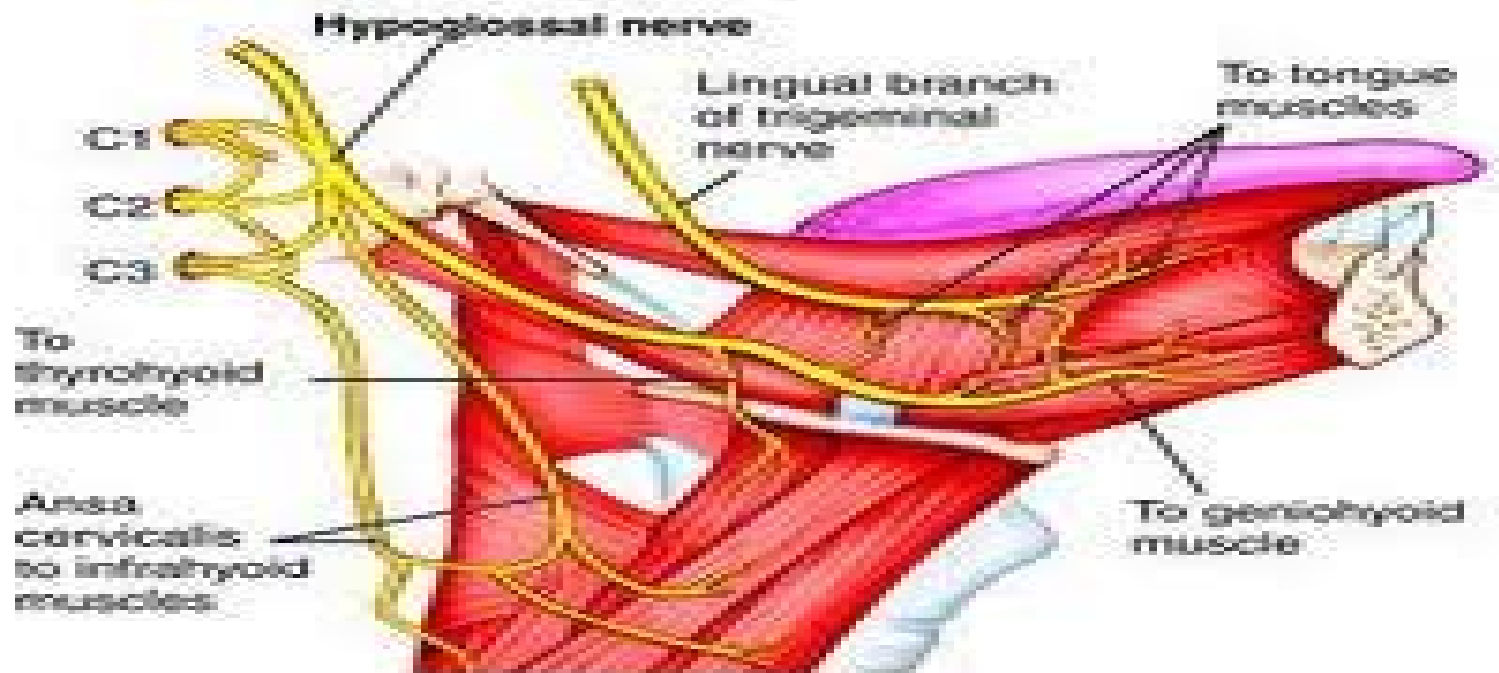
I. Intranural –

- .. fibers pass forwards & lateral to medial longitudinal bundle , medial lemniscus , pyramidal tract & medial to reticular formation & olivary nucleus
- .. Nerve attaches to anterolateral sulcus of medulla betn pyramid & olive by 10 -15 rootlets
- .. Leaves skull through hypoglossal canal (anterior condylar)

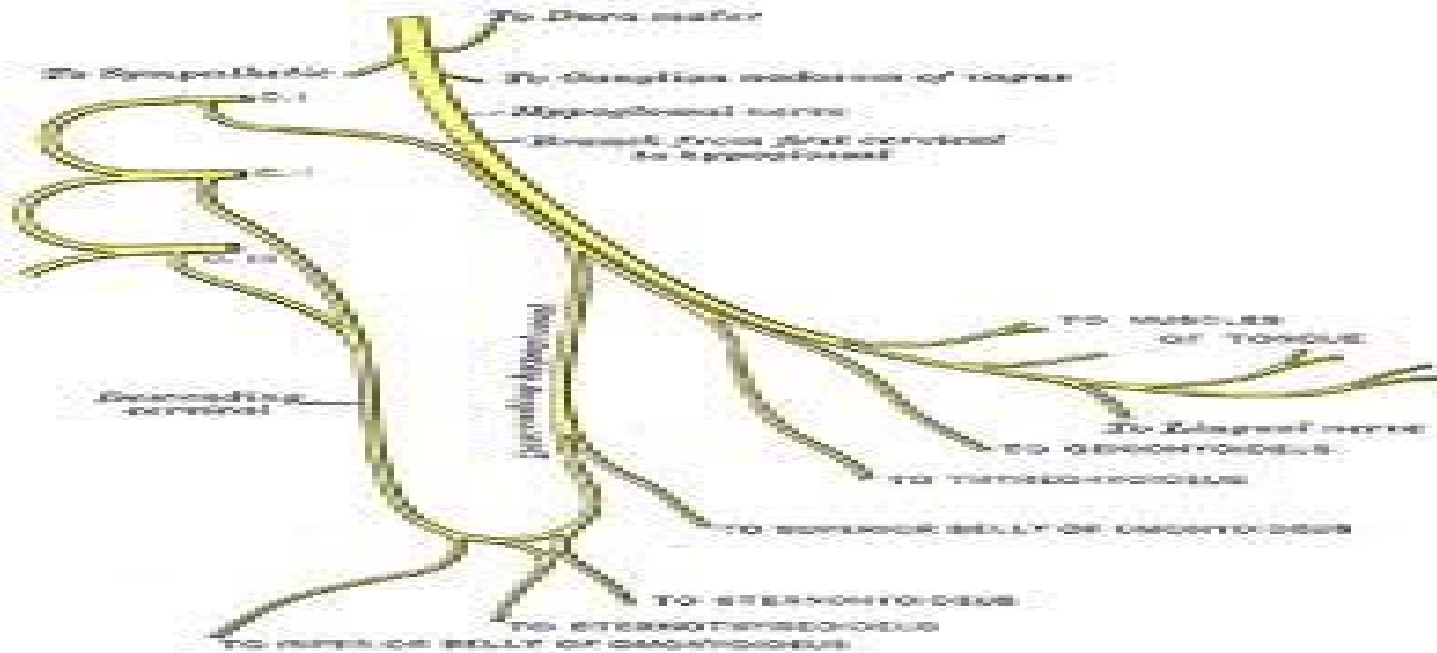
Branches & distribution

- Branches containing fibers of hypoglossal proper supply

all extrinsic & intrinsic muscles of tongue , styloglossus , genioglossus , superior inferior longitudinal , transverse , vertical except palatoglossus



Branches & distribution



- **Branches of hypoglossal containing CI fibers**
 - .. meningeal branch – contains sensory & sympathetic fibers , supplies bone & meninges in ant part of PCF
 - .. descending branch –as descendens hypoglossi or upper root of ansa cervicalis
 - .. Branches to thyrohyoid & geniohyoid