

Booklet no.

**495**

College of Medicine  
Second Year  
Second Semester  
1428-1429

Pages no

**22**

**2** Ear  
**nd year**

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All required lectures in 1st semester

for **ANATOMY 124**

with Notes + MCQs

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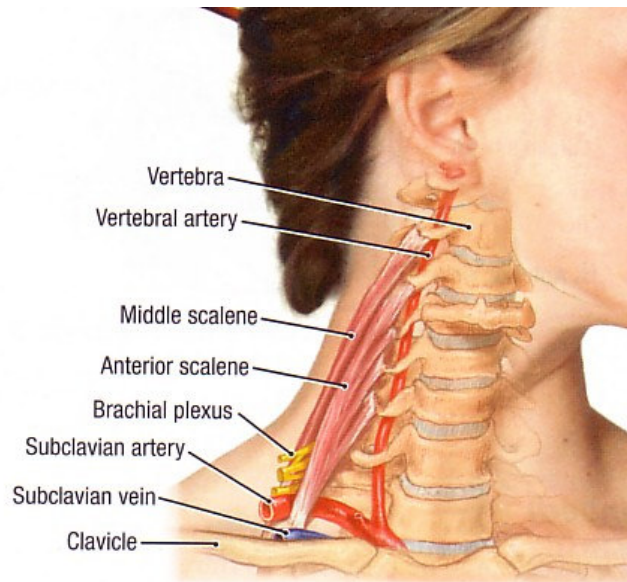
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## (1) SCALENAE MUSCLES

1- All of the following statement are true about Scalenus Anterior EXCEPT :

- a. Lies deep in the root of the neck, behind sternomastoid.
- b. Origin : transverse process of C3,4,5 & 6.
- c. Insertion : scalene tubercle of 1<sup>st</sup> rib.
- d. Nerve supply : ant. rami of C4,5 & 6.
- e. **Elevates 1<sup>st</sup> rib, medial rotation & flexion of cervical vertebrae. (Lateral)**



2- All of the following are in front of Scalenus Anterior EXCEPT :

- a. Prevertebral fascia.
- b. Phrenic nerve.
- c. Suprascapular & transverse cervical arteries.
- d. Subclavian vein.
- e. **External J.V. (Internal J.V.)**

3- Regarding the relation of Scalenus Anterior, all of the following are true EXCEPT :

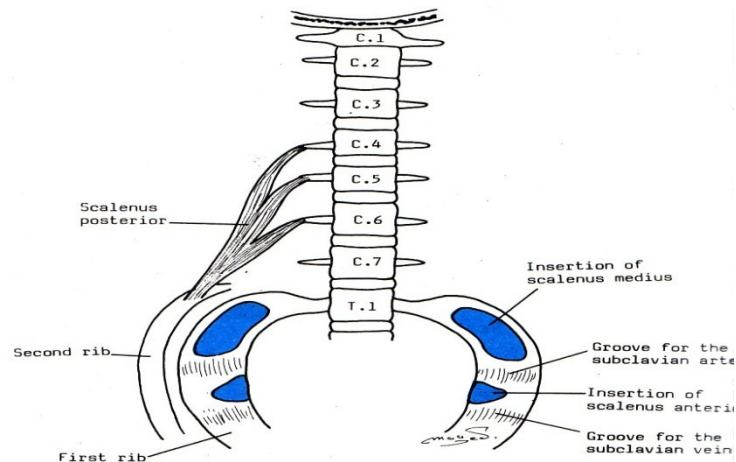
- a. Post. : scalenus medius, root of brachial plexus and cervical dome of pleura.
- b. Med. : vertebral vessels, inferior thyroid artery thyrocervical trunk, sympathetic trunk & thoracic duct in Lt. side.
- c. Lat. : trunks of brachial plexus, roots of phrenic nerve.
- d. Posterior and lateral may found subclavian artery.
- e. **Thoracic duct is found only in the Rt. side. (Lt. side)**

4- Regarding the Scalenus Medius, the incorrect statement :

- a. It is the largest of scalene muscles and it lies deep & lateral to scalenus anterior.
- b. **It has the same action of Scalenus posterior. (Scalenus anterior)**
- c. Take origin from Transverse process of Atlas (Axis) & the following 5 cervical vertebrae.
- d. Inserted in Upper surface of 1<sup>st</sup> rib behind groove for subclavian artery.
- e. Take nerve supply from ant. rami of cervical nerves ( C3-8 ).

5- Regarding the Scalenus Posterior, which statement is TRUE :

- a. Origin : transverse process of upper cervical vertebrae. (Lower)
- b. Insertion : inner surface of 2<sup>nd</sup> rib. (Inner)
- c. Nerve : ant. rami of upper cervical nerves. (Lower)
- d. Action : elevates 2<sup>nd</sup> rib, medial flexion of cervical vertebrae. (Lateral)
- e. *It may be absent or fused with scalenus medius.*



6- Regarding the Cervical Plexus, all of the following are true EXCEPT :

- a. Formed by ant. rami of upper 4 cervical nerves and share in formation of ansa cervicalis.
- b. Lies in front of levator scapulae, scalenus medius.
- c. *It gives branch to the vagus nerve.* (Phrenic)
- d. Lies behind carotid sheath, IJV deep to sternomastoid muscle.
- e. Covered by prevertebral layer of deep cervical fascia.

7- All of the following are Cutaneous branch of cervical plexus EXCEPT :

- a. Great auricular C2,3.
- b. Lesser occipital C2.
- c. Transverse cervical C2,3.
- d. *Lesser auricular C2,3.*
- e. Supraclavicular C3,4.

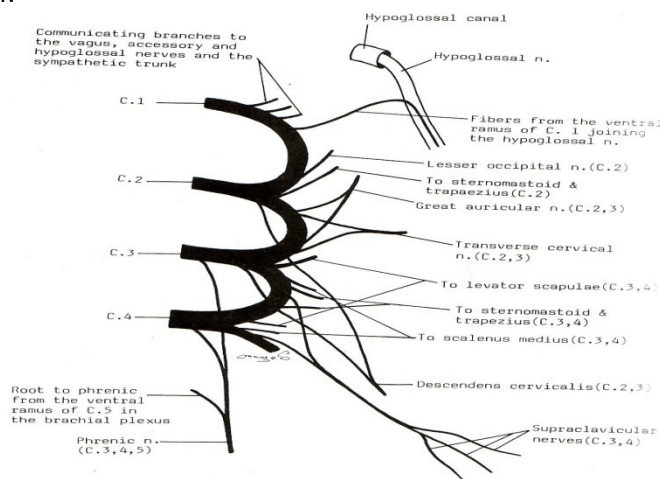


Fig. 235: Distribution of the cervical plexus.

8- All of the following are Muscular branch of cervical plexus EXCEPT :

- a. To rectus capitis anterior.
- b. To trapezius.
- c. To sternomastoid.
- d. To levator scapulae.
- e. *To platysma.*

## (2) BLOOD SUPPLY OF THE NECK

### EXTERNAL CAROTID ARTERY :

- The **right common carotid artery** arises from the *brachiocephalic artery*.
- The **left common carotid artery** arises from the *arch of the aorta*.
- The common carotid artery divides into the **external and internal carotid arteries**.
  - *The common carotid artery gives off no branches.*
- At the point of division, of the common carotid artery or the beginning of the internal carotid artery there is a *localized dilatation*, called the **carotid sinus**.
- The **carotid sinus** contains numerous nerve endings derived from the **glossopharyngeal nerve**.
- The carotid sinus serves as a reflex **pressoreceptor** mechanism.
- The **carotid body** innervated by the glossopharyngeal nerve and is a **chemoreceptor**.
- **External carotid artery** begins at the level of the upper border of the thyroid cartilage and terminates in the substance of the parotid gland behind the neck of the mandible by dividing into :
  - **Superficial temporal**, and
  - **Maxillary arteries**.
- External carotid artery branches :
  1. **Superior thyroid** : it gives off :
    - **Sternomastoid a.**
    - **Superior laryngeal a.** ( which pierces the thyrohyoid membrane with the internal laryngeal nerve ).
  2. **Ascending pharyngeal** :
    - Is a long, slender artery.
    - It arises from the **medial** aspect of the external carotid artery.
  3. **Lingual** :
    - It loops upward to enter the submandibular region.
    - The loop of the artery is crossed superficially by the hypoglossal nerve.
    - It supplies the tongue.
  4. **Facial** : it supplies the face.
  5. **Occipital** :
    - It passes upward and reaches the back of the scalp.
    - Its terminal part accompanies branches of the greater occipital n. to supply the back of the scalp.
  6. **Posterior auricular** : it passes backward to reach the auricle.
  7. **Superficial temporal** :
    - The small terminal branch of the external carotid artery.
    - It ascends in front of the auricle parallel to the auriculotemporal nerve.
    - It supplies the skin over the frontal and temporal regions.
  8. **Maxillary** :
    - The larger terminal branch of the external carotid artery in the parotid gland.
    - It then leaves the **infratemporal fossa** and, passing through the pterygomaxillary fissure, to enters the **pterygopalatine fossa**.
    - Here, it splits into branches that accompany the branches of the maxillary nerve.
    - Branches :
      - **Inferior alveolar artery** : runs with the inferior alveolar nerve into the mandibular canal.
      - **Middle meningeal artery** :
        - Embossed by the two roots of the auriculotemporal nerve.
        - Enters the skull through the foramen spinosum.
        - Supplies the meninges in the skull.

## INTERNAL CAROTID ARTERY :

- The artery begins at the level of the upper border of thyroid cartilage.
- It supplies the brain, the eye, the forehead, and part of the nose.
- It enters the cranial cavity through the **carotid canal** in the petrous part of the temporal bone.
- It lies in the **carotid sheath** with the internal jugular vein and vagus nerve.
- The internal carotid artery gives off no branches in the neck.

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## MAIN VEINS OF THE NECK

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### INTERNAL JUGULAR VEIN :

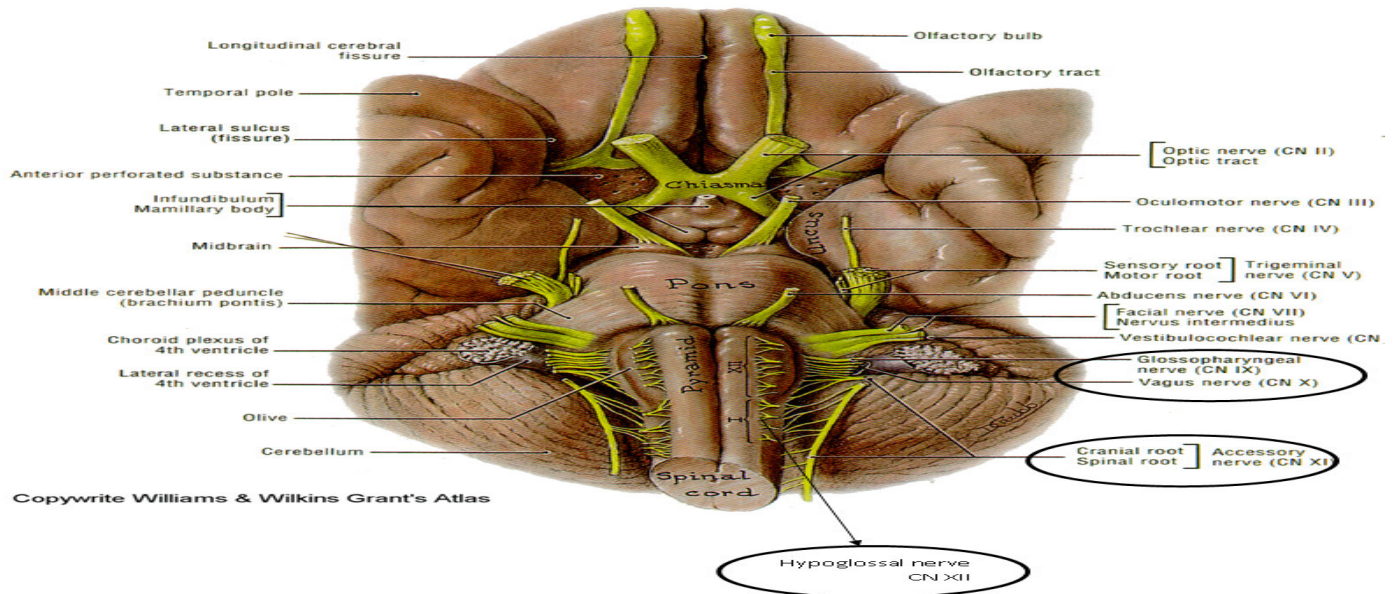
- It begins at the jugular foramen in the skull as a continuation of the sigmoid sinus.
- Receives blood from : **Brain, Face, and Neck.**
- Unites with the **subclavian vein** behind the medial end of the clavicle to form the **brachiocephalic vein.**
- It has a dilatation at its upper end called the **superior bulb** and another near its termination called the **inferior bulb.**
  - Directly above the inferior bulb there is a **bicuspid valve.**
- Tributaries :
  1. **Inferior petrosal sinus :**
    - Assists in draining the cavernous sinus
    - Leaves the skull through the anterior part of the jugular foramen and joins the internal jugular vein at the *superior bulb.*
  2. **Facial vein :**
    - Joined by anterior division of retromandibular vein.
    - The vein then crosses the carotid sheath and its contents and joins the internal jugular vein.
  3. **Pharyngeal veins :** drain the pharyngeal venous plexus.
  4. **Lingual vein :** drains into the internal jugular vein.
  5. **Superior thyroid vein :** leaves the superior pole of the thyroid gland.
  6. **Middle thyroid vein :** leaves the lobe of the thyroid gland.
  7. **Occipital vein :** drains into the internal jugular vein. More often, it joins the vertebral or post. auricular v.

### CAROTID SHEATH :

- The carotid sheath contains :
  - **Carotid arteries,**
  - **Internal jugular vein,**
  - **Vagus nerve, and**
  - **Deep cervical lymph nodes.**



### (3) LAST FOUR CRANIAL NERVES



#### GLOSSOPHARYNGEAL NERVE :

- Motor and sensory.
- Emerges from anterior surface of the medulla oblongata, **between the olive and inferior cerebellar peduncle.**
- Leave the skull through **jugular foramen** to descend in the neck within carotid sheath.
- It has 2 sensory ganglia (superior & inferior) in the jugular foramen.
- It **descends** between internal jugular vein & internal carotid artery in upper part of carotid sheath, lying deep to styloid process & muscles attached to it.
- It **leaves** carotid sheath to pass between internal carotid artery & external carotid artery.
- It winds around stylopharyngeus muscle between superior & middle constrictors of pharynx into the back of tongue deep to hyoglossus.
- **Branches of the glossopharyngeal nerve :**
  - Tympanic branch : **arises from inferior ganglion**, and has parasympathetic secretomotor to parotid gland via auriculotemporal nerve.
  - Carotid branch : **sensory** to carotid sinus & carotid body to regulate blood pressure & respiration.
  - Nerve to the stylopharyngeus muscle (**motor**).
  - Pharyngeal branch.
  - Lingual branch : supply general & taste sensation to mucus membrane of post. 1/3<sup>rd</sup> of tongue.

#### VAGUS NERVE :

- Motor and sensory.
- Emerges from anterior surface of the medulla oblongata, **between the olive and inferior cerebellar peduncle.**
- Leave the skull through **jugular foramen**.
- It has 2 sensory ganglia, superior within jugular foramen & inferior just below jugular foramen.
- **At inferior ganglion, cranial root of accessory nerve joins vagus nerve and distributed in its pharyngeal & recurrent laryngeal branches.**
- It descends in the upper part of neck within carotid sheath, firstly between int. J.V. & int. carotid artery, then between Int. J.V. & common carotid artery.
- At the root of neck, it lies anterior to 1<sup>st</sup> part of subclavian artery.
- It innervates heart, great vessels of thorax, larynx, trachea, bronchi, lungs, G.I.T. ( pharynx + Lt. colic flexure ), liver & pancreas.

- 1- All the following are true about pharyngeal plexus EXCEPT :
  - a. Pharyngeal branch of vagus and cranial root of accessory.
  - b. Superior cervical sympathetic ganglion.
  - c. Pharyngeal branch of the glossopharyngeal.
  - d. **Branch of hypoglossal.**
  - e. Lies on outer surface of middle constrictor.
  
- 2- All of the following are supplied by pharyngeal plexus EXCEPT :
  - a. Salpingopharyngeus.
  - b. Superior constrictors.
  - c. **Stylopharyngeus.**
  - d. Middle constrictors.
  - e. Inferior constrictors
  
- 3- All muscles of soft palate are supplied by pharyngeal plexus EXCEPT :
  - a. **Tensor veli palatine. ( by mandibular division of trigeminal ).**
  - b. Levator veli palatini.
  - c. Palatopharyngeus.
  - d. Palatoglossus.
  - e. Musculus uvulae.
  
- 4- All of the following are not branches of the glossopharyngeus EXCEPT :
  - a. Recurrent laryngeal.
  - b. Meningeal branch.
  - c. Auricular branch.
  - d. Superior laryngeal.
  - e. **Carotid branch.**
  
- 5- Regarding the right recurrent laryngeal nerve :
  - a. Supply the Cricothyroid.
  - b. Supply the mucus membrane of larynx (sensory), above vocal folds.
  - c. It hooks around arch of aorta, behind ligamentum arteriosum.
  - d. Supply the pharynx.
  - e. **Supply the thyroarytenoid (vocalis)**
  
- 6- All are true regarding the roots of accessory nerve EXCEPT :
  - a. Cranial root separates from spinal root to join vagus at its inferior ganglion.
  - b. Spinal root crosses int. J.V. and pierces deep surface of Sternomastoid.
  - c. **Spinal root supply levator scapulae.**
  - d. Spinal root crosses posterior triangle
  - e. Cranial root is part of the pharyngeal plexus supplying the pharynx ,larynx, and the soft palate.
  
- 7- Regarding the hypoglossal nerve :
  - a. **It is motor nerve to the tongue.**
  - b. Arises from spinal cord.
  - c. In its lower part, it is joined by a branch from cervical plexus.
  - d. Upper leaves hypoglossal nerve as its descending branch.
  - e. It supply the palatoglossus muscle.

## (4) ORAL CAVITY

- Divided into vestibule, mouth cavity proper.
- The opening of the parotid duct is opposite to the upper 2<sup>nd</sup> molar tooth.
- The frenulum connects the lower part of the tongue to the floor of the mouth.
- On each side of the frenulum the opening of the submandibular duct.
- Sublingual fold produced by sublingual salivary gland.
- **Sensory Innervation :**
  - Roof : greater palatine + nasopalatine of the maxillary nerve.
  - Floor : lingual of the mandibular nerve.
  - Taste fibers : chorda tympani of the facial.
  - Cheek : buccal of the mandibular nerve.
- Remember the close relation between the lingual nerve & the lower 3<sup>rd</sup> molar tooth.

### TONGUE :

- Ant. 2/3<sup>rd</sup> in the mouth, post. 1/3<sup>rd</sup> in the pharynx by the sulcus terminalis which apex –foramen cecum– projects backward.
- Foramen cecum is the remnant of the thyroglossal duct.
- Divided into right & left by a fibrous septum.
- Papillae on the ant. 1/3<sup>rd</sup> filiform, fungiform, vallate papillae.
- Lingual tonsil on the post. 1/3<sup>rd</sup>, there is no papillae.
- Lateral to the frenulum : lingual artery, nerve, vein, plica fimbriate.
- Intrinsic muscle, no bony attachment, innervated by hypoglossal nerve, , alter the shape of the tongue.
- **Extrinsic muscles :** Genioglossus, Hyoglossus, Styloglossus & Palatoglossus.
- All muscles of the tongue are innervated by the hypoglossal nerve ( *EXCEPT the palatoglossus by the pharyngeal plexus* ).
- **Blood supply :** lingual + tonsillar + ascending pharyngeal artery branches of the external carotid → Int. J.V.
- **Lymph drainage :**
  - Tip of the tongue → submental.
  - Remainder of ant. 2/3<sup>rd</sup> → submandibular & deep cervical.
  - Post. 1/3<sup>rd</sup> → deep cervical lymph node.
- **Sensory Innervation :**
  - Ant. 2/3<sup>rd</sup>, lingual nerve/G, chorda tympani of taste fibers EXCEPT vallate.
  - post. 1/3<sup>rd</sup> + vallate by glossopharyngeal nerve.

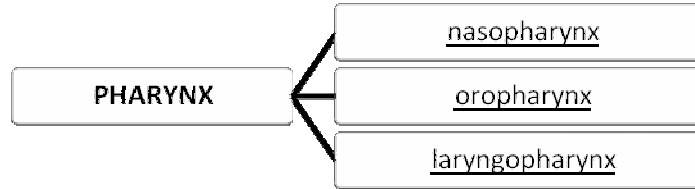
### PALATE :

- **Hard palate :** palatine process of the maxilla + horizontal palate of the palatine. Covered by mucoperiosteum.
- **Soft palate :** post. --- uvula.
- **Palatine aponeurosis :** extended tendon of the tensor veli palatine.
- All muscles of the palate are supplied by pharyngeal plexus except the tensor veli palatine by nerve to the medial pterygoid of the mandibular nerve.
- Palatoglossus narrows the oropharyngeal isthmus.
- **Sensory supply :**
  - Greater & lesser palatine. the nasopalatine through the incisive foramen → hard palate.
  - Glossopharyngeal → soft palate.
- **Blood supply :** greater palatine, ascending palatine, ascending pharyngeal.
- **Lymph drainage :** deep cervical lymph nodes.



## (5) PHARYNX

- A musculo-membranous tube. Lies behind nasal cavity, oral cavity & larynx.
- Extent from base of skull to **C6**.
- It's length 12 – 14 cm.
- Wide at its beginning & Narrow at its termination.



### NASOPHARYNX :

- Extent from base of skull to level of soft palate **C1**.
- Communications : *Laterally* with tympanic cavity through auditory tube.  
*Inferiorly* with oropharynx through pharyngeal isthmus.  
*Anteriorly* with nasal cavities through posterior nasal openings.
- **lateral wall nasopharynx** :
  - Pharyngeal opening of auditory tube.
  - Tubal elevation: produced by posterior margin of tube.
  - Salpingopharyngeal fold : a mucous fold produced by salpingopharyngeus muscle attached to the lower end of tube.
  - Pharyngeal recess.
- **Pharyngeal tonsil** : collection of lymphoid tissue that lies at junction of roof & posterior wall.

### OROPHARYNX :

- Extent : from level of soft palate (**C1**) to level of upper end of epiglottis (**C3**).
- Communications : *Superiorly* : with nasopharynx through pharyngeal isthmus.  
*Anteriorly* : with oral cavity through oropharyngeal isthmus.  
*Inferiorly* : continuous with laryngopharynx.
- **Lateral wall oropharynx** :
  - ( *Backwards* : Palatoglossal arch (fold), Palatine tonsil & Palatopharyngeal ).
  - Palatoglossal arch (fold) : an anterior fold of mucous membrane overlying palatoglossus muscle.
  - Palatopharyngeal arch (fold) : a post. fold of mucous membrane overlying palatopharyngeus muscle.
- **Palatine tonsil**: Lying in a triangular recess “tonsillar sinus”. *Between palatoglossal & palatopharyngeal arches.*
  - **Arterial supply** : tonsillar branch of facial artery.
  - **Nerve supply** : *tonsillar branch of glossopharyngeal nerve.*
  - **Applied anatomy** : tonsillitis may cause referred pain in ear.

### LARYNGOPHARYNX :

- Extent : from level of upper end of epiglottis (**C3**). End in level of lower border of cricoid cartilage (**C6**).
- Communications : *anteriorly* with larynx through inlet of larynx  
*Inferiorly* continuous with esophagus.

## MUSCLES OF PHARYNX :

- Outer layer : **3** constrictors muscles.
- Inner layer : **3** longitudinal muscles.

## CONSTRUCTORS OF PHARYNX :

- Overlap each other from below upward.
- **Are mostly absent in nasopharynx.**
- Are inserted into pharyngeal raphe.
- **Action of constrictors :**
  1. **Superior + middle + thyropharyngeus** : propel food downward.
  2. **Cricopharyngeus** : act as a sphincter at lower end of pharynx, remains contracted to prevent suction of air into esophagus, relaxes at 3<sup>rd</sup> stage of deglutition (swallowing) to allow passage of food to esophagus.

## LONGITUDINAL MUSCLES :

- **Actions :**
  1. Elevate thyroid cartilage (larynx) to close inlet of larynx.
  2. Elevate pharynx to shorten it during swallowing.

## NOTE :

- Pharyngeal tonsil may be enlarged in children (**adenoids**), causing :
  - **Obstruction of nasophaynx.**
  - **Difficulty in breathing.**
- **Functional Considerations** : the nasopharynx is *kept opened* to allow breathing by :
  1. The rigidity of its wall ( well developed **pharyngobasilar fascia** ).
  2. The lack of pharyngeal constrictors over its wall.

## (6) NASAL CAVITY

- Divided by nasal septum. Open externally by nostrils, internally into nasopharynx by choanae.
- Roof made by :
  - Anterior sloping part : frontal & nasal bones.
  - Middle horizontal part : cribriform plate of ethmoid.
  - Posterior sloping part : body of sphenoid.
- Floor made by hard palate.
- Bony part of nasal septum made by :
  - Perpendicular plate of ethmoid (*superiorly*).
  - Vomer : *posteriorly & inferiorly*.
  - Septal cartilage : *Anteriorly & inferiorly*.
- Superior and middle conchae are made by the ethmoid bone, the inferior is a separate bone.
- The meatuses lie inferolaterally to the corresponding concha.
- Sphenoethmoidal recess is a triangular fossa between superior concha & roof of nose.
- In the lateral wall of middle meatus we will find :
  - Bulla ethmoidalis : rounded elevation.
  - Hiatus semilunaris : a crescentic groove, below bulla ethmoidalis.
    - Its anterior end leads into a curved channel (infundibulum).
- Lateral wall openings :
  - Sphenoidal air sinus : sphenoethmoidal recess.
  - Posterior ethmoidal air sinuses : superior meatus.
  - Middle ethmoidal air sinuses : bulla ethmoidalis.
  - Anterior ethmoidal air sinuses : hiatus semilunaris.
  - Maxillary air sinuses : hiatus semilunaris (behind opening of anterior ethmoidal air sinuses).
  - Frontal air sinuses : infundibulum.
  - Nasolacrimal duct : inferior meatus.
- Olfactory region : roof, superior concha & opposed part of nasal septum.
- Respiratory region : rest of nasal cavity.
- Olfaction is by the olfactory nerve.
- Anterior part of the cavity is innervated by the anterior ethmoidal of the olfactory division of the trigeminal.
- Posterior, medial and lateral parts are innervated by the pterygopalatine ganglion.
- Blood is supplied to the cavity by branches of the maxillary, facial and ophthalmic arteries.
- **The main artery is the sphenopalatine branch of the maxillary artery.**

### COMMON SITES FOR EPISTAXIS (BLEEDING FROM NOSE) [IMP.]

- **Anterior : site of anastomosis between 3 arteries at antero-inferior part of septum, in the region of vestibule (*Little's area*) :**
    1. **Sphenopalatine artery.**
    2. **Septal branch of superior labial of facial artery.**
    3. **Greater palatine branch of maxillary artery.**
  - **Posterior : site of anastomosis between branches of sphenopalatine artery.**
- 
- Venous drainage by the facial vein and the pterygoid plexus.
  - Lymphatic drainage from the vestibule : into submandibular lymph nodes.
  - Lymphatic drainage from the rest of the cavity : **upper deep cervical lymph nodes.**
  - Paranasal sinuses is lined by respiratory epithelium.

## (7) LARYNX

- It consists of 9 cartilages connected together by ligaments & membranes and moved by muscles.
- It is lined with M. M.
- It is situated in front of the 4<sup>th</sup>, 5<sup>th</sup>, and 6<sup>th</sup> cervical vertebrae.
- Thyroid cartilage is the largest single hyaline cartilage, consist of 2 laminae, and provide an attachment of sternothyroid, thyrohyoid, and inferior constrictor muscle.
- Cricoid cartilage is shaped like a signet ring, lies below the thyroid cartilage and on each side of the lateral surface is a facet for articulation with the inferior cornu of the thyroid.
- Arytenoid cartilages are small 2 pyramidal cartilages, situated at the back of larynx, They articulate with cricoid cartilage, it has apex above, and base below.
- Vocal process projects anteriorly to give attachment to vocal ligament.
- Muscular process projects laterally to give attachment to post. & lateral crico-arytenoid muscle.
- Corniculate are two small conical-shaped cartilages articulate with the arytenoid cartilages, they give attachment to the aryepiglottic folds.
- **Cuneiform cartilages** : are 2 small, rod-shaped pieces of cartilage present in each ary-epiglottic fold.
- Epiglottis is a leaf-shaped elastic cartilage, its sides are connected to arytenoid cartilages by ary-epiglottic folds of mucous membrane.

### MEMBRANES AND LIGAMENTS OF THE LARYNX :

- **Thyro-hyoid membrane** : connects upper margin of thyroid cartilage to body & greater cornu of hyoid bone.
- The membrane is thickened in midline to form *median* thyro-hyoid ligament, and posterior borders are thickened to form *lateral* thyro-hyoid ligaments.
- On each side, thyro-hyoid membrane is pierced by superior laryngeal vessels & internal laryngeal nerve.
- **Crico-tracheal ligament** : connects lower margin of cricoid cartilage to 1<sup>st</sup> ring of trachea.
- **Quadrangular membrane** : it is the upper part of fibro-elastic membrane, its lower border is thickened to form **vestibular ligament** (false cord).
- **Crico-thyroid ligament** is the lower part of fibro-elastic membrane lining larynx, its lateral part on each side is thin and called crico-vocal membrane which its upper margin is thickened to form **vocal ligament** on each side.

### LARYNGEAL FOLDS :

- The vestibular fold is a fold on each side of the larynx.
- The vocal fold is a mobile, **avascular** and it white in color.
- The gape between the vocal folds is called the **Rima glottis**.

### MUSCLES OF THE LARYNX :

- **Extrinsic muscles** : these muscles move the larynx up and down during swallowing.
  - **Elevation** : Digastric, Stylohyoid, Mylohyoid, Geniohyoid, Stylopharyngeus, Salpingopharyngeus, and Palatopharyngeus muscles.
  - **Depression** : Sternothyroid, Sternohyoid, and Omohyoid muscles.

- **Intrinsic muscles** : two muscles modify the laryngeal inlet.
  - Narrowing the inlet : the oblique arytenoid muscle.
  - Widening the inlet : the thyroepiglottic muscle.
- Five muscles move the vocal folds (cords) :
  - Tensing the vocal cords : the cricothyroid muscle.
  - Relaxing the vocal cord : the thyroarytenoid (vocalis) muscle.
  - Adducting the vocal cords : the lateral cricoarytenoid muscle.
  - Abducting the vocal cords : the posterior cricoarytenoid muscle.
  - Moves the arytenoid cartilages : the transverse arytenoid muscle.

### **NERVE SUPPLY OF THE LARYNX :**

- **Sensory Nerves** :
  - Above the vocal cord : the internal laryngeal branch of the superior laryngeal branch of the vagus.
  - Below the vocal cord : The recurrent laryngeal nerve.
- **Motor Nerves** :
  - All the intrinsic muscles of the larynx are supplied by the recurrent laryngeal nerve *EXCEPT the cricothyroid muscle*.
  - The *cricothyroid muscle* is supplied by the ext. laryngeal br. of the sup. laryngeal br. of the vagus.

### **BLOOD SUPPLY OF THE LARYNX :**

- The superior laryngeal branch of the superior thyroid artery.
- The inferior laryngeal branch of the inferior thyroid artery.

### **LYMPH DRAINAGE OF THE LARYNX :**

- The lymph vessels drain into the deep cervical group of nodes.



## (8) EAR

- Ear is an organ of hearing & balance.
- **Consists of three parts :**
  - a. **External Ear (Pinna).**
  - b. **Middle Ear (Tympanic cavity).**
  - c. **Internal Ear (labyrinth).**

### EXTERNAL EAR :

- It consists of :
  - a. **Auricle (Pinna) :** is formed of elastic cartilage covered by skin , It funnels sound waves into the external auditory meatus.
  - b. **External auditory Meatus :** is a curved tube covered by skin and extends from auricle to tympanic membrane , Its :
    - outer 1/3<sup>rd</sup> is elastic cartilage containing hairs,sebaceous & ceruminous glands (modified sweat glands secreting yellowish brown wax),
    - inner 2/3<sup>rd</sup> is bone, formed of tympanic plates.
    - **Sensory nerve supply :**
      1. Auriculo-temporal N. (trigeminal).
      2. Auricular branch of vagus N.
    - **Lymph drainage :** into superficial parotid, mastoid & superficial cervical lymph nodes.
  - c. **Tympanic membrane (Ear drum) :** It is a thin ,fibrous membrane placed obliquely forward & downward forming the lateral wall of middle ear cavity.
    - It separates external acoustic meatus from middle ear cavity.
    - The membrane is tense, **pars tensa**, except a small triangular area in its upper part.
      - This area is bounded by the anterior & post. malleolar folds, it is lax & is called **Pars Flaccida**.
      - The most depressed centre point of concavity called **UMBO**.
    - It is sensitive to pain and is innervated by : **auriculotemporal N. & auricular br. of vagus**.

### MIDDLE EAR :

- It is an air-containing cavity in the petrous part of the temporal bone.
- It contains the auditory ossicles, whose function is to transmit the vibrations of the tympanic membrane (eardrum) to the perilymph of the internal ear.
- It communicates anteriorly with nasopharynx through auditory tube, and posteriorly with mastoid antrum.
- **The borders :**
  - **Roof :** is formed by a thin plate of bone, tegmen tympani, which is part of petrous temporal bone.
  - **Floor :** it is formed by a thin plate of bone which separates tympanic cavity from jugular foramen & superior bulb of internal jugular vein.
  - The promontory lies in the middle wall.
- **Auditory Ossicles :**

Malleus : is the largest consists of head, neck, handle, ant & lateral processes.

Incus : consists of a large rounded body, two processes (long & short), body articulates anteriorly with the head of malleus.

Stapes : has a head, a neck & 2 limbs & base.
- **Muscle of the ossicles :**
  - Tensor Tympani ( wall of auditory tube to handle of malleus ).
  - Stapedius ( pyramid bony projection on the posterior wall of middle ear to neck of the stapes ).

### **AUDITORY TUBE :**

- Auditory (Eustachian) or pharyngotympanic tube connects the middle ear with the Nasopharynx.
- Its posterior 1/3<sup>rd</sup> is bony and anterior 2/3<sup>rd</sup> is cartilaginous.
- It serves to equalize air pressure in the tympanic cavity & nasopharynx.

### **MASTOID ANTRUM:**

- Lies behind the middle ear in the petrous part of the temporal bone.
- It communicates with the middle ear through the aditus.

### **INTERNAL EAR (LABYRINTH) :**

- The internal ear or labyrinth lies in the petrous part of the temporal bone.
- It's consist of bony labyrinth & membranous labyrinth.

### **BONY LABYRINTH :**

- 1- **Vestibule** : is the central part of bony labyrinth.
- 2- **Semicircular canals** : three bony semicircular canals ( Superior, Posterior & Lateral ).
  - Lie posterosuperior to the vestibule & set at right angle to each other.
- 3- **Cochlea** : resembles a snail shell. It opens into the anterior part of the vestibule, the structure of it is conical, at oval window **scala tympani** which communicates with **scala vestibuli** through the helicotrema at the apex of the cochlea & ends at the round window.

### **MEMBRANOUS LABYRINTH :**

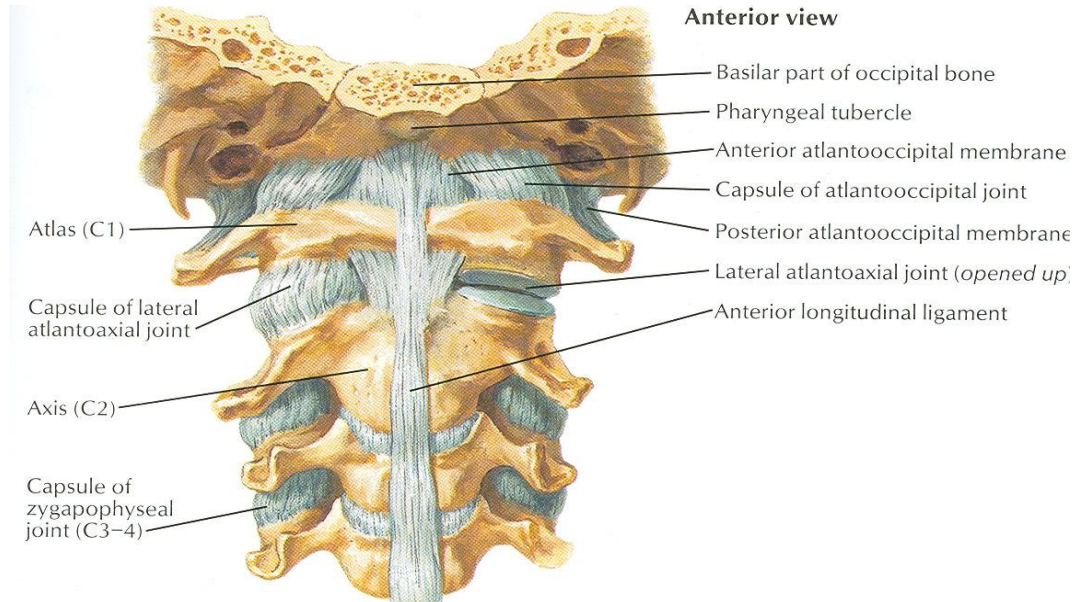
- The membranous labyrinth is lodged within the bony labyrinth.
  - It is filled with endolymph and surrounded by **perilymph**.
  - It consists of the utricle and saccule, which are lodged in the bony vestibule; the three semicircular ducts, which lie within the bony semicircular canals; and the duct of the cochlea, which lies within the bony cochlea.
  - All these structures freely communicate with one another.
- a. **Cochlear duct** : it is wedged between the scala vestibuli & scala tympani & contains the spiral organ of corti.
  - b. **Utricle & Saccule** : are dilated membranous sacs in the vestibule contains sensory organ called maculae.
  - c. **Semicircular Ducts** : consist of ant. post & lateral ducts, their dilated ends are called **AMPULLAE**.

## (9) JOINTS OF HEAD & NECK

- There are Atlanto-Occipital Joints and Atlanto-Axial Joints all of them are synovial joints.

### ATLANTO-OCCIPITAL JOINTS :

- Formed between the occipital condyles above and the superior surfaces of the lateral masses of the atlas below.
- Occipital condyles are found on either side of the foramen magnum.



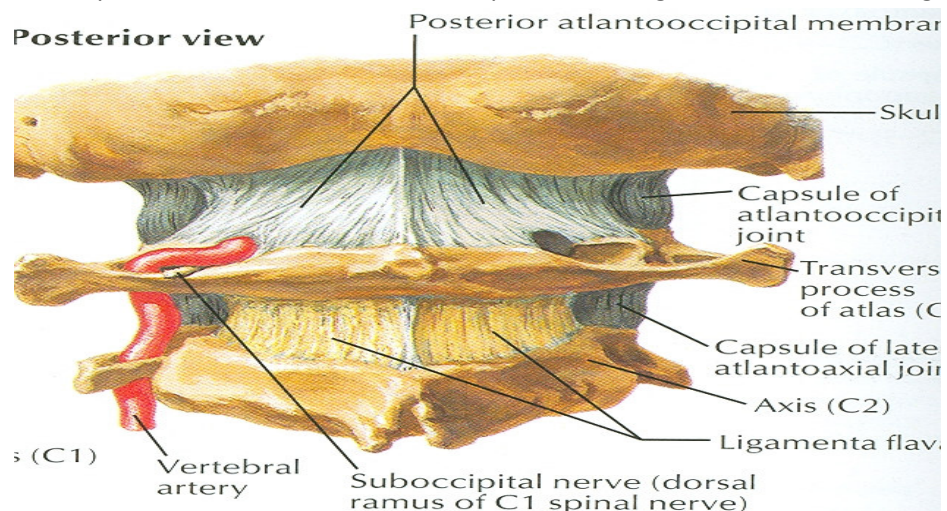
#### • Ligaments :

##### a) Anterior atlanto-occipital membrane :

- This is a continuation of the anterior longitudinal ligament.
- It runs as a band down the anterior surface of the vertebral column.
- The membrane connects the anterior arch of the atlas to the anterior margin of the foramen magnum.

##### b) Posterior atlanto-occipital membrane :

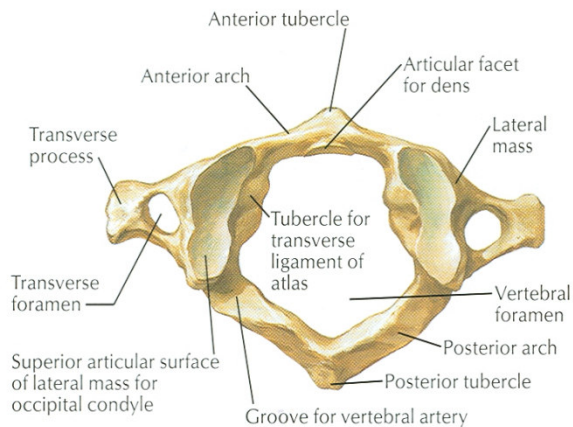
- This membrane is similar to the ligamentum flavum.
- It connects the posterior arch of the atlas to the posterior margin of the foramen magnum.



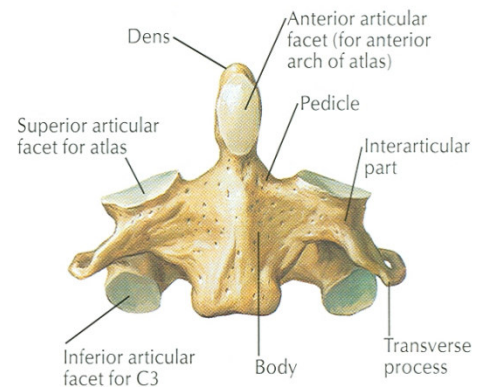
- Movements : flexion, extension, lateral flexion ( **they do not rotate** ).

## ATLANTO-AXIAL JOINTS :

- They are 3 :
  - One is between the odontoid process and the anterior arch of the atlas.
  - Other two are between the lateral masses of the bones.



Atlas (C1): superior view



Axis (C2): anterior view

### • Ligaments :

#### a) **Apical ligament** :

- This median placed structure connects the apex of the odontoid process to the anterior margin of the foramen magnum.

#### b) **Alar ligaments** :

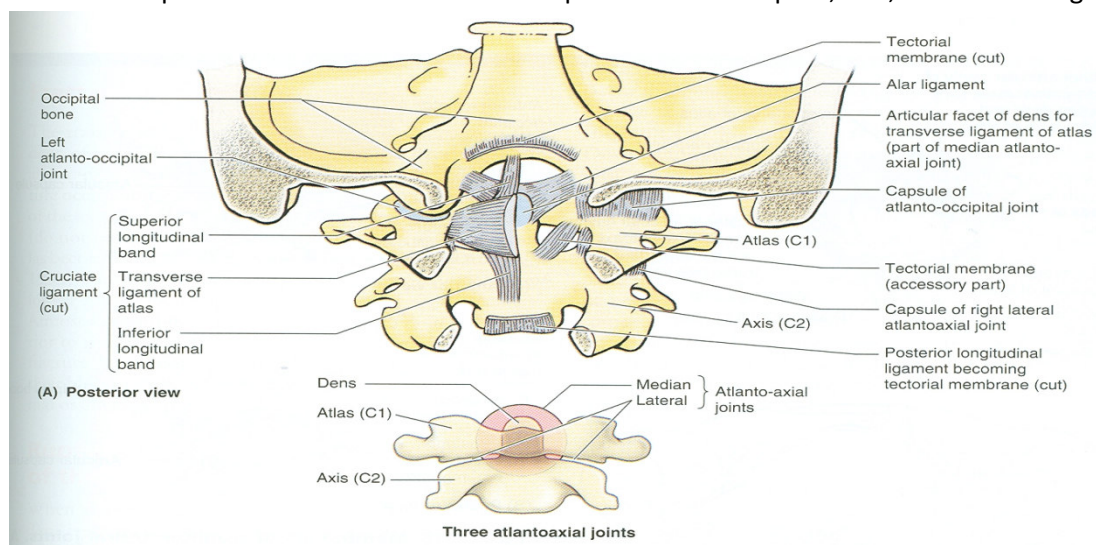
- These lie one on each side of the apical ligament and connect the odontoid process to the medial side of the occipital condyles.

#### c) **Cruciate ligament** :

- This ligament consists of a transverse part and a vertical part.
- The transverse part is attached on each side to the inner aspect of the lateral mass of the atlas.
- It binds the odontoid process to the anterior arch of the atlas.
- The vertical part runs from the posterior surface of the body of the axis to the anterior margin of the foramen magnum.

#### d) **Membrana tectoria** :

- This is an upward continuation of the posterior longitudinal ligament.
- Attached above to the occipital bone just within the foramen magnum.
- It covers the posterior surface of the odontoid process and the apical, alar, and cruciate ligaments.

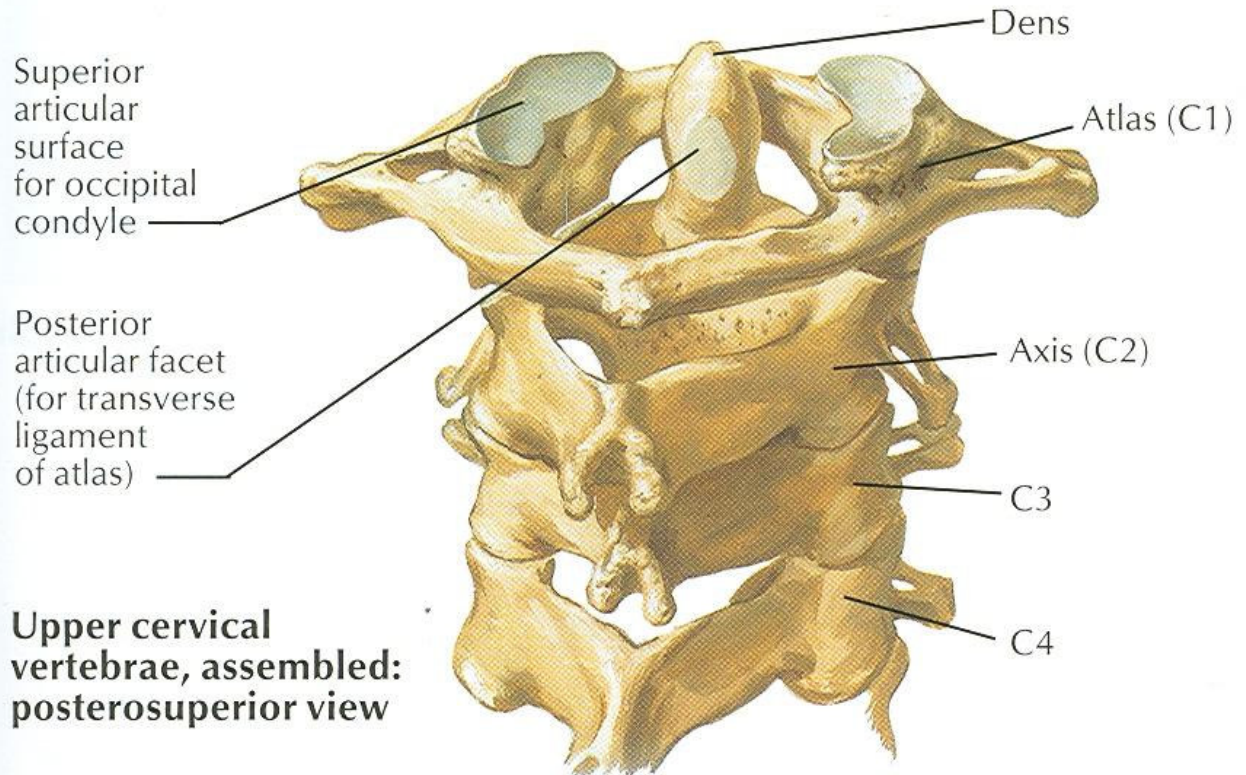


- Movements : **extensive rotation** of the atlas and thus of the head on the axis.



### FRACTURE OF ODONTOID PROCESS

- Fractures of odontoid process are relatively common.
- Result from falls and blows on the head.
- Excessive mobility of the odontoid fragment or rupture of the transverse ligament can result in compression injury to the spinal cord.



### FRACTURE OF PEDICLE OF AXIS

- Cause is severe extension injury of the neck, such as automobile accident or a fall.
- Sudden overextension of the neck, as produced by the knot of a hangman's rope beneath the chin.
- Forward displacement of the vertebral body of the axis occurs.
- Spinal cord is rarely compressed.



## (10) AUTONOMIC SYSTEM AND LYMPH DRAINAGE

### CERVICAL SYMPATHETIC CHAIN :

- It lies on the **prevertebral** fascia and muscles deep to the carotid sheath.
- Each trunk has three ganglia and is continuous below with the **ganglionated thoracic trunk**.
- Cerebrum is the largest part of the forebrain & it reaches the greatest degree of development in the human.
- **Post ganglionic** fibers are distributed as visceral, spinal and vascular branches.

### SUPERIOR GANGLION :

- It lies opposite the 2<sup>nd</sup> and 3<sup>rd</sup> cervical transverse processes behind the angle of the mandible.
- Its post ganglionic fibers pass to :
  1. Branches of the **Common** and **External carotid** arteries.
  2. **Internal carotid** artery and its intra cranial branches (carotid plexus).
  3. Pharyngeal and laryngeal branches.
  4. Cardiac branches.
  5. Grey rami communicantes to the upper four cervical nerves.
  6. Cranial nerve branches to **the 9<sup>th</sup>, 10<sup>th</sup> and 12<sup>th</sup> nerves**.

### MIDDLE CERVICAL GANGLION :

- It is at the level of the 6<sup>th</sup> cervical vertebra and cricoid cartilage.
- Its post ganglionic fibers pass to : **(MCQ)**
  1. Inferior thyroid artery.
  2. Cardiac plexus.
  3. Ansa subclavia which pass around the subclavian artery.
  4. Grey rami to the 5<sup>th</sup> and 6<sup>th</sup> cervical nerves.

### INFERIOR GANGLION :

- It lies opposite the 7<sup>th</sup> cervical vertebra.
- Its post ganglionic fibers pass to :
  1. Vertebral & subclavian arteries.
  2. Cardiac plexus.
  3. Grey rami to the **7<sup>th</sup> and 8<sup>th</sup>** cervical nerves.
  4. A loop to the middle ganglion (ansa subclavia).
- In half of the population **the inferior ganglion** combines with 1<sup>st</sup> thoracic ganglion to form the **stellate ganglion**.
- It lies on the neck of the **first rib**.

### PARASYMPATHETIC SYSTEM :

- The fibers pass in **the oculomotor, facial, glossopharyngeal and vagus** nerves.
- They relay in one of the (4) parasympathetic ganglia of the head, which are :
  1. Ciliary.
  2. Pterygopalatine.
  3. Submandibular.
  4. Otic.

## **CILIARY GANGLION :**

- Position : in the orbit **posterolateral to the optic nerve**.
- Preganglionic fibers : from the **inferior division of the oculomotor nerve** (via the br. to the inferior oblique).
- Postganglionic fibers : to the **sphincter pupillae and ciliary muscles through the short ciliary nerves**.
- **Other fibers passing (without relay) :**
  1. Sympathetic from the (**SCG**) to the eyeball.
  2. Sensory from the eyeball through the nasociliary nerve.

## **PTERYGOPALATINE GANGLION :**

- It is deeply placed in the pterygopalatine fossa.
- It is suspended from the **maxillary nerve**.
- Preganglionic fibers : from the **facial nerve (in the middle ear) through the greater petrosal nerve**.
- Postganglionic parasympathetic fibers : to the **Lacrimal gland, glands of the nose, palate and nasopharynx**.
- Sympathetic fibers : from the **SCG** through the internal carotid plexus to supply the nose, palate and nasopharynx.
- Sensory fibers : from the nose, palate and nasopharynx are conveyed through the ganglion to the **maxillary nerve**.
- Because of its distribution, stimulation of this ganglion causes the manifestations of (**Hay Fever**) :
  - Watering eyes, running nose and itching palate and back of the mouth.

## **SUBMANDIBULAR GANGLION :**

- It is lateral to the hyoglossus muscle and suspended from **the lingual nerve**.
- Preganglionic fibers : from the **facial nerve in its chorda tympani br. which has a ride through the lingual nerve**.
- Post ganglionic fibers : supply the **submandibular, sublingual and other glands in the buccal mucosa**.
- Sympathetic fibers : *from the SCG to the glands* in the floor of the mouth.
- Taste fibers : may pass through the ganglion.

## **OTIC GANGLION :**

- It lies medial to the mandibular nerve on the tensor veli palatini.
- It receives postganglionic sympathetic fibers from the SCG to the parotid gland.
- The **preganglionic** fibers are from the glossopharyngeal nerve through its tympanic plexus and the lesser petrosal nerve.
- The **postganglionic** fibers pass through the auriculotemporal nerve to the parotid gland.

## **LYMPH DRAINAGE :**

- The lymph nodes of the head & neck are divided into two groups :
  - a) **Circular chain** around the base of the skull.
  - b) **Deep and Superficial cervical chains** accompanying the great veins of the neck.

## **CIRCULAR CHAIN :**

- It consists of (7) groups :
  1. **Occipital :**
    - It is around the occipital artery.
    - It drains the posterior scalp and adjacent neck.
  2. **Retroauricular (mastoid) :**
    - It is on the mastoid process.
    - It drains the ext.acoustic meatus, posterior auricle and the adjacent scalp.
  3. **Parotid :**
    - **Superficial :** in front of the tragus. It drains the ext.meatus,front of the auricle and the adjacent scalp.
    - **Deep :** It is in the parotid gland.
    - It drains : anterior scalp,lateral eyelids, upper molar teeth,orbit, ext.meatus and the parotid gland.
  4. **Submandibular :**
    - It is between the mandible and the submandibular gland.
    - It drains : ant.nasal cavities,tongue,teeth and gums, submandibular and sublingual glands, ALL the face ( **EXCEPT** lateral eye lids and the medial part of the lower lip and chin ).
  5. **Buccal (facial) :**
    - Along the facial vein.
  6. **Submental :**
    - It is behind the chin on the mylohyoid.
    - It drains : the tip of the tongue, floor of the mouth and the lower lip and chin.
  7. **Retropharyngeal :**
    - It is between the pharynx and prevertebral fascia.
    - It drains the nasopharynx, auditory tube and the upper part of cervical vertebrae.

## **SUPERFICIAL CERVICAL CHAIN :**

1. **Superficial cervical nodes :**
  - They lie along the **Eternal jugular vein**.
  - They receive lymph from the superficial parotid and nodes at the side of the neck.
  - They drain into **the subclavian lymph trunk**.
2. **Anterior cervical nodes :**
  - They lie along the **Anterior jugular vein**.
  - They receive lymph from the superficial tissues in front of the neck.
  - They drain to **the external jugular chain or the deep cervical chain**.

## DEEP CERVICAL CHAIN :

- It lies along the internal jugular vein.
- Its named groups are :
  1. **Jugulodigastric :**
    - It is behind the mandible.
    - It drains the **tonsil** and the **lateral part of the tongue.**
  2. **Jugulo-omohyoid :**
    - It is between **the IJV and the superior belly of omohyoid.**
    - It receives lymph mainly from the **tongue.**
  3. **Para and Pretracheal :**
    - Lie along **the inferior thyroid vessels.**
    - They drain **the trachea and thyroid gland.**
    - The efferent vessels pass to **the tracheobronchial nodes.**
    - It drains most of the circular chain of nodes.
    - It **receives direct efferents from :**
      - Salivary glands.
      - Tongue.
      - Tonsil.
      - Nose, pharynx and larynx.
  4. **Jugular lymph trunk :**
    - It is formed from the **deep cervical efferents.**
    - On the left : It **joins the thoracic duct.**
    - On the right : It **joins the right lymph trunk.**
    - It can open separately into the IJ or Subclavian veins.

## LYMPH DRAINAGE :

- The most common lymph nodes to enlarge in the head are the **jugulodigastric nodes of the deep cervical chain** as a result of tonsillar or nasopharyngeal infection.
- Cancers of the mouth, larynx and pharynx may **produce cervical lymph node enlargement** as a result of metastatic spread.

# THE END OF ANATOMY ...BEST WISHES...

LoveTomy Team 426

Team leader : Dr. hams

Omar Bin Husain

Dr. noop

Dr. S

Abo Slo7

Cute Killer

همني بـروحـي

ابتـسم !!

M . A . M

