



Respiratory system

Larynx & Pharynx

Dr. Mohamed Fathi

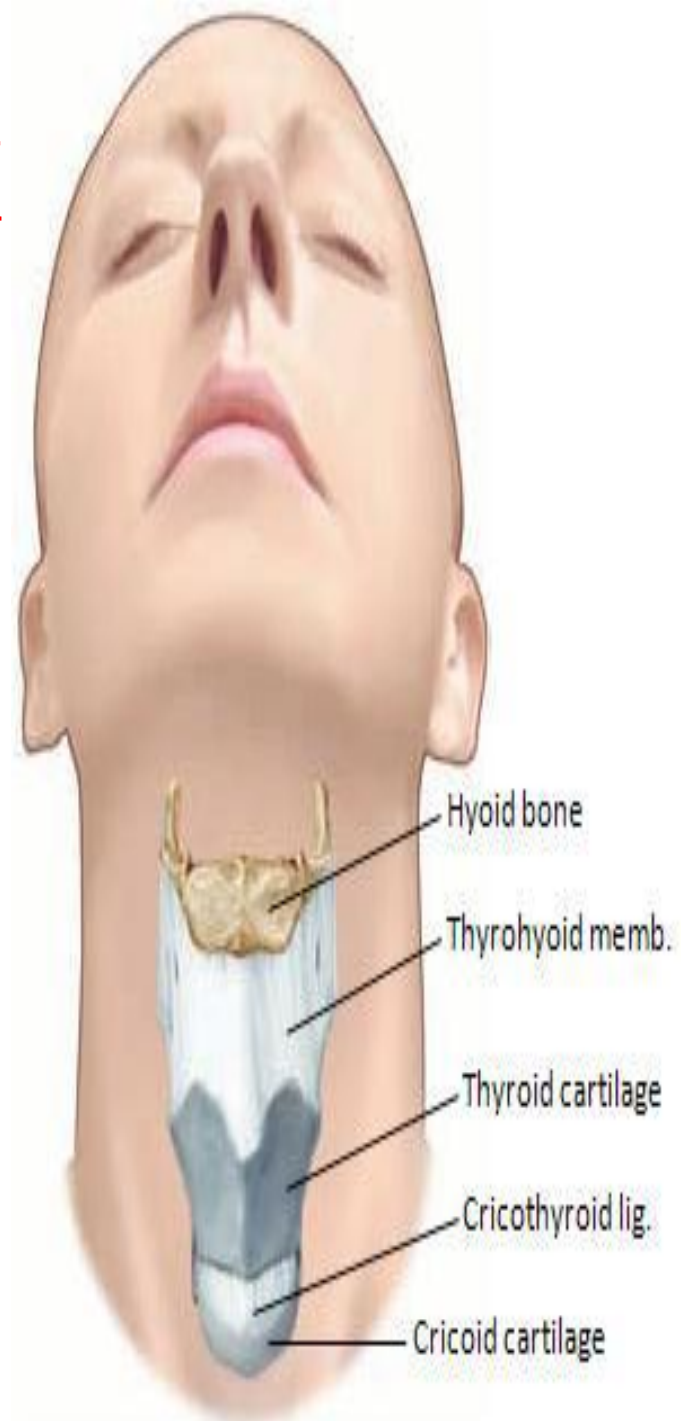
Assistant professor of Anatomy Department
Faculty of medicine

By the end of this lecture you must know:

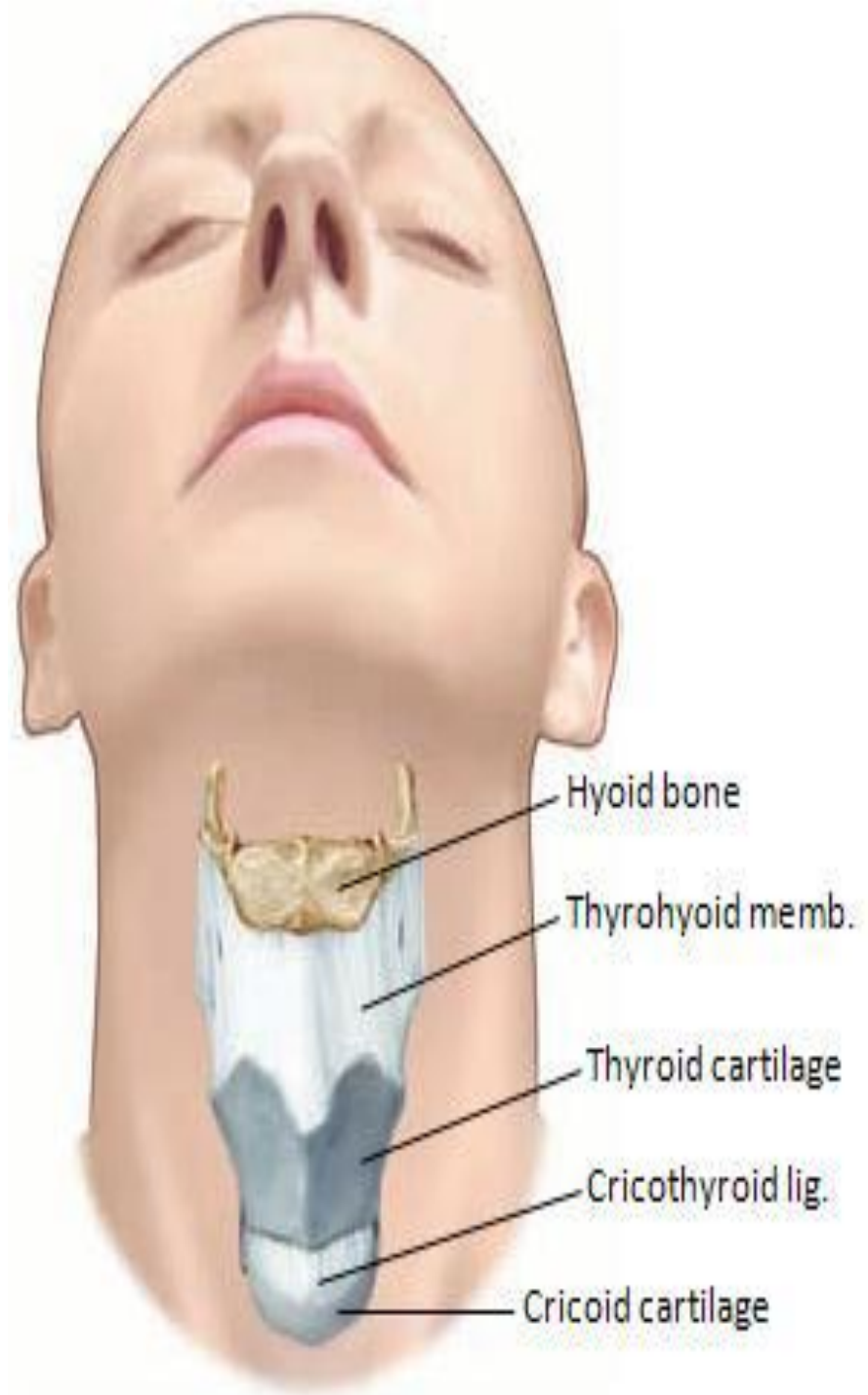
- 1- Larynx (definition, extension, size and construction).
- 2- Laryngeal ligaments and membranes.
- 3- Laryngeal inlet and laryngeal cavity.
- 4- Laryngeal muscles , actions and nerve supply.
- 5- Blood supply of the larynx.
- 6- Histology of the larynx
- 7- Pharynx (structure, boundaries and parts).
- 8- Pharyngeal muscles (names, action, relations and nerve supply).
- 9- Sensory innervation of the pharynx.
- 10- Interior of the pharynx
- 11- Palatine tonsils (Anatomy and applied anatomy).

LARYNX

- **Definition:** part of respiratory tract that acts as organ of phonation (*voice production*) & it has a sphincteric function to prevent passage of food and foreign bodies through its inlet.
- **Extent:** from the root of tongue to trachea. It lies in front of C3-C6 vertebrae

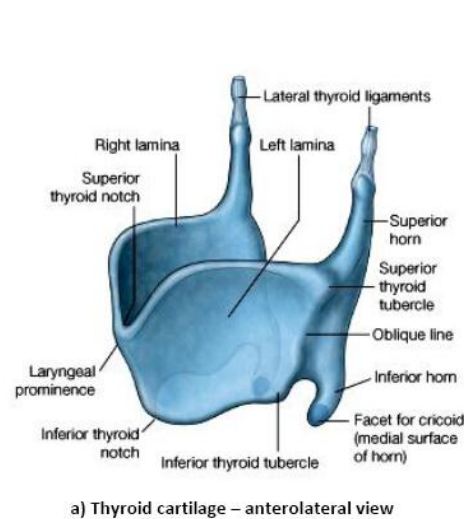


*** Constrictions:** Formed of skeletal framework of cartilages connected together by joints, ligaments & membranes. It is lined by mucous membrane.

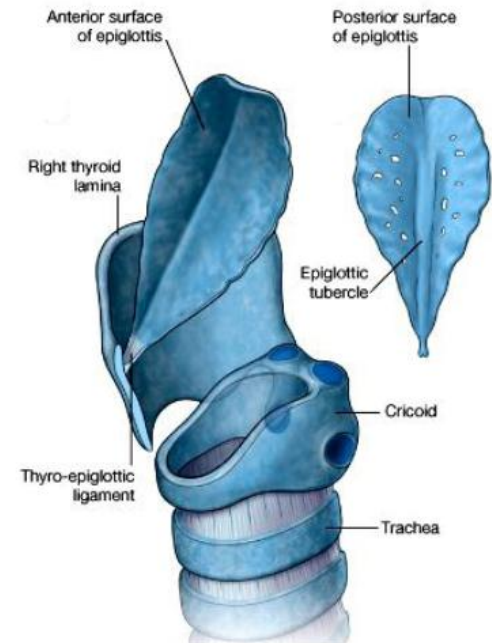


* Cartilages of Larynx:

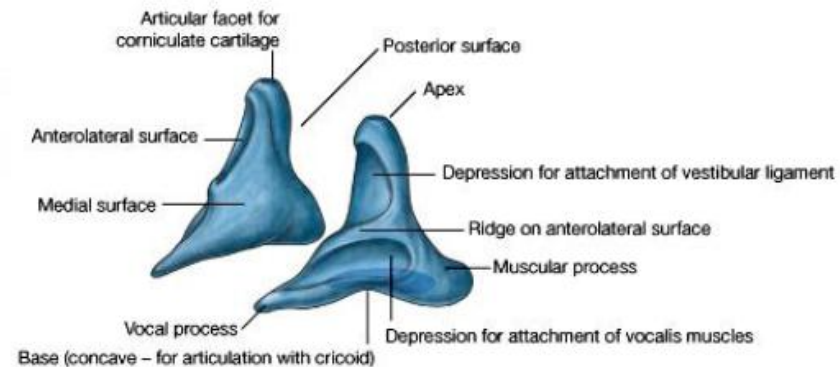
- **Single :** Thyroid, cricoid & epiglottis.
- **Paired:** Arytenoid, corniculate and cuneiform.



a) Thyroid cartilage – anterolateral view



b) Epiglottis – anterolateral view and posterior surface



c) Arytenoid cartilages

Laryngeal ligaments & membranes

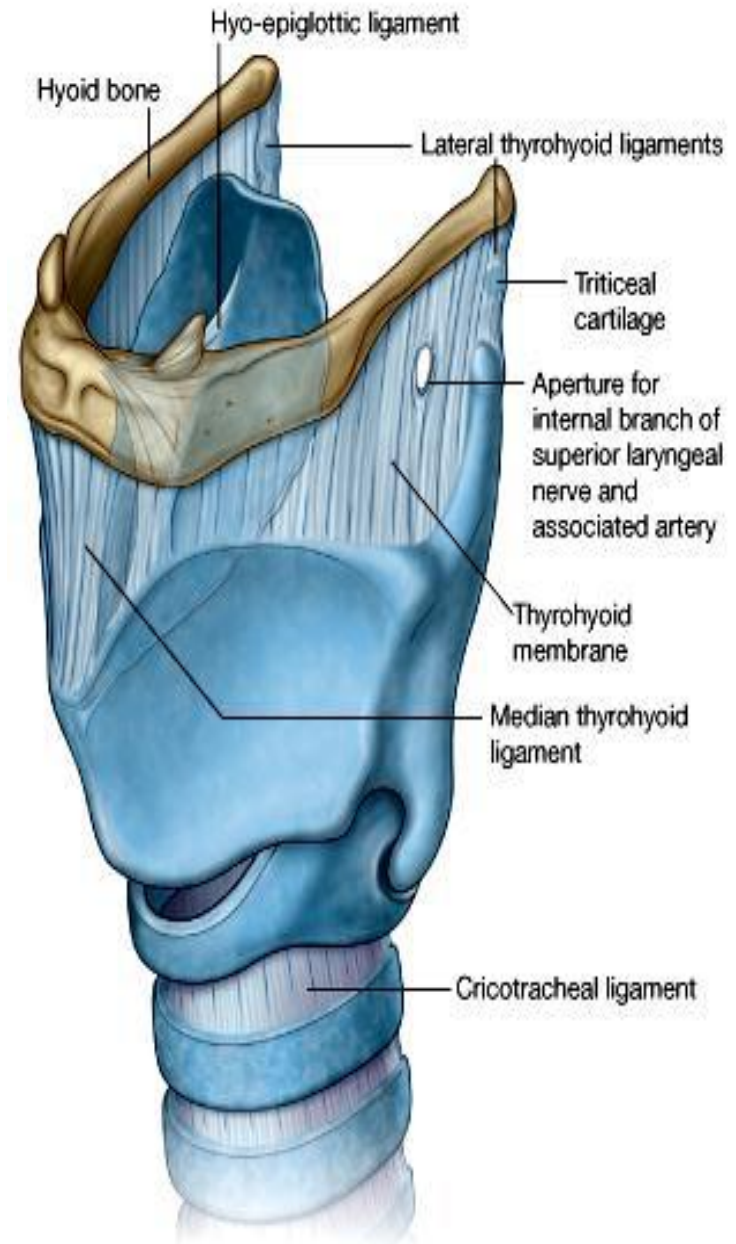
A) Extrinsic ligaments:

1-Thyrohyoid membrane: Extends from lower border of hyoid to upper border of thyroid cartilage.

- It is **pierced** by the internal laryngeal nerve & superior laryngeal artery.

2- Cricotracheal ligament: Connects lower border of cricoid cartilage & 1st tracheal ring.

3- Glosso-epiglottic ligament : connecting tongue to epiglottis.



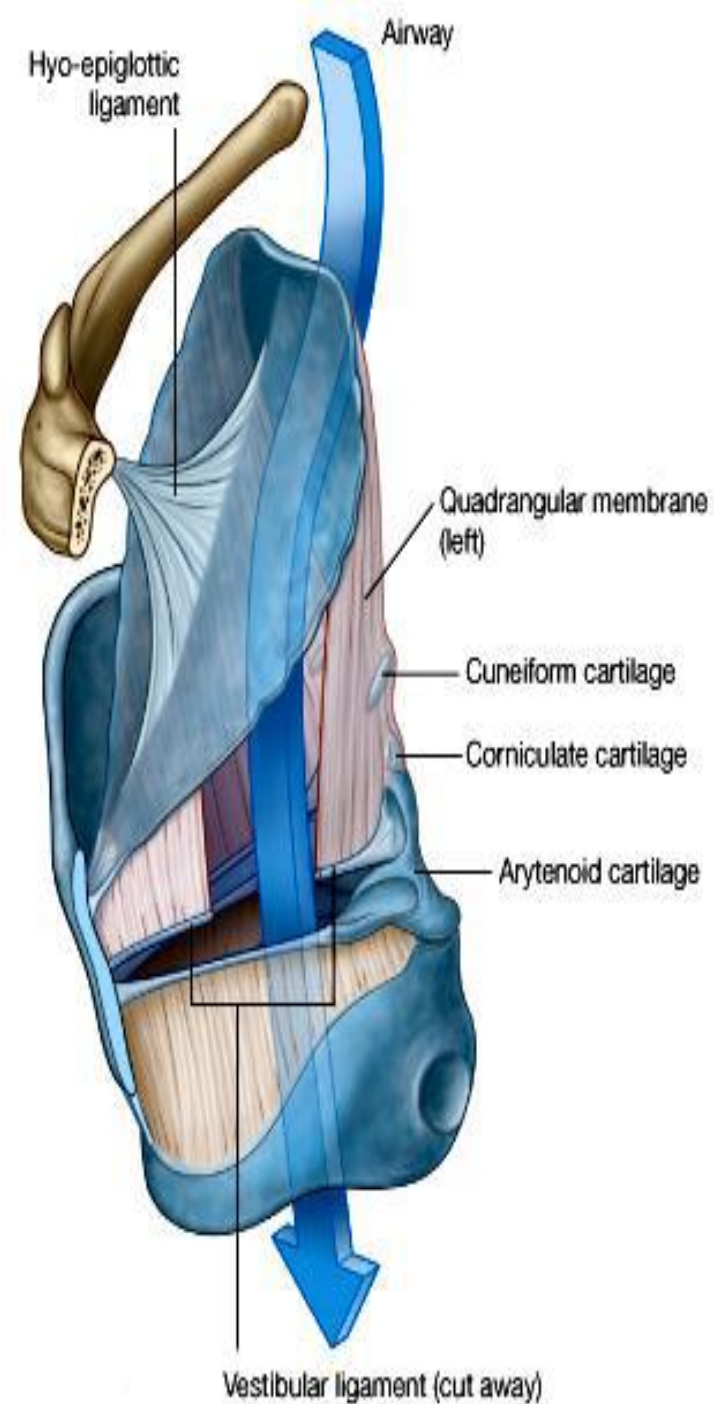
B) Intrinsic ligaments:

1-Quadrate membrane: a fibro-elastic membrane that lies beneath mucous membrane of vestibule of larynx.

- Anteriorly: attached to side of epiglottis.
- Posteriorly: attached to arytenoid cartilage.
- Its upper border is free and forms aryepiglottic fold.
- Its lower border is free and forms vestibular ligament.

2- Cricothyroid ligament: a fibro-elastic membrane that lies beneath mucous membrane of lower part of larynx.

- Its anterior part is thick & connects the adjacent sides of cricoid and thyroid cartilages.
- Its lateral part has an upper free border that forms vocal ligaments.



Laryngeal cavity:

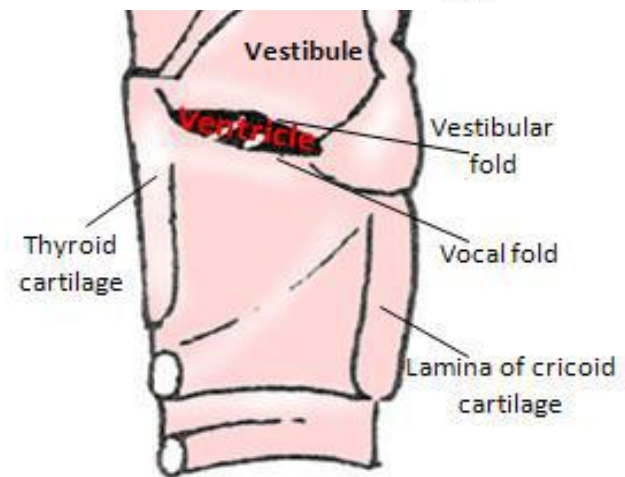
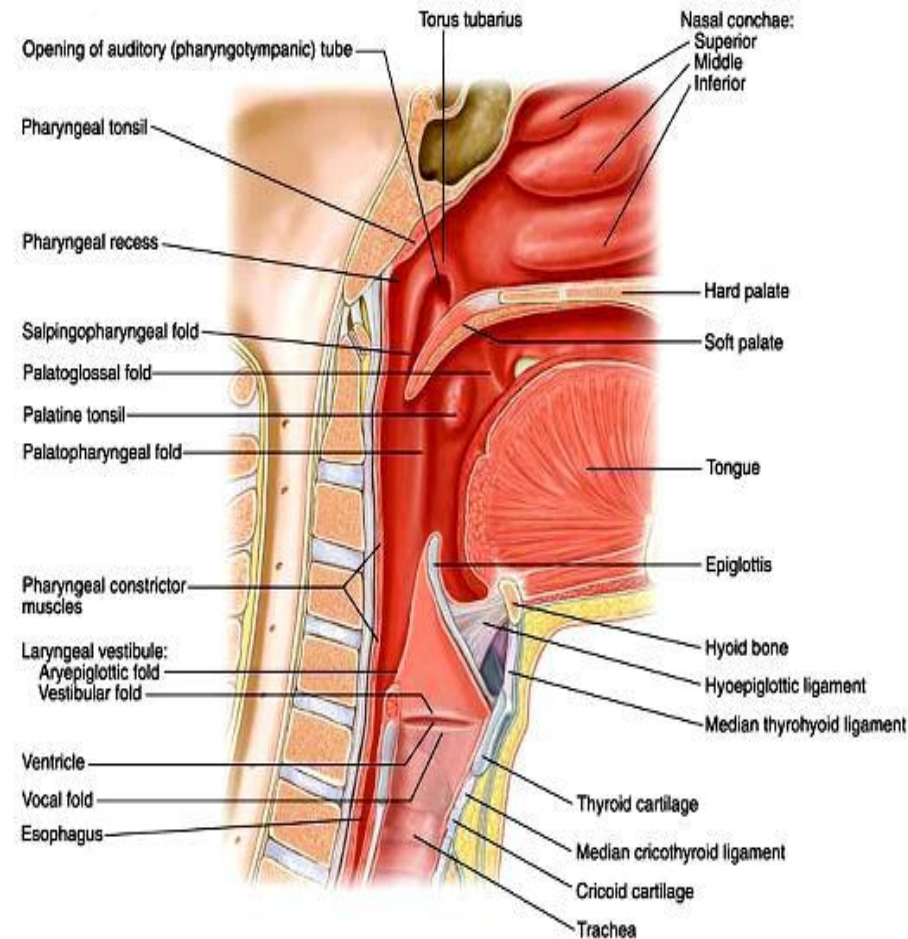
- Extends from laryngeal inlet to the trachea.
- It is partially divided into three areas by two folds of mucosa.
- The upper folds: vestibular folds and the lower folds: the vocal folds.

1- The *vestibule* lies between inlet and vestibular folds.

2- The *laryngeal ventricle (sinus)* is the depression between the vestibular folds above and the vocal folds below.

3- *infraglottic part of the larynx:*

The area below the vocal folds

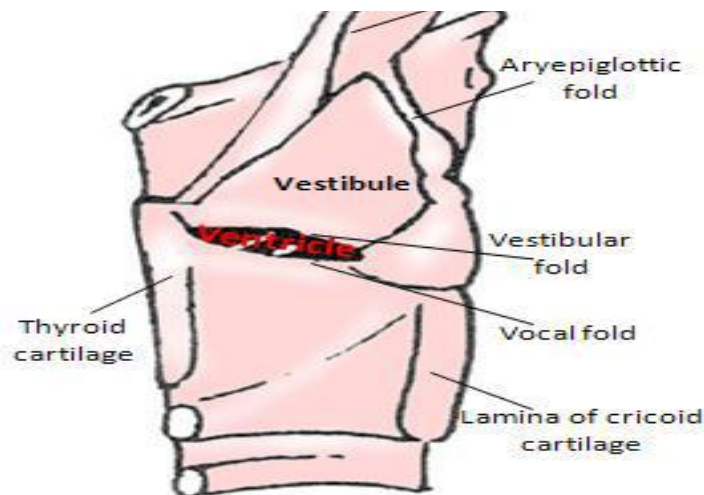
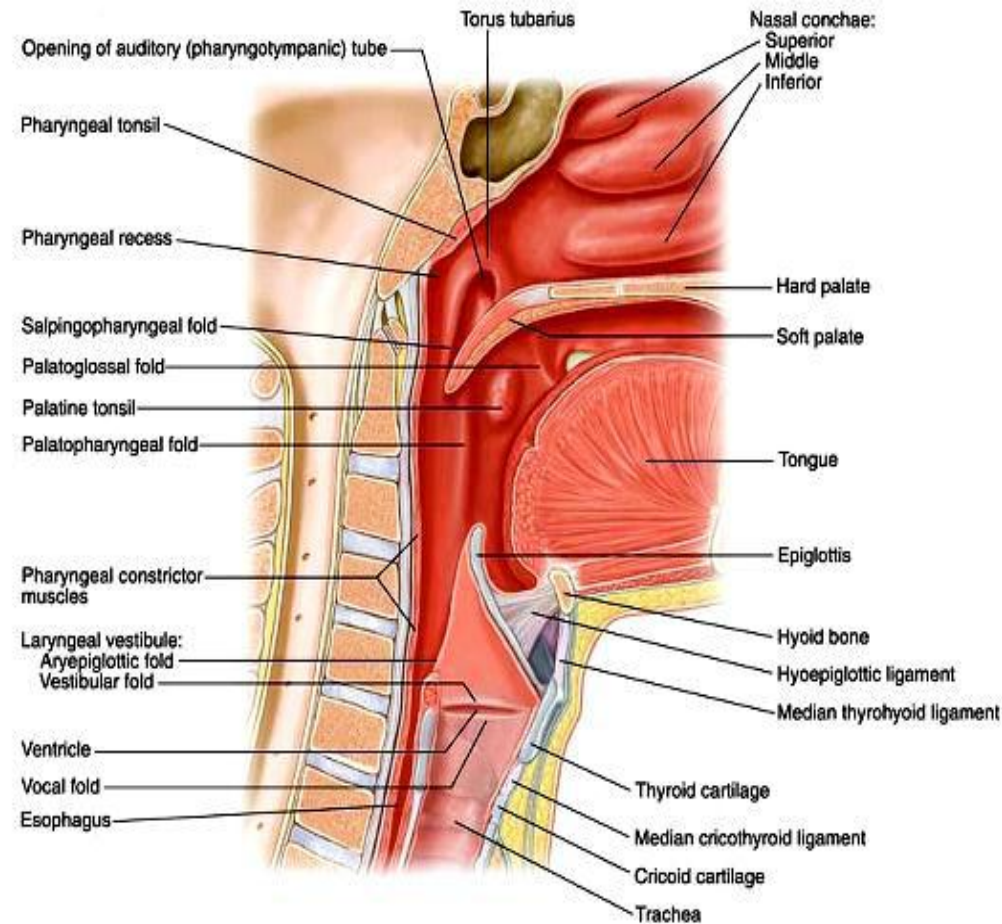


- *** Boundaries of Laryngeal Inlet:**

-Anteriorly: Epiglottis (upper end).

-Laterally: Aryepiglottic folds.

-Posteriorly: Mucosa covering the arytenoid cartilages.



Laryngeal muscles

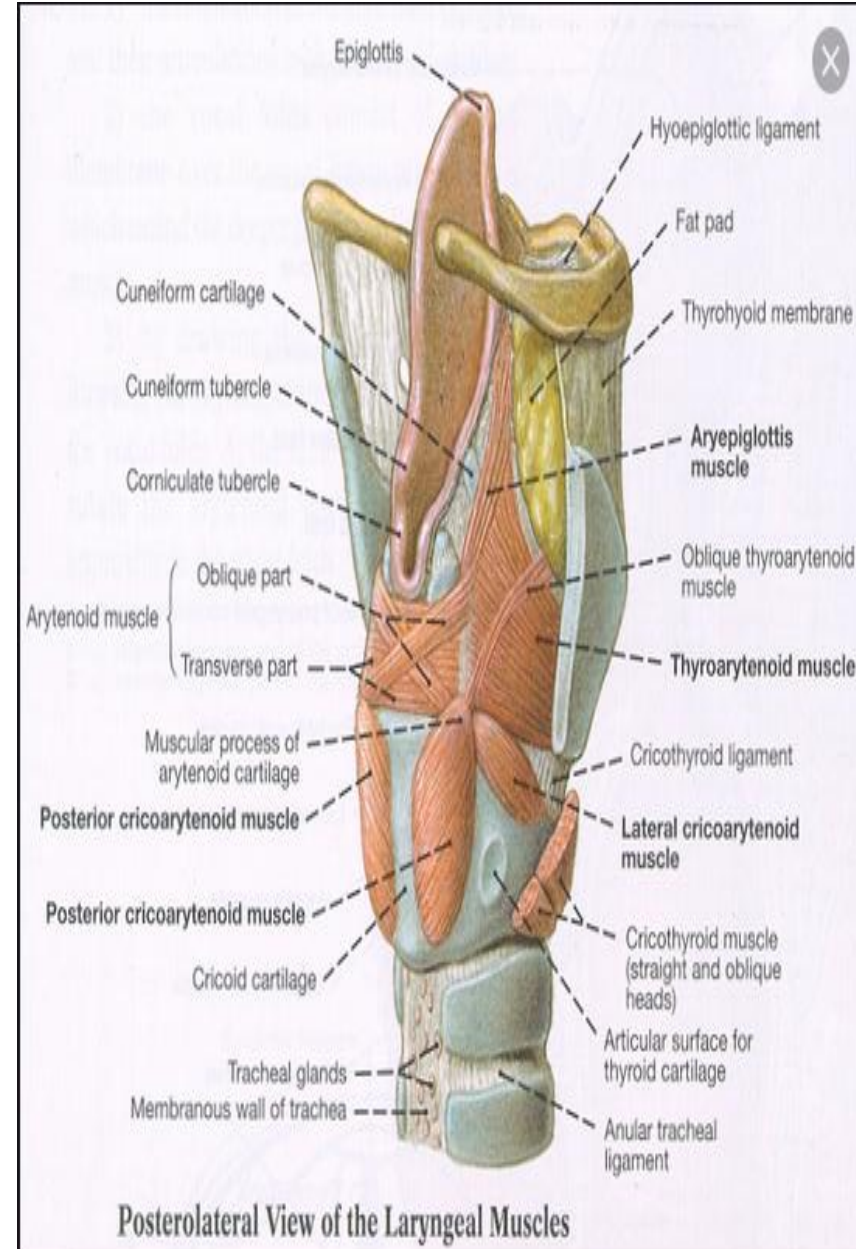
- **-The extrinsic muscles:**

Include: infra-hyoid muscles, the inferior constrictor, stylopharyngeus m and palatopharyngeus m.

- **-The intrinsic muscles:**
- They have no extra laryngeal attachment (*connecting different cartilages together, so most of them are paired except transverse arytenoid muscle*).
- - All of them lies from inside except cricothyroid m that lies externally
- - All of them are developed from 6th pharyngeal arch except cricothyroid m which is developed from 4th arch.

Action of laryngeal muscles

| Muscle | Action |
|--|----------------------------------|
| 1-Aryepiglottic m | Close laryngeal inlet |
| 2-Thyroarytenoid m | Open laryngeal inlet |
| 3-Cricothyroid m | Stretch vocal fold”tense” |
| 4-Thyroarytenoid m | Relax vocal fold |
| 5-posterior cricoarytenoid m | Abduct vocal folds |
| 6-Lateral cricoarytenoid m 7-Transverse arytenoid m | Adduction of vocal folds |



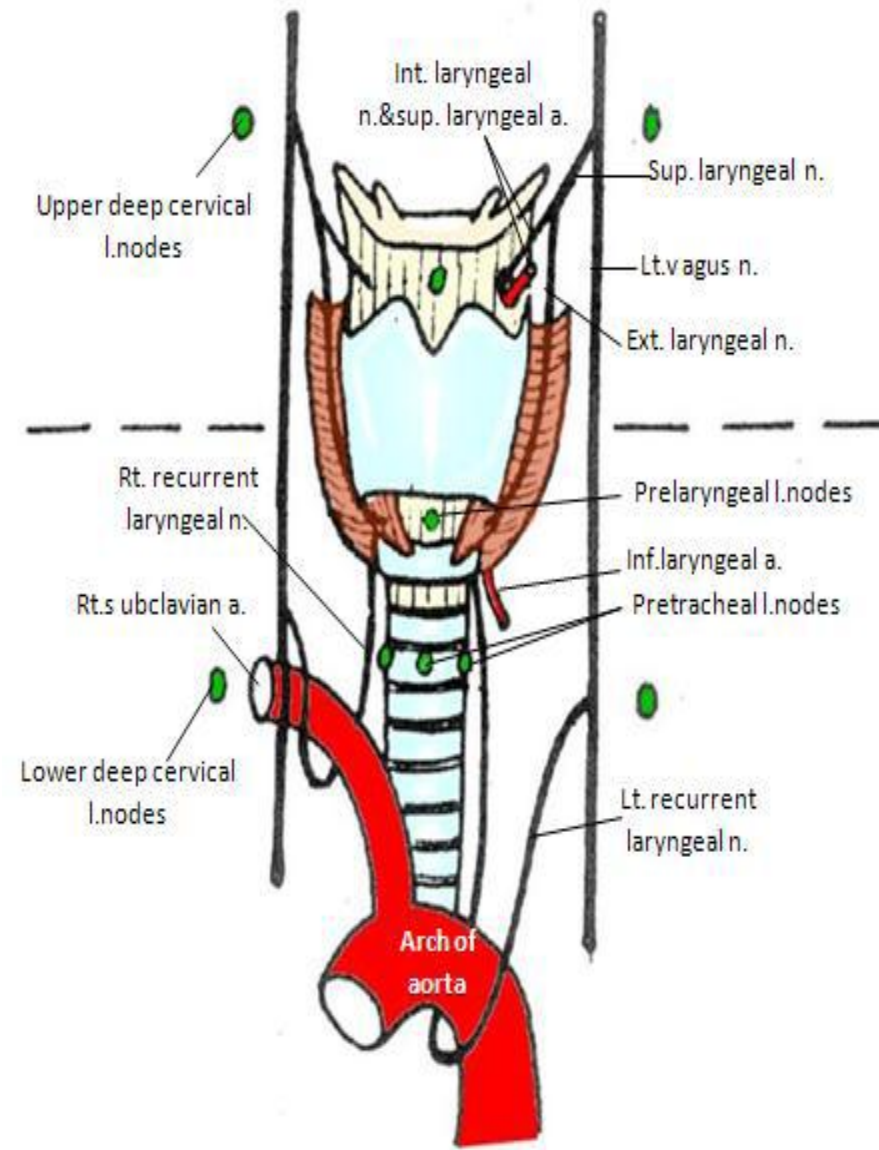
Nerve supply

1- Motor supply: all intrinsic laryngeal ms. are supplied by **recurrent laryngeal n.** branch of vagus n except **cricothyroid m** which is supplied by **external laryngeal n.** a branch of superior laryngeal nerve of vagus n.

2- Sensory supply: the mucosa above vocal cords is supplied by **internal laryngeal nerve** while the mucosa below vocal cords is supplied by **recurrent laryngeal nerve.**

Blood supply of the larynx

- **1- Above vocal cords:**
supplied by **superior laryngeal**
(branch of superior thyroid a.).
- **2- Below the cords:**
supplied by **inferior laryngeal**
(branch of inferior thyroid a.).



Histology of larynx

- **1. Epithelium:** Pseudo-stratified ciliated columnar with goblet cells.

Except: (V.I)

1-The vocal cords.

2- anterior Surface of epiglottis

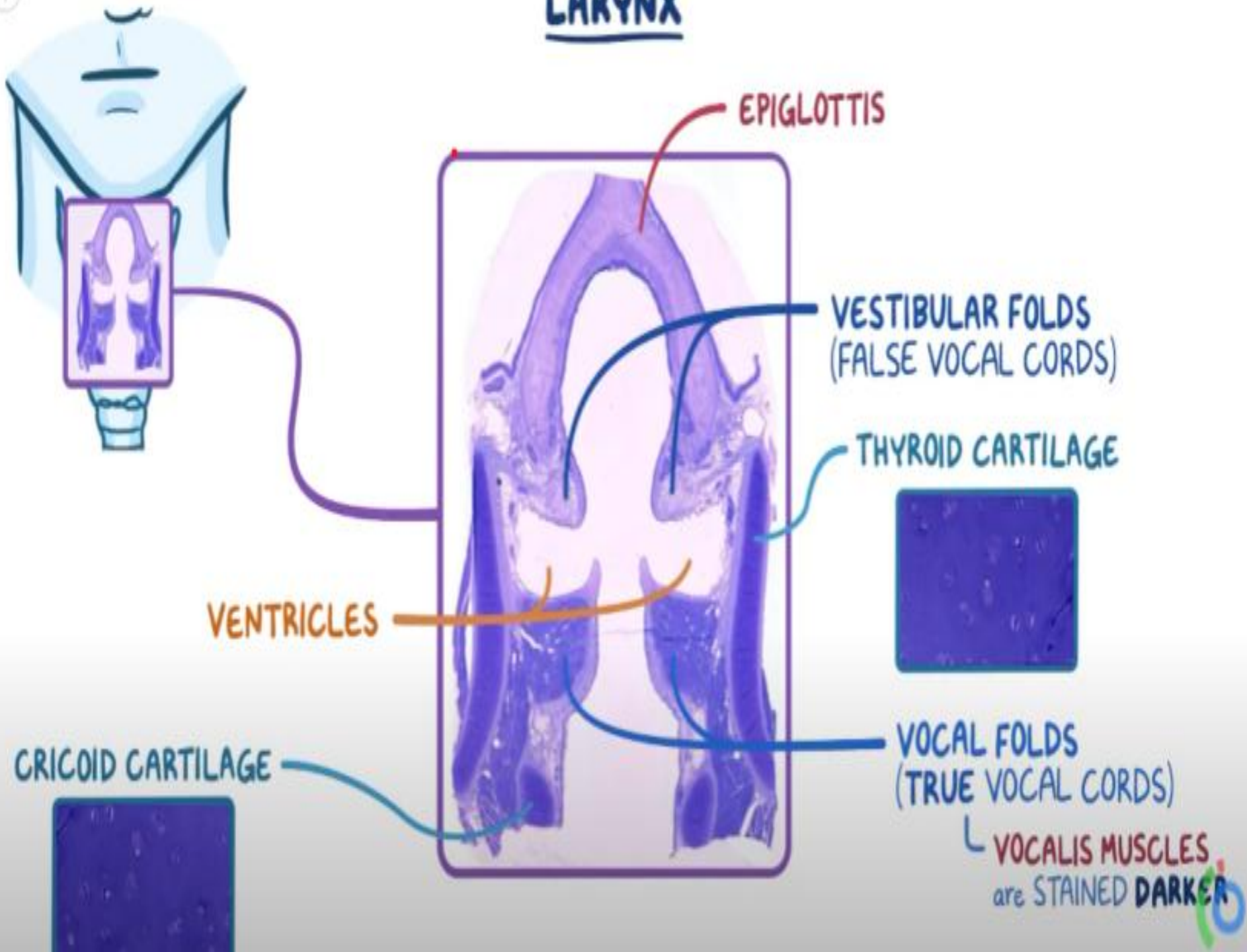
**3- the upper part of posterior surface of epiglottis
are lined by stratified squamous non-keratinized
epithelium.**

2. lamina propria:

It contains mucus and serous glands.

It contains a number of large and small cartilages which are interconnected by ligaments and voluntary muscles

LARYNX



UPPER VESTIBULAR FOLD

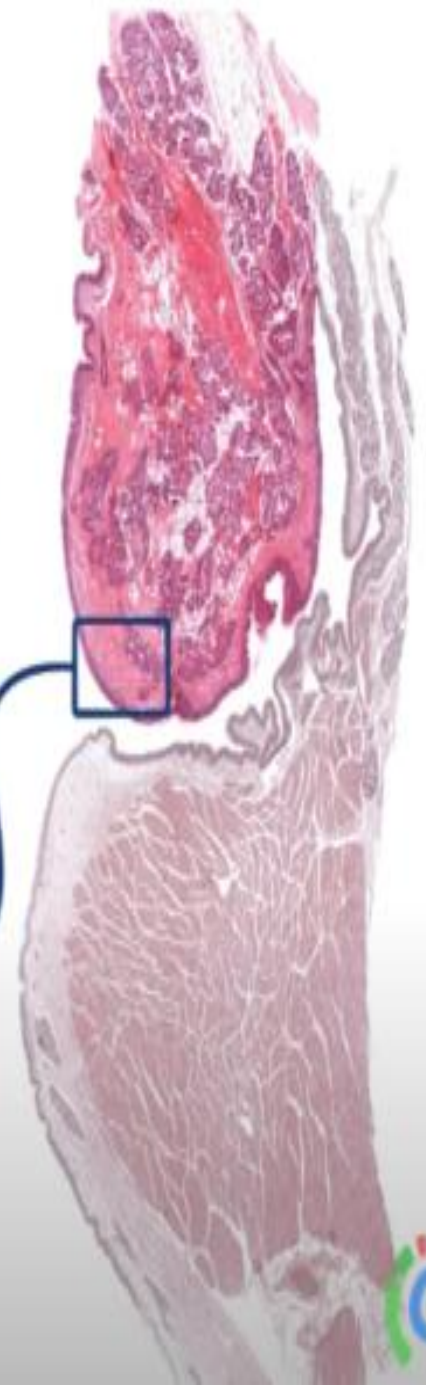
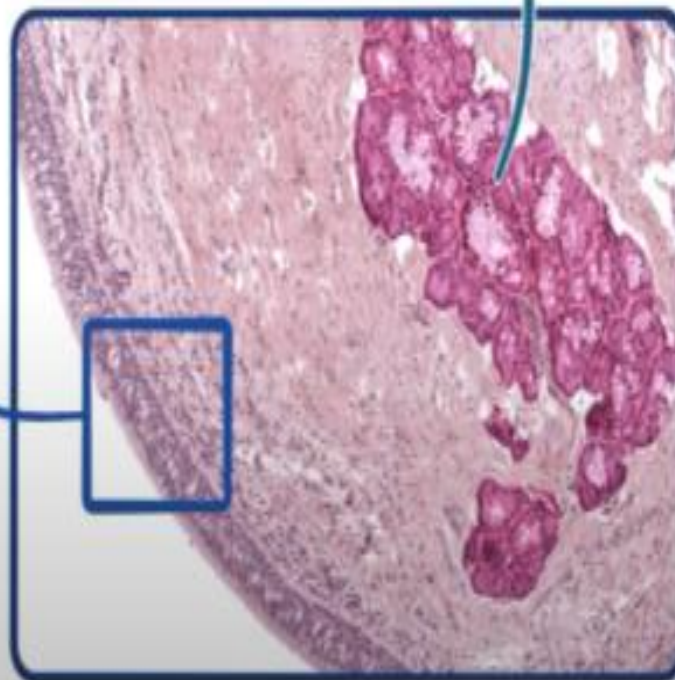
PSEUDOSTRATIFIED CILIATED
EPITHELIUM with GOBLET CELLS



RESPIRATORY EPITHELIUM

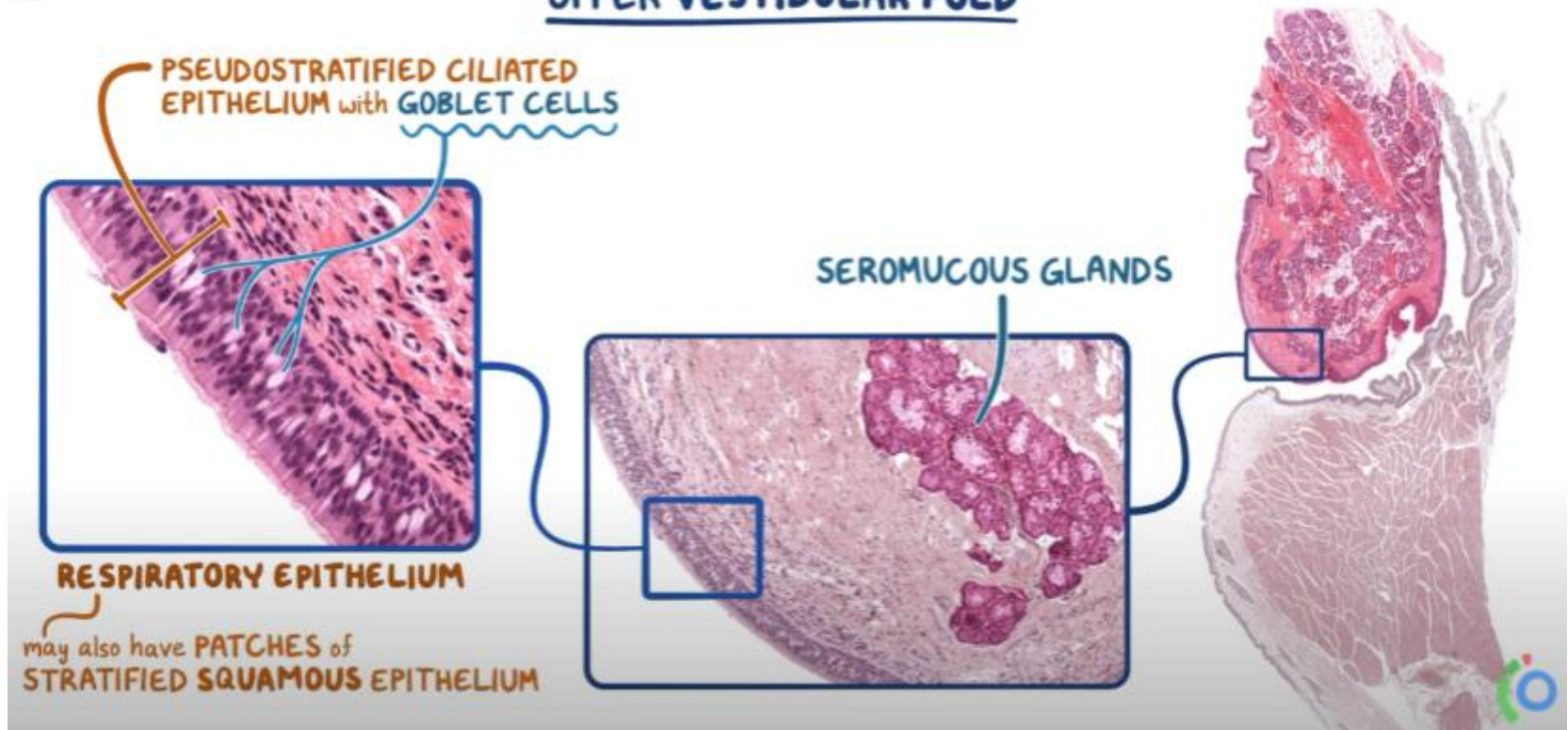
may also have PATCHES of
STRATIFIED SQUAMOUS EPITHELIUM

SEROMUCOUS GLANDS

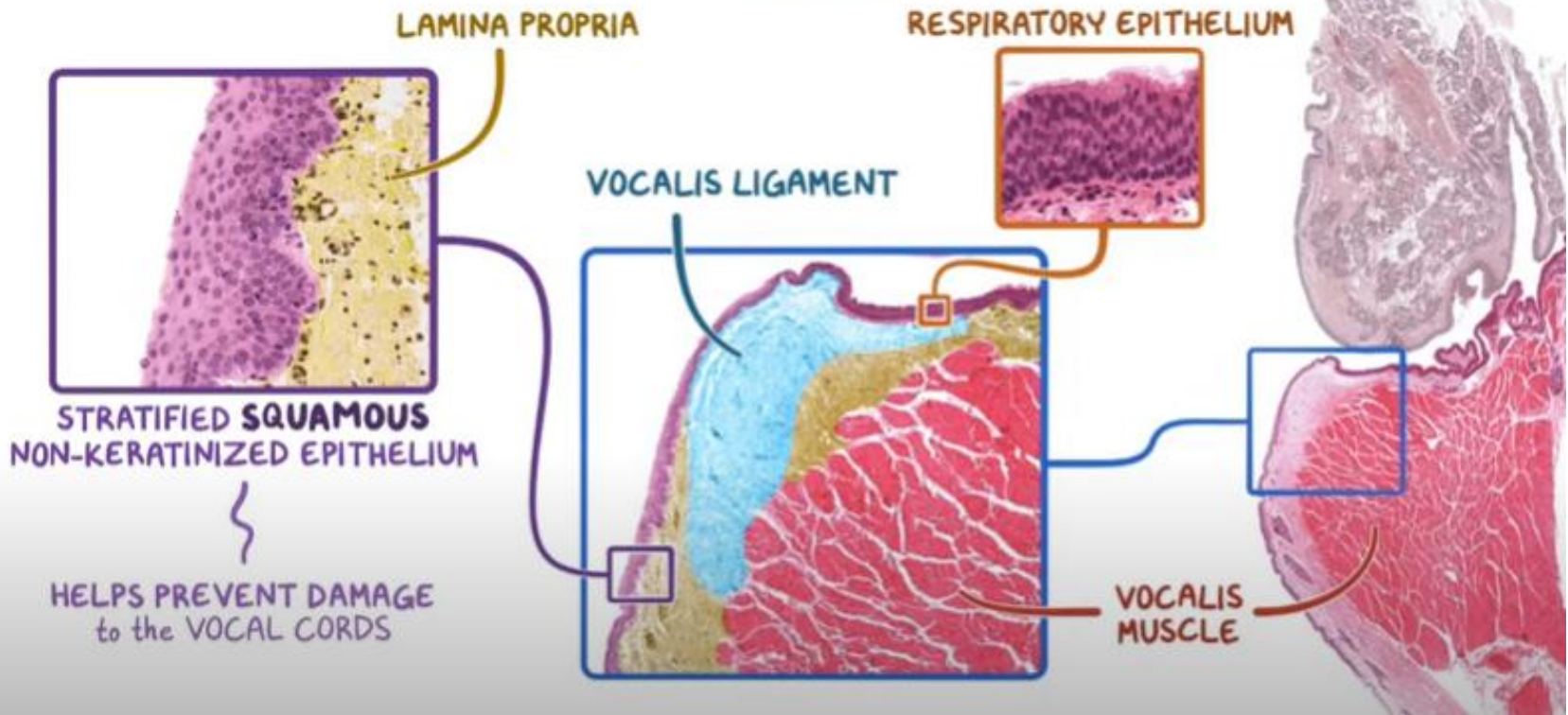


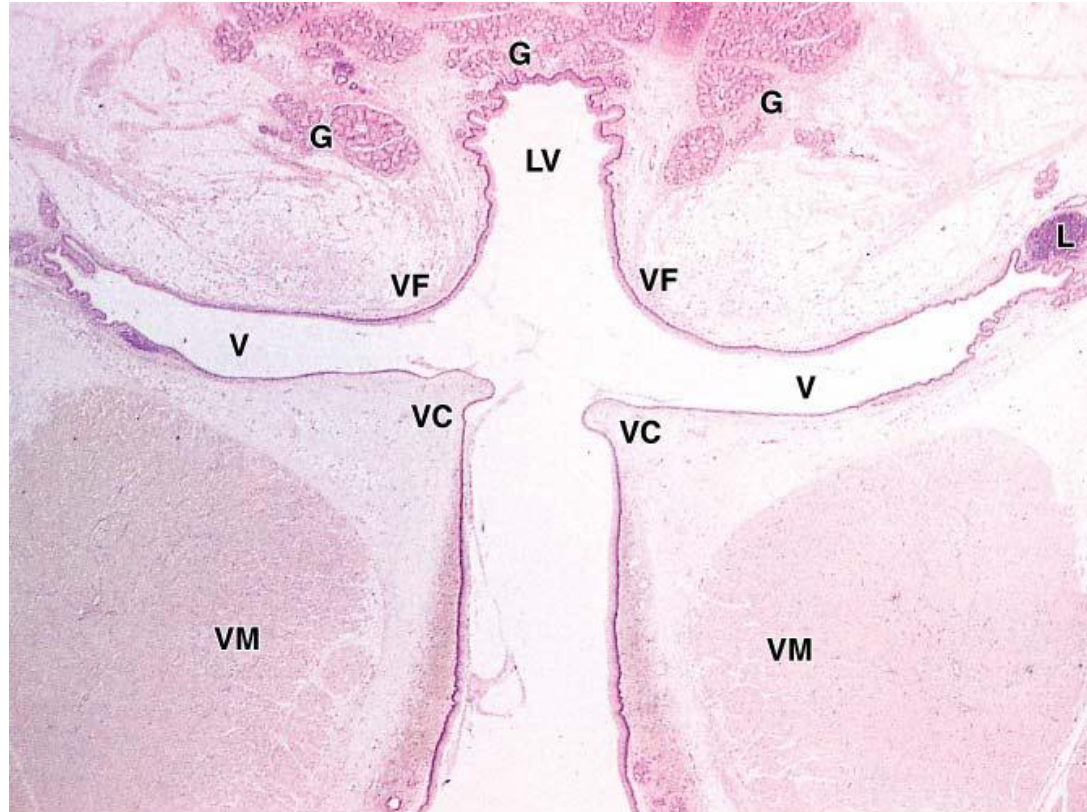
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UPPER VESTIBULAR FOLD



TRUE VOCAL CORDS



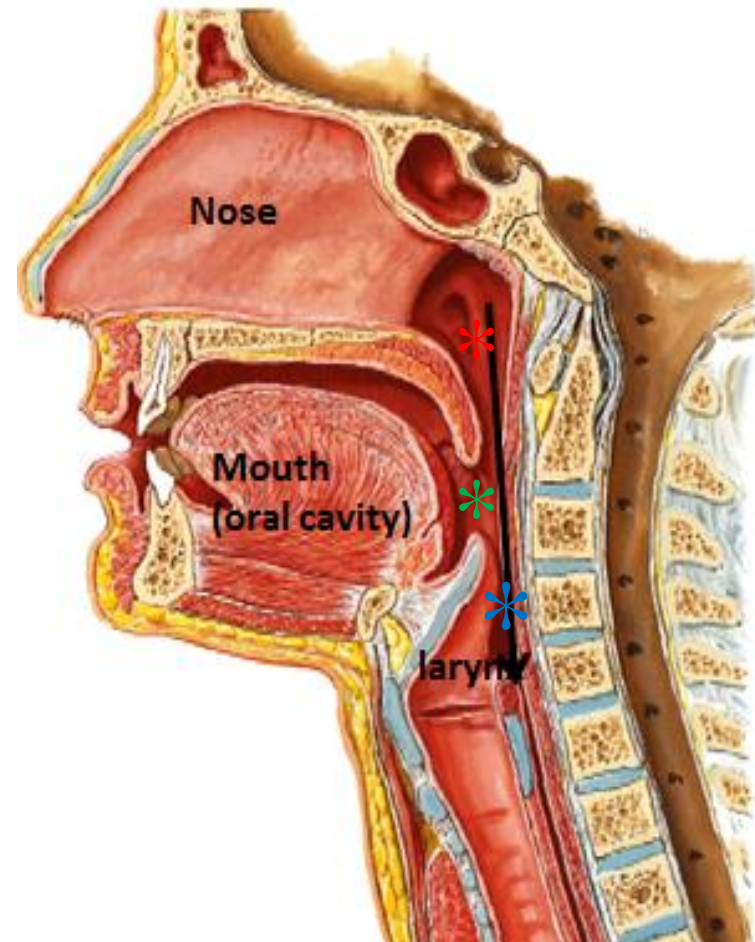


Source: Mescher AL: *Junqueira's Basic Histology: Text and Atlas*, 12th Edition: <http://www.accessmedicine.com>
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The low-power micrograph shows the upper laryngeal vestibule (LV), which is surrounded by seromucous glands (G). The lateral walls of this region bulge as a pair of broad folds, the vestibular folds (VF). These contain seromucous glands, often with lymphoid nodules (L) and are largely covered by respiratory epithelium, with regions near the epiglottis having stratified squamous epithelium. Below each large vestibular fold is a narrow space or ventricle (V), below which is another pair of lateral folds, the vocal folds or cords (VC). These are covered by stratified squamous epithelium and project more sharply into the lumen, defining the rim of the opening into the larynx itself. Each contains a large striated vocalis muscle (VM)

PHARYNX

- A wide muscular tube situated behind nose (nasopharynx *), mouth (oropharynx*) & larynx (laryngopharynx *).
- It begins at base of the skull & ends at lower border of cricoid cartilage opposite 6th cervical vertebra.
- - It has no anterior wall.



- **Length:** 5 inches.

- ***Width:***

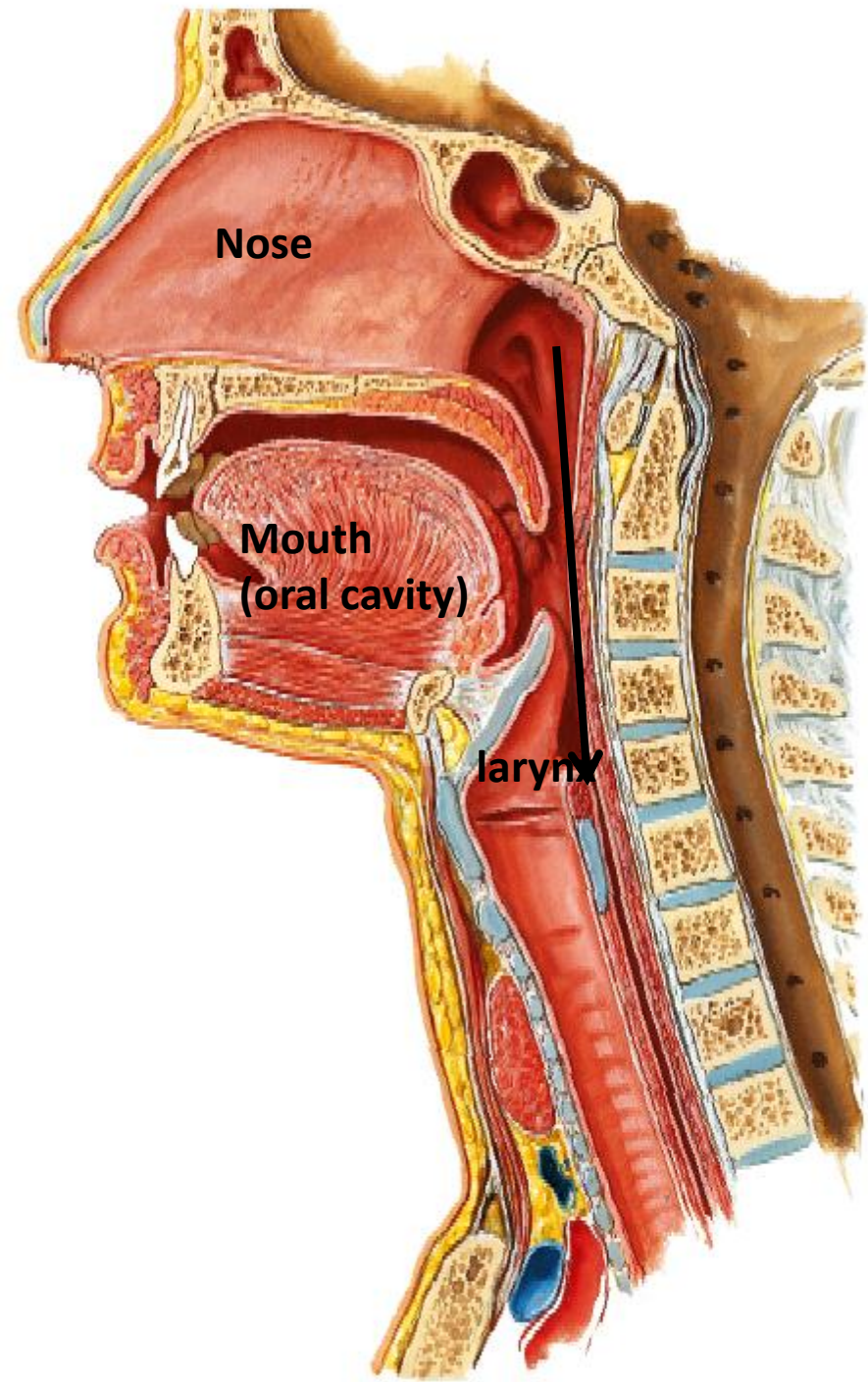
1-The upper part is the widest ($1\frac{1}{2}$ inch).

2- The middle part is narrower, than the upper part.

3-The lower part is the narrowest ($1.5cm$).

Boundaries

- *Superiorly:* base of skull
- *Inferiorly:* continuous with the esophagus.
- *Posteriorly:* C1-C6 vertebrae, separated from it by prevertebral fascia.
- *Anteriorly:* communicates with the nose, oral cavity & larynx.
- *Laterally:* related to styloid apparatus & CCA, ICA & ECA with its branches.



Structure of pharynx

4 layers from inside to outside:

1 - Inner mucous membrane.

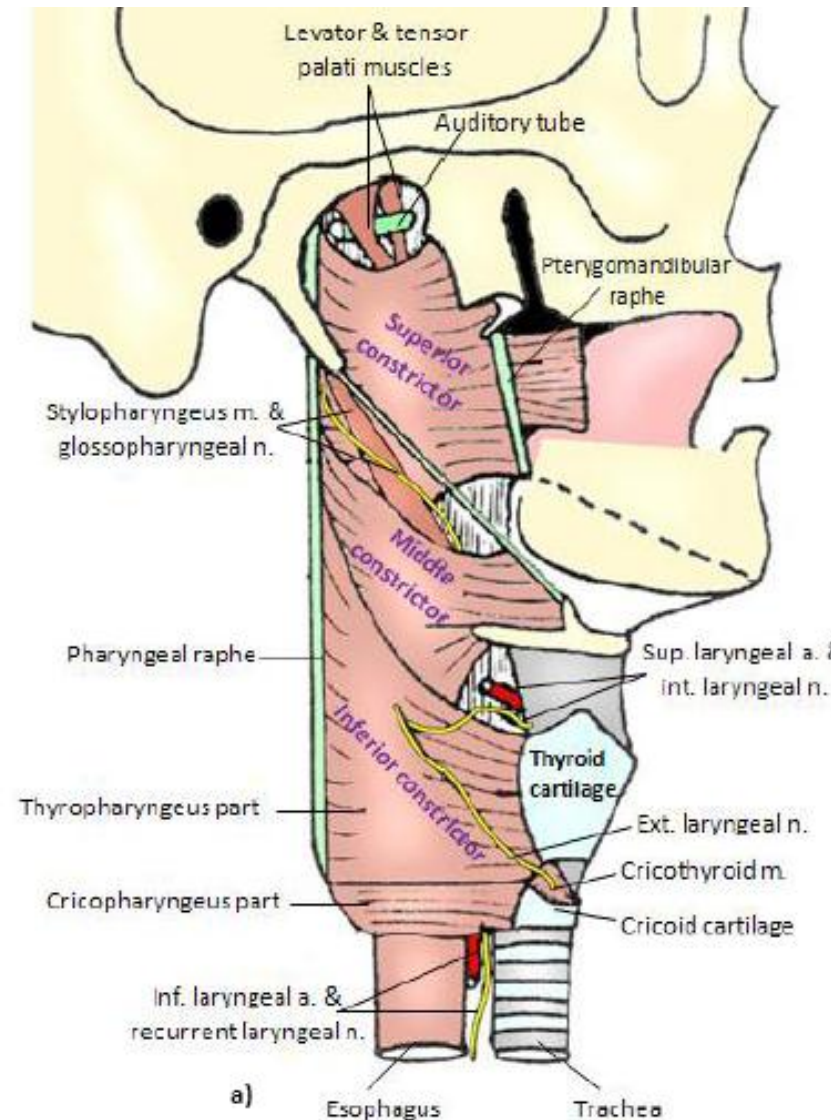
2- Pharyngeo-basilar fascia

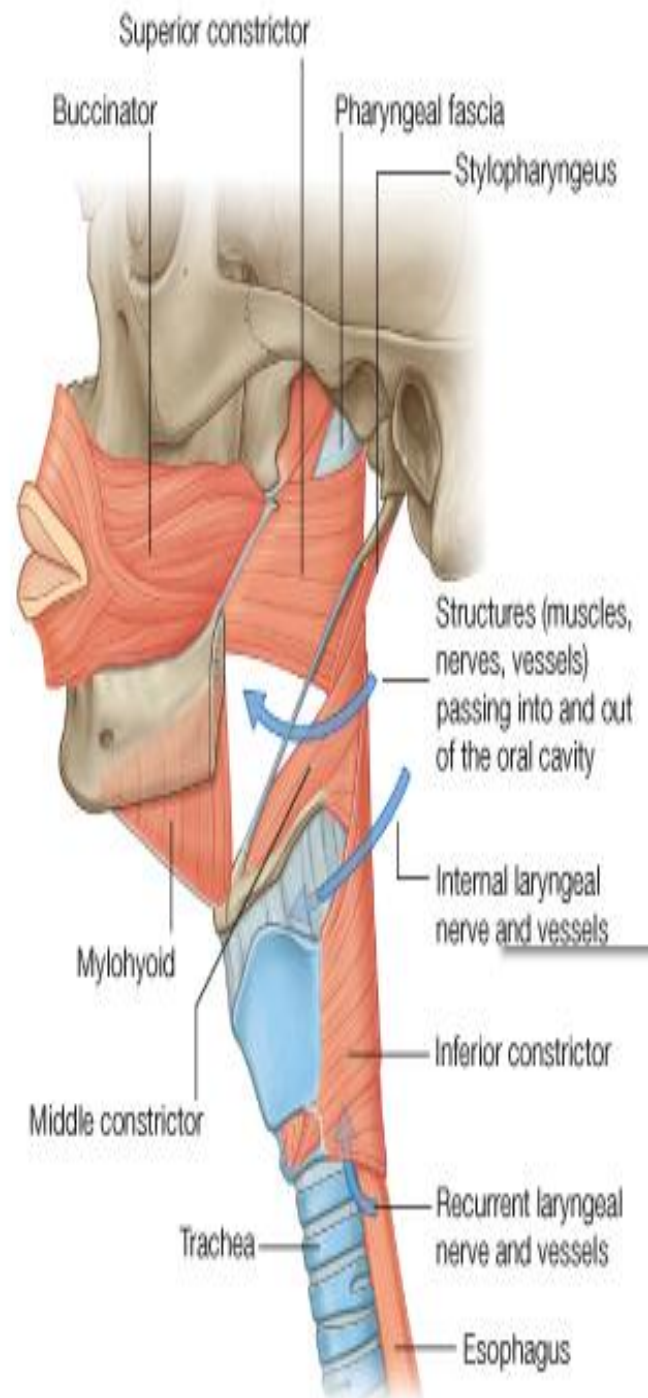
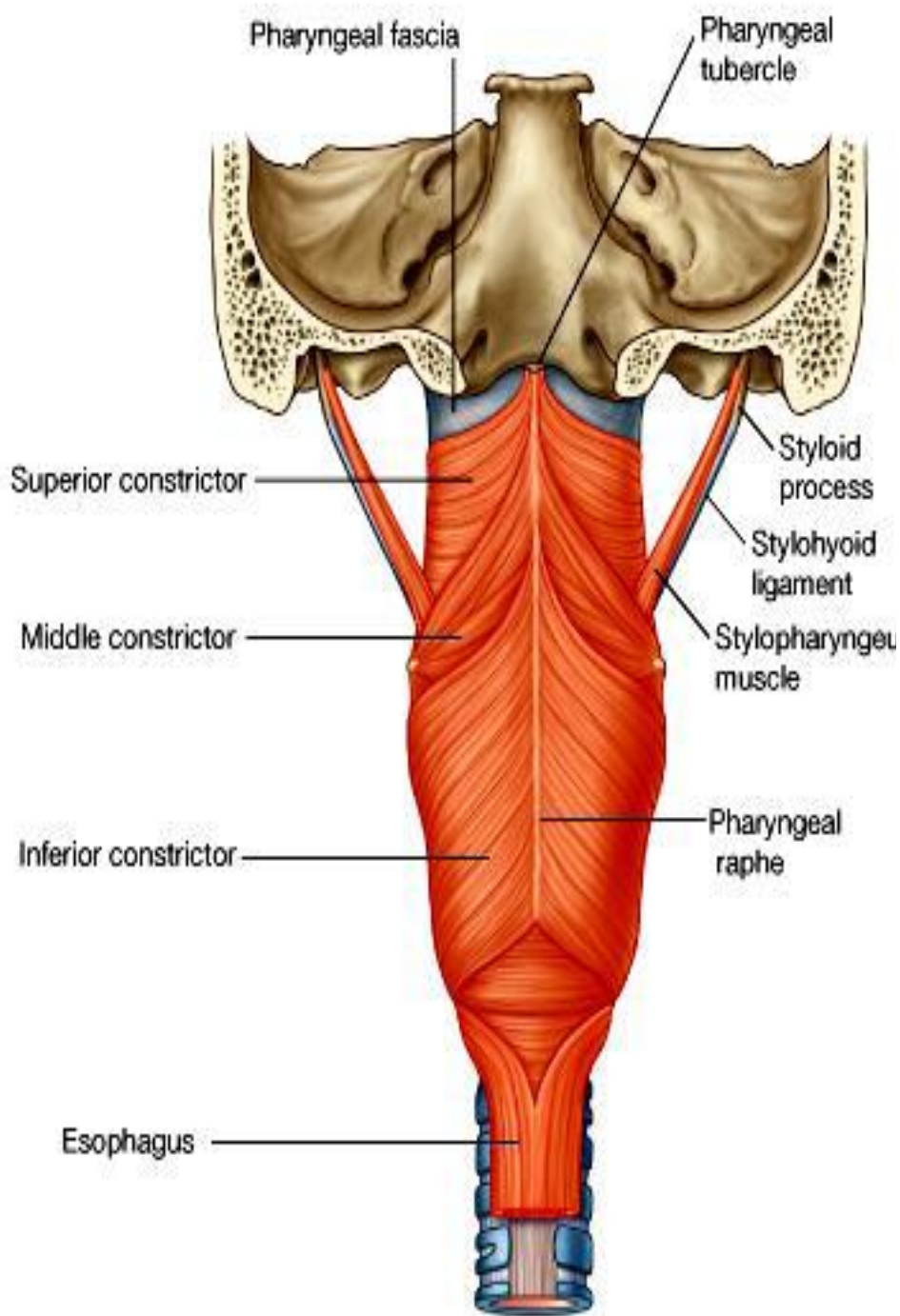
3- Muscular layer: formed of 2 layers:

a- Outer circular: 3 constrictors (superior, middle and inferior).

b- Inner longitudinal: formed of stylopharyngeus, salpingopharyngeus & palatopharyngeus.

4- Buccopharyngeal fascia: The pharyngeal plexuses of veins and nerves lie beneath this fascia.





Relations of the pharyngeal muscles

| Gap number | Site | Structures pass through |
|---|--|---|
| 1st gap (largest) “sinus of Morgagni” | Above upper border of superior constrictor muscle | Auditory tube Levator palati muscle Tensor palati muscle Ascending pharyngeal artery |
| 2nd gap | Between superior constrictor muscle and middle constrictor muscle | Stylopharyngeus muscle Glossopharyngeal nerve Stylohyoid muscle |
| 3rd gap | Between middle constrictor muscle and inferior constrictor muscle | Internal laryngeal nerve Superior laryngeal artery |
| 4th gap | Between inferior constrictor muscle and esophagus | Recurrent laryngeal nerve Inferior laryngeal artery |

Action of pharyngeal muscles

- **Superior, middle constrictor ms& thyropharyngeal part of inferior constrictor** are propulsive muscles during swallowing.
- **The cricopharyngeal part of inferior constrictor** is a sphincter to lower end of pharynx preventing suction of air into the esophagus, (*relaxes at the end of 2nd stage of swallowing to allow passage of food into the esophagus*).
- **The 3 longitudinal muscles** pull larynx & pharynx upward in 2nd stage of swallowing to close the laryngeal inlet.

Nerve supply

- by pharyngeal plexus that lies on middle constrictor, formed of:
- 1-Pharyngeal branch of vagus n (cranial accessory n): mainly motor.
- 2-Pharyngeal branch of glossopharyngeal n: mainly sensory to mucosa of oropharynx.
- 3- Pharyngeal branch of sup. cervical sympathetic ganglion: mainly vasomotor.

Sensory Nerve Supply of Pharynx

- **Nasopharynx:** (V) maxillary nerve (pharyngeal branch of pterygopalatine ganglion).
- **Oropharynx:** (IX) glossopharyngeal (sensory branch that joins the pharyngeal plexus).
- **Laryngopharynx:** (X) vagus (internal laryngeal branch of superior laryngeal nerve).

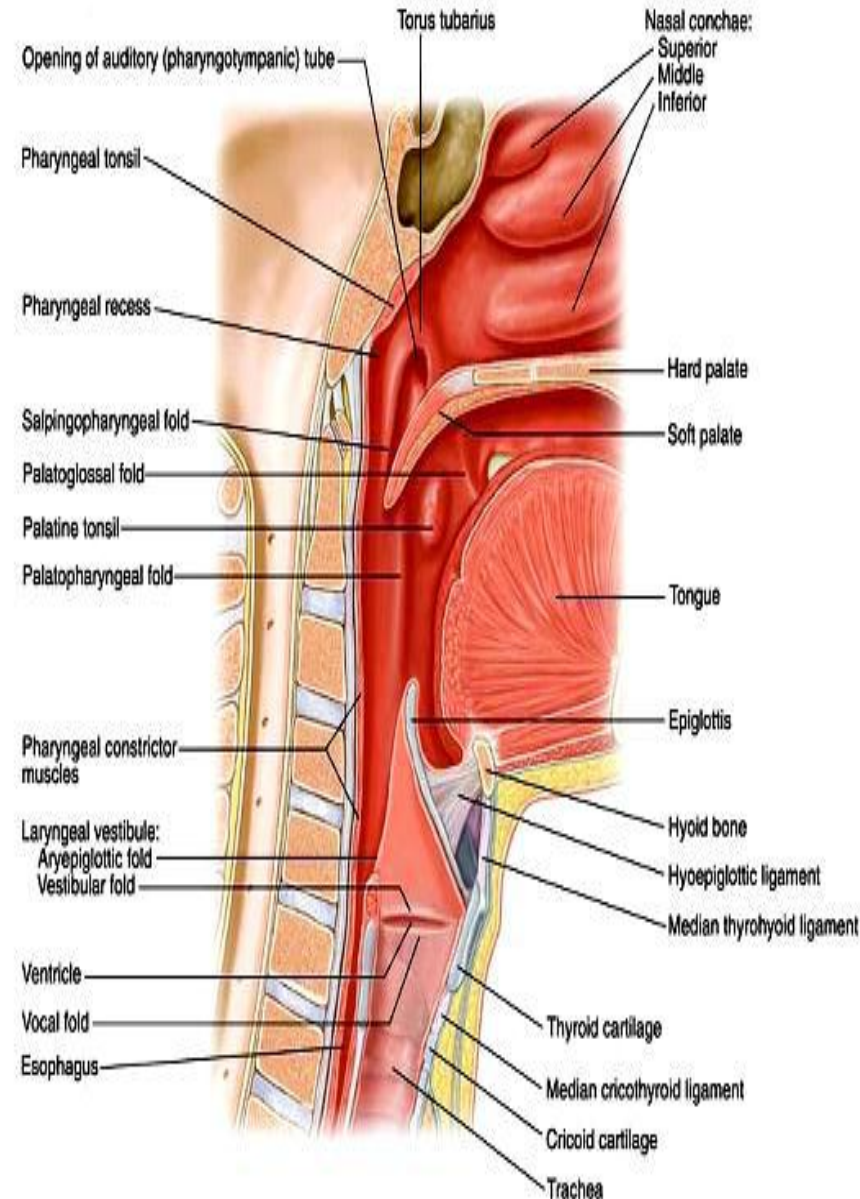
INTERIOR OF THE PHARYNX

- **Nasopharynx:** lies behind the nasal cavities.

- ***Roof:** Body of sphenoid bone

- ***Floor:** Soft palate. -Between the free edge of the soft palate and the posterior wall of pharynx, the nasal and oral parts of the pharynx communicate through a space, the **pharyngeal isthmus**.

- * **Anterior wall:** Deficient and opens into the nose



***Features of nasopharynx:**

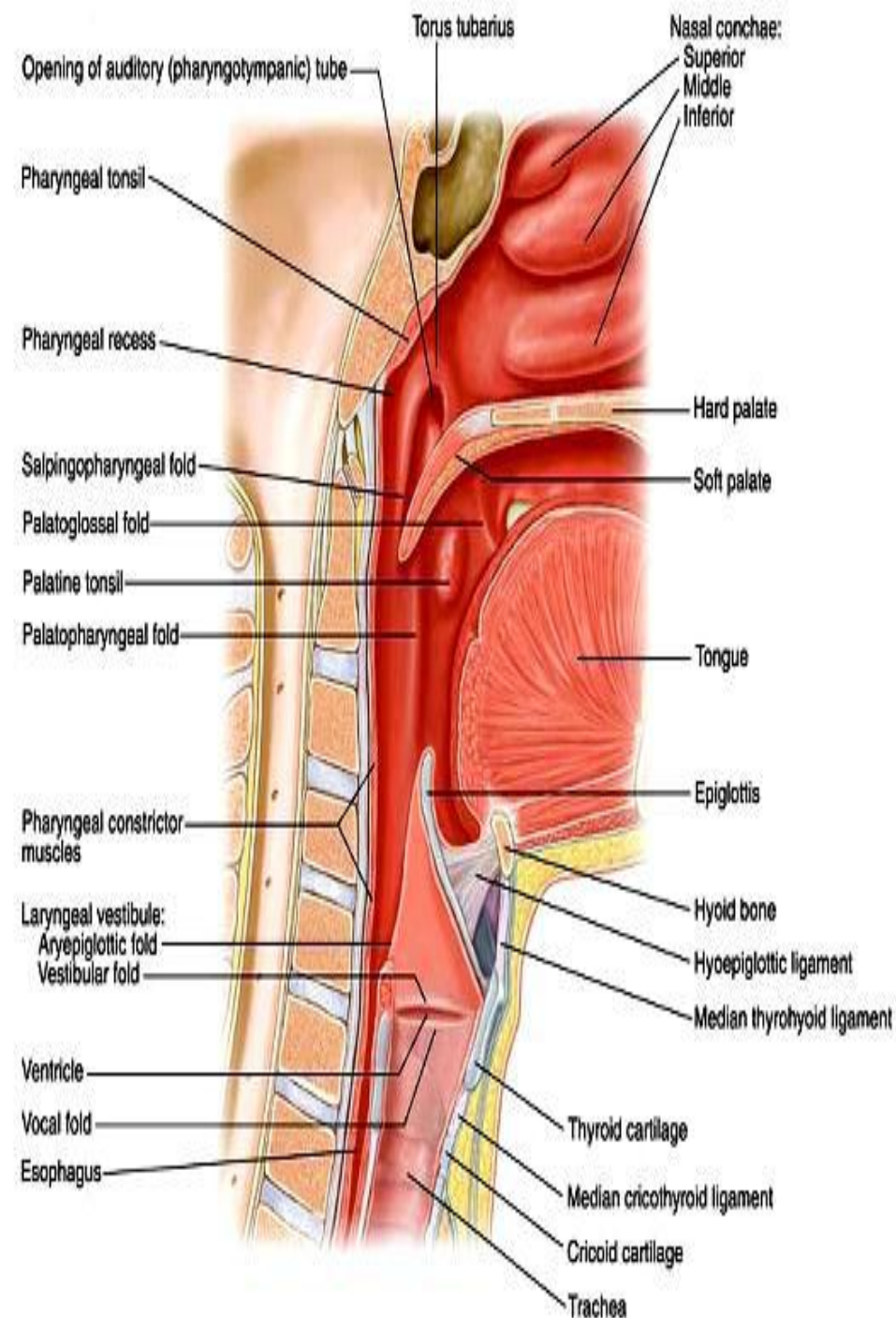
1- nasopharyngeal tonsil.

2-pharyngeal recess: lodge ICA.

3- opening of Auditory tube.

4-tubal elevation.

5-salpingopharyngeal fold below it presence of salpingopharyngeal muscle



- **Oropharynx** - Oropharynx lies behind the oral cavity and extends from soft palate superiorly to level of upper border of epiglottis inferiorly.

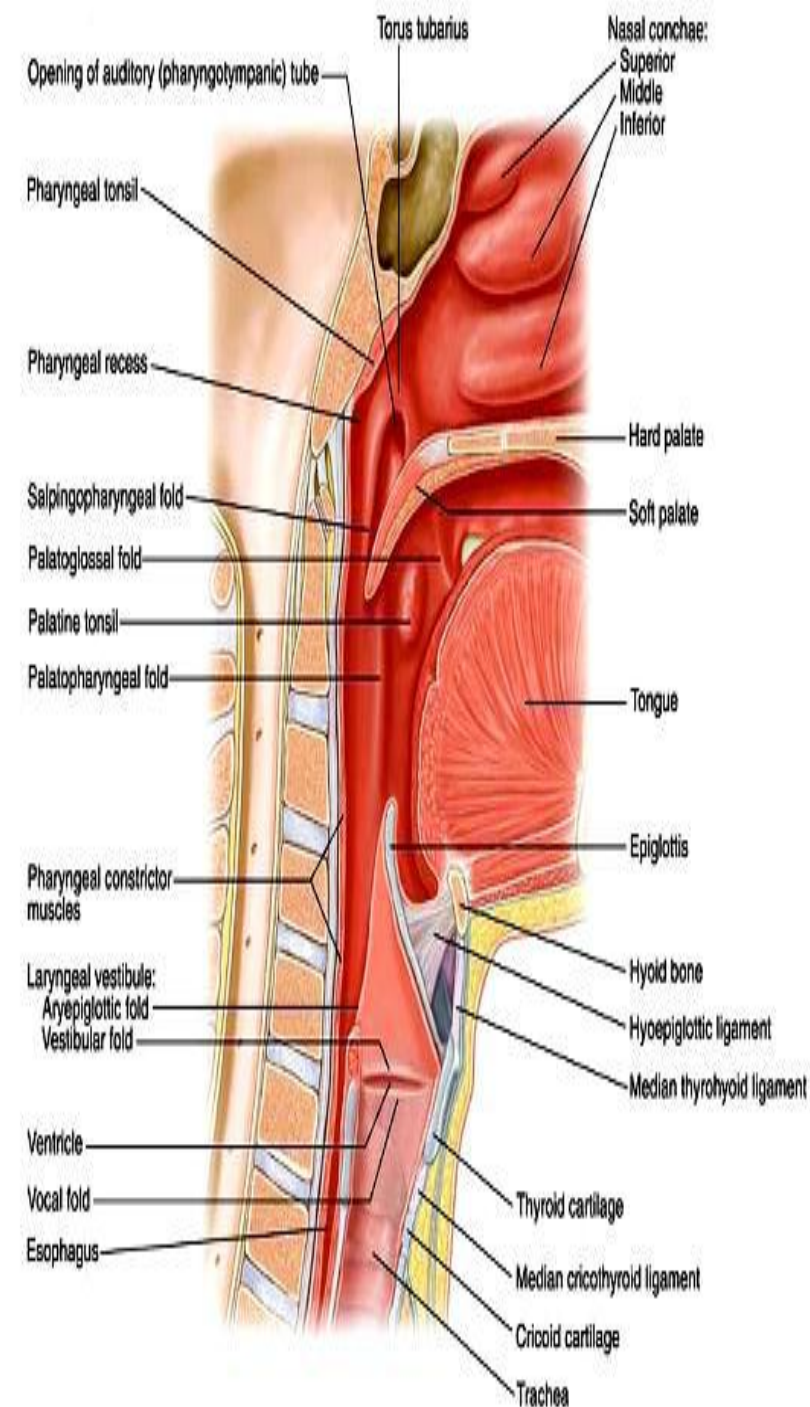
***Roof:** soft palate.

* **Floor:** posterior part of tongue.

***Anterior wall:** deficient and communicates with oral cavity through *oropharyngeal isthmus*.

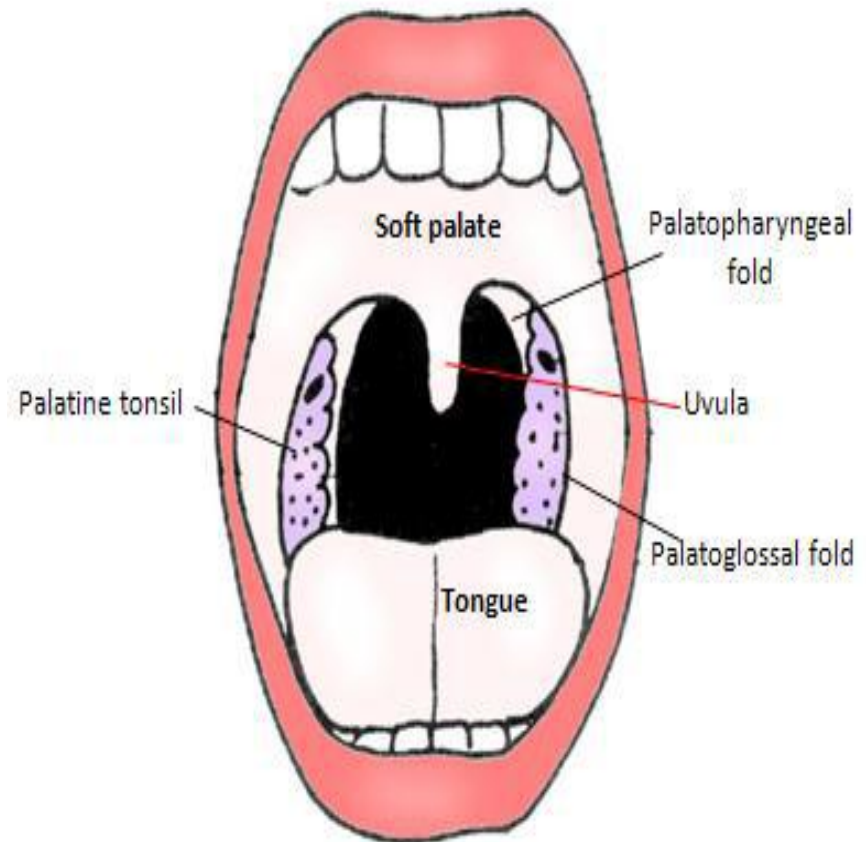
***Posterior wall:** supported by second and third cervical vertebrae.

***Lateral wall:** shows palatoglossal and palatopharyngeal arches with the *palatine tonsil* lying in the fossa in between.



THE PALATINE TONSILS

- **A large lymphoid mass situated in lateral wall of oropharynx.**
- **Represents the lateral part of Waldeyer's ring**
- **- This ring is formed by pharyngeal tonsils superiorly, palatine & tubal tonsils laterally & lingual tonsils inferiorly.**
- **Site: Tonsillar fossa (sinus) between palatoglossal & palatopharyngeal arches.**
- **Shape: oval or almond shape. It has 2 borders, 2 poles, 2 surfaces.**



*** Blood Supply:-**

I) Arterial supply:-

1- The main source: tonsillar branch of facial artery.

2- Additional sources:

- - *Ascending palatine of facial artery.*
- - *Ascending pharyngeal artery, a branch of EC.*
- - *Tonsillar branch of greater palatine artery.*
- - *Dorsal lingual artery.*

II)-The venous drainage: accompany the arteries to end in paratonsillar vein, pharyngeal vein or facial vein.

*** Lymphatic drainage:** jugulodigastric L.N.

***Nerve supply:** glossopharyngeal & lesser palatine nerves.

***Function:** trapping the foreign materials & bacteria by their crypts then initiate the formation of antibodies against them.

Applied anatomy

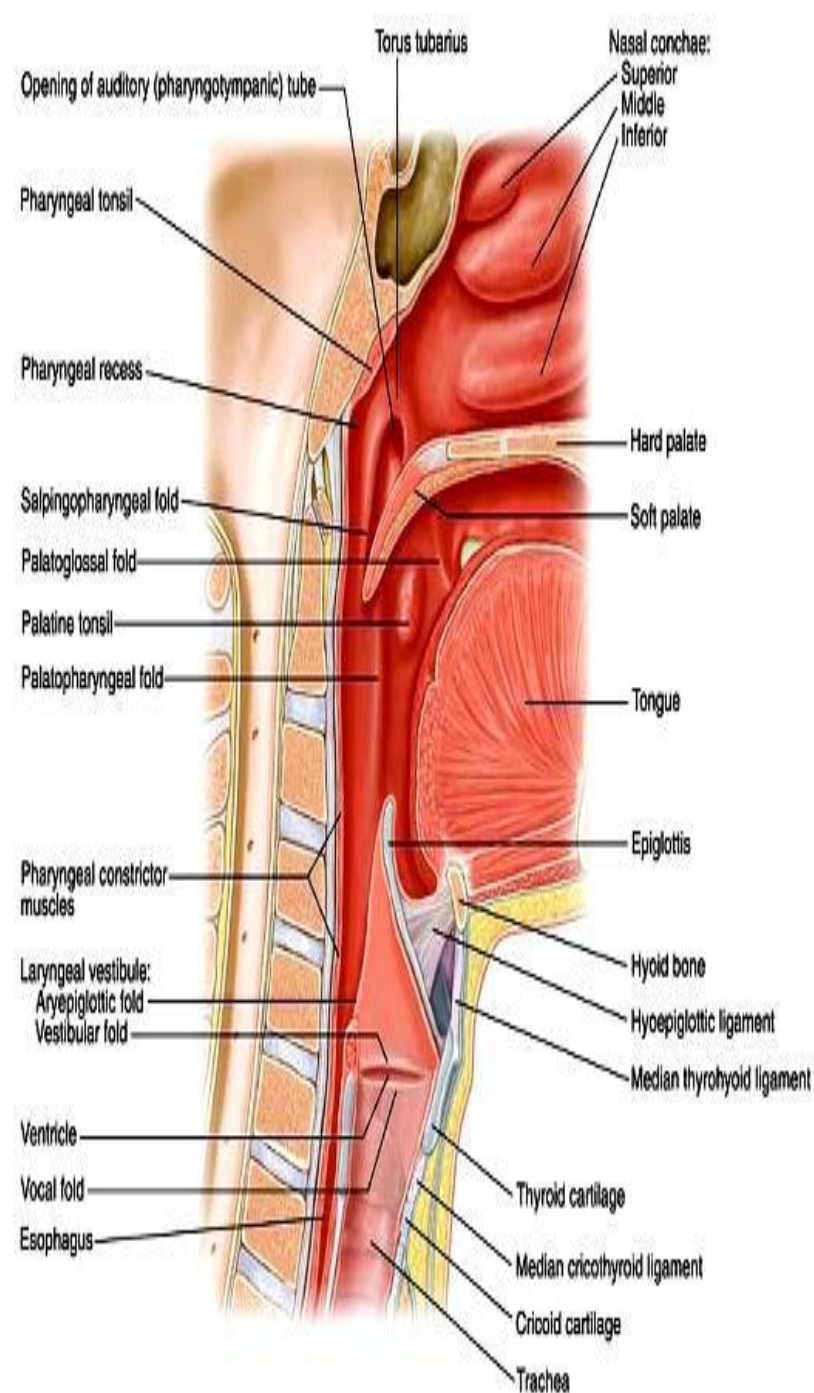
- Septic infection of the tonsils is called tonsillitis, it may be removed by operation (*tonsillectomy*).
- 2-Tonsillitis may lead to referred pain in the ear.

- **Laryngopharynx:** lies behind laryngeal inlet and posterior surface of the larynx. -It extends from upper border of epiglottis to lower border of cricoid cartilage where it is continuous with oesophagus.

***Anterior wall:** inlet of larynx (superiorly) and back of cricoid (inferiorly).

***Posterior wall:** supported by bodies of 3-6 cervical vertebrae.

***Lateral wall:** shows the *piriform fossa*: (Foreign bodies (as fish bones) may lodge in the piriform fossa)





Thank You
Thank You
Thank You!!!!