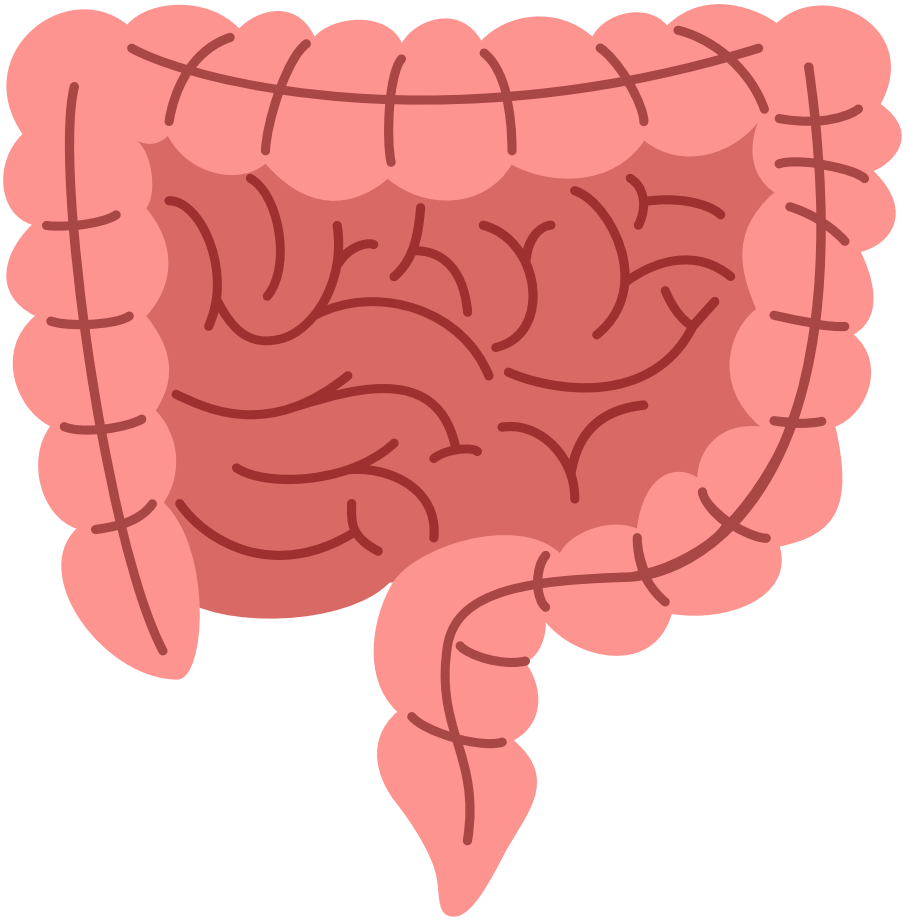
GIS

Sheet no. 2

Anatomy



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The salivary glands .

- We consider the salivary glands as association organs to the digestive tract, they secrete around 8 liters of saliva daily because the mouth should be kept moist, dryness of the mouth will cause an increased susceptibility to infections due to increase in the number of bacteria in the oral cavity.

We have 2 types of salivary glands:

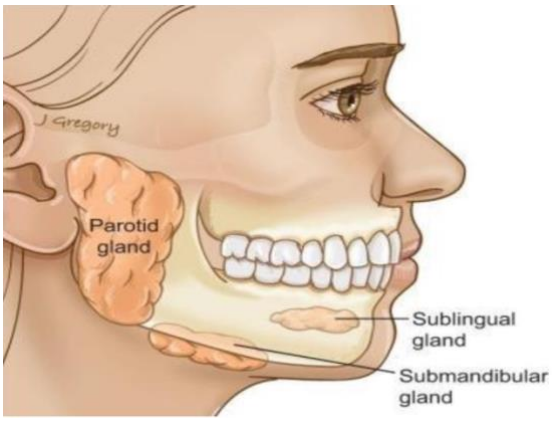
1. **Major salivary glands** (our topic for this lecture):

A . Parotid : Over the ramus of the mandible.
B. Sublingual gland : Below the tongue.
C. Submandibular : Below the mandible.

* Histology note :

Any gland is surrounded by a capsule of connective tissue that divides the glands into lobes and lobules by septa, it provides protection and blood and nerve supply to the gland.

2. **Minor salivary glands:** the oral cavity is filled with minor glands and they're named according to the organ (labial, lingual, palatial) each one has its own small duct which opens directly into the oral cavity.



Parotid gland:

1- It's the **largest** salivary gland and is composed mostly of serous acini.

2- **Location**: lies in a deep hollow below the external auditory meatus, behind the ramus of the mandible (overlap) and in front of the sternocleidomastoid muscle.

3- **Shape** : It is pyramidal in shape its **Base is superficial** and the **apex is deep**, directed towards the pharynx

4- **Secretion** : **Serous** Secretion (rich in proteins and enzymes).

5- **Capsule**: The gland is surrounded by **two capsules** (an exception):

1) The regular connective tissue capsule surrounding the gland which sends connective tissue septa dividing it into lobes and lobules.
Each lobule has its own duct, at the end they all unit to form one large duct → parotid duct.

2) The outer capsule which is part of the deep fascia of the neck.

Advantage of the capsules：provide protection to the gland.

Disadvantage of the capsules ：infections like mumps (viral) to the gland can cause it to swell and the capsules prevent expansion leading to severe pain in the gland.

6- **Duct** : (5 cm long).

- It emerges from the anterior border of the gland and passes forward over the lateral surface of the masseter muscle then turns medially to penetrate the buccinator muscle of the cheek. It enters the vestibule of the mouth upon a small papilla opposite the upper second molar tooth.

- it can become obstructed by stones (tested by squeezing lemon onto the patient's tongue, if the parotid gland swells then the duct is obstructed due to inability to excrete the saliva).

7- **Contents :**

1) Extra cranial part of facial Nerve and its five branches.

Stem of the facial nerve divides the parotid into superficial and deep parts Branches of facial nerve: Temporal, Zygomatic, Buccal, Mandibular, Cervical .All provide **motor** to the muscles of the face (facial expression) and the platysma(cervical) .

Note: a tumor in the parotid gland causes damage to the structures inside the gland and destroys the anatomy of the parotid.

Surgery is the most common treatment; it's a challenging surgery because the facial nerve is the first structure the surgeon encounters **(the most superficial structure)**, and he needs to be really cautious due to the branches of the facial nerve, as not to cause nerve injuries.

▪ The first thing the doctor will do after surgery is to check the function of the facial nerve by the asking the patient to close his eyes (if one eye does not close it means the temporal nerve on that side is damaged) or to blow (tests the buccal nerve) or if there was dribbling of saliva during eating for example, if there is any issue in the previous actions, it means that one or more of the branches of the facial nerve was damaged (remember the function of the muscles above and their nerve supply).

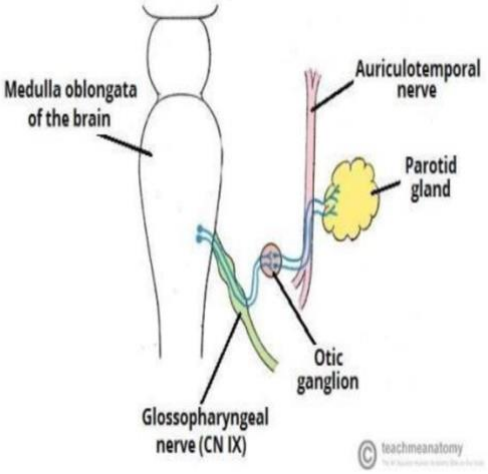
2- Retromandibular vein (formed inside the parotid from maxillary vein and superficial temporal vein).

3) External carotid artery (as its ascending upwards, it divides at the level of neck of mandible into maxillary artery and superficial temporal artery).
4) Auriculotemporal nerve .
5) Parotid lymph nodes.
6) Lymphatic vessels.

8- **Innervation** : 3 types (the doctor only elaborated about the parasympathetic)
1. Sensory
2. Parasympathetic(Secreto-Motor).
3. Sympathetic (no effect on secretions).

Parasympathetic innervation :

From brain stem, **inferior salivary nucleus** , the glossopharyngeal nerve (#9) emerges along with parasympathetic fibers . These fibers reach the gland via the following pathway : the tympanic branch of cranial nerve #9 — lesser petrosal nerve — otic ganglia — auriculotemporal nerve.



- The otic ganglia is found in the infra temporal fossa directly below foramen ovale which is found in the base of the skull with the mandibular nerve emerging from it.
- Lesser petrosal nerve is a preganglionic parasympathetic nerve which means it synapses in the ganglia.

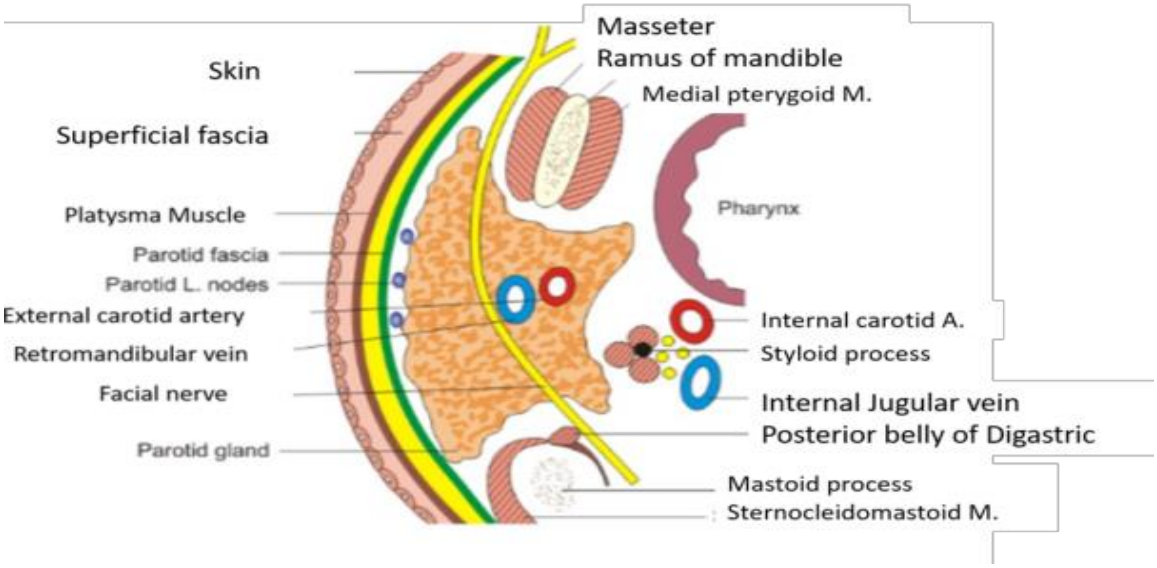
- Post-ganglionic parasympathetic fibers travel through auriculotemporal nerve which is also SENSORY to the gland (Auriculotemporal nerve is the one that transmits sensations like pain in case of mumps infection and swelling, it is also secreto-motor).

9- Anatomical relations :

▪ The parotid gland lies in the parotid bed that is formed by:

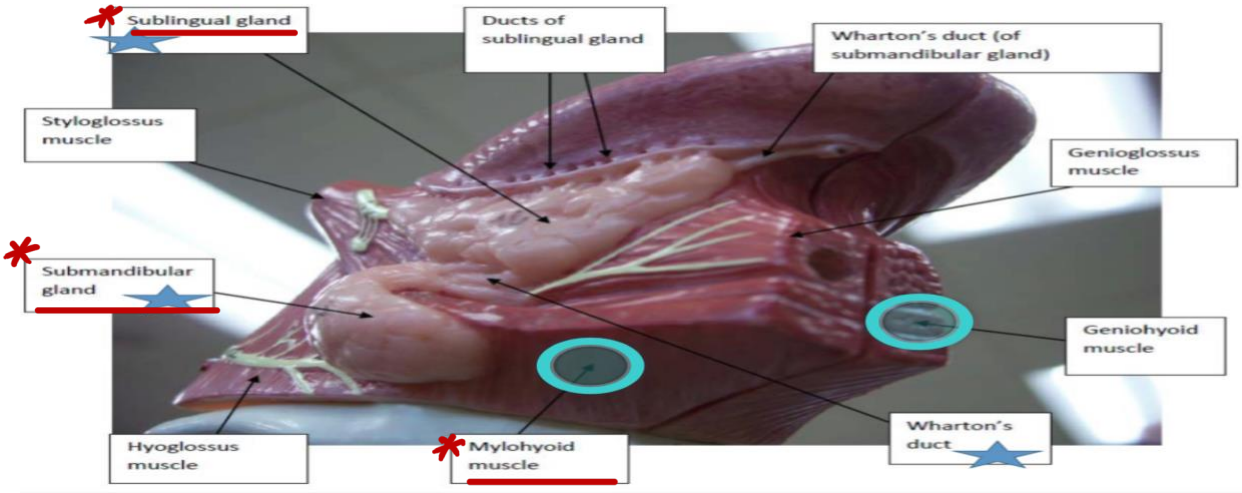
- Posteriorly → the sternocleidomastoid muscle and the posterior belly of digastric .
- Anteriorly → the ramus of mandible .
- Superiorly → the base of the trench is formed by the external acoustic meatus and the posterior aspect of the zygomatic arch.
- Medially → the carotid sheath and its contents (Vagus nerve, CCA, IJV).

It also formed by the facial nerve and the last 4 cranial nerve, styloid process, stylohyoid muscle.



Submandibular gland :

• Location: it lies beneath the lower border of the body of the mandible (between anterior and posterior belly of digastric)
• Divided into superficial and deep parts by the mylohyoid muscle, the mylohyoid muscle also separates between the submandibular gland (below) and sublingual gland (above) .



• The deep part of the gland lies beneath the mucous membrane of the mouth on the side of the tongue.

• **Secretion:** Mixed (seromucous) • **Capsule:** Surrounded by one capsule.

• **Duct :**
-It emerges from the anterior end of the deep part of the gland and runs forward beneath the mucous membrane of the mouth.
-It opens into the mouth on a small papilla, which is situated on the side of the frenulum of the tongue .

• **Innervation:**
Parasympathetic (secreto-motor) : via the facial nerve Originate from superior salivary nucleus found in the medulla oblongata.

Note: when chorda tympani joins the lingual nerve, it doesn't mean that the fibers get mixed together; because lingual fibers are sensory, and chorda tympani are

parasympathetic, so the lingual nerve only carries chorda tympani fibers to the submandibular ganglia.

Parasympathetic preganglionic fibers	**Parasympathetic postganglionic fibers**	**Sympathetic:**
Chorda tympani branch from facial nerve which also transmits taste fibers. In the infratemporal fossa, chorda tympani joins the lingual nerve which leads it to the submandibular ganglion (located in the submandibular triangle) where the preganglionic fibers synapse with the postganglionic fibers	Directly from the ganglia to the gland, supplying both the submandibular and sublingual gland.	Sympathetic branches along blood vessels like lingual artery Sensory innervation via the lingual nerve.

•the larger arm of the hook (superficial part) of the gland is directed forward in the horizontal plane below the mylohyoid muscle and is therefore outside the boundaries of the oral cavity-this larger superficial part of the gland is directly against a shallow impression on the medial side of the mandible (submandibular fossa) inferior to the mylohyoid line.

• the smaller arm of the hook (or deep part) of the gland loops around the posterior margin of the mylohyoid muscle to enter and lie within the floor of the oral cavity where it is lateral to the root of the tongue on the lateral surface of the hyoglossus muscle.

Sublingual gland :

• Location: The sublingual gland lies beneath the mucous membrane (sublingual fold) of the floor of the mouth, close to the frenulum of the tongue.

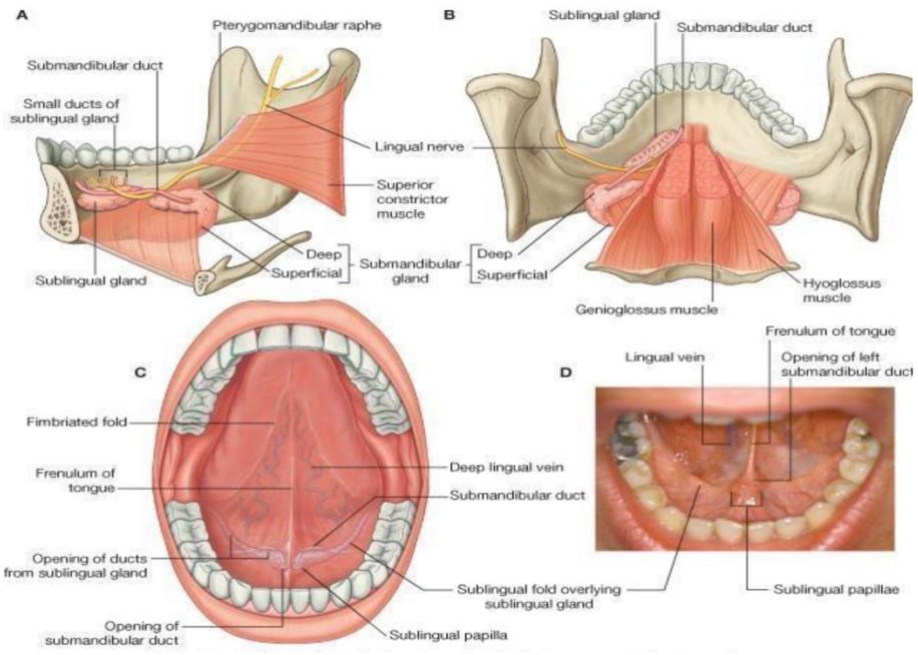
• Secretion: has both serous and mucous acini, with the latter predominating (MUCOUS)
• Ducts: The sublingual ducts (8 to 20 in number) which opens directly in oral cavity or with submandibular duct.

• Innervation: **Same as submandibular gland** (postganglionic parasympathetic fibers from submandibular ganglia).

When tongue is raised up, papilla is visible with an opening for the submandibular duct .

▪ Visible blue lines are the lingual veins (picture C above)
▪ Medial to lingual vein are the lingual arteryand nerve .

▪ Important:
-Lingual nerve has triple relations with the submandibular duct (picture A above)
Lateral → below → anteromedially (deep)
Then ascends into the tongue .

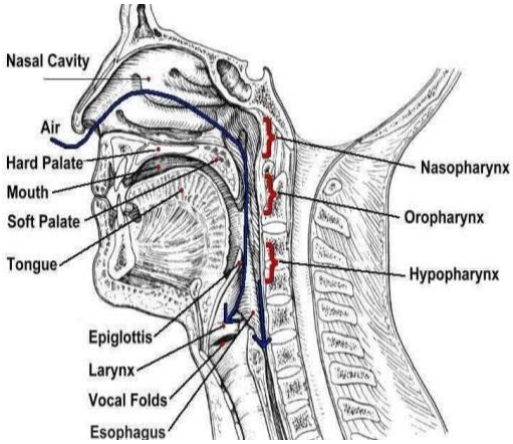


Medial relation to submandibular gland :
Submandibular duct , lingual nerve, genioglossus muscle, lingual vessels.

باقي الشيت مأخوذ حرفيًا من شيت ٢٠١٨ لانه الدكتور لم يضف شيئًا جديدًا عليه .
سامحونا على التقصير ، الشيت طويل وفيه حكي كثير ، حاولت أسهّل الأمور قد ما أقدر بس هي المادة هيك فيها حكي كثير بس سهلة ان شاء الله ..

The pharynx

• Muscular tube (5 inches long) with musculo-membranous wall which is *deficient* anteriorly. (open anteriorly). It's situated behind the nasal cavities, the mouth, and the larynx and may be divided into: nasal, oral, and laryngeal parts:



→At the sides and posteriorly, it has a wall made of constrictor muscles with the inner surface of the wall made up of mucus membrane (musculo-membranous wall)
→ Anteriorly its open and is replaced by:

☆ the posterior openings into the nose (choanae) *into the nasopharynx*

☆ the opening into the mouth (Oropharyngeal isthmus) *into the oropharynx*

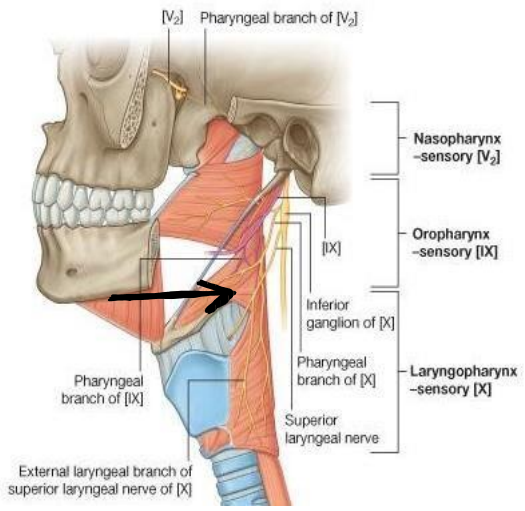
☆ the inlet of the larynx *into the laryngopharynx (hypopharynx)*

- The pharynx is funnel shaped, its upper **wider** end lying under the skull and its lower **narrow** end becoming **continuous with the esophagus** opposite the sixth cervical vertebra
- Difference between esophagus and pharynx Esophagus: a fingerlike structure, muscular tube
- By means of the auditory tube, the mucous membrane is also continuous with that of the tympanic cavity.
- Lined by mucosa interiorly: non-keratinized stratified squamous epithelium (like esophagus), then we find muscular layer (constrictor muscles), and externally it is surrounded by connective tissue which covers the wall of the pharynx and esophagus

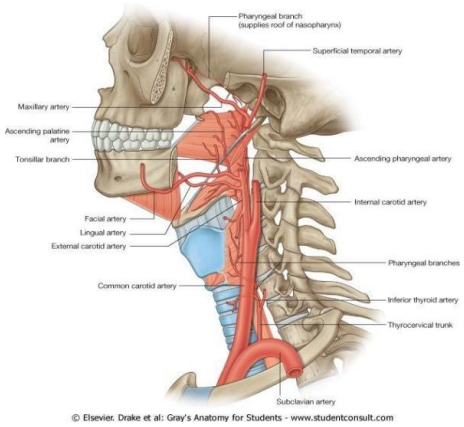
Sensory Nerve Supply of the Pharyngeal Mucous Membrane

• Nasal pharynx: The maxillary nerve (V2)

- Oral pharynx: The glossopharyngeal nerve
- Laryngeal pharynx (around the entrance into the larynx): The internal laryngeal branch of the vagus nerve



⇒ Note: the internal laryngeal nerve pierces the ***thyrohyoid membrane*** and passes between the ***middle and inferior constrictor muscles.***



Blood Supply of the Pharynx

- Ascending pharyngeal, tonsillar branches of facial arteries, and branches of maxillary and lingual arteries

Venous drainage

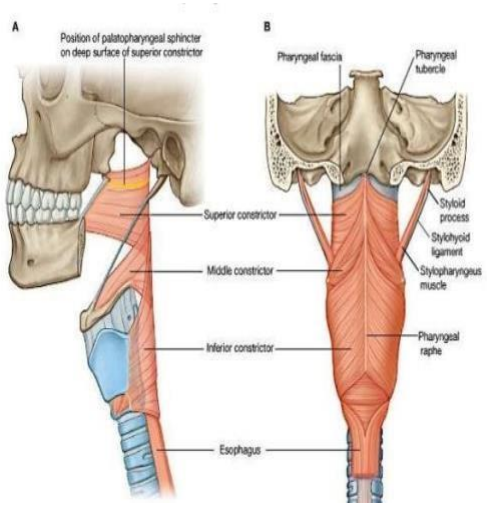
Veins that also drain into internal jugular vein

Lymph Drainage of the Pharynx

Directly into the deep cervical lymph nodes or indirectly via the retropharyngeal or paratracheal nodes into the deep cervical nodes

Muscles of the pharynx

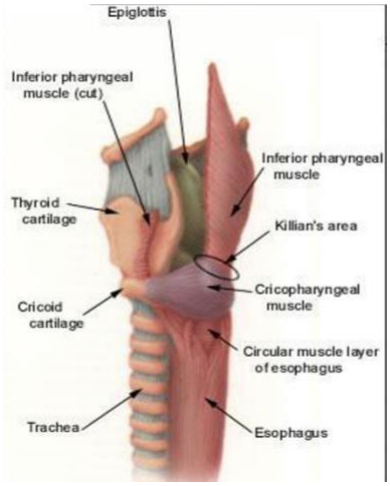
-3 constrictors (Circular fibers)
Superior constrictor, middle constrictor, Inferior constrictor
-2 oblique/longitudinal fibers
Salpingopharyngeus, Stylopharyngeus



The constrictor muscles overlap each other so that the middle constrictor lies on the outside of the lower part of the superior constrictor and the inferior constrictor lies outside the lower part of the middle constrictor muscles, *the 3* extend around the pharyngeal wall to be inserted into pharyngeal raphe. ❼

Pharyngeal raphe: **a fibrous band that extends from**

pharyngeal tubercle which is found in the basilar part of the occipital bone in front of the foramen magnum to the level of C6 vertebra where it blends with the posterior wall of the esophagus



- The **lower** part of the inferior constrictor, which arises from the cricoid cartilage, is called the ***cricopharyngeus*** muscle (located above the esophagus). The fibers of the cricopharyngeus pass horizontally around the lowest and narrowest part of the pharynx and act as a sphincter, it is **always contracted and only opens by the stimulation of bolus of food.** ❾ Advantage: prevents passage of air to the stomach Only little amount of air passes through and is collected in the fundus of the stomach

- **Kilian's dehiscence** is a very sensitive area located in the posterior pharyngeal wall between the upper propulsive part of the inferior constrictor and the lower sphincter part, the cricopharyngeus.

Muscle	Origin	Insertion	Innervation	Action
Superior constrictor	Medial pterygoid plate, pterygoid hamulus, pterygomandibular ligament, mylohyoid line of mandible	Pharyngeal tubercle of occipital bone, raphe in midline posteriorly	Pharyngeal plexus	Aids soft palate in closing off nasal pharynx, propels bolus downward
Middle constrictor	Lower part of stylohyoid ligament, lesser and greater cornu of hyoid bone	Pharyngeal raphe	Pharyngeal plexus	Propels bolus downward
Inferior constrictor	Lamina of thyroid cartilage, cricoid cartilage	Pharyngeal raphe	Pharyngeal plexus	Propels bolus downward

Cricopharyngeus (lowest fibers of inferior constrictor muscle)	Sphincter at lower end of pharynx			
Stylopharyngeus	Styloid process of temporal bone	Posterior border of thyroid cartilage	Glossopharyngeal nerve	Elevates larynx & pharynx during swallowing
Salpingopharyngeus	Auditory tube	Blends with palatopharyngeus	Pharyngeal plexus	Elevates pharynx
Palatopharyngeus	Palatine aponeurosis	Posterior border of thyroid cartilage	Pharyngeal plexus	Elevates wall of pharynx, pulls palatopharyngeal arch medially

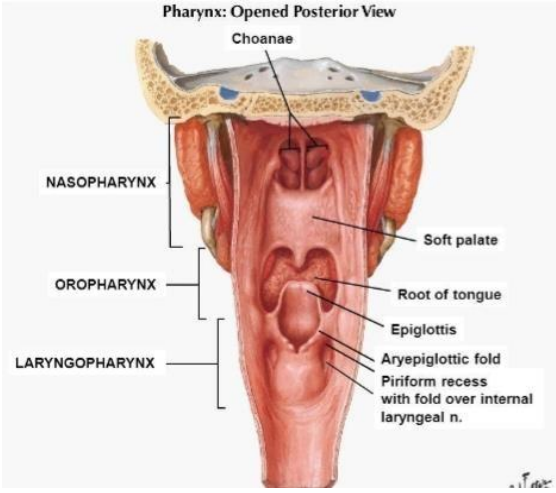
Interior of the Pharynx

- Nasal Pharynx

• This lies above the soft palate and behind the nasal cavities

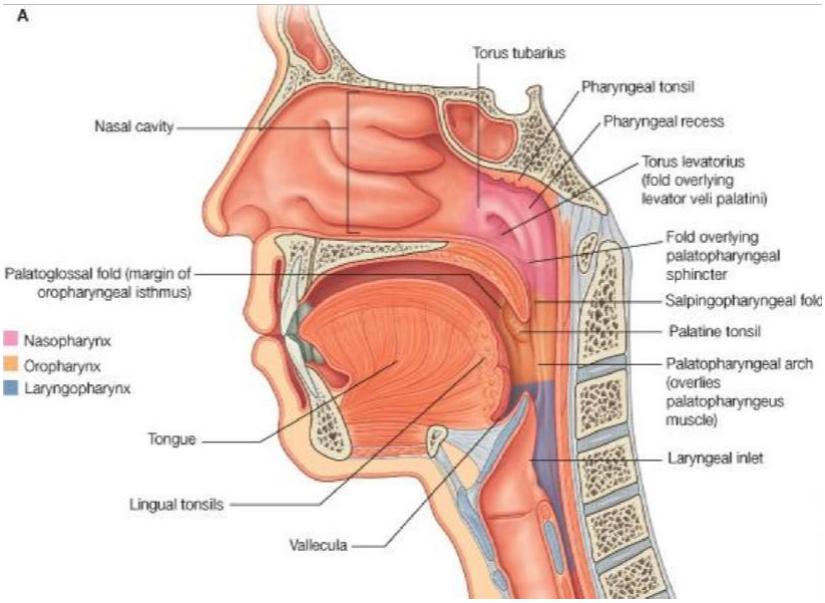
• In the submucosa of the roof is a collection of lymphoid tissue called the pharyngeal tonsil • The pharyngeal recess is a depression in the pharyngeal wall behind the tubal elevation

• The salpingopharyngeal fold is a vertical fold of mucous membrane covering the salpingopharyngeus muscle.



- **Oral Pharynx**

• This lies behind the oral cavity • The floor is formed by the posterior one third of the tongue and the interval between the tongue and epiglottis



• In the midline is the median glossoepiglottic fold and on each side the lateral glossoepiglottic fold.
• The depression on each side of the median glossoepiglottic fold is called the vallecula
• On the lateral wall on each side are the palatoglossal and the palatopharyngeal arches or folds and the palatine tonsils between them
• The interval between the two palatoglossal arches is called the oropharyngeal isthmus and marks the boundary between the mouth and pharynx.

● **Laryngeal Pharynx**

• This lies behind the opening into the larynx
• The lateral wall is formed by the thyroid cartilage and the thyrohyoid membrane
• The piriform fossa is a depression in the mucous membrane on each side of the laryngeal inlet

- **Piriform fossa (important)**
  - A depression, antero-lateral to laryngopharynx
  - Foreign bodies such as fish bones are lodged into

The Process of Swallowing (Deglutition)

• Masticated food is formed into a ball or bolus on the dorsum of the tongue and voluntarily pushed upward and backward against the undersurface of the hard palate • This is brought about by the contraction of the styloglossus muscles on both sides, which pull the root of the tongue upward and backward
• The palatoglossus muscles then squeeze the bolus backward into the pharynx.
• From this point onward the process of swallowing becomes an involuntary act.

• The nasal part of the pharynx is now shut off from the oral part of the pharynx by the elevation of the soft palate.

• the pulling forward of the posterior wall of the pharynx by the upper fibers of the superior constrictor muscle, and the contraction of the palatopharyngeus muscles.
All of this prevents the passage of food and drink into the nasal cavities.

• The larynx and the laryngeal part of the pharynx are pulled upward by the contraction of the stylopharyngeus, salpingopharyngeus, thyrohyoid, and palatopharyngeus muscles
• The main part of the larynx is thus elevated to the posterior surface of the epiglottis, and the entrance into the larynx is closed by the epiglottis.

• The laryngeal entrance is made smaller by the approximation of the aryepiglottic folds, and the arytenoid cartilages are pulled forward by the contraction of the aryepiglottic, oblique arytenoid, and thyroarytenoid muscles.

• The bolus moves downward over the epiglottis, the closed entrance into the larynx, and reaches the lower part of the pharynx as the result of the successive contraction of the superior, middle, and inferior constrictor muscles.

• Some of the food slides down the groove on either side of the entrance into the larynx, that is, down through the piriform fossae.
• Finally, the lower part of the pharyngeal wall (the cricopharyngeus muscle) relaxes and the bolus enters the esophagus.

Big thanks :
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Made with love .. دبسة لحده يا مؤمن..

Bilal