Anatomy

Faculty of Medicine - JU2017

Number >>	2
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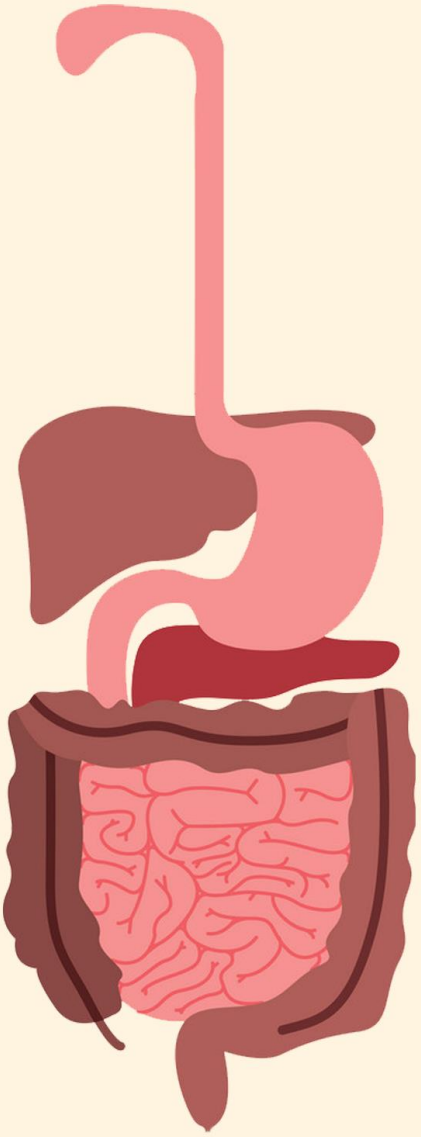
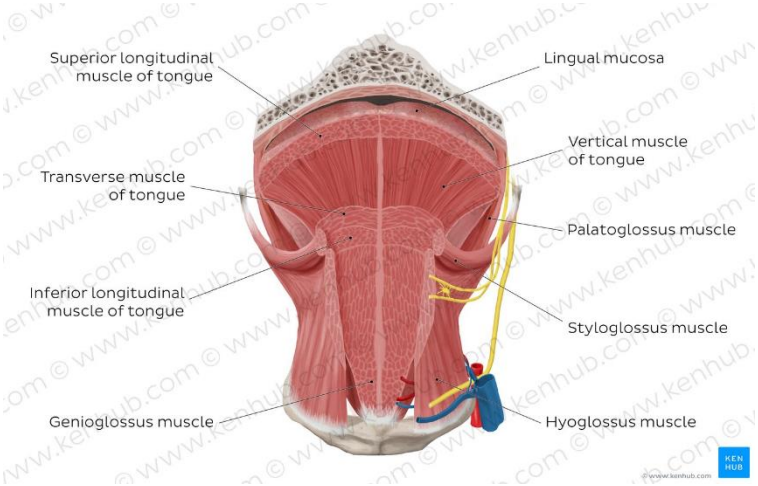


2nd system - GI

Muscles of the tongue

The tongue is a muscular organ and contains intrinsic and extrinsic muscles.

The intrinsic muscle contains vertical, oblique, and transverse muscles confined to the tongue and are not attached to bone. They are responsible for the **shape of the tongue.**



The 4 **extrinsic** muscles:

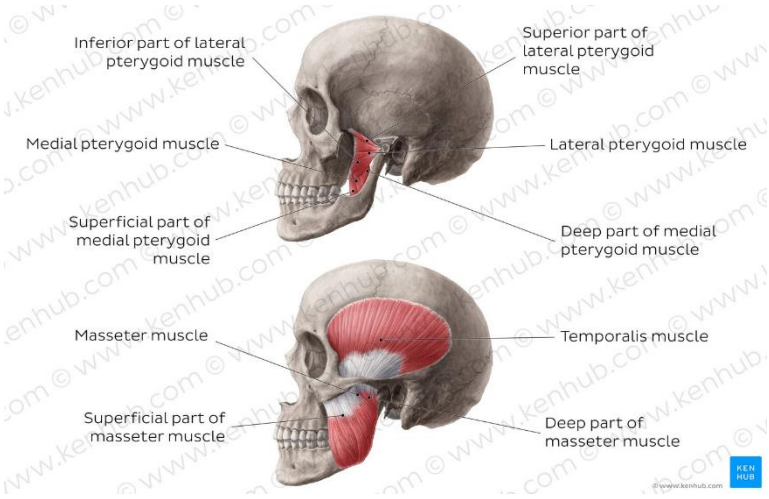
1. Styloglossus
2. Hyoglossus
3. Genioglossus
4. Palatoglossus

Supplied by the hypoglossal nerve except for palatoglossus by the pharyngeal plexus via the vagus nerve.

-us or -is means muscle

The 4 Muscles of **mastication**:

1. Temporalis (O: from temporal bone\ I: coronoid process of mandible)
2. Masseter (O: zygomatic arch {from the internet} Inserts in Ramus of Mandible)
3. Medial pterygoid
4. Lateral pterygoid



Origin: Base of the Skull

Insertion: Mandible

Function: Mastication; closure of the mouth

Other functions:

Lateral Pterygoid: opens the mouth (the only muscle that assists in opening the jaw)

Posterior fibers of temporalis;
pulls mandible backward (retraction of mandible)

The pterygoid muscles (M and L)
can protrude the mandible they also assist with side to side movement

Nerve Supply: Anterior Division of Mandibular Nerve of Trigeminal

EXCEPT

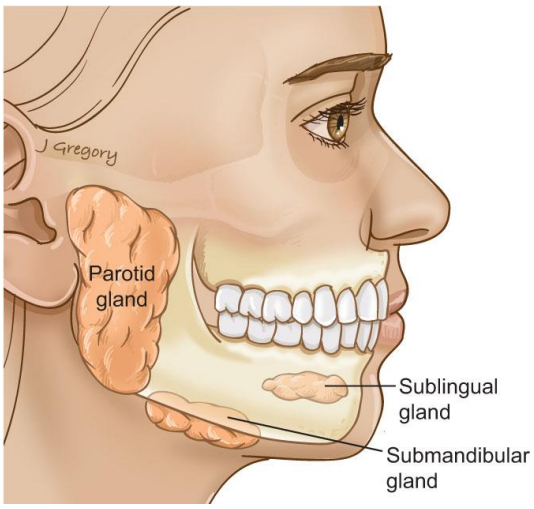
Medial Pterygoid → Stem of mandibular nerve

- After chewing using these muscles, bolus of food is formed in the oral cavity.

Salivary glands

We consider the salivary glands an association organ to the digestive track.

We have 2 types of salivary glands:



1. Major salivary glands – which is our topic-:
   a. **Parotid**: over the Ramus (serous secretion)
   b. **Submandibular**: below mandible (mixed)
   c. **Sublingual gland**: Below the tongue (mostly mucus)

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

2. Minor salivary gland (800-1000):
   each one has its own small duct which opens directly into the oral cavity.

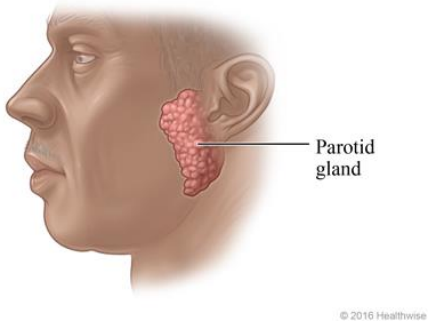
> For each one of these glands, we must know the site, type of secretion, nerve supply, blood supply, lymphatic drainage and relations of the gland. In addition, some of them have surface anatomy (for example, you must know the surface anatomy of the parotid duct).

Parotid Gland

- largest salivary gland

Position:

1. Front of the ear over the ramus
2. Overlies the masseter muscle anteriorly
3. Overlies the sternocleidomastoid muscle posteriorly



   - It is pyramidal in shape
- Base: Superficial
- Apex: Deeply directed towards the pharynx

a. Medio-anterior surface
b. Medio-posterior surface (parotid bed)

Secretion: **Serous Secretion** (rich in protein)

- Contains lobes and lobules
- Inside lobule: parotid acini (singular: Acinus)
- Acinus: group of cells which have basement membrane centered by lumen.
- The gland is surrounded by two capsules (an exception):

1. The regular connective tissue capsule surrounding the gland and sends connective tissue septa dividing it into lobes and lobules
   a. Lobule: contain Serous Acini
   b. Septa: contain blood vessels, nerves, ducts (that are larger than the ducts in the acini and form the parotid duct)
2. The outer capsule which is part of the deep fascia of the neck.

Advantage: The capsules provide **protection** to the gland

Disadvantage: **Infection,** like mumps, to the gland can cause it to swell and the capsules prevent expansion leading to severe pain in the gland.

Parotid Duct:

- **Length**: 5cm
- **Origin**: Anterior border of the parotid
- Sometimes there may be small glands called *accessory parotid glands* above it
- Above the parotid duct sometimes has the accessory parotid gland.
- **Surface anatomy**: 1 finger below the zygomatic arch
- It **crosses** the masseter muscle, **Pierces** the buccinator muscle and **ends** by opening in the vestibule of the mouth at the level of the upper 2nd molar tooth.

Salivary stones form when chemicals in the saliva accumulate in the duct or **gland;** they cause no symptoms as they form, but if they reach a size that blocks the duct, saliva backs up into the **gland**, causing pain and swelling upon eating and treatment is surgical.

Diagnosis of Parotid stones is to give the patient something sour (lemon), which causes excess secretion in oral cavity causing swelling.

Contents of the Parotid Gland:

1. **Facial Nerve**
   and its five branches.

- Stem of the facial divides the parotid into superficial and deep part
- Branches: Temporal, Zygomatic, Buccal, Mandibular, Cervical.
- All motor to the muscles of the face (facial expression).

Temporal → Orbicularis oculi and frontalis

Zygomatic → zygomaticus minor and major

Buccal → buccinator (assists in blowing)

Cervical → platysma

- Superficial Structure → Facial nerve and **2. retromandibular vein** (that forms inside the parotid from maxillary vein and superficial temporal vein)
- Deep structure → **3. external carotid artery** (ascends upward which divides at the level of neck of mandible into maxillary artery and superficial temporal artery)
- When there is a tumor in the parotid gland, this causes damage for structures inside the parotid gland and destroys the anatomy inside the parotid.
- Surgery is the most common treatment; the doctors usually refuse to make this surgery because the facial nerve is the first structure the surgeon encounters in surgery, and so he might find difficulty due to the branches of the facial nerve, keeping in mind that the anatomy is destroyed. 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 (diagnoses the buccal nerve) or if there was dribbling of saliva during eating for example, if there is any issues that means one of the branches of the facial nerve was damaged (remember the function of the muscles above and their nerve supply)

4. Auriculotemporal nerve

Upwards from the content of the gland.

5. Parotid lymph nodes

6. Lymphatic Vessels

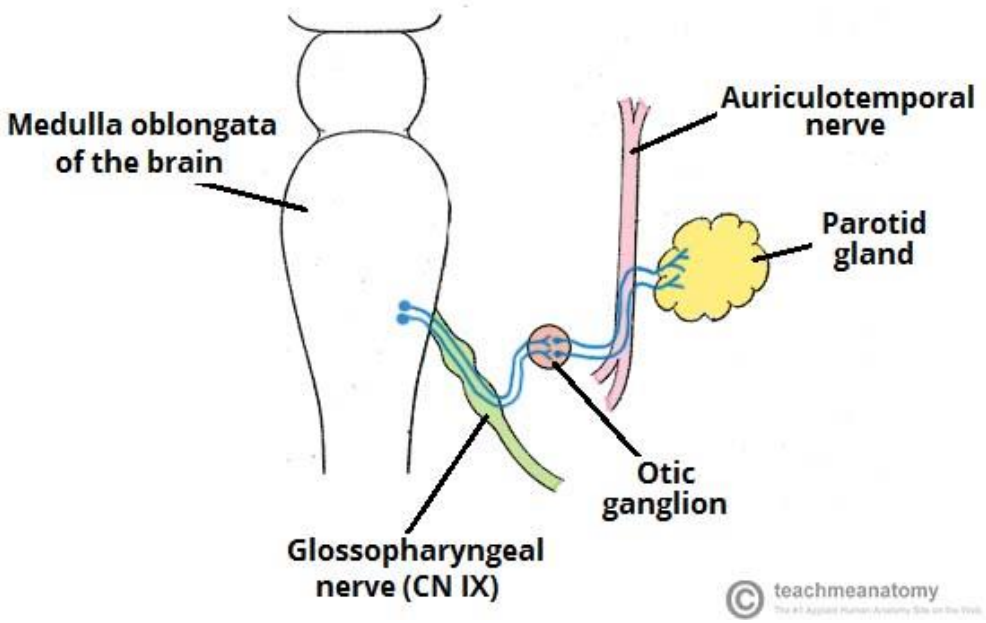
Innervation: 3 types (the doctor only elaborated about the parasympathetic)

1. Sensory
2. Parasympathetic (Secreto-Motor)
3. Sympathetic

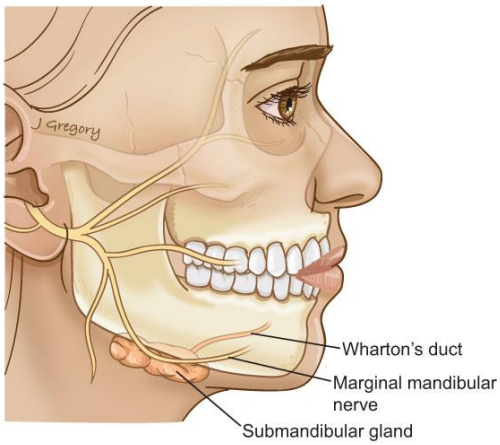
Blood supply: Branches of the external carotid (maxillary and superficial temporal).

Parasympathetic Secreto-Motor

- starts from brain stem, **inferior salivary nucleus**, with **glossopharyngeal nerve (#9)** emerging from it along with parasympathertic fibers (these fibers reach the gland via the tympanic branch, lesser petrosal nerve, otic ganglia and auriculotemporal nerve)
- then it reaches **otic gangilia** (lying directly below foramen ovale, which is found on the base of the skull, emerging from it the mandibular nerve).
- **lesser petrosal nerve** is a pregangilionic parasympathetic nerve which means it synapses in the ganglia.
- Post-gangilionic parasympathetic fibers travel through **auriculotemporal nerve** which is also SENSORY to the gland (Auriculotemporal nerve is the one that transimits sensations like pain in case of mumps infection and swelling, it is also secreto motor).



Submandibular Gland



- It lies in the **submandibular triangle**.
- It consists of 2 parts: deep and superficial.
- **Mylohyoid muscle** which originates from the mylohyoid line of mandible separates the superficial and deep parts of the gland.
- Above the mylohyoid line, sublingual fossa
- Below the mylohyoid, submandibular fossa
- These fossae are for the sublingual and submandibular gland.

- **Superficial part** is composed of 2 parts
  1. First one is lying in the fossa of mandible
  2. Second part is lying under the skin of the submandibular triangle, below the lower border of the mandible.

Submandibular Duct:

- **Origin:** Anterior part of deep part.
- **Opens** at the submandibular papilla which **Lies** at the sides of the lingual frenulum at the base of the tongue.

5 structures related to the submandibular gland

- Lie between 2 **muscles**,
  1. Mylohyoid (superficial)
  2. Hyoglossus (deep)

1. **Deep part** of submandibular gland
2. Submandibular **duct**
3. Submandibular **ganglia** (parasympathetic)
4. **Nerves**: Lingual & Hypoglossal nerve
   a. Lingual: Nerve is sensory to the tongue and floor of the mouth.
   b. Hypoglossal: Muscles of the tongue

parasympathetic **Facial Nerve**

- has a nucleus**, superior salivary nucleus** found in the brain stem.

  parasympathetic pregangilionic fibers: Chorda tympani which also transmits taste fibers.

  chorda tympani in the infratemporal fossa joins the lingual nerve which leads it to the ganglion,then the fibers synapse in the submandibular ganglia.

  parasympathetic postgangilionic fibers: directly from the ganglia to the gland and supplies the submandibular and sublingual gland.

sympatheic

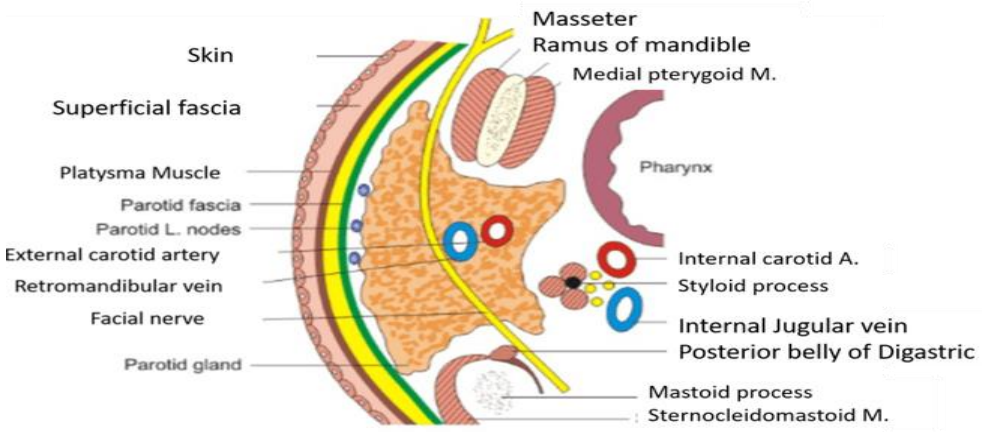
via blood vessels like lingual artery

Sensory innervation via the lingual nerve.

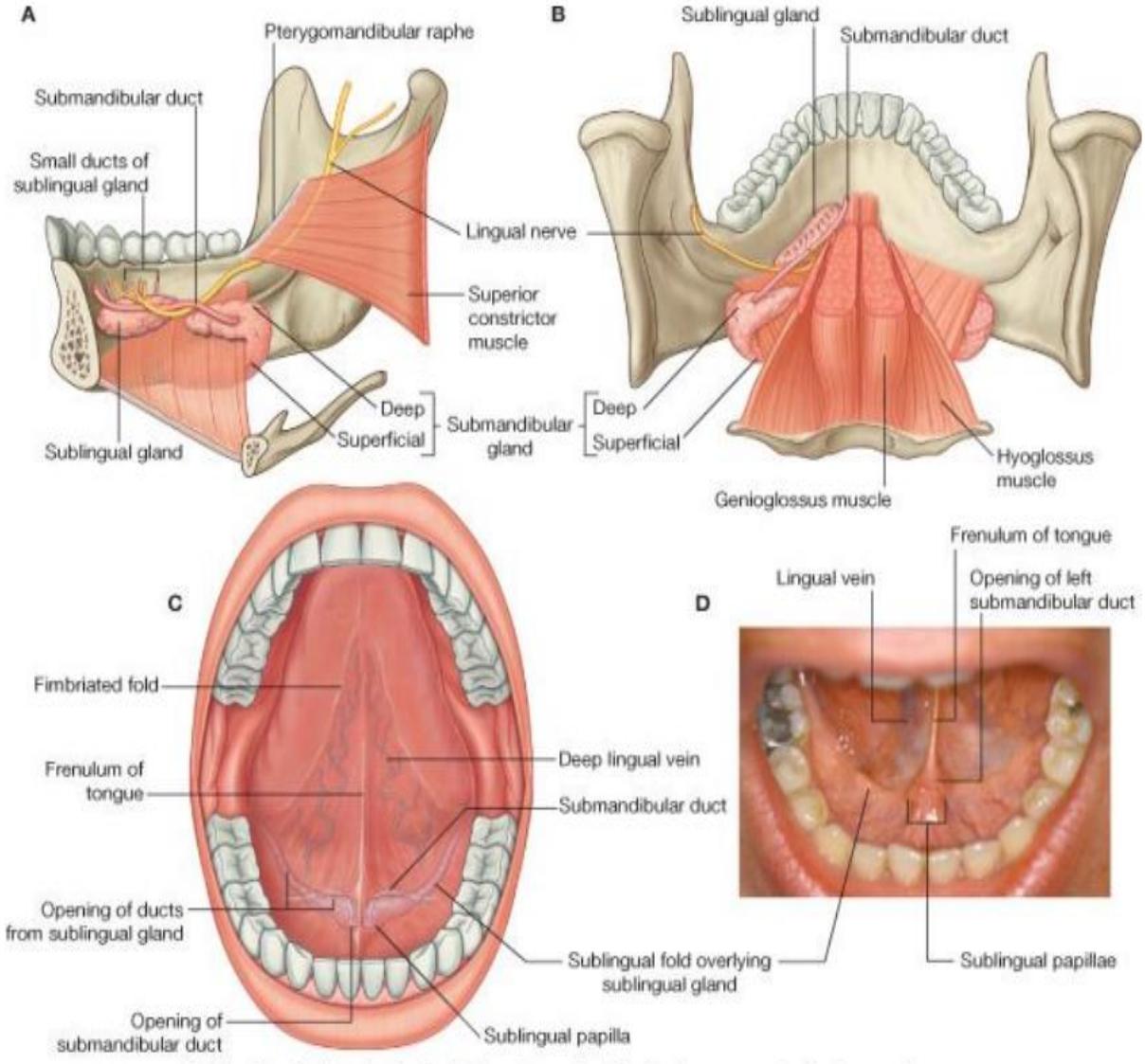
Anatomical Relations:

- The doctor pointed at the following:
  1. Parotid
  2. Submandibular
  3. Sublingual
  4. Submandibular ganglia
  5. Lingual nerve
  6. Hypoglossal nerve

     Between mylohyoid and hyoglossus
  7. **Parotid bed**: posteromedial relation of the parotid
     A. Posterior belly of digastric, stylohyoid
     B. External and internal carotid artery
     C. Vein: internal jugular vein
     D. Last 4 cranial nerves (deep or in the parotid bed)
     E. Styloid process crossed by facial nerve
  8. Anterio-Medial: ramus, masseter muscle and medial pterygoid



- Submandibular gland **<u>Mode of Secretion: Mixed (seromucous)</u>**
- Surrounded by <u>one capsule</u>
- Divided by connective tissue septa into lobes and lobule
- Has numerous ducts
- Submandibular duct opens at submandibular papilla located at the two sides of lingual frenulum.
- Papilla means a small rounded protuberance on a part or organ of the body, with an opening on the tip.



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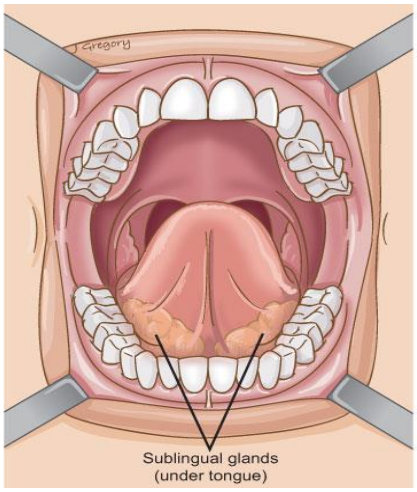
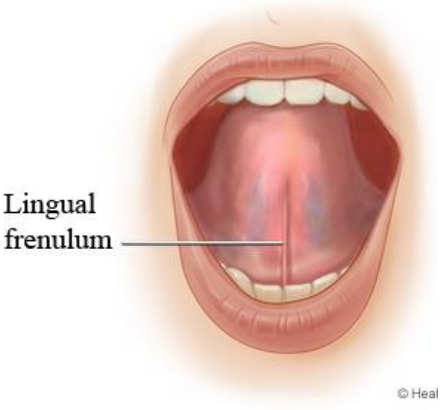
Sublingual Gland



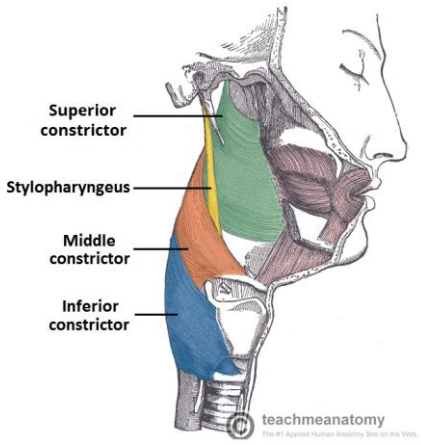
- Lies under the tongue
- Covered by mucosa
- 8-20 small ducts which opens directly in oral cavity or with submandibular duct
- **Mode of secretion:** mostly mucus, with little serous
- **Innervation:** same as submandibular gland (postganglionic parasympathetic fibers from submandibular ganglia)
- When tongue is raised up, papilla is visible with an opening for the submandibular duct
- Blue lines that are visible are the lingual veins (picture C above)
- Medial to lingual vein are the lingual artery and nerve.
- Chorda tympani carries pre-ganglionic parasympathetic fibers
- In Infratemporal fossa it joins the lingual nerve.
- However, 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 tympany fibers to the submandibular ganglia
- Lingual nerve has triple relations with the submandibular duct (picture A above)
  Lateral → below → medial
  PAY ATTENTION TO RELATIONS

- **Opening of Submandibular duct**: Base of the Lingual Frenulum
- Deep and Superficial parts of sublingual gland is separated by mylohyoid muscle

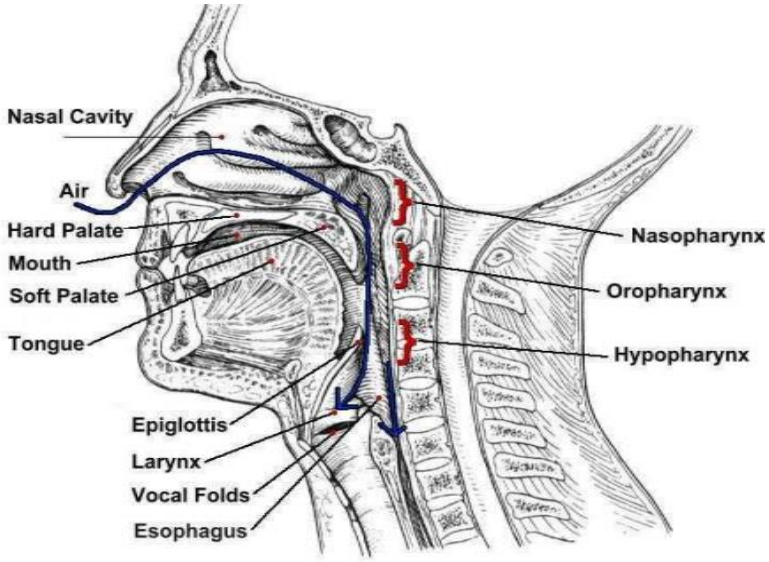


Up till here we have discussed the major salivary glands

Pharynx



- Muscular tube with musculomembranous wall
- **Origin**: base of the skull
- **Insertion:** lower border of 6th cervical vertebra (Cricoid Cartilage)
- Continues as esophagus
- **Length**: 15 cm (5 in.)
- Esophagus length: 25 cm
- Difference between esophagus and pharynx
  Esophagus: a fingerlike structure, muscular tube
  Pharynx: anteriorly bounded by cavities (nasal, oral, laryngeal)



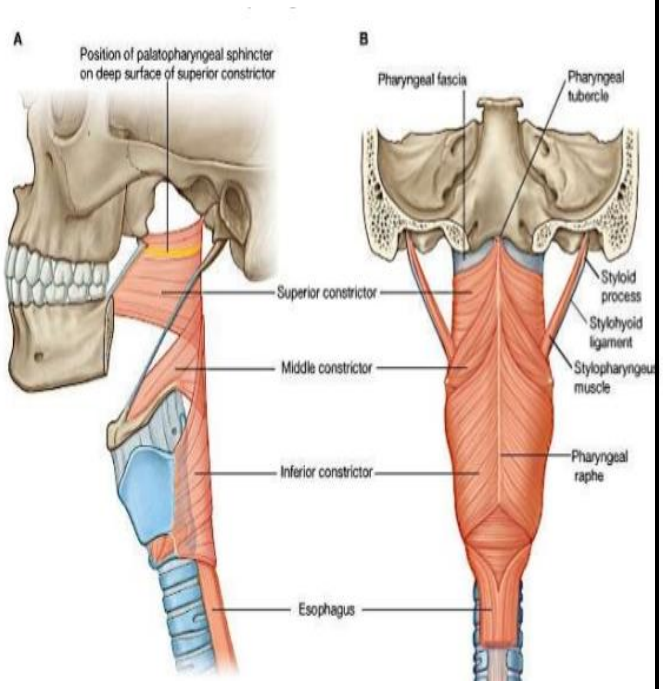
- **3 Parts of the Pharynx**
  1. Nasopharynx
  2. Oropharynx
  3. Laryngopharynx
- Funnel in shape, wide upwards and narrow downwards.

Openings:

- Choanae → posterior openings into the nose (with nasopharynx)
- Oropharyngeal Ismuth →opening into the mouth (with Oropharynx)
- And the inlet into the larynx

- Musculo-membranous wall inner surface is made up of mucus membrane.
- Epithelium: Stratified Squamous non-keratinized (like esophagus).

Muscles of the pharynx



- **Five** in number
- Three constrictors (Circular fibers and they overlap each other)
  1. Superior constrictor
  2. Middle constrictor
  3. Inferior constrictor
- Two oblique\ longitudinal fibers
  1. Salpingopharyngeus
  2. Stylopharyngeus

There is also the palatopharyngeus.

- All muscles are innervated by **pharyngeal plexus of nerves**

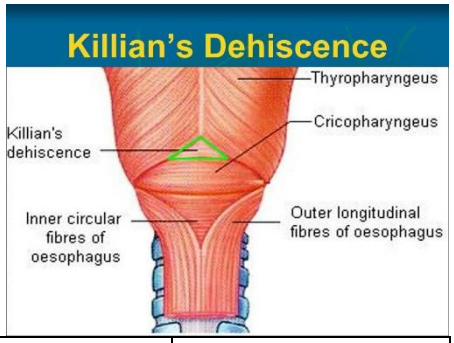
EXCEPT

Stylopharyngeus by glossopharyngeal (cranial nerve #9)

- Externally it is surrounded by connective tissue which covers the wall of the pharynx and esophagus
- **Inferior constrictor** part of it is called cricopharyngeas muscle and its fiber are completely horizontal and work as a **sphincter**; it is always contracted and only opens by the stimulation of bolus of food.

  Advantage: prevents passage of **air** to the stomach
  - Only little amount of air passes through and is accumulated in the fundus of the stomach and is seen using x-ray, visible as a black dot.
  - Air must go to the inlet of the larynx.
- 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 sphincteric part, the cricopharyngeal.

- Found between inferior constrictor and cricopharyngeal muscle



Muscle	**Origin**	**Insertion**	**Innervation**
Superior Constrictor	1. the medial pterygoid plate, 2. pterygoid humulus 3. pterygomandibuLar ligament 4. Mylohyoid line of mandible	pharyngeal raphe (a fibrous band that extends from pharyngeal tubercle which is found in front of the foramen magnum to the level of c6 vertebra where it blends with the posterior wall of the esophagus)	pharyngeal plexus of nerves
Middle Constrictor	1. lower part of stylohyoid ligament 2. Lesser and greater cornu of hyoid bone	pharyngeal raphe	pharyngeal plexus of nerves
Inferior Constrictor	1. lamina of thyroid cartilage 2. cricoid cartilage	pharyngeal raphe	pharyngeal plexus of nerves
Cricopharyngeus	Sides of cricoid and thyroid cartilage	pharyngeal raphe	pharyngeal plexus of nerves

Salpingopharyngeus	1. auditory tube 2. styloid process of temporal bone	1. posterior border of thyroid cartilage 2. blends with palatopharengeus muscle	pharyngeal plexus of nerves
Stylopharyngeus	Styloid process of temporal bone	Posterior border of thyroid cartilage	Glossopharyngeal nerve

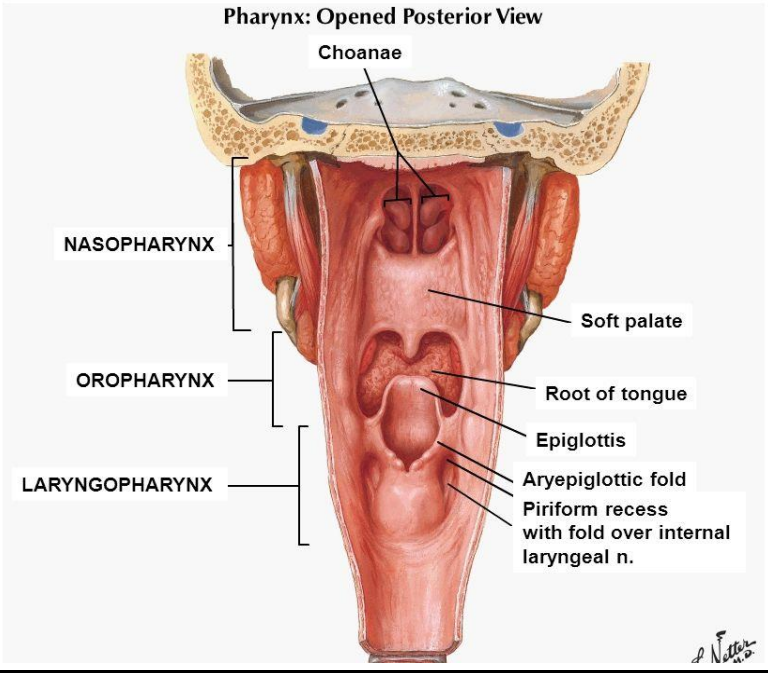
The constrictors help propel the bolus of food downward (superior constrictor aids soft palate in closing off the nasopharynx)

The stylopharyngeus elevates the larynx during swallowing

The Salpingopharyngeus elevates the pharynx

Palatopharyngeus is also part of the muscles of the palate

Interior of the pharynx



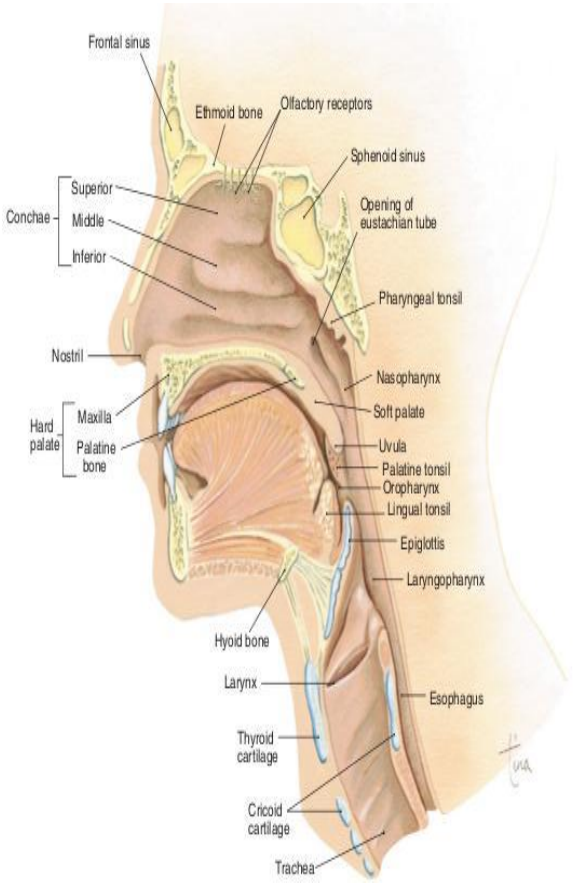
- nasopharynx: Choana openings with the nasal cavity
- Oropharyngeal Isthmus
- Inlet of larynx

- Foreign materials other than air will cause obstruction which will lead to coughing until it exits the pharynx

Piriform fossa

- Is a Depression
- Antero-lateral to laryngopharynx
- foreign bodies such as fish bones are lodged into it

Mid sagittal section →



Lateral wall of nasopharynx:

- Eustachian tube; auditory tube
- Brings air into the middle ear
- Heavier sensation in the middle ear when you experience a change in the surrounding pressure, so you keep swallowing air to balance the change on the tympanic membrane.
- Disadvantage: in children, entry of foreign bodies will lead to **otitis media**, infection of the middle ear. So, you always must check tympanic membrane in children.
- Oropharynx: palatine tonsil in lateral wall, repetition of tonsillitis
- If acute tonsillitis occurs more than 3-4 times, children must undergo tonsillectomy because the infection can reach the heart, kidney, knee joint and lead to rheumatoid arthritis.

Interval between constrictor muscles (from KenHub because the doctor didn't mention them but said we had to look for them "واجب عليكو")

Between the superior constrictor muscle and the skull, the levator palatini muscle, the auditory tube and the ascending palatine artery pass through. Between the superior and middle pharyngeal constrictor muscles, the stylopharyngeus muscle, the glossopharyngeal nerve and the stylohyoid muscle pass through. Between the middle and inferior pharyngeal constrictor muscles, the internal laryngeal nerve and the superior

laryngeal artery and vein pass through. Lastly, below the inferior pharyngeal constrictor muscle, the recurrent laryngeal nerve and the inferior laryngeal artery pass through.

Sensory innervation

- Nasal → maxillary
- Oral → glossopharyngeal
- Laryngeal → internal laryngeal, branch from vagus

Blood supply:

- External carotid artery
- Ascending pharyngeal tonsillar branch of facial
- Maxillary
- Lingual (all of these are branches from the ECA)

Lymphatic drainage:

- Directly → cervical lymphatic nodes
- Indirect → retropharyngeal or paratracheal lymph nodes

Process of swallowing:

- **Bolus** at dorsal of tongue
- During mastication, **closure of oropharynx** by soft palate
- Deglutition or swallowing: soft palate moves **upward**, closing the nasopharynx
- To reach esophagus: inlet of larynx should be closed by downward movement of epiglottis and upward movement of larynx

With contraction of constrictor muscles, bolus moves downward.

(في تفاصيل كثير بالسلايدات ما حكاهم الدكتور ما بعرف الصراحة اذا مطلوب نعرفهم)