

THE



SYSTEM

Anatomy

Sheet

Slide

Handout

Number:

1

Subject:

Oral Cavity & Salivary glands

Done By:

Haya O. Karamah

Corrected By:

Hashim Ahmad

Doctor:

Mohammad H. Muhtaseb

Date:

Price:

The Digestive system

Salam Everyone

This sheet will be about our first lecture in the GI system. It was written according to record of section 1 (note that the arrangement of the information are not exactly the same as in the record).

As you all know you should also study the slides as the sheet alone is not enough. Best of luck.

In the first lecture, two topics were discussed

The Oral cavity and the Salivary glands.

A general description about the GI:

The GI system is an organ system, it is divided into:

- The Alimentary tract (also known as GI tube)
- Accessory organs

☆ The Alimentary tract (the GI tube):

Is a tube that begins by an opening (the mouth), and ends by another opening (the anus).

It begins by the oral cavity → pharynx →
esophagus → stomach → small intestine
large intestine → rectum → anal canal

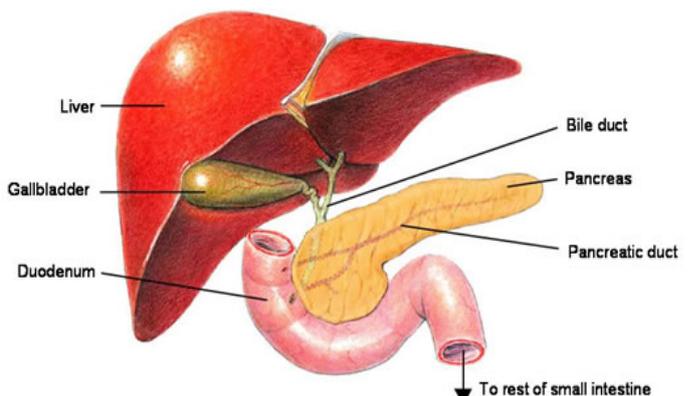
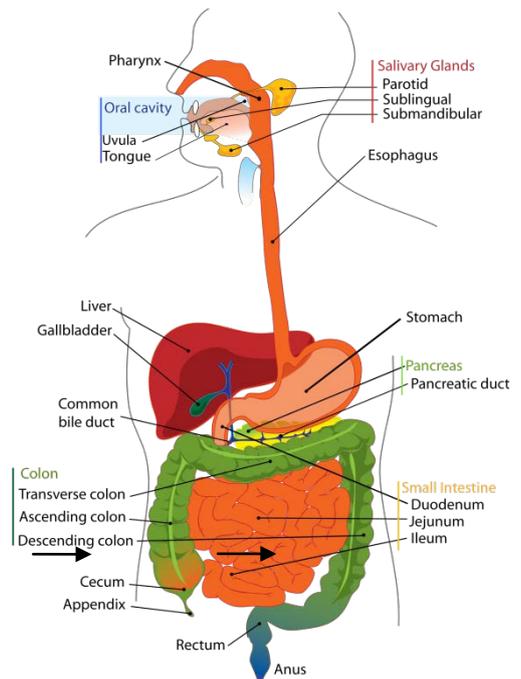
So the food that we intake is digested within this tube and excreted as stool through the rectum and the anal canal.

☆ The accessory organs:

- The liver
- The gallbladder
- The pancreas
- The salivary glands

-Both liver & gallbladder have a duct in common which is called (**The Bile duct**), this duct opens at the second part of the duodenum.

-The pancreas has a (**pancreatic duct**) which also opens at the *second part* of the duodenum.



-The Salivary glands:

They are exocrine glands that have ducts and this type of glands is found **numerous** throughout **the whole** GI tract.

- **Note that:** We have 3 major types of salivary glands (which are classified according to the different type of secretions)

(All of these types are found in the GI tract)

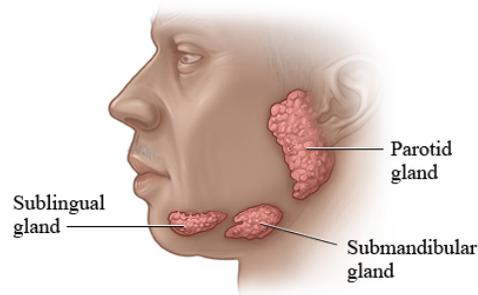
Type of gland	Type of secretion
1. Mucous gland	Mucous secretion
2. Serous gland	Serous (watery secretion)
3. Mixed gland	Both serous & mucous secretion

Glands in the GI

➔ In the GI tract we have **3 pairs of large salivary glands; there are serous, mucous & mixed glands:**

1. The Parotid gland (which is found in front of the ear) ➔ Serous gland
2. The Submandibular gland ➔ Mixed gland (serous & mucous)
3. The Sublingual gland ➔ Mucous gland

All these glands **have ducts**, and their secretions reach the oral cavity.



➔ There is another type of glands found in the **mucosa of the GI**; these glands **have ducts** which open into the lumen of the GI tract.

The general description finishes here now we will take in more details about the oral cavity and the salivary glands. :)

The Oral cavity (the mouth)

The oral cavity is a cavity that has 2 openings:

- Anterior opening (**The mouth**)
- Posterior opening (**Fauces also known as the Oropharyngeal Isthmus**)

➔ The mouth (the anterior opening) [Lips and Fauces, floor of the mouth]

The mouth is cavity which is bound **superiorly** and **inferiorly** by the LIPS.

The lips; differences from inside and the outside

- ❖ From the *outside*: Each lip (both upper & lower) is covered by skin, the type of epithelium here is **stratified squamous & keratinized**; In which we can find hair follicles, sebaceous glands & sweat glands.
- ❖ From the *inside* we have 2 things :
 1. A muscle: **Orbicularis oris**
 2. The mucosa (the place in which where there are glands)

1. **The orbicularis oris muscle**: it is a striated muscle, one of the muscles of the facial expression, it acts as a sphincter and it is innervated by the facial nerve. {A sphincter muscle is a circular muscle which surrounds an opening}.

2. **The mucosa**: here the epithelium is **stratified squamous & non-keratinized**

Pay attention to the differences in the type of epithelium

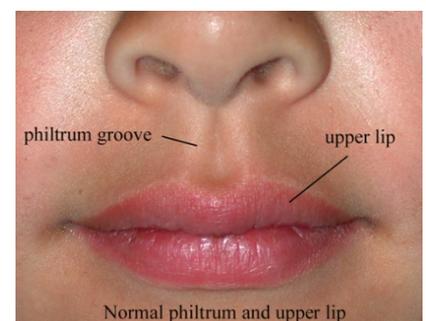
In fact all of the inside of the oral cavity is mucosa which is stratified squamous non-keratinized epithelium.

➔ Oropharyngeal isthmus-Fauces: (the posterior opening)

This opening leads to the pharynx (we can think of the mouth as a bridge), because it allows the passage of the food to the pharynx.

The lips

- ☆ We have 2 lips: upper one & lower one (they bound the mouth superiorly and inferiorly), each one has an Angle.
- ☆ In the middle of the upper lip we have a depression (groove) known as **The Philtrum**.
(This groove is only found in the upper lip).



The **Orbicularis Oris** muscle: forms the lips from *inside*.

It is a striated muscle; its fibers are at the angle, they ascend downwards or upwards and are arranged in a circular way (this corresponds to the fact that it acts as a sphincter).

☆ The inside of the lip: has mucosa filled with **minor** salivary glands.

☆ The characteristics of a section of the lip:

1. Connective tissue
2. Rich in blood vessels (that's why it is **reddish**)
3. Rich in nerve supply (that's why they are **very sensitive**; because there are large numbers of nerve endings)

☆ **The nerve supply for the lip:**

From outside, it gets sensory innervations from:

Branches of the Trigeminal nerve (cranial nerve number 5)

- Upper lip (& upper jaw) → Maxillary nerve
- Lower lip (& lower jaw) → Mandibular nerve

The oral cavity

Notice the: upper jaw, lower jaw, tongue & the posterior opening.

☆ **The Oropharyngeal isthmus**

On both sides of the opening we have **Palatine tonsils**;

- Their function is to do filtration of the foreign bodies that's why it is subjected to **Tonsillitis**. [specially affects **Children/frequently**]
- Found between 2 pillars (folds of mucosa) an **Anterior fold** and a **Posterior fold** [in which muscles are found]

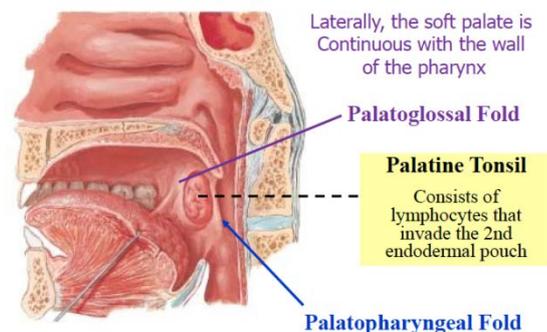
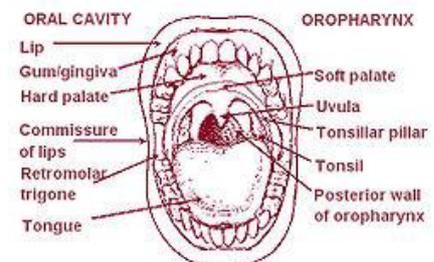
1. The palatoglossal fold [*anterior* one]: inside it we have the palatoglossal muscle.

2. The palatopharyngeal fold [*posterior* one]: inside it we have the palatopharyngeal muscle.

Note: these 2 muscles contract.

Remember that all the muscles of the facial expression are supplied by the **facial nerve (motor)**

- The Buccinators muscle, the Orbicularis Oculi & Orbicularis Oris.
- The Buccinator muscle : compresses the cheeks and the lips against the teeth (we use it when we whistle/blow)



The floor of the mouth it is composed of **the dorsum of the tongue**. On the other hand **The upper part** is composed of **the Hard palate**.

The hard palate ends by **the Soft palate**,
The soft palate ends by the **Uvula (اللهاة)**.

☆ **The mouth's parts:**

The mouth is divided into:

- The Vestibule
- The Mouth proper

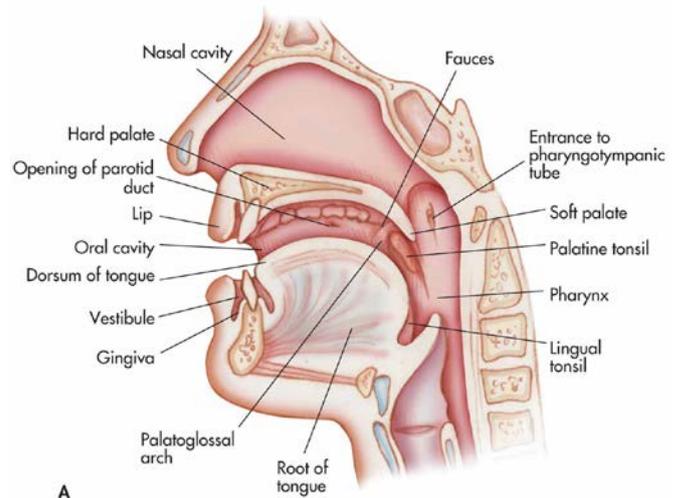
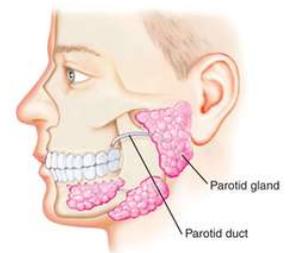
✦ **The Vestibule:**

- It is a space between the cheeks and outside the closed teeth.
- Boundaries : **Anteriorly** by lips
On the sides by the cheeks
- It is where you move the tooth brush to brush your teeth(the upper and lower jaw are closed).

Its importance: For the opening of the parotid gland.

More specifically, the duct of the parotid duct opens at the level of **the upper second molar tooth in the vestibule**.

Remember: the parotid gland is located behind the ear and its secretions reach the oral cavity-through the duct that opens in the vestibule-.



✦ **The Mouth proper:**

- It is the space inside the closed teeth
- **The Boundaries:** (could be a question)

Roof: *The Hard palate*

Floor: *Tongue*

Sides: *Cheeks*

Posteriorly: *The Fauces* [which leads to the pharynx]

The function: it is important in mastication (when we chew we close our mouth to exert pressure).

During **mastication** (المضغ), the food is grinded, a food bolus forms, then this bolus goes to the dorsum of the mouth after this, **deglutition** (البلع) happens (swallowing process) through the posterior opening to the pharynx.

- ✓ The vestibule & the mouth proper are connected through an opening which is located behind the last molar tooth (This proves that the secretions of the parotid gland enter the mouth proper).

The secretions go through the duct, and by this opening reach the mouth.

- ✦ The Frenulum: A fold of mucosa in the midline (lingual from the tongue), this structure appears when the tongue is raised.

[Remember: there are another 2 folds surrounding the palatine tonsils; Palatoglossal fold & Palatopharyngeal fold.]

- ✦ The lower teeth are embedded in the lower gingiva (the gum).

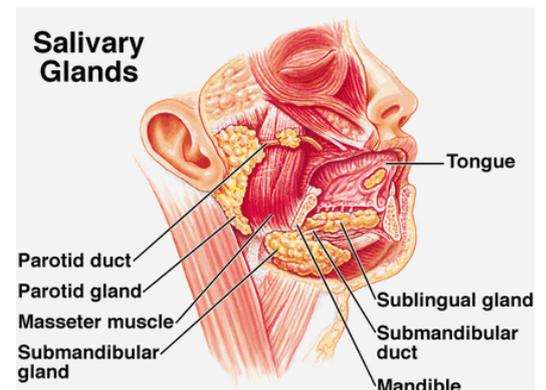
The gingiva is very hard; its mucosa is adherent to the periosteum of the bone, connected by hard connective tissue (I think what the doctor means here is dense connective tissue).

Unlike the mucosa surrounding the tongue, this mucosa is loose (it is elastic) and it is connected to the tongue by loose connective tissue.

- ✦ The sublingual gland: has an opening

- ✦ The submandibular gland has a papilla & it's duct opens in it.

The submandibular and the sublingual ducts open in the sublingual papilla which is located in the floor of the mouth (under the tongue).

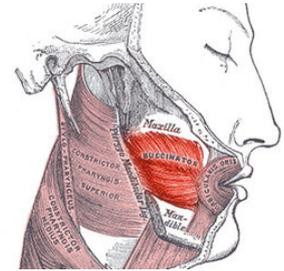


☆ The innervation of the mouth (the doctor said that it is important)

- ❖ **Roof**: Greater palatine nerve & Nasopalatine nerve which are branches of the *maxillary nerve*. [Remember: the upper jaw, the upper part of the mouth is supplied by branches of the maxillary nerve].
- ❖ **Floor**: Lingual nerve; a branch of the *mandibular nerve*. [the lower jaw, the lower part of the mouth is supplied by branches of the mandibular nerve].
- ❖ **The taste**
 - You should know that the taste is a special sensation; we have lingual papillae (also known as: taste buds) found on the dorsum of the tongue – (on the anterior 2/3 of the tongue).
 - The Chorda tympani (branch from the *facial nerve*) originate from them supplies them and send messages to the brain about the taste.

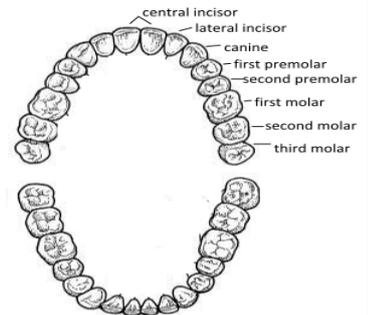
- ❖ The general sensation is supplied by the lingual nerve (from the mandibular nerve).
- ❖ The buccinators muscle: a muscle of the facial expression, we use it to blow .

- **Sensory:** The Buccal nerve (branch from the mandibular nerve) supplies the mucosa deep to the muscle.
- **Motor:** The Facial nerve



☆ Teeth:

Teeth are embedded in the gingival (the gum). [Remember: the gingiva is adherent to the periosteum of the bone and has tough connective tissue].



- **Types of teeth:**

	Deciduous(milk)	Permanent
Number	In children , they are 20: 10 in the upper jaw and 10 in the lower jaw	Adults , they are 32: 16 in the upper jaw and 16 in the lower jaw
Classification (in each jaw)	2 canine 4 incisors 4 molars	2 canine 4 incisors 4 premolars 6 molars
Eruption time	Occurs at 6 months -2 years (A 2 year old baby has all his milk teeth erupted)	6 years old *The central incisors erupt then the lateral ones
notes	Teeth of lower jaw appear first	The last tooth to erupt is the third molar (Wisdom tooth) It sometimes take longer time to erupt [17-30 years old], has complications associated with it, causes pain and may require surgical removal.

☆ The tongue

- The tongue is a muscular organ, it has a dorsal surface and a lower surface (the lower is attached to the floor of the mouth).
- The muscles forming the mouth are symmetrical on both sides, the nerve supply is paired (meaning that we have right and left nerve).
- The tongue is divided into 2 halves: Right & Left by a midline groove.

➡ It is also divided into: - Anterior two thirds (It is where the taste buds are found)
 - Posterior third

These 2 thirds are separated by:

1. Foramen cecum
2. Sulcus terminalis

In front of the sulcus terminalis we have circumvallate papillae:

- It is responsible for the tasting of *bitter*.
- **Found** in the anterior two thirds, but it **belongs** to the posterior third.

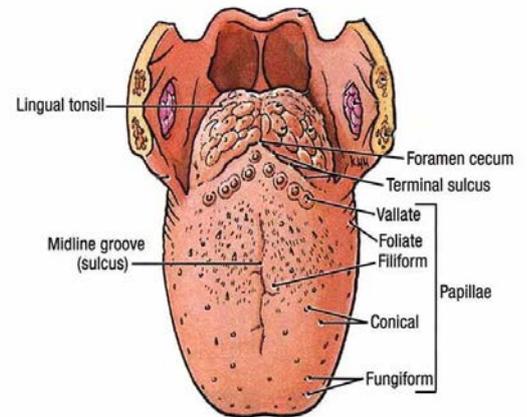


Fig 7.52 Agur & Dalley, Grant's Atlas of Anatomy, Lippincott, Williams & Wilkins, 2005

Differences between Anterior 2/3 and Posterior 1/3:- (important)

	<i>Anterior two thirds</i>	<i>Posterior third</i>
Embryology	Develops from: The <u>first</u> pharyngeal arch in the embryo	Develops from : The <u>third</u> pharyngeal arch in the embryo.
Innervation	General sensation: <u>Lingual nerve</u> The taste: <u>Chorda tympani</u> (of the facial nerve)	<u>Glossopharyngeal nerve</u> (motor and sensory)
Name	<u>The oral part</u> Because when a person opens his/her mouth the first thing we see is the anterior two third.	<u>The pharyngeal part</u>
Contents	Taste buds	Lymphatic lobules (has a lymphatic tissue and it doesn't have taste buds)
*Notes		The pharyngeal part cannot be seen because it is directed backwards and posterior toward the pharynx – but if we use a tongue depressor we can see the posterior wall of the pharynx and the pharyngeal part.

☆ The mucous membrane:

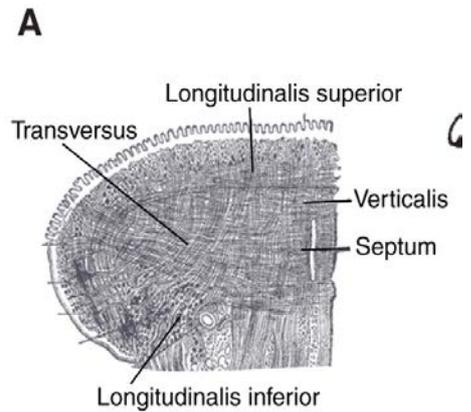
1. on the lower surface

- ✓ It is loose (it moves)
- ✓ Type: Stratified squamous non- keratinized epithelium .

Pay attention to the differences in the type of epithelium

2. on the dorsum surface

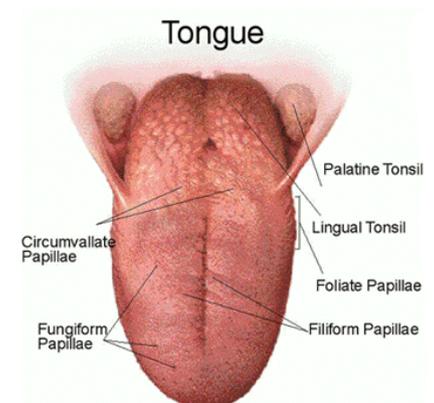
- ✓ Has taste buds
- ✓ The mucosa is adherent to the muscles and connective tissue.
- ✓ Type: the Parakeratinized epithelium (it is NOT keratinized)
(This epithelium is subjected to injury and can regenerate; so its type changes), the doctor kept saying Parakeratinized don't forget!



☆ Taste buds

There are 2 types of taste buds:

1. Circumvallate papillae :
 - 8-12 in number
 - Responsible for tasting of bitterness.
2. Filiform papillae & Fungiform papillae:
 - Anterior
 - Responsible for tasting in general.



Taste

- ❖ Tip of the tongue: Sweet
- ❖ The edges : Sour & Salt
- ❖ Posterior: Bitter (it is a common mistake that patients put medication directly on the bitter part.)

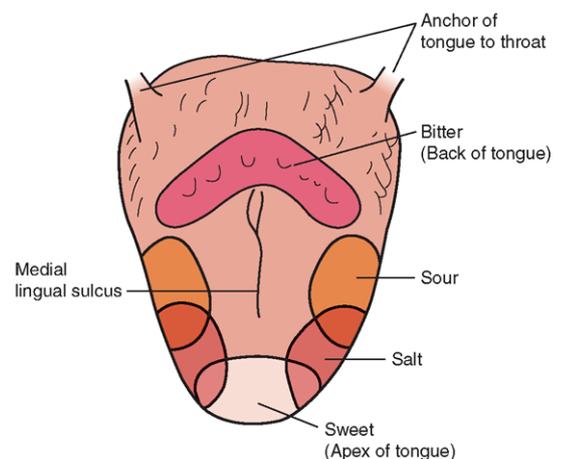
☆ The muscles of the tongue

- Intrinsic muscles
- Extrinsic muscles

The intrinsic muscles:

They are four muscles, their fibers go in different directions; they are named according to the direction of their fibers:

1. Longitudinal muscle → longitudinal fibers
 2. Transverse muscle → transverse fibers
 3. Oblique muscle → oblique fibers
 4. Vertical muscle → vertical fibers
- ❖ Supplied by :
 - ✓ Hypoglossal nerve (cranial nerve #12) [all muscles]
 - ❖ Responsible for changing the shape and the size of the mouth; hence they help in speech.



The extrinsic muscles:

The name indicates the origin

Four striated muscles, they come from outside.

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

❖ Supplied by :

✓ [Hypoglossal nerve](#)

Important notes:

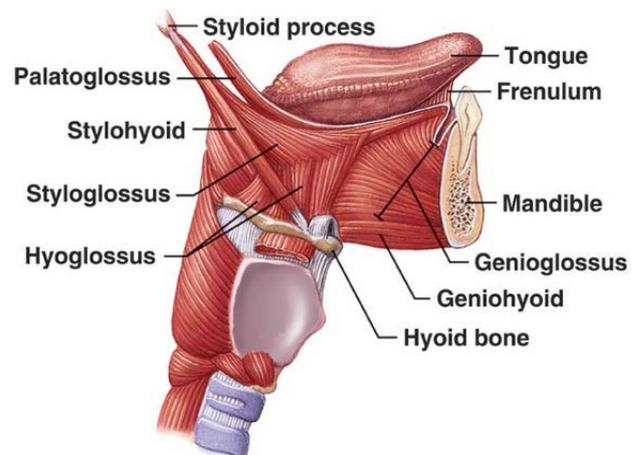
1. All the intrinsic and extrinsic muscles are supplied by the hypoglossal nerve **EXCEPT the Palatoglossus muscle.**
 - ✓ It is supplied by the [Pharyngeal plexus](#), and the [Vagus nerve](#) (the cranial part of the accessory nerve)
2. Many muscles are involved in the process of **protrusion**. However the most important muscle in this process is the [Genioglossus muscle](#).

- The Genioglossus muscle :

It is innervated by the hypoglossal nerve; it originates from the superior mental spine (Genial tubercle) from the mandible, and then goes to the floor and dorsum of the mouth from backwards.

It's course is important in its function because when this muscle contracts it pushes the tongue outside of the mouth.

The tongue goes out straight; hence both sides of the mouth (right and left) work together. [The muscles are symmetrical and the innervation is paired].



Clinical importance of this muscle:

Pay attention to the innervation.



Injury of the hypoglossal nerve

The Genioglossus muscle helps us in the diagnosis of the injury of the hypoglossal nerve .How?

We said that the Genioglossus muscle is responsible for protrusion (sticking out) the tongue. When it contracts the tongue goes out **straight** [because the innervation is paired and the muscles are symmetrical on both sides].

However, the injury of the hypoglossal nerve on either side will lead to the deviation of the tongue to the paralyzed side because the paralyzed side doesn't work and the innervation is no longer paired.

So injury of Hypoglossal nerve → Deviation of the mouth to the paralyzed side.

(To the test its function, you ask the patient to stick his/her tongue out)

☆ The Palate:

- Hard palate
- Soft palate
- Uvula: A muscular structure present in the midline of the soft palate (اللهاة)

➔ The Hard palate :

- It is composed of 2 parts :
 - ✓ Palatine part
 - ✓ Maxillary part
- It is formed by 2 bones:
 - ✓ Palatine process of maxilla
 - ✓ Horizontal plate of palatine bone
- The mucosa is adherent by **Dense connective tissue**.

➔ The soft palate: (extremely important)

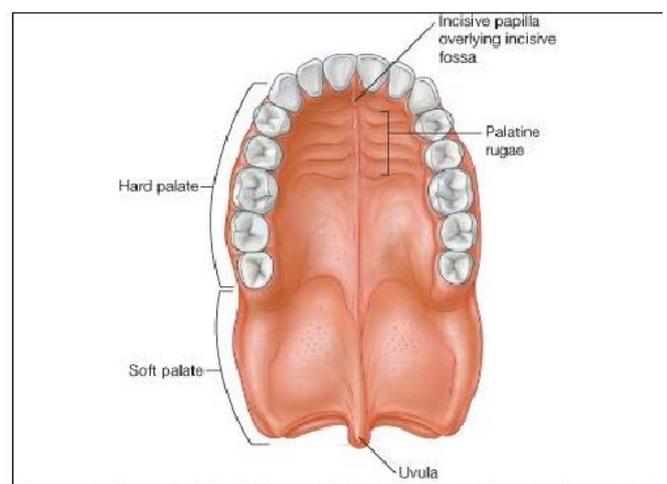
- ✓ **Posterior Palatine Tendon:** it is a tendon that emerges from the palatine process – which is located posteriorly.
- ✓ **The Tensor Veli Palatini muscle :** it is one of the muscles of the soft palate, we have one on the right and one on the left and together they form a tendon which is called **palatine tendon**

Note: the continuation of this tendon forms **the uvula**.

- The mucosa on the soft palate is **loose and elastic**.

The Palatine aponeurosis:

1. It is a fibrous sheath attached to the posterior border of the hard palate.
2. It is an expansion on the tendon of **Tensor veli palatini muscle**.



➔ Muscles of the soft palate:

There are 5 muscles; these muscles are closely related to the tendon of the **tensor veli palatini muscle**.

Relations: *two* of these muscles are inserted in the tendon; the *other three* originate from the tendon.

1. Tensor veli palatini muscle.
2. Levator veli palatini muscle (elevates to the soft palate).
3. Palatopharyngeus muscle.
4. Uvulae

Note: The **Palatopharyngeus** muscle & the **Uvulae** do folds on both sides of the palatine tonsils.

A student asked which muscles are inserted in the tendon and which takes origin?

- The muscles coming from above are they take origin from the tendon (what are these muscles) according to its name

Innervation of the muscles

- **The Pharyngeal Plexus.**
- **EXCEPT,** The Tensor Veli Palatini muscle which is innervated by the stimulation of **Mandibular Nerve.**

Read the origin and the insertion.

The movement of the soft palate

The soft palate is present between the nasopharynx and the oropharynx. It is normally relaxed, hence to allow the air that comes from the nose to go directly to the pharynx and then to the larynx. And also the air coming from the oral cavity goes to the pharynx and then to the larynx.

However, the soft palate changes from relaxed in 2 cases:

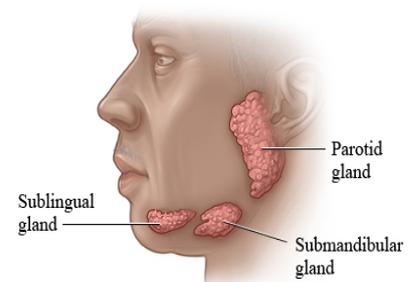
1. It shuts down and becomes contracted (مشدود) in:
 - ✓ Mastication because we need high pressure in the oral cavity so it becomes closed and descends downwards
2. It is raised up in the case of vomiting, in order to prevent the vomit from getting out through the nose and instead to get out through the mouth, so it shuts the nasopharynx.
3. In the articulation for the pronunciation of certain letters that have a nasal sound. It lets the air reach the nose (not a complete closure)
Example : when you pronounce "N".

NOTE : The movements of the soft palate are important, you should know when it is relaxed, when it closes the oropharynx and when it closes the nasopharynx .

Nerve supply of the soft palate:

Branches of the maxillary nerve:

- **Greater palatine nerve:** it emerges through the greater palatine foramen (along with the greater palatine artery).
- **Lesser palatine nerve:** emerges through the lesser palatine foramen.



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The salivary glands:

There are 3 pairs of salivary glands present in the mouth:

- ❖ 2 Parotid glands
- ❖ 2 Submandibular glands (mixed)
- ❖ 2 Sublingual glands

Relations:

1. All are related to the mandible:
 - ✓ The parotid gland is related to the **ramus of the mandible** from outside.
 - ✓ The submandibular gland is related to the **body of the mandible (submandibular fossa inside the body)**.
 - ✓ The sublingual gland.
2. The sublingual gland & the submandibular gland are separated by the **mylohyoid muscle & mylohyoid line**.

Mylohyoid muscle:

- Originates from the Mylohyoid line
- It composes the floor of the oral cavity

➤ Parotid gland

- Serous secretion.
- It has a duct that emerges from the anterior border of the gland, takes a steep turn at the boarder of the masseter and passes through the buccinators muscle opening into the vestibule of the mouth at the level of upper second molar, on this duct we can find a small gland which is called **the accessory parotid gland** .

The **contents** of the parotid gland:

1. The external carotid artery and its terminal branches: (The deepest structure)
2. [Superficial temporal artery](#) and the [maxillary artery](#) (the terminal branches of the external carotid artery).
3. [Superficial temporal vein](#) (coming superficially) and the [maxillary vein](#) together they form the [retromandibular vein](#) which comes in the middle.
4. [Facial nerve](#). (Most superficial structure)
5. [Auriculotemporal nerve](#) (branch of the [mandibular nerve](#), which is *the nerve supply for this gland*)
6. [The parotid lymph nodes](#).

The most superficial structure	Facial nerve
The middle	Retromandibular vein
The deepest	External carotid artery

⇒ **The facial nerve:**

- Divides the gland into superficial and deep parts
- it gives off 5 branches inside the gland
 - T: temporal
 - Z: zygomatic
 - B: buccal
 - M: mandibular
 - C: cervical

(The most dangerous thing in a parotid operation is the chance of cutting of one of the branches of the facial nerve, because if any branch is cut then the muscles innervated by this branch will become paralyzed.)

Innervation of the parotid gland:

- Sensory and secretomotor : [Auriculotemporal nerve](#)
- The Parasympathetic: [Glossopharyngeal nerve](#) (it begins from the inferior salivary nucleus in the medulla oblongata).
- The Pre-ganglionic nerve: [Lesser petrosal nerve](#)
- The Ganglia is called the [otic ganglia](#) (which is found in the *infratemporal fossa*)
- The Post-ganglionic: [Auriculotemporal nerve](#) (it carries post ganglionic parasympathetic nerve)
- The Sympathetic: Comes from the [superior cervical sympathetic ganglia](#) by the blood supply.

➤ The Submandibular gland

- Secretion: mucus & serous
- It is composed of 2 parts:
 - Superficial part
 - Deep part

The Superficial part :

- ✓ Has a depression (a fossa in the mandible)

The Deep part:

- ✓ Located between 2 muscles which are the mylohyoid & hypoglossus muscles

The gland has a duct that opens in the floor of the mouth in the [submandibular papilia](#) under the tongue.

Parasympathetic innervation: Chorda tympani to the Submandibular ganglia.

There are 5 structures that passes from it which are:

1. Submandibular gland (deep part)
2. Submandibular ganglia
3. Hypoglossal nerve
4. Lingual nerve
5. Submandibular duct

Some important relations:

- The parotid bed;

We notice that the parotid gland is found in front of the ear, over the ramus, overlies the sternocleidomastoid muscle.

However its parotid bed composed of:

1. Posterior belly of digastric muscle
 2. The stylohyoid muscle
 3. internal carotid artery and external carotid artery
 4. The last 4 cranial nerves
 5. The internal jugular vein
-

- The facial artery does a groove on its posterior border and gives it **blood supply**.
- Has a duct.

➤ The Sublingual gland

- Found under the tongue
- It has a fold
- Secretion: mucus
- Has many ducts which opens in the submandibular duct

Most important thing:

Medial relation

1. Lingual nerve
2. Submandibular duct
3. Genioglossus muscle and the parasympathetic submandibular ganglia are going to the submandibular gland.

There are multiple photos in the slides showing the relation focus on the one which shows **the relation between the lingual and submandibular gland.**

(It has a triple relation).

The lingual nerve is lateral then bellow then becomes medial to the duct.

Special thanks to all the people that supported me while writing this sheet.

Sorry for any mistakes

Best of luck everyone enshalah.

ما زلتُ حياً في مكان ما، وأعرفُ ما أريدُ ... سأصيرُ يوماً ما أريدُ-محمود درويش.

Written by Haya O. Karameh