Anatomy

● Sheet ○ Slide

number	1
Done by	Haya Karameh
Correction	Yaman Jarrar
Doctor	Mohammad Al- Muhtaseb

The Digestive system

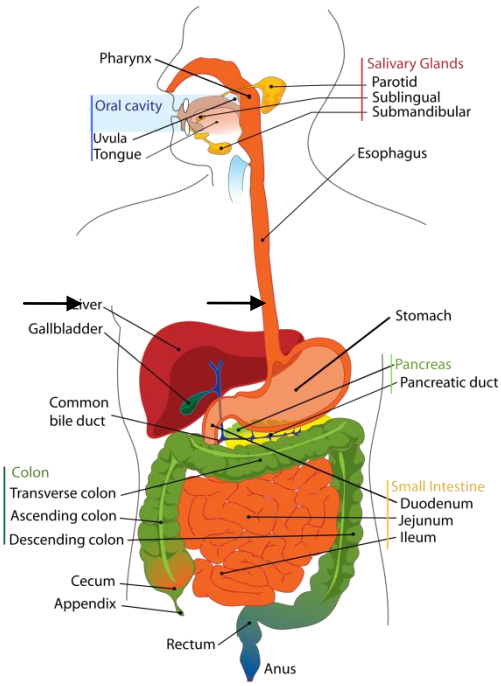
As you all know you should also study the slides as the sheet alone is not enough. Best of luck.

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 and finally the 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:**

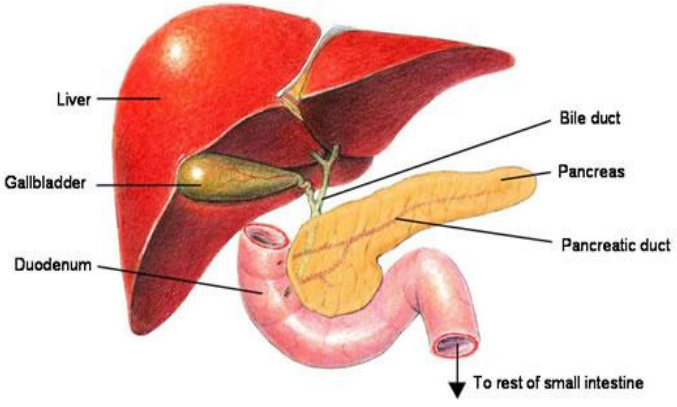
- **The liver**
- **The gallbladder**
- **The pancreas**
- **The salivary glands3**

-Both liver and the gallbladder have a duct which is called (Common Bile duct), this duct opens at the second part of the duodenum.

-The pancreas is found in the posterior abdominal wall and 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 secretion)**

  (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(a watery secretion)
3. Mixed gland	Both serous and mucous secretion

Glands in the GI

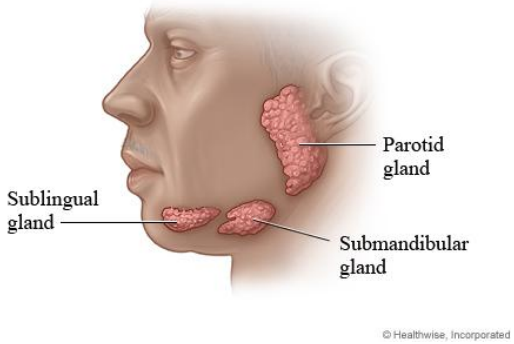
➡ **In the GI tract we have 3 pairs of large salivary glands, and there are serous, mucous and mixed glands:**

1. The parotid gland (which is found in front of the ear) ⟶ serous gland

2. The submandibular gland ⟶ mixed gland

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:

- **an anterior opening (The mouth)**
- **a posterior opening (Fauces also known as the Oropharyngeal Isthmus)**

➡ The mouth [lips and Fauces, floor of the mouth]

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

Between the upper lip and the lower lip we have the anterior oral orifice.

After mastication of the food, deglutition of the bolus occurs. Then it goes to the posterior opening of the oral cavity.

Deglutition: the action of swallowing.

Bolus: the shape of the food after mastication.

➡ 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; differences from inside and the outside

- **Outside: Each lip (both the upper and the lower) are covered by skin, the type of epithelium here is stratified squamous keratinized. In which we can find hair follicles, sebaceous glands and sweat glands.**
- **Transitional zone: it is called the red zone because it contains large number of vessels and nerve terminals, the type of epithelium here is modified skin(no keratin) because we can't find hair follicles, sebaceous glands and sweat glands.**
- **Inside we have 2 things :**
  1. **A muscle: Orbicularis oris**
  2. **The mucosa (the place where there are glands)**

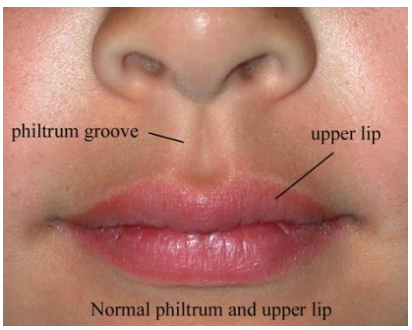
Pay attention to the differences in the type of epithelium

1. The orbicularis oris muscle: forms the lips from inside, 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. And large number of minor(labial) glands

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

The lips



☆ **We have 2 lips; upper one and a 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.**

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 mouth's parts:

The mouth is divided into:

- **the vestibule**
- **the mouth proper**

✧ The Vestibule:

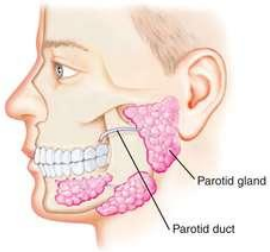
- **It is a space between the cheeks,lips and the closed teeth.**
- **Boundaries : Anteriorly by lips**
  On the sides by the cheeks
- **It is where you move the tooth brush to brush your teeth(the upper and lower jaw are closed.**

Its importance: it is that 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.

It also contains minor glands.

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



✧ The mouth proper:

- **Is the cavity inside the closed teeth**
- **The Boundaries: (could be a question)**
  Roof: the Hard palate
  Floor: the tongue
  Sides: the teeth.
  Posteriorly: the fauces [which leads to the pharynx)

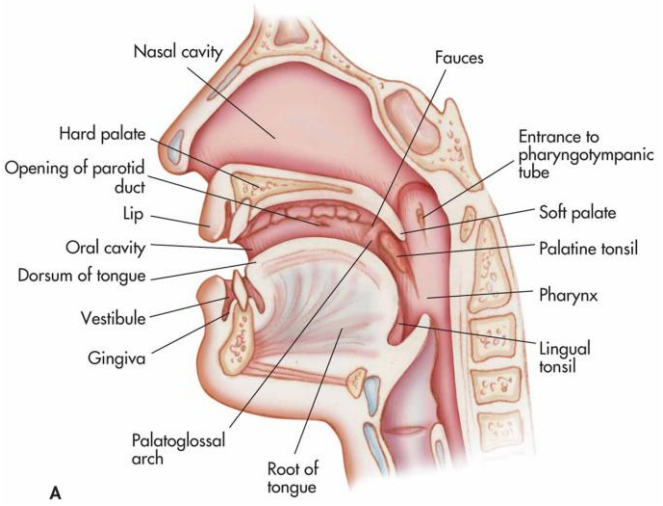
The function: it is important in mastication (when we chew we close our mouth to exert pressure).

During mastication, the food is grinded, a food bolus forms, then this bolus goes to the dorsum of the mouth after this, deglutition happens through the posterior opening to the pharynx.

- ✓ **The vestibule and 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 Oropharengeal isthmus(posterior opening)



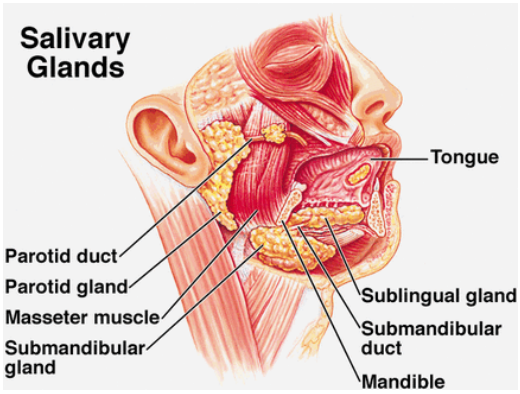
On both sides of the opening we have Palatine tonsils.

- **Their function is to do filtration of the foreign bodies that's why it is subjected to Tonsillitis.[specially affects Children/frequently].**
- **are 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 that: these 2 muscles contract.



The floor of the mouth it is composed 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).

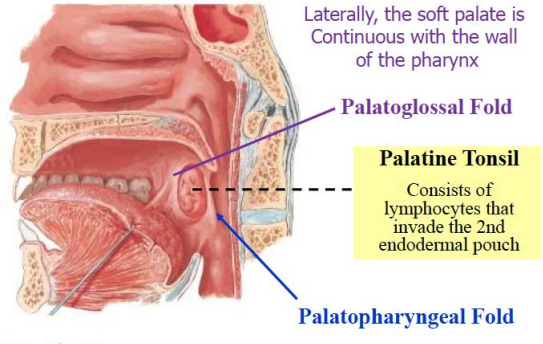
✧ **The Frenulum: is a fold of the mucosa in the midline (lingual from the tongue), this structure appears when the tongue is raised.**

Under the tongue, the submandibular gland has a papilla and its duct opens in it.

The mucosa inside the oral cavity is stratified squamous non-keratinized

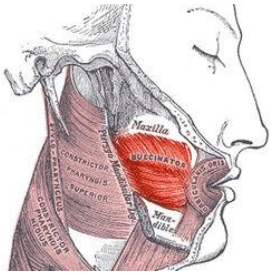
✧**The lower teeth are embedded in the lower gingiva (the gum).**

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



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

- ❖ **Roof: Greater palatine nerve and 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: supplied by the lingual nerve; a branch of the mandibular nerve [the lower jaw, the lower part of the mouth is supplied by branches of the mabdibular nerve].**

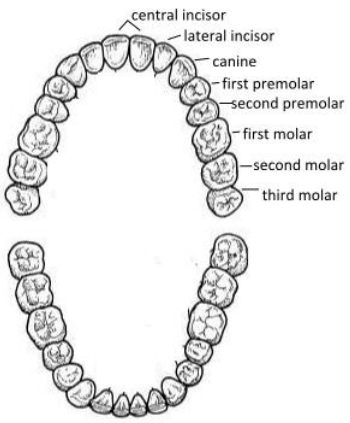
[the lingual nerve is the general sensation for the oral cavity like pain, temperature and touch]

- ❖ **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 – particularly on the anterior 2/3 of the tongue.**
  - **The Chorda tympani (a branch from the facial nerve) originate from them supplies them and send messages to the brain about the taste.**

- ❖ **The buccinators muscle: a muscle of the facial expression, we use it to blow .**
  - **Sensory: the Buccal nerve (a branch of the mandibular nerve) supplies the mucosa deep to the muscle.**
  - **Motor: the muscle itself is supplied by the facial nerve (buccinator nerve).**

☆Teeth:

Teeth are embedded in the gingival (the gum).



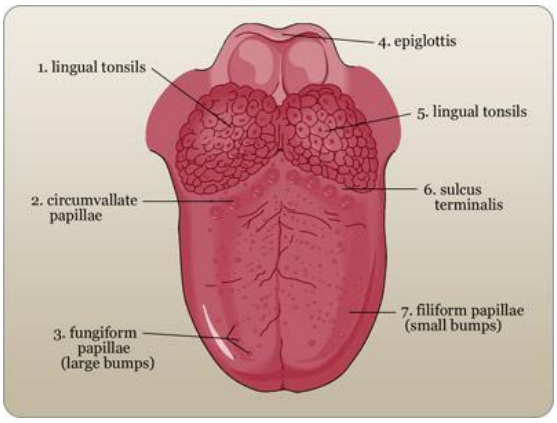
- **types of teeth:**

	Deciduous(milk)	Permanent
Number	In children , they are 20: 10 in the upper jaw and 1o 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 years -30 years old], has complications associated with it , cause pain and may require surgical removal

The gingiva is very hard(fibrous connective tissue) its mucosa is adherent to the periosteum of the bone. 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 tongue

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



- **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.**
- **It is found in the anterior two thirds but it belongs to the posterior third .**

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

	Anterior two thirds	Posterior third
Embryology	Develops from: The first pharyngeal arch in the embryo	Develops from : The third pharyngeal arch in the embryo
Innervation	General sensation : the lingual nerve The taste :chorda tympani of the facial nerve	Glossopharyngeal nerve (motor and sensor)
name	The oral part Because when a person opens his/her mouth the first thing we see is the anterior two third.	The pharyngeal part
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

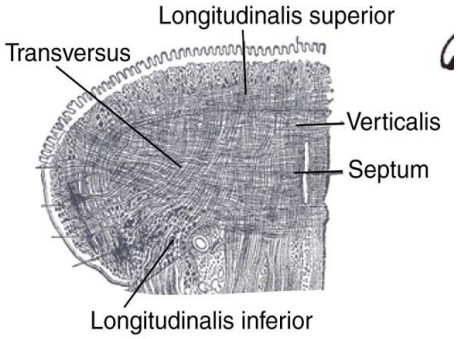
- ✓ It is loose (it moves)
- ✓ Type: Stratified squamous non- keratinized epithelium .

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!

A

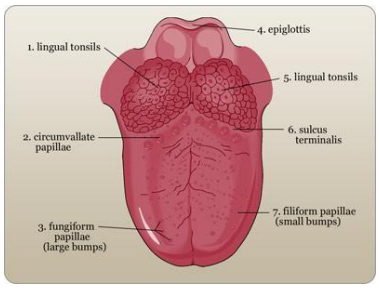


Picture showing

- ✓ **Sulcus terminalis [postetior to it we have the lingual tonsil)]**
- ✓ **anterior 2 thirds**

☆ Taste buds

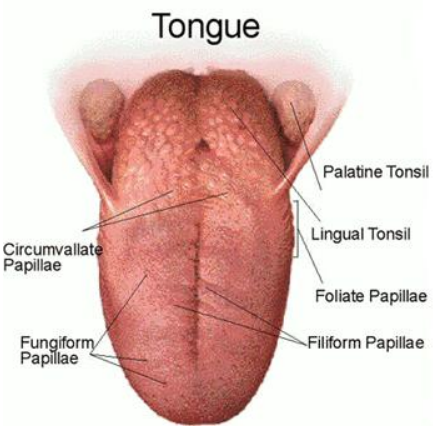
There are 2 types of taste buds: we are going to take



1. **<u>Circumvallate papillae</u>:**
   - **8-12 in number**
   - **responsible for the tasting of bitter**
2. **<u>Filiform papillae</u>, <u>fungiform papillae:</u>**
   - **found on the anterior**
   - **responsible for tasting in general.**

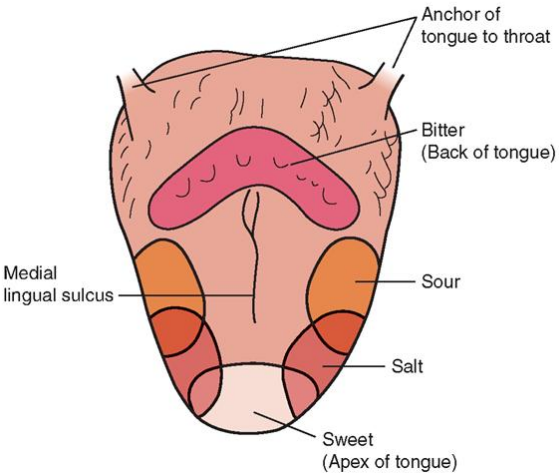
Taste

- ❖ **on the tip of the tongue: sweet**
- ❖ **The edges: the sour**
- ❖ **Salt**
- ❖ **Bitter (it is a common mistake that patients put medication directly on the bitter part.)**



☆ The muscles of the tongue

- **Intrinsic muscles**
- **Extrinsic muscles**



<u>The intrinsic muscles:</u>

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 :**
  - ✓ **the Hypoglossal nerve (cranial nerve #12) [all muscles]**
- **Responsible for changing the shape and the size of the tongue ; hence they help in speech.**

The extrinsic muscles:

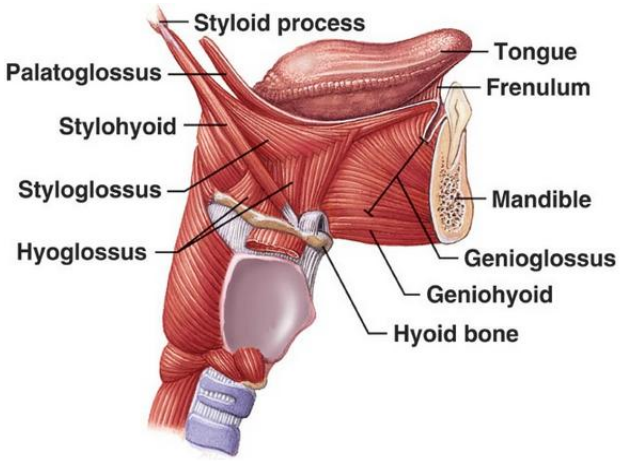
Four striated muscles, they come from outside.

The name indicates the origin

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

- **Supplied by :**
  - ✓ **The hypoglossal nerve**

The extrinsic muscles are responsible for the movement of the tongue.



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)**

The doctor said that everyone should read the origin and the insertion of these muscles

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.

Its 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)

-Arterial supply: The lingual artery, the tonsillar branch of the facial artery, and the ascending pharyngeal artery supply the tongue

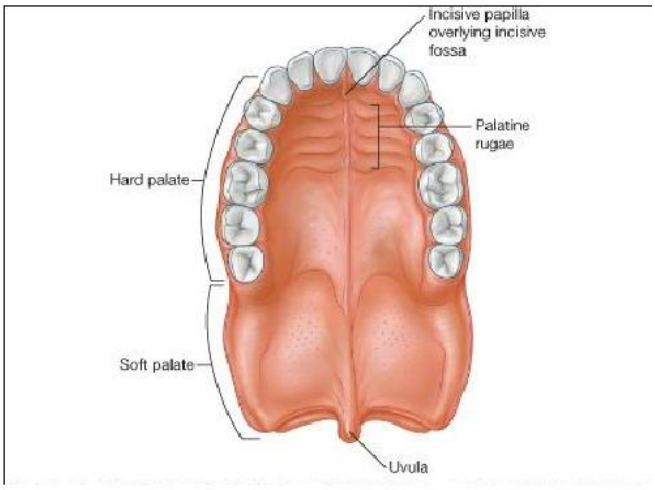
-venous drainage: into the internal jugular vein.

-lymphatic drainage:

1-Tip: Submental lymph nodes

2-Sides of the anterior two thirds: Submandibular and deep cervical lymph nodes

3-Posterior third: Deep cervical lymph nodes



☆

The palate:

- Hard palate
- Soft palate

- **the Uvula: is a muscular structure present In the midline of the soft palate (اللهاة)**

➡ **The Hard palate :**

- **It is composed of 2 parts :**
  - ✓ **The palatine part**
  - ✓ **Maxillary part**

- **It is formed by 2 bones:**
  - ✓ **Palatine process of maxilla (anteriorly)**
  - ✓ **Horizontal plate of palatine bone(posteriorly)**
- **The mucosa is adherent by Dense connective tissue.**
- **Contains:**
  1-anteriorly: the incisive foramen that opens to the nasal cavity
  2-on both sides: the greater and lesser palatine foramen [greater and lesser palatine nerve and vessels passes through it]

➡ **The soft palate: (extremely important)**

The soft palate is a mobile fold attached to the posterior border of the hard palate.

Its free posterior border presents in the midline a conical projection called the uvula.

The soft palate is continuous at the sides with the lateral wall of the pharynx.

The soft palate is composed of mucous membrane, palatine aponeurosis, and muscles.

The mucous membrane covers the upper and lower surfaces of the soft palate.

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. Musculus Uvulae

Note: the palatopharyngeus muscle and the Uvulae do folds on both sides of the palatine tonsils.

Origin and insertion Slide 20+21

Innervation of the muscles

- **The pharyngeal plexus**
- **EXCEPT, the tensor veli palatini muscle which is innervated by the stim of mandibular nerve .**

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.**

Blood Supply of the Palate: The greater palatine branch of the maxillary artery, the ascending palatine branch of the facial artery, and the ascending pharyngeal artery.

Lymph Drainage of the Palate: Deep Cervical Lymph Nodes.

The End