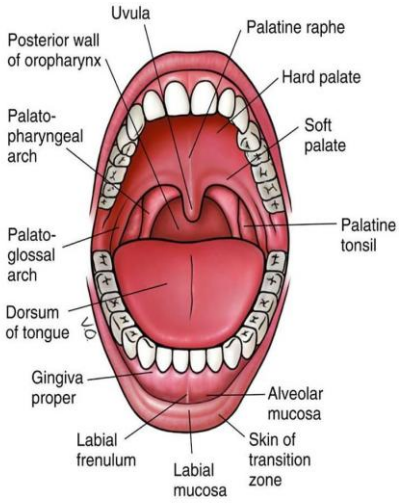
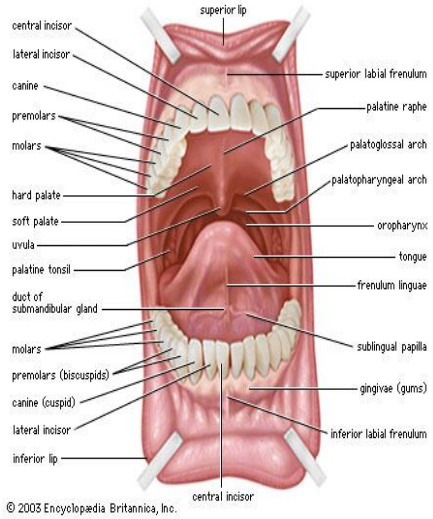
بسم الله الرحمن الرحيم

Today we will talk about digestive system in the head & neck

We have the mouth , teeth , tongue , palate & salivary glands all of these are included in this lecture

*First we will start with the mouth or oral cavity :





* It has two openings: anterior & posterior.

A) The anterior opening :

lies between the upper & lower lips , the core of lips is formed by orbicularis oris muscle that is innervated by facial nerve (7^{th} CN) , the superior or upper lip has vertical fold which is the philtrum that comes from the development of the face in the embryo

* The lips have 3 zones:

1) Outer zone: that is covered by skin (stratified squamous keratinized epithelium)

2) Transitional or vermilion zone: red zone, modified skin without sebaceous glands or hair

3) Inside zone: is covered by stratified squamous non-keratinized epithelium which contain labial glands (minor glands)

B) The other opening in the oral cavity is the posterior opening (the fauces) :

It leads to the pharynx "oropharynx"

We have boundaries for the oropharngeal isthmus (the fauces): above which we have soft palate, in the floor we have the posterior one-third of the tongue (pharyngeal part of the tongue) , also has palatine tonsils on each side or lateral side (they usually get inflamed in

children) , the tonsil lies between two fold , anterior fold (palatoglossal fold) & posterior fold (palatopharngeal fold)

* The oral cavity is divided into two part: 1) vestibule 2) mouth proper

1)Vestibule:

It is a space between the cheeks (laterally on both sides), lips (anteriorly) & closed teeth, (like when you use the Toothbrush you will put it in your vestibule)

It is important due to the fact that it receives the parotid duct & opens in it at the level of upper second molar tooth

2) Mouth proper:

It is the space inside the closed teeth & it has boundaries: the roof is formed by hard palate (anteriorly) & soft palate (posteriorly), floor is formed by dorsum of the tongue & floor of the mouth or mucosa of the oral cavity, on each side we have cheeks and skin.

Cheeks is composed from outside by skin (stratified squamous keratinized epithelium) while from inside it is (stratified squamous non-keratinized epithelium) & between them there is buccisnator muscle which is innervated by facial nerve & it`s needed for blowing

* So if a patent came with facial palsy he/she won`t be able to blow in the injured area.

We have connection between the vestibule & mouth proper after the last molar tooth

Also in the midline of the under surface of tongue we have a fold of mucosa connected to the floor of the mouth called frenulum& at the base we have submandibular papilla (the opening of submandibular duct)

So mouth proper receives opening of other glands (like submandibular & sublingual glands) –the vestibule receives the parotid duct.

<u>the secretion of the glands is needed for :</u>

1) formation the polus after eating, to go to the dorsum of the tongue for deglutition

2) Moistening of the mouth (glands produce about 0.5 – 1.5 L of saliva per day in the mouth to moist it) this is important because dryness will cause infection & difficulty to speak

The mucous membrane of the mouth on the hard palate is Para- keratinized & connected by dense connective tissue while in the mucosa of the cheeks, it is non- keratinized & connected by loose connective tissue

* Sensory innervation of the mouth:

(The doctor said that it is important subject & if he wants to put question about the mouth it will be on this subject)

We have general rule that include that the innervation of the upper jaw is from maxillary nerve while the lower jaw is by the mandibular nerve

1) Roof: by greater palatine & nasopalatine nerve of the maxillary division of the trigeminal nerve (5th CN)

2) Floor: it is by lingual nerve a branch of mandibular division of the trigeminal nerve (5th CN)

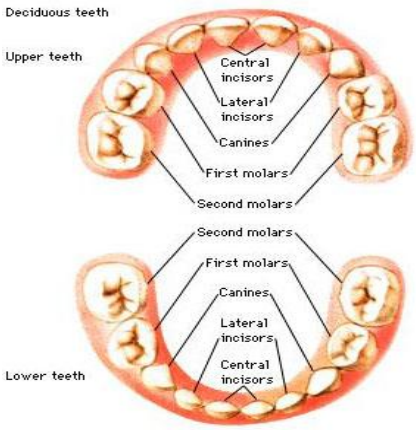
& this is for general sensation (touch, temperature & pain)

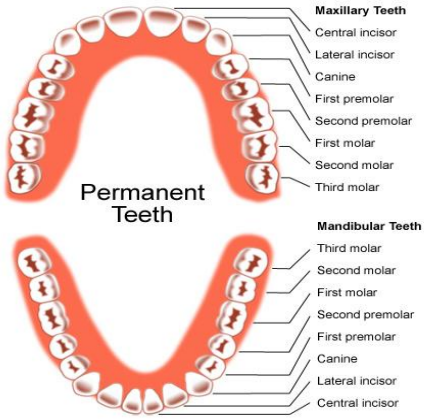
3) For taste: (special sensation)

Through chorda tympani a branch of facial nerve for the anterior 2/3 of the tongue while the posterior 1/3 is by the glossopharngeal nerve (9th CN)

4) Cheeks: outside is innervated by facial nerve but from inside is innervated by buccial branch of mandibular division of the trigeminal nerve

*Secondly, teeth:





They are important for grinding the food

Masseter muscle is the strongest muscle in our body.

* **We have two types of the teeth:**

(Both exist in the gingivae (gum) that have socket in the gum for them)

1) Deciduous teeth (milky teeth) 2) Permanent teeth

1) Deciduous teeth (milky teeth): they are 20 in number, divided into 10 in the upper jaw & 10 in the lower jaw

In each jaw we have: 4 incisores, 2 canines & 4 molars

They start to erupt at 6 month after birth until 2 years of age & the teeth of the lower jaw erupt before the teeth of upper jaw especially the incisores

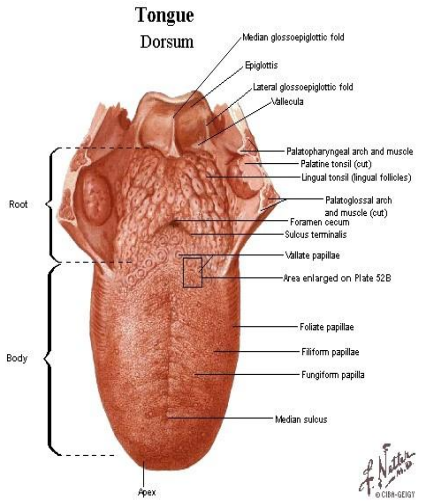
2) Permanent teeth: they are 32 in number, divided into 16 in the upper jaw & 16 in the lower jaw

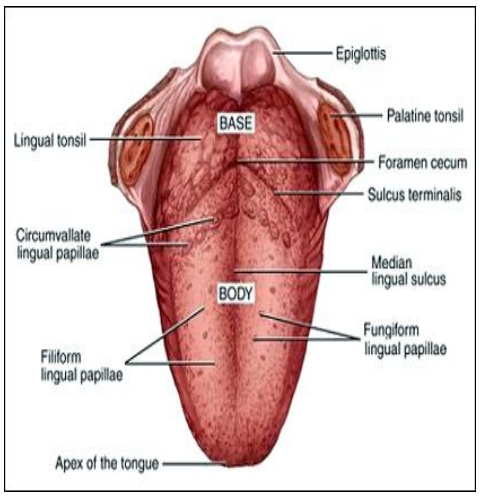
In each jaw we have: 4 incisores, 2 canines, 4 premolars & 6 molars

They displace the deciduous teeth after 6 years until 12 years of age, but we have an exception which is the Wisdom tooth (last molar) that erupt between the age of 17-33 (it doesn`t have a rule, sometime it erupt early, sometimes late, sometimes doesn`t erupt & sometime it cause infection & it must be eradicate) it cause a lot of problems

There is other important function of the permanent teeth beside grinding food which is the Vowels (lingual Vowels) like the letter (L)

* Thirdly, the tongue:





It is a muscular organ present in the oral cavity that have tip, edges & root that it is attached to the floor of the oral cavity

The tongue is divided by mid sagittal line into 2 symmetrical halves: right & left (it means that both halves have the same muscles on its side), also the tongue is divided into anterior 2/3 & posterior 1/3

The anterior 2/3 in embryo it belong to the first pharyngeal pouch so innervated by chorda tympani of facial nerve while the posterior 1/3 it belong to the third pharyngeal pouch or arch & it is supplied by glossopharyngel nerve

The land mark that divides the tongue into anterior & posterior aspect is foramen cecum (which comes from the development of the thyroid gland) & on the right & left side we have sulcus terminalis

In the anterior 2/3 we have filiform papillae, fungiform papillae & circumvallate papillae (different type of lingual papillae) that contain taste buds, so taste buds are present in the anterior 2/3 of the tongue not the posterior 1/3

Taste buds areinnervated by chorda tympani a branch of facial nerve except circumvallate papillae which is innervated by glossopharyngel nerve (it belongs to the posterior 1/3 in embryonic development)

Circumvallate papillae is responsible for Bitter taste, tip of the tongue is responsible for sweet taste & the edges of the tongue is responsible for salt & sour taste

one of the mistakes that patent do when they take their medication is by placing the drug on the back of the tongue , in order to avoid the bitter taste of the drug which is where circumvallate papillae are , so they actually put them in the place that is responsible for Bitter taste which is a wrong thing to do if you want to avoid the bitter taste.

Posterior 1/3 is devoted of taste bud but it contains lymphatic nodules (lingual tonsils) & on the sides we have palatine tonsils

Dorsum of the tongue contains stratified squamous Para-keratinized epithelium (neither keratinized nor non-keratinized) which is different than that of the lower surface which is non-Keratinized

Foliate papillae: it is more evident in animals & it is rudimentary in the human

Filifom papillae: is devoted from taste buds but the other papillae contain taste buds

Muscles of the tongue:

We have 2 types of muscles: 1) Intrinsic muscles 2) Extrinsic muscles

1) Intrinsic muscle: it means that it has muscle fibres running different directions (vertical, oblique, longitudinal ...), it is supplied by hypoglossal nerve (12^{th} CN), this muscle changes the shape of the tongue (alter it)

2) Extrinsic muscles: it means that they have origin outside the tongue like the bone of the skull or other bones & insertion in the tongue

examples : styloglossus which originate from styloid process of the skull , palatoglossus which originate from palate , hyoglossus which originate from hyoid bone & genioglossus which originate from superior genial tubercle of the mandible

Extrinsic muscles are supplied by hypoglossal nerve except the palatoglossus muscle that is supplied by cranial accessory through the vagus.

The doctor said that we have to memorize all the muscles of the tongue (their origin, insertion, nerve supple & action)

*Movement of the tongue:

Protrusion, retraction, depression, retraction &elevation & shape changes

Genioglossus muscle is the most important clinically due to the fact that it is responsible for protrusion of the tongue (because it`s origin is from superior genial tubercle of the mandible

& it`s insertion at the bottom & back of the tongue so when it contract, it will pull the tongue from posterior to anterior & it will get out of the oral cavity)

This is important in diagnose the hypoglossal nerve injure , if a patent came with right hypoglossal nerve injure (first you will examine the tongue by looking at it to see any change in the shape of the muscle due to shrinkage of the muscles , after that we ask from the patent to protrude his/her tongue outside , if the tongue is normal it will protrude in straight manner but if it is injured it will be deviated to the injured (paralyzed) side because the injured muscle won`t be able to pull the tongue like the normal muscle

Innervation:

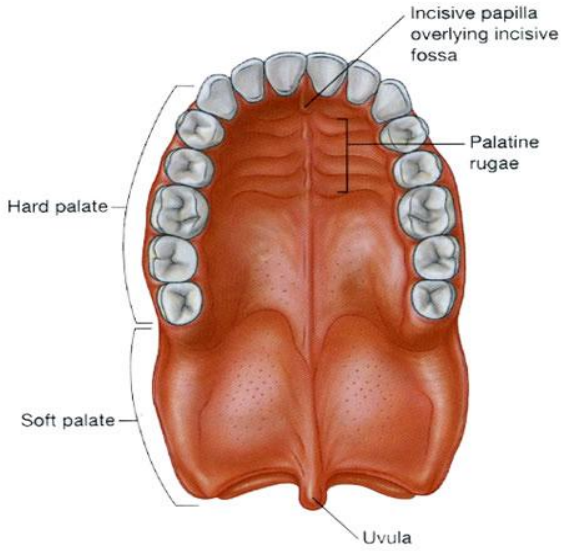
Motor by hypoglossal nerve except the palatoglossus muscle that is supplied by cranial accessory through the vagus

Sensation (two kind): Taste (special sensation) & general sensation (touch , temperature & pain)

In the posterior 1/3 is supplied by glosspharyngeal for both sensory & taste with the circumvallate papillae that is located in the anterior 2/3 but belong to the posterior 1/3

In the anterior 2/3 is supplied by lingual nerve a branch of mandibular of the trigeminal nerve (for sensation) & the taste is from chorda tympani a branch of facial nerve

*Fourthly, the palate:



We have hard palate & soft palate (which end with the uvula)

Uvula descend downward, conical in shape & it`s muscle is called musculus uvulae.

A) Hard palate:

Is composed of two bones palatine process of the maxilla & the horizontal plate of palatine bone & there is suture between the bones.

The mucosa in the hard palate is connected to the periossteium by dense connective tissue

B) Soft palate :

It moves upward & backward, this movement is important because it closes the nasopharyngeal isthmus & oropharyngeal isthmus

The palatine apoeurosis is a fibrous sheet attached to the posterior border of the hard palate & it is considered tendon of musculus uvulae, it is also the expanded tendon of the tensor veli palatini muscle

In the palatine we have greater & lesser palatine foramen for greater & lesser palatine nerve & vessels (nerve & blood supply for the hard & soft palate). nerves are branches from the maxillary nerve for the upper jaw (maxilla)

Muscles of the soft palate : tensor veli palatine; it tenses the palate , levator veli palatini muscle; its action is elevation , these muscles are inserted in the palate in the aponeurosis (tendon) , whereas other muscles originate from the aponeurosis like palatoglossus & palatopharngeus (which are present in the folds around the palatine tonsils)

Palatine tonsils lay between two folds: the palatoglossal & palatopharngeal folds that contain muscles inside it (palatoglossus & palatopharngeus)

&the last muscle is musclus uvulae: (you should read the origin & insertion of it from the slides), but the important thing is the palatine aponeurosis & muscles that are originated from it or insertd into it

Action of the soft palate: it moves upward & backward to close the nasopharynx, this happened in deglutition & with the help of the posterior wall of the pharynx that moves forward & completes the closure

Also we need this complete closure in the case of vomiting in order to prevent the vomit from entering the nose.

During mastication the oropharynx will be closed & we need high pressure in the oral cavity & this is done by moving the oropharynx downward & the posterior 1/3 of the tongue moves upward , but during respiration it will relax (it will be in the midline , it won`t close the nasopharynx or the oropharynx)

There is some disadvantages in children due to the incomplete development of soft palate & it`s movement because some mothers after feeding their babies they lay them on their back then they vomit & it will enter the nasopharynx & through auditory tube to the middle ear then it will cause otitis media (as a result of non functional soft palate)

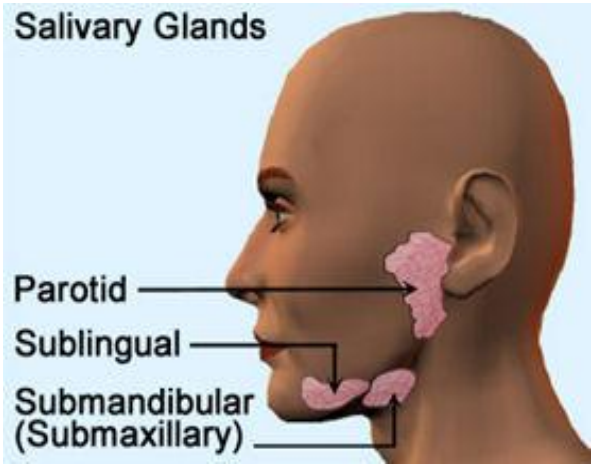
Nerve supple of palate is from: soft palate: greater & lesser palatine nerve of the maxillary nerve. Hard palate: nasopalatine nerve branch from the maxillary nerve (it goes to the hard palate & also goes to the nose) it enters through the incisive foramen (in the anterior part of the hard palate, for the passage of nasopalatine nerve)

Glossopharyngeal nerve also supply the soft palate.

Blood supple is from greater palatine artery branch from maxillary, ascending palatine branch of facial & ascending pharyngeal artery

Lymphatic drainage goes to the deep cervical lymph node

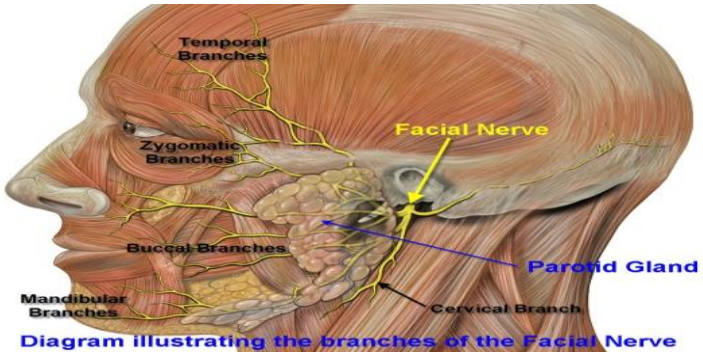
* Fifth & last, the salivary gland:



We have 3 pair of salivary glands (parotid, submandibular & sublingual)

They differ in their secretions : the parotid have (serous) secretion , submandibular (mixed but mostly serous) , sublingual (mostly mucous) , **other difference that the parotid has 2 capsules** (outer capsule from deep investing fascia of the neck & the other it is connective tissue capsule that send septa which divide the gland into lobes & lobules. Other two glands have only one capsule.

1)Parotid gland:



Located on the ramus of the mandible, it's overlaying masseter muscle (anteriorly) & sternocleidomastoid muscle (posteriorly)

Also it lays anterior & below the external auditory meatus ,it lays posterior to the angle of the mandible , it is pyramidal in shape , it has base (superficial) & apex (deep) which is close to the pharynx , it has parotid bed (it mean that it lays over a group of structures)

The contents:

1) Facial nerve (the most superficial) , it divides the gland into superficial & deep part , it gives 5 branches in the gland : temporal , zygomatic , buccial , mandibular , cervical & it is dangerous area to do surgery on it because of the presence of this nerve superficially & any cut of it or it's branches will cause paralysis.

Parotid duct is from the anterior border of the gland, it is 5 cm in length, it lays one finger below zygomatic arch (this is the surface anatomy of the duct), and it opens into vestibule at level of the upper 2nd molar tooth

2) Retromandibular vein (in the middle) , it is formed by the union of the superficial temporal vein & the maxillary vein , in the lower border of the gland it is divided into anterior & posterior division

3) External carotid artery (the deepest structure) & it`s two terminal branches (maxillary & superficial temporal arteries)

Also we have lymph nodes (parotid lymph nodes) & auriculotemporal nerve in the upper border of parotid (some book consider it as a content of the parotid bed)

The importance of auriculotemporal nerve that it carries the sensation of the parotid, it also carries parasympathetic fibres to the parotid gland

When we talk about any gland innervation we must consider 3 things :

1) Sensation 2)Parasympathetic 3)Sympathetic

Innervation of the parotid gland:

1)Sensation: by auriculotemporal nerve

2)Parasympathetic: by auriculotemporal nerve

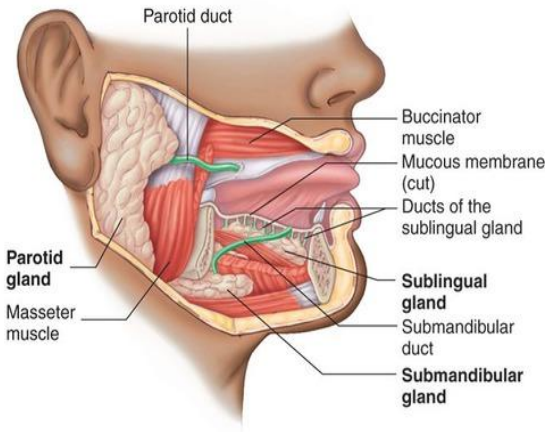
3)Sympathetic: by branches of external carotid artery that come from superior cervical sympathetic ganglion

The parasympathetic is the secreto motor that squeezes the gland & causes secretion while the sympathetic is vasomotor for blood vessel so it causes vasoconstriction & reduces the secretion.

The parasympathetic reaches the auriculotemporal nerve by origin or nucleus that are present in the medulla oblongata (inferior salivary nucleus) then through the

glossopharyngeal nerve to the lesser petrosal nerve & there ganglia (otic ganglia) , it is parasympathetic ganglia , it is below the foramen ovale.

The lesser petrosal nerve is preganglionic while the auriculotemporal nerve in the parotid gland is postganglionic (this is the parasympathetic for parotid gland)



2)Submandibular gland :

It lays in the submandibular fossa of the mandible, we have superficial & deep part of the gland separated by mylohyoid muscles

The submandibular duct starts from deep part & opens into the papilla under the tongue

Innervation of the Submandibular gland:

1)Sensation : by lingual nerve

2)Parasympathetic : chorda tympani branch from facial nerve.

3)Sympathetic : superior cervical sympathetic ganglia through blood vessels like facial & lingual branches of the external carotid artery.

Whereas the parasympathetic from chorda tympani of facial through lingual nerve from submandibular ganglia (like otic ganglia), parasympathetic ganglia is present in mylohyoid & hyoglossus muscles

Hyoglossus (is deep) going to the tongue & mylohyoid (is superficial)

There are some structures that lay between these two muscles (5 structures) :

The deep part of submandibular gland, submandibular ganglia, submandibular duct, lingual nerve, hypoglossal nerve

3)Sublingual gland:

It lays in the sublingual fossa above mylohyoid muscle , it have ducts (7-20 small ducts) in the floor of the oral cavity , it is close to the tongue (under it) but we have structures medial to it: lingual nerve , submandibular duct ,

The relation or the parotid bed (it means the structure that are deep & the parotid sleeps on)

Examples :external carotid artery , internal carotid artery , internal jugular vein , last 4 cranial nerve , styloid process & it`s attachment

While for submandibular gland there is groove for the facial artery (gives it blood supply)

Sorry for any mistake

Done by: Zaha Al-Zoubi

Notes from the correction team (After checking with the professor)

- Boundaries between cells in the mucus acini are well-defined while they are not well-defined in the serose acini.
- Serous secretions contains lysoenzymes and immunoglobulins, especially IgA