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17/MHS01/215

ANATOMY ASSIGNMENT 1

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ANATOMY ASSIGNMENT

1. Discuss the anatomy of the tongue and comment on its applied anatomy.

GENERAL ANATOMY

The tongue is a muscular structure that forms part of the floor of the oral cavity and part of the anterior wall of the oropharynx.

The functions of the tongue include, feeding, masticating and swallowing the food besides its role in speech.

PARTS OF THE TONGUE

- i. **THE TIP** : The tip of the tongue is directed forwards and it remains in contact with the incisor teeth when the mouth is closed.
- ii. **THE ROOT** : The root of the tongue lies in the floor of the mouth and is composed of the genioglossus and hyoglossus muscles. It is attached to the mandible and the hyoid bone.
- iii. **THE INFERIOR SURFACE** : It is covered with mucous membrane which is continuous with the mucous membrane of the floor of the mouth. A midline mucosal fold called frenulum linguae connects the inferior surface to the floor of the mouth. The deep lingual vein is located on either side of the frenulum linguae. On both sides of the posterior end of frenulum, there is sublingual fold and papilla. The submandibular duct opens in the summit of this papilla.



Upper lip

Fimbriated fold

Deep Lingual Vein

Frenulum linguae

Sublingual fold with openings of ducts of sublingual gland

Sublingual papilla with opening of Wharton's duct

Lower lip

iv. The curved dorsal surface or dorsum of the tongue.

The dorsum presents a V shaped sulcus terminalis. The apex of the V is directed posteriorly and the limbs are directed forwards and laterally from the apex, which coincides with the foramen caecum. The foramen caecum is a pit indicating the site of origin of embryonic thyroglossal duct, which develops into the thyroid gland. The sulcus terminalis divides the dorsum of the tongue into 2 parts namely, anterior two-thirds (pre-sulcal or oral) and posterior one third (post-sulcal or pharyngeal). The mucous membrane covering the two parts differs in gross features, sensory innervation and development.

A ANTERIOR TWO-THIRD

The mucous membrane on this part is characterized by the presence of lingual papillae, which are the projections of the mucosa. These papillae are responsible for the rough appearance to the dorsum. There are four types of papillae

- i) FILIFORM PAPILLAE; are small cone shaped projections of the mucosa that end in one or more points.
- ii) FUNGIFORM PAPILLAE; are rounder in shape and larger than filiform papillae, and tend to be concentrated along the margins of the tongue.
- iii) VALLATE PAPILLAE, The largest of the papillae, blunt-ended cylindrical papillae invaginations in the tongue's surface - there are only about 8-12 vallate papillae in a single V shaped line immediately anterior to the terminal sulcus of the tongue.
- iv) FOLIATE PAPILLAE; linear folds of mucosa on the sides of the tongue near the terminal sulcus of the tongue.

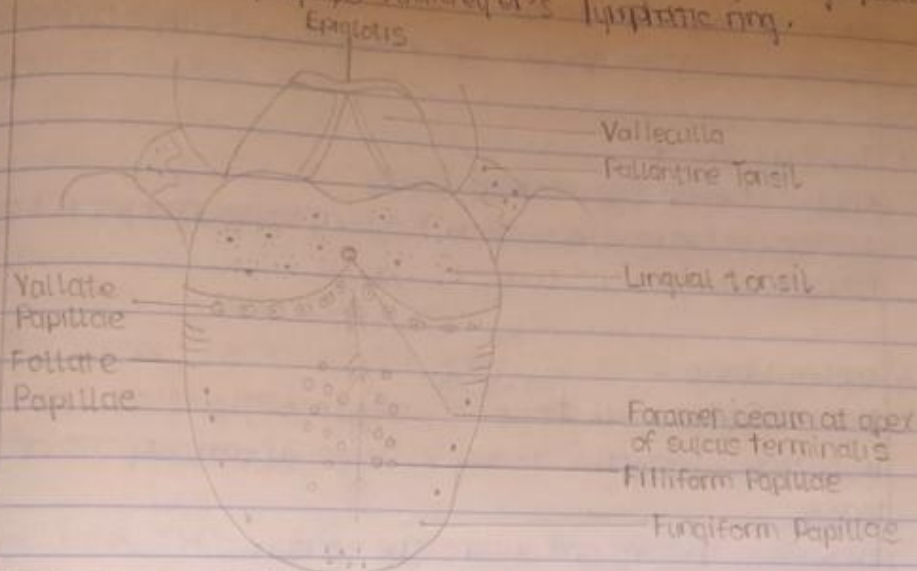
The papillae in general increase the area of contact between the surface of the tongue and the contents of the oral cavity. All except filiform papillae have taste buds on their surfaces.

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B. POSTERIOR ONE-THIRD

This part is located in the floor of oropharynx. The palatoglossal folds connect it to the palate. A median and two lateral glossoepiglottic folds attach the base of the tongue to the epiglottis.

- The mucosa on the dorsum of this part is devoid of papillae.
- Its surface has characteristic cobblestone appearance due to presence of lingual tonsils, which are submucosal lymphatic nodules belonging to Waldeyer's lymphatic ring.



MUSCLES OF TONGUE

The bulk of the tongue is composed of muscle.

The tongue is divided completely into left and right halves by a median sagittal septum composed of connective tissue. This means that all muscles of the tongue are paired. There are intrinsic and extrinsic lingual muscles.

Except for the palatoglossus which is innervated by the vagus nerve (X), all muscles are innervated by the hypoglossal nerve (XII).

INTRINSIC MUSCLES

1. Superior longitudinal muscle (just deep to the surface of the tongue)

ORIGIN: Submucosal connective tissue at the back of the

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Median septum of the tongue

INSERTION: Muscle fibers pass forward and obliquely to submucosal connective tissue and insert on margins of tongue

FUNCTION: Shortens tongue, curls apex and sides of tongue.

2. Inferior longitudinal (between genioglossus and hyoglossus)

ORIGIN: Root of tongue (some fibres from hyoid)

INSERTION: Apex of tongue

FUNCTION: Shortens tongue, curls apex and turns it downwards

3. Transverse Muscle

ORIGIN: Median septum of the tongue

INSERTION: Submucosal connective tissue on lateral margins of tongue.

FUNCTION: Narrows and constricts tongue

4. Vertical Muscle

ORIGIN: Submucosal ^{connective} tissue on dorsum of tongue.

INSERTION: Connective tissue in more ventral regions of the tongue

FUNCTION: Flattens and widens the tongue.

EXTRINSIC MUSCLES

1. Genioglossus

ORIGIN: Superior mental spines

INSERTION: Body of hyoid; entire length of tongue

FUNCTION: Protrudes tongue; depresses center of tongue.

2. Hyoglossus

ORIGIN: Greater horn and adjacent part of body of hyoid bone

INSERTION: Lateral surface of tongue.

FUNCTION: Depresses tongue.

3. Styloglossus

ORIGIN: Styloid process (anterolateral part)

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INSERTION: Lateral surface of tongue

FUNCTION: Elevates and retracts tongue.

4 Palatoglossus

ORIGIN: Inferior surface of palatine aponeurosis.

INSERTION: Lateral margin of tongue

FUNCTION: Depresses palate; raises palatoglossal fold toward midline; elevates back of tongue

NERVE SUPPLY

MOTOR NERVE SUPPLY

All the muscles of the tongue except the palatoglossus are supplied by the hypoglossal nerve. The palatoglossus is the only one supplied by vagus- accessory complex through pharyngeal plexus.

SENSORY NERVE SUPPLY

The sensory nerves of the tongue are divided into two groups;

- i) Nerves carrying general sensations like pain, touch and temperature.
- ii) Nerves carrying special sensations of taste.

ANTERIOR TWO-THIRD

The lingual nerve carries the general ^{a branch of the facial} sensations and the chorda tympani nerve carries the taste sensations from all the taste buds except on vallate papillae.

POSTERIOR ONE-THIRD

The glossopharyngeal nerve carries the general sensations as well as the taste sensation from the vallate papillae. The internal laryngeal nerve (a branch of vagus) supplies a small area adjacent to epiglottis.

ARTERIAL SUPPLY

- i) The lingual artery, a branch of external carotid artery, is the main arterial supply to the tongue through its dorsal and deep branches.
- ii) The lingual branches of inferior alveolar artery also supply the tongue.

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VENOUS DRAINAGE

DORSAL LINGUAL and
DEEP LINGUAL veins

LYMPHATIC DRAINAGE

- i) Oblique lymph vessels from the tip of the tongue drain bilaterally in submental nodes. A few reach directly to jugulodigastric nodes. Thus, cancer of the tip of the tongue spreads to almost all axillary nodes.
- ii) The central lymph vessels from either side of the midline pass vertically downward through the substance and end bilaterally in the jugulodigastric nodes.
- iii) The lymphatics from the lateral part of the anterior two-thirds reach unilaterally to the submandibular nodes.
- iv) The lymphatics from the posterior one-third pass bilaterally to the jugulodigastric and jugulothyroid.

DEVELOPMENTAL ANATOMY (EMBRYOLOGY)

The tongue appears in embryos of approximately 4 weeks in the form of two lateral lingual swellings and one median swelling, the tuberculum impar. These three swellings originate from the first pharyngeal arch. A second median swelling, the copula or hypobranchial eminence, is formed by the mesoderm of the second, third, and part of the fourth arch, marks development of the epiglottis. Immediately behind this swelling is the laryngeal orifice which is flanked by the arytenoid swellings.

As the lateral lingual swellings increase in size, they overgrow the tuberculum impar and merge, forming the anterior two-thirds or body of the tongue. Because the mucosa covering the body of the tongue originates from the first pharyngeal arch, sensory innervation to this area is by the mandibular branch of the trigeminal nerve.

The posterior part, or root of the tongue originates from the second, third parts of the fourth pharyngeal arch. The fact that sensory innervation to this part of the tongue

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is supplied by the glossopharyngeal nerve indicates that the tissue of the third arch overlaps that of the second. The epiglottis and extreme posterior part of the tongue are innervated by the superior laryngeal nerves, reflecting their development from the fourth arch. Some of the tongue muscles probably differentiate in situ, but are mostly derived from myoblasts originating in occipital somites. The tongue musculature is innervated by hypoglossal nerve.

MICROANATOMY (HISTOLOGY)

The substance of the tongue is made up chiefly of skeletal muscle supported by connective tissue. The muscle is arranged in bundles that run in vertical and longitudinal directions. This arrangement of muscle permits intricate movements of the tongue associated with the drawing and swallowing of food and those necessary for speech. The substance of the tongue is divided into right and left halves by a connective tissue septum.

The surface of the tongue is covered by mucous membrane lined by stratified squamous epithelium which is supported on a layer of connective tissue. The mucous membrane on the under surface or ventral surface of the tongue resembles the lining of the rest of the oral cavity and the epithelium is not keratinized.

The mucous membrane lining the dorsum of the tongue are; On the anterior part; the mucosa bears numerous projections or papillae. Each papilla consists of a lining epithelium (partially keratinized) and a core of connective tissue. On the posterior part; the mucosa bears numerous rounded elevations which are produced by collections of lymphoid tissue present deep to the epithelium which are collectively called lingual tonsil.

Mucous glands are most numerous in the posterior part; in relation to the masses of lymphoid tissue.

The serous glands are present mainly in relation to circumvallate papillae, and open into the furrows surrounding the papillae; they also open in the vicinity of other taste buds.

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Taste buds are present in relation to circumvallate papillae, to fungiform papillae and to folia linguae. They are also present in the soft palate, the epiglottis, the palatoglossal arches and the posterior wall of the oropharynx.

Each taste bud is a pitiform structure made up of modified epithelial cells. It extends through the entire thickness of the epithelium.

CLINICAL ANATOMY

Damage to the hypoglossal nerve leads to the weakness of the ipsilateral tongue muscles; the tongue, when protruded, deviates towards the weak side because of the unopposed action of the innervated contralateral genioglossus muscle.

Black Hairy Tongue

It is a temporary, harmless oral condition that gives the tongue a dark, furry appearance. The distinct look usually results from a build up of dead skin cells on the many tiny projections (papillae) on the surface of the tongue that contain taste buds. These papillae which are longer than normal can easily trap and be stained by bacteria, yeast, tobacco, food and other substances.

Glossitis

A problem in which the tongue is swollen and inflamed. This often makes the surface of the tongue appear smooth.

It is often a symptom of other conditions such as allergic reactions, injury, infection, irritants etc.

Damage to the facial nerve can impair the chorda tympani's function.

Chorda tympani damage may cause:

Reduced salivary secretion on the affected side.

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- Loss of taste to the front two-thirds of the tongue.
- Increased pain response in the tongue
- Increased taste - perception of salt
- Phantom tastes (tasting things that aren't there)
- Phantom sensations
- Changes in the mouth feel of food and beverages.

2. Write an essay on the air sinuses

PARANASAL AIR SINUSES

They are air-filled spaces in some bones surrounding the nasal cavity. These sinuses open in the lateral wall of the nasal cavity. They are named according to the bone in which they are located. These sinuses are visible on plain radiograph of skull as translucent areas in respective bones.

GENERAL CHARACTERISTICS:

Developmentally, the sinuses are the extensions of the nasal cavity. Hence, they are lined with thin pseudostratified ciliated columnar epithelium with goblet cells. The secretions of the goblet cells are drained through the openings of the sinuses into the nasal cavity. The main function is to warm and humidify the inspired air. They add to the resonance of voice and reduce the weight of the skull. The sinuses are filled during expiration. The warmed and humidified air is released in the nasal cavity during inspiration.

DEVELOPMENT

The paranasal sinus develops as invagination or outpocketing of the nasal epithelium into the bones surrounding the nasal cavity during the third to fourth month of intrauterine life. Therefore the lining of the paranasal sinuses is ectodermal.

The sinuses are not fully developed at the time of birth. The ethmoidal sinuses begin to develop before birth and of

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four cells are present at birth:

- The maxillary sinuses are first to develop they appear as shallow grooves on the medial surface of each maxilla around third year of interuterine life. At birth the size of the maxillary sinus is about $7 \times 8 \times 11$ mm. The first spurt in the growth of the maxillary sinus is during 6 to 7 years. They achieve adult size after the eruption of permanent teeth.
- The sphenoidal sinuses begin to develop before birth. At the time of birth, they appear as extensions of the nasal cavity in the sphenoidal cartilage. During the 2nd to 2nd years, they expand in body and during adolescence adult size is achieved.
- The frontal sinuses are usually absent at birth.

FRONTAL SINUS

It is situated between the inner and outer tables of the frontal bone above and deep to supraorbital margin.

The right and left sinuses are often as symmetrical as the septum between them is obliquely placed.

The anterior wall of the sinus is thick and related to the skin of the forehead. The posterior wall is thin and related to the meninges and frontal lobe of the brain. Its inferior wall forms the roof of the orbit. The frontonasal duct begins in the opening of the sinus and which is located in the floor of the sinus. Usually, the frontal sinus opens by this duct in the anterior end of the infundibulum of the middle meatus. Drainage is via this frontonasal duct.

The frontal sinus is marked on the surface by drawing a triangle joining the nose, a point 3 cm above nose and a point at the junction of medial-third and lateral two-thirds of ^{supra}orbital margin.

The frontal sinuses are innervated by branches of supraorbital nerve a branch of the frontal nerve which arises from the ophthalmic nerve (CN V).

Their blood supply is from branches of anterior ethmoidal arteries.

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ETHMOIDAL SINUS

These sinuses are thin walled air cells in the labyrinth of the ethmoid bone. They are located between the upper part of the lateral nasal wall and medial wall of the orbit. The roof is related to the meninges of the anterior cranial fossa. The lateral wall is formed by paper like lamina of bone called lamina papyracea. This wall is extremely fragile hence slightest injury to it can lead to spread of ethmoidal infection to the orbit.

There are 3 groups of ethmoidal sinuses.

- The anterior group opens in the anterior part of the infundibulum of middle meatus.
- The middle group project in the middle meatus producing ethmoidal bulla. The middle group opens at the summit of the bulla.
- The posterior group opens in the superior meatus.

The ethmoidal cells are innervated by

- The anterior and posterior ethmoidal branches of the nasociliary nerve from the ophthalmic nerve (CN V₁) and
- The maxillary nerve (CN V₂) via orbital branches from the pterygopalatine ganglion.

Blood supply is through branches of anterior and posterior ethmoidal arteries.

SPHENOIDAL SINUS

These sinuses occupy the body of the sphenoid bone. The right and left sinuses are separated from each other by a deflected bony septum. The two sinuses are therefore asymmetrical in size. Each sinus opens in the sphenoidal recess of the lateral wall of the nasal cavity by an opening situated in the upper part of its anterior wall.

Relations of the sinus

The anterior part of the roof is related to the optic chiasm.
The posterior part of the roof is related to the pituitary gland.
Each lateral wall is related to the carotid sinus, internal carotid artery and oculomotor, trochlear, abducent and 2 divisions of the trigeminal nerve.

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Innervation:

- The posterior ethmoidal branch of ophthalmic nerve and
- The maxillary nerve, via orbital branches from the pterygo-palatine ganglion

Blood Supply - Branches of pterygo-facial arteries from the maxillary arteries:

MAXILLARY SINUS (ANTHURUM OF HIGHMORE)

Is the largest sinus. It has the capacity of 15ml in the adult. Each sinus occupies the body of the maxilla of its side. It is pyramid shaped with base (its medial wall) directed towards the lateral wall of nasal cavity and apex pointing laterally towards zygomatic bone.

Innervation - Infra-orbital and gloeolar branches of the maxillary nerve (V₂)

Blood Supply - Branches from the infra-orbital and gloeolar branches of the maxillary arteries.

Sphenoidal recess

Cribriform plate of ethmoid bone

Crista galli

Ethmoidal air Sinuses

