

# **GROSS ANATOMY ASSIGNMENT**

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**MATRIC NO: 17/MHS01/257**

**DEPT: MBBS**

**COURSE: GROSS ANATOMY OF THE HEAD AND NECK**

## **QUESTION 1**

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

### **THE TONGUE**

**DEFINITION:** The **tongue** is a fleshy, movable, muscular organ in the mouth which is important in the digestive system as it is the primary organ of taste in the gustatory system.

**LOCATION:** The tongue is located partly in the **oral cavity** and partly in the **oropharynx**.

#### **FUNCTIONS:**

- It facilitates perception of gustatory (taste) stimuli.
- It also plays important roles in mastication and deglutition (swallowing).
- It is an integral component of the speech pathway, as it helps with articulation.

#### **DESCRIPTION:**

- Under normal circumstances, the tongue is a pink, muscular organ located within the oral cavity proper.
- It is kept moist by the products of the major and minor, which aids the organ as it facilitates deglutition, speech, and gustatory perception.
- While there is significant variability in the length of the tongue among individuals, on average, the organ is roughly 10 cm long.

**The tongue has 3 main parts and 2 surfaces: the parts include:**

A. The **tip or apex:**

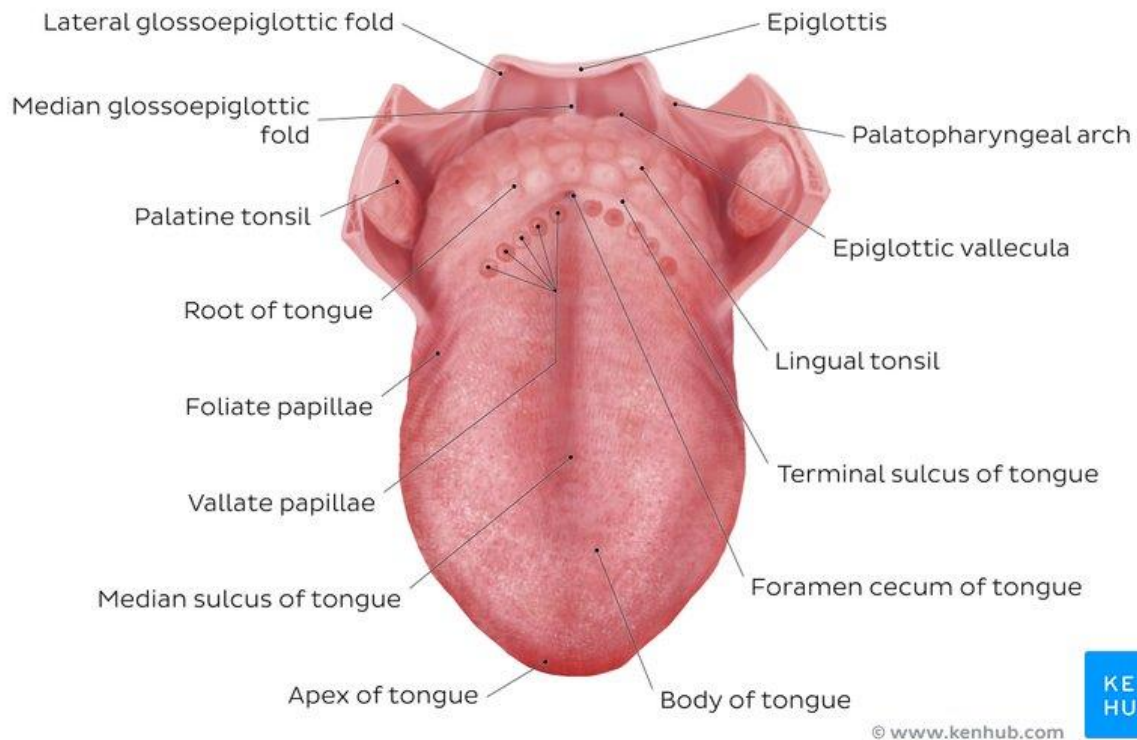
- It is the most anterior, and most mobile aspect of the organ.
- It forms the anterior free end which, at rest, lies behind the upper incisor teeth

B. The **Root:**

- It is the part of the tongue that rests on the floor of the mouth.
- It is attached to the mandible and soft palate above, and to the hyoid bone below.
- Because of these attachments we are not able to swallow the tongue itself.
- In between the two bones, it is related to the geniohyoid and mylohyoid muscles.
- Usually referred to as the posterior third of the tongue.
- It is populated by numerous lymphoid aggregates known as the lingual tonsils along with foliate papillae along the posterolateral surface.

C. The **Body:** It has a curved upper *surface* or *dorsum* and an *inferior surface*.

- **The dorsum of the tongue:** is convex in all directions. It is divided into:
- An *oral part* or anterior two-thirds, and a *pharyngeal part* or posterior one-third, by a faint V-shaped groove, the *sulcus terminalis*.
  - The two limbs of the 'V' meet at a median pit, named the *foramen caecum*.
  - They run laterally and forwards up to the palatoglossal arches.
  - The foramen caecum represents the site from which the thyroid diverticulum grows down in the embryo.



The oral part of the dorsal surface of the tongue has a rough appearance due to the presence of the mucous membrane. These projections are called **Papillae**. They include:

i. ***Vallate or circumvallate papillae:***

- They are large and flat topped and are 8-12 in number.
- They are situated immediately in front of the sulcus terminalis and are arranged in a V-shaped row.
- They are surrounded by deep circular trenches, the walls of which are studded with **taste buds**. The ducts of the serous glands of the tongue open into the trenches

ii. ***The fungiform papillae:***

- They are most numerous near the apex and margins of the tongue, but some of them are also scattered over the dorsum.
- These are smaller than the vallate papillae but larger than the filiform papillae.
- Each papilla consists of a narrow pedicle and a large rounded head.
- They are distinguished by their bright red color.

iii. ***The filiform papillae or conical papillae :***

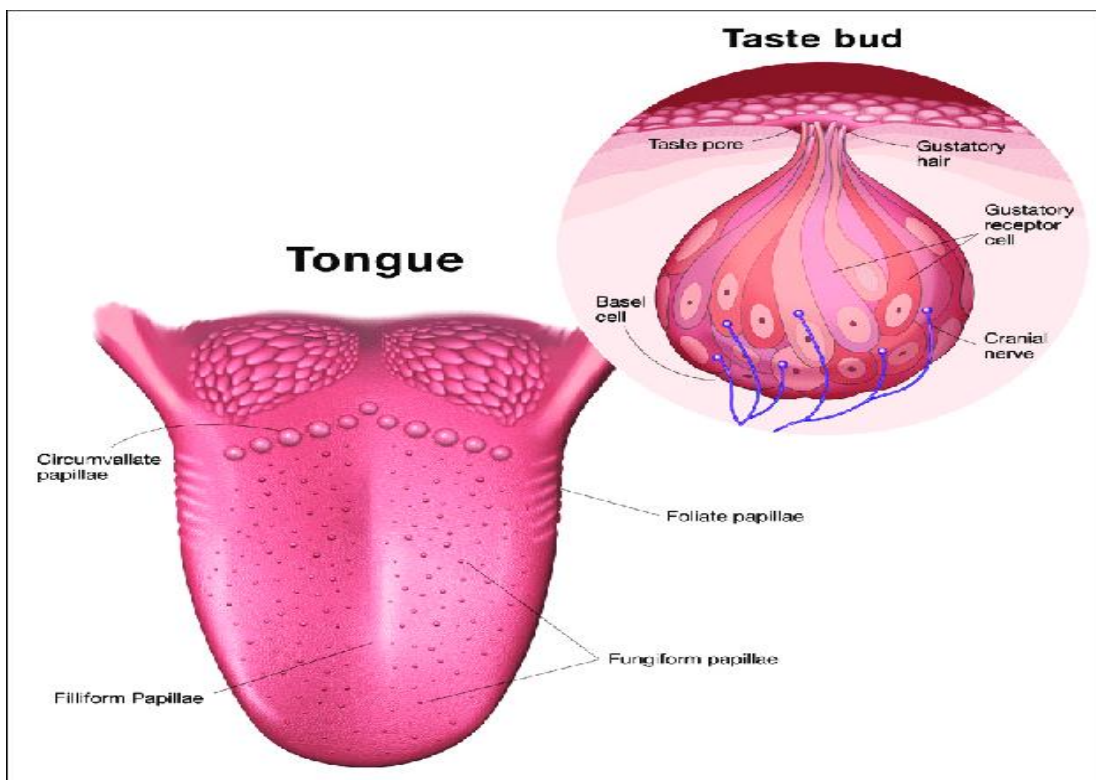
- These scaly, conical projections are pinkish gray and are arranged in V-shaped rows that are parallel to the terminal sulcus, except at the apex, where they tend to be arranged transversely.

- They are the smallest and most numerous of the lingual papillae.
  - They are pointed and covered with keratin;
  - the apex is often split into filamentous processes long and numerous, contain afferent nerve endings that are sensitive to touch.
- iv. **Foliate papillae**: small lateral folds of the lingual mucosa. They are poorly developed in humans.

The vallate, foliate, and most of the fungiform papillae contain taste receptors in the taste buds.

**Note:**

- There are four basic taste sensations: sweet, salty, sour, and bitter
- **Sweetness** is detected at the apex.
- **saltiness** at the anterolateral margins.
- **sourness** at the posterolateral margins .
- **bitterness** at the posterior part of the tongue.



The **pharyngeal part/ posterior part** of the dorsum of the tongue

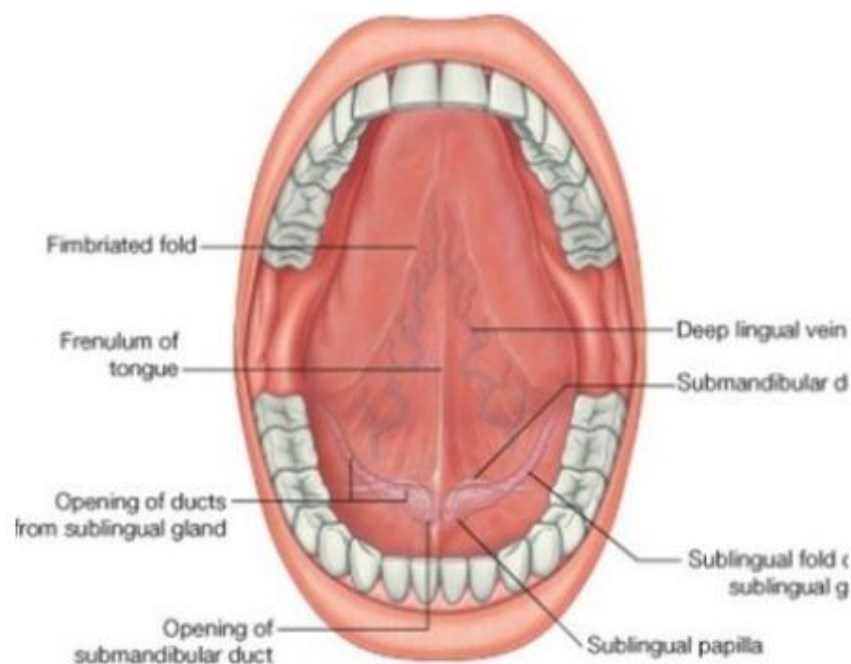
- Has a mucosa which is thick and freely movable.
- It has no lingual papillae, but the underlying lymphoid nodules give this part of the tongue an irregular, cobblestone appearance.
- The lymphoid nodules are known collectively as the **lingual tonsil**.

- The pharyngeal part of the tongue constitutes the anterior wall of the oropharynx and can be inspected only with a mirror or downward pressure on the tongue with a tongue depressor.

➤ **The inferior surface of the tongue:**

- It is covered with a thin, transparent mucous membrane .
- This surface is connected to the floor of the mouth by a midline fold called the *frenulum* of the tongue.
- The frenulum allows the anterior part of the tongue to move freely.
- On each side of the frenulum, a *deep lingual vein* is visible through the thin mucous membrane.
- A *sublingual caruncle* (papilla) is present on each side of the base of the lingual frenulum that includes the opening of the submandibular duct from the submandibular salivary gland.

## INFERIOR SURFACE



## MUSCLES OF THE TONGUE

There are two groups of muscles that make up the tongue: the *extrinsic* and *intrinsic* group of muscles.

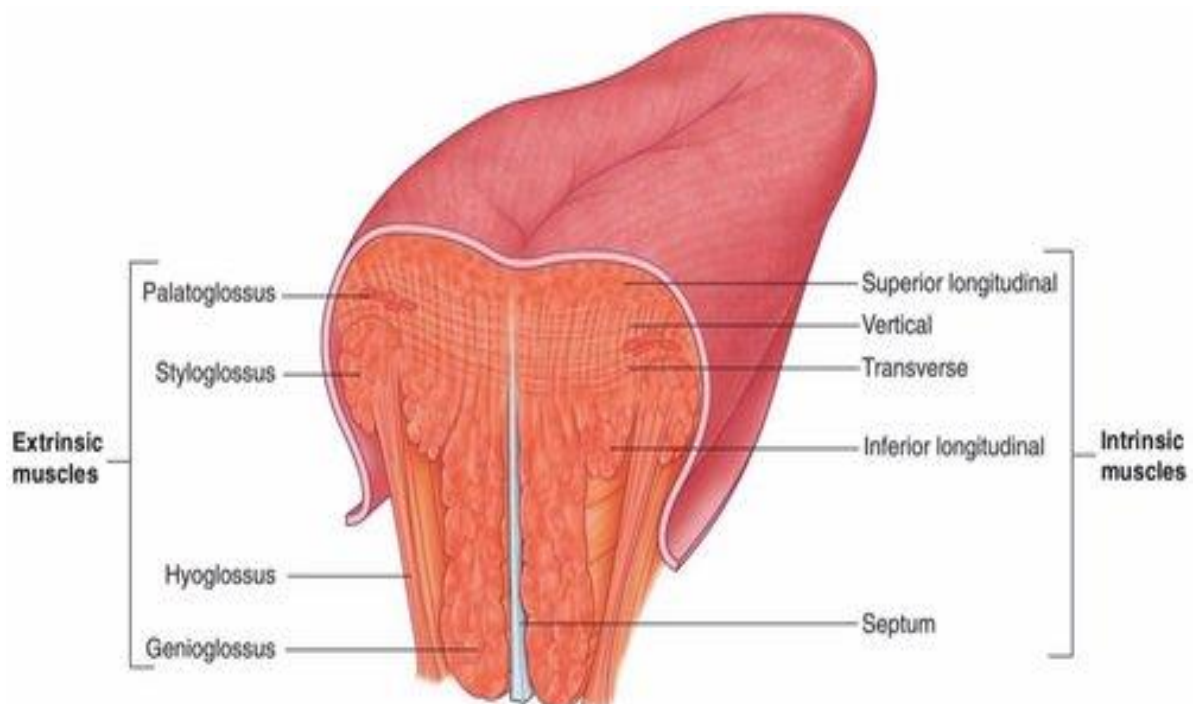
➤ **Extrinsic Muscles:** These are muscles that originate outside the tongue and attach to it. They mainly help in changing the position of the tongue, but can sometimes alter its shape. These muscles include:

- (a) Genioglossus.
- (b) Hyoglossus.
- (c) Styloglossus.
- (d) Palatoglossus.

➤ **Intrinsic Muscles:** These are muscles that originate and insert inside the tongue. They mainly help in altering the shape of the tongue. They include:

- (a) Superior longitudinal muscles.
- (b) Inferior longitudinal muscles.
- (c) Transverse muscles.
- (d) Vertical muscles.

**NOTE:** The four intrinsic and four extrinsic muscles in each half of the tongue are separated by a median fibrous lingual septum, which merges posteriorly with the lingual aponeurosis.



## VASCULATURE OF THE TONGUE

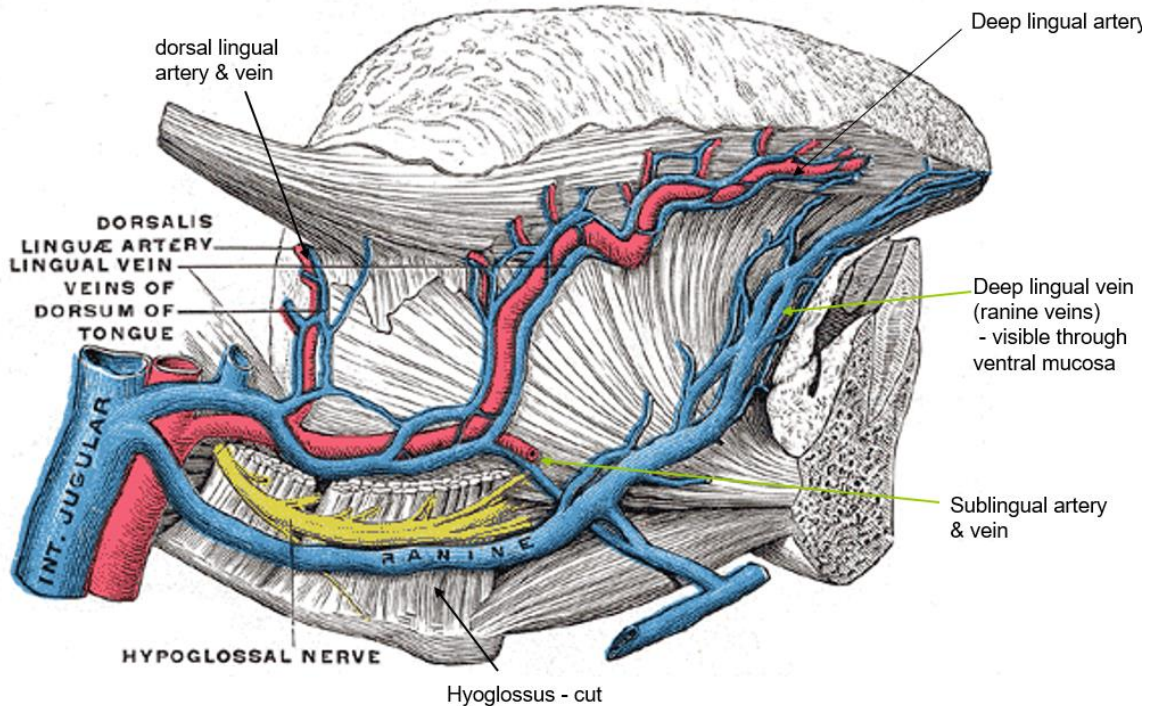
### Arterial Supply

- ❖ The arteries of the tongue are derived from the *lingual artery*, which arises from the *external carotid artery*.
- ❖ On entering the tongue, the lingual artery passes deep to the hyoglossus muscle.
- ❖ The dorsal lingual arteries supply the root of the tongue; the deep lingual arteries supply the lingual body.
- ❖ The deep lingual arteries communicate with each other near the apex of the tongue.
- ❖ The dorsal lingual arteries are prevented from communicating by the **lingual septum**.

### Venous drainage

- ❖ The veins of the tongue are the *dorsal lingual veins*, which accompany the lingual artery;
- ❖ *the deep lingual veins*, which begin at the apex of the tongue, run posteriorly beside the lingual frenulum to join the *sublingual vein*.
- ❖ The sublingual veins in elderly people are often varicose (enlarged and tortuous).
- ❖ Some or all of them may drain into the *Internal Jugular Vein*, or they may do so indirectly, joining first to form a lingual vein that accompanies the initial part of the lingual artery.

BLOOD SUPPLY OF TONGUE - DETAILS - diagram not examinable  
 Grays Anatomy, 20th Ed, 1918 (copyright expired)

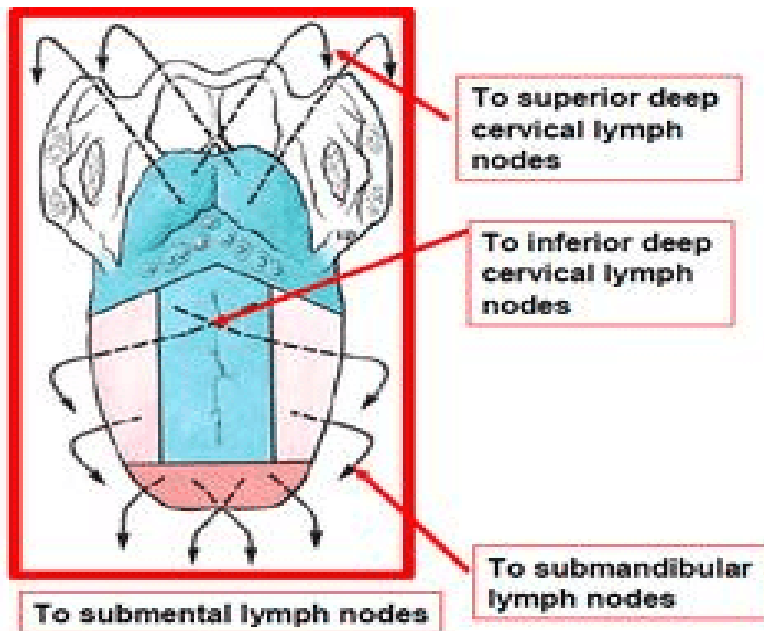


### Lymphatic drainage

- ❖ Most of the lymphatic drainage converges toward and follows the venous drainage; however, lymph from the tip of the tongue, frenulum, and central lower lip runs an independent.
- ❖ Lymph from the tongue takes four routes:
  - Lymph from the root drains bilaterally into the *superior deep cervical lymph nodes*
  - Lymph from the medial part of the body drains bilaterally and directly to the *inferior deep cervical lymph nodes*.
  - Lymph from the right and left lateral parts of body drains to the *submandibular lymph nodes* on the ipsilateral side.
  - The apex and frenulum drain to the *submental lymph nodes*, the medial portion draining bilaterally.

All lymph from the tongue ultimately drains to the deep cervical nodes, and passes via the jugular venous trunks into the venous system at the right and left venous angles.





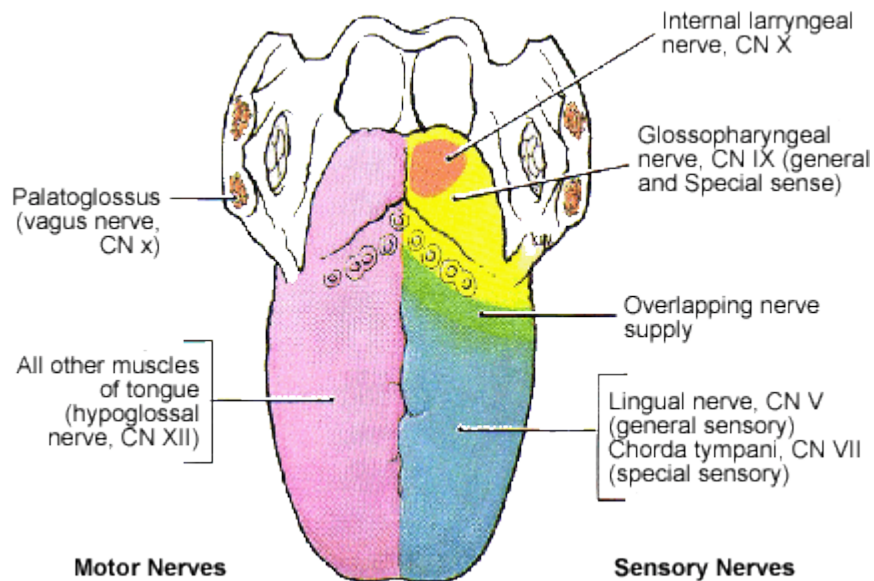
## INNERVATION OF THE TONGUE

### ❖ Motor innervation:

- All the intrinsic and extrinsic muscles, except the palatoglossus, are supplied by the *hypoglossal nerve*.
- The palatoglossus is supplied by the cranial root of the *accessory nerve* through the pharyngeal plexus.

### ❖ Sensory innervation:

- The lingual nerve is the nerve of general sensation.
- The chorda tympani is the nerve of taste for the anterior two-thirds of the tongue except vallate papillae.
- The glossopharyngeal nerve is the nerve for both general sensation and taste for the posterior one-third of the tongue including the circumvallate papillae.
- The posteriormost part of the tongue is supplied by the vagus nerve through the internal laryngeal branch.



## APPLIED ANATOMY OF THE TONGUE

- ❖ **Glossitis**: is usually a part of generalized ulceration of the mouth cavity or stomatitis. In certain anaemias, the tongue becomes smooth due to atrophy of the filiform papillae.



**GLOSSITIS**

**LARGE LABIAL FRENULUM**

- ❖ **Large Labial Frenulum**: An excessively large superior labial frenulum in children may cause a space between the central incisor teeth. Resection of the frenulum and the underlying connective tissue (frenulectomy) between the incisors allows approximation of the teeth, which may require an orthodontic appliance (“brace”). A large lower labial frenulum in adults may pull on the labial gingiva and contribute to gingival recession, which results in an abnormal exposure of the roots of the teeth.

- ❖ **Dysgeusia:** or a pure taste disorder, is rare and is usually associated with olfactory disorders.
- ❖ **Glossoptosis:** is a medical condition and abnormality which involves the downward displacement or retraction of the tongue. It may cause non-fusion of the hard palate, causing cleft palate. It is one of the features of Pierre Robin sequence and Down syndrome.



**GLOSSOPTOSIS**

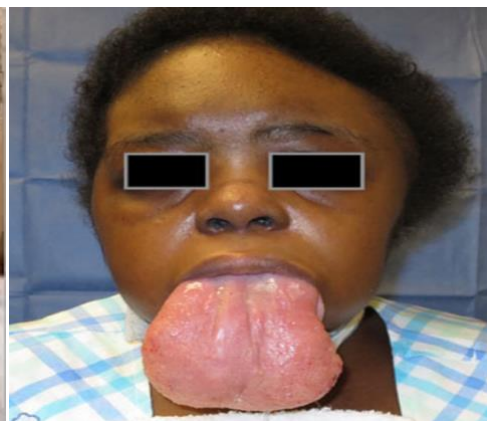


**AGLOSSIA**

- ❖ **Aglossia (aglossia congenita)** is a congenital defect resulting in a partial development or complete absence of a tongue. Aglossia is commonly associated with craniofacial and limb defects (Adactylia syndrome) and is thought to belong to a family of oromandibular limb hypogenesis syndrome or OLHS.
- ❖ **Ankyloglossia**, also known as tongue-tie, is a congenital oral anomaly that may decrease the mobility of the tongue tip and is caused by an unusually short, thick lingual frenulum, a membrane connecting the underside of the tongue to the floor of the mouth.



**ANKYLOGLOSSIA**



**MACROGLOSSIA**

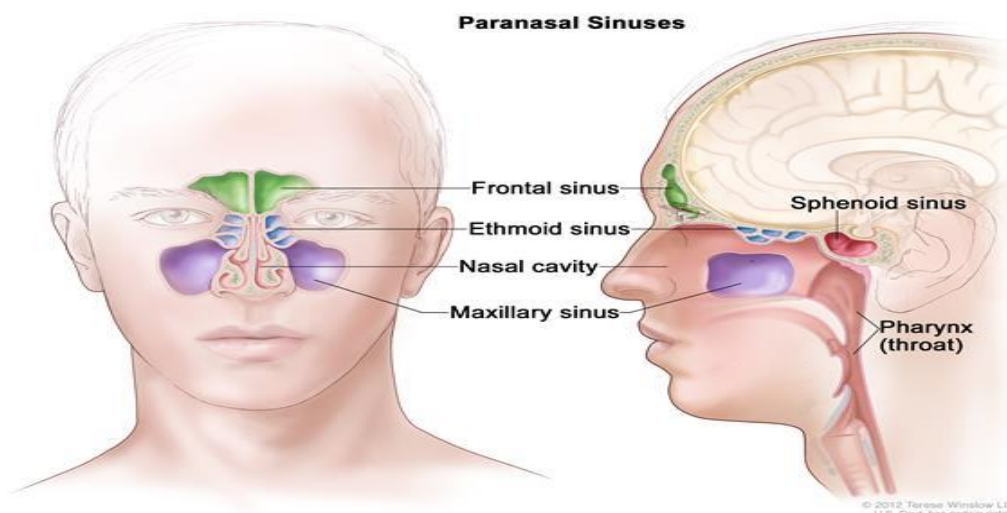
- ❖ **Macroglossia** is the medical term for an unusually large tongue. Severe enlargement of the tongue can cause cosmetic and functional difficulties in speaking, eating, swallowing and sleeping. Macroglossia is uncommon, and usually occurs in children.

## QUESTION 2

### Write an Essay on the Air Sinuses.

**Air Sinuses/ Paranasal sinuses** are *air filled spaces* present within some bones around the nasal cavities. They are named according to the bones in which they are located. The sinuses continue to invade the surrounding bone, and marked extensions are common in the crania of older individuals. There are four different pairs of sinuses and they are called the:

- **maxillary sinuses**
  - **frontal sinuses**
  - **sphenoidal sinuses**
  - **ethmoidal sinuses**
- All of them open into the nasal cavity through its lateral wall.
- *The function of the sinuses is to make the skull lighter and add resonance to the voice. In infections of the sinuses or sinusitis, the voice is altered.*
- *These sinuses help circulate the air that is breathed in and out of the respiratory system.* They are situated around the nasal cavity and they are all paired and sometimes symmetrical, while always being bilateral.
- The sinuses are rudimentary, or even absent at birth. They enlarge rapidly during the ages of six to seven years, i.e. time of eruption of permanent teeth and then after puberty.
- From birth to adult life the growth of the sinuses is due to enlargement of the bones; in old age it is due to resorption of the surrounding cancellous bone.
- The anatomy of individual sinuses is important as they are frequently infected.



## MAXILLARY SINUS

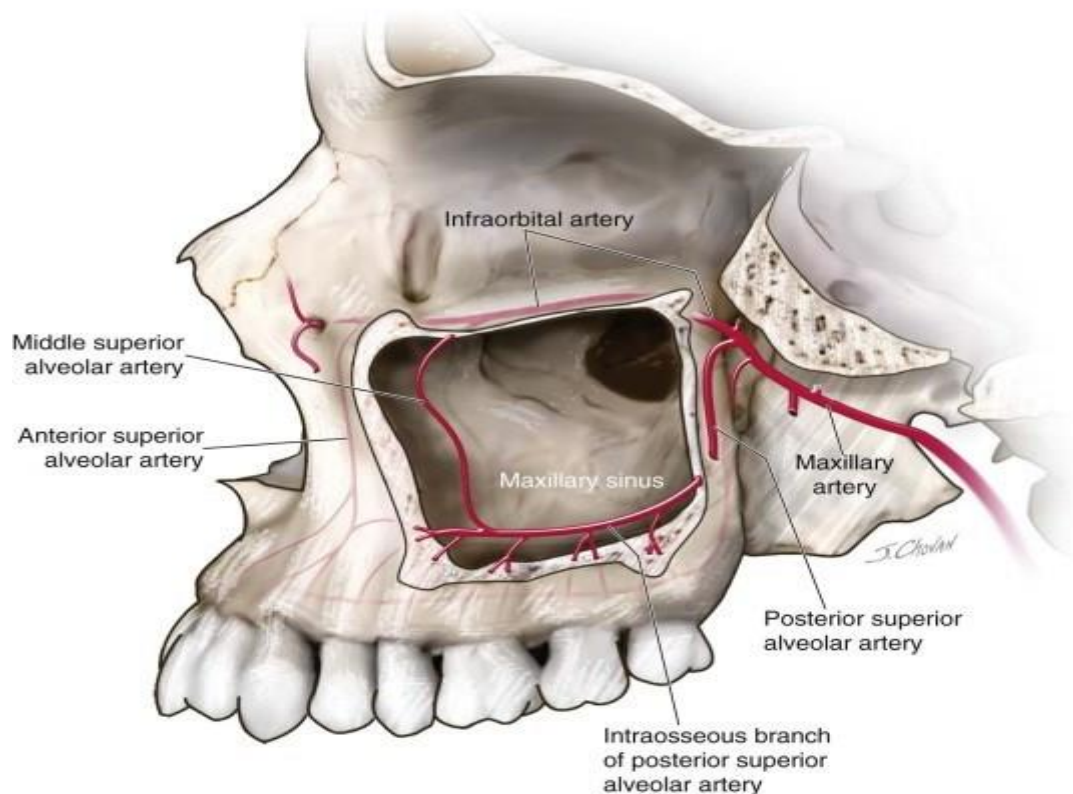
The maxillary sinuses are the **largest** of all the paranasal sinuses. They have thin walls which are often penetrated by the long roots of the posterior maxillary teeth.

- The **superior border** of this sinus is the bony orbit.
- The **inferior border** is the maxillary alveolar bone and corresponding tooth roots.
- The **medial border** is made up of the nasal cavity.
- The **lateral and anterior border** are limited by the cheekbones.
- **Posteriorly**, two anatomical spaces known as the **pterygopalatine fossa** and the **infratemporal fossa** exist.

### **VASCULATURE:**

Arterial supply: The blood supply includes a contribution from the:

- Anterior superior alveolar artery.
- Middle superior alveolar artery.
- Posterior superior alveolar artery.
- Branches of the descending and greater palatine arteries supply the floor of the sinus.



### Venous drainage:

- Each maxillary sinus drains by one or more openings, the maxillary ostium (ostia), into the middle nasal meatus of the nasal cavity by way of the semilunar hiatus.

### Lymphatic drainage:

- The submandibular lymph nodes are the main destination during lymphatic drainage.

**INNERVATION:** Innervation occurs through nerves of the same names as the arteries which are: the anterior, middle, and posterior superior alveolar nerves, which are branches of the maxillary nerve.

### **FRONTAL SINUS**

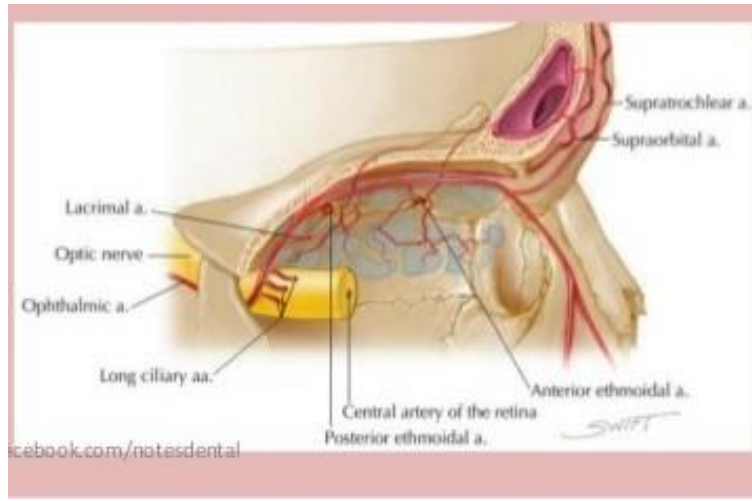
This pair of sinuses are irregular in shape when compared to one another and is underdeveloped at birth. They reach their full size and shape around **seven** to **eight years** of age. The right and left frontal sinuses are between the outer and inner tables of the frontal bone, posterior to the superciliary arches and the root of the nose.

- **Anteriorly**, the frontal sinuses are contained by the forehead and the superciliary arches.
- **superiorly** and **posteriorly** by the anterior cranial fossa.
- **inferiorly** by the bony orbit, the anterior ethmoidal sinuses and the nasal cavity.
- **Medially** the sinuses face one another, separated by the midline.

### **VASCULATURE:**

Arterial supply: The frontal sinuses are supplied by the:

- anterior ethmoidal artery
- supraorbital artery
- supratrochlear artery.



**Venous drainage:** The right and left sinuses each drain through a **frontonasal duct** into the **ethmoidal infundibulum**, which opens into the **semilunar hiatus** of the **middle nasal meatus**.

**Lymphatic drainage:** Occurs via the **submandibular lymph nodes**.

**INNERVATION:** It is innervated by the **ophthalmic nerve**, including the supraorbital and supratrochlear branches.

### **SPHENOIDAL SINUS**

- The **most posterior** of all the sinuses in the head, the sphenoidal sinuses are large and irregular, just like their septum, which is made by the sphenoid bone.
- They are unevenly divided and separated by a bony septum.
- Because of this extensive pneumatization (formation of air cells), the body of the sphenoid is fragile.
- ***The sphenoidal sinuses are derived from a posterior ethmoidal cell that begins to invade the sphenoid at approximately 2 years of age. In some people, several posterior ethmoidal cells invade the sphenoid, giving rise to multiple sphenoidal sinuses that open separately into the sphenothmoidal recess.***
- **Laterally**, a cavernous sinus exists which is part of the middle cranial fossa and also the carotid artery and cranial nerves III, IV, V/I, V/II and VI can be found.

- The **anterior wall** separates this pair of sinuses from the nasal cavity, as does the hypophyseal fossa, the pituitary gland and the optic chiasm **superiorly** and the nasopharynx and pterygoid canal **inferiorly**.

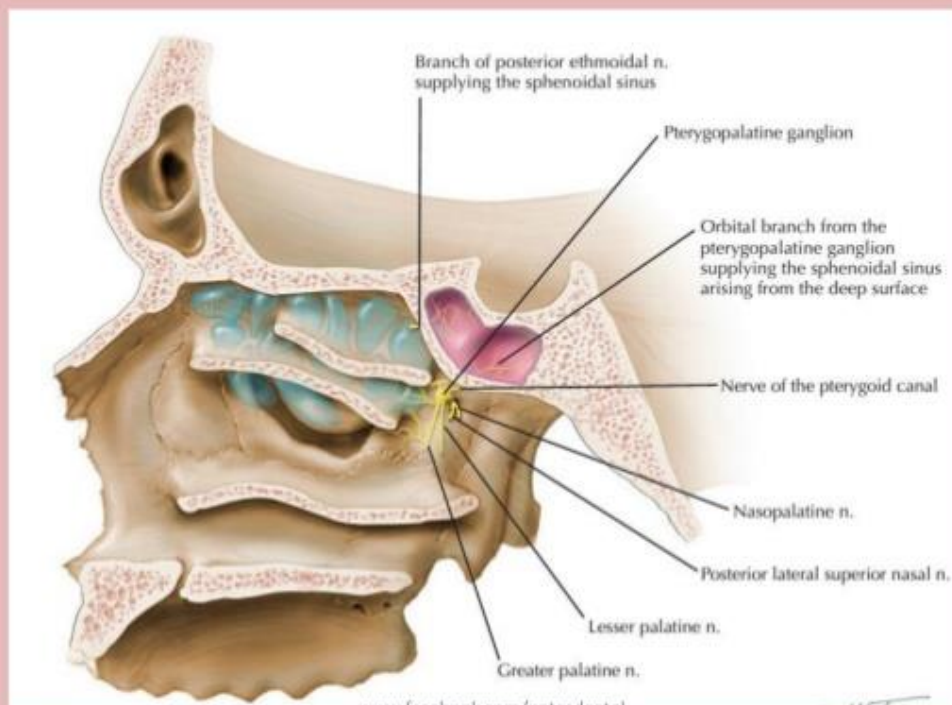
#### **VASCULATURE:**

Arterial supply: The **posterior ethmoidal artery** and the **posterior lateral nasal branches** supply the sphenoidal sinuses.

Lymphatic drainage: The lymphatic drainage occurs in the same way as the posterior ethmoid sinus which is the **retropharyngeal lymph nodes**.

**INNERVATION:** The **posterior ethmoidal nerve** and the orbital branch of the **pterygopalatine ganglion** innervate them.

## **Sphenoidal sinuses: Nerve Supply**





## **ETHMOIDAL SINUS**

The ethmoidal cells (sinuses) are small invaginations of the mucous membrane of the middle and superior nasal meatus into the ethmoid bone between the nasal cavity and the orbit.

On each side of the midline, anywhere from three to eighteen **ethmoidal air cells** may be grouped together. These air cells are smaller individual sinuses grouped together to form one large one which encompass the anterior, middle and posterior nasal meatuses.

- **Superior** to the ethmoidal sinus is the anterior cranial fossa and the frontal bone.
- **Laterally** the orbit can be found
- nasal cavity is situated **medially**.

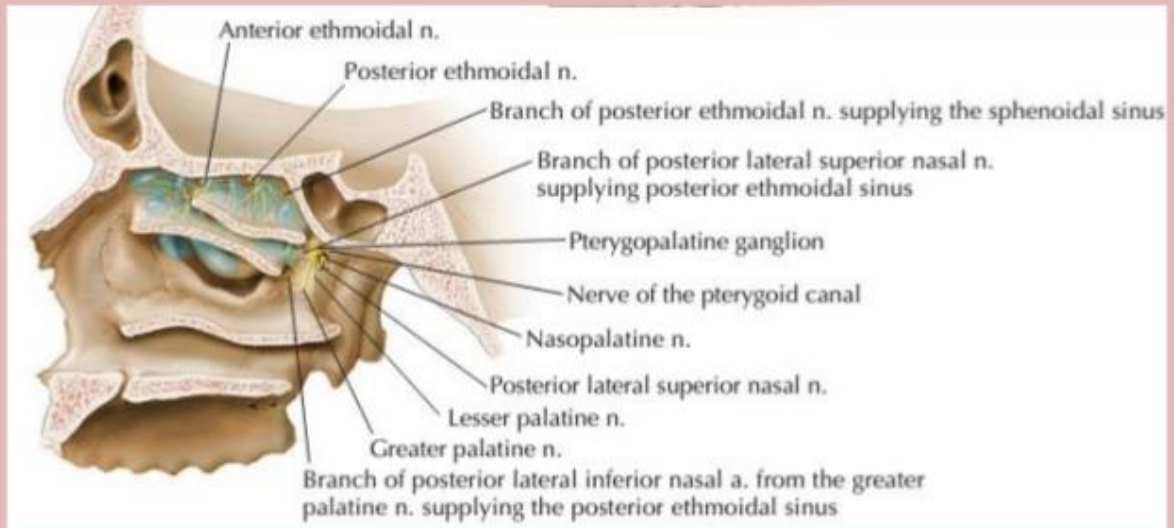
The ethmoid sinuses are unique because they are the only paranasal sinuses that are more **complex** than just a single cavity.

### **VASCULATURE:**

- Arterial supply: The **anterior** and **posterior ethmoidal arteries**, as well as the **posterior lateral nasal branches** provide an ample blood supply to this region.
- Venous drainage: Ethmoid sinus venous drainage is by the **maxillary** and **ethmoid veins**.
- Lymphatic drainage: The anterior and middle ethmoid sinuses send their lymphatic drainage to the **submandibular lymph nodes** while the posterior ethmoid sinus sends its own to the **retropharyngeal lymph nodes**.

**INNERVATION:** the **anterior** and **posterior ethmoidal nerves** and the **posterior lateral superior** and **inferior nasal nerves** help innervate it.

# Ethmoid Sinus : Nerve Supply



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## CLINICAL ANATOMY

### SINUSITIS

**Sinusitis** is an inflammation or swelling of the tissue lining the sinuses. Healthy sinuses are filled with air. But when they become blocked and filled with fluid, germs can grow and cause an infection. Conditions that can cause sinus blockage include: The common cold.



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# SINUSITIS

