QUESTION:

1. Discuss the anatomy of the tongue and comment on its applied anatomy
2. Write an essay on the air sinuses
3. **Tongue**

The tongue is a mobile muscular organ that can assume a variety of shapes and positions. It is partly in the **oral cavity** and partly in the **oropharynx**. The tongue is involved with mastication, taste, deglutition (swallowing), articulation, and oral cleansing; however, its main functions are forming words during speaking and squeezing food into the oropharynx when swallowing

**Parts and Surfaces of the Tongue**

The tongue has

* **a root**: is the part of the tongue that rests on the floor of the mouth. It is usually defined as the posterior third of the tongue
* **a body**: is the anterior two thirds of the tongue
* **an apex**: is the anterior end of the body, which rests against the incisor teeth
* **a curved dorsum**: is the posterosuperior surface, which is located partly in the oral cavity and partly in the oropharynx
* **an inferior surface**

The dorsum is characterized by a V-shaped groove called the **terminal sulcus** or **groove (sulcus terminalis)** posterior to this groove is **foramen cecum**. This small pit, frequently absent, is the non-functional remnant of the proximal part of the embryonic thyroglossal duct from which the thyroid gland developed. The terminal sulcus divides the dorsum of the tongue into the:

* **anterior (oral) part** in the **oral cavity proper**
* **posterior (pharyngeal)** part in the **oropharynx**

The margin of the tongue is related on each side to the lingual gingivae and lateral teeth. The mucous membrane on the anterior part of the tongue is rough because of the **presence of numerous small lingual papillae (small nipple like process)**:

* Vallate papillae: Large and flat topped, they lie directly anterior to the terminal sulcus and are arranged in a V-shaped row
* Foliate papillae: Small lateral folds of the lingual mucosa. They are poorly developed in humans
* Filiform papillae: Long and numerous, they contain afferent nerve endings that are sensitive to touch
* Fungiform papillae: Mushroom shaped pink or red spots, they are scattered among the filiform papillae but are most numerous at the apex and margins of the tongue
* The vallate, foliate, and most of the fungiform papillae contain taste receptors in the taste buds. The mucous membrane over the anterior part of the dorsum of the tongue is thin and closely attached to the underlying muscle. A shallow midline groove of the tongue divides the tongue into right and left halves called the **median sulcus**. The mucous membrane of the posterior part of the tongue 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. The inferior surface of the tongue is covered with a thin, transparent mucous membrane through which one can see the underlying veins. 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.

**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



**Muscles of the Tongue**

* The tongue is essentially a mass of muscles that is mostly covered by mucous membrane
* extrinsic muscles alter the position of the tongue while intrinsic muscles alter its shape
* 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

**Extrinsic Muscles of the Tongue**

These include:

* genioglossus
* Hyoglossus
* styloglossus
* palatoglossus
* They originate outside the tongue and attach to it
* They mainly move the tongue but they can alter its shape as well

**Intrinsic Muscles of the Tongue**

They include:

* superior longitudinal muscle
* inferior longitudinal muscle
* transverse muscle
* vertical muscles
* They have their attachments entirely within the tongue and are not attached to bone

**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 and give rise to the:

* The dorsal lingual arteries which supply the posterior part (root);
* the deep lingual arteries supply the anterior part.
* 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

**APLLIED ANATOMY**

1. **Frenectomy:**

An overly large lingual frenulum (tongue-tie/ ankyloglossa) interferes with tongue movements and may affect speech. In unusual cases, a frenectomy (cutting the frenulum) in infants may be necessary to free the tongue for normal movement and speech.

1. **Thyroglossal Duct Cyst**:

A cystic remnant of the thyroglossal duct, associated with development of the thyroid gland, may be found in the root of the tongue and be connected to a sinus that opens at the foramen cecum. Surgical excision of the cyst may be necessary. Most thyroglossal duct cysts are in the neck, close or just inferior to the body of the hyoid bone

1. **Microglossia:**

This is a rare developmental condition characterized by an abnormally small tongue. This condition will cause some difficulties related to speech and swallowing. There is no treatment to this condition.

1. **Fissure tongue:**

Also known as **scrotal tongue** (the appearance of the tongue often resembles the scrotum). This abnormality may also present in people with Down’s syndrome or Melkersson-Rosenthal syndrome. Clinically, multiple grooves (fissures) are present on the surface of the tongue. The condition is painless and usually requires no treatment.



1. **Geographic tongue:**

It is also known as **benign migratory glossitis.** The lesion appearssmooth red area surrounded by raised irregular yellowish borders. The red areas may regress spontaneously but reappear over time.

They tend to migrate from one area to another and change in size and shape, resembling a map. Other parts of the oral mucosa may also be affected. Often it is an incidental finding during routine dental check-up.



2. The paranasal sinuses are air-filled spaces located within the bones of the skull and facial bones. They are centered on the nasal cavity and have various functions, including lightening the weight of the head, humidifying and heating inhaled air, increasing the resonance of speech, and serving as a crumple zone to protect vital structures in the event of [facial trauma](http://emedicine.medscape.com/article/1284288-overview).Four sets of paired sinuses are recognized: maxillary, frontal, sphenoid, and ethmoid (see the image below).

Sinuses, anterior and sectioned views.

### **Maxillary sinus**

The maxillary sinus is the largest paranasal sinus and lies inferior to the eyes in the maxillary bone. It is the first sinus to develop and is filled with fluid at birth. It grows according to a biphasic pattern, in which the first phase occurs during years 0-3 and the second during years 6-12. The earliest phase of pneumatization is directed horizontally and posteriorly, whereas the later phase proceeds inferiorly toward the maxillary teeth.

This development places the floor of the sinus well below the floor of the nasal cavity. The shape of the sinus is a pyramid, with the base along the nasal wall and the apex pointing laterally toward the zygoma. The natural ostium of the maxillary sinus is located in the superior portion of the medial wall.

The anterior maxillary sinus wall houses the infraorbital nerve, which runs through the infraorbital canal along the roof of the sinus and sends branches to the soft tissues of the cheek. The thinnest portion of the anterior wall is above the canine tooth, called the canine fossa, which is an ideal entry site for addressing various disease processes of the maxillary sinus.

The roof of the maxillary sinus is the floor of the orbit. Behind the posteromedial wall of the maxillary sinus lies the pterygopalatine fossa, a small inverted space that houses several important neurovascular structures and communicates with several skull base foramina. The infratemporal fossa lies behind the posterolateral wall of the maxillary sinus.

The maxillary sinus is supplied by branches of the internal maxillary artery, which include the infraorbital, alveolar, greater palatine, and sphenopalatine arteries. It is innervated by branches of the second division of the [trigeminal nerve](http://emedicine.medscape.com/article/1873373-overview), the infraorbital nerve, and the greater palatine nerves.

### **Frontal sinus**

The frontal sinus is housed in the frontal bone superior to the eyes in the forehead. It is formed by the upward movement of anterior ethmoid cells after the age of 2. Developmentally, this is the last sinus to pneumatize. Growth increases at age 6 years and continues until the late teenage years.The frontal sinuses are funnel-shaped structures with their ostia located in the most dependent portion of the cavities. The posterior wall of the frontal sinus, which separates the sinus from the anterior cranial fossa, is much thinner than its anterior wall.

The frontal sinus is supplied by the supraorbital and supratrochlear arteries of the ophthalmic artery. It is innervated by the supraorbital and supratrochlear nerves of the first division of the trigeminal nerve.

### **Sphenoid sinus**

The sphenoid sinus originates in the sphenoid bone at the center of the head. It arises not from an outpouching of the nasal cavity but from the nasal embryonic lining. The sinus reaches its full size by the late teenage years. The sphenoid sinus is variably pneumatized and may extend as far as the foramen magnum in some patients.

The thickness of the walls of the sphenoid sinus is variable, with the anterosuperior wall and the roof of the sphenoid sinus (the planum sphenoidale) being the thinnest bones. The sphenoid sinus ostium is located on the anterosuperior surface of the sphenoid face, usually medial to the superior turbinate.

The sphenoid sinus is supplied by the sphenopalatine artery, except for the planum sphenoidale, which is supplied by the posterior ethmoidal artery. Innervation of the sphenoid sinus comes from branches of the first and second divisions of the trigeminal nerve.

### **Ethmoid sinus**

The ethmoid sinuses arise in the ethmoid bone, forming several distinct air cells between the eyes. They are a collection of fluid-filled cells at birth that grow and pneumatize until the age of 12. The ethmoid cells are shaped like pyramids and are divided by thin septa. They are bordered by the middle turbinate medially and the medial orbital wall laterally. The ethmoid labyrinth may extend above the orbit, lateral and superior to the sphenoid, above the frontal sinus, and into the roof of the maxillary sinus.

The ethmoid sinuses are supplied by the anterior and posterior ethmoidal arteries from the ophthalmic artery (internal carotid system), as well as by the sphenopalatine artery from the terminal branches of the internal maxillary artery (external carotid system).