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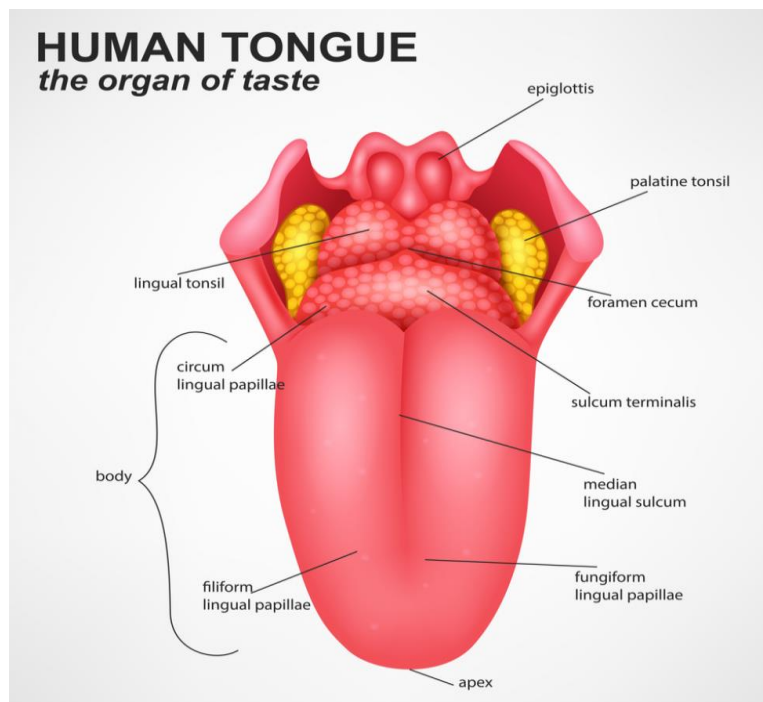
Department: Medicine and Surgery, 3001

Course: Gross Anatomy of the Head and Neck

Date: 30th April, 2020

Anatomy of the Tongue

The tongue is a muscular organ in the mouth of most vertebrates that manipulates food for mastication and is used in the act of swallowing. It is a mass of interlacing skeletal muscle, connective tissue with some serous and mucous glands and pockets of adipose tissue, covered by stratified squamous epithelium (oral epithelium). The tongue develops from the first, second, third and fourth pharyngeal arches.



Relations of the Tongue

There are numerous important structures surrounding the tongue. It is limited;

- Anteriorly and superiorly by the upper and lower rows of teeth
- Superiorly by the hard and soft palate
- Inferiorly by the floor of the oral cavity

Parts of the Tongue

From anterior to posterior, the tongue has three parts

1. **Tip or apex**: The tip of the tongue is the most anterior and most mobile aspect of the tongue.
2. **Body**: Posterior to the tip lies the body of the tongue. It has a rough dorsal surface, which touches the palate and is populated with taste buds and lingual papillae, and a smooth ventral (inferior) surface that is attached to the floor of the oral cavity by the lingual frenulum. The median sulcus of the tongue divides the body of the tongue into left and right halves. It marks the embryological point of fusion of the lateral lingual swellings that form the tongue.
3. **Base or root**: The base of the tongue is the most posterior part of the tongue. It is separated from the body by a V-shaped furrow called the sulcus terminalis (terminal sulcus). The base of the tongue contains the lingual tonsils.

Based on the embryological origin of the tongue, the tongue is also divided into

1. Anterior two-third
2. Posterior one-third

Anterior Two-third (Oral tongue)

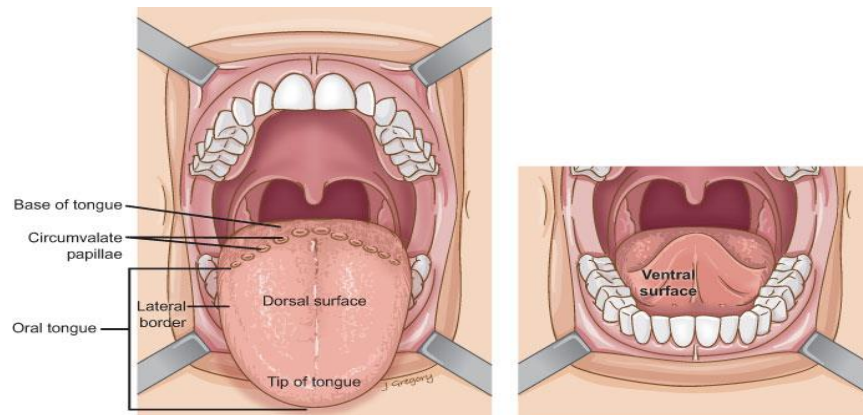
The anterior two-third includes the apex and body of the tongue. It terminates at the sulcus terminalis, a V-shaped furrow extending from the foramen cecum to the palatoglossal arch. The surface of the anterior two-third derives its characteristic appearance from the presence of lingual papillae which are projections of lamina propria covered with epithelium. There are four lingual papillae. They are;

1. **Vallate papillae**: Large and flat topped, they lie directly anterior to the terminal sulcus and are arranged in a V-shaped row
2. **Foliate papillae**: Small lateral folds of the lingual mucosa. They are poorly developed in humans
3. **Filiform papillae**: Long and numerous, they contain afferent nerve endings that are sensitive to touch
4. **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.

Posterior One-third (Pharyngeal Tongue)

The remainder of the tongue that lies posterior to the sulcus terminalis is made up by the base of the tongue. It lies behind the palatoglossal arch and functions as the anterior wall of the oropharynx. Unlike the anterior two-thirds, the posterior one-third does not have lingual papillae. Instead, its mucosa is populated by aggregates of lymphatic tissue known as lingual tonsils.

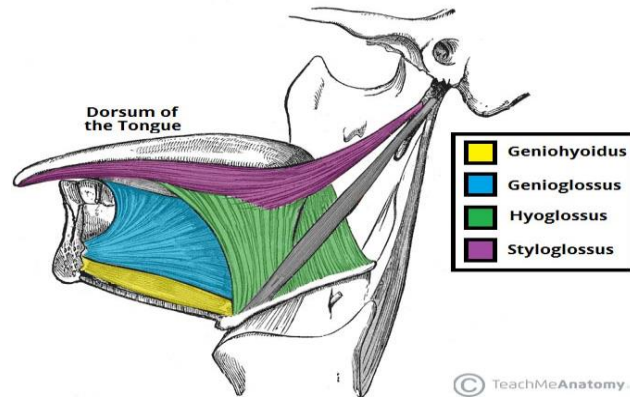


Muscles of the Tongue

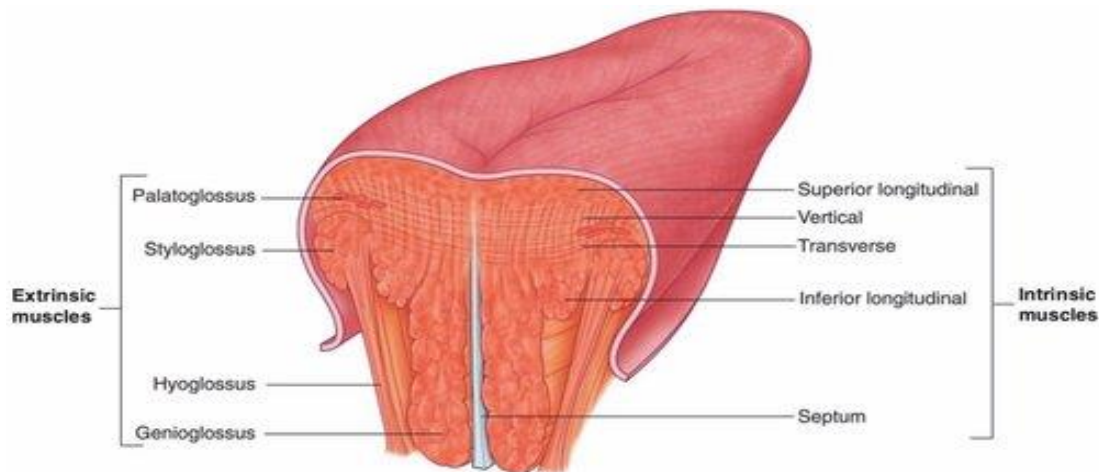
All the muscles of the tongue are paired structures with each copy being found on either side of the median longitudinal septum (found underneath the median sulcus). The muscles of the tongue are divided into two;

1. **Extrinsic muscles**: These are the muscles that originate outside of the tongue and attach to it. The extrinsic muscles are responsible for the movement of the tongue within and out of the oral cavity. There are four pairs of the extrinsic muscles
 - Styloglossus
 - Palatoglossus
 - Genioglossus
 - Hyoglossus

The styloglossus and palatoglossus arise from above the tongue while the genioglossus and hyoglossus arise from below the tongue.



2. ***Intrinsic muscles***: These are the set of muscles confined to each half of the tongue. They have their attachments entirely within the tongue and are not attached to bone. They are responsible for adjusting the shape of the tongue. It is made up of four pairs of muscles. In dorsolateral manner, they are;
- Superior longitudinal muscles
 - Vertical muscles
 - Transverse muscles
 - Inferior longitudinal muscles



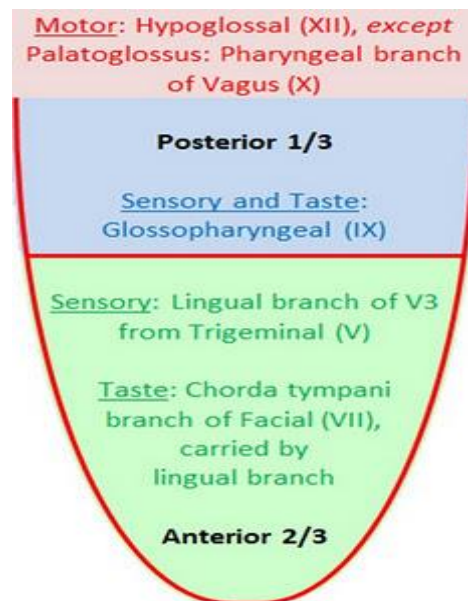
Innervation of the Tongue

The tongue has multiple sources of innervation based on its embryological origins. The tongue receives its motor innervation from the hypoglossal nerve. That is, this nerve innervates all the muscles of the tongue except the palatoglossus which is innervated by the vagus nerve.

Sensory Innervation

In the anterior two-third, general sensation (touch) is supplied by the trigeminal nerve (CN V). Specifically, the lingual nerve, a branch of the mandibular division (CN V3). While the special sensation

(taste) is supplied by the facial nerve (CN VII). The chorda tympani branch of the facial nerve which travels through the middle ear and continue to the tongue. The posterior one-third of the tongue receives both touch and taste sensation from the glossopharyngeal nerve (CN IX).



Vasculature of the Tongue

The vascular artery of the tongue is provided by branches of lingual artery which is a branch of the external carotid artery. Venous drainage is by the lingual veins which joins the facial vein to form the common facial vein which drains into the internal jugular vein.

Lymphatic Drainage

- **Anterior two-third:** Lymph from the anterior part of the tongue drains into the submental and submandibular nodes which empties into the deep cervical lymph nodes.
- **Posterior one-third:** lymph from the posterior part of the tongue drains into the deep cervical lymph nodes directly.

Clinical Anatomy

1. **Tongue Tied:** The tongue is attached anteroinferiorly by a piece of connective tissue called frenulum. When apoptosis does not occur in the frenulum during development, the frenulum is excess and it is referred to as tongue-tied. It is present in children. In some cases, it can restrict the movement of the tongue causing difficulties with breast feeding and speech. This can be corrected with simple surgery.
2. **Pierre Robin Syndrome:** This results from defect in the first pharyngeal arch. It causes glossoptosis among other symptoms. This particular defect causes the tongue to be displaced posteriorly and may cause airway obstruction or apnea.
3. **Lingual Carcinoma:** This is one of several kinds of oral cancers. Like other cancers, it happens when cells divide out of control and form a growth or tumor. There are two types. One called

oral tongue cancer because it affects the anterior two-third of the tongue. The other happens at the base of the tongue where it connects to the throat.

4. **Bulbar Palsy**: It refers to a range of different signs and symptoms linked to impairment of function of CN IX, X, XI and XII which occurs due to a lower motor neuron lesion in the medulla. One out of many structures affected is the tongue which receives innervation from CN IX and XII. This will result in difficulty swallowing and speaking. Treatment is aimed to help cope with the symptoms.

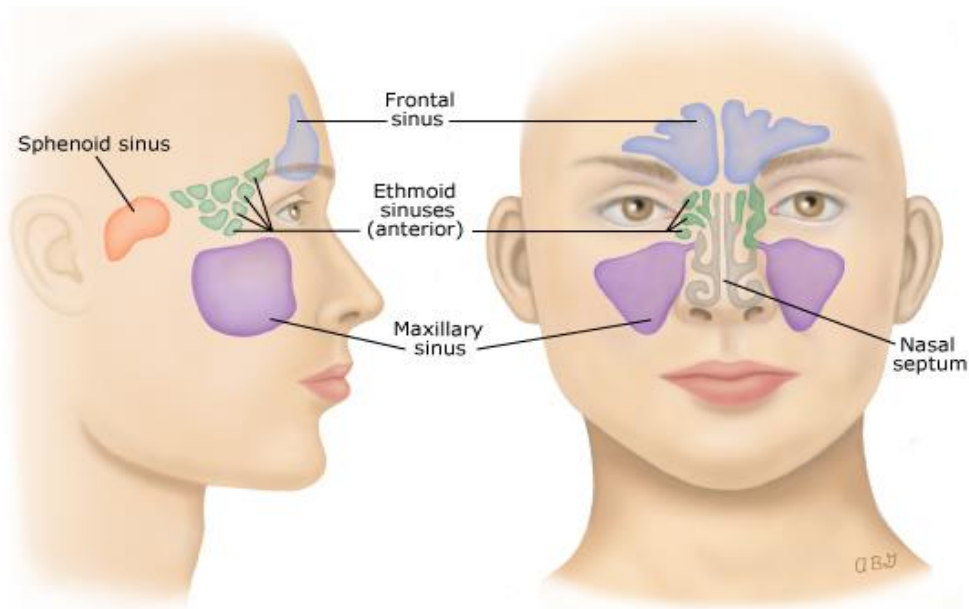
Air Sinuses (Paranasal sinuses)

The paranasal sinuses are air-filled spaces located within the bones of the face. They are formed in childhood by the nasal cavity eroding into surrounding bones. As they are outgrowths of the nasal cavity, they drain back into it. Openings to the paranasal cavities are found on the roof and lateral walls of the nasal cavity. The inner surface of these sinuses is lined by respiratory mucosa. The paranasal sinuses are centered on the nasal cavity and have various functions which includes;

- Lightening the weight of the head
- Humidifying and heating inhaled air
- Increasing the resonance of speech
- Serving as a crumple zone to protect vital structures in event of facial trauma.

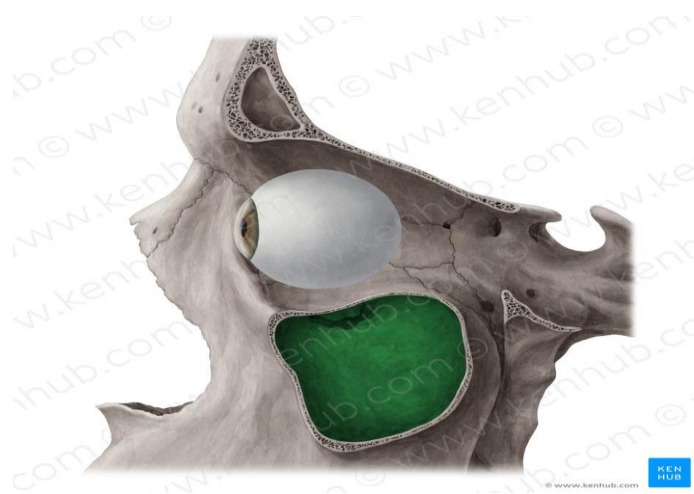
There are four pairs of sinuses named according to the bone they are located. They are

- Maxillary sinuses
- Frontal sinuses
- Sphenoidal sinuses
- Ethmoidal sinuses



Maxillary sinuses

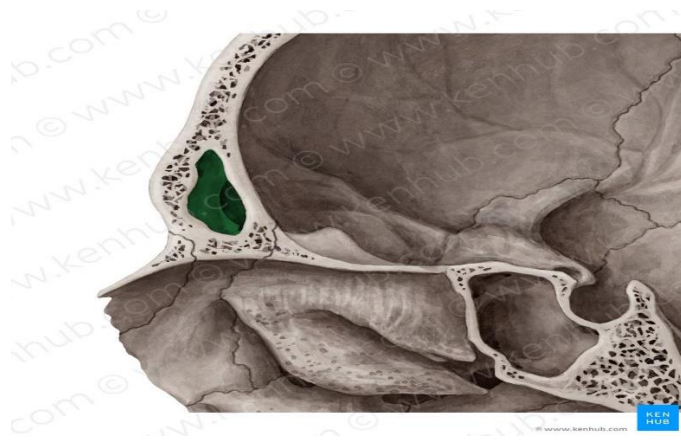
They are the largest sinuses located laterally and inferiorly to the nasal cavities. The superior border of this sinus is the bony orbit, the inferior border is the maxillary alveolar bone and corresponding tooth roots, the medial border is made up of the nasal cavity, the anterior and lateral borders are limited by the cheekbones. It drains into the nasal cavity at the hiatus semilunaris (a groove on the lateral wall of the nasal cavity) underneath the frontal sinus opening. This is a potential pathway for spread of infection because fluid draining from the frontal sinus can enter the maxillary sinus.



Frontal Sinuses

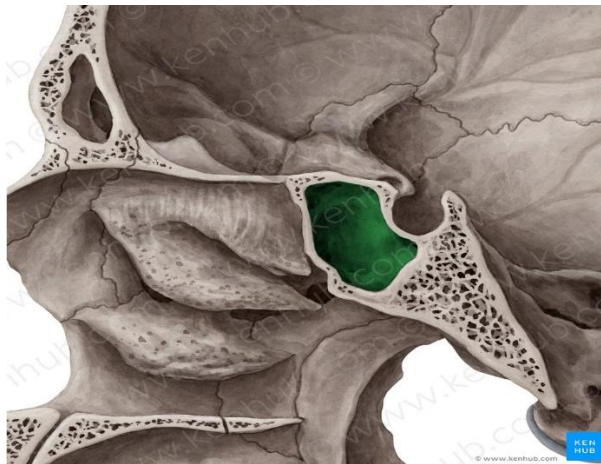
These are the most superior in location, found within the frontal bone. Superiorly and posteriorly, it is bounded by the anterior cranial fossa, inferiorly by the bony orbit and medially the sinuses face one

another, separated by the midline. They are variable in size but always triangular in shape. They drain into the nasal cavity via frontonasal duct, which opens out at the hiatus semilunaris on the lateral wall.



Sphenoidal Sinuses

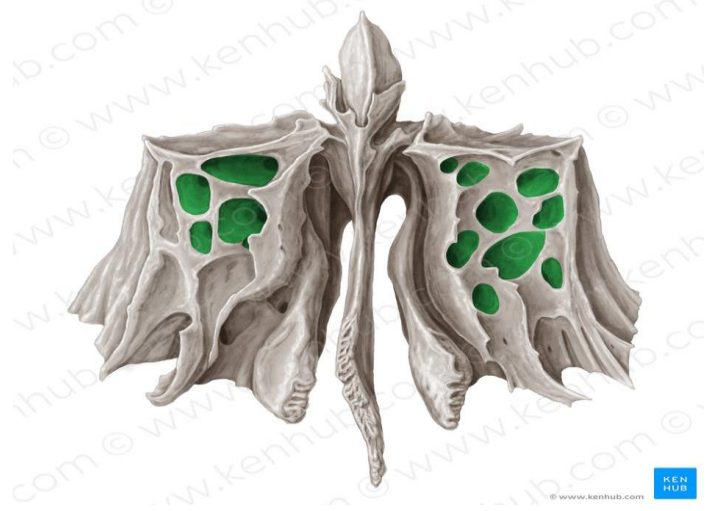
These are the most posterior of all the sinuses. They are related superiorly and laterally to the middle cranial fossa. The sphenoid sinuses drain onto the roof of the nasal cavity. The relationships of this sinus are of clinical importance because the pituitary gland can be surgically accessed via passing through the nasal roof into the sphenoid sinus.



Ethmoidal Sinuses

Superior to the ethmoid sinuses is the frontal bone, laterally the orbit and medially the nasal cavities. There are three ethmoidal sinuses

- Anterior ethmoid sinus (which opens through the hiatus semilunaris)
- Middle ethmoid sinus (which opens through ethmoid bulla)
- Posterior ethmoid sinus (which opens through superior meatus)



Clinical Anatomy

Sinusitis

Inflammation of the mucosa of a sinus as a result of spread of infection from the upper respiratory tract is called Sinusitis. This results in pain and swelling of the sinus. If more than one sinus is affected, it is called Pansinusitis. Antivirals, antibiotics are prescribed in persistent cases.