

ASSIGNMENT ON GROSS ANATOMY OF HEAD AND NECK

NOSE AND ORAL CAVITY

BY

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

The tongue is a muscular organ in the mouth that not only facilitates perception of gustatory stimuli but also plays important roles in mastication and deglutition.



Additionally, the tongue is an integral component of the speech pathway, as it helps with articulation.

THE HUMAN TONGUE

Parts of the tongue

The root of the tongue is the part of the tongue that rests on the floor of the mouth and is usually defined as the posterior third of the tongue.

The body of the tongue is the anterior two thirds of the tongue.

The apex (tip) of the tongue is the anterior end of the body, which rests against the incisor teeth. The body and apex of the tongue are extremely mobile.

The dorsum (dorsal surface) of the tongue is the posterosuperior surface, which is located partly in the oral cavity and partly in the oropharynx.

Surfaces of the tongue

Upper surface of the tongue

The human tongue is divided into two parts, an oral part at the front and a pharyngeal part at the back. The left and right sides are also separated along most of its length by a vertical section of fibrous tissue (the lingual septum) that

results in a groove, the median sulcus, on the tongue's surface. The foramen cecum marks the end of this division (at about 2.5 cm from the root of the tongue) and the beginning of the terminal sulcus. The foramen cecum is also the point of attachment of the thyroglossal duct.

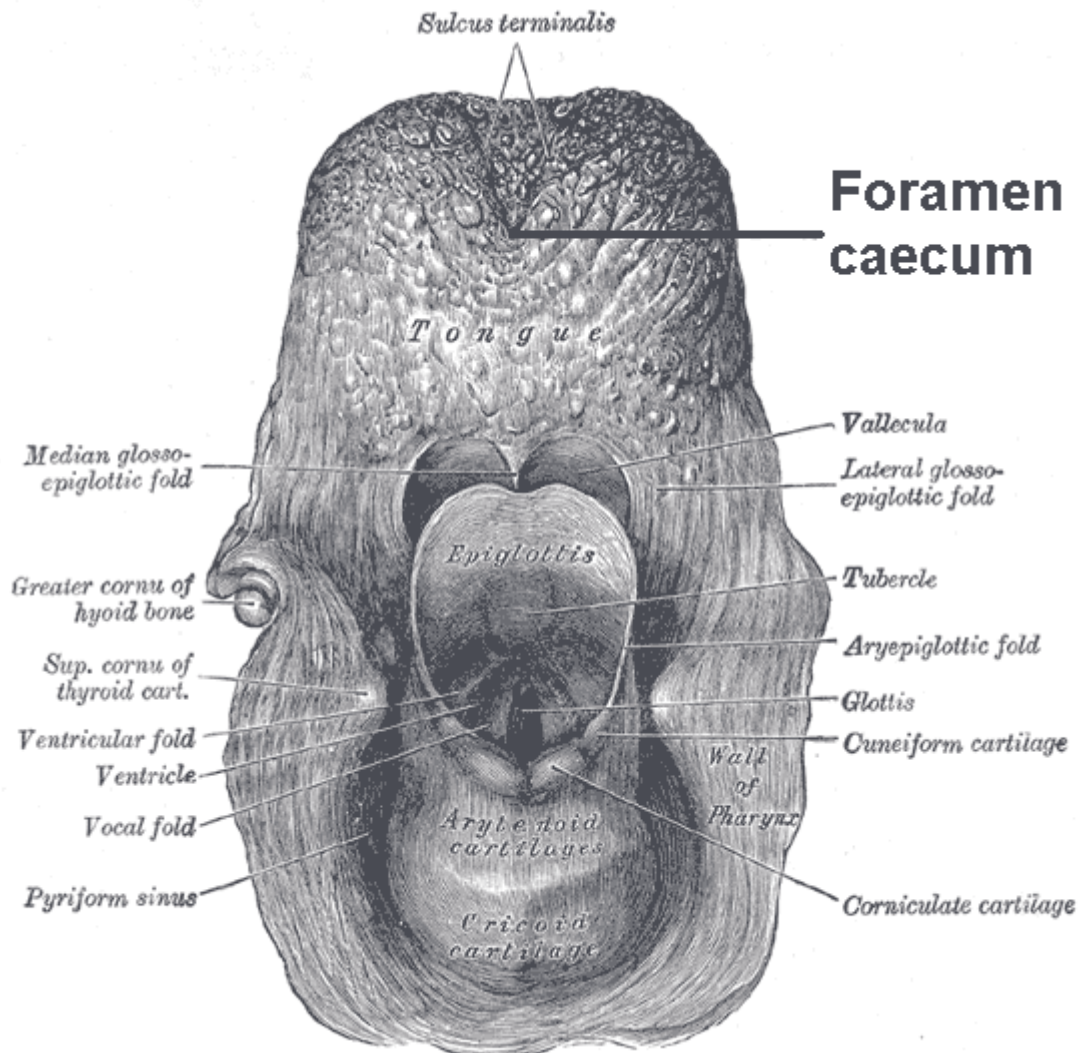


DIAGRAM SHOWING FORAMEN CECUM AND TERMINAL SULCUS

The terminal sulcus is a shallow groove that runs forward as a shallow groove in a V shape from the foramen cecum, forwards and outwards to the margins (borders) of the tongue. The terminal sulcus divides the tongue into a posterior pharyngeal part and an anterior oral part.

Under surface of the tongue

On the under surface of the tongue is a fold of mucous membrane called the frenulum that tethers the tongue at the midline to the floor of the mouth. On either side of the frenulum are small prominences called sublingual caruncles that the major salivary submandibular glands drain into.

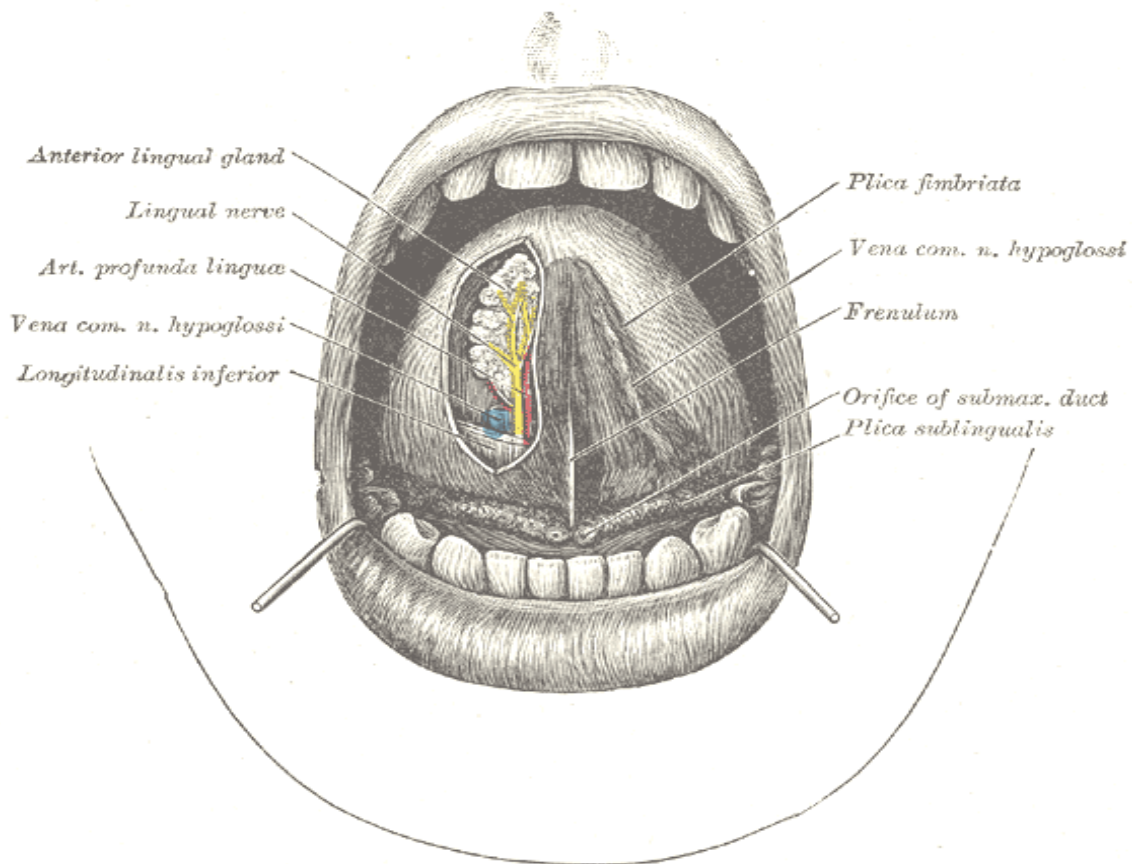


DIAGRAM SHOWING UNDER SURFACE OF TONGUE

The tongue is covered with moist, pink tissue called mucosa. Tiny bumps called papillae give the tongue its rough texture. Thousands of taste buds cover the surfaces of the papillae. Taste buds are collections of nerve-like cells that connect to nerves running into the brain.

There are four types of lingual papillae; all except one containing taste buds:

Fungiform papillae - as the name suggests, these are slightly mushroom-shaped if looked at in longitudinal section. These are present mostly at the dorsal surface of the tongue, as well as at the sides. Innervated by facial nerve.

Foliate papillae - these are ridges and grooves towards the posterior part of the tongue found at the lateral borders. Innervated by facial nerve (anterior papillae) and glossopharyngeal nerve (posterior papillae).

Circumvallate papillae - there are only about 10 to 14 of these papillae on most people, and they are present at the back of the oral part of the tongue. They are arranged in a circular-shaped row just in front of the sulcus terminalis of the tongue. They are associated with ducts of Von Ebner's glands, and are innervated by the glossopharyngeal nerve.

Filiform papillae - the most numerous type but do not contain taste buds. They are characterized by increased keratinisation and are involved in the mechanical aspect of providing abrasion.

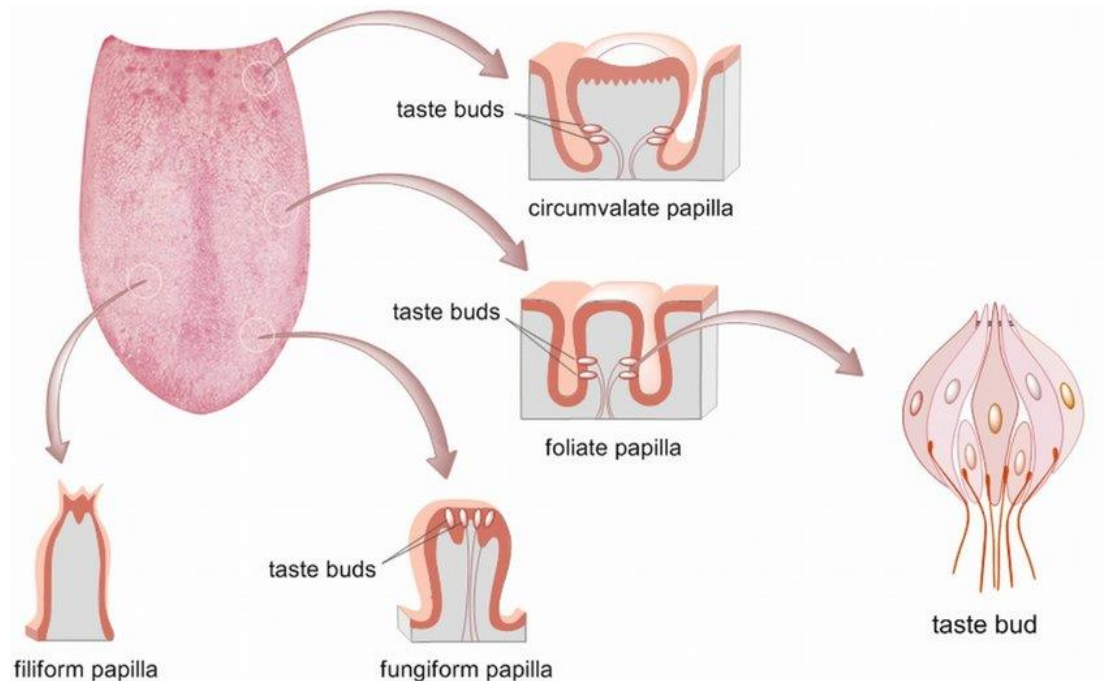


DIAGRAM SHOWING DIFFERENT TYPES OF TASTE BUDS

There are four basic taste sensations: sweet, salty, sour, and bitter

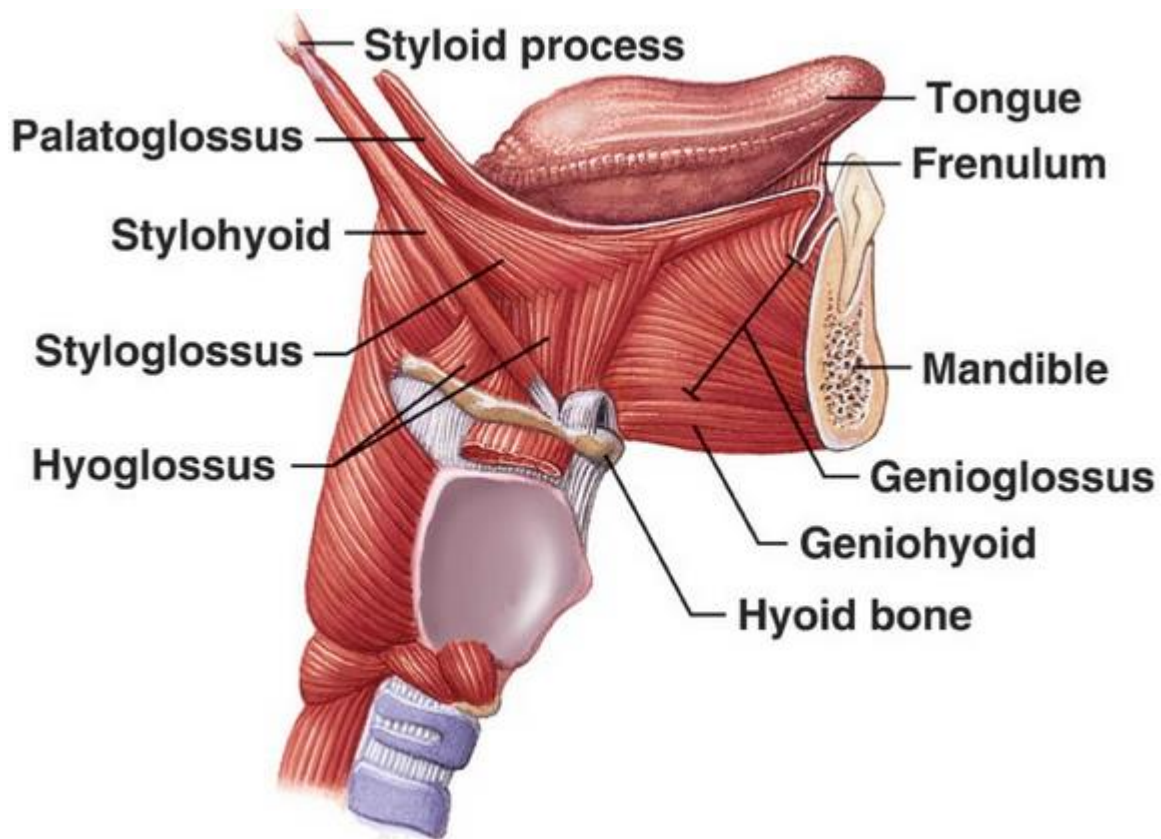


- Sweetness is detected at the apex
- saltiness at the anterolateral margins
- sourness at the posterolateral margins
- bitterness at the posterior part of the tongue

TONGUE MAP

Muscles of the Tongue

The tongue is essentially a mass of muscles that is mostly covered by mucous membrane. The eight muscles of the human tongue are classified as either intrinsic or extrinsic. The four intrinsic muscles act to change the shape of the tongue, and are not attached to any bone. The four extrinsic muscles act to change the position of the tongue, and are anchored to bone.



MUSCLES OF THE TONGUE

Extrinsic muscles of the tongue

The four extrinsic muscles originate from bone and extend to the tongue. They are the:

- i). **Genioglossus**: arises from the mandible and protrudes the tongue. It is also known as the tongue's "safety muscle" since it is the only muscle that propels the tongue forward.
- ii). **Hyoglossus** (often including the chondroglossus): arises from the hyoid bone and retracts and depresses the tongue. The chondroglossus is often included with this muscle.
- iii). **Styloglossus**: arises from the styloid process of the temporal bone and draws the sides of the tongue up to create a trough for swallowing.
- iv). **Palatoglossus**: arises from the palatine aponeurosis, and depresses the soft palate, moves the palatoglossal fold towards the midline, and elevates the back of the tongue during swallowing.

Their main functions are altering the tongue's position allowing for protrusion, retraction, and side-to-side movement.

Intrinsic muscles of the tongue

Four paired intrinsic muscles of the tongue originate and insert within the tongue, running along its length. They are the:

- i). **Superior longitudinal muscle:** runs along the upper surface of the tongue under the mucous membrane, and elevates, assists in retraction of, or deviates the tip of the tongue. It originates near the epiglottis, at the hyoid bone, from the median fibrous septum.
- ii). **Inferior longitudinal muscle:** lines the sides of the tongue, and is joined to the styloglossus muscle.
- iii). **Vertical muscle:** is located in the middle of the tongue, and joins the superior and inferior longitudinal muscles.
- iv). **Transverse muscle:** divides the tongue at the middle, and is attached to the mucous membranes that run along the sides.

These muscles alter the shape of the tongue by lengthening and shortening it, curling and uncurling its apex and edges as in tongue rolling, and flattening and rounding its surface. This provides shape and helps facilitate speech, swallowing, and eating.

Arterial supply

The tongue receives its blood supply primarily from the lingual artery, a branch of the external carotid artery. There is also a secondary blood supply to the root of tongue from the tonsillar branch of the facial artery and the ascending pharyngeal artery. The floor of the mouth also receives its blood supply from the lingual artery.

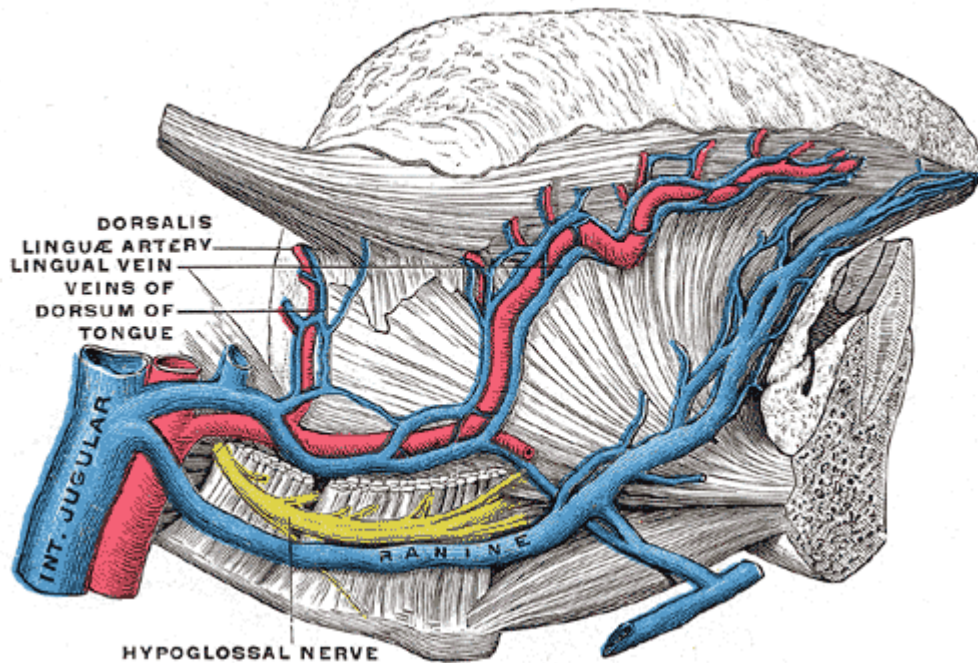
Venous drainage

The lingual veins drain into the internal jugular vein.

Lymphatic drainage

Lymph from the tongue takes four routes:

- Lymph from the posterior third drains into the superior deep cervical lymph nodes.
- Lymph from the medial part of the anterior two thirds drains directly to the inferior deep cervical lymph nodes.
- Lymph from the lateral parts of the anterior two thirds drains to the submandibular lymph nodes.
- The apex and frenulum drain to the submental lymph nodes.
- The posterior third and the medial part of the anterior two thirds drain bilaterally.



BLOOD SUPPLY AND INNERVATION OF THE TONGUE

Innervation

Innervation of the tongue consists of motor fibers, special sensory fibers for taste, and general sensory fibers for sensation

- Motor supply for all intrinsic and extrinsic muscles of the tongue is supplied by efferent motor nerve fibers from the hypoglossal nerve (CN XII), with the exception of the palatoglossus, which is innervated by the vagus nerve (CN X).

Innervation of taste and sensation is different for the anterior and posterior part of the tongue because they are derived from different embryological structures (pharyngeal arch 1 and pharyngeal arches 3 and 4, respectively)

- Anterior two thirds of tongue (anterior to the vallate papillae):
 - Taste: chorda tympani branch of the facial nerve (CN VII) via special visceral afferent fibers
 - Sensation: lingual branch of the mandibular (V3) division of the trigeminal nerve (CN V) via general visceral afferent fibers
- Posterior one third of tongue:
 - Taste and sensation: glossopharyngeal nerve (CN IX) via a mixture of special and general visceral afferent fibers
- Base of tongue
 - Taste and sensation: internal branch of the superior laryngeal nerve (itself a branch of the vagus nerve, CN X)

CLINICAL ANATOMY

I). 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)

II). Macroglossia

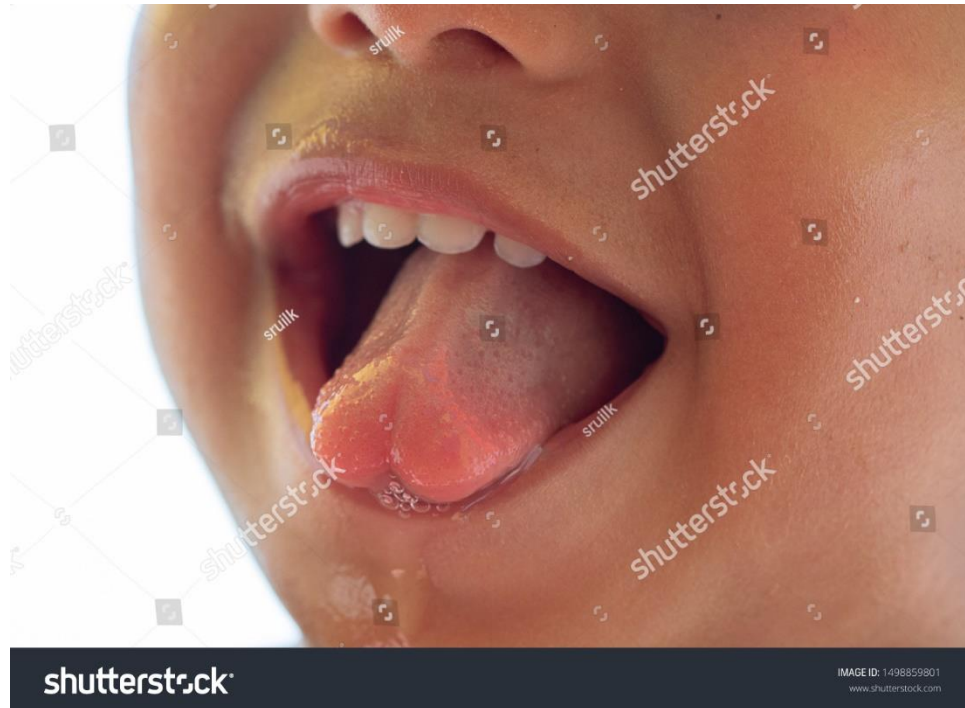


Macroglossia is the medical term for an unusually large tongue. Severe enlargement of the tongue can cause cosmetic and functional difficulties in speaking, eating, swallowing and sleeping. Macroglossia is uncommon, and usually occurs in children. There are many causes.



III). **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.

IV). Cleft tongue



A bifid or cleft tongue (glossoschissis) is a tongue with a groove or split running lengthwise along the tip of the tongue. It is the result of incomplete fusion of the distal tongue buds.

V). 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#

Others are burning tongue syndrome, cancer sores, oral leukoplakia, hairy tongue, herpes stomatitis, oral cancer etc

Question 2 Write an essay on the air sinuses.

Air sinuses are also known as *paranasal sinuses*. Paranasal sinuses are a group of four paired air-filled spaces that are within the bones of the skull and facial bones.

They are centred 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.

The paranasal air sinuses are lined with respiratory epithelium (ciliated pseudostratified columnar epithelium).

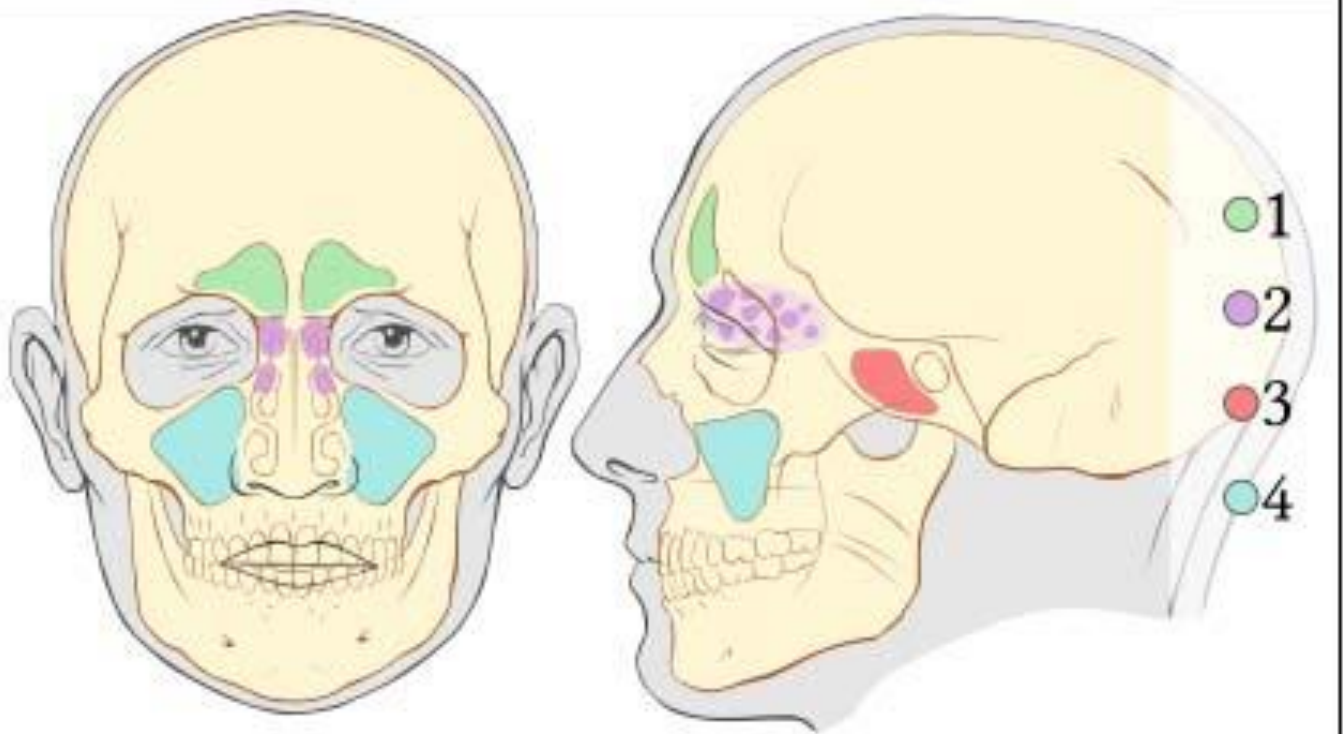


DIAGRAM SHOWING AIR SINUSES

They are:

1. Frontal sinuses
2. Ethmoidal sinuses
3. Sphenoidal sinuses
4. Maxillary sinuses

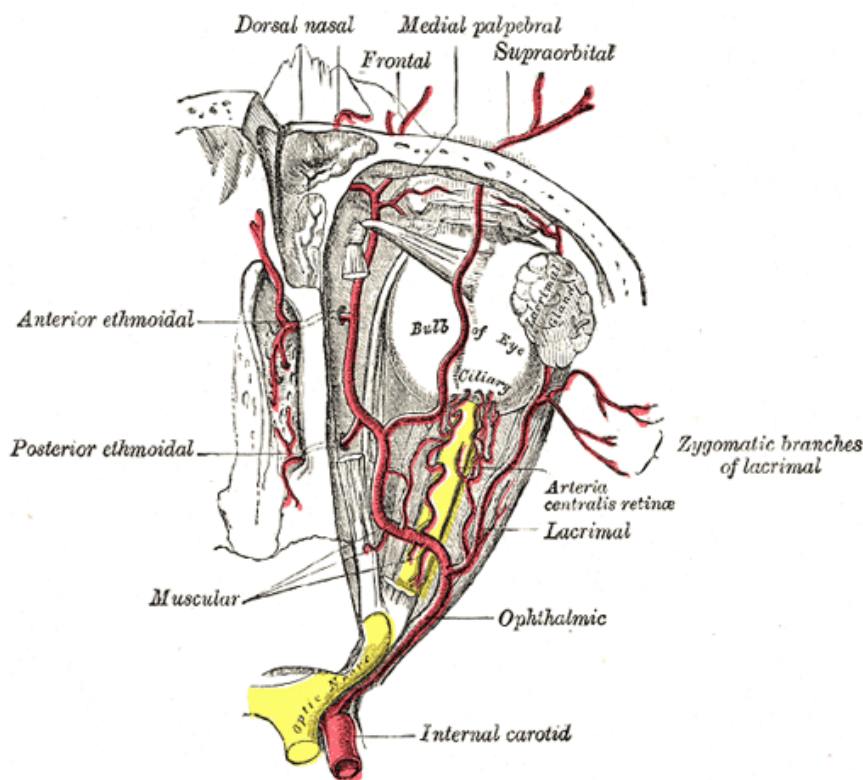
FRONTAL SINUSES:

These are the most superior in location, found under the forehead. The frontal sinuses are variable in size, but always triangular-shaped.

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

They drain into the nasal cavity via the frontonasal duct, which opens out at the hiatus semilunaris on the lateral wall.

They are also innervated by the trigeminal nerve (CN Va) and supplied by anterior ethmoidal, supraorbital, supratrochlear arteries (branches of the ophthalmic artery).



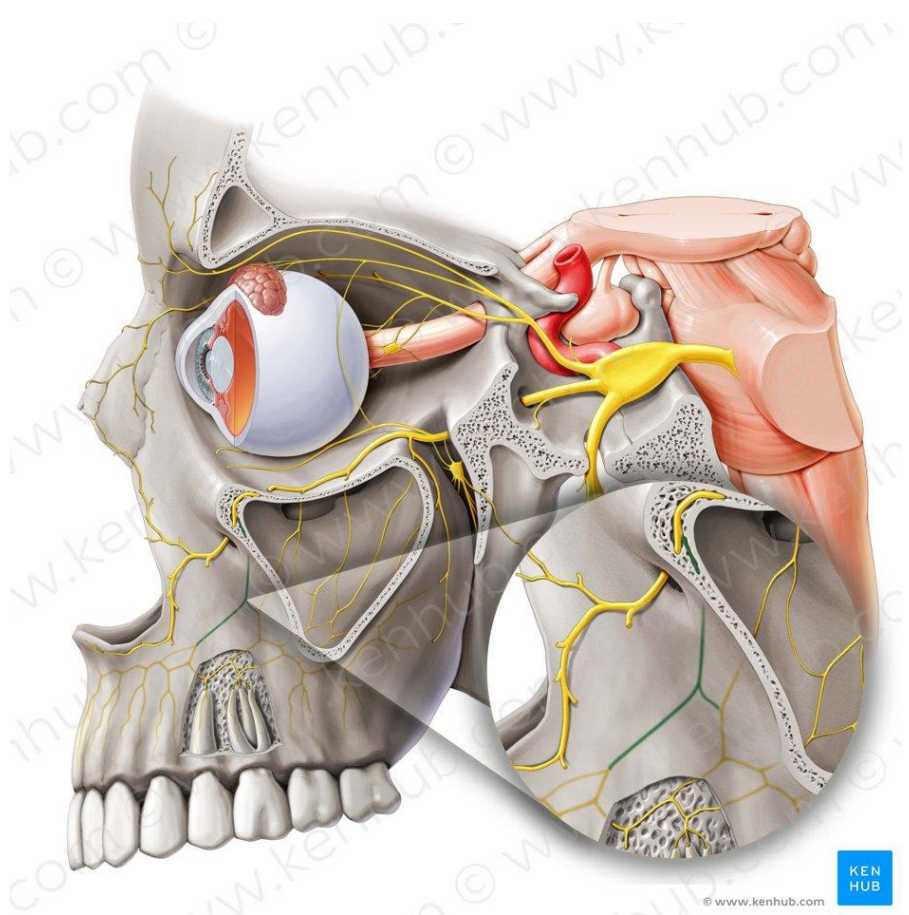
They drain primarily into the ethmoidal infundibulum and the corresponding lymph drainage occurs via the submandibular lymph nodes.

DIAGRAM SHOWING BLOOD SUPPLY TO FRONTAL SINUSES

MAXILLARY SINUSES:

The largest of the sinuses. It is located laterally and slightly inferiorly to the nasal cavities. They have thin walls which are often penetrated by the long roots

of the posterior maxillary teeth. It drains into the nasal cavity at the hiatus semilunaris, underneath the frontal sinus opening.



The superior border of this sinus is the bony orbit, the inferior is the maxillary alveolar bone and corresponding tooth roots, the medial border is made up of the nasal cavity and the lateral and anterior border are limited by the cheekbones.

Posteriorly, two anatomical spaces known as the pterygopalatine fossa and the infratemporal fossa exist.

This is a potential pathway for spread of infection – fluid draining from the frontal sinus can enter the maxillary sinus.

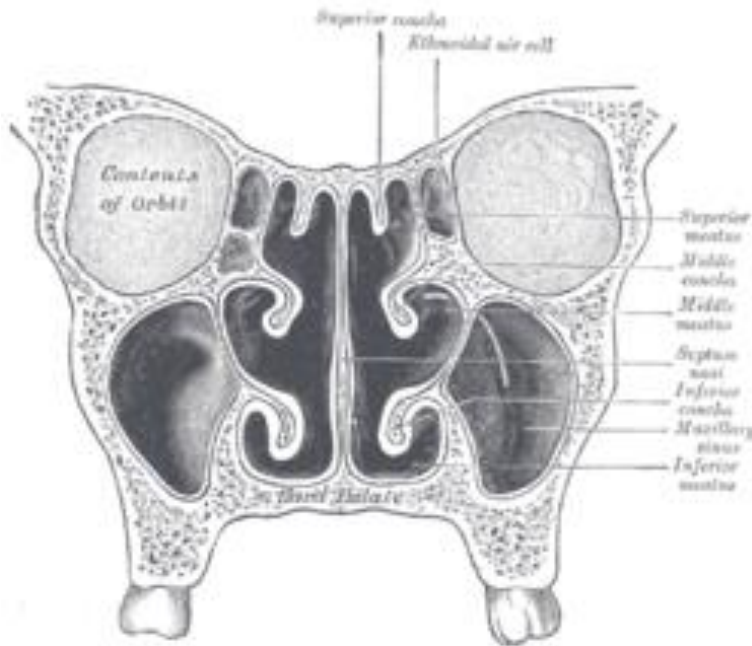
They are innervated by the trigeminal nerve (CN Vb) and supplied by anterior superior alveolar, middle superior alveolar, posterior superior alveolar arteries (branches of the maxillary artery). The submandibular lymph nodes are the main destination during lymphatic drainage.

ETHMOIDAL SINUSES:

Superior to the ethmoidal sinus is the anterior cranial fossa and the frontal bone, laterally the orbit can be found, while the 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.

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.

There are three ethmoidal sinuses; anterior, middle and posterior. They empty into the nasal cavity at different places:



Anterior – Hiatus semilunaris
 Middle – Ethmoid bulla
 Posterior – Superior meatus

DIAGRAM SHOWING ETHMOIDAL SINUSES

They are innervated by the ethmoidal nerves, which branch from the nasociliary nerve of the trigeminal nerve (CN Va) and supplied by anterior and posterior ethmoidal arteries (branches of the ophthalmic artery). 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.

SPHENOIDAL SINUSES:

The sphenoid sinuses also lie relatively superiorly, at the level of the sphenoid-ethmoidal recess. They are found more posteriorly, and are related superiorly and laterally to the cranial cavity. The sphenoid sinuses drain out onto the roof of the nasal cavity. The sphenoidal sinuses are large and irregular, just like their septum, which is made by the sphenoid bone. 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.

The relationships of this sinus are of clinical importance – the pituitary gland can be surgically accessed via passing through the nasal roof, into the sphenoid sinus and through the sphenoid bone.

They are innervated by the trigeminal nerve (CN Va & Vb) and supplied by posterior ethmoidal, posterior lateral nasal arteries (branches of the ophthalmic artery). The lymphatic drainage occurs in the same way as the posterior ethmoid sinus.

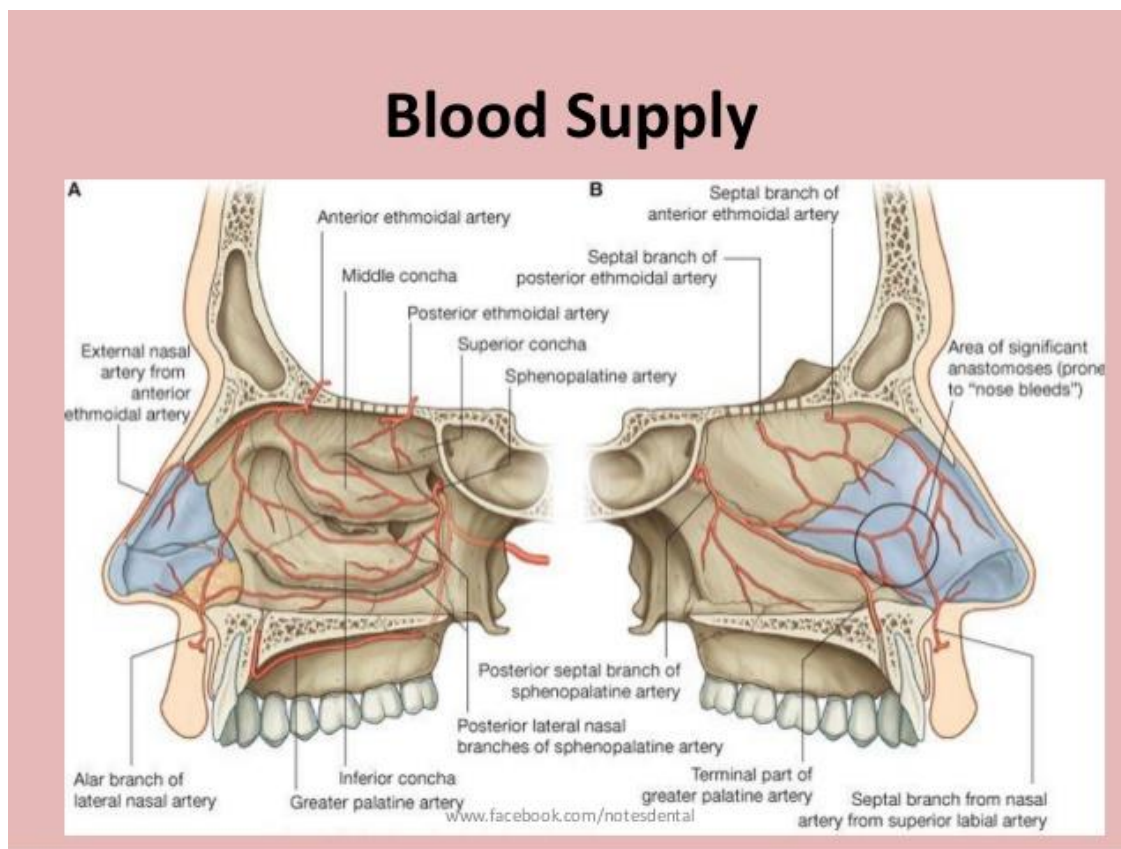


DIAGRAM SHOWING BLOOD SUPPLY TO SPHENOIDAL SINUSES

CLINICAL SIGNIFICANCE

Inflammation

As the paranasal sinuses are continuous with the nasal cavity via small orifices called *ostia*; an upper respiratory tract infection can spread to the sinuses. These become blocked easily by allergic inflammation, or by swelling

in the nasal lining that occurs with a cold. If this happens, normal drainage of mucus within the sinuses is disrupted, and sinusitis may occur. Infection of the sinuses causes inflammation (particularly pain and swelling) of the mucosa, and is known as sinusitis.

If more than one sinus is affected, it is called pansinusitis.

The maxillary nerve supplies both the maxillary sinus and maxillary teeth, and so inflammation of that sinus can present with toothache. These clinical problems can include secondary sinusitis, the inflammation of the sinuses from another source such as an infection of the adjacent teeth.

These conditions may be treated with drugs such as decongestants, which cause vasoconstriction in the sinuses; reducing inflammation; by traditional techniques of nasal irrigation; or by corticosteroid.

Sinusitis is an extremely common outpatient case which presents as an inflammation of the epithelia of the sinuses. The causes can be either a viral or bacterial infection, or an allergic reaction. The inflammation can be acute or chronic and the maxillary sinuses are the most frequently affected. Antivirals, antibiotics and antihistamines are prescribed in persistent cases.

Cancer

Malignancies of the paranasal sinuses comprise approximately 0.2% of all malignancies. About 80% of these malignancies arise in the maxillary sinus. Men are much more often affected than women. They most often occur in the age group between 40 and 70 years. Carcinomas are more frequent than sarcomas. Metastases are rare. Tumours of the sphenoid and frontal sinuses are extremely rare.