ANATOMY OF HEAD AND NECK ASSIGNMENT by DR OGEDENGBE

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

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 salivary glands, 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. It has three main parts:

1. The tip or apex of the tongue is the most anterior, and most mobile aspect of the organ.
2. The tip is followed by the body of the tongue. It has a rough dorsal (superior) surface that abuts 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.
3. The base of the tongue is the most posterior part of the organ. It is populated by numerous lymphoid aggregates known as the lingual tonsils along with foliate papillae along the posterolateral surface. There are numerous important structures surrounding the tongue. It is limited anteriorly and laterally by the upper and lower rows of teeth. Superiorly, it is bordered by the hard (anterior part) and soft (posterior part) palates. Inferiorly, the root of the tongue is continuous with the mucosa of the floor of the oral cavity; with the sublingual salivary glands and vascular bundles being located below the mucosa of the floor of the oral cavity.

The palatoglossal and palatopharyngeal arches (along with the palatine tonsils) have lateral relations to the posterior third of the tongue. Posterior to the base of the tongue is the dorsal surface of the epiglottis and laryngeal inlet, and the posterior wall of the oropharynx. As mentioned earlier, the presulcal and postsulcal parts of the tongue differ not only by anatomical location, but also based on embryological origin, innervation, and the type of mucosa found on its surface.

Anterior two thirds

The presulcal tongue includes the apex and body of the organ. It terminates at the sulcus terminalis; which can be seen extending laterally in an oblique direction from the foramen cecum towards the palatoglossal arch. The mucosa of the dorsal surface of the oral tongue is made up of circumvallate, filiform, and fungiform papillae. There is also a longitudinal midline groove running in an anteroposterior direction from the tip of the tongue to the foramen cecum. This marks the embryological point of fusion of the lateral lingual swellings that formed the oral tongue. It also represents the location of the median lingual (fibrous) septum of the tongue that inserts in the body of the hyoid bone.

On the lateral surface of the oral tongue are foliate papillae arranged as a series of vertical folds. The ventral mucosa of the oral tongue is comparatively unremarkable. It is smooth and

continuous with the mucosa of the floor of the mouth and the inferior gingiva. The lingual veins are relatively superficial and can be appreciated on either side of the lingual frenulum. Lateral to the lingual veins are pleated folds of mucosa known as the plica fimbriata. They are angled anteromedially toward the apex of the tongue.

Posterior third

The remainder of the tongue that lies posterior to the sulcus terminalis is made up by the base of the organ. It lies behind the palatoglossal folds and functions as the anterior wall of the oropharynx. Unlike the oral tongue, the pharyngeal tongue does not have any lingual papillae. Instead, its mucosa is populated by aggregates of lymphatic tissue known as the lingual tonsils. The mucosa is also continuous with the mucosa of the laterally located palatine tonsils, the lateral oropharyngeal walls, and the posterior epiglottis and glossoepiglottic folds.

Muscles

The tongue is chiefly a muscular organ with some amount of fatty and fibrous tissue distributed throughout its substance. All the muscles of the tongue are paired structures, with each copy being found on either side of the median fibrous septum. There are muscles that extend outside of the organ to anchor it to surrounding bony structures, known as extrinsic muscles. The other set of muscles are confined to each half of the organ and contribute to altering the shape of the organ; these are the intrinsic muscles.

Intrinsic Muscles

The **intrinsic** muscles only attach to other structures in the tongue. There are four paired intrinsic muscles of the tongue and they are named by the direction in which they travel: the **superior longitudinal, inferior longitudinal, transverse** and **vertical** muscles of the tongue. These muscles affect the shape and size of the tongue – for example, in tongue rolling – and have a role in facilitating speech, eating and swallowing.

Motor innervation for the intrinsic muscles of the tongue is via the hypoglossal nerve (CNXII).

Extrinsic Muscle

The extrinsic muscles are as follows:

1. Genioglossus

Attachments: Arises from the mandibular symphysis. It inserts into the body of the hyoid bone and the entire length of the tongue.

Function: Inferior fibers protrude the tongue, middle fibers depress the tongue, and superior fibers draw the tip back and down

Innervation: Motor innervation via the hypoglossal nerve (CNXII).

2. Hyoglossus

Attachments: Arises from the hyoid bone and inserts into the side of the tongue

Function: Depresses and retracts the tongue

Innervation: Motor innervation via the hypoglossal nerve (CNXII)

3. Styloglossus

Attachments: Originates at the styloid process of the temporal bone and inserts into the side of the tongue
Function: Retracts and elevates the tongue
Innervation: Motor innervation via the hypoglossal nerve (CNXII).
4. Palatoglossus
Attachments: Arises from the palatine aponeurosis and inserts broadly across the tongue
Function: Elevates the posterior aspect of the tongue
Innervation: Motor innervation via the vagus nerve (CNX).
All of the intrinsic and extrinsic muscles are innervated by the hypoglossal nerve (CN XII), except palatoglossus, which has vagal innervation (CN X).
Innervation
In the anterior 2/3, general sensation is supplied by the trigeminal nerve (CNV). Specifically the lingual nerve, a branch of the mandibular nerve (CN V3).
On the other hand, taste in the anterior 2/3 is supplied from the facial nerve (CNVII). In the petrous part of the temporal bone, the facial nerve gives off three branches, one of which is chorda tympani. This travels through the middle ear, and continues on to the tongue.
The posterior 1/3 of the tongue is slightly easier. Both touch and taste are supplied by the glossopharyngeal nerve (CNIX).
Vasculature: The **lingual artery** (branch of the external carotid) does most of the supply, but there is a branch from the facial artery, called the **tonsillar artery**, which can provide some collateral circulation. Drainage is by the **lingual vein**.
Lymphatic Drainage: The lymphatic drainage of the tongue is as follows:
Anterior two thirds – initially into the submental and submandibular nodes, which empty into the deep cervical lymph nodes.
Posterior third – drains directly into the deep cervical lymph nodes.

The lingual papillae
There are four types of lingual papillae found on the surface of the human tongue. These include:
1. Filiform papillae are the most abundant of the four types of papillae. They are stretched, conical, grey-white papillae that are covered in a heavy coat of keratinized squamous epithelium. By making the dorsal surface of the tongue rough, these papillae provide friction to allow movement of the food bolus during chewing. It should be noted that these papillae do not possess taste buds.
2. Fungiform papillae are weakly keratinized and less abundant than the filiform papillae. However, they are scattered across the entire dorsal surface of the tongue. These highly vascular, mushroom-shaped papillae contain a few taste buds on the apical aspect.
3. Foliate papillae appear as bilaterally paired, parallel, longitudinal slits on the posterolateral margin of the tongue, near the sulcus terminalis. The mucosa is non-keratinized and the

papillae are populated with numerous taste buds.
4. Circumvallate (Vallate) papillae are organized linearly, as a set of four to six large papillae anterior to each limb of the sulcus terminalis (i.e. eight to twelve papillae in total). In longitudinal section, the characteristic furrow found within the papillae can be appreciated. These moats facilitate the drainage of serous salivary von Ebner glands that empty into the structure. The persistent lubrication creates a favorable environment for gustatory particles to dissolve so that they can be detected by the taste buds.

Applied Anatomy

Frenectomy if the frenulum is overly large(ankyloglosssa), it interferes with the movements of the tongue and often affect speech. Therefore in most cases, frenectomy(frenulum cutting) is needed.

Thyroglossal Duct cyst in this case, 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.

QUESTION 2: Write an essay on the air sinuses

The paranasal/air sinuses are air cavities that 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. There are four different pairs of sinuses and they are called the:

1. maxillary sinuses
2. frontal sinuses
3. sphenoidal sinuses
4. ethmoidal sinuses

The maxillary sinuses

Anatomy: The maxillary sinuses are the largest of the 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 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.

Vascularization, innervation and lymphatics

The submandibular lymph nodes are the main destination during lymphatic drainage. The blood supply includes a contribution from the:

1. anterior superior alveolar artery
2. Middle superior artery

3. Posterior superior alveolar artery

Innervation occurs through nerves of the same names as the arteries.

The frontal sinuses

Anatomy: 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 is 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.

Vascularization, innervation and lymphatics

They drain primarily into the ethmoidal infundibulum and the corresponding lymph drainage occurs via the submandibular lymph nodes. It is innervated by the ophthalmic nerve, including the supraorbital and supratrochlear branches.

The frontal sinuses are supplied by the:

1. Anterior ethmoidal artery
2. Supraorbital artery
3. Supratrochlear artery

The sphenoidal sinuses

Anatomy: 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. Laterally, a cavernous sinus exist which is part of the middle cranial fossa and also the carotid artery and cranial nerves III, IV, V1, V2 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.

Vascularization, innervation and lymphatics

The lymphatic drainage occurs in the same way as the posterior ethmoid sinus. The posterior ethmoidal artery and the posterior lateral nasal branches supply the sphenoidal sinuses.

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

The ethmoidal sinuses

Anatomy: 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.

Vascularization, innervation and lymphatics

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.

The anterior and posterior ethmoidal arteries, as well as the posterior lateral nasal branches provide an ample blood supply to this region. Meanwhile the anterior and posterior ethmoidal nerves and the posterior lateral superior and inferior nasal nerves help innervate it.

Applied Anatomy

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.