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COURSE TITLE: GROSS ANATOMY OF HEAD AND NECK

ASSIGNMENT TITLE: NOSE AND ORAL CAVITY

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

ANSWER: The tongue is a mobile muscular organ covered with mucous membrane. It can assume variety of shapes and positions. It is partly in the oral cavity and partly in the oropharynx. The tongue's main functions are articulation (forming words during speaking) and squeezing food into the oropharynx as part of deglutition (swallowing). It is also involved in mastication, taste and oral cleansing.

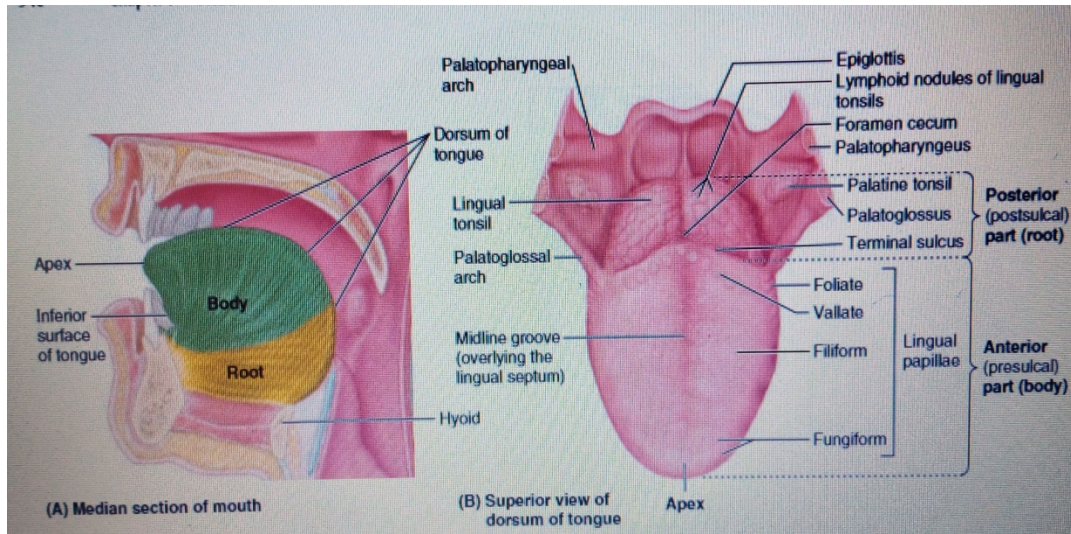
PARTS AND SURFACES OF TONGUE:

The tongue has a root, body, and apex. The **ROOT** of the tongue is the attached at the posterior portion, extending between the mandible, hyoid, and the nearly vertical posterior surface of the tongue. The **BODY** of the tongue is the anterior, approximately two thirds of the tongue between root and apex. 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 tongue features two surfaces which are the more extensive, **superior and posterior surface** is the dorsum of the tongue (commonly referred to as the "top" of the tongue). **The inferior surface of the tongue** (commonly referred to as its "underside") usually rests against the floor of the mouth. The margin of the tongue separating the two surfaces is related on each side to the lingual gingivae and lateral teeth. The dorsum of the tongue is characterized by a V-shaped groove, the terminal sulcus of the tongue, the angle of which points posteriorly to the foramen cecum. This small pit which is 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 transversely into a **presulcal anterior part in the oral cavity proper and a postsulcal posterior part in the**

oropharynx. A midline groove divides the anterior part of the tongue into right and left parts. The mucosa of the anterior part of the tongue is relatively thin and closely attached to the underlying muscle. It has a rough texture because of numerous small lingual papillae:

- Vallate papillae: large and flat topped. It lies directly anterior to the terminal sulcus 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.
- Foliate papillae: small lateral folds of the lingual mucosa. They are poorly developed in humans.
- Filiform papillae: long and numerous, contain afferent nerve endings that are sensitive to touch. 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.
- Fungiform papillae: mushroom shaped pink or red spots scattered among the filiform papillae but 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 mucosa 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 and can be inspected only with a mirror or downward pressure on the tongue with a tongue depressor. The inferior surface of the tongue 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.



MUSCLES OF TONGUE:

The tongue is essentially a mass of muscles that is mostly covered by mucosa (mucous membrane). The muscles of the tongue do not act in isolation and some even perform multiple functions. We have the extrinsic and intrinsic muscles of the tongue. Intrinsic muscles are located within the tongue and are responsible for altering its shape and its mobility. Extrinsic muscles are those that originate from structures other than the tongue and insert onto it to cause gross tongue movement. It is responsible for altering the position of the tongue. There are four each of the intrinsic and extrinsic muscles and they are separated by a median fibrous lingual septum which merges posteriorly with lingual aponeurosis.

Muscle	Shape and position	Proximal attachment	Distal attachment	Main actions
EXTRINSIC MUSCLES(THEY ARE PAIRED)				
GENIOGLOSSUS	Fan-shaped muscle. It constitutes the bulk of tongue	Via a short tendon from superior part of mental spine of mandible	Entire dorsum of tongue; most inferior and most posterior fibers attach to body of hyoid bone	Bilateral activity depresses tongue, especially central part, creating a longitudinal furrow. It makes the superior part of the tongue to become transversely concave. Posterior part pulls tongue anteriorly for protrusion; a most anterior part retracts apex of protruded tongue;

				unilateral contraction deviates (“wags”) tongue to contralateral side
HYPOGLOSSUS	Thin, quadrilateral muscle	Body and greater horn of hyoid bone	Inferior aspects of lateral part of tongue	Depresses tongue, especially pulling its sides inferiorly; helps shorten (retrude) tongue
STYLOGLOSSUS	Small, short, triangular muscle	Anterior border of distal styloid process; stylohyoid ligament	Sides of tongue posteriorly, interdigitating with hyoglossus	Retrudes tongue and curls (elevates) its sides, working with genioglossus to form a central trough during swallowing
PALATOGLOSSUS	Narrow, crescent-shaped palantine muscle. Forms posterior column of isthmus of fauces	Palatine aponeurosis of soft palate	Enters posterolateral tongue transversely, blending with intrinsic transverse muscles	Capable of elevating posterior tongue or depressing soft palate; most commonly acts to constrict isthmus of fauces

MUSCLES	SHAPE AND POSITION	PROXIMAL ATTACHMENT	DISTAL ATTACHMENT	MAIN ACTIONS
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INTRINSIC MUSCLES OF TONGUE				
SUPERIOR LONGITUDINAL	Thin layer deep to mucous membrane of dorsum	Submucosal fibrous layer and median fibrous septum	Margins of tongue and mucous membrane	Curls tongue longitudinally upward, elevating apex and sides of tongue; shortens (retrudes) tongue
INFERIOR LONGITUDINAL	Narrow band close to inferior surface	Root of tongue and body of hyoid bone	Apex of tongue	Curls tongue longitudinally downward, elevating apex and sides of tongue; shortens (retrudes) tongue
TRANSVERSE	Deep to superior longitudinal muscle	Median fibrous septum	Fibrous tissue at lateral lingual margins	Narrows and elongates (protrudes) tongue
VERTICAL	Fibers intersect transverse muscle	Submucosal fibrous layer of dorsum of tongue	Inferior surface of borders of tongue	Flattens and broadens tongue

These muscles all act simultaneously to protrude tongue.

INNERVATION OF TONGUE:

All muscles of the tongue except for palatoglossus muscle are innervated by CNXII, HYPOGLOSSAL NERVE. Palatoglossus is a palatine muscle supplied by the pharyngeal plexus. For general sensation (touch and temperature), the mucosa of the anterior two thirds of the tongue is supplied by the LINGUAL NERVE, a branch of CNV₃. For special sensation (taste), this part of the tongue, except for the vallate papillae, is supplied the CHORDA TYMPANI NERVE, a branch of CNVII, the FACIAL NERVE. The chorda tympani join the lingual nerve in the infratemporal fossa and runs anteriorly in its sheath. The mucosa of the posterior one third of the tongue and the vallate papillae are supplied by the lingual branch of the GLOSSOPHARYNGEAL NERVE (CNIX) for both general and special sensation. Twigs of the INTERNAL LARYNGEAL NERVE, a branch of the VAGUS NERVE (CNX) supply mostly the general sensation and some special sensation to a small area of the tongue just anterior to the epiglottis. These mostly sensory nerves also carry parasympathetic secretomotor fibers to serous glands in the tongue. There are four basic taste sensations: sweet, salty, sour, and bitter. Sweetness is detected at the apex, saltiness at the lateral margins, and sourness and bitterness at the posterior part of the tongue. All other "tastes" expressed by gourmets are olfactory (smell and aroma).

VASCULATURE OF TONGUE:

The arteries of the tongue arise 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.

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 VEINS. 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.

LYMPHATIC DRAINAGE OF TONGUE

The lymphatic drainage of the tongue is unique. 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 course. Lymph from the tongue takes four routes:

- i. Lymph from the root drains bilaterally into the superior deep cervical lymph nodes.
- ii. Lymph from the medial part of the body drains bilaterally and directly to the inferior deep cervical lymph nodes.
- iii. Lymph from the right and left lateral parts of body drains to the submandibular lymph nodes on the ipsilateral side(same side)
- iv. 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.

APPLIED ANATOMY

- Gag Reflex: It is possible to touch the anterior part of the tongue without feeling discomfort; however, when the posterior part is touched, the individual gags. CN IX and CN X are responsible for the muscular contraction of each side of the pharynx. Glossopharyngeal branches provide the afferent limb of the gag reflex.
- Paralysis of Genioglossus: When the genioglossus muscle is paralyzed, the tongue has a tendency to fall posteriorly, obstructing the airway and presenting the risk of suffocation. Total relaxation of the genioglossus muscles occurs during general anesthesia; therefore, an airway is inserted in an anesthetized person to prevent the tongue from relapsing.
- Injury to Hypoglossal Nerve Trauma, such as a fractured mandible, may injure the hypoglossal nerve (CN XII), resulting in paralysis and eventual atrophy of one side of the tongue. The tongue deviates to the paralyzed side during protrusion because of the action of the unaffected genioglossus muscle on the other side.
- Frenectomy: An overly large frenulum of the tongue (tongue-tie) 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 movements and speech.
- Lingual Carcinoma: A lingual carcinoma in the posterior part of the tongue metastasizes to the superior deep cervical lymph nodes on both sides, whereas a tumor in the anterior part usually does not metastasize to the inferior deep

cervical lymph nodes until late in the disease. Because the nodes are closely related to the internal jugular vein, metastases from the tongue may be distributed through the submental and submandibular regions and along the internal jugular veins in the neck.

QUESTION 2: Write an essay on the air sinuses.

ANSWER: Air sinuses are also called **PARANASAL SINUSES** which are air-filled spaces of the respiratory part of the nasal cavity into the following bones which are frontal, ethmoid, sphenoid and maxilla. The sinuses are named according to bones which they are located.

FRONTAL SINUSES

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. Frontal sinuses are usually detectable in children by 7 years of age. 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. **The frontal sinuses are innervated by branches of the supra-orbital nerves (CN V₁), the ophthalmic division of trigeminal nerve.** The right and left frontal sinuses are rarely of equal size, and the septum between them is not usually situated entirely in the median plane. The frontal sinuses vary in size from approximately 5mm to large spaces extending laterally into the greater wings of the sphenoid. Often a frontal sinus has two parts: a vertical part in the squamous part of the frontal bone, and a horizontal part in the orbital part of the frontal bone. One or both parts may be large or small. When the supra-orbital part is large, its roof forms the floor of the anterior cranial fossa and its floor forms the roof of the orbit.

ETHMOIDAL CELLS OR SINUSES

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. The ethmoidal cells usually are not visible in plain radiographs before 2 years of age but are recognizable in CT scans. The anterior ethmoidal cells drain directly or indirectly into the middle nasal meatus through the ethmoidal infundibulum. The middle

ethmoidal cells open directly into the middle meatus and are sometimes called “bullar cells” because they form the ethmoidal bulla, a swelling on the superior border of the semilunar hiatus. The posterior ethmoidal cells open directly into the superior meatus. **The ethmoidal cells are supplied by the anterior and posterior ethmoidal branches of the nasociliary nerves (CN V1).**

SPHENOIDAL SINUSES

The sphenoidal sinuses are located in the body of the sphenoid, but they may extend into the wings of this 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. Only thin plates of bone separate the sinuses from several important structures: The optic nerves and optic chiasm, the pituitary gland, the internal carotid arteries, and the cavernous sinuses. 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 sphenoidal recess. The posterior ethmoidal arteries and the posterior ethmoidal nerves that accompany the arteries supply the sphenoidal sinuses.

MAXILLARY SINUSES

The maxillary sinuses are the largest of the paranasal sinuses. They occupy the bodies of the maxillae and communicate with the middle nasal meatus. Each is pyramidal in shape with the apex directed laterally and the base deep to the lateral wall of the adjacent nasal cavity. The medial wall or base of the maxillary sinus is formed by the maxilla and by parts of the inferior concha and palatine bone that overlie the maxillary hiatus

- The apex of the maxillary sinus extends toward and often into the zygomatic bone.
- The base of the maxillary sinus forms the inferior part of the lateral wall of the nasal cavity.
- The roof of the maxillary sinus is formed by the floor of the orbit.
- The floor of the maxillary sinus is formed by the alveolar part of the maxilla. The roots of the maxillary teeth, particularly the first two molars, often produce conical elevations

in the floor of the sinus. 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. The arterial supply of the maxillary sinus is mainly from superior alveolar branches of the maxillary artery; however, branches of the descending and greater palatine arteries supply the floor of the sinus. Innervation of the maxillary sinus is from the anterior, middle, and posterior superior alveolar nerves, which are branches of the maxillary nerve.

Most sinuses open into the middle nasal meatus but the sphenoidal sinuses open into the sphenoidal recess.

