ONYEMA FAVOUR CHINAZAM

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GROSS ANATOMY ASSIGNMENT

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

The Tongue.

The tongue is a mobile muscular organ covered with mucous membrane and found in the mouth. It is covered with moist pink tissue called mucosa. It can assume a variety of shapes and positions and is located partly in the oral cavity and partly in the oropharynx. The tongue's main functions are articulation while speaking and squeezing food into the oropharynx as part of deglutition. The tongue is also involved in mastication, oral cleansing and taste. The four common tastes detected by the tongue are sweet, sour, bitter and salty.

Parts and Surfaces of the Tongue

The tongue has a root, body and apex

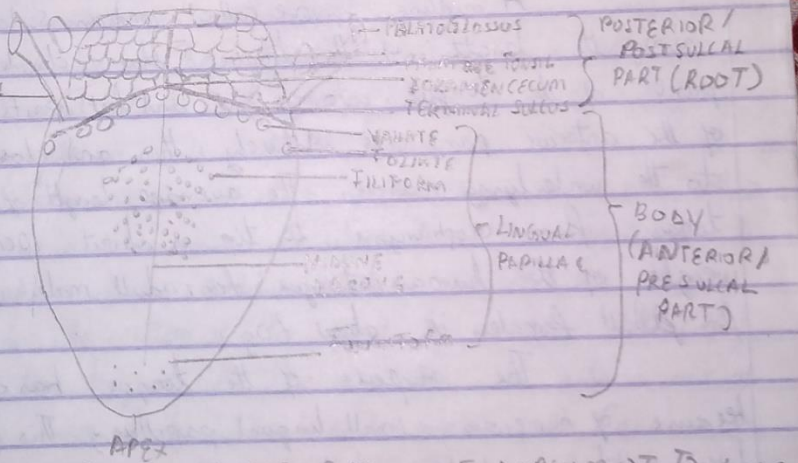

DIAGRAM SHOWING SUPERIOR VIEW OF DORSUM OF TONGUE

The root of the tongue is the attached posterior portion extending between the mandible, hyoid and the nearly vertical posterior surface of the tongue. The body of the tongue is the anterior ~~the~~ between the root and apex and is about two thirds of the entire tongue. The apex of the tongue is the anterior end of the body of the tongue

that rests against the incisor teeth. The apex and body of the tongue are extremely mobile.

The tongue features two surfaces; The dorsum of the tongue (top of the tongue) which is the more extensive, superior and posterior surface, and the inferior surface of the tongue (underside) which usually rests against the floor of the mouth. The margin of the tongue separates the two surfaces and is related on each side to the lingual gingivae and lateral teeth.

The dorsum of the tongue is characterized by a V-shaped groove (Terminal sulcus of the tongue), the angle of which points posteriorly to the foramen cecum. This small pit is the non-functional remnant of the proximal part of the embryonic thyroglossal duct from which the thyroid gland developed. This Terminal sulcus divides the tongue into anterior and posterior part. It divides the dorsum of the tongue transversely into presulcal anterior part in the oral cavity proper and a post sulcal posterior part in the oropharynx

A midline groove called median sulcus is a division along the length of the tongue that divides the anterior part of the tongue into right and left parts. The mucosa of the anterior part is relatively thin and closely attached to the underlying muscle. The average length of the human tongue from oropharynx to tip is about 10cm. The average weight of the human tongue for adult males is 70g while for adult females is about 60g.

The surface of the tongue has a rough texture because of numerous small lingual papillae; This papillae are of different types which include

i Vallate papillae: These are 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 whose walls are studded with taste buds. The ducts of serous glands of the tongue open into these trenches.

Foliate papillae: These are small lateral folds of the lingual mucosa. They are poorly developed in humans

Filiform papillae: These are long and numerous, and they contain afferent nerve endings that are sensitive to touch. These scaly, conical projections, pinkish gray in colour are arranged in V shaped rows that are parallel to the terminal sulcus except at the apex where they are arranged transversely

Fungiform papillae: These are ~~poorly~~ mushroom shaped pink or red spots scattered among the filiform papillae but mostly at the apex and margins of the tongue

The vallate, foliate and most of the fungiform papilla contain taste receptors in taste buds. All the lingual papillae are embedded in masticatory mucosa which is a type of oral mucosa consisting of keratinized stratified squamous epithelium. This is the mucosa of the anterior part.

The mucosa of the posterior part of the tongue is thick, freely movable and has no lingual papillae. The underlying lymphoid nodules however give it an irregular cobblestone appearance. The lymphoid nodules are collectively known as 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 which consists of stratified non-keratinized squamous epithelium which is smooth. This surface is connected to the floor of the mouth by a midline fold called Frenulum of the tongue. This frenulum allows the anterior part of the tongue to move freely and on each sides of the frenulum is a deep lingual vein that is visible through the thin mucous membrane. Also on base of each side of the frenulum is a sublingual caruncle (papilla) that includes the opening of the submandibular duct from the submandibular salivary.

Muscles of the Tongue

There are eight muscles of the human tongue

The muscles of the tongue do not act in isolation but work simultaneously at times. Some parts of a single muscle can work independently. The muscles of the human tongue are classified into Intrinsic or Extrinsic. There are four Intrinsic and four Extrinsic muscles and they are separated by a median fibrous lingual septum which merges posteriorly with the lingual aponeurosis.

I Extrinsic Muscles of Tongue:

They originate outside the tongue and they are anchored to the bone. These muscles act to change the position of the tongue and can alter its shape as well. The extrinsic muscles of the tongue are:

a Genioglossus; This is a fan shaped muscle that constitutes bulk of the tongue

Proximal Attachment: short tendon from superior part of mental spine of mandible

Distal Attachment: Entire dorsum of tongue (inferior most and posterior most fibres attach to body of hyoid bone)

Action

i Bilateral activity depresses tongue (especially central part) Creating a longitudinal furrow

ii Posterior part pull tongue anteriorly for protrusion

iii Most anterior part retracts apex of protruded tongue

iv Unilateral contraction deviates tongue to contralateral side

Innervation: Cranial Nerve XII (Hypoglossal nerve)

Blood Supply: It is supplied by the sublingual branch of the lingual artery, a branch of external carotid artery

Vein: Sublingual vein.

b Hypoglossus: This is a thin quadrilateral muscle

Proximal Attachment: Body and greater horn of hyoid bone

Distal Attachment: Inferior aspects of lateral part of the tongue

Action: i) It depresses tongue (especially pulling its sides inferiorly)

ii It helps retrude the tongue
Innervation: Cranial Nerve XII (Hypoglossal nerve)
Blood Supply: Lingual artery
Vein: Lingual vein

c. Styloglossus: This is a small, short triangular muscle
Proximal Attachment: Anterior border of distal styloid process, stylohyoid ligament
Distal Attachment: Sides of tongue posteriorly, interdigitating with hyoglossus
Action: It retrudes the tongue and curls its sides
ii It works with the genioglossus to form a central trough during swallowing
Innervation: Cranial Nerve XII (Hypoglossal nerve)
Blood Supply: Sublingual branch of Lingual artery
Vein: Lingual vein.

d Palatoglossus: This is a narrow crescent shaped palatine muscle. It forms posterior column of isthmus of fauces.
Proximal Attachment: Palatine aponeurosis of soft Palate
Distal Attachment: Posterolateral tongue ~~transv~~ transversely blending with intrinsic transverse muscles
Action: It is capable of elevating Posterior tongue or depressing soft palate
ii It acts to constrict isthmus of fauces
Innervation: Innervated by pharyngeal plexus from the pharyngeal branch of the vagus nerve.
Blood Supply: Lingual artery
Vein: Lingual vein

I Intrinsic Muscles of the tongue: These muscles alter the shape of the tongue by lengthening and shortening it, curling and unrurling its apex and edges as in tongue rolling and flattening and rounding its surface. This provides shape and helps facilitate speech, swallowing and eating. They are not attached to any bone and have their attachments entirely within the tongue. These muscles include

a Superior Longitudinal muscle : It is a thin layer deep to the mucous membrane of dorsum
Proximal Attachment : Submucosal fibrous layer and median fibrous septum
Distal Attachment : Margins of tongue and mucous membrane
Action : Curls tongue longitudinally upward, elevating apex and sides of tongue
II It Retrudes tongue.
Innervation : Cranial Nerve XII (Hypoglossal nerve)
Blood supply : Deep lingual arteries of lingual artery
Veins : Deep lingual veins of lingual vein.

b Inferior Longitudinal muscle : It is a narrow band close to inferior surface
Proximal Attachment : Root of tongue and body of hyoid bone
Distal Attachment : Apex of tongue
Action : Curls tongue longitudinally downward, depressing apex
II It shortens tongue.
Innervation : Cranial Nerve XII (Hypoglossal nerve)
Blood supply : Lingual artery
Veins : Lingual vein

c Transverse : This muscle is deep to superior longitudinal muscle
Proximal Attachment : Median fibrous septum
Distal Attachment : Fibrous tissue at lateral lingual margins
Action : Narrows and elongates tongue
Innervation : Cranial Nerve XII (Hypoglossal nerve)
Blood Supply : Lingual artery
Veins : Lingual vein.

d Vertical muscle : This muscle fibres intersects transverse muscle
Proximal Attachment : Submucosal fibrous layer of dorsum of tongue
Distal Attachment : Inferior surface of borders of tongue
Action : It flattens and broadens tongue (it works simultaneously with Transverse to protrude tongue)

Innervation: Cranial Nerve XII (Hypoglossal nerve)
Blood supply: Lingual artery
Vein: Lingual vein.

Innervation of Tongue

i The muscles of tongue are all innervated by Cranial nerve XII (Hypoglossal nerve) except Palatoglossus which is innervated by the pharyngeal plexus of the pharyngeal branch of the vagus nerve.

ii General sensation such as touch and temperature, the lingual nerve, a branch of Cranial Nerve V (Trigeminal nerve) innervates two thirds of anterior mucosa of tongue

iii For Special sensation like taste, all taste buds, except in the vallate papilla, are supplied by Chorda tympani, a branch of Cranial nerve VII (Facial nerve). This nerve joins the lingual nerve in the infratemporal fossa and runs anterior in its sheath

iv The posterior one third and vallate papillae are innervated by the lingual branch of the glossopharyngeal nerve (Cranial nerve IX) for both general and special sensation respectively.

v Internal Laryngeal nerve: This is a branch of Vagus nerve (Cranial Nerve X) and it supplies mostly general but some special sensation to a small area of the tongue anterior to the epiglottis

The 4 basic taste sensations are sweet, salty, sour and bitter, but a fifth one (umami stimulated by monosodium glutamate) has been added.

Vasculature of the Tongue:

Arteries of the tongue are from the lingual artery that arises from the external carotid artery. On entering the tongue, the lingual artery passes deep to the hyoglossus muscles and bifurcates to form Dorsal lingual arteries that supply the root of the tongue and Deep lingual arteries that

supplies the body of the tongue. The deep lingual arteries communicate with each other at the apex of the tongue but the dorsal lingual arteries are separated by Lingual septum.

Veins of the tongue are Dorsal lingual veins which accompanies lingual artery and deep lingual veins which begin at apex of tongue and run posteriorly beside lingual frenulum to join sublingual vein. These veins drain into Internal Jugular Vein but some join to form lingual vein.

Lymphatic Drainage of the Tongue:

The tongue's lymphatic drainage is exceptional. Most of the lymphatic drainage converges toward and follows the venous drainage but the lymph from the tip of the tongue, frenulum and central lower lip runs an independent course. Four routes that lymph drain into are:

i Lymph from the root of tongue drain bilaterally into the superior deep cervical lymph nodes

ii Lymph from medial part of the body of tongue drains into the Inferior deep cervical lymph nodes bilaterally and directly

iii Lymph from right and left lateral parts of

Embryological development:

The tongue begins to develop in the fourth week of embryonic development from a median swelling (the median tongue bud / tuberculum impar) of the first pharyngeal arch. In the 5th week, a pair of lateral lingual swellings on each side form on 1st pharyngeal arch and these lingual swellings expand and cover median tongue bud and they form anterior part of tongue with their line of fusion marked by median sulcus.

In the 4th week a swelling appears from second pharyngeal arch in the Copula (midline). During 5th and 6th weeks the Copula is overgrown by the hypopharyngeal eminence from 3rd and 4th arches and this forms the posterior part of the tongue.

Clinical Anatomy of the Tongue

i Lingual Carcinoma :

A tumor in the posterior part of the tongue metasizes to the superior deep cervical lymph nodes on both sides. However a tumor in the anterior part usually does not metastasize to the inferior deep cervical lymph nodes until late in the disease. The lymph nodes are closely related to the Internal Jugular Vein and hence metastases from the tongue may be distributed through the submental and submandibular regions and along the Internal Jugular Vein in the neck

ii Glossitis : This is soreness of the tongue or inflammation with desquamation of the dorsal surface of the tongue leaving a smooth and erythematous surface. It is often caused by nutritional deficiencies and may be painless or cause discomfort. There is burning sensation, difficulty with chewing, swallowing or speaking and tongue swelling.

iii Black Hairy Tongue: This is a condition of the tongue in which the small papillae on the tongue elongate with black or brown discoloration giving a black or hairy appearance. It is a harmless condition caused by factors including smoking, Xerostomia (dry mouth), soft diet, poor oral hygiene and certain medications.

2. Write an Essay on Air Sinuses

Air Sinuses

These are also called Paranasal Sinuses ; They are air filled extensions of the respiratory part of the nasal cavity in the frontal, ethmoid, sphenoid and maxilla cranial bones. These sinuses are named according to the bones in which they are located. The sinuses continue to invade surrounding bone but marked extensions are common in cranial of older people.

The four types of Paranasal sinuses are

i Frontal sinuses : This is divided into the right and left frontal Sinuse

The both of these sinuses are between the outer and inner tables of the frontal bone posterior to the superciliary arches and root of the nose. These sinuses are easily visible in children from the age of 7. The right and left sinuses both drain through a fronto nasal duct into the ethmoidal infundibulum which opens into semilunar hiatus of the middle nasal meatus. The Right and left sinuses are rarely equal as the septum between them is not usually situated entirely in the median plane. They vary in size from about 5mm to large spaces extending into greater wing of sphenoid laterally.

A frontal sinus has 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. If supra-orbital part is large, its roof forms floor of anterior cranial fossa and its floor forms the roof of the orbit. The frontal sinus is innervated by branches of Supra-orbital branches of Cranial Nerve V (Trigeminal nerve, opthalmic branch)

Ethmoid cells or sinuses: These 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 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 called bullar cells as they form ethmoidal bulla (swelling) on the superior border of semi-lunar hiatus. The posterior ethmoidal cells open directly into Superior meatus. Ethmoidal cells are innervated by anterior and branches of the nasociliary nerves of Cranial Nerve V (Trigeminal nerve, Opthalmic nerve branch)

Sphenoidal Sinuses:

These ~~sinuses~~ sinuses are located in the body of the sphenoid but may extend into the wings of sphenoid. They are unevenly divided and separated by a bony septum. The body of the sphenoid is fragile due to extensive pneumatization. Only thin plates of bone separate the sinuses from structures like optic nerves, optic chiasm, pituitary gland,

internal carotid arteries and the cavernous sinuses. The sphenoidal sinuses are derived from a posterior ethmoidal cell that invades sphenoid at about 2years of age. In some people, several posterior ethmoid cells invade the sphenoid giving rise to multiple sphenoid sinuses that open separately into sphenoethmoidal recess. Posterior ethmoidal arteries and Posterior ethmoidal nerves of the nasociliary branch of the ophthalmic nerve innervates the sphenoidal sinuses.

iv Maxillary Sinuses:

These are the largest paranasal sinuses and they occupy the bodies of the maxillae and interact with the middle nasal meatus. The apex of the maxillary sinus extends towards and into the zygomatic bone, the base of the maxillary sinus form inferior part of the lateral wall of the nasal cavity, the roof of the maxillary sinus is formed by the floor of the orbit and the floor of the maxillary sinus is formed by the alveolar part of the maxilla (which often produces conical elevations in the floor of the sinus). Each maxillary sinus drains by one or more openings of the maxillary ostium into the middle nasal meatus of the nasal cavity of the semilunar hiatus.

Arterial supply: Superior alveolar branches of maxillary arteries and also descending and greater palatine arteries

Innervation: Anterior, middle and Posterior alveolar nerve branches of maxillary nerve (Cranial Nerve V)

Clinical Anatomy

i Inflammation of sinuses: This can occur due to allergy or during Cold. It causes normal drainage of mucus to be disrupted and Swelling of nasal lining occurs. It could lead to Sinusitis

ii Sinusitis: It is also called Rhinosinusitis. It is an inflammation of the mucous membrane that line sinuses resulting in thick nasal mucus, plugged nose and facial pain. Other symptoms include fe headaches; poor sense of smell, sore throat and Cough.