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MATRIC NO: 17/MHS01/244

DEPARTMENT: MEDICINE & SURGERY

COURSE TITLE: ANA 301(GROSS ANATOMY OF HEAD & NECK)

ASSIGNMENT TITLE: NOSE & ORAL CAVITY

- 1.) Discuss the anatomy of the tongue and comment on its applied anatomy.
- 2.) Write an essay on the air sinuses.

Answers

1.) 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 has importance in the digestive system and is the primary organ of taste in the gustatory system. The tongue's upper surface(dorsum) is covered by taste buds housed in numerous **lingual papillae**. It is sensitive and kept moist by saliva and is richly supplied with nerves and blood vessels. The tongue also serves as a natural means of cleaning the teeth. A major function of the tongue is the enabling of speech in humans and vocalization in other animals.

The human tongue is divided into two(2) parts, an **oral** part(about 2/3) at the front and a **pharyngeal** part(about 1/3) 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 at the very back of the pharyngeal part, on the tongue's surface.

The human tongue is divided into **anterior(oral) and posterior(pharyngeal)** parts by the terminal sulcus which is a V-shaped groove. The apex of the terminal sulcus is marked by a blind foramen, the **foramen cecum**, which is a remnant of the median **thyroid diverticulum** in early *embryonic development*. The anterior part is the visible part at the front while the posterior part is the part closest to the throat and they differ in terms of their embryological development and nerve supply.

The anterior tongue is, at its apex, thin and narrow. It is directed forward against the lingual surfaces of the lower incisor teeth. The posterior part is, at its root, directed backward, and connected with the **hyoid bone** by the **hyoglossi** and **genioglossi** muscles and the **hyoglossal membrane**, with the **epiglottis** by three(3) **glossoepiglottic folds** of mucous membrane, with the **soft palate** by the **glossopalatine arches**, and with the

pharynx by the **superior pharyngeal constrictor muscle** and the **mucous membrane**. It also forms the anterior wall of the **oropharynx**.

The average length of the human tongue from the oropharynx to the tip is 10cm. The average weight of the human tongue from adult males is 70g & for adult females 60g.

Undersurface of the tongue

Here, there 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.

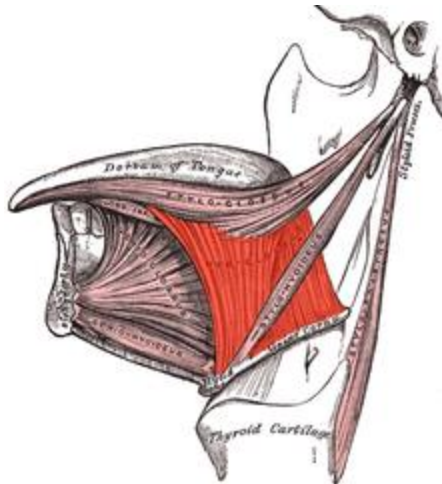
Muscles

There are two(2) groups of muscles of the tongue. The four(4) **intrinsic muscles** which are *paired* alter the shape of the tongue and are not attached to the bone. The four(4) **extrinsic muscles** change the position of the tongue and are anchored to bone.

Extrinsic Muscles

- Genioglossus(known as the tongue's "safety muscle")
 - a) Attachments: Arises from the mandibular symphysis. Inserts into the body of the hyoid bone and the entire length of the tongue.
 - b) Function: Inferior fibres protrude the tongue, middle fibres depress the tongue & superior fibres draw the tip back and down.
- Hyoglossus(the chondroglossus is often included with this muscle)
 - a) Attachments: Arises from the hyoid bone and inserts into the side of the tongue.
 - b) Function: Depresses and retracts the tongue.
- Styloglossus
 - a) Attachments: Originates at the styloid process of the temporal bone and inserts into the side of the tongue.
 - b) Function: Retracts and elevates the tongue.
- Palatoglossus
 - a) Attachments: Arises from palatine aponeurosis and inserts broadly across the tongue.
 - b) Function: Elevates the posterior aspect of the tongue during swallowing.

NOTE: ALL OF THE INTRINSIC & EXTRINSIC MUSCLES ARE INNERVATED BY THE **HYPOGLOSSAL NERVE(CN XII), EXCEPT PALATOGLOSSUS, WHICH HAS **VAGAL INNERVATION(CN X)****

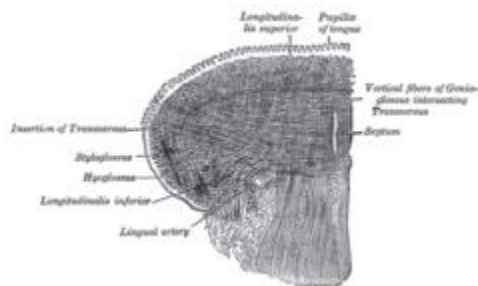


extrinsic muscles of tongue

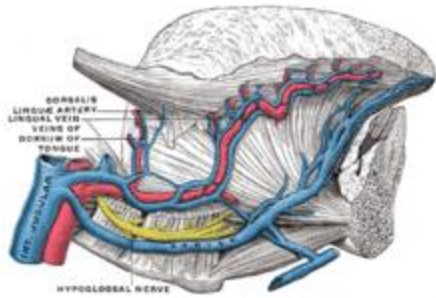
Intrinsic Muscles

The intrinsic muscles only attach to other structures in the tongue and 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 & size of the tongue- for example, in tongue rolling- and have a role in facilitating speech, eating and swallowing.

The 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. The inferior longitudinal muscle lines the sides of the tongue, and is joined to the styloglossus muscle. The vertical muscle is located in the middle of the tongue, and joins the superior and inferior longitudinal muscles. The transverse muscle divides the tongue at the middle, and is attached to the mucous membranes that run along the sides.



intrinsic muscles of tongue



Blood supply of the tongue

The tongue receives its blood supply primarily from the **lingual artery**, a branch of the external carotid artery. The lingual veins drain into the internal jugular vein. The floor of the mouth also receives its blood supply from the lingual 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.

An area in the neck sometimes called the Pirogov triangle is formed by the intermediate tendon of the digastric muscle, the posterior border of the mylohyoid muscle, and the hypoglossal nerve. The lingual artery is a good place to stop severe hemorrhage from the tongue.

Nerve supply

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):
 - I. Taste: chorda tympani branch of the facial nerve (CN VII) via special visceral afferent fibers
 - II. Sensation: lingual branch of the mandibular (V3) division of the trigeminal nerve (CN V) via general visceral afferent fibers
- Posterior one third of tongue:
 - I. Taste and sensation: glossopharyngeal nerve (CN IX) via a mixture of special and general visceral afferent fibers
- Base of tongue

- I. Taste and sensation: internal branch of the superior laryngeal nerve (itself a branch of the vagus nerve, CN X)

Lymphatic drainage

The tip of tongue drains to the submental nodes. The left and right halves of the anterior two-thirds of the tongue drains to submandibular lymph nodes, while the posterior one-third of the tongue drains to the jugulo-omohyoid nodes.

Histology

The upper surface of the tongue is covered in masticatory mucosa a type of oral mucosa which is of keratinized stratified squamous epithelium. Embedded in this are numerous papillae that house the taste buds and their taste receptors. The lingual papillae consist of filiform, fungiform, vallate and foliate papillae and only the filiform papillae are not associated with any taste buds.

The tongue can also divide itself in dorsal and ventral surface. The dorsal surface is a stratified squamous keratinized epithelium which is characterized by numerous mucosal projections called papillae. The lingual papillae covers the dorsal side of the tongue towards the front of the terminal groove. The ventral surface is stratified squamous non-keratinized epithelium which is smooth.

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 fifth week a pair of lateral lingual swellings, one on the right side and one on the left, form on the first pharyngeal arch. These lingual swellings quickly expand and cover the median tongue bud. They form the anterior part of the tongue that makes up two thirds of the length of the tongue, and continue to develop through prenatal development. The line of their fusion is marked by the median sulcus.

In the fourth week a swelling appears from the second pharyngeal arch, in the midline, called the copula. During the fifth and sixth weeks the copula is overgrown by a swelling from the third and fourth arches (mainly from the third arch) called the hypopharyngeal eminence, and this develops into the posterior part of the tongue (the other third). The hypopharyngeal eminence develops mainly by the growth of endoderm from the third pharyngeal arch. The boundary between the two parts of the tongue, the anterior from the first arch and the posterior from the third arch is marked by the terminal sulcus. The terminal sulcus is shaped like a V with the tip of the V situated posteriorly. At the tip of the terminal sulcus is the foramen cecum, which is the point of attachment of the thyroglossal duct where the embryonic thyroid begins to descend.

Clinical significance

A congenital disorder of the tongue is that of **ankyloglossia** also known as tongue-tie. The tongue is tied to the floor of the mouth by a very short and thickened frenulum and this affects speech, eating, and swallowing.

The tongue is prone to several pathologies including glossitis and other inflammations such as geographic tongue, and median rhomboid glossitis; burning mouth syndrome, oral hairy leukoplakia, oral candidiasis (thrush), black hairy tongue and fissured tongue.

There are several types of oral cancer that mainly affect the tongue. Mostly these are squamous cell carcinomas.

Food debris, desquamated epithelial cells and bacteria often form a visible tongue coating. This coating has been identified as a major factor contributing to bad breath (halitosis), which can be managed by using a tongue cleaner.

2.) Air Sinuses

Air sinuses (also known as **paranasal sinuses**) are a group of four paired air-filled spaces that surround the nasal cavity. The maxillary sinuses are located under the eyes; the frontal sinuses are above the eyes; the ethmoidal sinuses are between the eyes and the sphenoidal sinuses are behind the eyes. The sinuses are named for the facial bones in which they are located.

Structure

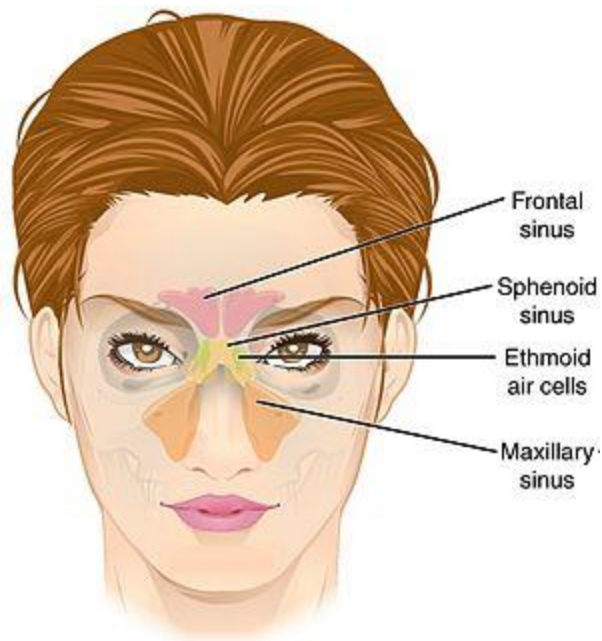
Humans possess four paired paranasal sinuses, divided into subgroups that are named according to the bones within which the sinuses lie: **The maxillary sinuses**, the largest of the paranasal sinuses, are under the eyes, in the maxillary bones (open in the back of the semilunar hiatus of the nose). They are innervated by **the maxillary division of trigeminal nerve (CN Vb)**.

The frontal sinuses, superior to the eyes, in the frontal bone, which forms the hard part of the forehead. They are also innervated by the **ophthalmic division of trigeminal nerve (CN Va)**.

The ethmoidal sinuses, which are formed from several discrete air cells within the ethmoid bone between the nose and the eyes. They are innervated by **the ethmoidal nerves**, which branch from the nasociliary nerve of the trigeminal nerve (CN Va).

The sphenoidal sinuses, in the sphenoid bone. They are innervated by the trigeminal nerve (CN Va & Vb).

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



Development

Paranasal sinuses form developmentally through excavation of bone by air-filled sacs (pneumatic diverticula) from the nasal cavity. This process begins prenatally (intrauterine life), and it continues through the course of an organism's lifetime.

The results of experimental studies suggest that the natural ventilation rate of a sinus with a single sinus ostium (opening) is extremely slow. Such limited ventilation may be protective for the sinus, as it would help prevent drying of its mucosal surface and maintain a near-sterile environment with high carbon dioxide concentrations and minimal pathogen access. Thus composition of gas content in the maxillary sinus is similar to venous blood, with high carbon dioxide and lower oxygen levels compared to breathing air.

At birth only the maxillary sinus and the ethmoid sinus are developed but not yet pneumatized; only by the age of seven they are fully aerated. The sphenoid sinus appears at the age of three, and the frontal sinuses first appear at the age of six, and fully develop during adulthood.

Clinical significance

- Inflammation(Sinusitis)

The paranasal sinuses are joined to the nasal cavity via small orifices called **ostia**. 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. Because the maxillary posterior teeth are close to the maxillary sinus, this

can also cause clinical problems if any disease processes are present, such as an infection in any of these teeth. These clinical problems can include secondary sinusitis, the inflammation of the sinuses from another source such as an infection of the adjacent teeth.[5]

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.

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.