GROSS ANATOMY OF THE TONGUE

The tongue is a mass of muscle that is almost completely covered by a mucous membrane that is moist and pink in color. It occupies most of the oral cavity and oropharynx. It is known for its role in taste, but it also assists with mastication (chewing), deglutition (swallowing), articulation (speech), and oral cleansing. . It is attached via muscles to the hyoid bone, mandible, styloid process, palate, and pharynx and divided into two parts by the V-shaped sulcus terminalis. These two parts, an anterior two thirds (oral part) and a posterior one third(pharyngeal part), are structurally and developmentally distinct.

The tongue has:

-A root

-An apex

- A body which has a curved dorsum part and an inferior surface

-And 2 Lateral borders

**Relations**:

The root is attached to the soft palate and mandible above while below its attached to the hyoid bone

The apex or tip of the tongue when at rest lies at the lower incisors

The body is convex shaped and is divided into the oral part which is the anterior two third and the pharyngeal part which is the posterior one third, the body is attached to the floor of the oral cavity.

The lateral border is related to the gum and inferior alveolar process

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

**Papillae**

There are 4 types of papillae in the tongue which are

Filiform papillae: it is present in the anterior two third of the tongue, it’s cone shaped ,act as abrasive coating for cleaning and grasping action and it has no taste buds

Fungiform papillae: its round shaped, bigger than filiform papillae and unlike them also it has tastebuds, its embedded in the tip and margin of the tongue and it has both sweet and sour tastes.

Foliate papillae: it has red leaf like mucosal ridges, its present at the sides near the sulcus terminalis ,has numerous taste buds

**Muscle**

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.

Extrinsic

The four **extrinsic muscles** originate from bone and extend to the **tongue**. They are the genioglossus, the hyoglossus (often including the chondroglossus) the styloglossus, and the palatoglossus. Their main functions are altering the **tongue's** position allowing for protrusion, retraction, and side-to-side movement.

The genioglossus arises from the mandible and protrudes the tongue. It is also known as the tongues "safety muscle" since it is the only muscle that propels the tongue forward.

The hyoglossus, arises from the hyoid bone and retracts and depresses the tongue. The chondroglossus is often included with this muscle.

The styloglossus arises from the styloid process of the temporal bone and draws the sides of the tongue up to create a trough for swallowing.

The 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.

Intrinsic

The **intrinsic muscles of the tongue** are muscles that are located only in the tongue. These muscles do not originate or insert outside of the tongue. Since the intrinsic muscles are located inside the tongue, these muscles function to change the actual shape of 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)

**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):

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)

**Applied anatomy**

Gag reflex: It is possible to touch the anterior part of the tongue with out feeling discomfort. When the posterior part is touched, the individual gags. CN IX, CN X, are responsible for the muscular contractions of each side of the pharynx.

Paralysis of genioglossus: When this muscle is paralysed the tongue has a tendency to fall posterior, obstructing the airway and preventing the risk of suffocation. Total relaxation of the genioglossus muscles occurring during general anesthesia therefore an airway is inserted in an anesthetized person to prevent the tongue from relapsing.

Injury to the hypoglossal nerve: Trauma , such as fractured mandible , may injure the hypoglossal nerve, resulting in paralysis and eventual atrophy of one side of the tongue.

A lingual carcinoma in the posterior part of the tongue metastases to the superior deep cervical lymph nodes on both sides, where as a tumor in the anterior part usually does not metastasize to the inferior deep cervical lymph nodes until late in the disease. Because these nodes are closely related to I J V, metastases from the tongue may be widely distributed.

Frenectomy: A large lingual frenulum (tongue tie) interefere with the tongue movements and may affect speech. In unusual cases a frenectomy in infants may be required.

Ulcers of the tongue:Various types of ulcers are follows(i) Aphthous ulcers: is a small painful ulcer seen on tip , under surface of the tongue in its anterior part. (ii) Dental ulcer : is caused by mechanical irritation either by a jagged tooth or denture. (iii) Syphilitic ulcer: mainly snail track ulcers ulcers in second stage of syphilis.(iii) carcinomatous ulcers : It usually occurs in elderly individuals above the age of 50 years . Common site is at the margins particularly in anterior two third of the tongue.

**Air sinuses**

Paranasal sinuses which is an air-filled cavities in the human facial bones, plays very vital roles which include; humidifying and warming of inspired air, controlling pressure within the nasal cavity, reducing of the weight of the skull and helping in the resonance ability of the nasal cavity.

Four sets of paired sinuses are recognized and named after the bones they are found: maxillary, ethmoid, sphenoid sinuses and frontal sinuses.

Maxillary sinuses: A pair of maxillary sinuses are located in the cheekbones on either side of the nose, between the top teeth and the eye. The maxillary sinuses are the largest sinus cavities and the most common site of sinus cancer.

Ethmoid sinuses: Pair of ethmoid sinuses are located between the eyes, on either side of the top of the nose.

Sphenoid sinuses: Pair of sphenoid sinuses are located deeper inside the center of the skull, directly behind the nose at the skull base.

Frontal sinuses: Pair of frontal sinuses are located in the lower forehead, above the eyes and nose.

**Development**

The maxillary and ethmoid sinuses are present at birth, starting to form around the 3rd or 4th month of gestational development . They further develop over the first few years of life . Rudimentary sphenoid sinuses are there at birth, forming (pneumatizing) completely by the age of 5 years The frontal sinuses are the last to appear, around 7-8 years of age, with the pneumatization being complete only after the individual reaches late adolescence. Due to this, the shape and size of the sinuses usually vary from person to person in adulthood

**Drainage**

The two frontal sinuses drain through the frontonasal duct, which opens in the lateral wall of the nasal cavity, at the semilunar hiatus .Their drainage path may vary depending on how the frontal sinus drainage pathway (FSDP) develops

The maxillary sinuses also open out at the semilunar hiatus, just below the frontal sinuses, to drain into the nasal cavity

According to their location, the two pairs of anterior, and middle ethmoid sinuses drain into the middle nasal meatus (the semilunar hiatus and the ethmoid bulla respectively) while the posterior ethmoid sinus drains into the superior meatus

The sphenoid sinuses drain into the sphenoethmoidal recess just above the superior concha in the upper back wall of the nasal cavity.

**Lining**

Like the nasal cavity walls, all the sinuses have mucus , and cilia (tiny hair-like structures) covering their inner surfaces. The mucus produced within them is continually swept into the nasal cavity by the cilia

**Functions**:

Their purpose is not yet clearly known; however, being extensions of the nasal cavity, helping with cleaning and humidification of air during breathing is believed to be one of their main functions The mucus lining of the sinuses helps in purifying the air, as all dust and other harmful particles stick to the mucus, to be brushed out of the body through the nasal cavity

Three more functions attributed to them are:

Reducing the weight of the skull

Working as resonance chambers for better sound and speech production (they are believed to play a vital role in making different people sound different)

Protecting the face and facial bones from trauma (by working like an airbag)

**Associated Conditions**

Sinusitis: As the sinuses directly continue from the nasal cavity, infections of the upper respiratory tract, such as the flu, or rhinitis, can easily spread into the sinus cavities, leading to a condition called sinusitis [2]. Characteristic symptoms include a sinus headache, facial pain or tenderness, and feeling of a stuffy nose [16]. Most commonly affecting the maxillary sinuses,inflammation or infection in this area may cause pain in the maxillary teeth as both are innervated by the maxillary nerve.

Any blockage in a sinus passage may cause mucus to accumulate, also leading to bacterial or viral infections .