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The Tongue

The tongue is a mass of muscle that is almost completely covered by a mucous membrane. 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. Five cranial nerves contribute to the complex innervation of this multifunctional organ.

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 Muscles

The extrinsic muscles are as follows:

Genioglossus

Attachments: Arises from the mandibular symphsis. Inserts into the body of the hyoid bone and the entire length of the tongue.

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

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

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).

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).

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 – directly into the deep cervical lymph nodes

CLINICAL RELEVANCE

Atrophic (smooth tongue): The most obvious cause of an atrophic tongue is the use of dentures and the mechanical exfoliation of the dorsal surface. Nutritional deficiencies, especially vitamin

Macroglossia:Macroglossia is swelling or enlargement of the tongue and can be caused by routine things such as allergies, medications, and injuries. Allergic reaction to medications, food, or insect bites can cause swelling of the tongue. Tongue swelling can also be a side effect of medication. Some medications that have this side effect are ACE inhibitors, NSAIDs (nonsteroidal anti-inflammatory drugs), and aspirin12 deficiency (pernicious anemia), can also be a root cause.

Microglossia:Microglossia may result from damage to the upper motor neurons of the corticobulbar tracts that innervate the tongue. This condition presents with a small, stiff tongue. In newborns there may be an apparent microglossia that results from a congenitally short lingual frenulum (ankyloglossia), commonly called tongue-tie.

2. Air Sinuses

Air Sinuses also known as paranasal sinuse are air-filled extensions of the respiratory part of the nasal cavity. There are four paired sinuses, named according to the bone in which they are located; maxillary, frontal, sphenoid and ethmoid.

The function of the sinuses is not clear. It is thought that they may contribute to the humidifying of the inspired air. They also reduce the weight of the skull.

Sinuses are formed in childhood by the nasal cavity eroding into surrounding bone. As they are outgrowths of the nasal cavity, they all drain back into it – openings to the paranasal sinuses are found on the roof and lateral walls of the nasal cavity. The inner surface is lined by a respiratory mucosa

Frontal Sinuses: These are the most superior in location, found under the forehead. The frontal sinuses are variable in size, but always triangular-shaped. They drain into the nasal cavity via the frontonasal duct, which opens out at the hiatus semilunaris on the lateral wall.

Sphenoid Sinuses: The sphenoid sinuses also lie relatively superiorly, at the level of the spheno-ethmodial recess. They are found more posteriorly, and are related superiorly and laterally to the cranial cavity. The sphenoid sinuses drain out onto the roof of the nasal cavity. The relationships of this sinus are of clinical importance – the pituitary gland can be surgically accessed via passing through the nasal roof, into the sphenoid sinus and through the sphenoid bone.

Ethmoidal Sinuses: There are three ethmoidal sinuses; anterior, middle and posterior. They empty into the nasal cavity at different places:

Anterior – Hiatus semilunaris

Middle – Ethmoid bulla

Posterior – Superior meatus

Maxillary Sinuses: The largest of the sinuses. It is located laterally and slightly inferiorly to the nasal cavities. It drains into the nasal cavity at the hiatus semilunaris, underneath the frontal sinus opening. This is a potential pathway for spread of infection – fluid draining from the frontal sinus can enter the maxillary sinus.

Clinical Relevance: Sinusitis

As the paranasal sinuses are continuous with the nasal cavity, an upper respiratory tract infection can spread to the sinuses. Infection of the sinuses causes inflammation (particularly pain and swelling) of the mucosa, and is known as sinusitis. If more than one sinus is affected, it is called pansinusitis.

The maxillary nerve supplies both the maxillary sinus and maxillary teeth, and so inflammation of that sinus can present with toothache.