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**THE ANATOMY OF THE TONGUE**

The tongue is a unique organ located at the oral cavity that not only facilitates perception of gustatory stimuli but also plays important roles in mastication and deglutination. Additionally, the tongue is an integral component of the speech pathway, as it helps with articulation.

Another important point to note is that the tongue is embryologically divided into an anterior and a posterior part. The anterior part of the tongue is also called the **oral or presulcal part** of the tongue. Conversely, the posterior part of the tongue is referred to as the **pharyngeal or postsulcal part** of the tongue. Lastly, avoid interchanging the words root and base when discussing the tongue, as these represent two anatomically distinct areas. The **base** of the tongue refers to the postsulcal part that forms the ventral wall of the oropharynx, while the **root** of the tongue refers to a part of the presulcal tongue that is attached to the floor of the oral cavity.

Under normal circumstances, the tongue is a pink, muscular organ located within the oral cavity proper. It is kept moist by the products of the major and minor [salivary glands](https://www.kenhub.com/en/library/anatomy/the-salivary-glands), which aids the organ as it facilitates deglutition, speech, and gustatory perception. While there is significant variability in the length of the tongue among individuals, on average, the organ is roughly 10 cm long. It has three main parts:

* The tip or apex of the tongue is the most anterior, and most mobile aspect of the organ.
* The tip is followed by the body of the tongue. It has a rough dorsal (superior) surface that abuts the palate and is populated with taste buds and lingual papillae, and a smooth ventral (inferior) surface that is attached to the floor of the oral cavity by the lingual frenulum.
* The base of the tongue is the most posterior part of the organ. It is populated by numerous lymphoid aggregates known as the lingual tonsils along with foliate papillae along the posterolateral surface.
* There are numerous important structures surrounding the tongue. It is limited anteriorly and laterally by the upper and lower rows of [teeth](https://www.kenhub.com/en/library/anatomy/the-teeth). Superiorly, it is bordered by the hard (anterior part) and soft (posterior part) palates. Inferiorly, the root of the tongue is continuous with the mucosa of the floor of the oral cavity; with the sublingual salivary glands and vascular bundles being located below the mucosa of the floor of the oral cavity.
* The palatoglossal and palatopharyngeal arches (along with the [palatine tonsils](https://www.kenhub.com/en/library/anatomy/tonsils)) have lateral relations to the posterior third of the tongue. Posterior to the base of the tongue is the dorsal surface of the epiglottis and laryngeal inlet, and the posterior wall of the oropharynx. As mentioned earlier, the presulcal and postsulcal parts of the tongue differ not only by anatomical location, but also based on embryological origin, innervation, and the type of mucosa found on its surface.

Anterior two-thirds

* The presulcal tongue includes the apex and body of the organ. It terminates at the sulcus terminalis; which can be seen extending laterally in an oblique direction from the foramen cecum towards the palatoglossal arch. The mucosa of the dorsal surface of the oral tongue is made up of circumvallate, filiform, and fungiform papillae. There is also a longitudinal midline groove running in an anteroposterior direction from the tip of the tongue to the foramen cecum. This marks the embryological point of fusion of the lateral lingual swellings that formed the oral tongue. It also represents the location of the median lingual (fibrous) septum of the tongue that inserts in the body of the [hyoid bone](https://www.kenhub.com/en/library/anatomy/hyoid-bone).
* On the lateral surface of the oral tongue are foliate papillae arranged as a series of vertical folds. The ventral mucosa of the oral tongue is comparatively unremarkable. It is smooth and continuous with the mucosa of the floor of the mouth and the inferior gingiva. The lingual veins are relatively superficial and can be appreciated on either side of the lingual frenulum. Lateral to the lingual veins are pleated folds of mucosa known as the plica fimbriata. They are angled anteromedially toward the apex of the tongue

Posterior third

* The remainder of the tongue that lies posterior to the sulcus terminalis is made up by the base of the organ. It lies behind the palatoglossal folds and functions as the anterior wall of the oropharynx. Unlike the oral tongue, the pharyngeal tongue does not have any lingual papillae. Instead, its mucosa is populated by aggregates of lymphatic tissue known as the lingual tonsils. The mucosa is also continuous with the mucosa of the laterally located palatine tonsils, the lateral oropharyngeal walls, and the posterior epiglottis and glossoepiglottic folds.

*The* tongue is composed of two sets of muscles the intrinsic and extrinsic

Intrinsic muscles of the tongue

* The intrinsic tongue muscles are responsible for adjusting the shape and orientation of the organ. It is made up of four paired muscles, which are discussed below in a dorsoventral manner.
* The superior longitudinal muscles are made up of a thin layer of muscle fibers traveling in a mixture of oblique and longitudinal axes just deep to the superior mucosal surface of the organ. These fibers arise from the median fibrous septum as well as the fibrous layer of submucosa from the level of the epiglottis. They eventually insert along the lateral and apical margins of the organ. These muscles are responsible for retracting and broadening the tongue, as well as elevating the tip of the tongue. The net effect of these muscles results in shortening of the organ.
* Another set of muscles occupy the dorsoventral plane of the tongue deep to the superior longitudinal muscles. These are the vertical muscles that arise from the root of the organ and genioglossus muscle and insert into the median fibrous septum, along the entire length of the organ. These muscles facilitate flattening and widening of the tongue.

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| Superior longitudinal | **Origin** - submucosa of posterior tongue, lingual septum**Insertion** - apex/anterolateral margins of tongue**Innervation** - hypoglossal nerve (CN XII)**Blood supply** - lingual branch of external carotid artery**Action** - retracts and broadens tongue, elevates apex of tongue |
| Inferior longitudinal | Origin - root of tongue, body of hyoid boneInsertion - apex of tongueInnervation - hypoglossal nerve (CN XII) Blood supply - lingual branch of external carotid arteryAction - retracts and broadens tongue, lowers apex of tongue |
| Transverse muscle | Origin - lingual septumInsertion - lateral margin of tongueInnervation - hypoglossal nerve (CN XII) Blood supply - lingual branch of external carotid arteryAction - narrows and elongates tongue |
| Vertical muscle | Origin - root of tongue, genioglossus muscleInsertion - lingual aponeurosisInnervation - hypoglossal nerve (CN XII)Blood supply - lingual branch of external carotid arteryAction - broadens and elongates tongue |

Extrinsic tongue muscles
While the shape of the tongue is determined by the intrinsic muscles of the tongue, movement of the organ within (and out of) the oral cavity is dependent on the extrinsic tongue muscles. There are four pairs of **extrinsic** **muscles**, which can be viewed as those arising from above the tongue, and those that originate from below the tongue.

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| Genioglossus | Origin - Superior mental spine of mandibleInsertion - entire length of dorsum of tongue, lingual aponeurosis, body of hyoid boneInnervation - hypoglossal nerve (CN XII) Blood supply -  sublingual branch of lingual artery, submental branch of facial arteryAction - depresses and protrudes tongue (bilateral contraction); deviates tongue contralaterally (unilateral contraction) |
| Hyoglossus | Origin - body and greater horn of hyoid boneInsertion - inferior/ventral parts of lateral tongueInnervation - hypoglossal nerve (CN XII) Blood supply -  sublingual branch of lingual artery, submental branch of facial arteryAction - depresses and retracts tongue |
| Styloglossus | Origin - anterolateral aspect of styloid process (of temporal bone), stylomandibular ligamentInsertion - blends with inferior longitudinal muscle (longitudinal part); blends with hyoglossus muscle (oblique part)Innervation - hypoglossal nerve (CN XII) Blood supply -  sublingual branch of lingual arteryAction - retracts and elevates lateral aspects of tongue |
| Palatoglossus | Origin - palatine aponeurosis of soft palateInsertion - lateral margins of tongue, blends with intrinsic muscles of tongueInnervation - vagus nerve (CN X) (via branches of pharyngeal plexus) Blood supply -  ascending palatine branch of facial artery, ascending pharyngeal arteryAction - elevates root of tongue, constricts isthmus of fauces |

Innervation

In the anterior 2/3, general sensation is supplied by the [**trigeminal nerve**](https://teachmeanatomy.info/head/cranial-nerves/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**](https://teachmeanatomy.info/head/cranial-nerves/facial-nerve/) (CNVII). In the petrous part of the [temporal bone](https://teachmeanatomy.info/head/osteology/temporal-bone/), the [facial nerve](https://teachmeanatomy.info/head/cranial-nerves/facial-nerve/) gives off three branches, one of which is **chorda tympani**. This travels through the [middle ear](https://teachmeanatomy.info/head/organs/ear/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**](https://teachmeanatomy.info/head/cranial-nerves/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

Look further towards the back of your tongue – there is a transverse line near the root of the tongue. This is called **sulcus terminalis**, and in the centre, where it meets the **median sulcus**, there is a pit. This is the now-closed top of a deep pit, the **foramen cecum** (blind window), at the end of which lies the thyroid gland. During development, this descends from the tongue down into the neck, If, on the way down, the pit (**thyroglossal duct**) doesn’t close behind the gland, midline **thyroglossal cysts** or **fistulae** may remain.



Fig 1,1 – Tongue tied

The tongue is attached anteroinferiorly by a piece of connective tissue called the **frenulum,**which lies in the midline. The process by which the frenulum is formed is the same by which your fingers are made, and is known as sculpting apoptosis. Just as some people may have webbed fingers if this process fails, it can result in excess frenulum. This is called being ‘**tongue-tied**’, and presents in children. There are varying degrees of severity of tongue-tie and in some cases it can restrict the movement of the tongue causing difficulties with breast feeding. This can be managed with simple surgery.

PART 2

**PARANASAL SINUSES/AIR SINUSES**

The paranasal sinuses 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

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**.

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