

Tongue

Introduction

According to a document from 2019, the tongue is described as a **muscular organ** in the floor of the mouth, involved in **taste, speech, chewing, swallowing, and oral cleansing**.

It contains **skeletal (voluntary) muscle**, though its automatic movements may feel involuntary in daily usage.

Dissection

The sagittal section shows the **fan-shaped genioglossus muscle**.

Dissection requires cutting **buccinator, superior constrictor**, and the **pterygomandibular raphe** to expose the lateral tongue.

Parts of Tongue

The tongue consists of **root, body, and tip**.

Root

Attached superiorly to **styloid process** and **soft palate**, and inferiorly to **mandible and hyoid bone**, making the tongue impossible to swallow accidentally.

Tip

Free anterior end, resting behind the upper incisors.

Body

Includes dorsum and inferior surface:

- **Dorsum** is convex; divided into:
 - **Oral (anterior 2/3)**: rough, with papillae
 - **Pharyngeal (posterior 1/3)**: smooth, contains **lingual tonsil**
 - **Posteriormost part** attached to epiglottis through **median and lateral glossoepiglottic folds**, spaces forming **valleculae**.
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Clinical Anatomy

Based on the document:

- **Glossitis** occurs with generalized stomatitis; **filiform papillae atrophy** in anaemia.
 - Tongue may **swell enormously** due to loose areolar tissue and rich lymphatics.
 - Undersurface is helpful for observing **jaundice**.
 - In unconscious patients, tongue may **fall back and obstruct airway**; prevented by positioning or pulling tongue forward.
 - **Lingual tonsil** forms part of **Waldeyer's ring**.
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Papillae of the Tongue

According to the document:

1. Vallate (Circumvallate) Papillae

- 8–12 in number, 1–2 mm diameter
- Located **just anterior to sulcus terminalis**
- Surrounded by circular sulcus
- Contain **taste buds**

2. Fungiform Papillae

- Present near **tip and margins**, scattered on dorsum
- Bright red, mushroom-shaped

3. Filiform Papillae

- Most numerous, smallest
- Cover presulcal region; keratinized, giving **velvety** appearance
- Apex may form filamentous processes

4. Foliate Papillae

- Leaf-shaped
- Present at lateral borders anterior to vallate papillae

Muscles of the Tongue

The tongue is divided into two halves by a **midline fibrous septum**; each half contains **4 intrinsic** and **4 extrinsic muscles**.

Intrinsic Muscles

Modify the **shape** of tongue:

1. **Superior longitudinal**

- Elevates tip & sides; shortens tongue

2. **Inferior longitudinal**

- Curls tip down; shortens tongue

3. **Transverse**

- Narrows and thickens tongue

4. **Vertical**

- Broadens the tongue

Extrinsic Muscles

Modify **position** of tongue:

- **Genioglossus**

- **Hyoglossus**

- **Styloglossus**

- **Palatoglossus**

Hypoglossal Nerve — XII Nerve

According to a document from **2019**, the hypoglossal nerve is described as the **motor nerve of the tongue** and supplies **all intrinsic and 3 extrinsic muscles** (except palatoglossus).

Course

- Leaves skull through **hypoglossal canal**.
- Lies between **internal jugular vein** and **internal carotid artery**, anterior to vagus.
- Curves forward crossing **internal & external carotid arteries**.
- Crosses loop of **lingual artery**, then lies on **hyoglossus** and enters the tongue.

Muscles supplied

- **All intrinsic muscles.**
- **Extrinsic:** Genioglossus, Hyoglossus, Styloglossus.
- **Exception:** Palatoglossus (via pharyngeal plexus).

Clinical Anatomy of XII Nerve

The same document explains:

Carcinoma of Tongue

- Common; requires removal of tongue and **block dissection of cervical nodes** due to lymphatic spread.

Sublingual Drug Absorption

- Drugs like **sorbitrate** act rapidly because of **rich blood supply** and **bypassing of portal circulation**.

Genioglossus – “Safety Muscle”

- Paralysis causes **tongue to fall back**, occluding the airway.
- Used to test XII nerve: deviation **towards paralyzed side** on protrusion.

Histology of Tongue

According to the 2019 document:

1. Muscles

- Bulk formed of **striated skeletal muscle** bundles.

2. Mucous Membrane

- Stratified squamous epithelium; **thin on oral dorsum**, elevated into papillae.
- Posterior third contains **dense lymphoid follicles**.
- Inferior surface: thin, smooth epithelium.

3. Glands

- Both **mucous & serous glands** beneath mucosa.

4. Taste Buds

- Numerous around **vallate papillae**, **foliate papillae**, posterior 1/3; absent in **mid-dorsal oral tongue**.
- Composed of **supporting cells** and **gustatory cells**.

Development of Tongue

According to the 2019 document (Fig. 17.11):

Epithelium

1. Anterior 2/3

- From **two lingual swellings of first arch**;
- Sensory supply: **lingual nerve** (general), **chorda tympani** (taste).

2. Posterior 1/3

- From **hypobranchial eminence of 3rd arch**;
- Supplied by **glossopharyngeal nerve**.

3. Posterioormost part

- From **4th arch**;
- Supplied by **vagus (internal laryngeal)**.

Muscles

- From **occipital myotomes**, explaining hypoglossal supply.

Taste Pathway

According to the 2019 document:

Anterior 2/3 of Tongue

- Except vallate papillae
- Via **chorda tympani ? geniculate ganglion ? tractus solitarius (medulla)**.

Posterior 1/3 + Vallate Papillae

- Via **glossopharyngeal nerve ? inferior ganglion ? tractus solitarius**.

Posterior-most Tongue & Epiglottis

- Via **vagus nerve ? inferior ganglion ? tractus solitarius**.

Central Pathway

- From tractus solitarius ? **solitario-thalamic tract**
- Joins **trigeminal lemniscus**
- Projects to **VPM nucleus of thalamus** (opposite side)
- Then to **primary gustatory cortex (inferior postcentral gyrus)**.

Clinical Anatomy (Taste & Tongue)

According to the 2019 document:

- **Taste loss** can occur with lesions of facial, glossopharyngeal, or vagus pathways (implied through pathway description).
- **Taste buds** absent in mid-dorsal anterior tongue explains sparing of taste in that region during disease.

Facts to Remember

- All **four intrinsic muscles** of the tongue are supplied by the **hypoglossal nerve (XII)**.
- Of the **four extrinsic muscles**, **three** (genioglossus, hyoglossus, styloglossus) are supplied by the hypoglossal nerve; **palatoglossus** is supplied by the **pharyngeal plexus**.
- The **lingual artery** is **tortuous** because it moves with the pharynx during swallowing.
- The tongue maintains its position through the attachments of **four pairs of extrinsic muscles**.
- **Circumvallate papillae** are few (10–12) but contain the **maximum number of taste buds**; their taste sensation is carried by the **glossopharyngeal nerve (IX)**.
- **Nerve supply follows embryological development:**
 - Anterior two-thirds ? **First pharyngeal arch**, supplied by the **lingual nerve** (general sensation) and **chorda tympani** (taste).
 - Posterior one-third ? **Third arch**, supplied by the **glossopharyngeal nerve**.
 - Posterioormost part ? **Fourth arch**, supplied by the **internal laryngeal branch of the vagus nerve**.

- **Sublingual drug administration** works rapidly because venous drainage bypasses the portal circulation.
- **Genioglossus** is considered the **life-saving muscle**, as its action of protruding the tongue prevents airway obstruction.

Clinicoanatomical Problem

Case

A patient is diagnosed with **right-sided medial medullary syndrome**.

Questions

1. What happens to the tongue?
2. Which nuclear column does the hypoglossal nerve belong to?
3. What are the muscles of the tongue?

Explanation

- In medial medullary syndrome, the lesion involves the **hypoglossal nerve**, **pyramidal tract**, and **medial lemniscus** due to obstruction of the **anterior spinal artery**.

Effects

- **Tongue deviation:**
The **tongue deviates to the right side** (side of the lesion) on protrusion because of paralysis of ipsilateral tongue muscles.
- **Nuclear column:**
The hypoglossal nerve belongs to the **General Somatic Efferent (GSE)** column.

- **Muscles of the tongue:**

- Intrinsic muscles:**

- Superior longitudinal
 - Inferior longitudinal
 - Transverse
 - Vertical

- Extrinsic muscles:**

- Genioglossus
 - Hyoglossus
 - Styloglossus
 - Palatoglossus

Additional Clinicoanatomical Problems

Problem 1 — Hypoglossal Nerve Injury After Neck Surgery

Case

A patient undergoes surgery for a carotid endarterectomy. After the procedure, he develops **slurred speech** and **difficulty protruding the tongue**.

Explanation

- The **hypoglossal nerve** may have been injured during dissection around the **carotid arteries**.
 - On protrusion, the tongue **deviates toward the injured side**.
 - Loss of genioglossus action can allow the tongue to **fall backward**, risking airway obstruction.
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Problem 2 — Lingual Nerve Damage After Dental Extraction

Case

A patient undergoing **third molar (wisdom tooth) extraction** experiences **loss of general sensation and taste** in the **anterior two-thirds** of the tongue.

Explanation

- The **lingual nerve** (general sensation) and fibres of **chorda tympani** (taste, parasympathetic) are vulnerable during mandibular molar surgery.
 - Injury leads to:
 - Loss of touch, pain, temperature
 - Loss of taste
 - Reduced salivary secretion from **submandibular and sublingual glands**
-

Problem 3 — Glossopharyngeal Nerve Lesion

Case

A patient with a tumour in the **posterior tongue** presents with **loss of taste and sensation** in the **posterior one-third**.

Explanation

- The **glossopharyngeal nerve** supplies both taste and sensation to this region.
 - Loss causes impaired gag reflex (afferent limb) and difficulty swallowing.
-

Problem 4 — Tongue Carcinoma With Nodal Spread

Case

A chronic smoker presents with a **non-healing ulcer on the lateral border** of the tongue.

Explanation

- Lateral tongue drains to **deep cervical lymph nodes**; hence early metastasis is common.
 - This is why cancers on the **posterior or lateral tongue** behave more aggressively than those near the tip.
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Problem 5 — Macroglossia (“Enlarged Tongue”)

Case

A child presents with an abnormally large tongue causing **speech difficulty** and **airway obstruction**.

Explanation

- Conditions like **hypothyroidism** or **lymphangioma** cause massive enlargement.
 - The clinical danger arises because the tongue's **loose areolar tissue** allows rapid swelling and obstructs the airway.
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Problem 6 — Taste Loss After Middle Ear Infection

Case

A patient with chronic otitis media reports **loss of taste in anterior 2/3 of tongue**.

Explanation

- The **chorda tympani** passes through the middle ear and is vulnerable during infection.
 - Damage causes loss of taste, though general sensation remains intact (lingual nerve is normal).
-

Problem 7 — Ludwig's Angina

Case

A patient with dental infection develops **floor-of-mouth swelling**, fever, and difficulty breathing.

Explanation

- Infection spreads to the sublingual and submandibular spaces.
 - Tongue is **pushed upward and backward**, risking **fatal airway obstruction**.
 - Emergency airway management is crucial.
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Problem 8 — Inability to Whistle

Case

A patient cannot curl or shape the tongue properly to whistle.

Explanation

- Damage to **intrinsic muscles** of the tongue affects tongue **shape control**.
- Hypoglossal nerve lesions impair both intrinsic and extrinsic functions.

Problem 9 — Loss of Gag Reflex

Case

A patient loses the gag reflex on the right side.

Explanation

- **Afferent limb:** Glossopharyngeal nerve (posterior tongue + pharynx)
- **Efferent limb:** Vagus nerve
- Loss of sensation on the posterior tongue is an important clue.

Problem 10 — Burning Sensation of the Tongue

Case

A young woman complains of burning sensation, smooth tongue, and taste disturbances.

Explanation

- Likely due to **atrophy of filiform papillae** in **iron-deficiency anaemia**.
- The tongue appears **glossy and smooth**

Frequently Asked Questions — Tongue

1. What are the parts of the tongue?

- Anterior two-thirds (oral part)
 - Posterior one-third (pharyngeal part)
 - Small posteriormost part near epiglottis
-

2. What are the subdivisions of the dorsum of the tongue?

- Oral (papillary) part
 - Pharyngeal (lymphoid) part
 - Separated by **sulcus terminalis**
-

3. How many types of papillae are present and which have the most taste buds?

There are **four types** of papillae:

- Vallate

- Fungiform
- Filiform
- Foliate

Vallate papillae contain the **maximum taste buds**.

4. Name the extrinsic muscles of the tongue with nerve supply.

- **Genioglossus** — Hypoglossal nerve
 - **Hyoglossus** — Hypoglossal nerve
 - **Styloglossus** — Hypoglossal nerve
 - **Palatoglossus** — Pharyngeal plexus
-

5. Name the intrinsic muscles with their nerve supply.

- Superior longitudinal
- Inferior longitudinal
- Transverse
- Vertical

All supplied by **hypoglossal nerve**.

6. What is the lymph node of the tongue?

- **Deep cervical lymph nodes** (especially jugulodigastric & jugulo-omohyoid)
-

7. What is the importance of the genioglossus muscle? What is its other name?

- Protrudes the tongue forward
 - Prevents airway obstruction
 - Also called the "**life-saving muscle**"
-

8. How does the tongue develop?

- Anterior two-thirds from **first pharyngeal arch**
 - Posterior one-third from **third arch**
 - Posterio-most part from **fourth arch**
-

9. What nerves supply general and special sensations to different parts?

- Anterior 2/3:
 - General: **Lingual nerve**
 - Taste: **Chorda tympani**
 - Posterior 1/3:
 - Both general & taste: **Glossopharyngeal nerve**
 - Posterio-most part + epiglottis:
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- Taste: **Internal laryngeal branch of vagus**
-

10. In injury to the right hypoglossal nerve, which way does the tongue deviate? Why?

- Deviates **to the right side**
 - Because the right genioglossus is paralysed
-

11. Trace taste fibres from circumvallate papillae to the cerebrum.

- Circumvallate ? **Glossopharyngeal nerve**
 - ? Inferior ganglion
 - ? Tractus solitarius
 - ? Solitario-thalamic tract
 - ? VPM nucleus of thalamus
 - ? Lower part of postcentral gyrus
-

12. Which drug is administered sublingually during angina and why?

- **Sorbitrate**
 - Rapid absorption due to rich vascularity and bypassing portal circulation
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13. What is the clinical importance of the colour and roughness of the tongue?

- Colour helps detect diseases such as **jaundice**
- Roughness depends on papillae; loss (e.g., iron deficiency) makes tongue smooth

Multiple Choice Questions — Tongue

1. The nerve supplying taste buds of the circumvallate papillae is:

- a. Lingual nerve
- b. Chorda tympani
- c. Glossopharyngeal nerve
- d. Internal laryngeal nerve

Correct answer: c. Glossopharyngeal nerve

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2. All intrinsic muscles of the tongue are supplied by:

- a. Vagus nerve
- b. Glossopharyngeal nerve
- c. Hypoglossal nerve
- d. Facial nerve

Correct answer: c. Hypoglossal nerve

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3. Palatoglossus is supplied by:

- a. Hypoglossal nerve
- b. Facial nerve
- c. Pharyngeal plexus
- d. Glossopharyngeal nerve

Correct answer: c. Pharyngeal plexus

4. The anterior two-thirds of the tongue develops from which arch?

- a. Second
- b. First
- c. Third
- d. Fourth

Correct answer: b. First

5. Deviation of the tongue to one side on protrusion indicates injury to:

- a. Glossopharyngeal nerve
- b. Hypoglossal nerve
- c. Lingual nerve
- d. Internal laryngeal nerve

Correct answer: b. Hypoglossal nerve

6. Which papillae contain the maximum number of taste buds?

- a. Filiform
- b. Fungiform
- c. Foliate
- d. Vallate

Correct answer: d. Vallate

7. The lymphatic drainage of the tip of the tongue is primarily to:

- a. Jugulo-omohyoid node
- b. Jugulodigastric node
- c. Submental node
- d. Parotid node

Correct answer: c. Submental node

(From anatomical correlation, consistent with text where tongue lymphatics are discussed.)

8. Sublingual placement of sorbitrate is effective because:

- a. It has slow absorption
- b. It is digested by salivary enzymes
- c. It bypasses the portal circulation
- d. It requires lymphatic transport

Correct answer: c. It bypasses the portal circulation

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9. Taste from the posteriormost part of the tongue is carried by:

- a. Lingual nerve
- b. Chorda tympani
- c. Glossopharyngeal nerve
- d. Vagus nerve

Correct answer: d. Vagus nerve

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10. The “life-saving muscle” of the tongue is:

- a. Styloglossus
- b. Hyoglossus
- c. Genioglossus
- d. Palatoglossus

Correct answer: c. Genioglossus

Additional MCQs — Tongue

1. General sensation from the anterior two-thirds of the tongue is carried by:

- a. Chorda tympani
- b. Glossopharyngeal nerve
- c. Lingual nerve
- d. Vagus nerve

Correct answer: c. Lingual nerve

2. Taste fibres from the anterior two-thirds of the tongue reach the brainstem via:

- a. Lingual nerve ? Geniculate ganglion
- b. Lingual nerve ? Trigeminal ganglion
- c. Chorda tympani ? Otic ganglion
- d. Chorda tympani ? Inferior ganglion of IX

Correct answer: a. Lingual nerve ? Geniculate ganglion (via chorda tympani)

3. Taste from the epiglottis is carried by which nerve?

- a. Facial
- b. Glossopharyngeal
- c. Trigeminal
- d. Vagus

Correct answer: d. Vagus (internal laryngeal branch)

4. Which papillae are keratinised and provide friction during mastication?

- a. Fungiform
- b. Vallate

- c. Filiform
- d. Foliate

Correct answer: c. Filiform

5. A patient has loss of taste from the anterior two-thirds but normal general sensation. Which nerve is damaged?

- a. Lingual nerve before joining chorda tympani
- b. Chorda tympani
- c. Glossopharyngeal nerve
- d. Vagus nerve

Correct answer: b. Chorda tympani

6. Paralysis of which muscle causes the tongue to fall backward and obstruct the airway?

- a. Styloglossus
- b. Palatoglossus
- c. Genioglossus
- d. Hyoglossus

Correct answer: c. Genioglossus

7. Posterior one-third of the tongue develops from which embryological structure?

- a. Lateral lingual swellings
- b. Hypobranchial eminence
- c. Tuberculum impar
- d. Epiglottic swelling

Correct answer: b. Hypobranchial eminence

8. Taste fibres from the posterior third of the tongue terminate in which nucleus?

- a. Motor nucleus of V
- b. Nucleus ambiguus
- c. Nucleus tractus solitarius
- d. Chief sensory nucleus

Correct answer: c. Nucleus tractus solitarius

9. On protrusion, the tongue deviates to the left. Which side's hypoglossal nerve is lesioned?

- a. Left
- b. Right
- c. Both sides
- d. Cannot determine

Correct answer: a. Left

10. Which extrinsic muscle elevates and retracts the tongue?

- a. Hyoglossus
- b. Genioglossus
- c. Styloglossus
- d. Palatoglossus

Correct answer: c. Styloglossus

11. Which of the following structures forms the anterior boundary of the oropharyngeal isthmus?

- a. Palatoglossal arch
- b. Palatopharyngeal arch
- c. Faucial isthmus
- d. Sulcus terminalis

Correct answer: a. Palatoglossal arch

12. Which papillae are most developed in newborns but diminish with age?

- a. Fungiform
- b. Filiform
- c. Foliate
- d. Vallate

Correct answer: c. Foliate

13. Loss of taste from vallate papillae occurs in a lesion of:

- a. Facial nerve
- b. Glossopharyngeal nerve
- c. Trigeminal nerve
- d. Vagus nerve

Correct answer: b. Glossopharyngeal nerve

14. Which of the following contains lymphoid follicles forming part of Waldeyer's ring?

- a. Anterior two-thirds
- b. Posterior one-third
- c. Tip of tongue
- d. Inferior surface

Correct answer: b. Posterior one-third

15. Which statement about the tongue's blood supply is TRUE?

- a. Lingual artery is straight and fixed
- b. Lingual artery is tortuous and moves during swallowing
- c. Venous drainage is mainly to subclavian vein
- d. Arterial supply is via facial artery alone

Correct answer: b. Lingual artery is tortuous and moves with pharyngeal movements

1. What are the parts of the tongue?

- Tip
 - Body (anterior two-thirds)
 - Posterior one-third
 - Posteriormost part near epiglottis
-

2. What is the sulcus terminalis?

- A **V-shaped groove** separating anterior two-thirds from posterior one-third.
-

3. Name the papillae of the tongue.

- Vallate
 - Fungiform
 - Filiform
 - Foliate
-

4. Which papillae contain the maximum number of taste buds?

- Vallate papillae
-

5. Which papillae are keratinised?

- Filiform papillae
-

6. Which nerve carries general sensation from the anterior two-thirds?

- Lingual nerve
-

7. Which nerve carries taste from the anterior two-thirds?

- Chorda tympani (via lingual nerve)
-

8. Which nerve carries sensation and taste from the posterior one-third?

- Glossopharyngeal nerve
-

9. Which nerve carries taste from the posteriormost part and epiglottis?

- Internal laryngeal branch of vagus
-

10. Name the intrinsic muscles of the tongue.

- Superior longitudinal
 - Inferior longitudinal
 - Transverse
 - Vertical
-

11. Name the extrinsic muscles of the tongue.

- Genioglossus
 - Hyoglossus
 - Styloglossus
 - Palatoglossus
-

12. What is the nerve supply of palatoglossus?

- **Pharyngeal plexus** (not hypoglossal)
-

13. What happens in hypoglossal nerve palsy?

- Tongue **deviates toward the affected side** on protrusion.
-

14. Which muscle prevents the tongue from falling back?

- **Genioglossus** — called the *life-saving muscle*.
-

15. What forms the lingual tonsil?

- **Lymphoid follicles** in the posterior one-third of the tongue.
-

16. Why do sublingual drugs act quickly?

- Rich vascularity
 - Direct entry into systemic circulation
-

- Bypasses portal system
-

17. What muscle elevates and retracts the tongue?

- Styloglossus
-

18. What muscle depresses the tongue?

- Hyoglossus
-

19. What muscle protrudes the tongue?

- Genioglossus
-

20. Why does the tongue swell rapidly in infections?

- Presence of **loose areolar tissue**
 - Rich lymphatic drainage
-

21. What does deviation of the uvula indicate?

(Not exactly tongue, but commonly asked with it)

- Lesion of the **vagus nerve**, uvula deviates **away** from the lesion.
-

22. From which pharyngeal arches does the tongue develop?

- Anterior 2/3 ? **First arch**

- Posterior 1/3 ? **Third arch**
 - Posteriormost part ? **Fourth arch**
-

23. What forms the median glossoepiglottic fold?

- Mucosal fold attaching the **epiglottis to the tongue**.
-

24. What are the valleculae?

- Small depressions between the **median and lateral glossoepiglottic folds**.