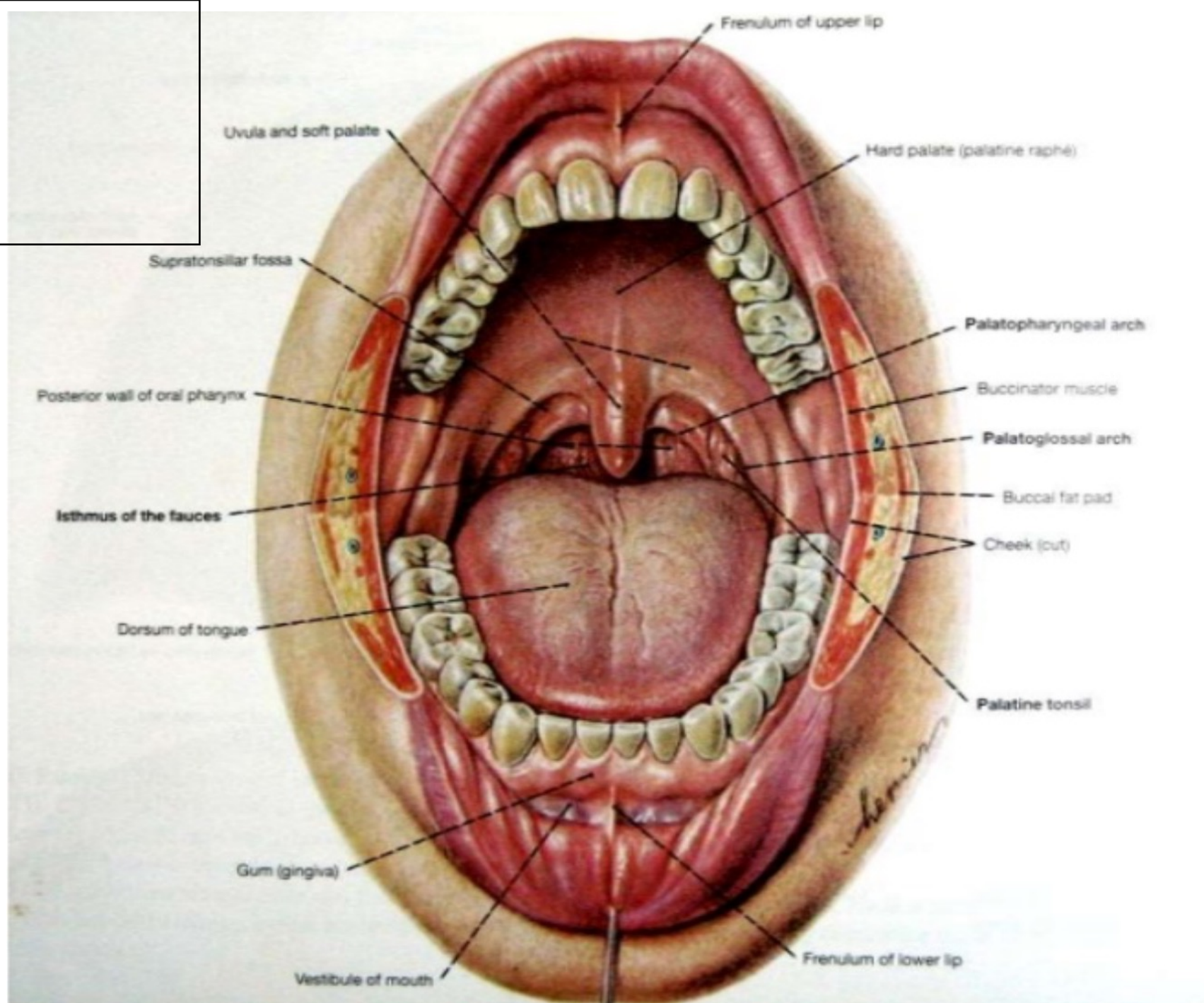


Anatomy of Oral Cavity



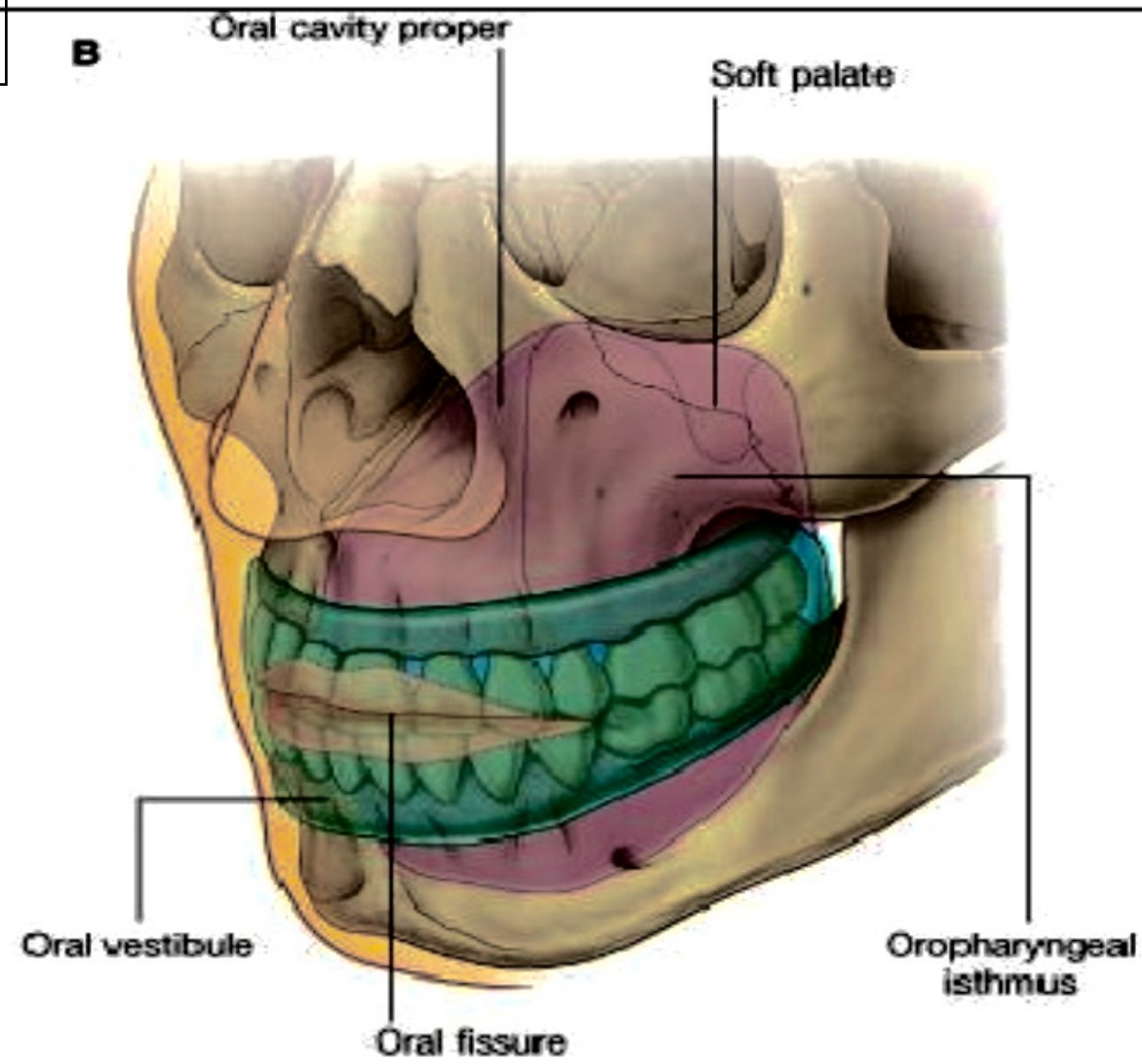
The oral cavity is separated into two regions by the upper and lower dental arches consisting of the teeth and alveolar bone that supports them.

- the outer **ORAL VESTIBULE**, which is horseshoe shaped, is between the dental arches and the deep surfaces of the cheeks and lips-the oral fissure opens into it and can be opened and closed by muscles of facial expression, and by movements of the lower jaw;

- the inner **ORAL CAVITY PROPER**, which is enclosed by the dental arches.

The oropharyngeal isthmus at the back of the oral cavity proper can be opened and closed by surrounding soft tissues, which include the soft palate and tongue.

Oral Vestibule and Oral cavity proper



Bones of Oral Cavity

Bones that contribute to the skeletal framework of the oral cavity are related to the

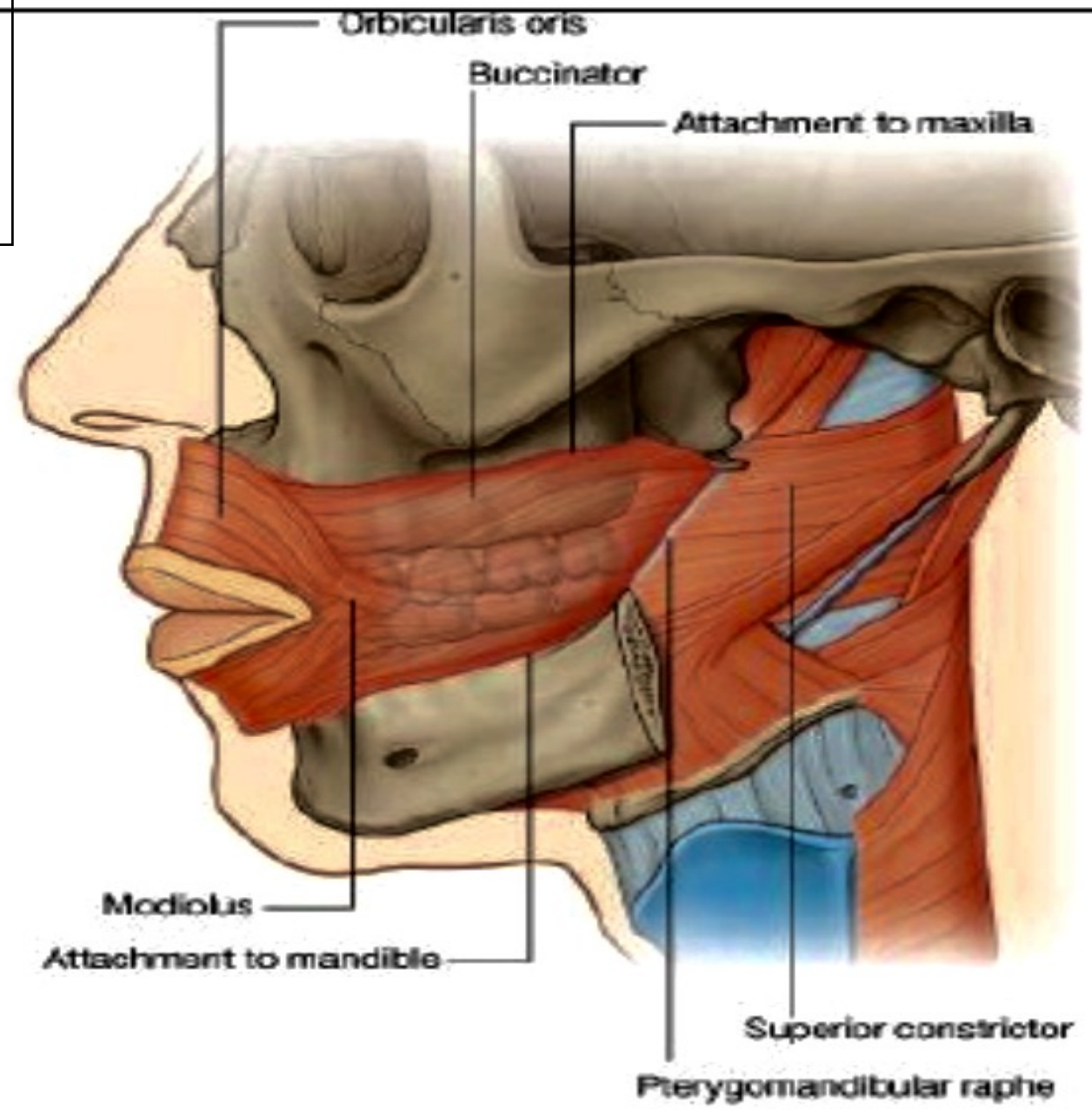
anatomy of structures in the oral cavity, they include:

- the paired **MAXILLAE**, and **PALATINE** and **TEMPORAL** bones;
- the unpaired **MANDIBLE**, **SPHENOID**, and **HYOID** bone.

In addition, the cartilaginous parts of the pharyngotympanic tubes on the inferior aspect of the base of the skull are related to the attachment of muscles of the soft palate.

Walls of oral Cavity

- Cheeks forms the walls of oral cavity
- Each Cheek consists of fascia and layer of skeletal muscle; sandwiched between skin externally and oral mucosa internally .
- The thin layer of skeletal muscle within the cheeks is principally the buccinator muscle



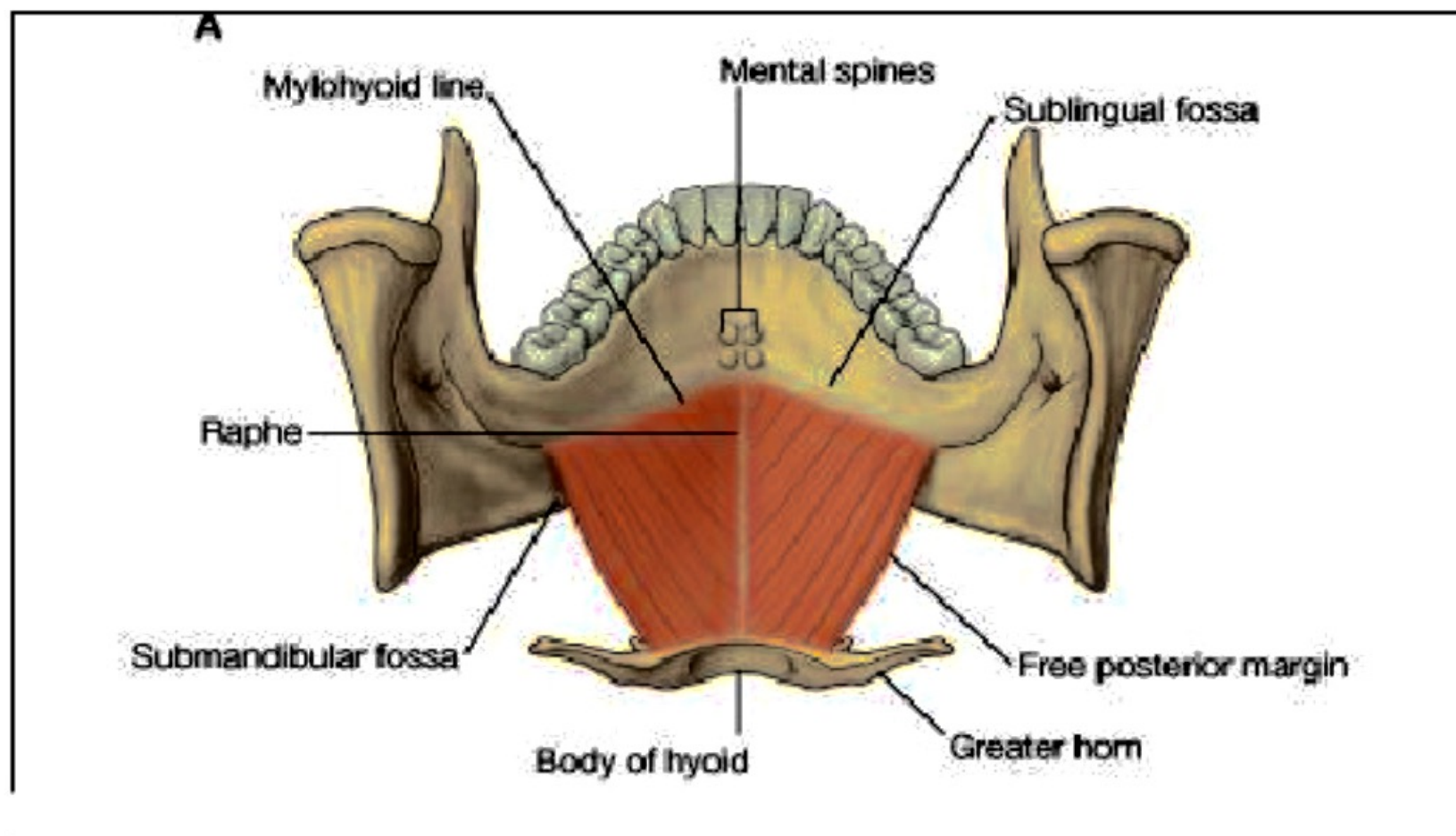
The floor of the oral cavity is formed mainly by the three structures

1. A muscular diaphragm, which fills the u-shaped gap between the left and right sides of the body of the mandible and is composed of the paired **mylohyoid muscles**;
2. Two cord-like **geniohyoid muscles** above the diaphragm, which run from the mandible in front to the hyoid bone behind;
3. The **tongue**, which is superior to the geniohyoid muscles.

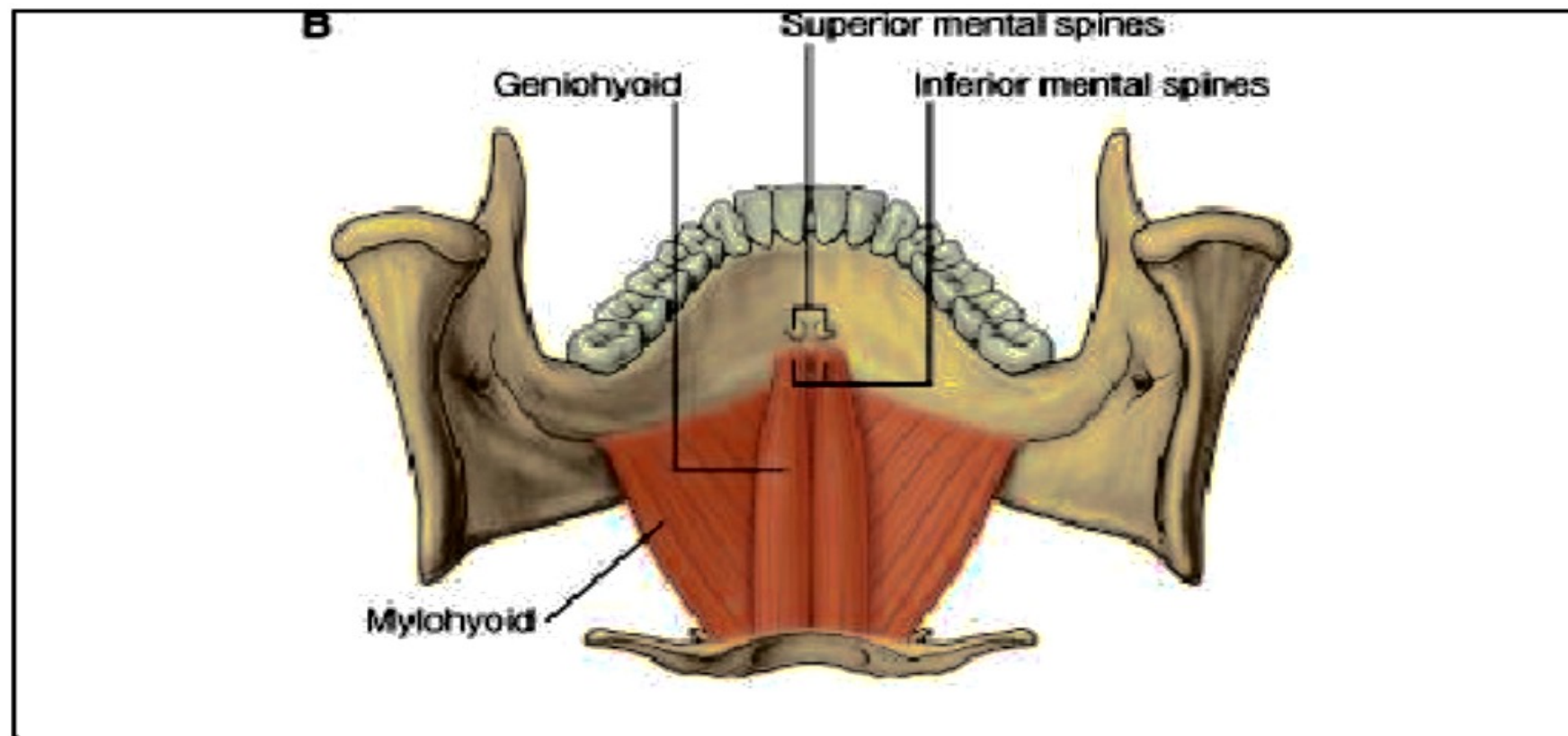
Also present in the floor of the oral cavity proper are salivary glands and their ducts.

The largest of these glands, on each side, are the sublingual gland and the oral part of the submandibular gland.

A muscular diaphragm, which fills the u-shaped gap between the left and right sides of the body of the mandible and is composed of the paired **mylohyoid muscles**;



Two cord-like **geniohyoid muscles** above the diaphragm, which run from the mandible in front to the hyoid bone behind;



MUSCLES IN THE FLOOR OF THE ORAL CAVITY

Muscles	Origin	Insertions	Innervation	Function
Mylohyoid	Mylohyoid line of mandible	Median fibrous raphe and adjacent part of hyoid bone	Nerve to mylohyoid from the inferior alveolar branch of mandibular nerve [V ³]	Supports and elevates floor of oral cavity; depresses mandible when hyoid is fixed; elevates and pulls hyoid forward when mandible is fixed
Geniohyoid	Inferior mental spines of mandible	Body of hyoid bone	C1	Elevates and pulls hyoid forward when mandible is fixed; depresses mandible when hyoid is fixed

Tongue

The tongue is a muscular structure that forms part of the floor of the oral cavity and part of the anterior wall of the oropharynx.

Its anterior part is in the oral cavity and is somewhat triangular in shape with a blunt **apex of tongue**.

The apex is directed anteriorly and sits immediately behind the incisor teeth.

The **root of tongue** is attached to the mandible and the hyoid bone.

The superior surface of the oral or anterior two-thirds of the tongue is oriented in the horizontal plane.

The **pharyngeal surface or posterior one-third** of the tongue curves inferiorly and becomes oriented more in the vertical plane.

The oral and pharyngeal surfaces are separated by a V-shaped **terminal sulcus of tongue**.

This terminal sulcus forms the inferior margin of the oropharyngeal isthmus between the oral and pharyngeal cavities.

At the apex of the V-shaped sulcus is a small depression (the **foramen caecum of tongue**), which marks the site in the embryo where the epithelium invaginated to form the thyroid gland.

The bulk of the tongue is composed of muscle.

The tongue is completely divided into a **left and right** half by a **median sagittal septum** composed of connective tissue.

This means that all muscles of the tongue are paired.

There are intrinsic and extrinsic lingual muscles.

Except for the palatoglossus, which is innervated by the vagus nerve [X], all muscles of the tongue are innervated by the hypoglossal nerve [XII].

Intrinsic muscles of the tongue

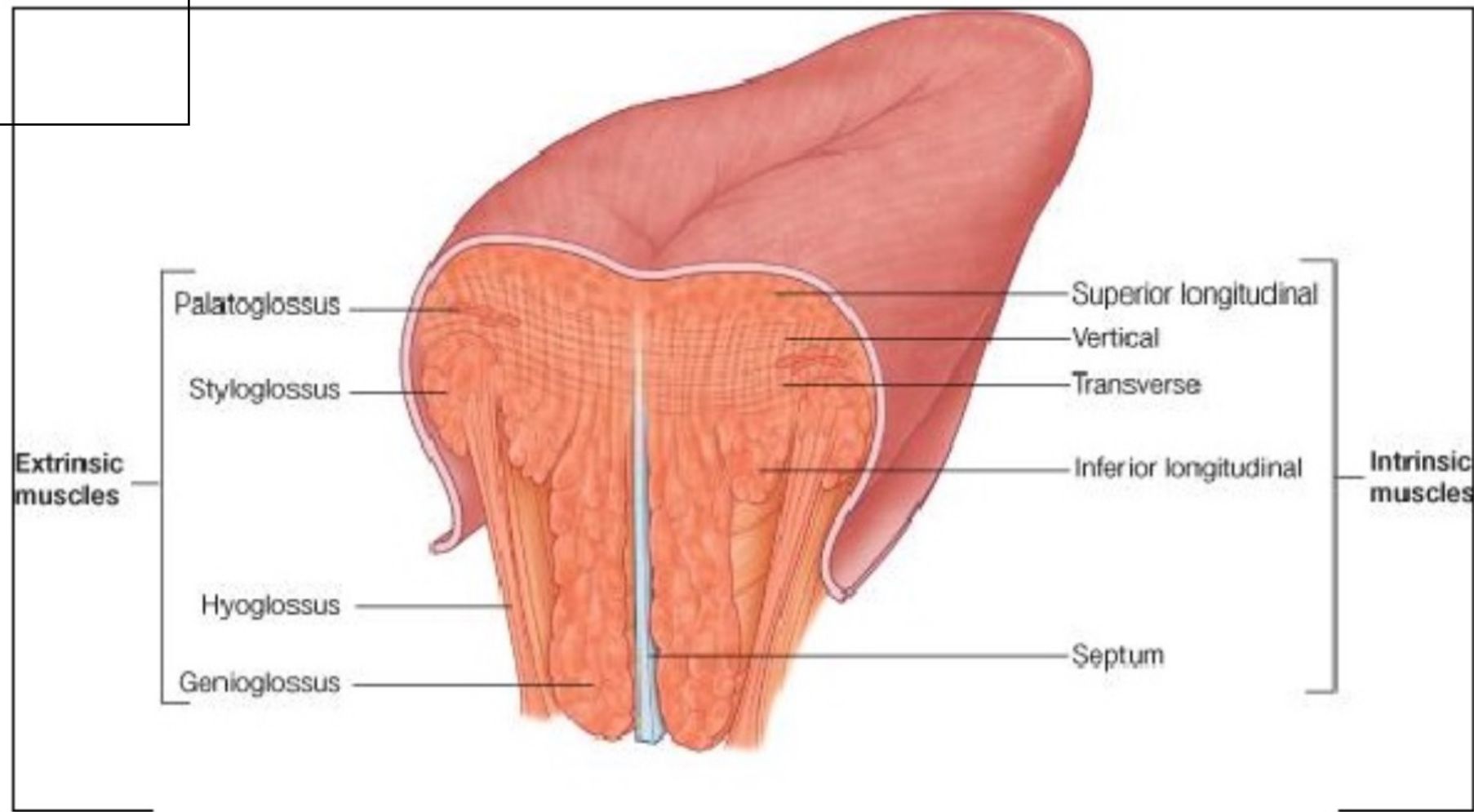
The intrinsic muscles of the tongue originate and insert within the substance of the tongue. They are divided into:

- superior longitudinal,
- inferior longitudinal,
- transverse,
- vertical muscles

They alter the shape of the tongue by:

- lengthening and shortening it;
- curling and uncurling its apex and edges;
- flattening and rounding its surface.

Working in pairs or one side at a time the intrinsic muscles of the tongue contribute to precision movements of the tongue required for speech, eating, and swallowing.

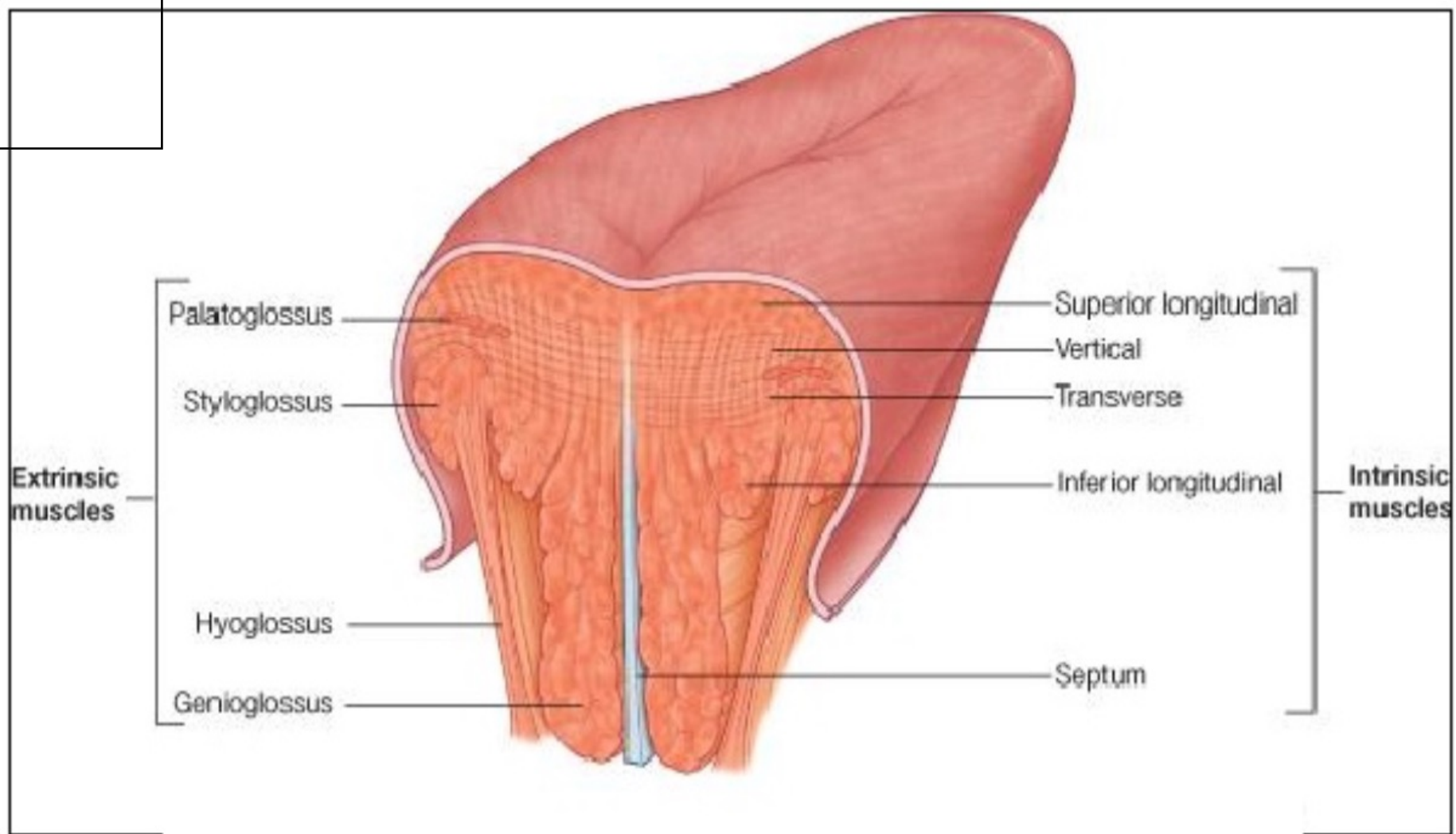


Extrinsic muscles of the tongue

Extrinsic muscles of the tongue originate from structures outside the tongue and insert into the tongue. There are **four** major extrinsic muscles on each side;

- Genioglossus
- Hyoglossus
- Styloglossus
- Palatoglossus.

These muscles protrude, retract, depress, and elevate the tongue.



Genioglossus

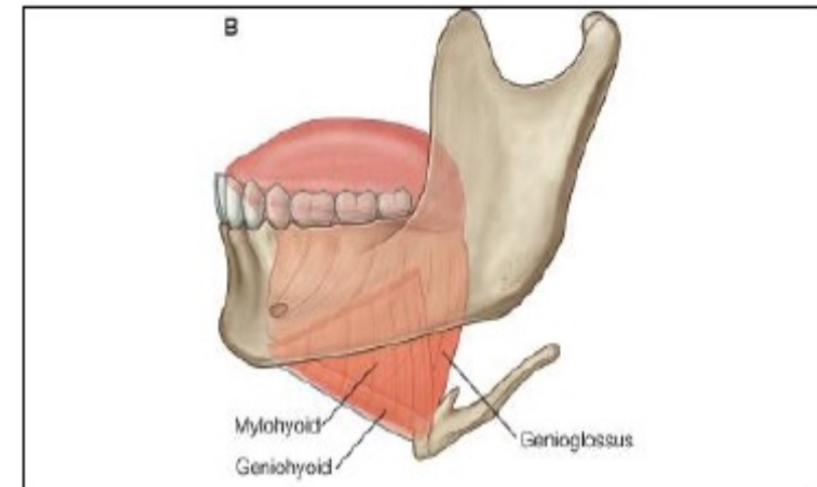
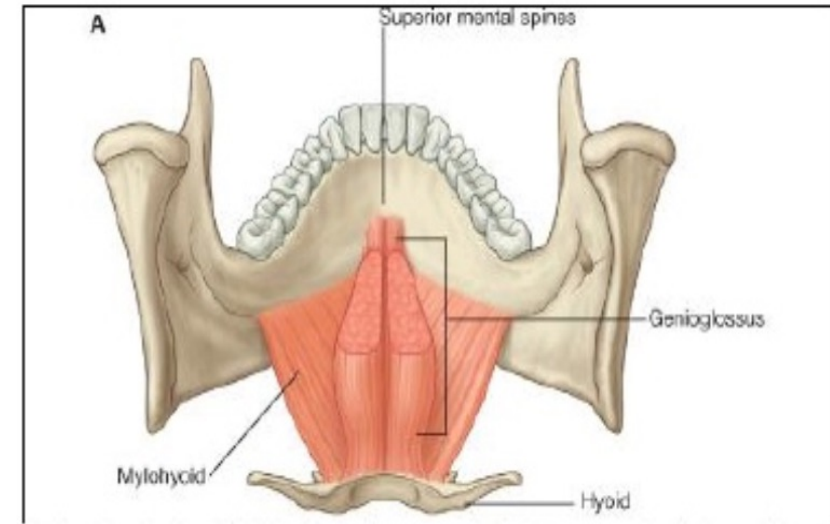
- Thick fan-shaped muscle which make a substantial contribution to the structure of the tongue.
- They occur on either side of the midline septum that separates left and right halves of the tongue.
- Originate from the superior mental tubercles on the posterior surface of the mandibular symphysis immediately superior to the origin of the geniohyoid muscles from the inferior mental tubercles. From this small site of origin, each muscle expands posteriorly and superiorly.
- The most inferior fibers attach to the hyoid bone. The remaining fibers spread out superiorly to blend with the intrinsic muscles along virtually the entire length of the tongue.

The genioglossus muscles:

•*depress the central part of the tongue;*

•*protrude the anterior part of the tongue out of the oral fissure (i.e. 'stick the tongue out').*

Like most muscles of the tongue, the genioglossus muscles are innervated by the hypoglossal nerves [XII].

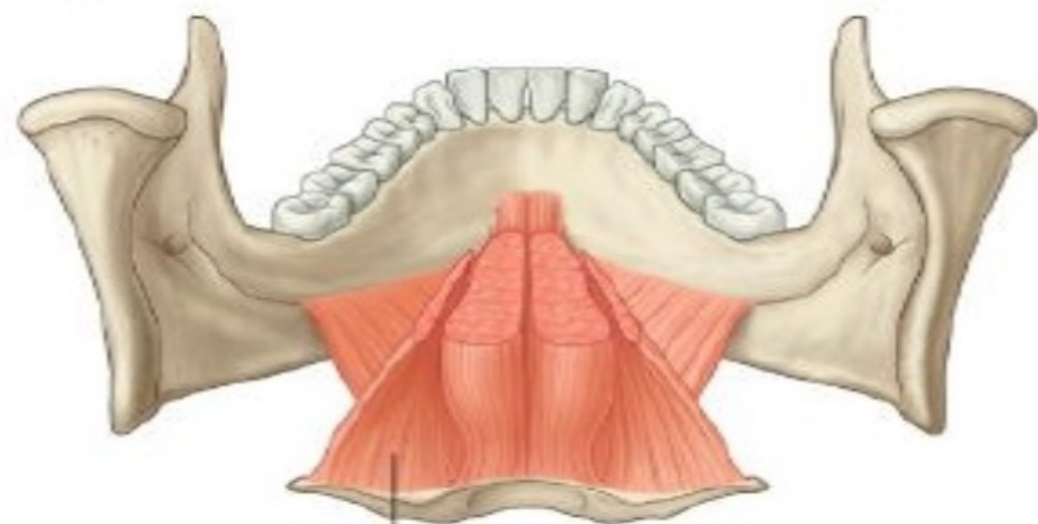


Hyoglossus

- They are thin **quadrangular** muscles lateral to the genioglossus muscles.
- Each hyoglossus muscle originates from the entire length of the greater horn and the adjacent part of the body of the **hyoid bone**. At its origin from the hyoid bone, the hyoglossus muscle is lateral to the attachment of the middle constrictor muscle of the pharynx.
- The muscle passes superiorly and anteriorly through the gap between the **superior constrictor, middle constrictor,** and **mylohyoid** to insert into the tongue lateral to the geniohyoid and medial to the styloglossus.
- It depresses the tongue
- Innervated by the hypoglossal nerve [XII].

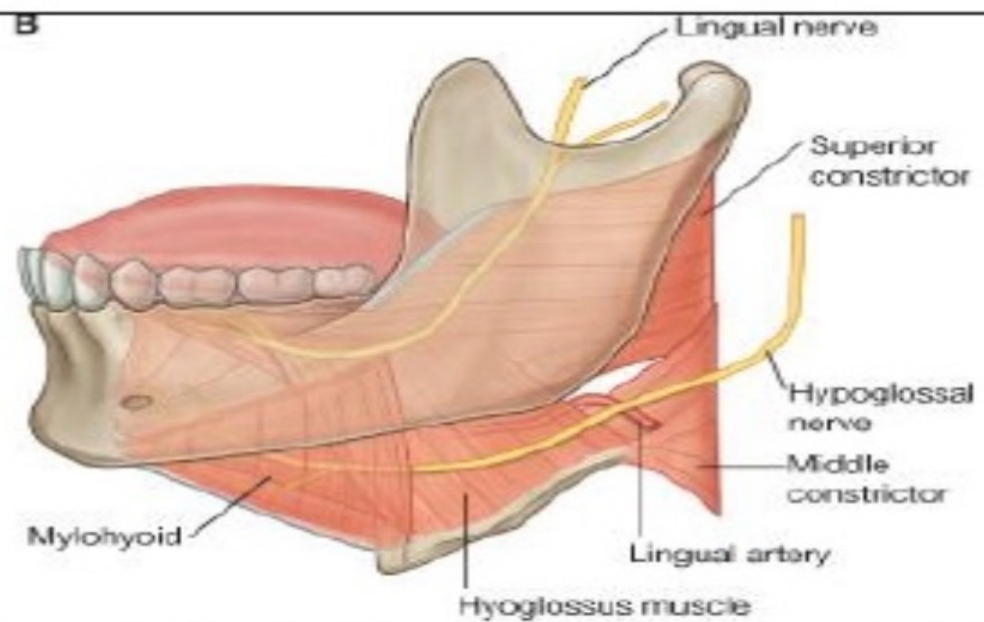
- It is an important landmark on the floor of the oral cavity: the lingual artery from the external carotid artery in the neck enters the tongue deep to the hyoglossus, between the hyoglossus and genioglossus;
- The hypoglossal nerve [XII] and lingual nerve (branch of the mandibular nerve [V₃]), from the neck and infratemporal fossa of the head, respectively, enter the tongue on the external surface of the hyoglossus.

A



Hyoglossus muscle

B



Lingual nerve

Superior constrictor

Hypoglossal nerve

Middle constrictor

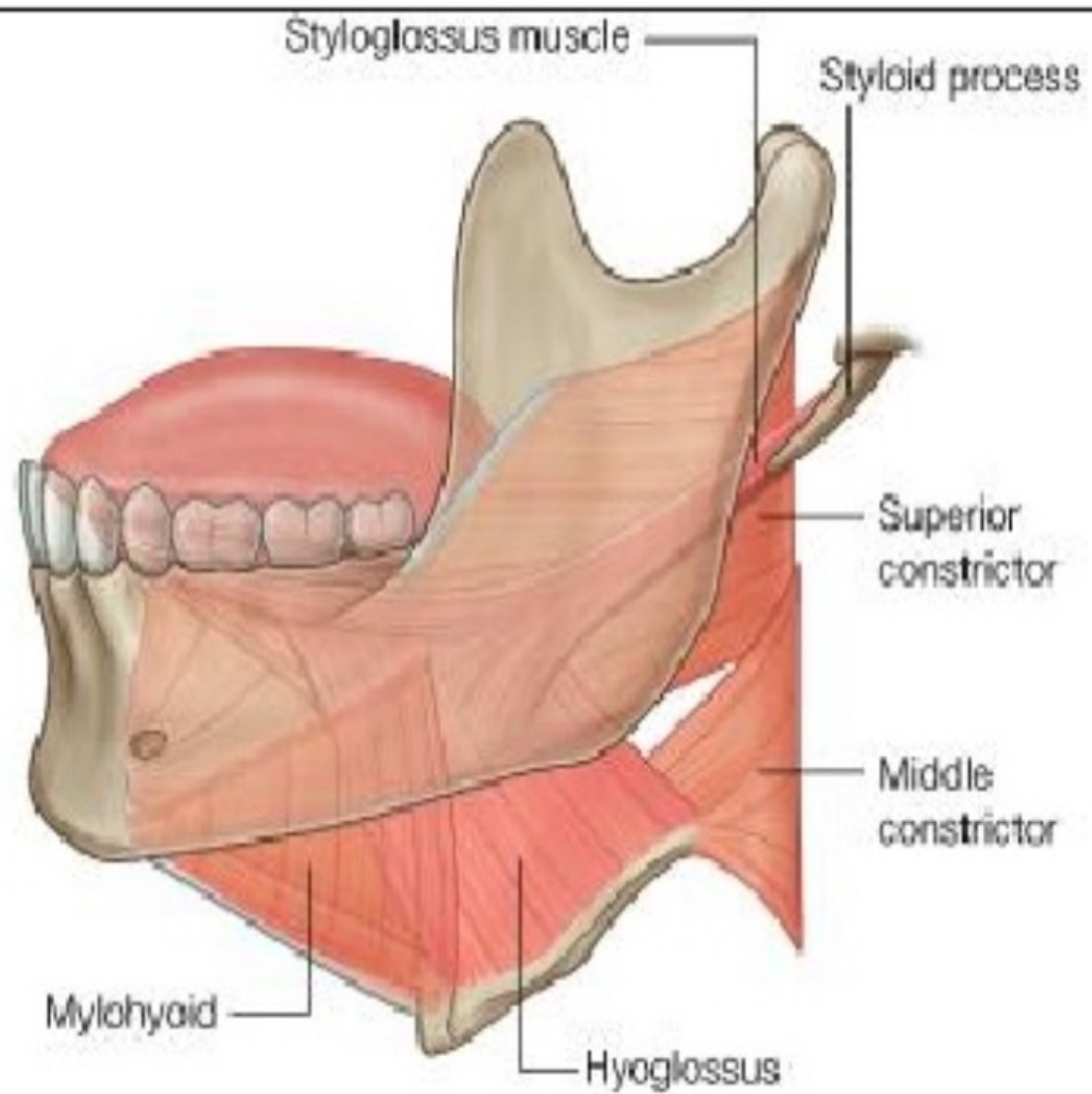
Lingual artery

Hyoglossus muscle

Mylohyoid

Styloglossus

- Originate from the anterior surface of the styloid processes of the temporal bones.
- From here, each muscle passes inferiorly and medially through the gap between the **middle constrictor, superior constrictor, and mylohyoid muscles** to enter the lateral surface of the tongue where they blend with the superior margin of the hyoglossus and with the intrinsic muscles.
- They retract the tongue and pull the back of the tongue superiorly.
- They are innervated by the hypoglossal nerves [XII].

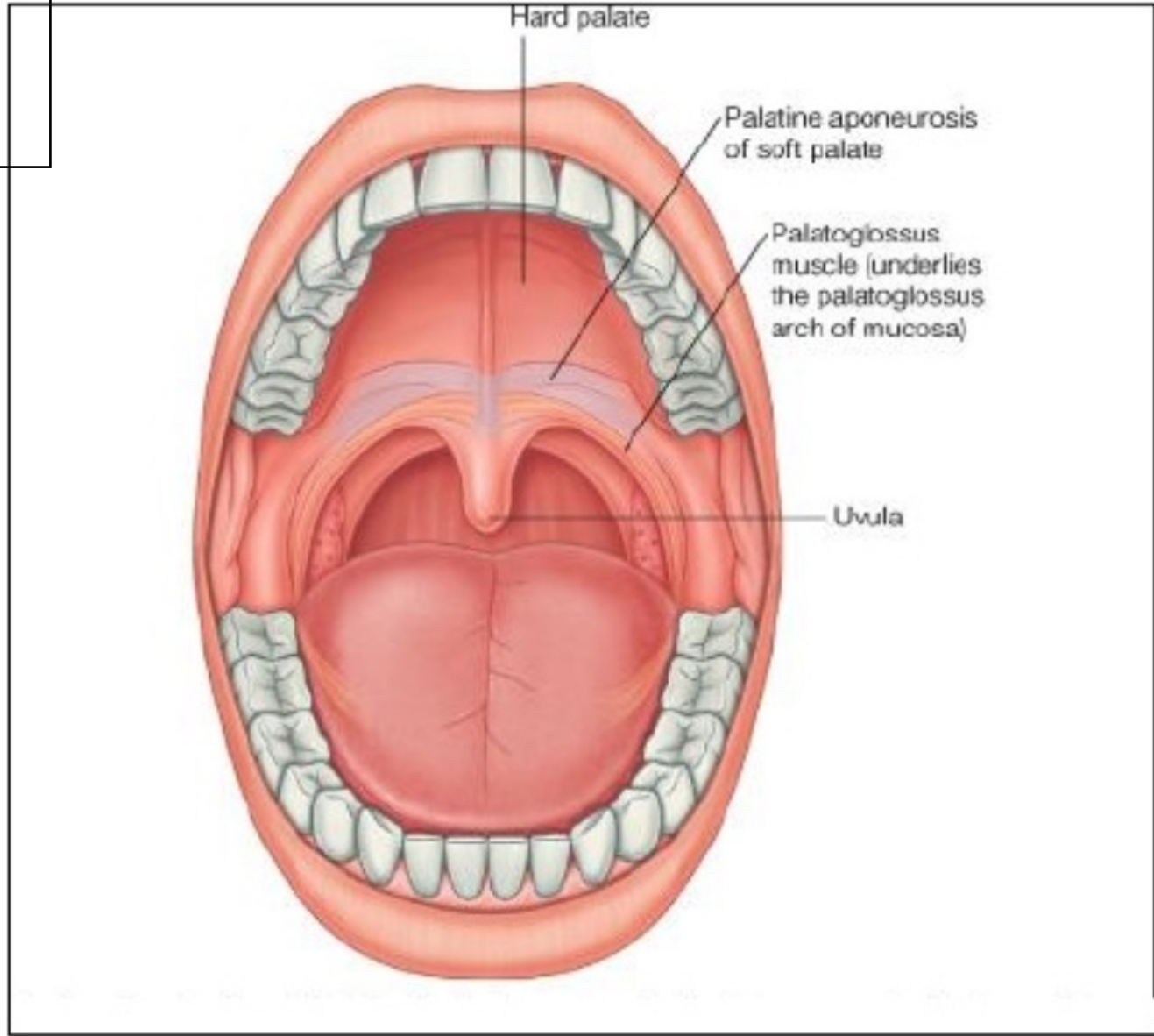


Palatoglossus

- Are muscles of the soft palate and the tongue.
- Originates from the under surface of the **palatine aponeurosis** and passes anteroinferiorly to the lateral side of the tongue.
- Elevate the back of the tongue
- Move the palatoglossal arches of mucosa toward the midline
- Depress the soft palate.

These movements facilitate closing of the oropharyngeal isthmus and as a result separate the oral cavity from the oropharynx.

Unlike other muscles of the tongue, but similar to most other muscles of the soft palate, the palatoglossus muscles are innervated by the **vagus nerves [X]**.

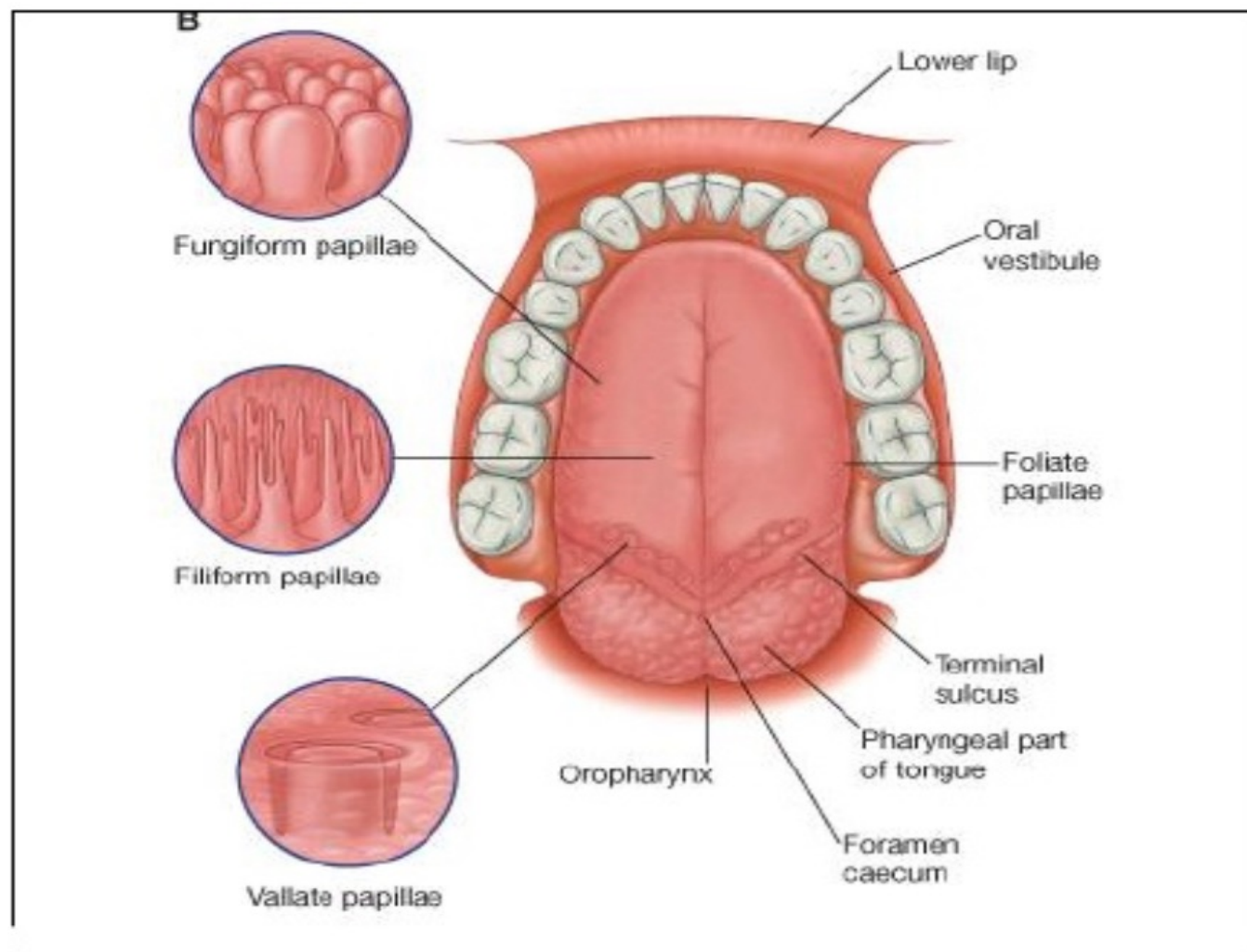


Papillae of the tongue

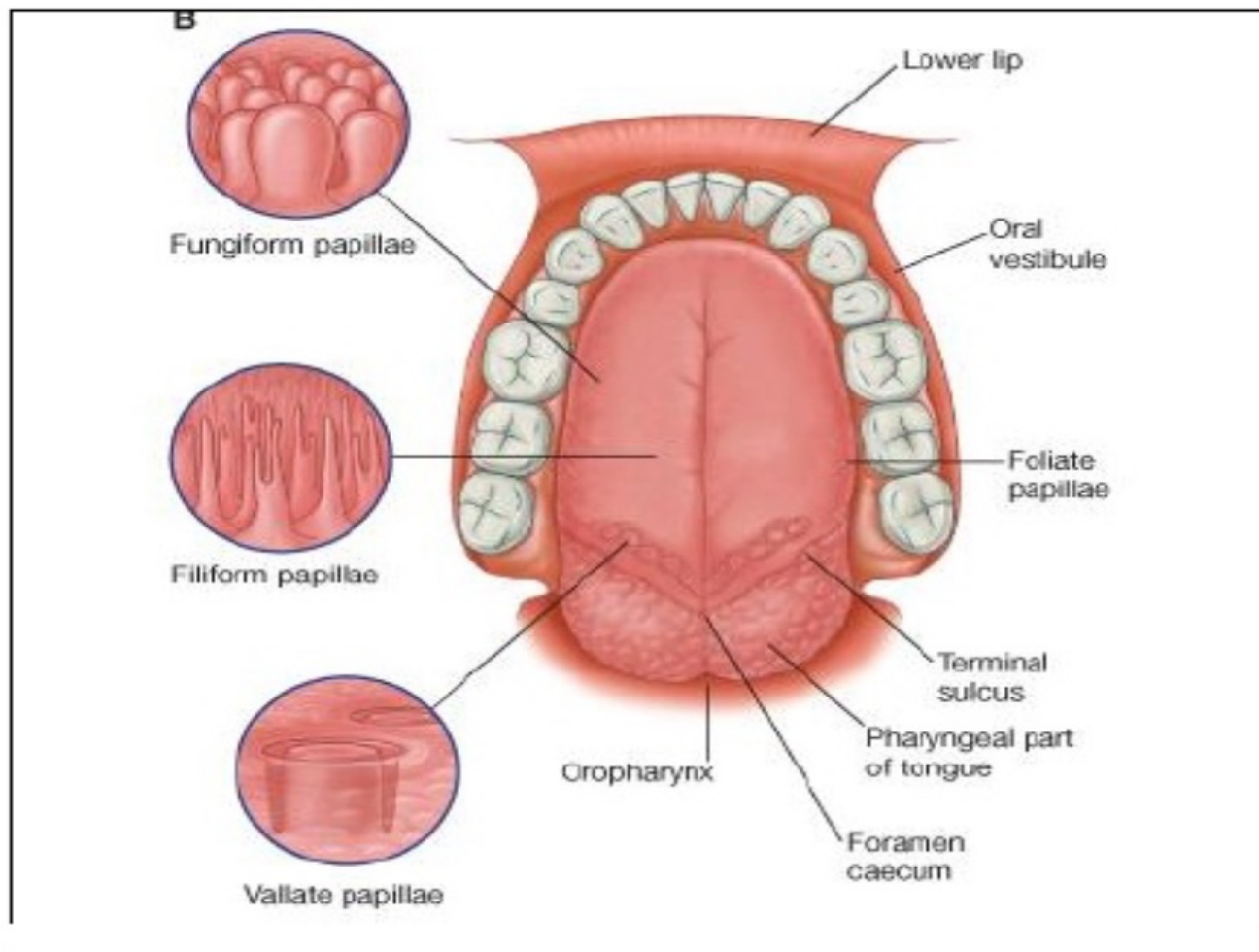
The superior surface of the oral part of the tongue is covered by hundreds of papillae:

1. **Filiform papillae** are small cone-shaped projections of the mucosa that end in one or more points;
2. **Fungiform papillae** are rounder in shape and larger than the filiform papillae, and tend to be concentrated along the margins of the tongue;
3. **Vallate papillae**, the largest of the papillae, which are blunt-ended cylindrical papillae in invaginations in the tongue's surface-there are only about 8 to 12 vallate papillae in a single v-shaped line immediately anterior to the terminal sulcus of tongue;
4. **Foliate papillae** are linear folds of mucosa on the sides of the tongue near the terminal sulcus of tongue.

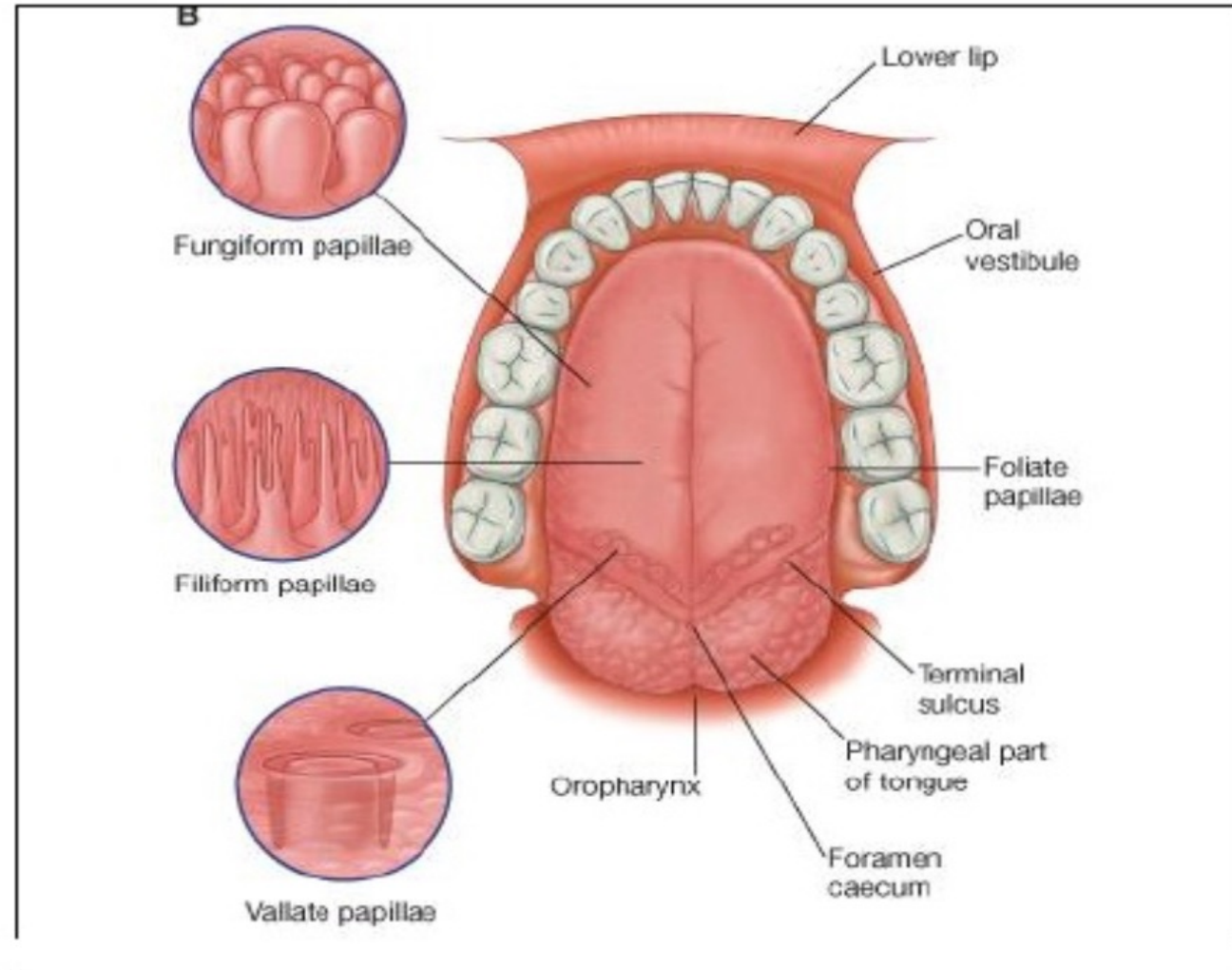
Filiform papillae are small cone-shaped projections of the mucosa that end in one or more points;



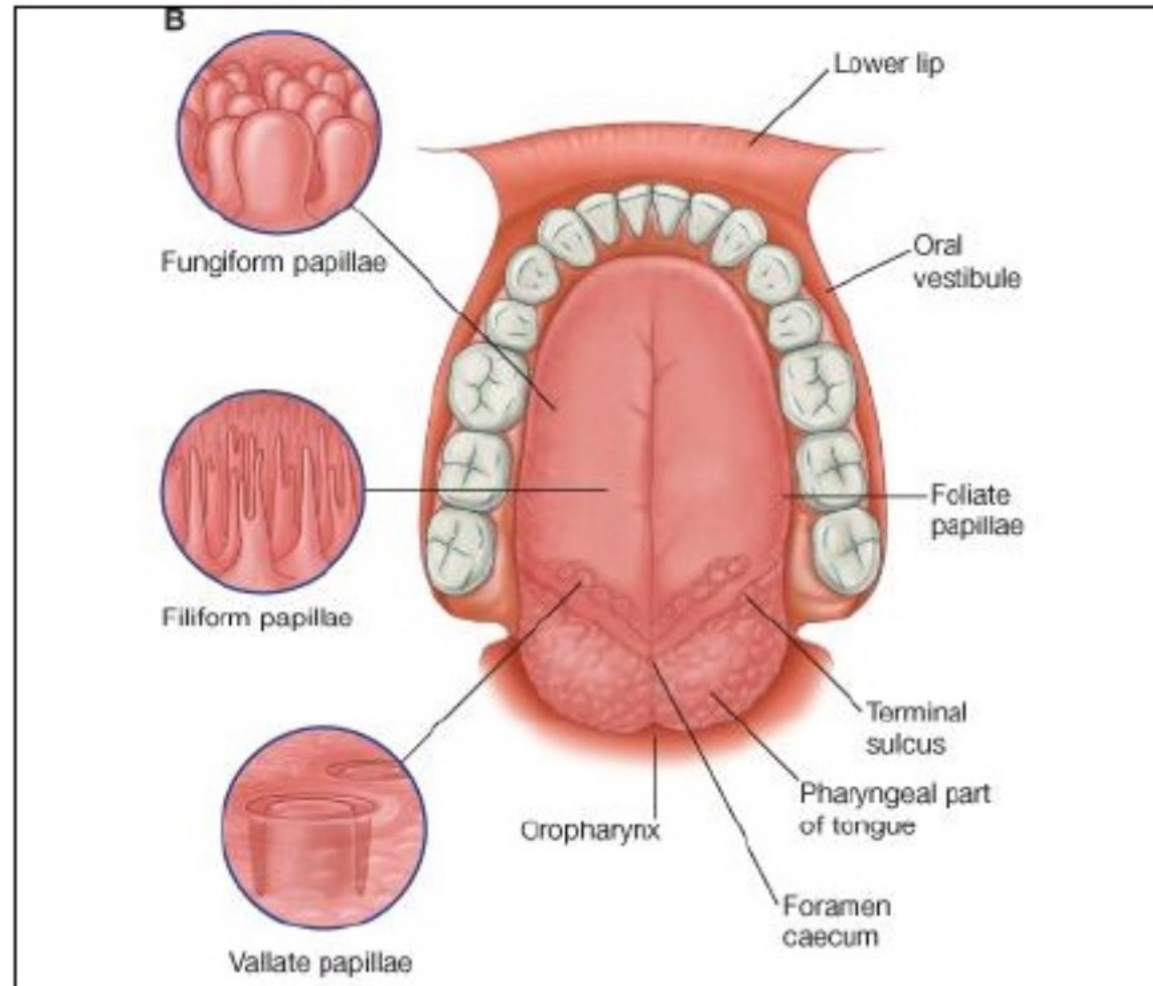
Fungiform papillae are rounder in shape and larger than the filiform papillae, and tend to be concentrated along the margins of the tongue



Vallate papillae, the largest of the papillae, which are blunt-ended cylindrical papillae in invaginations in the tongue's surface-there are only about 8 to 12 vallate papillae in a single v-shaped line immediately anterior to the terminal sulcus of tongue;

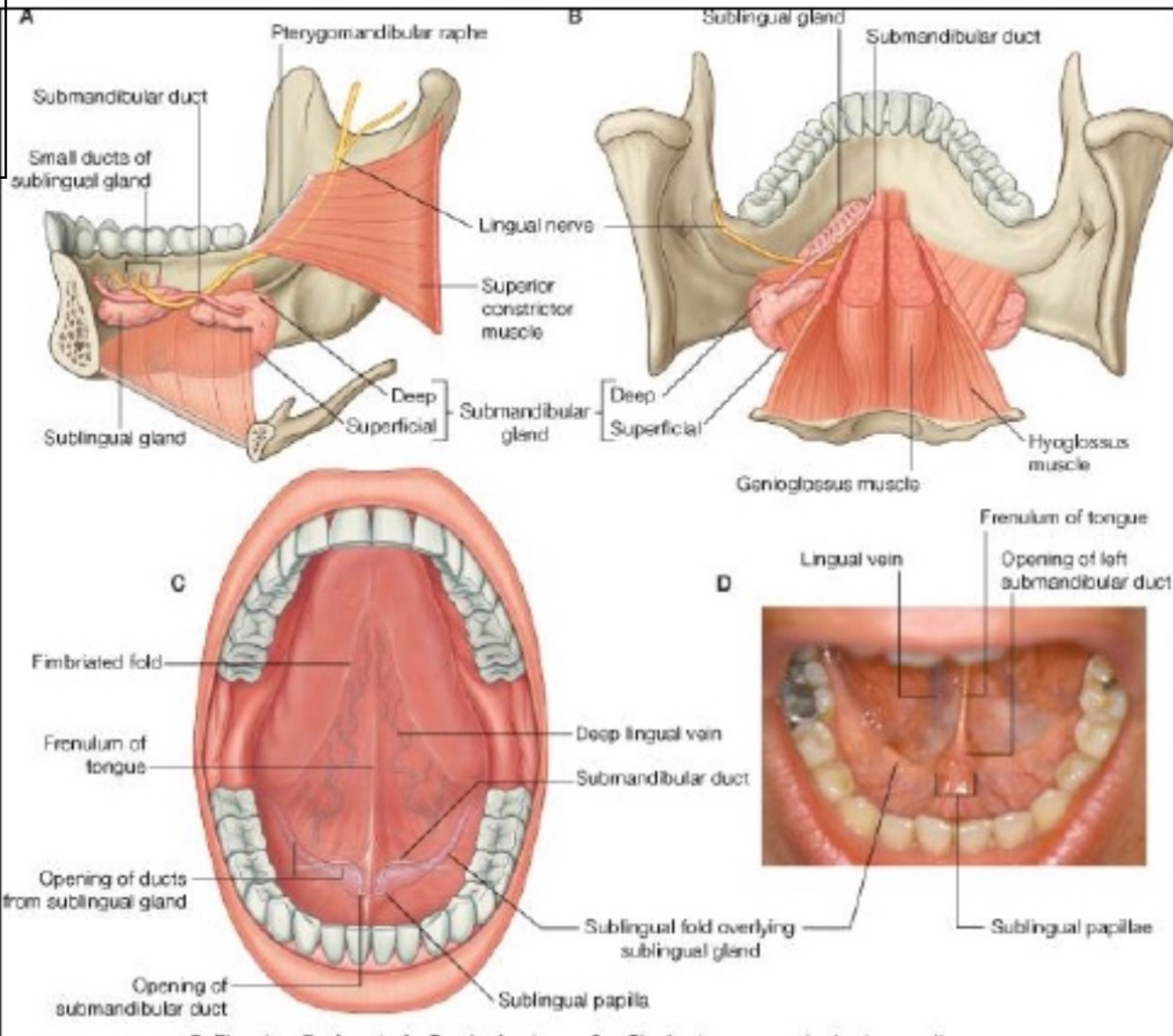


Foliate papillae are linear folds of mucosa on the sides of the tongue near the terminal sulcus of tongue.



Inferior surface of the tongue

The under surface of the oral part of the tongue lacks papillae, but does have a number of linear mucosal folds. A single median fold (the **frenulum of tongue**) is continuous with the mucosa covering the floor of the oral cavity, and overlies the lower margin of a midline sagittal septum, which internally separates the right and left sides of the tongue. On each side of the frenulum is a lingual vein, and lateral to each vein is a rough **fimbriated fold**.

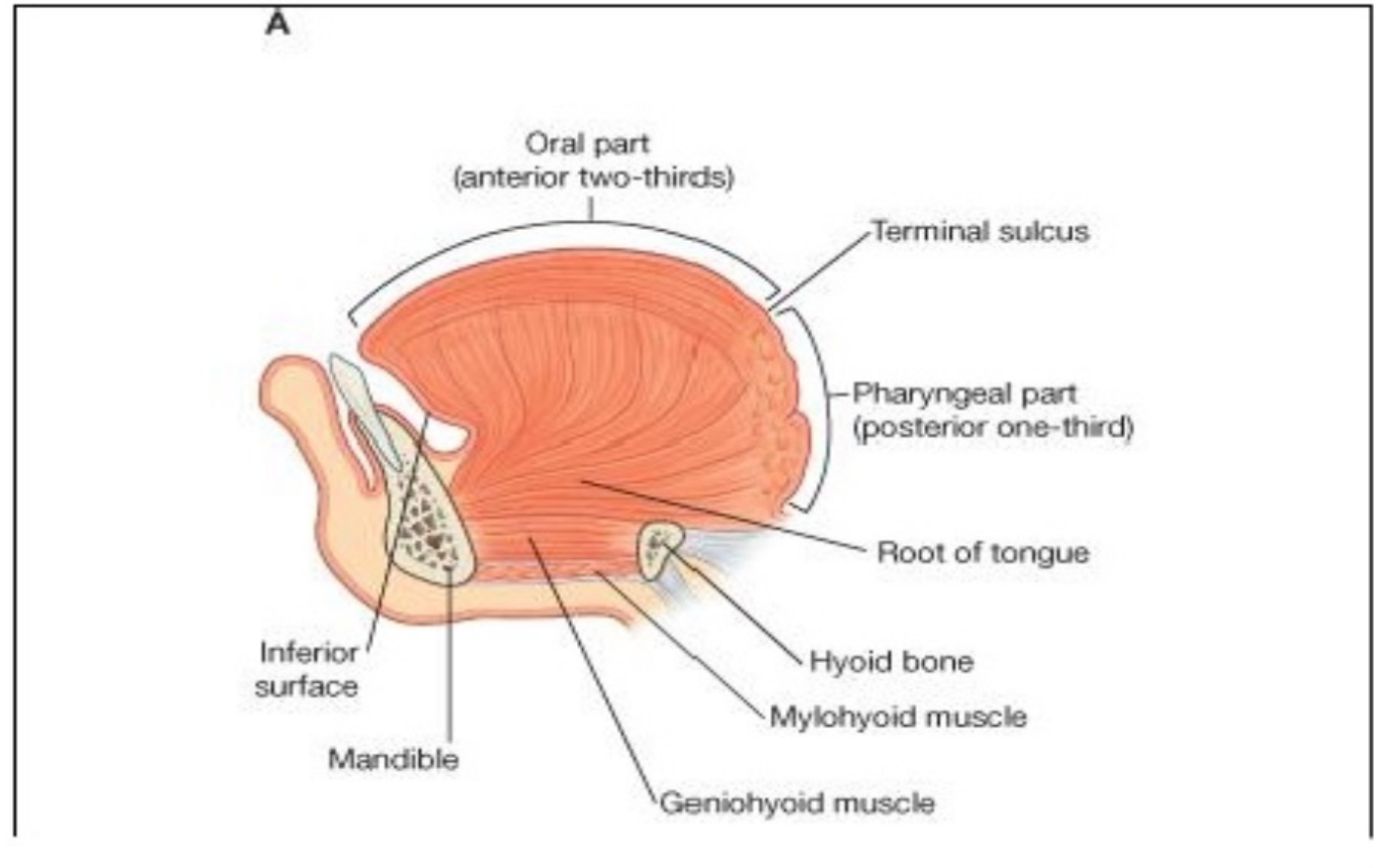


Pharyngeal surface of the tongue

Mucosa covering the pharyngeal

surface of the tongue is irregular in contour because of the many small nodules of lymphoid tissue in the submucosa. These nodules are collectively called the **LINGUAL TONSIL**.

NB: There are no papillae on the pharyngeal surface.



Arterial supply of the tongue

Artery

Lingual artery is the major artery to the tongue

It originates from the external carotid artery in the neck adjacent to the tip of the greater horn of the hyoid bone.

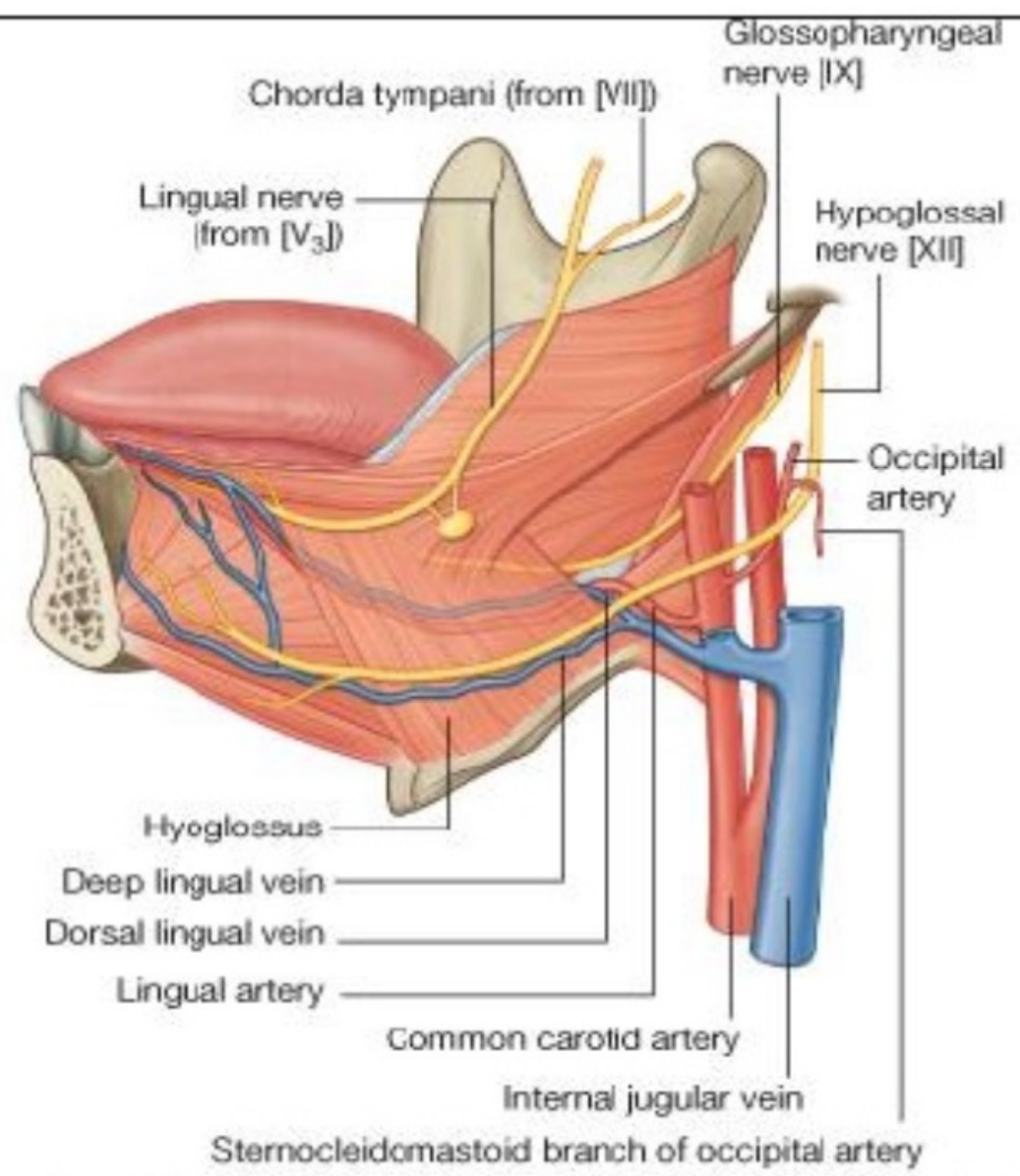
In addition to the tongue, the lingual artery supplies the sublingual gland, gingiva, and oral mucosa in the floor of the oral cavity.

Venous drainage of the tongue

Dorsal and **Deep** lingual veins.

The **deep lingual veins** are visible through the mucosa on the undersurface of the tongue. Although they accompany the lingual arteries in anterior parts of the tongue, they become separated from the arteries posteriorly by the hyoglossus muscles.

It joins the internal jugular vein in the neck.



Innervation of the tongue

Innervation of the tongue is complex and involves a number of nerves.

Glossopharyngeal nerve [IX]

Taste (SA) and general sensation from the pharyngeal part of the tongue are carried by the glossopharyngeal nerve [IX].

Lingual nerve

General sensory innervation from the anterior two-thirds or oral part of the tongue is carried by the **lingual nerve**

Facial nerve [VII]

Taste (SA) from the oral part of the tongue is carried into the central nervous system by the facial nerve [VII]

Hypoglossal nerve [XII]

All muscles of the tongue are innervated by the hypoglossal nerve [XII] except for the palatoglossus muscle, which is innervated by the vagus nerve [X].

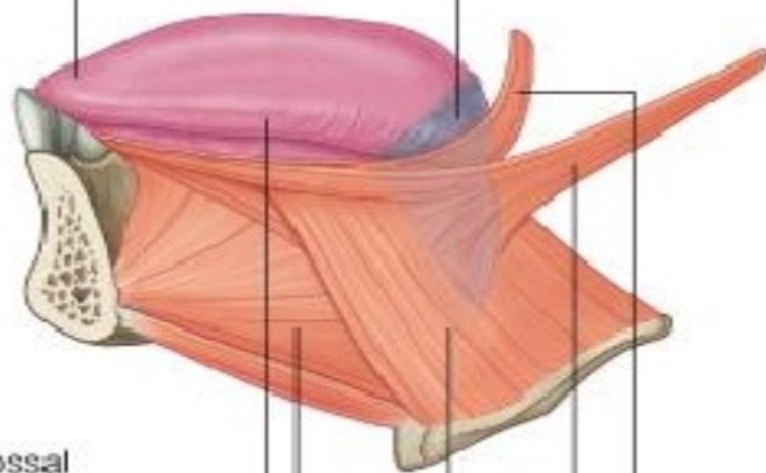
Sensory

Anterior two-thirds (oral)

- general sensation
mandibular nerve [V₃]
via lingual nerve
- special sensation (taste)
facial nerve [VII] via
chorda tympani

Posterior one-third (pharyngeal)

- general and special
(taste) sensation
glossopharyngeal nerve [IX]



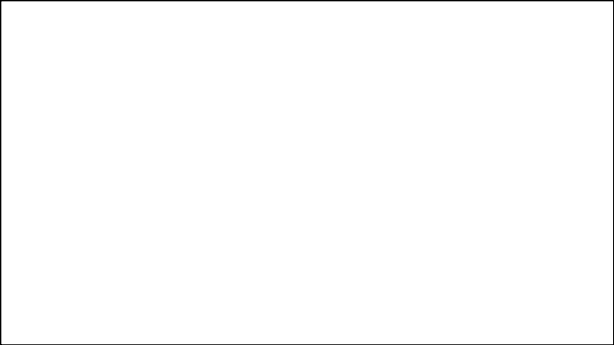
Motor

Hypoglossal
nerve [XII]

Intrinsic muscle
Genioglossus
Hyoglossus
Styloglossus

Palatoglossus – vagus nerve [X]

Muscles	Origin	Insertions	Innervation	Function
Intrinsic				
Superior longitudinal (just deep to surface of tongue)	Submucosal connective tissue at the back of the tongue and from the median septum of the tongue	Muscle fibers pass forward and obliquely to submucosal connective tissue and mucosa on margins of tongue	Hypoglossal nerve [XII]	Shortens tongue; curls apex and sides of tongue
Inferior longitudinal (between genioglossus and hyoglossus muscles)	Root of tongue (some fibers from hyoid)	Apex of tongue	Hypoglossal nerve [XII]	Shortens tongue; uncurls apex and turns it downward
Transverse	Median septum of the tongue	Submucosal connective tissue on lateral margins of tongue	Hypoglossal nerve [XII]	Narrows and elongates tongue
Vertical	Submucosal connective tissue on dorsum of tongue	Connective tissue in more ventral regions of tongue	Hypoglossal nerve [XII]	Flattens and widens tongue
Extrinsic				
Genioglossus	Superior mental tubercles	Body of hyoid; entire length of tongue	Hypoglossal nerve [XII]	Protrudes tongue; depresses center of tongue
Hyoglossus	Greater horn and adjacent part of body of hyoid bone	Lateral surface of tongue	Hypoglossal nerve [XII]	Depresses tongue
Styloglossus	Styloid process (anterolateral surface)	Lateral surface of tongue	Hypoglossal nerve [XII]	Elevates and retracts tongue
Palatoglossus	Inferior surface of palatine aponeurosis	Lateral margin of tongue	Vagus nerve [X] (via pharyngeal branch to pharyngeal plexus)	Depresses palate; moves palatoglossal fold toward midline; elevates back of the tongue

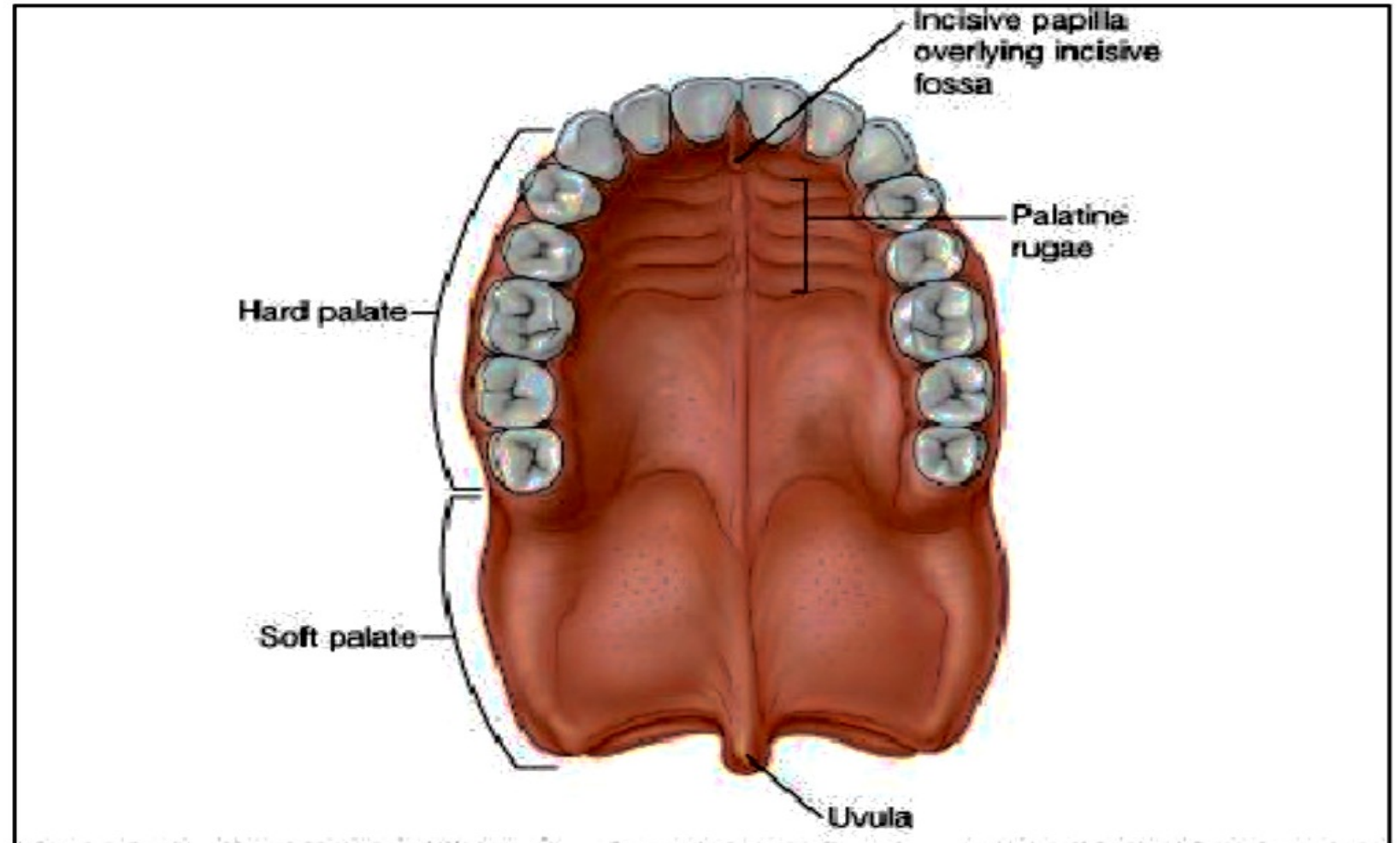


Roof of Oral Cavity

Roof-palate

The roof of the oral cavity consists of the palate, which has two parts:

- anterior hard palate
- posterior soft palate



Hard Palate

Separates the oral cavity from the nasal cavities.

It consists of a bony plate covered above and below by mucosa:

- above, it is covered by respiratory mucosa and forms the floor of the nasal cavities;
- below, it is covered by a tightly bound layer of oral mucosa and forms much of the roof of the oral cavity.

The palatine processes of the maxillae form the anterior three-quarters of the hard palate.

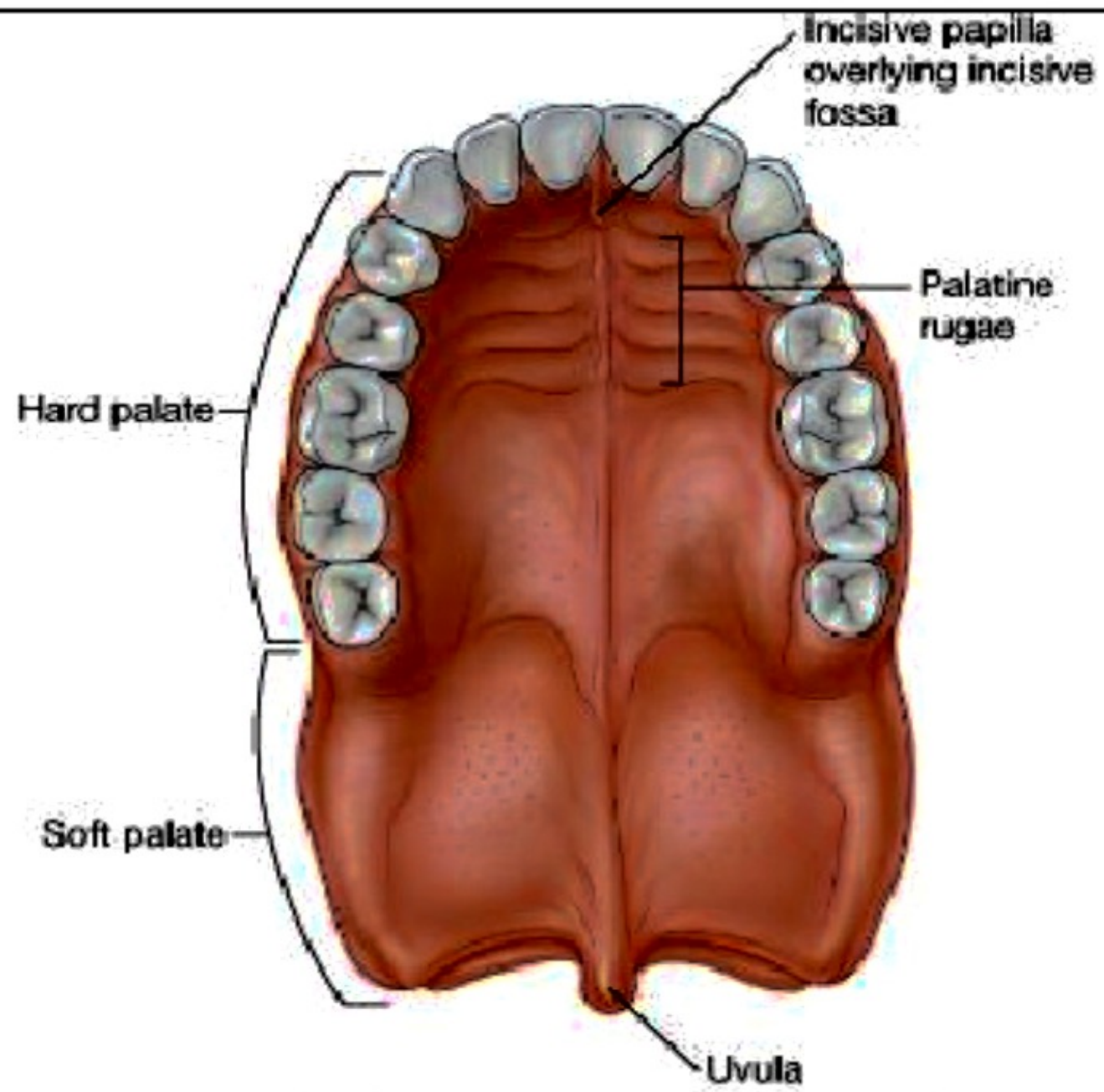
The horizontal plates of the palatine bones form the posterior one-quarter.

In the oral cavity, the upper alveolar arch borders the hard palate anteriorly and laterally.

Posteriorly, the hard palate is continuous with the soft palate.

The mucosa of the hard palate in the oral cavity possesses numerous **transverse palatine folds (palatine rugae)** and a median longitudinal ridge (**palatine raphe**), which ends anteriorly in a small oval elevation (**incisive papilla**).

The incisive papilla overlies the incisive fossa formed between the horizontal plates of the maxillae immediately behind the incisor teeth.



Soft Palate

Continues posteriorly from the hard palate and acts as a valve that can be:

- depressed to help close the oropharyngeal isthmus;
- elevated to separate the nasopharynx from the oropharynx.

The soft palate is formed and moved by four muscles and is covered by mucosa that is continuous with the mucosa lining the pharynx and oral and nasal cavities.

The small tear-shaped muscular projection that hangs from the posterior free margin of the soft palate is the **uvula**.

Muscles of the soft palate

Muscles	Origin	Insertions	Innervation	Function
Tensor veli palatini	Scaphoid fossa of sphenoid bone; fibrous part of pharyngotympanic tube; spine of sphenoid	Palatine aponeurosis	Mandibular nerve [V ³] via the branch to medial pterygoid muscle	enses the soft palate; opens the pharyngotympanic tube
Levator veli palatini	Petrous part of temporal bone anterior to opening for carotid canal	Superior surface of palatine aponeurosis	Vagus nerve [X] via pharyngeal branch to pharyngeal plexus	Only muscle to elevate the soft palate above the neutral position
Palatopharyngeus	Superior surface of palatine aponeurosis	Pharyngeal wall	Vagus nerve [X] via pharyngeal branch to pharyngeal plexus	Depresses soft palate; moves palatopharyngeal arch toward midline; elevates pharynx
Palatoglossus	Inferior surface of palatine aponeurosis	Lateral margin of tongue	Vagus nerve [X] via pharyngeal branch to pharyngeal plexus	Depresses palate; moves palatoglossal arch toward midline; elevates back of the tongue
Musculus uvulae	Posterior nasal spine of hard palate	Connective tissue of uvula	Vagus nerve [X] via pharyngeal branch to pharyngeal plexus	Elevates and retracts uvula; thickens central region of soft palate

Innervation of oral cavity

General sensory innervation is carried predominantly by branches of the trigeminal nerve [V]:

- the upper parts of the cavity, including the palate and the upper teeth, are innervated by branches of the **maxillary nerve [V₂]**;
- the lower parts, including the teeth and oral part of the tongue, are innervated by branches of the **mandibular nerve [V₃]**;

- Taste sensation from the oral part of anterior two-third of the tongue is carried by branches of facial nerve [VII] which are joined and distributed with branches of trigeminal nerve [V]

•Parasympathetic fibers to the glands within the oral cavity are also carried by branches of the **facial nerve [VII]**, which are distributed with branches of the **trigeminal nerve [V]**;

•**Sympathetic fibers** in the oral cavity ultimately come from spinal cord level T1, synapse in the superior cervical sympathetic ganglion, and are eventually distributed to the oral cavity along branches of the **trigeminal nerve [V]** or directly along blood vessels.

- All muscles of the tongue are innervated by the ***HYPOGLOSSAL NERVE* [XII]**,
- Except the ***PALATOGLOSSUS muscle***; **vagus nerve [X]**.
- Muscles of the soft palate are innervated by the **vagus nerve [X]**
- Except for the tensor veli palatini; branch from the **mandibular nerve [V₃]**.
- The muscle, mylohyoid, that forms the floor of the oral cavity is also innervated by
the **mandibular nerve [V₃]**.

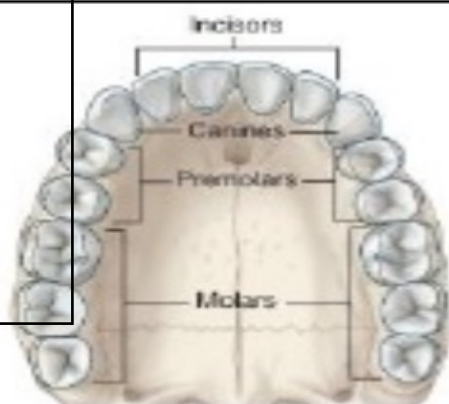
Teeth

They are attached to sockets or alveoli in two elevated arches of bone;

- **mandible below** and
- **maxillae above** (alveolar arches).

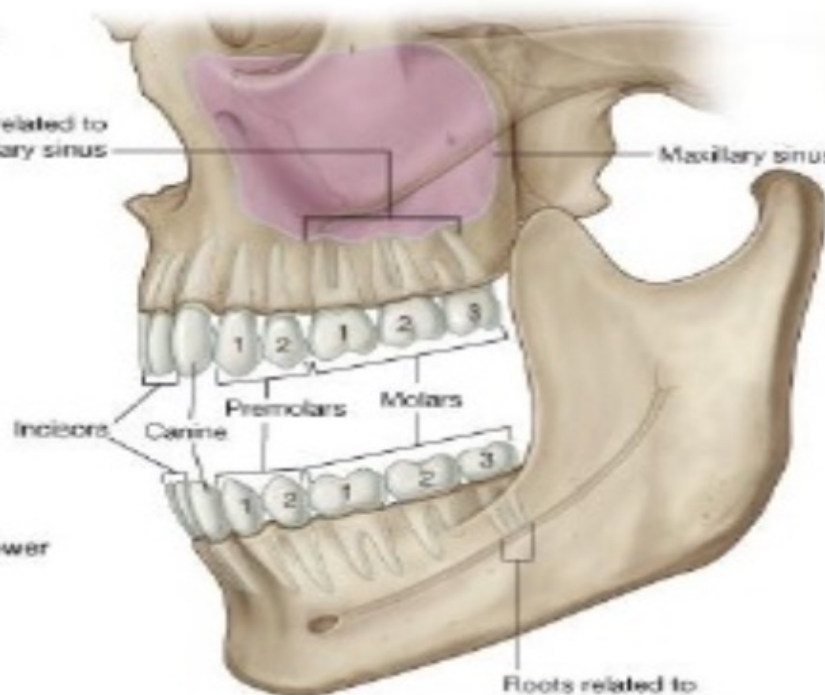
If the teeth are removed, the alveolar bone is resorbed and the arches disappear.

The **gingivae** or **gums** are specialized regions of the oral mucosa that surround the teeth and cover adjacent regions of the alveolar bone. The different types of teeth are distinguished on the basis of **morphology, position, and function**.

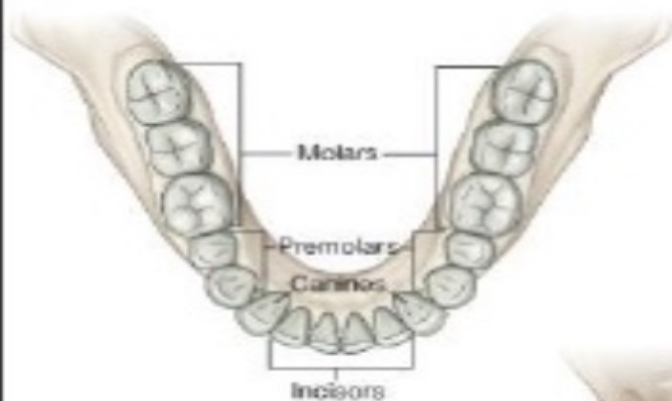
A**Upper**

Roots related to maxillary sinus

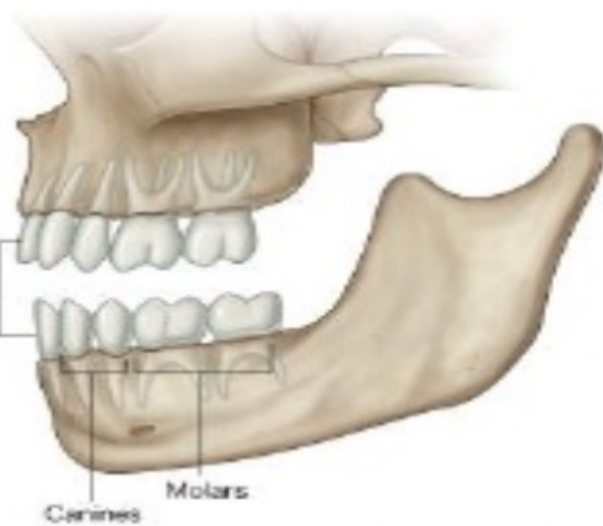
Maxillary sinus

**Lower**

Roots related to mandibular canal

**Upper****B**

Incisors

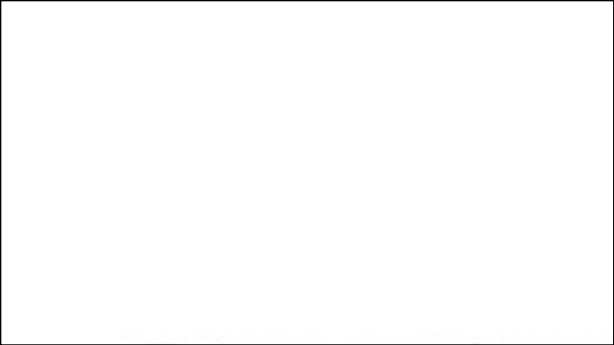
Lower

▪the **incisor teeth** are the 'front teeth' and have one root and a chisel-shaped crown, they are used for cutting;

▪the **canine teeth** are posterior to the incisors, they are the longest teeth, have a crown with a single pointed cusp, and they are for grasping.

▪the **premolar teeth** (bicuspid) have a crown with two pointed cusps, one on the buccal (cheek) side of the tooth and the other on the lingual (tongue) or palatal (palate) side. Generally they have one root (but the upper first premolar next to the canine may have two), and they are for grinding;

▪the **molar teeth** are behind the premolar teeth, they have three roots and crowns with three to five cusps, and they are for grinding.



Two successive sets of teeth develop in humans, deciduous teeth (baby teeth) and permanent teeth (adult teeth). The deciduous teeth emerge from the gingivae at between six months and two years of age.

Permanent teeth begin to emerge and replace the deciduous teeth at around age six years, and can continue to emerge into adulthood.

Arterial supply of teeth

All teeth are supplied by vessels that branch either directly or indirectly from the maxillary artery.

Inferior alveolar artery: All lower teeth are supplied by the **inferior alveolar artery**, which originates from the maxillary artery in the infratemporal fossa and divides opposite the first premolar into **incisor** and **mental branches**. The mental branch leaves the mental foramen to supply the chin, while the incisor branch continues in bone to supply the anterior teeth and adjacent structures.

Anterior and posterior superior alveolar arteries

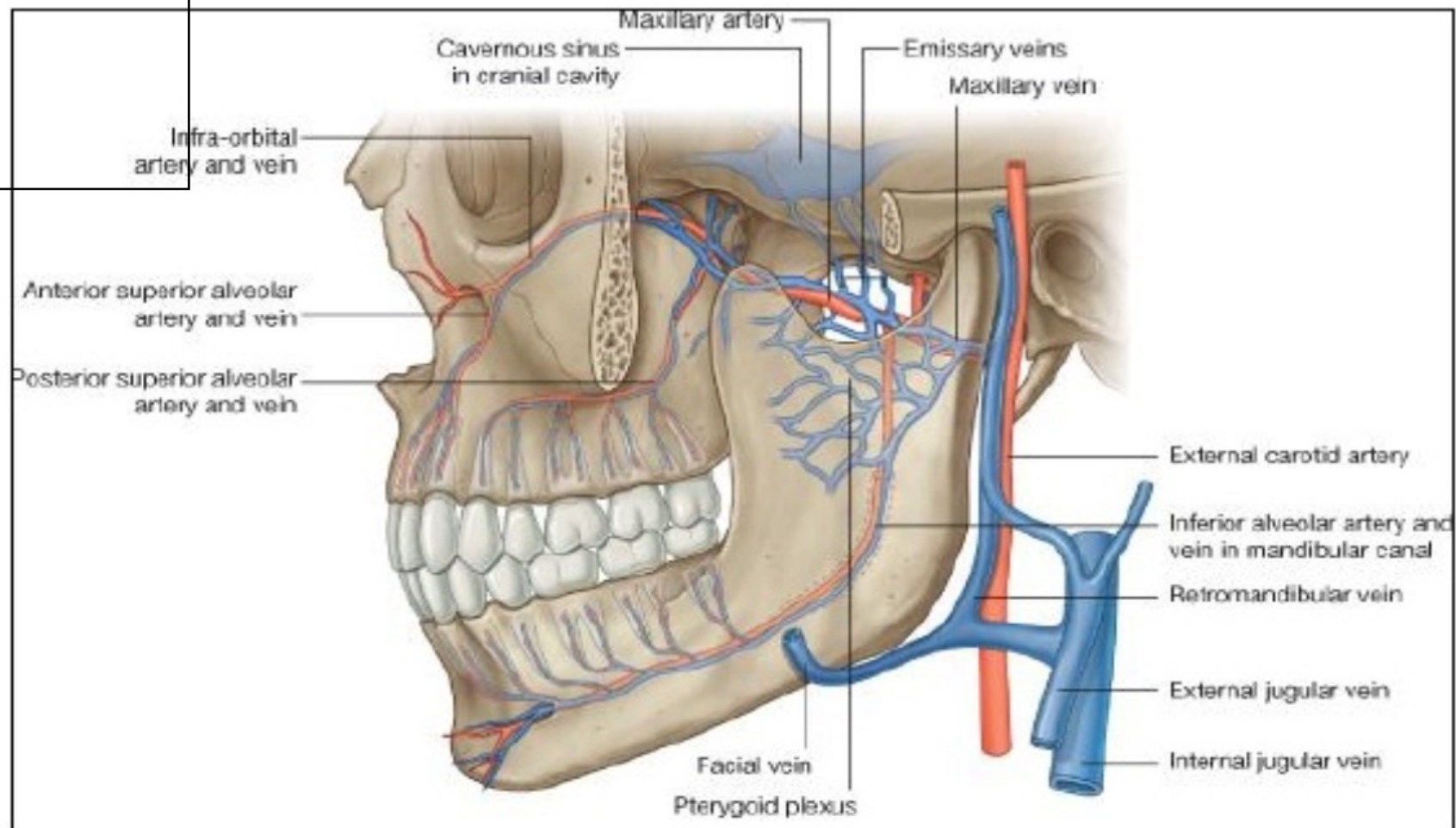
All upper teeth are supplied by anterior and posterior superior alveolar arteries.

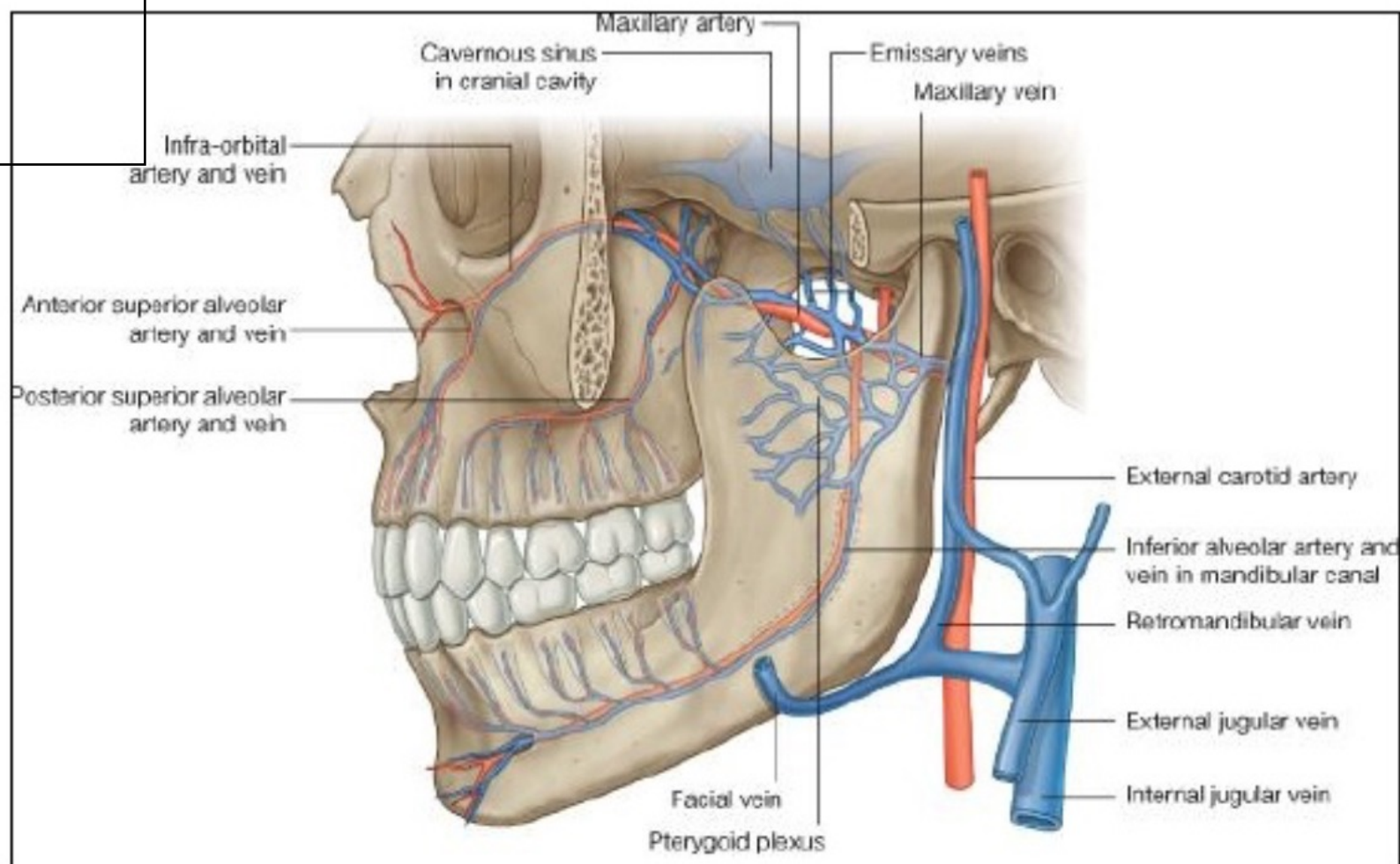
Venous drainage of teeth

Veins from the upper and lower teeth generally follow the arteries .

Inferior alveolar veins from the lower teeth, and **superior alveolar veins** from the upper teeth drain mainly into the **pterygoid plexus of veins** in the infratemporal fossa, although some drainage from the anterior teeth may be via tributaries of the facial vein.

The **pterygoid plexus** drains mainly into the maxillary vein and ultimately into the **retromandibular vein** and jugular system of veins. In addition, small communicating vessels pass superiorly, from the plexus, and pass through small emissary foramina in the base of the skull to connect with the cavernous sinus in the cranial cavity. *Infection originating in the teeth can track into the cranial cavity through these small emissary veins.* Venous drainage from the teeth can also be via vessels that pass through the mental foramen to connect with the facial vein.





Innervation of the teeth

All nerves that innervate the teeth are branches of the trigeminal nerve [V].

Inferior alveolar nerve: The lower teeth are all innervated by branches from the inferior alveolar nerve, which originates in the infratemporal fossa from the mandibular nerve [V₃]. Branches to the back teeth originate directly from the inferior alveolar nerve. Adjacent to the first premolar tooth, the inferior alveolar nerve divides into incisive and mental branches:

- the **incisive branch** innervates the first premolar, the canine, and the incisor teeth, together with the associated vestibular (buccal) gingiva;
- the **mental nerve** exits the mandible through the mental foramen and innervates the chin and lower lip.

Anterior, middle, and posterior superior alveolar nerves: All upper teeth are innervated by the anterior, middle, and posterior superior alveolar nerves, which originate directly or indirectly from the maxillary nerve [V₂].

