Tongue

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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.
- The tongue's very powerful muscular body make possible its motor functions in **mastication, swallowing, and speaking**.
- Its specialized mucosal coat covering the dorsum of the tongue make possible its equally important sensory functions (including **taste** and **fine tactile discrimination**).

Surface anatomy of the lingual mucosa - Superior view

The parts of the tongue are the root - is attached to the mandible and the hyoid bone, the apex - is directed anteriorly and sits immediately behind the incisor teeth and the body.

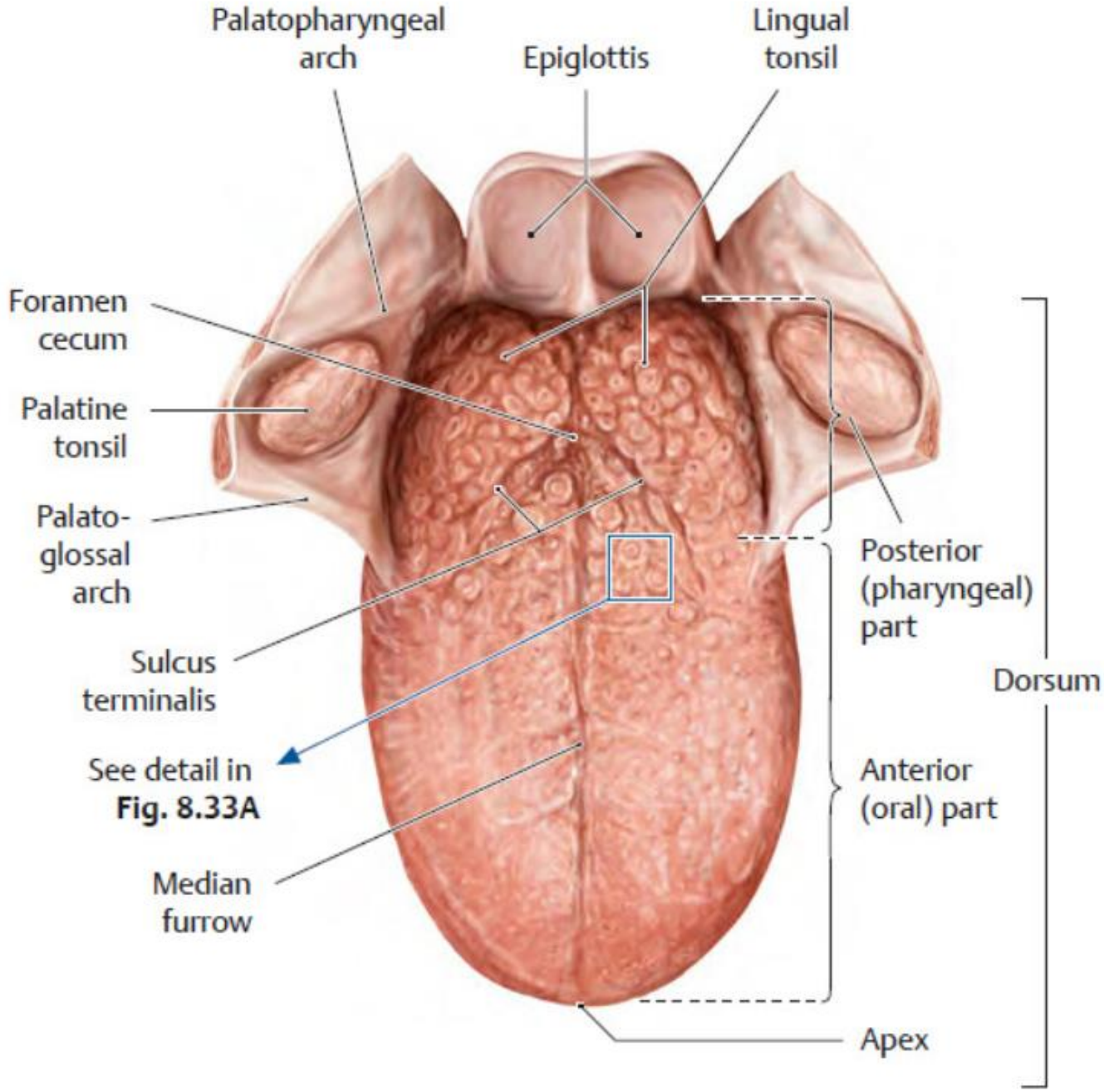
The tongue has the ventral (inferior) surface, and the dorsal (superior) surface.

The V shaped furrow on the dorsum (sulcus terminalis) divides the dorsal surface functionally and anatomically into an oral portion (comprising the anterior two thirds) and a pharyngeal portion (comprising the posterior one third).

Median furrow (midline septum): The furrow running anteriorly down the midline of the tongue; this corresponds to the position of the lingual septum. *Note:* Muscle fibers do not cross the lingual septum.

Foramen cecum: The embryonic remnant of the passage of the thyroid gland that migrates from the dorsum of the tongue during development. The foramen cecum is located at the convergence of the sulci terminalis. In some people a thyroglossal duct persists and connects the foramen cecum on the tongue with the thyroid gland in the neck.

Lingual tonsils: The submucosa of the posterior portion contains embedded lymph nodes known as the lingual tonsils, which create the uneven surface of the posterior portion.



Regions of the tongue

Anterior (oral, presulcal) portion of the tongue: The anterior ⅔ of the tongue contains the apex and the majority of the dorsum. It is attached to the oral floor by the lingual frenulum.

Mucosa:

- **Dorsal lingual mucosa:** This portion (with no underlying submucosa) contains numerous papillae.
- **Ventral mucosa:** Covered with the same smooth (nonkeratinized, stratified squamous epithelial) mucosa that lines the oral floor and gingiva.

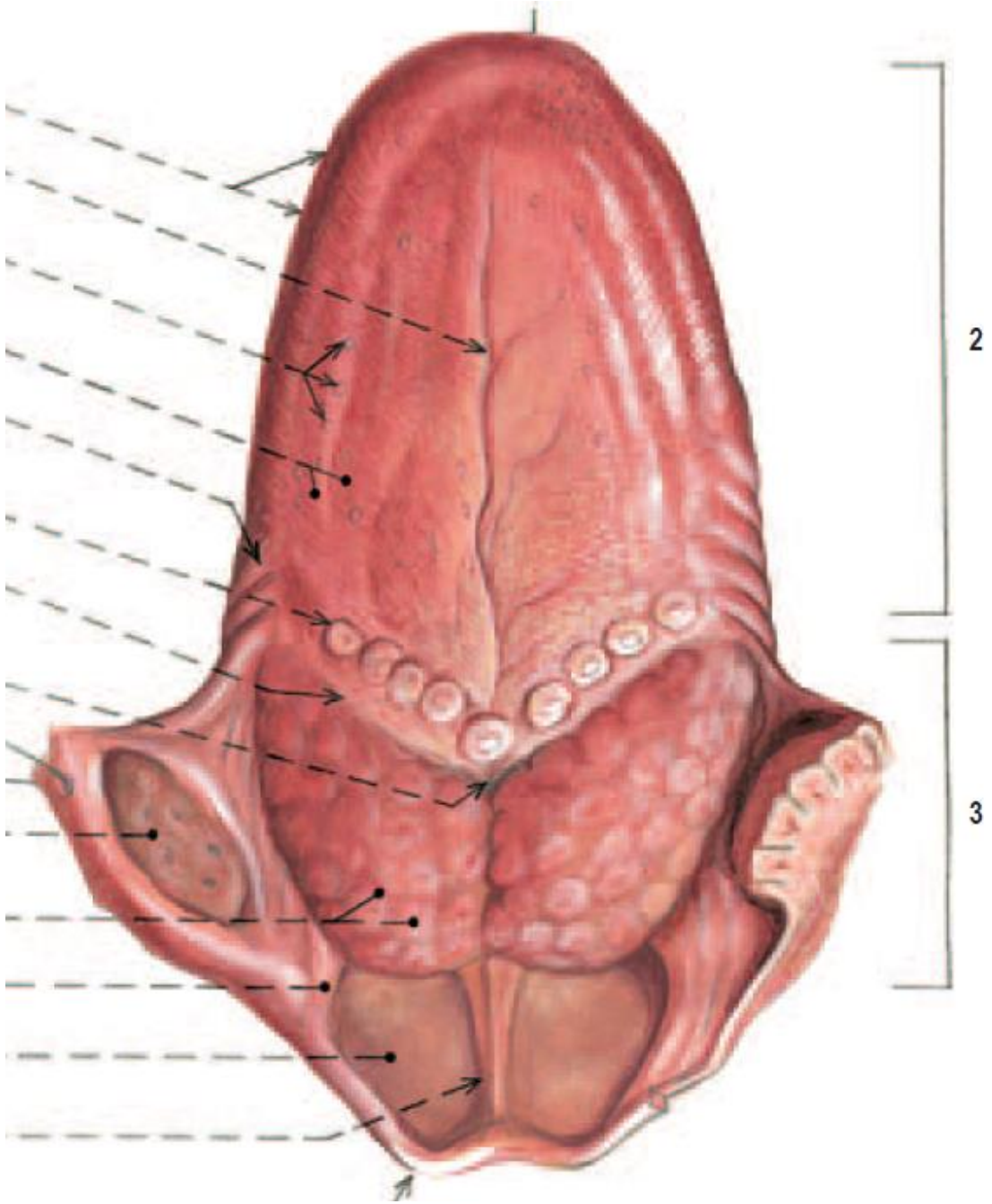
Innervation: The anterior portion is derived from the first (pharyngeal) arch and is therefore innervated by the lingual nerve, a branch of the mandibular nerve (CN V_3).

Posterior (pharyngeal, postsulcal) portion of the tongue: The base (root) of the tongue is located posterior to the sulcus terminalis.

Mucosa: The same mucosa that lines the palatine tonsils, pharyngeal walls, and epiglottis. The pharyngeal portion of the tongue does not contain papillae.

Innervation: The posterior portion is innervated by the glossopharyngeal nerve (CN IX). A small midline area at the root of the tongue is innervated by the vagus nerve (CN X).

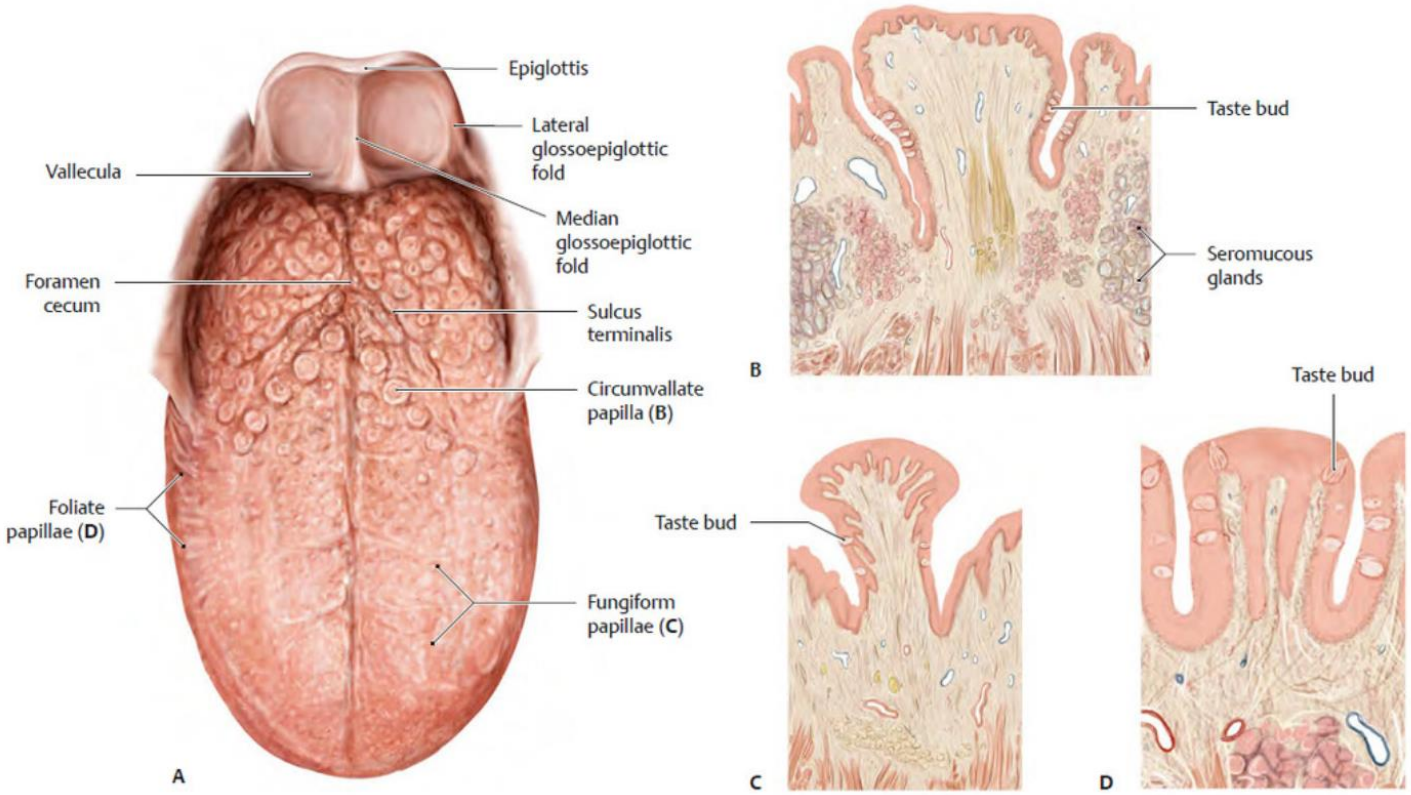
Glossoepiglottic folds and epiglottic valleculae: The (nonkeratinized, stratified squamous) mucosal covering of the posterior tongue and pharyngeal walls is reflected onto the anterior aspect of the epiglottis, forming one median and two lateral glossoepiglottic folds. The median glossoepiglottic fold is flanked by two depressions, the epiglottic valleculae.



Papillae of the tongue

The dorsal mucosa, which has **no submucosa**, is covered with nipplelike projections (papillae) that increase the surface area of the tongue and participate in mastication by increasing friction of the contact area between tongue and food particles. There are four types, all of which occur in the presulcal but not postsulcal portion of the tongue.

- **Circumvallate (B):** Encircled by a wall and containing abundant taste buds.
- **Fungiform (C):** Mushroom shaped papillae located on the lateral margin of the posterior oral portion near the palatoglossal arches. These have mechanical receptors, thermal receptors, and taste buds.
- **Filiform:** Thread shaped papillae that are sensitive to tactile stimuli. These are the only papillae that do not contain taste buds and are the papillae with keratinized epithelium.
- **Foliate (D):** Located near the sulcus terminalis, these contain numerous taste buds.



Papillae of the tongue

The mucosa of the **anterior dorsum** is composed of numerous papillae (A) and the connective tissue between the mucosal surface and musculature, which contains many small salivary glands. The papillae are divided into four morphologically distinct types:

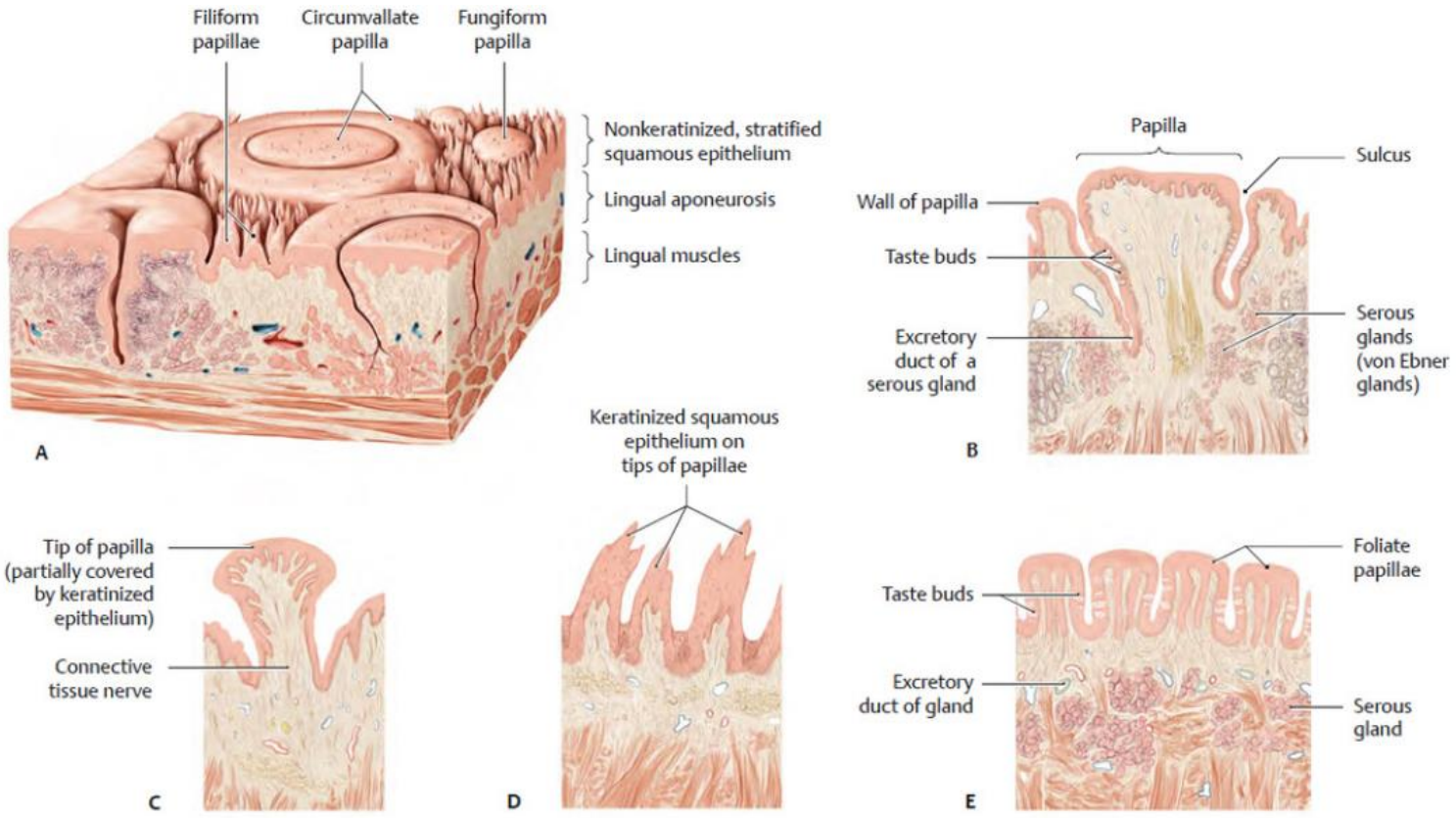
Circumvallate (B): Encircled and containing taste buds. There are only about 8 to 12 vallate papillae located immediately anterior to the terminal sulcus of the tongue.

Fungiform (C): Mushroom-shaped and containing mechanical and thermal receptors and taste buds. Tend to be concentrated along the margins of the tongue.

Filiform (D): small cone-shaped projections of the mucosa and they are sensitive to tactile stimuli (the only lingual papillae without taste buds).

Foliate (E): Containing taste buds. Located on the sides of the tongue near the terminal sulcus of tongue.

The surrounding serous glands of the tongue **(Von Ebner glands),** which are most closely associated with circumvallate papilla, constantly wash the taste buds clean to allow for new tasting.

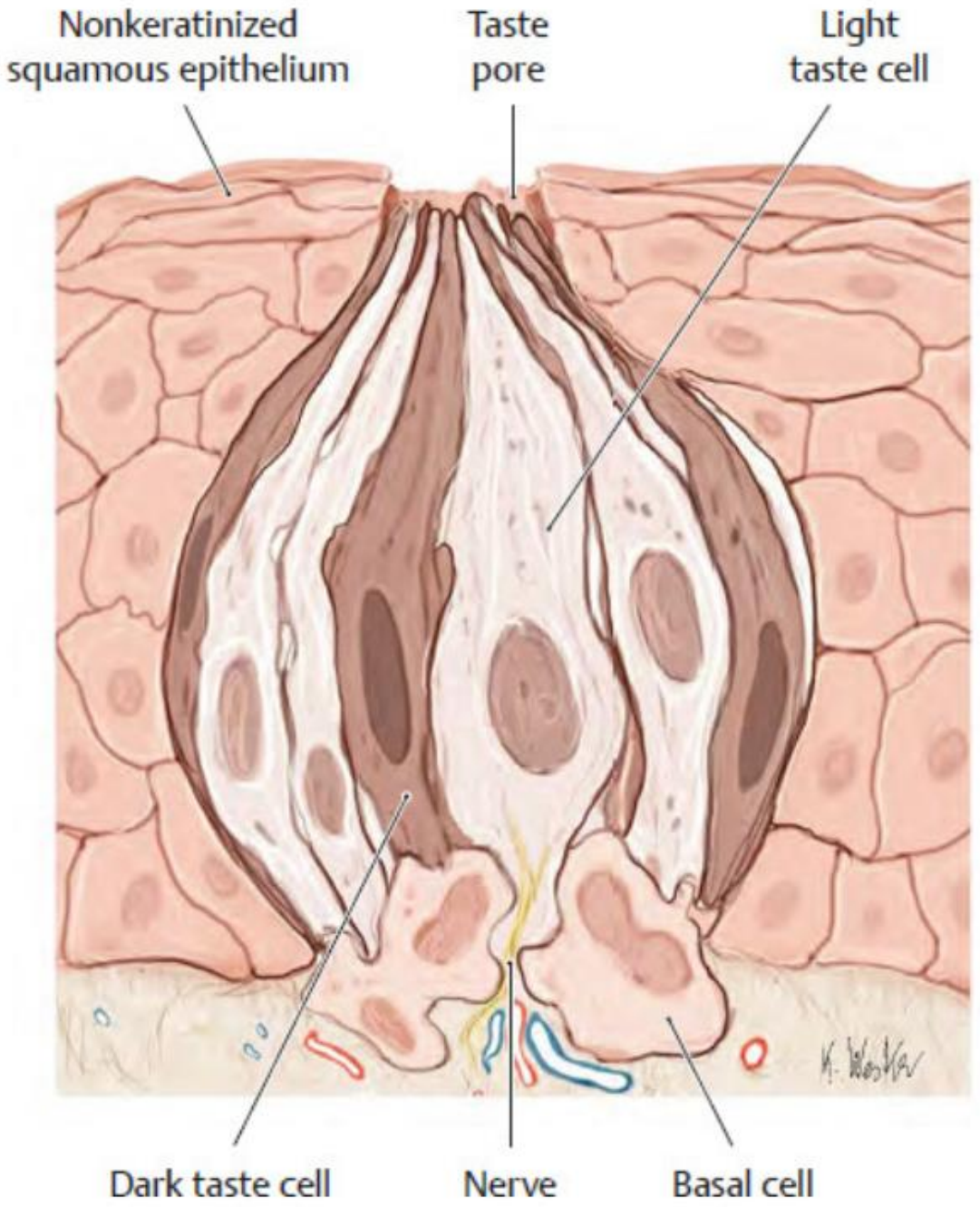


Taste buds

The human tongue contains approximately 4600 taste buds, in which the secondary sensory cells for taste perception are collected. The taste buds are embedded in the epithelium of the lingual mucosa and its surface expansions - **the circumvallate papillae (principal site), the fungiform papillae, and the foliate papillae.** Additionally, isolated taste buds are located in the mucous membranes of the **soft palate and pharynx!**. Humans can perceive five basic taste qualities: sweet, sour, salty, bitter, and umami - is activated by glutamate (a taste enhancer).

The taste cells have a life span of approximately 12 days and regenerate from cells at the base of the taste buds, which differentiate into new taste cells.

Note: The old notion that particular areas of the tongue are sensitive to specific taste qualities has been found to be false.

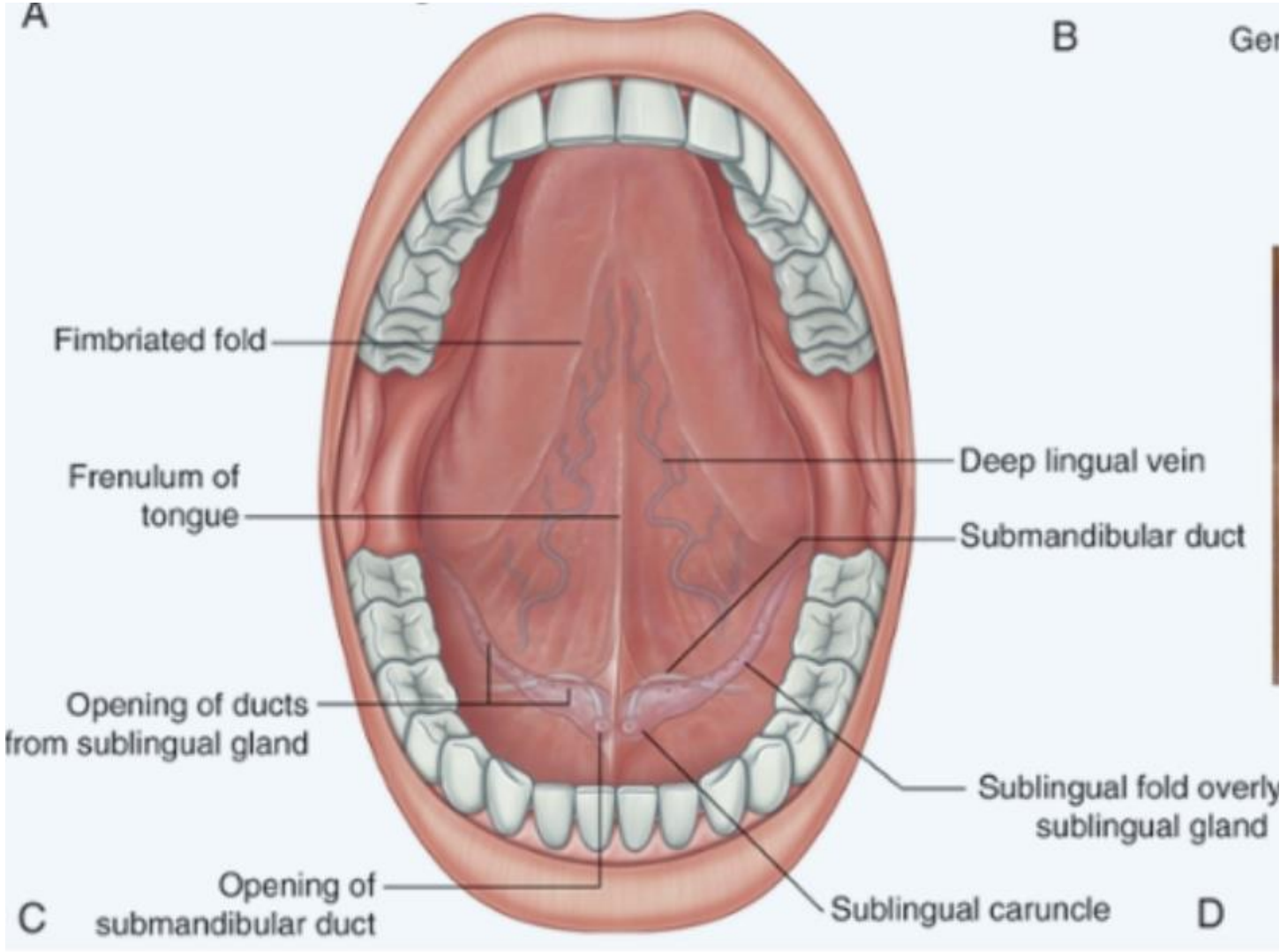


Inferior surface of tongue

The undersurface 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 the 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 **deep lingual vein**, and lateral to each vein is a rough **fimbriated fold.**



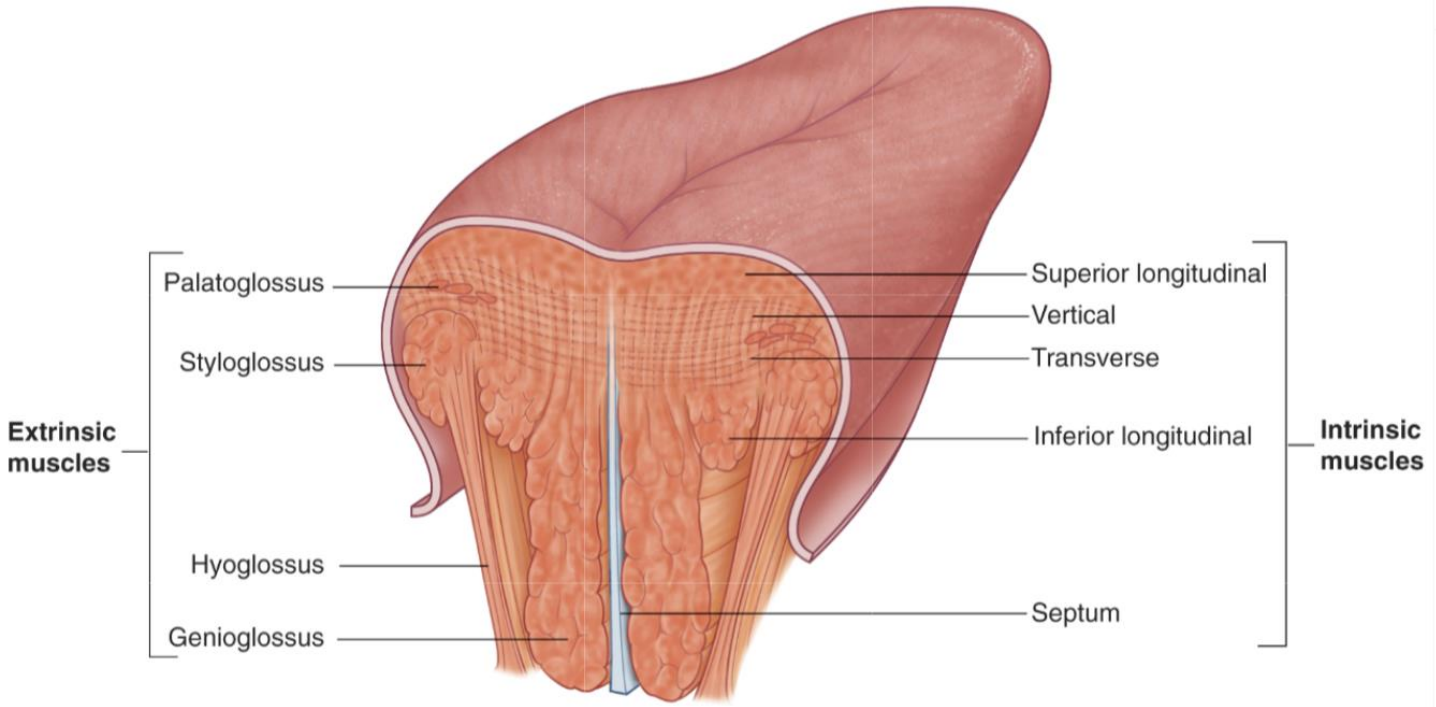
Muscles of the tongue

The bulk of the tongue is composed of muscle.

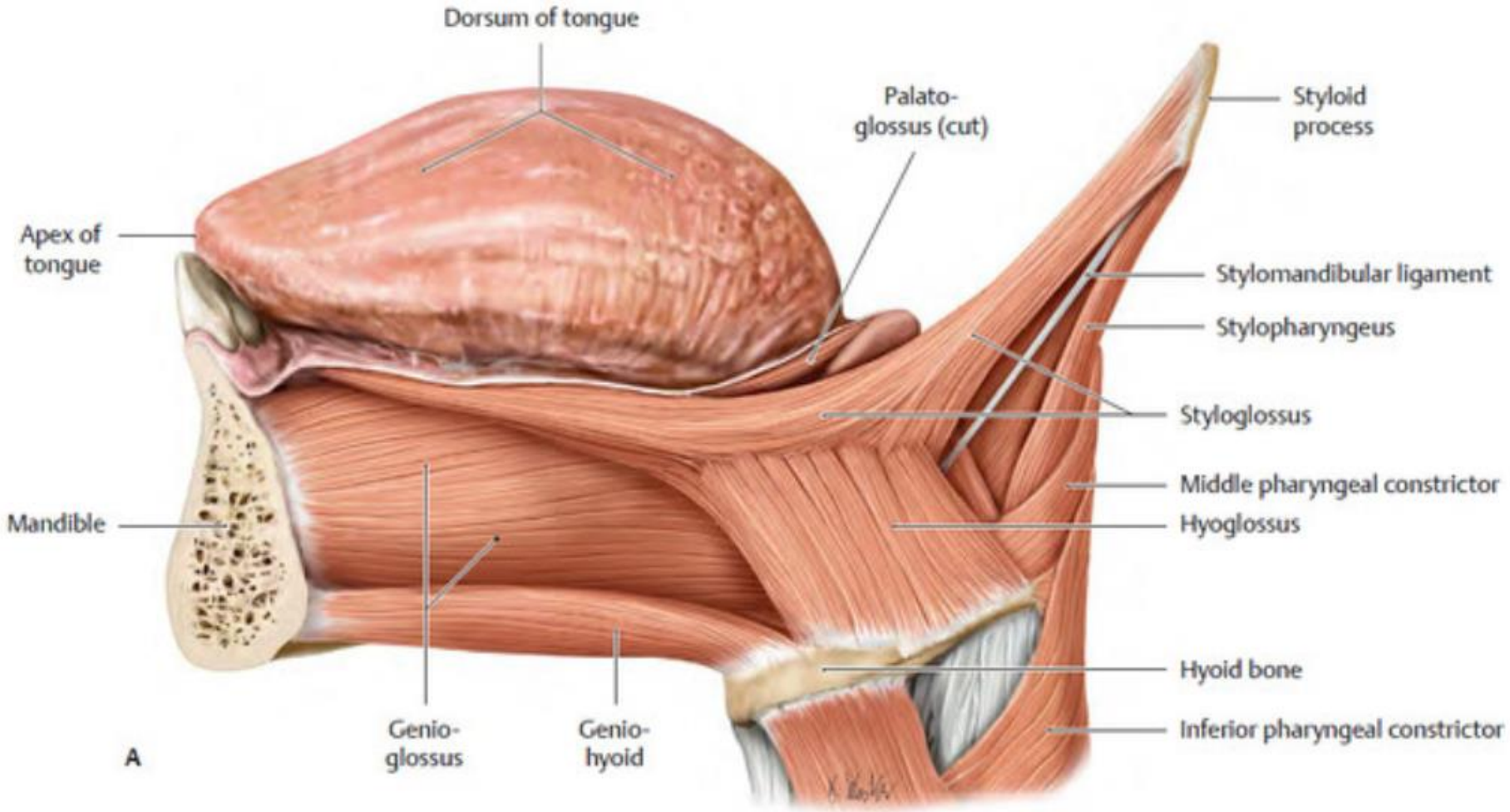
The tongue is completely divided into left and right halves by a **median sagittal septum** composed of connective tissue. This means that all muscles of the tongue are paired.

The **lingual aponeurosis** is the thickened lamina propria of the dorsum of the tongue and is a sheetlike fibrous membrane for the lingual muscles attachment.

There are **intrinsic (intraglossal) and extrinsic (extraglossal)** lingual muscles.



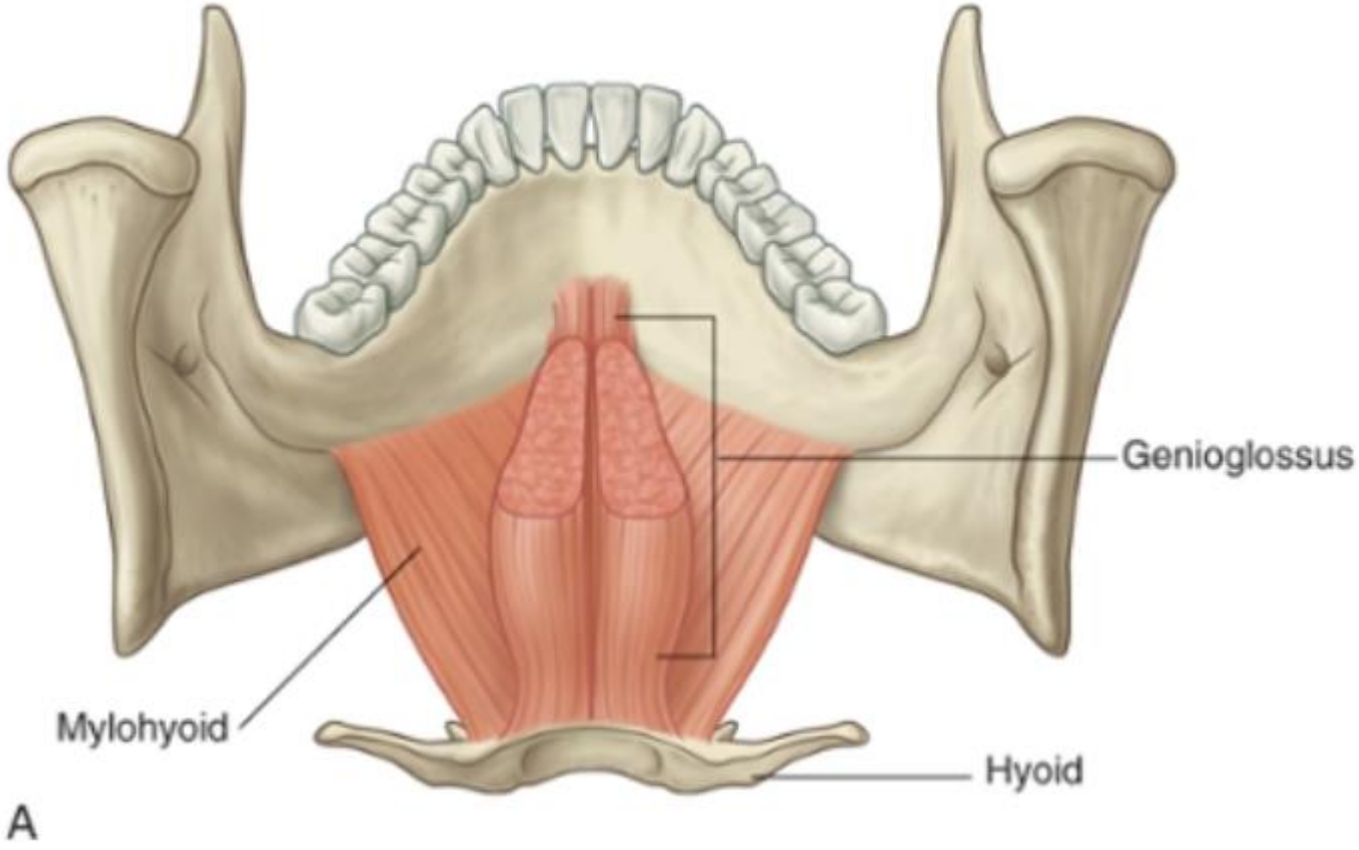
The extrinsic muscles, which are attached to specific bony sites outside the tongue, **move the tongue as a whole.**

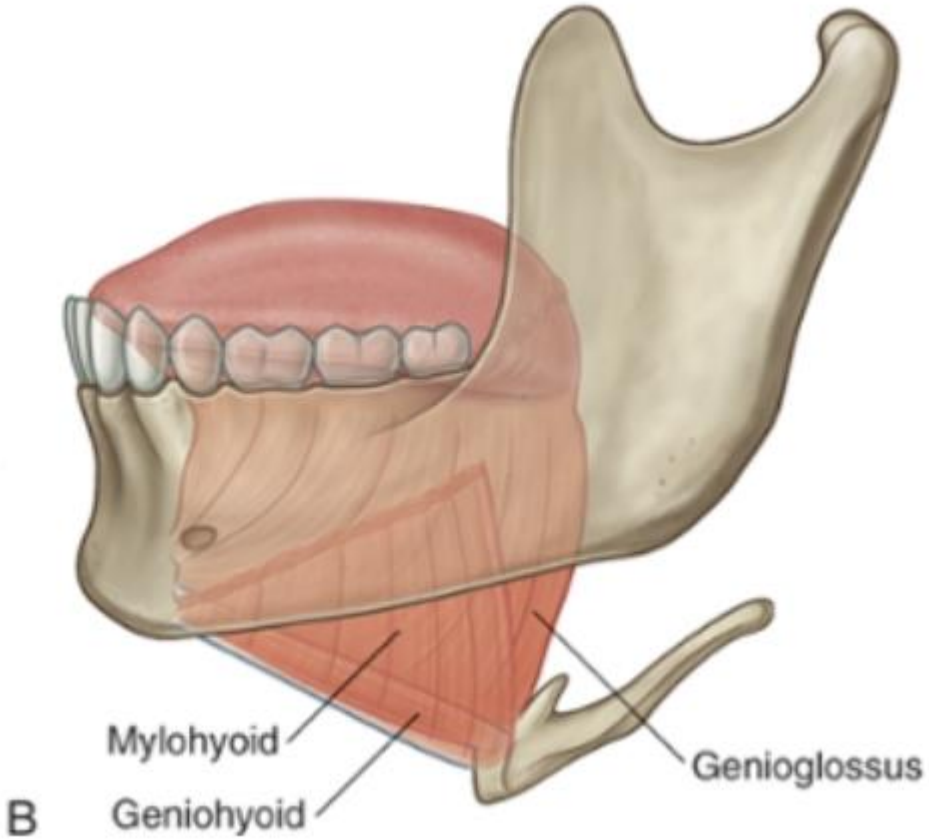


Muscle	Origin	Insertion	Innervation	Action
Extrinsic lingual muscles				
Genioglossus	Mandible (superior genial [mental] spine via an intermediate tendon); more posteriorly the two genioglossi are separated by the lingual septum	Inferior fibers: Hyoid body (anterosuperior surface)	**Hypoglossal n. (CN XII)**	Protrusion of the tongue *Bilaterally:* Makes dorsum concave *Unilaterally:* Deviation to opposite side
		Intermediate fibers: Posterior tongue		
		Superior fibers: Ventral surface of tongue (mix with intrinsic muscles)		
Hyoglossus	Hyoid bone (greater horn and anterior body)	Lateral tongue, between styloglossus and inferior longitudinal muscle		Depresses the tongue
Styloglossus	Styloid process of temporal bone (anterolateral aspect of apex) and stylomandibular ligament	Longitudinal part: Dorsolateral tongue (mix with inferior longitudinal muscle)		Elevates and retracts the tongue
		Oblique part: Mix with fibers of the hyoglossus		
Palatoglossus	Palatine aponeurosis (oral surface)	Lateral tongue to dorsum and fibers of the transverse muscle	**Vagus n. (CN X) via the pharyngeal plexus**	Elevates the root of the tongue; closes the oropharyngeal isthmus by contracting the palatoglossal arch

Genioglossus

Asking a patient to “stick your tongue out” can be used as a test for the hypoglossal nerves [XII]. If the nerves are functioning **normally,** the tongue should protrude evenly **in the midline**. If the nerve on one side is **not fully functional**, the tip of the tongue will point **to that side.**

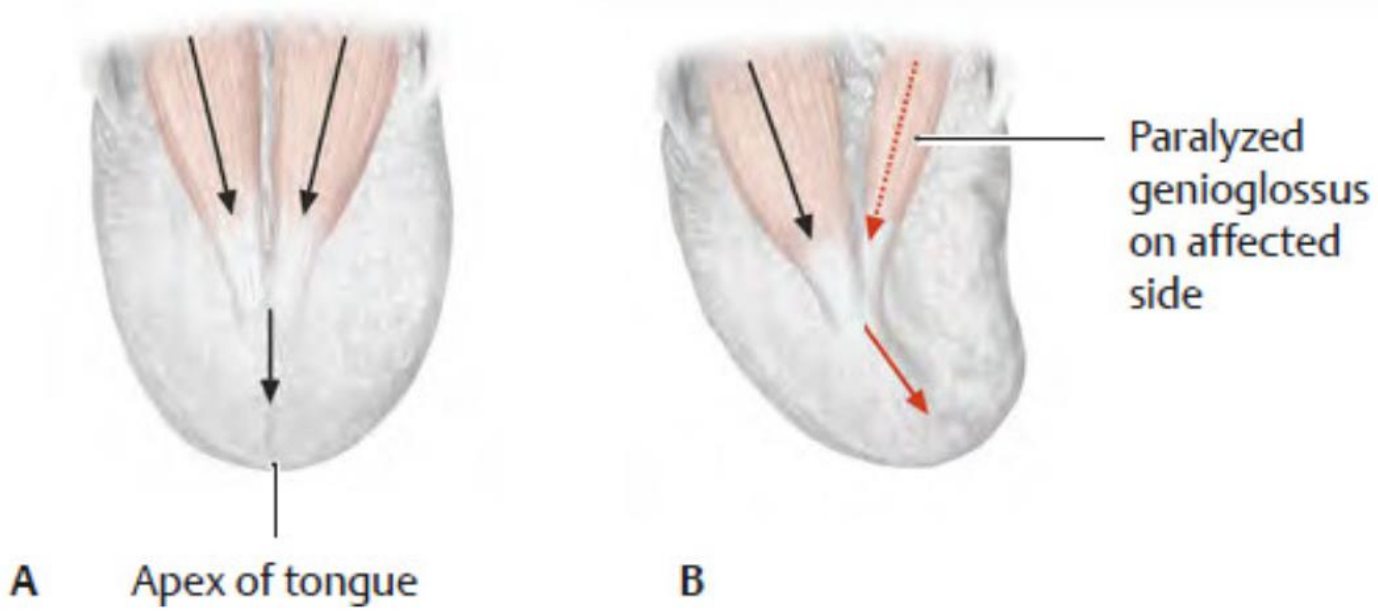




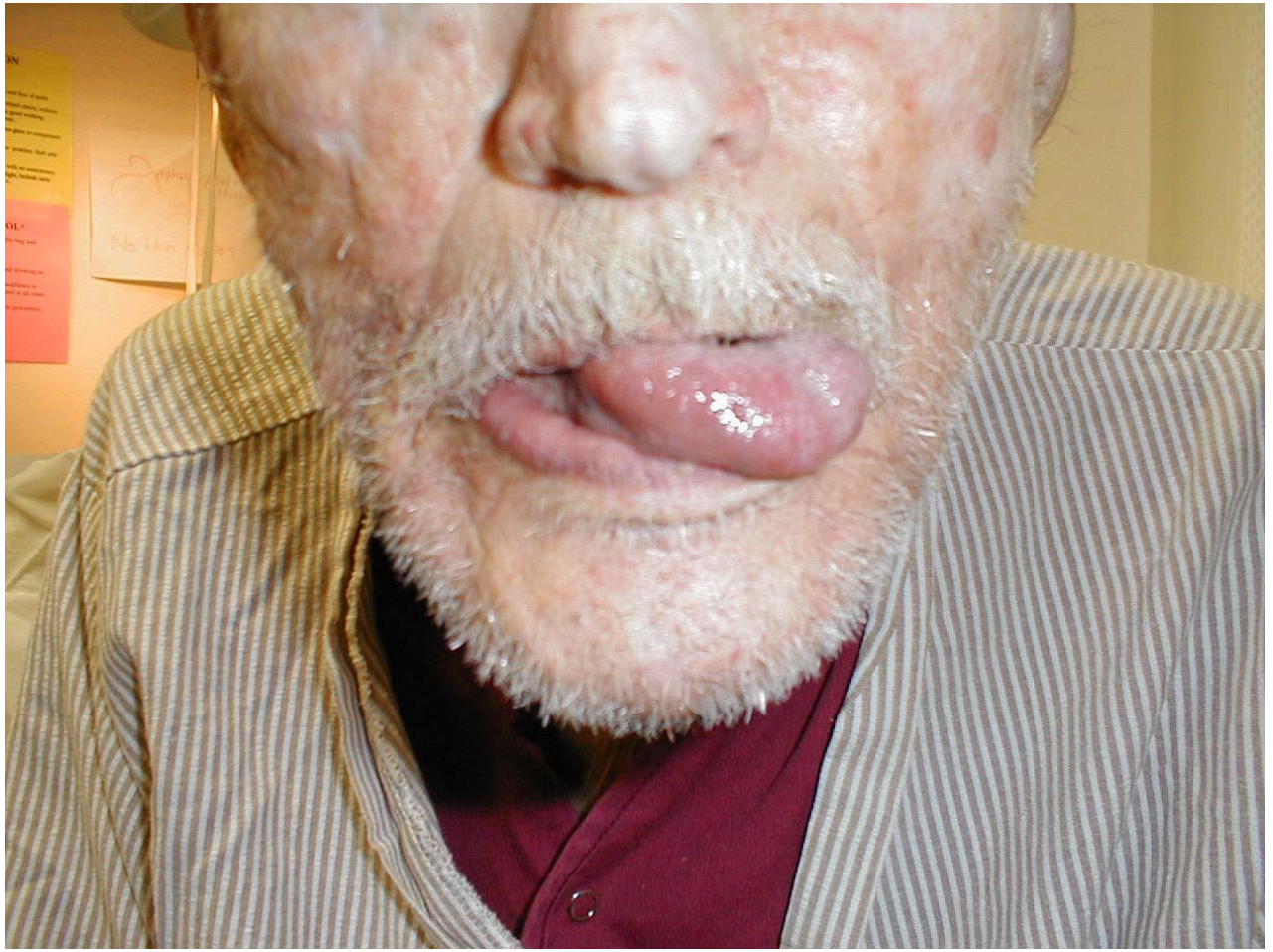
Unilateral hypoglossal nerve palsy

Active protrusion of the tongue with an intact hypoglossal nerve (**A**) and with a unilateral hypoglossal nerve lesion (**B**).

When the hypoglossal nerve is damaged on one side, the genioglossus muscle is paralyzed on the affected side. As a result, the healthy (innervated) genioglossus on the opposite side dominates the tongue across the midline toward the affected side. When the tongue is protruded, therefore, **it deviates *toward* the paralyzed side.**

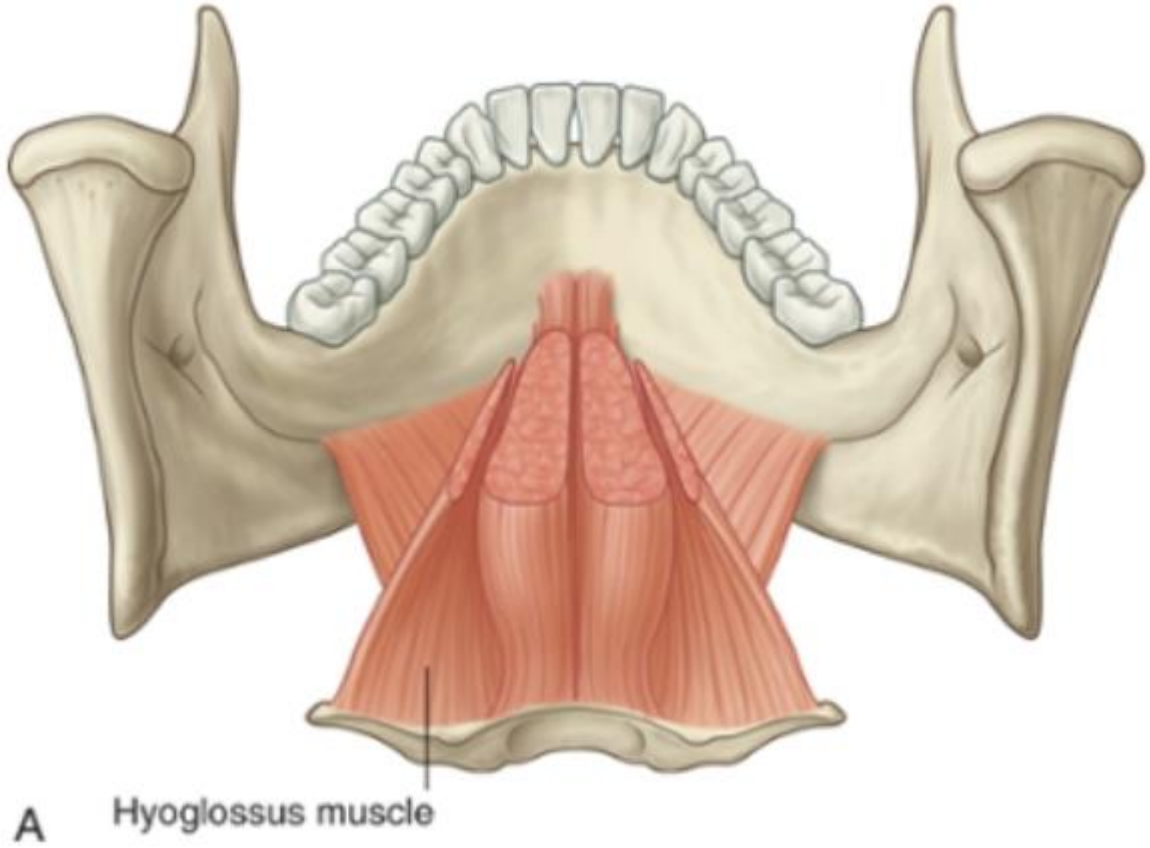


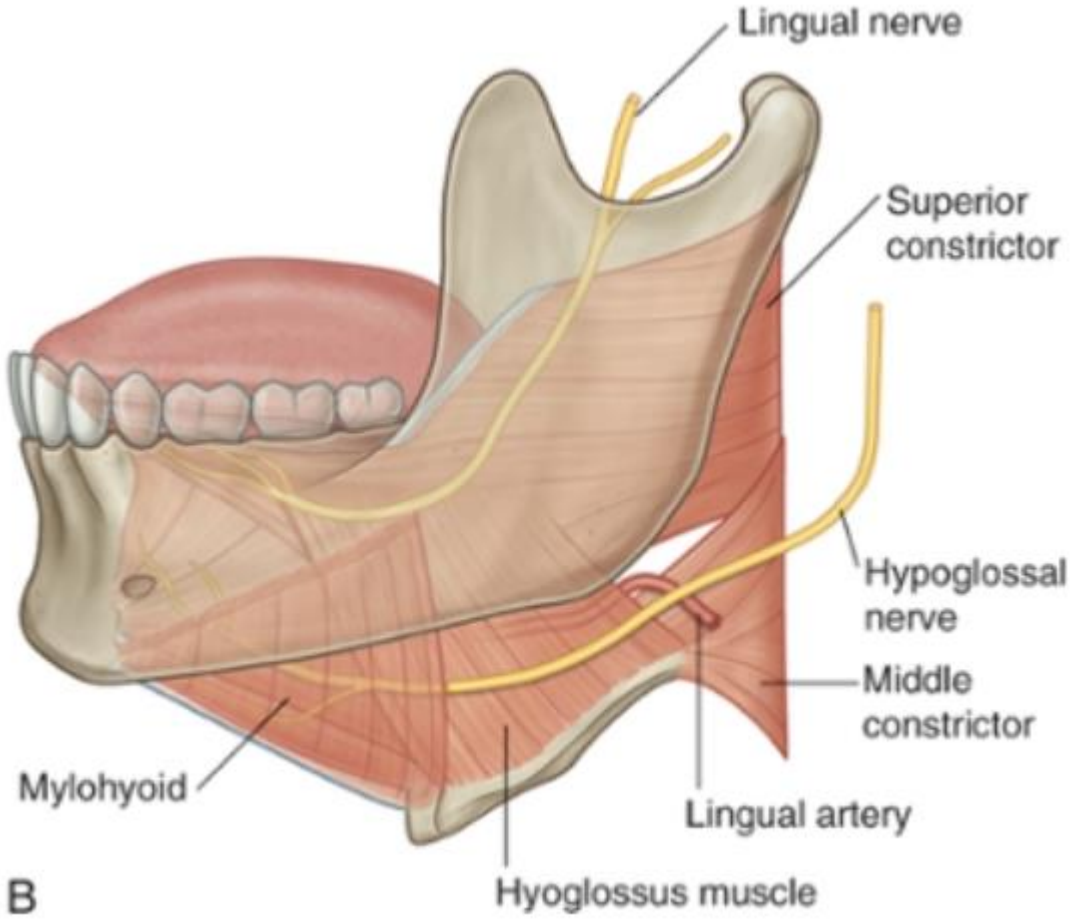
Lower motor neuron lesion to the CN.XII or its nucleus cause paralysis on the ipsilateral side: tongue deviates to the paralyzed side on protrusion, musculator atrophies and tongue fasciculation on the paralyzed side.
Upper motor neuron lesion(motor cortex): causes paralysis of the contralateral side- deviate and atrophise on side opposite the lesion



Hyoglossus

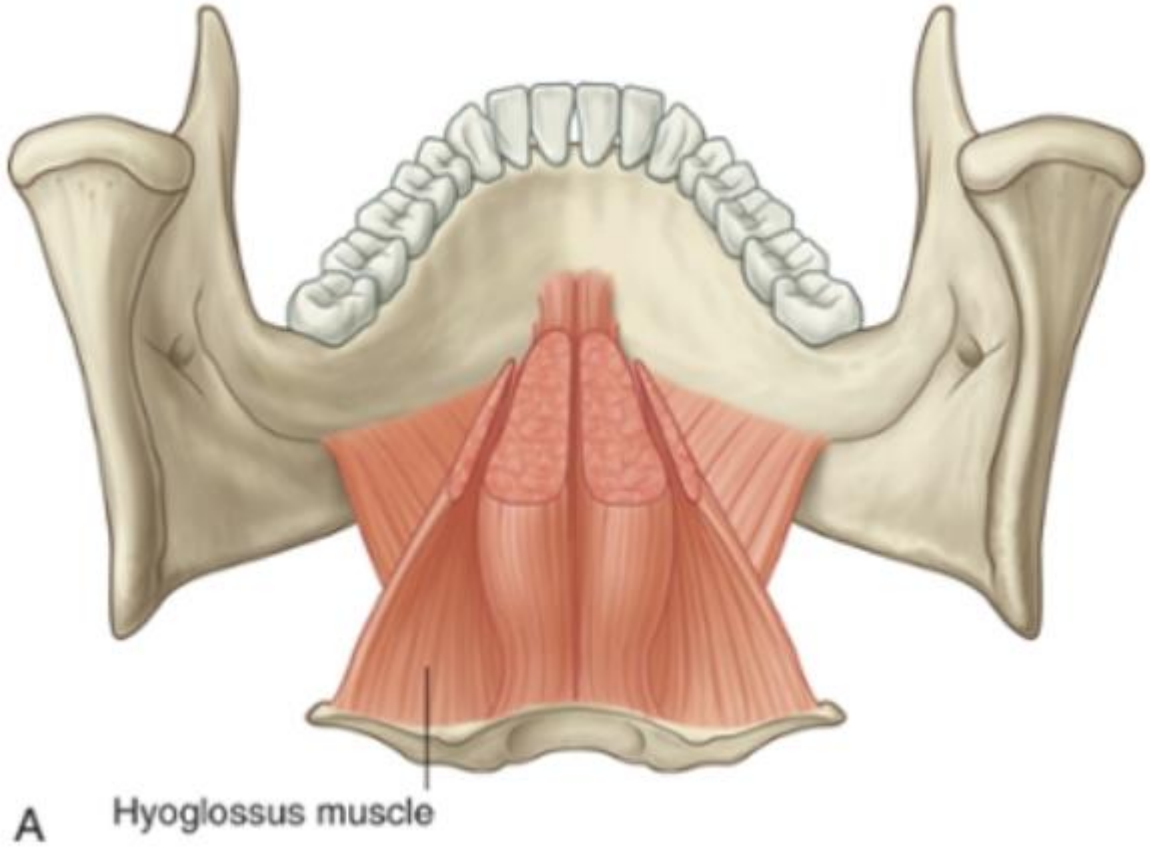
Are thin quadrangular muscles pass through the gap (oropharyngeal triangle) lateral to the genioglossus muscle and medial to the styloglossus.

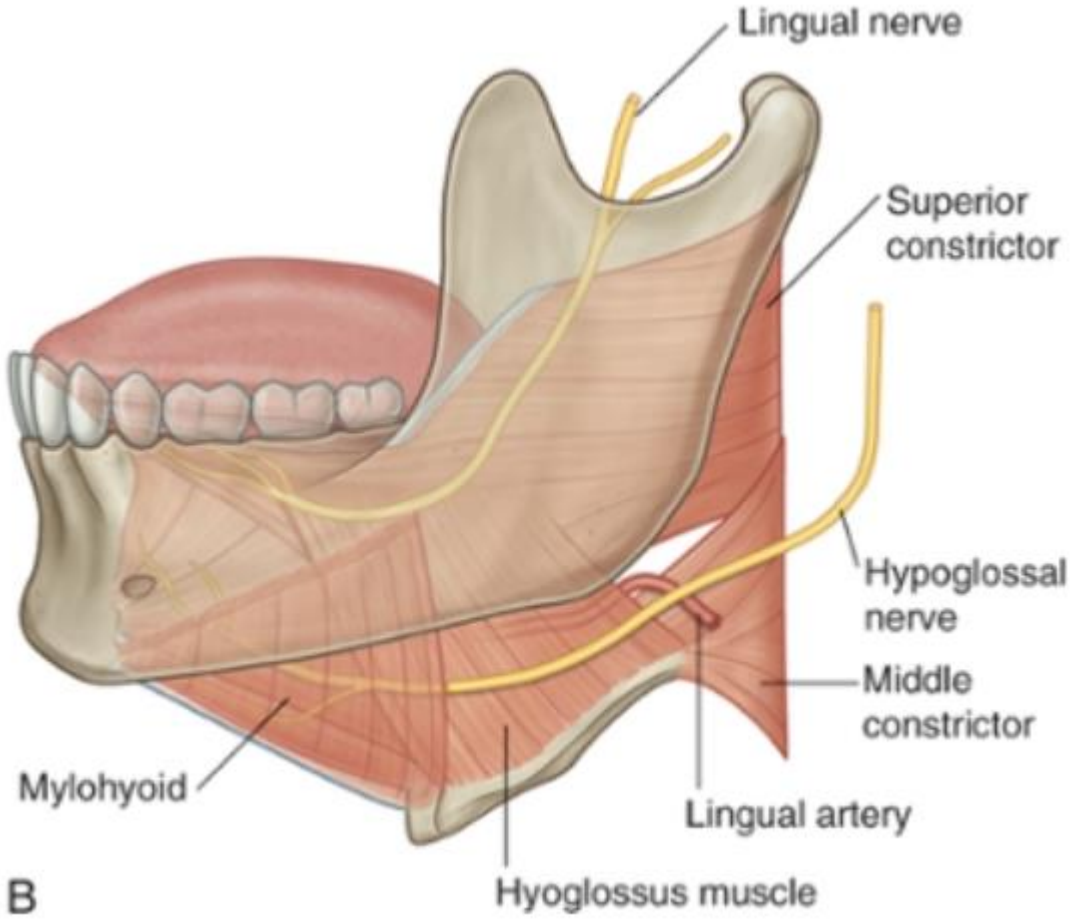




The hyoglossus muscle is an important landmark in the floor of the oral cavity:

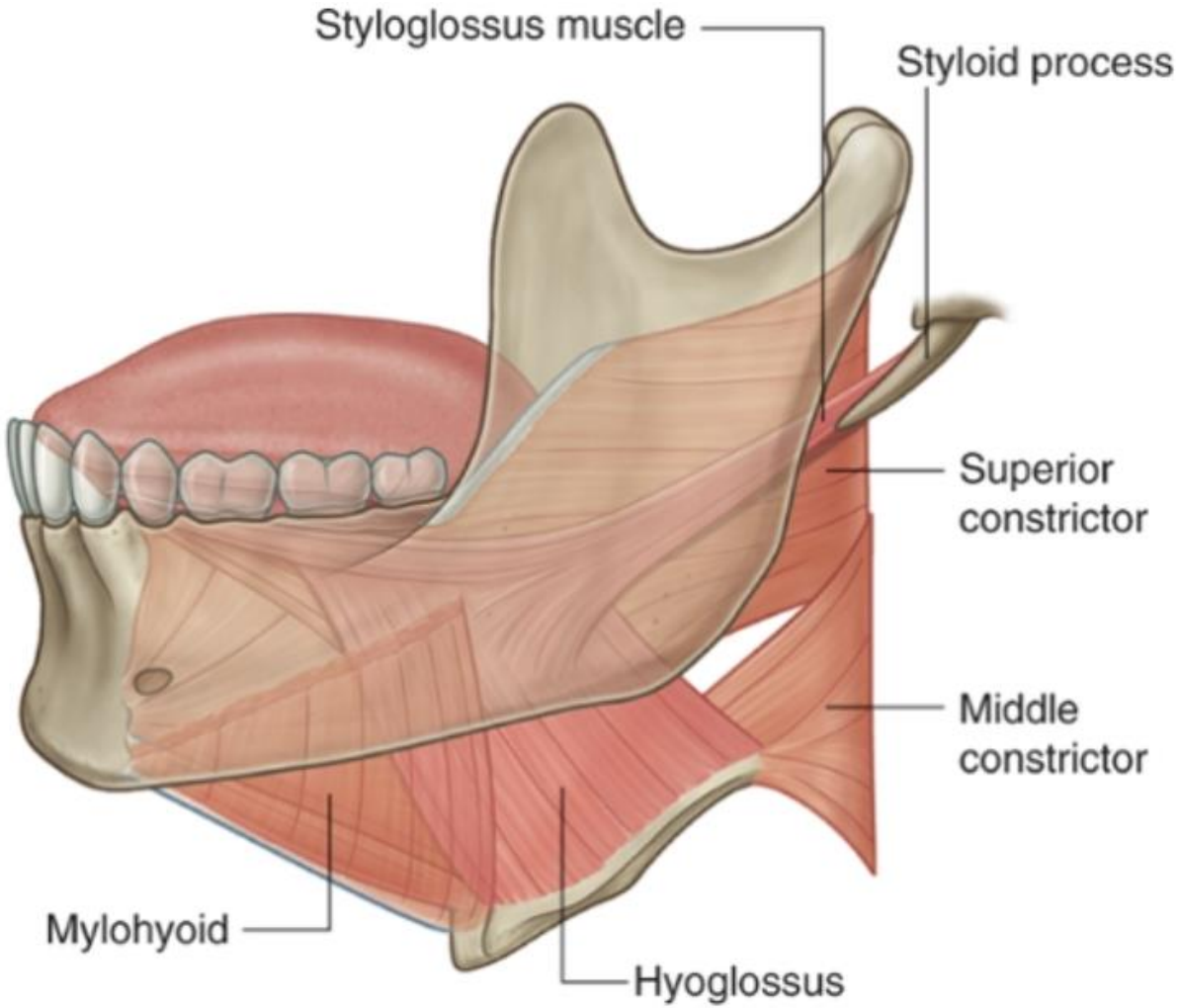
- The **lingual artery** from the external carotid artery in the neck enters the tongue **deep to the hyoglossus, between the hyoglossus and genioglossus. Glossopharyngeal nerve also travels deep to the hyoglossus.**
- The **hypoglossal nerve [XII] and lingual nerve** (branch of the mandibular nerve [V_3]), from the neck and infratemporal fossa of the head, respectively, enter the tongue **on the external surface of the hyoglossus and travel superficial to it.**





Styloglossus

Passes inferiorly and medially through the gap (oropharyngeal triangle) between the middle constrictor, superior constrictor, and mylohyoid muscles to enter the lateral surface of the tongue.



Palatoglossus

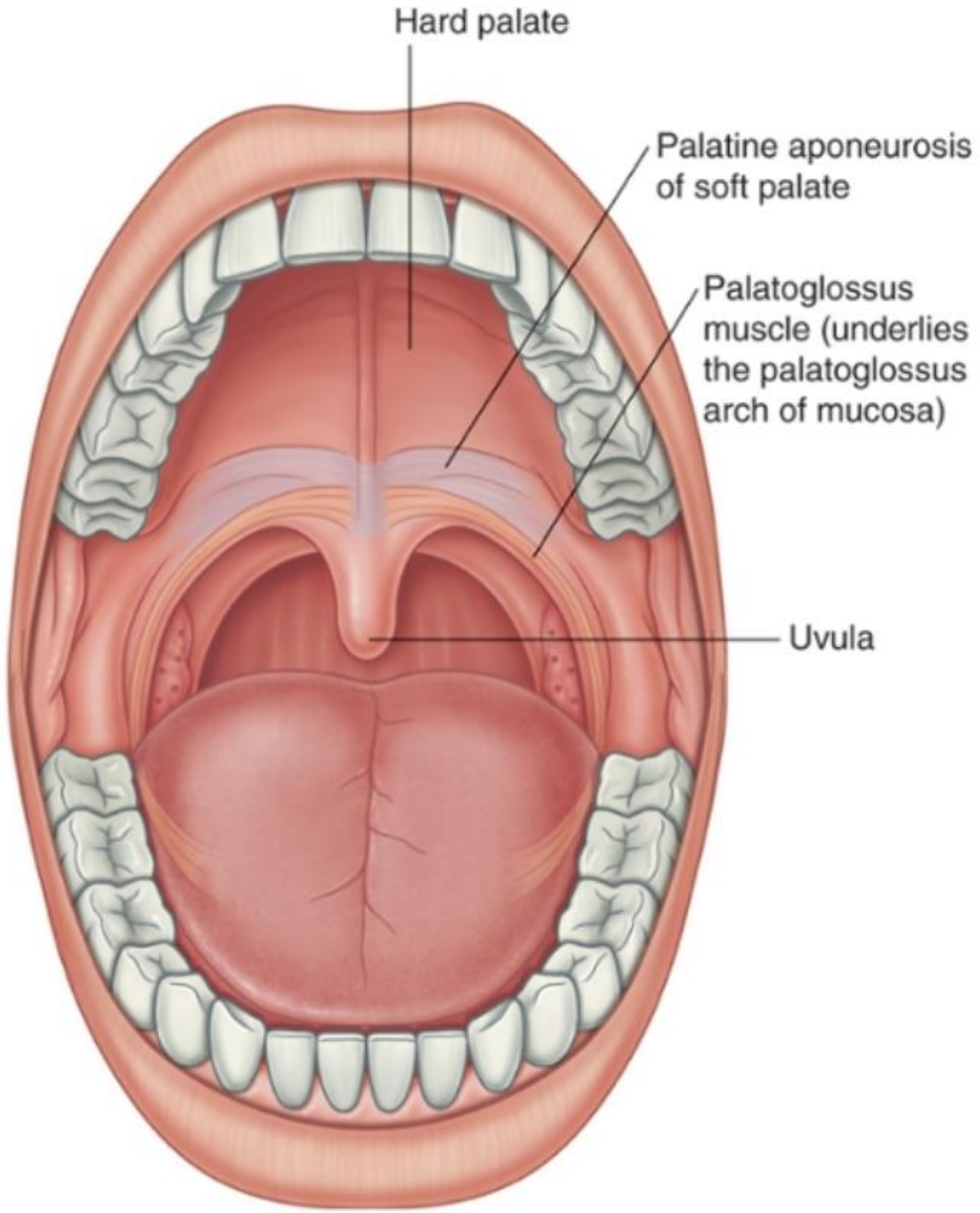
The palatoglossus muscles are muscles of the **soft palate and the tongue**. Each originates from the undersurface of the palatine aponeurosis and passes anteroinferiorly to the lateral side of the tongue.

The palatoglossus muscles:

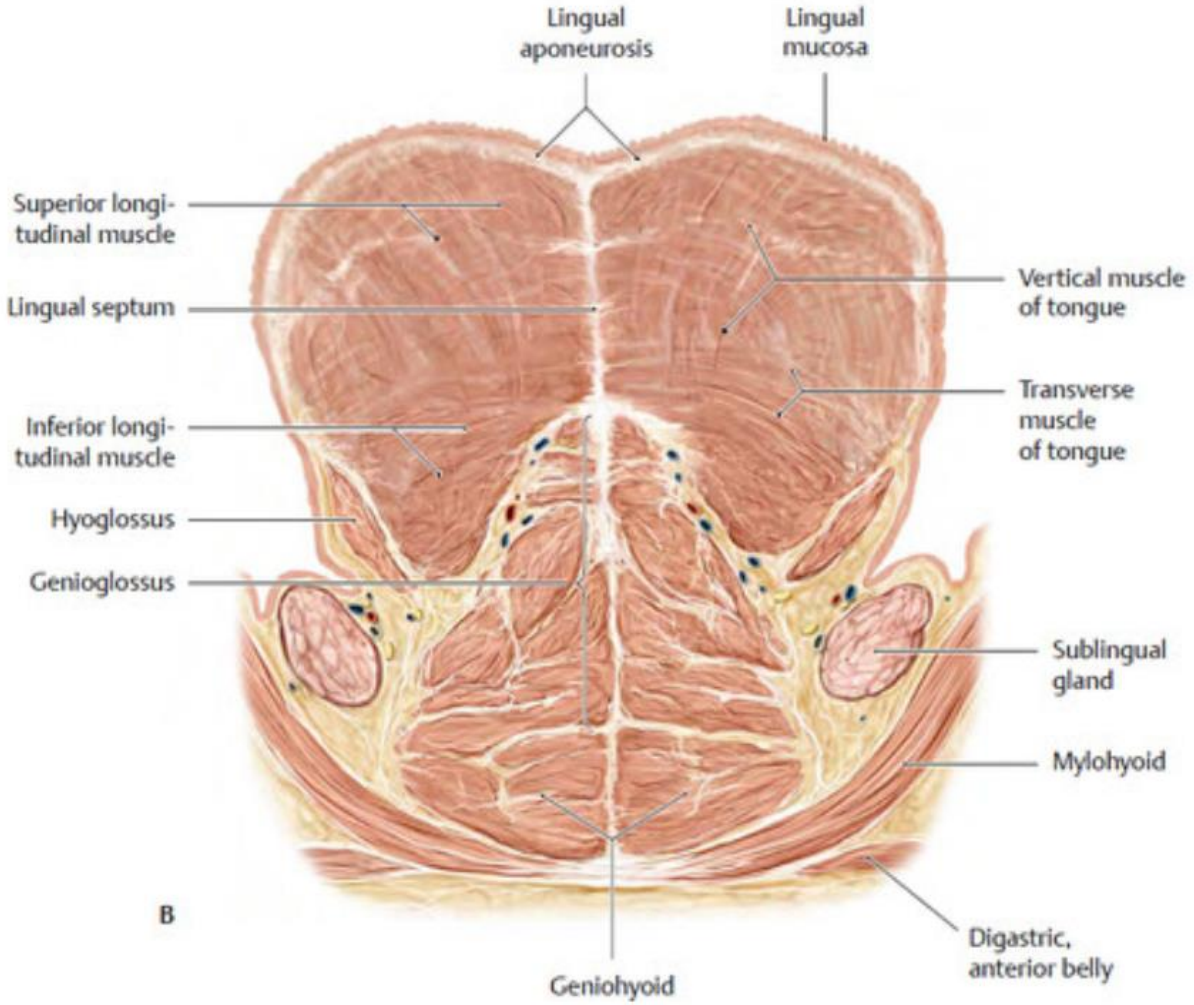
- **elevate the back of the tongue,**
- **move the palatoglossal arches of mucosa toward the midline, and**
- **depress the soft palate.**

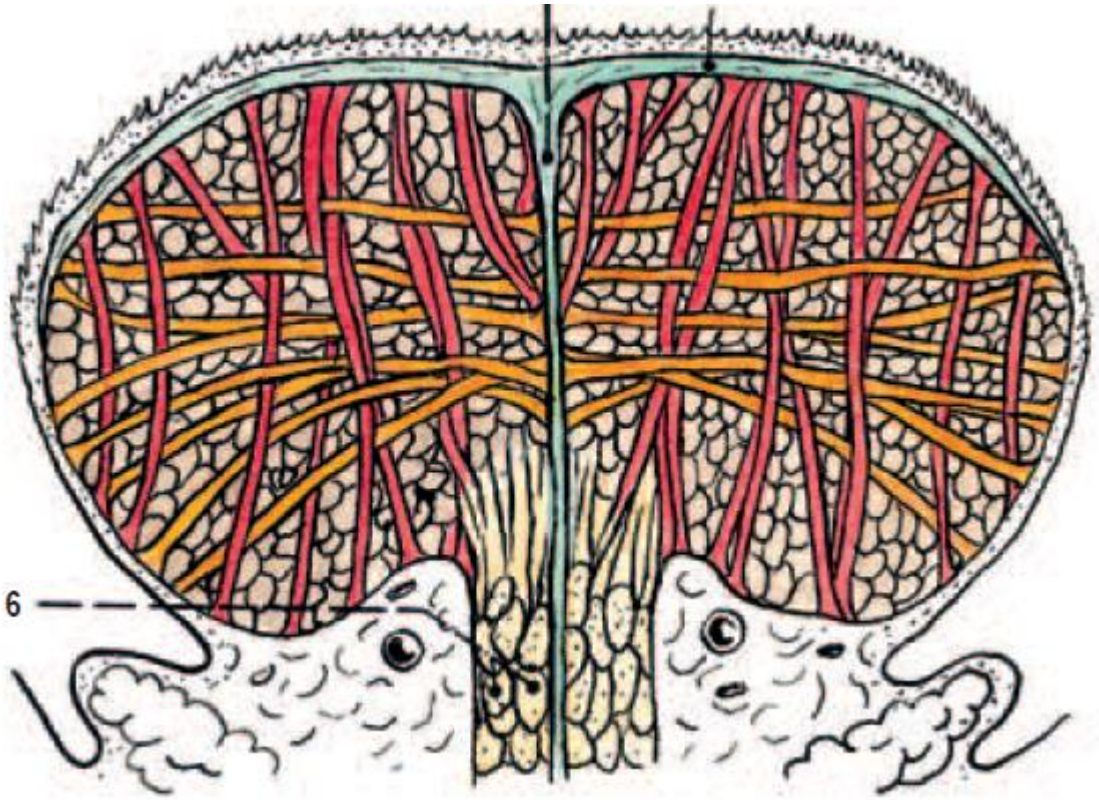
These movements facilitate closing of the oropharyngeal isthmus and as a result separate the oral cavity from the oropharynx.

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] via the pharyngeal plexus!!**



The intrinsic muscles, which have no attachments to skeletal structures (originate and insert within the substance of the tongue), **alter the shape of the tongue –** important for speech, eating, and swallowing.





Muscle	Origin and	Insertion	Innervation	Action
Intrinsic lingual muscles				
Superior longitudinal muscle	Thin layer of muscle inferior to the dorsal mucosa; fibers run anterolaterally from the epiglottis and median lingual septum		Hypoglossal n. (CN XII)	Shortens tongue; makes dorsum concave (pulls apex and lateral margin upward)
Inferior longitudinal muscle	Thin layer of muscle superior to the genioglossus and hyoglossus; fibers run anteriorly from the root to the apex of the tongue			Shortens tongue; makes dorsum convex (pulls apex down)
Transverse muscle	Fibers run laterally from the lingual septum to the lateral tongue			Narrows tongue; elongates tongue
Vertical muscle	In the anterior tongue, fibers run inferiorly from the dorsum of the tongue to its ventral surface			Widens and flattens tongue

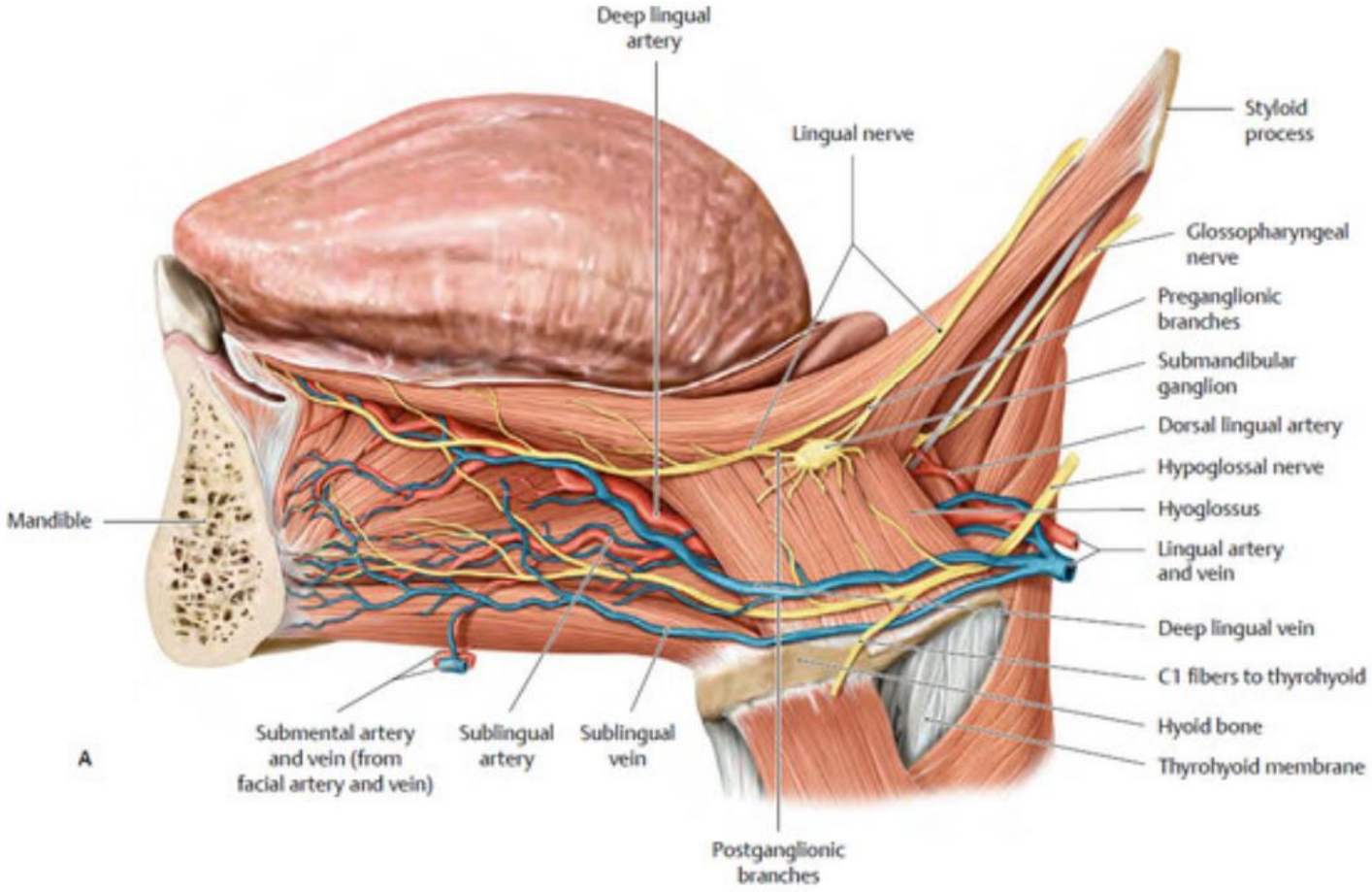
Blood supply of the tongue

The tongue is supplied by the ***lingual artery*** (from the **external carotid artery** in the neck adjacent to the tip of the greater horn of the hyoid bone), which divides into its terminal branches, the **deep lingual artery** and the **sublingual artery.** The **dorsal lingual artery** supplies the root of the tongue in the oropharynx.

It forms an upward bend and then loops downward and forward to pass **deep to the hyoglossus muscle**, and accompanies the muscle through the aperture (oropharyngeal triangle) formed by the margins of the mylohyoid, superior constrictor, and middle constrictor muscles, and enters the floor of the oral cavity.

The lingual artery then travels forward in the plane **between the hyoglossus and genioglossus muscles** to the apex of the tongue.

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



Blood supply	Source	Branches	Distribution
Lingual a.	External carotid a.	Dorsal lingual aa.	Dorsal surface of posterior one third of tongue, palatoglossal arch, palatine tonsil, epiglottis, soft palate
		Sublingual a.	Floor of oral cavity, sublingual gland and surrounding mucosa and muscles
		Deep lingual a.	Ventral surface of tongue
		Terminal branches	Dorsal surface of anterior two thirds of tongue
Submental a.	Facial a. (from external carotid a.)		Anatomoses with sublingual a. to supply sublingual gland and surrounding floor of mouth
Tonsillar a.	Facial a. (from external carotid a.)		Root of tongue
Ascending pharyngeal a.	External carotid a.		Root of tongue

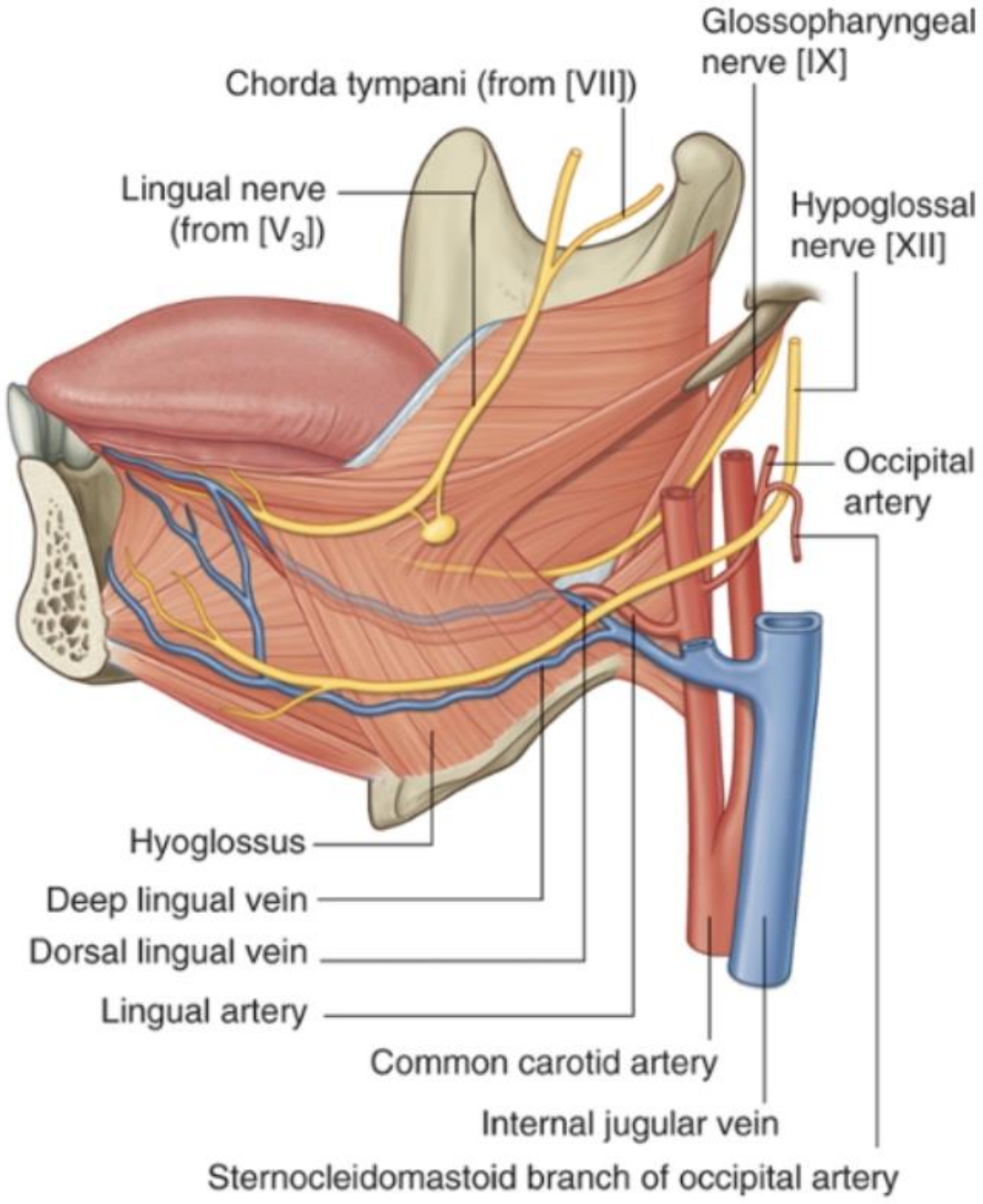
Venous drainage of the tongue

The lingual vein usually runs parallel to the artery but on the medial surface of the hyoglossus muscle and drains into the ***internal jugular vein***.

The tongue is drained by **dorsal lingual and deep lingual veins:**

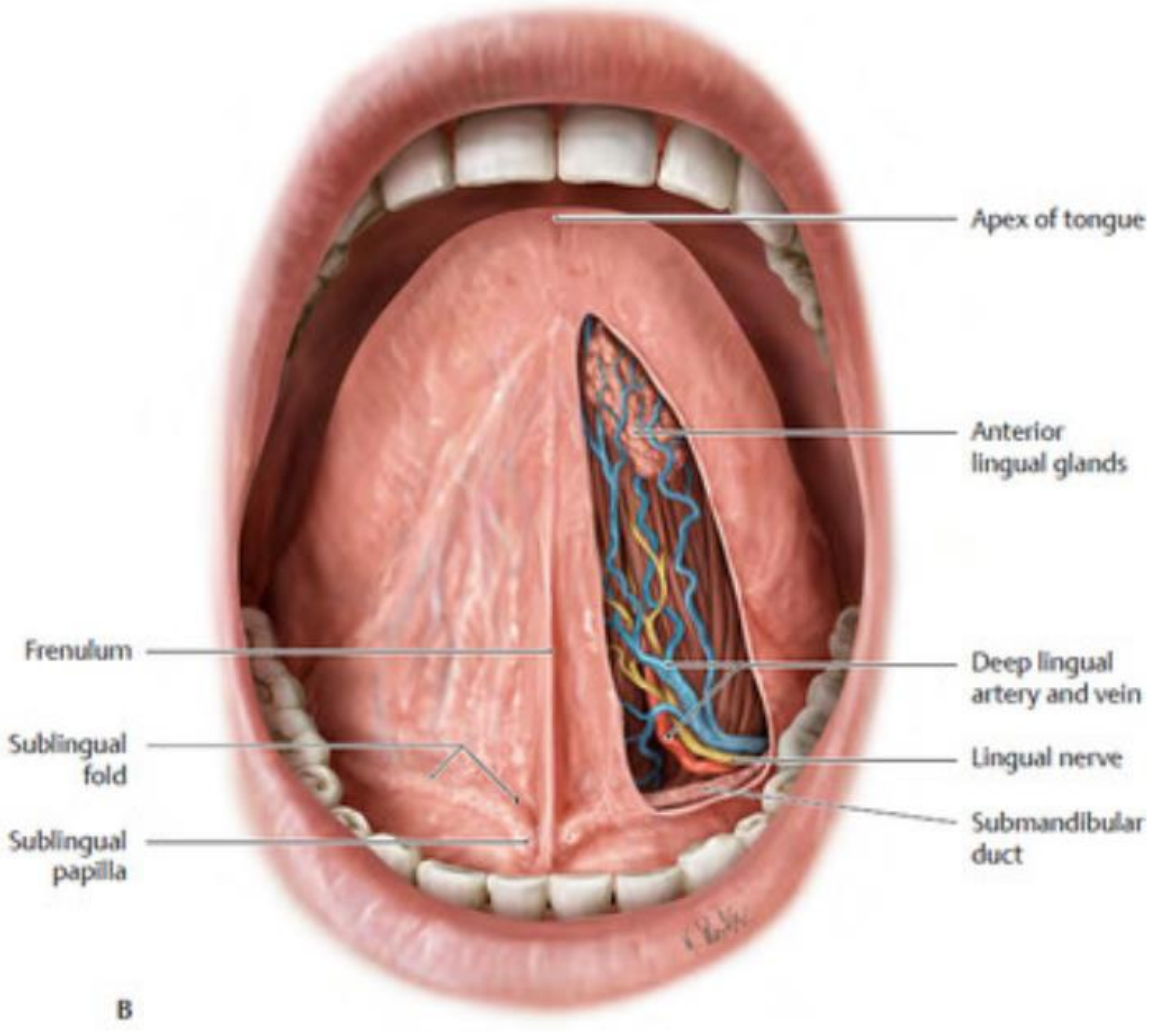
The deep lingual veins are visible through the mucosa on the undersurface of the tongue. Although they accompany the lingual arteries in anterior parts of the tongue, they become separated from the arteries posteriorly by the hyoglossus muscles. On each side, the deep lingual vein travels with the **hypoglossal nerve [XII]** on the external surface of the hyoglossus muscle and passes out of the floor of the oral cavity through the aperture formed by the margins of the mylohyoid, superior constrictor, and middle constrictor muscles. It joins the **internal jugular vein** in the neck.

The dorsal lingual vein follows the lingual artery between the hyoglossus and genioglossus muscles and, like the deep lingual vein, drains into the **internal jugular vein** in the neck.



Venous drainage of the tongue

Vein	Tributaries	Region drained	Drains to
Lingual v.	Deep lingual vv.	Ventral surface of tongue	Internal jugular v.
	Dorsal lingual vv.	Dorsum of tongue	
Submental v.		Anastomoses with branches of lingual vv. to help drain tongue	Facial v.



Innerevation

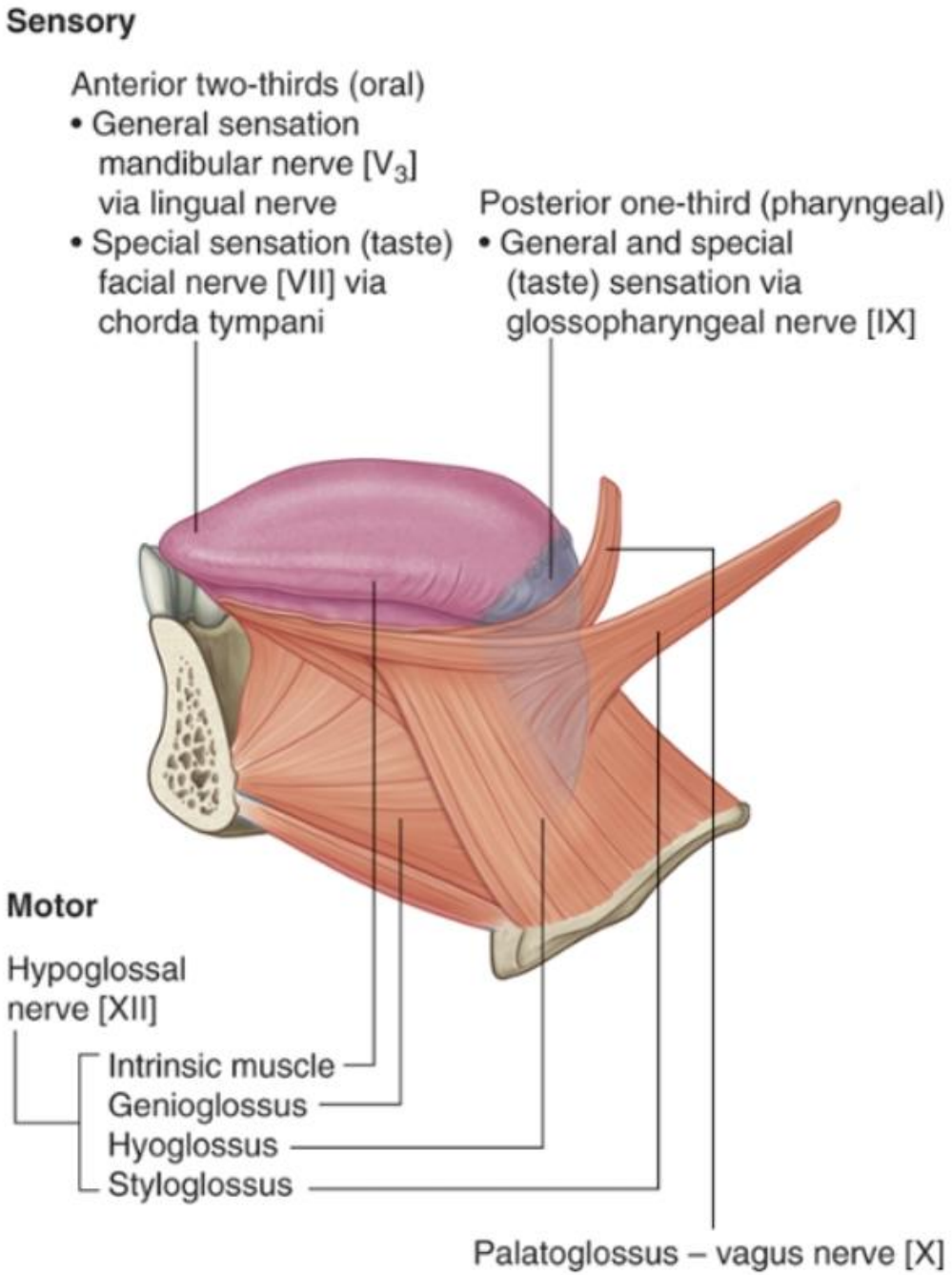
Lingual nerve

Chorda tympani

Glossopharyngeal nerve

Vagus nerve

Hypoglossal nerve

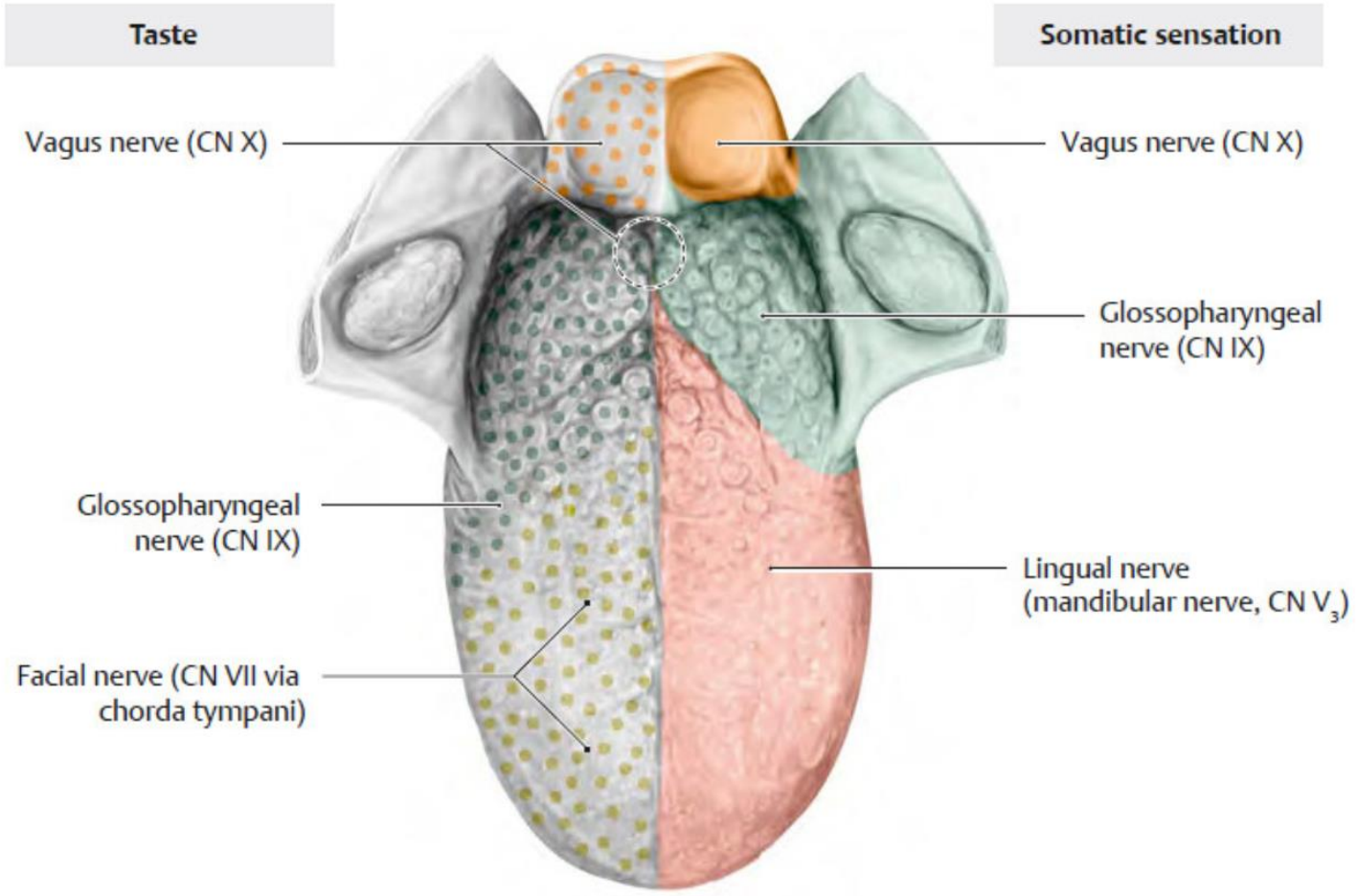


Innervation

The anterior two thirds of the lingual mucosa receives its ***somatosensory* innervation** (sensitivity to thermal and tactile stimuli) from the ***lingual nerve,*** which is a branch of the trigeminal nerve's mandibular division (CN V_3). The lingual nerve transmits fibers from the **chorda tympani** of the facial nerve (CN VII), among them the **afferent taste fibers** for the **anterior two thirds of the tongue.** The **chorda tympani** also contains presynaptic, **parasympathetic visceromotor** axons that synapse in the **submandibular ganglion**, whose neurons in turn innervate the **submandibular and sublingual glands**.

The posterior one third of the tongue (postsulcal part) primarily receives **somatosensory and taste innervation** from the **glossopharyngeal nerve (CN IX),** with additional taste sensation conveyed by the **vagus nerve (CN X) via the internal laryngeal nerve.**

The anterior two thirds of the tongue (presulcal part) receives its somatosensory innervation (e.g., touch, pain, and temperature) from the lingual nerve (branch of CN V_3) and its taste sensation from the chorda tympani branch of the facial nerve (CN VII) distributed by the lingual nerve (CN V_3). Disturbances of sensation in the presulcal tongue can therefore be used to determine facial or trigeminal nerve lesions.



Lymphatic drainage

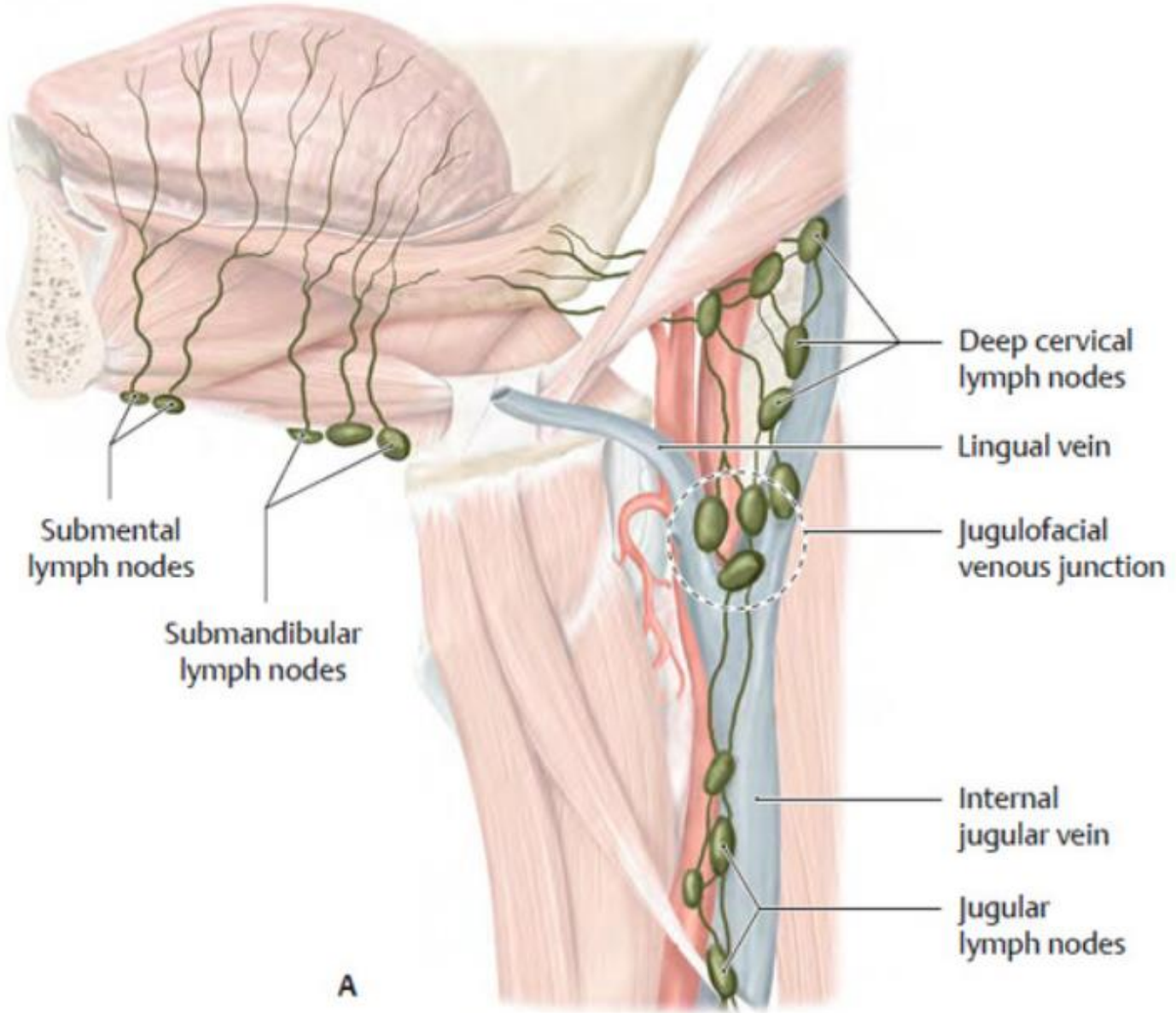
All lymphatic vessels from the tongue ultimately drain into the **deep cervical chain** of nodes **along the internal jugular vein:**

- **The pharyngeal part** of the tongue drains through the pharyngeal wall directly into mainly the **jugulodigastric node of the deep cervical chain.**

- **The oral part** of the tongue drains both **directly into the deep cervical nodes,** and **indirectly into** these nodes by passing first through the mylohyoid muscle and into **submental and submandibular nodes.**

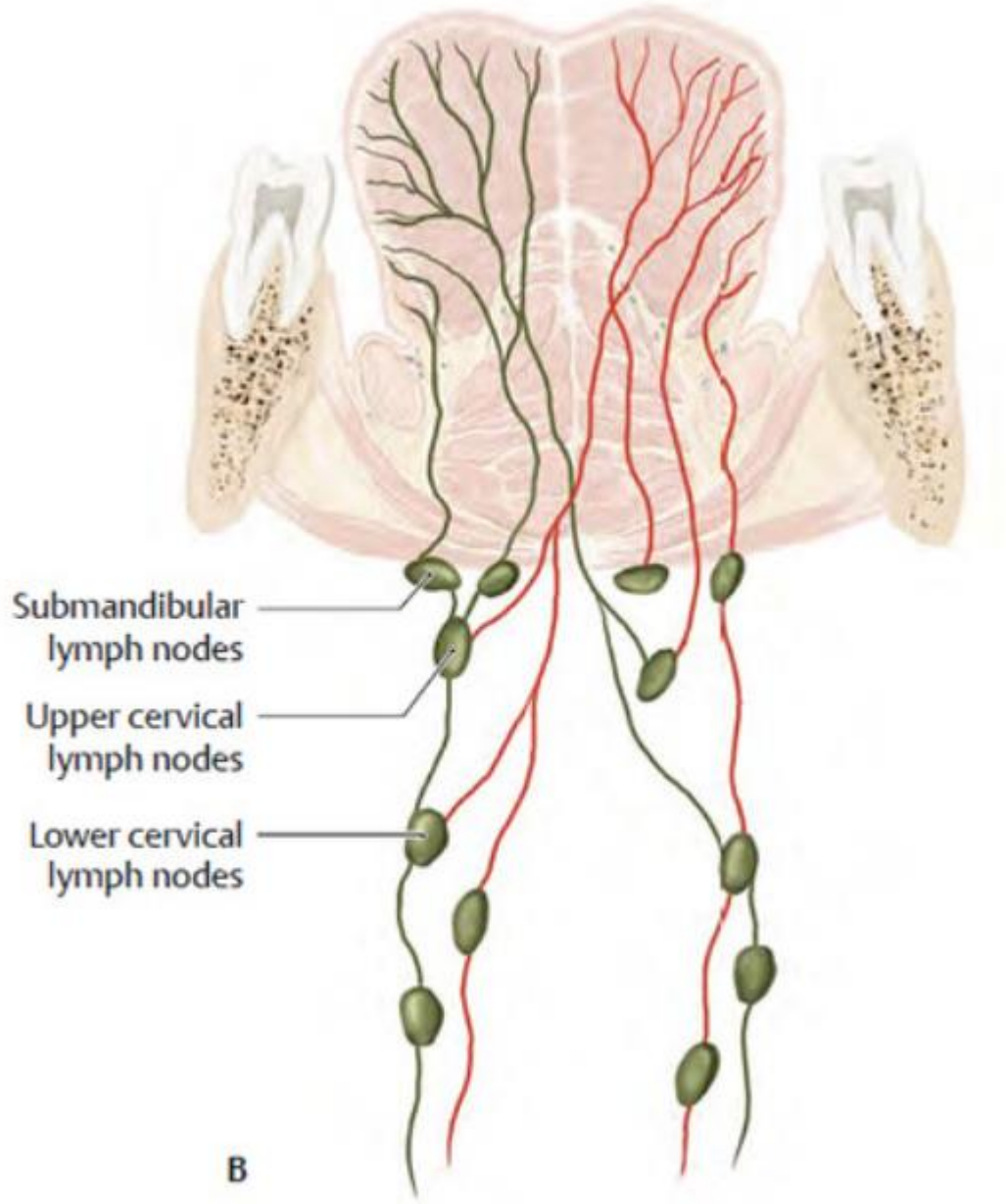
The submental nodes are inferior to the mylohyoid muscles and between the digastric muscles, while **the submandibular nodes** are below the floor of the oral cavity along the inner aspect of the inferior margins of the mandible.

The tip of the tongue drains through the mylohyoid muscle into the **submental nodes** and then into mainly **the jugulo-omohyoid node of the deep cervical chain.**



Lymphatic drainage

Because the lymph nodes receive drainage from both the **ipsilateral and contralateral sides**, tumor cells may become widely disseminated in this region (e.g., metastatic squamous cell carcinoma, especially on the lateral border of the tongue, frequently metastasizes to the opposite side).



Lymphatic drainage

The deep lymph nodes in the neck consist mainly of collecting nodes. They have major clinical importance as potential sites of metastasis from head and neck tumors. Affected deep cervical lymph nodes may be surgically removed (neck dissection) or may be treated by regional irradiation. For this purpose, the American Academy of Otolaryngology—Head and Neck Surgery has grouped the deep cervical lymph nodes into six levels (Robbins 1991):

I Submental and submandibular lymph nodes

II–IV Deep cervical lymph nodes along the internal jugular vein (lateral jugular lymph nodes):

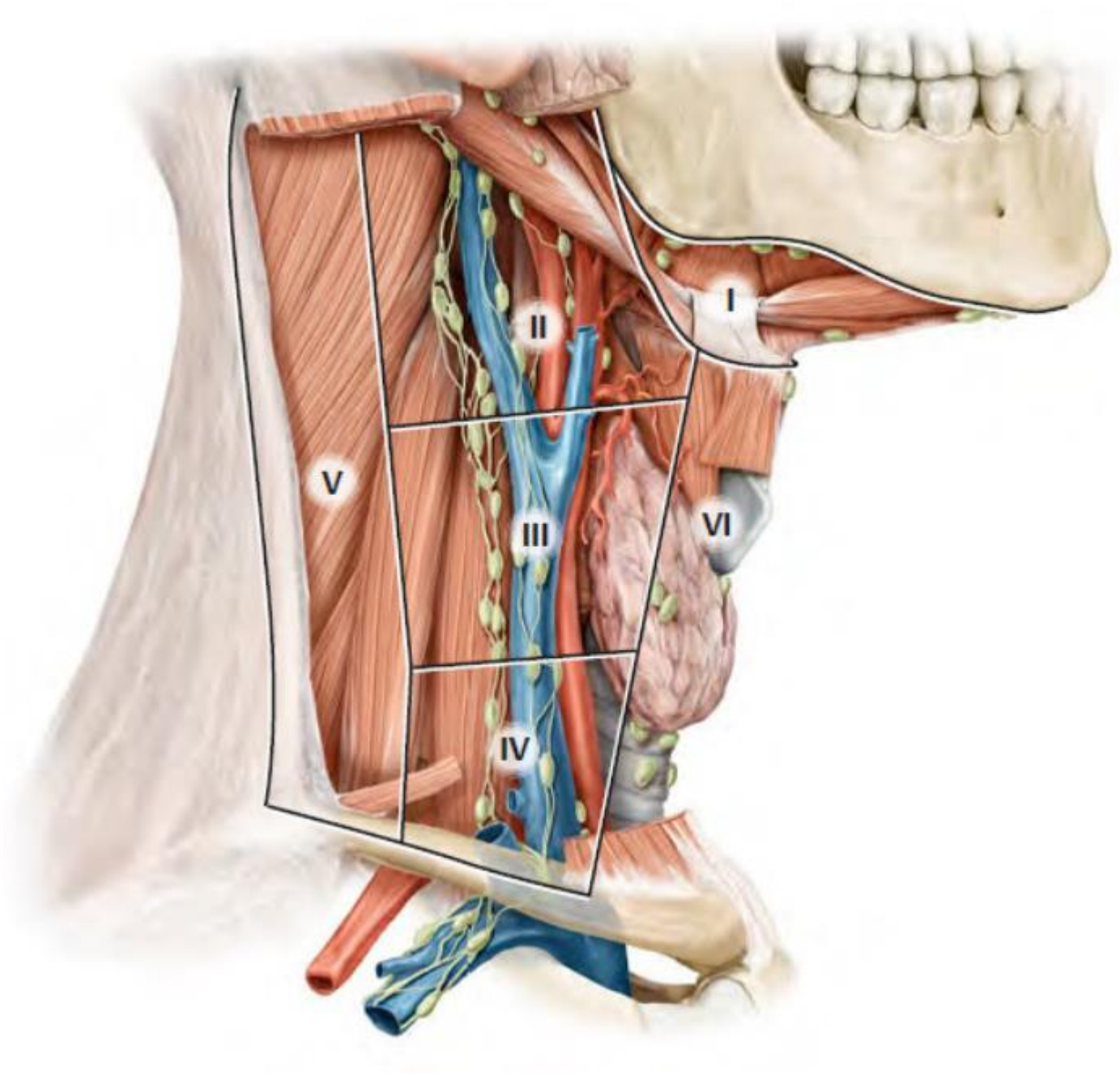
– II Deep cervical lymph nodes (upper lateral group)

– III Deep cervical lymph nodes (middle lateral group)

– IV Deep cervical lymph nodes (lower lateral group)

V Lymph nodes in the posterior cervical triangle

VI Anterior cervical lymph nodes



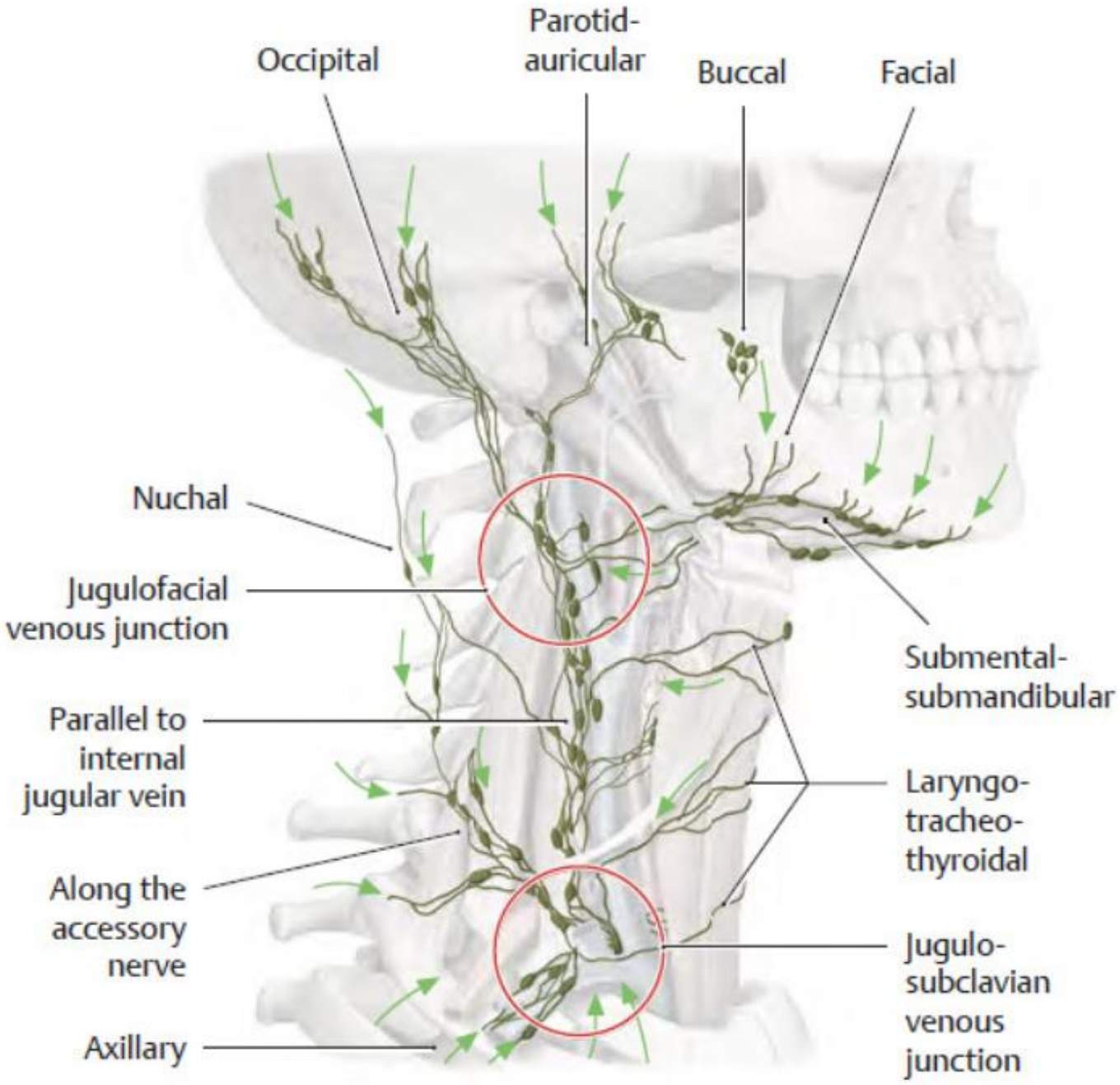
Directions of lymphatic drainage in the neck

Understanding this pattern of lymphatic flow is critical to identifying the location of a potential cause of enlarged cervical lymph nodes.There are two main sites in the neck where the lymphatic pathways intersect:

Jugulofacial venous junction: Lymphatics from the head pass obliquely downward to this site, where the lymph is redirected vertically downward in the neck.

Jugulosubclavian venous junction: The main lymphatic trunk, the thoracic duct, terminates at this central location, where lymph collected from the left side of the head and neck region is combined with lymph draining from the rest of the body.

If only peripheral nodal groups are affected, this suggests a localized disease process. If the central groups (e.g., those at the venous junctions) are affected, this usually signifies an extensive disease process. Central lymph nodes can be obtained for diagnostic evaluation by prescalene biopsy.

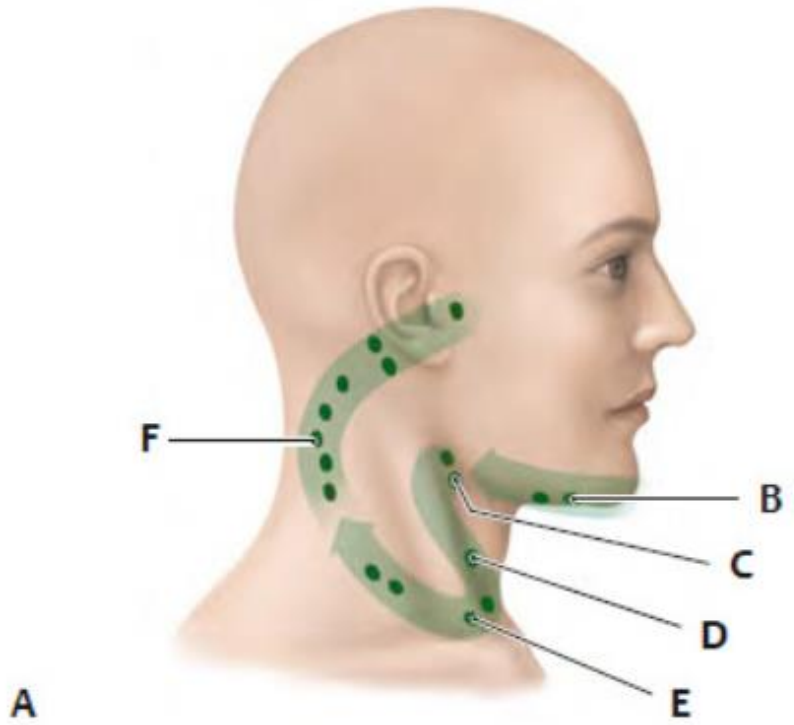


Systematic palpation of the cervical lymph nodes

The cervical lymph nodes are systematically palpated during the physical examination to ensure the detection of any enlarged nodes.

Panel **A** shows the sequence in which the various nodal groups are successively palpated. The examiner usually palpates the **submental-submandibular group first (B), including the mandibular angle (C), then proceeds along the anterior border of the sternocleidomastoid muscle (D). The supraclavicular lymph nodes are palpated next (E), followed by the lymph nodes along the accessory nerve and the nuchal group of nodes (F).**

If lymph nodes are palpable, the following characteristics should be noted and described: **size (<1 cm in diameter is normal), pain/tenderness (suggestive of inflammation), consistency (soft nodes suggest inflammation; firm, rubbery nodes suggest lymphoma; stony-hard nodes may be a sign of cancer),** location of lymphadenopathy, and whether it is localized or generalized as this may help aid diagnosis.



A good oral cancer exam is visual AND tactile.

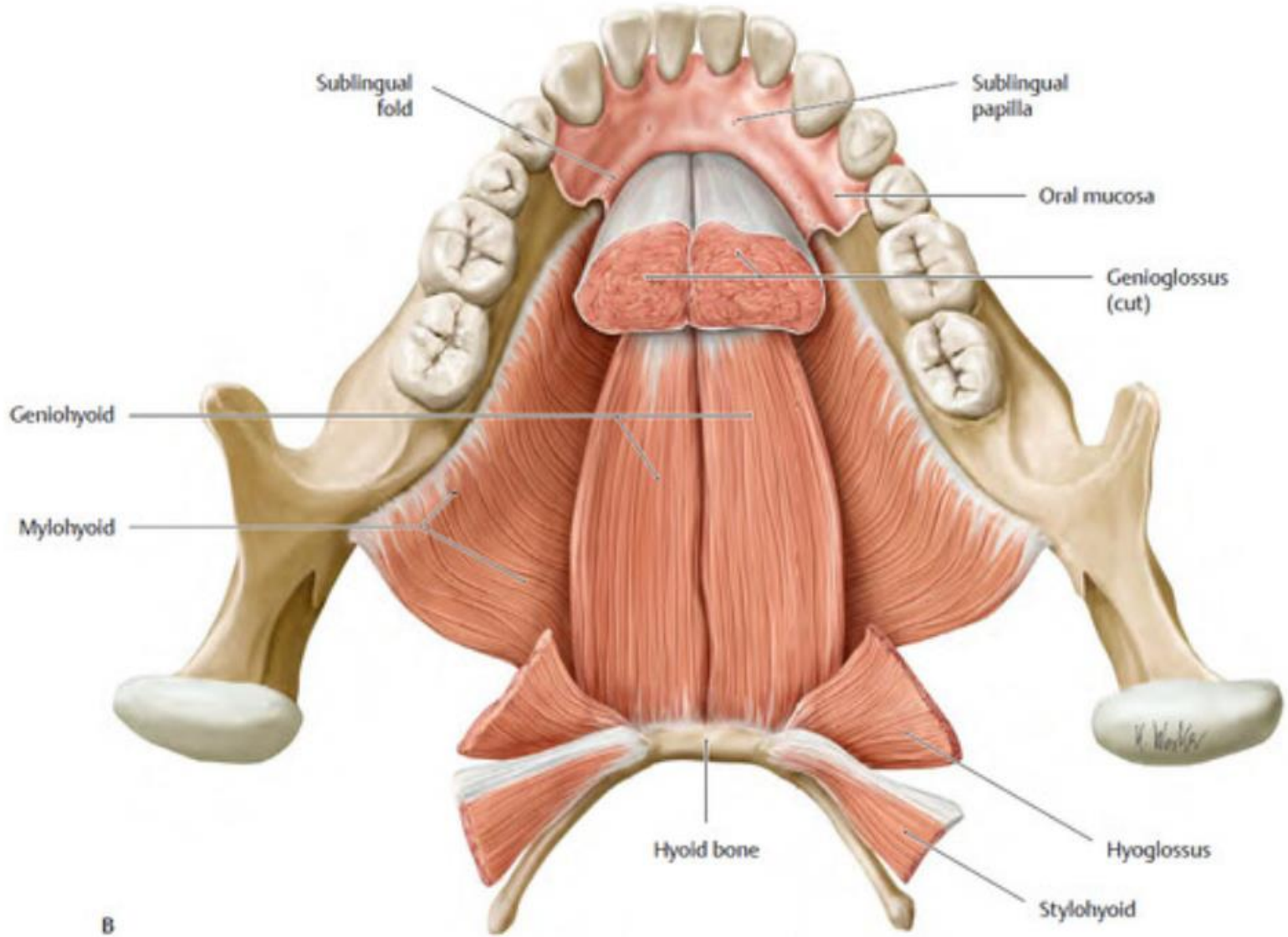
Squamous cell carcinoma: most cancer of oral cavity,usually on the anterolateral aspect, peak incidence around age 55

Sublingual region

Omid Moztarzadeh

Floor of the oral cavity

- The floor of the oral cavity proper is formed mainly by three structures:
- 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; and
- **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.


Sublingual fold
Sublingual papilla
Oral mucosa
Genioglossus (cut)
Geniohyoid
Mylohyoid
Hyoid bone
Hyoglossus
Stylohyoid
B

Mylohyoid muscle

Form a muscular diaphragm that defines the inferior limit of the floor of the oral cavity. Each muscle is triangular in shape with its apex pointed forward.

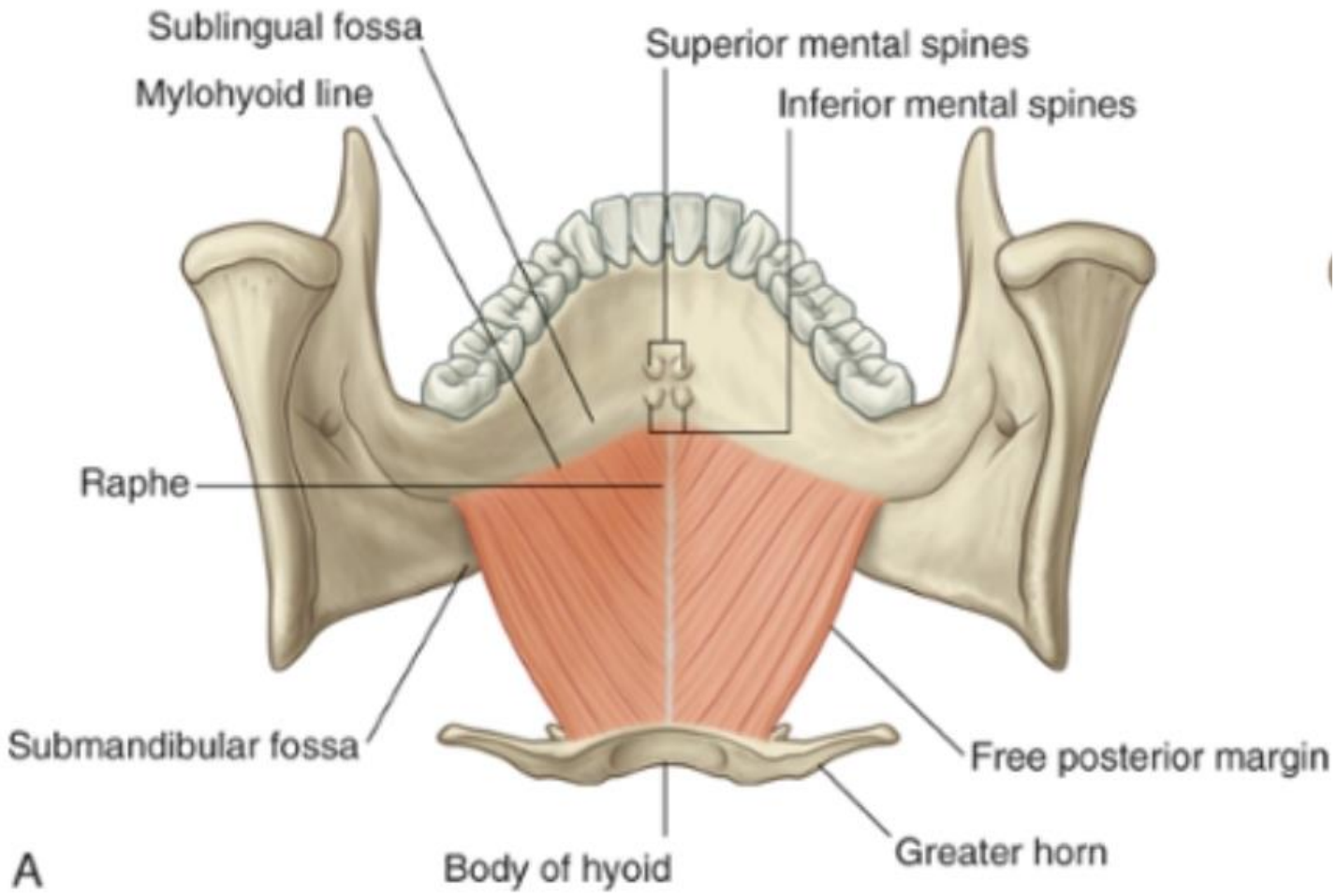
The lateral margin of each triangular muscle is attached to the mylohyoid line on the medial side of the body of the mandible. From here, the muscle fibers run slightly downward to the medial margin at the midline where the fibers are joined together with those of their partner muscle on the other side by a **raphe**. The raphe extends from the posterior aspect of the mandibular symphysis in front to the body of the hyoid bone behind.

The posterior margin of each mylohyoid muscle is free except for a small medial attachment to the hyoid bone.

The mylohyoid muscles:

- **contribute structural support to the floor of the oral cavity,**
- **participate in elevating and pulling forward the hyoid bone, and therefore the attached larynx, during the initial stages of swallowing, and**
- **when the hyoid bone is fixed in position, depress the mandible and open the mouth.**

Like the muscles of mastication, the mylohyoid muscles are innervated by the mandibular nerve [V_3]. The specific branch that innervates the mylohyoid muscles is the nerve to the mylohyoid from the inferior alveolar nerve.



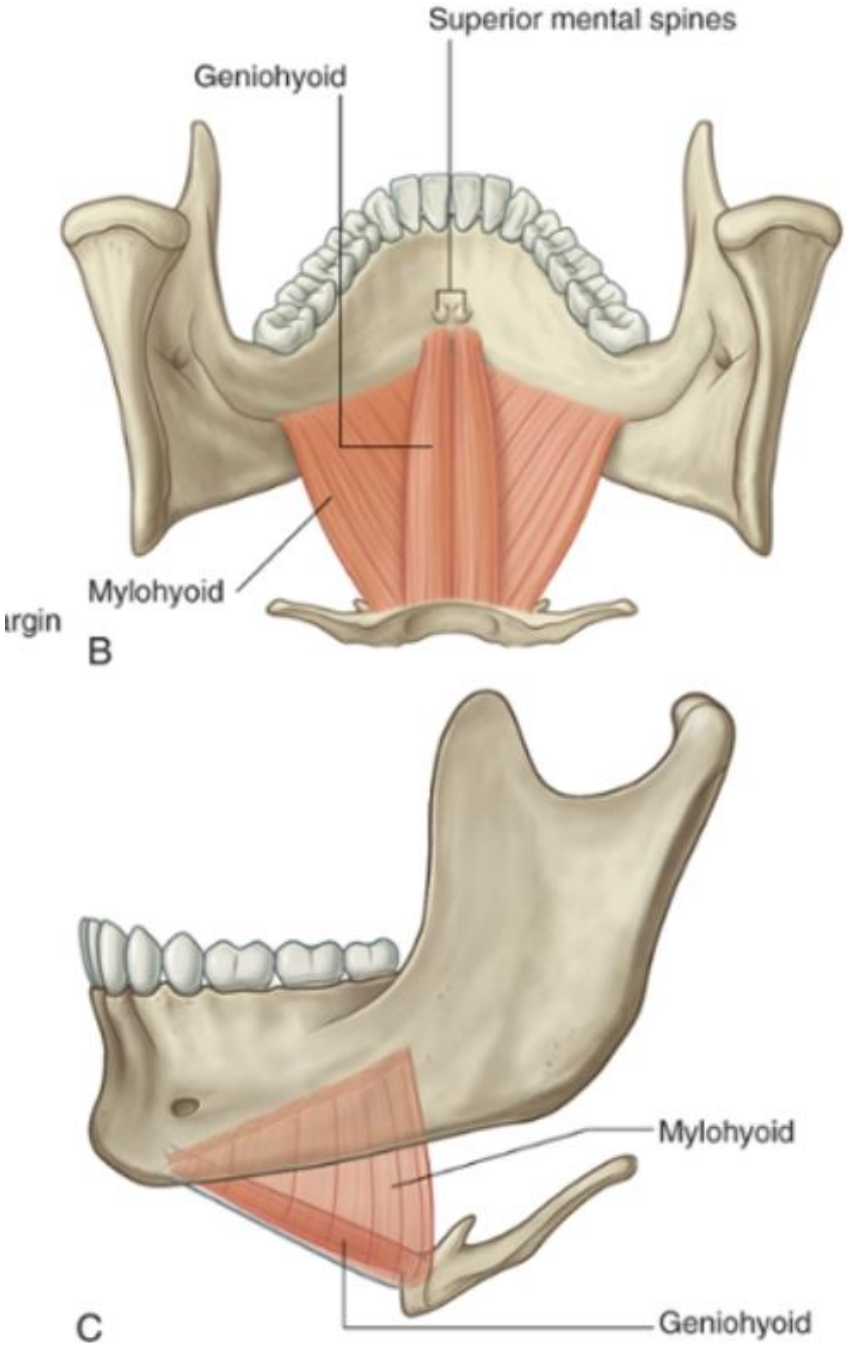
Geniohyoid muscle

Are paired cord-like muscles that run, one on either side of the midline, from the inferior mental spines on the posterior surface of the mandibular symphysis to the anterior surface of the body of the hyoid bone. They are immediately **superior to the mylohyoid muscles** in the floor of the mouth and **inferior to the genioglossus muscles** that form part of the root of the tongue.

The geniohyoid muscles:

- mainly pull the hyoid bone, and therefore the attached larynx, up and forward during **swallowing**; and
- because they pass posteroinferiorly from the mandible to the hyoid bone, when the hyoid bone is fixed, they can act with the mylohyoid muscles to **depress the mandible and open the mouth**.

Unlike other muscles that move the mandible at the temporomandibular joint, the geniohyoid muscles are innervated by a **branch of cervical nerve C1, which "hitchhikes" from the neck along the hypoglossal nerve [XII]** into the floor of the oral cavity.



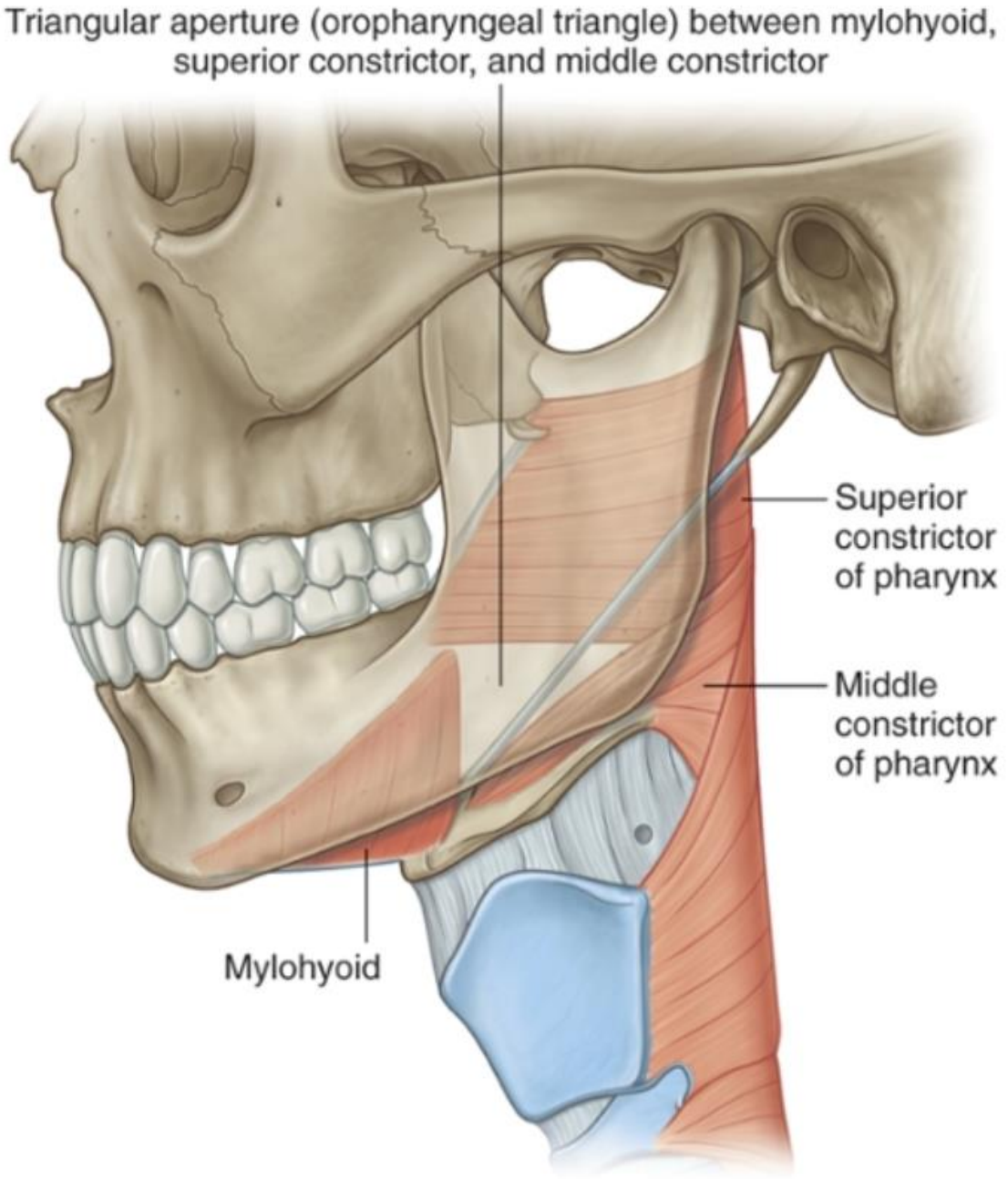
Muscle	Origin	Insertion	Innervation	Function
Mylohyoid	Mylohyoid line of mandible	Median fibrous raphe and adjacent part of hyoid bone	Nerve to mylohyoid from the inferior alveolar branch of mandibular nerve [V_3]	Supports and elevates floor of oral cavity; depresses mandible when hyoid is fixed; elevates and pulls hyoid forward when mandible is fixed
Geniohyoid	Inferior mental spines of mandible	Body of hyoid bone	C1	Elevates and pulls hyoid bone forward; depresses mandible when hyoid is fixed

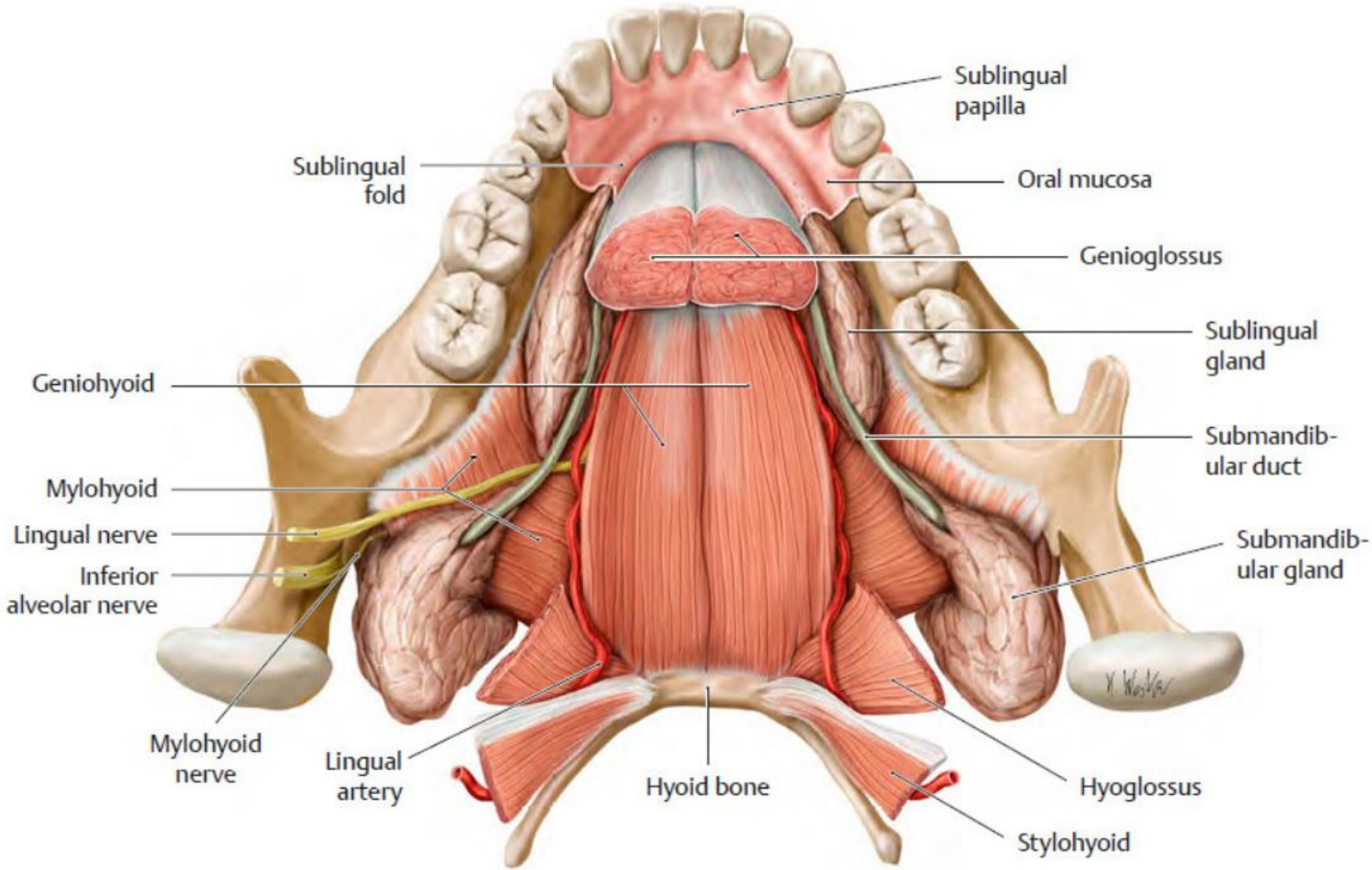
Oropharyngeal triangle

The **free posterior border of the mylohyoid muscle** on each side forms one of the three margins of a large **triangular aperture (oropharyngeal triangle)**, which is a major route by which structures in the **upper neck and infratemporal fossa of the head pass to and from structures in the floor of the oral cavity.** The other two muscles that complete the margins of the aperture are the **superior and middle constrictor muscles of the pharynx.**

Most structures that pass through the aperture are associated with the tongue and include muscles **(hyoglossus, styloglossus), vessels (lingual artery and vein), nerves (lingual, hypoglossal [XII], glossopharyngeal [IX]), and lymphatics**.

A large salivary gland (the **submandibular gland**) is “hooked” around the free posterior margin of the mylohyoid muscle and therefore also passes through the opening.




Sublingual papilla
Sublingual fold
Oral mucosa
Genioglossus
Sublingual gland
Geniohyoid
Submandib-ular duct
Mylohyoid
Lingual nerve
Inferior alveolar nerve
Submandib-ular gland
Mylohyoid nerve
Lingual artery
Hyoid bone
Hyoglossus
Stylohyoid

Borders of sublingual region

Lateral wall: Sublingual fovea of the mandible.

Medial wall: Muscles of the tongue (M.Hyoglossus, M. Genioglossus) the wall is completed by m. geniohyoideus ventrally and m. styloglossus dorsocranially.

Inferior wall: Mylohyoid m.- extended obliquely mediocaudally toward hyoid bone.

Superior wall: Covered by mucous membrane of the floor of the mouth – sublingual fold and Inferior surface of the tongue.

Dorsally: Communicating with the submandibular region through the posterior margin of the mylohyoid muscle.

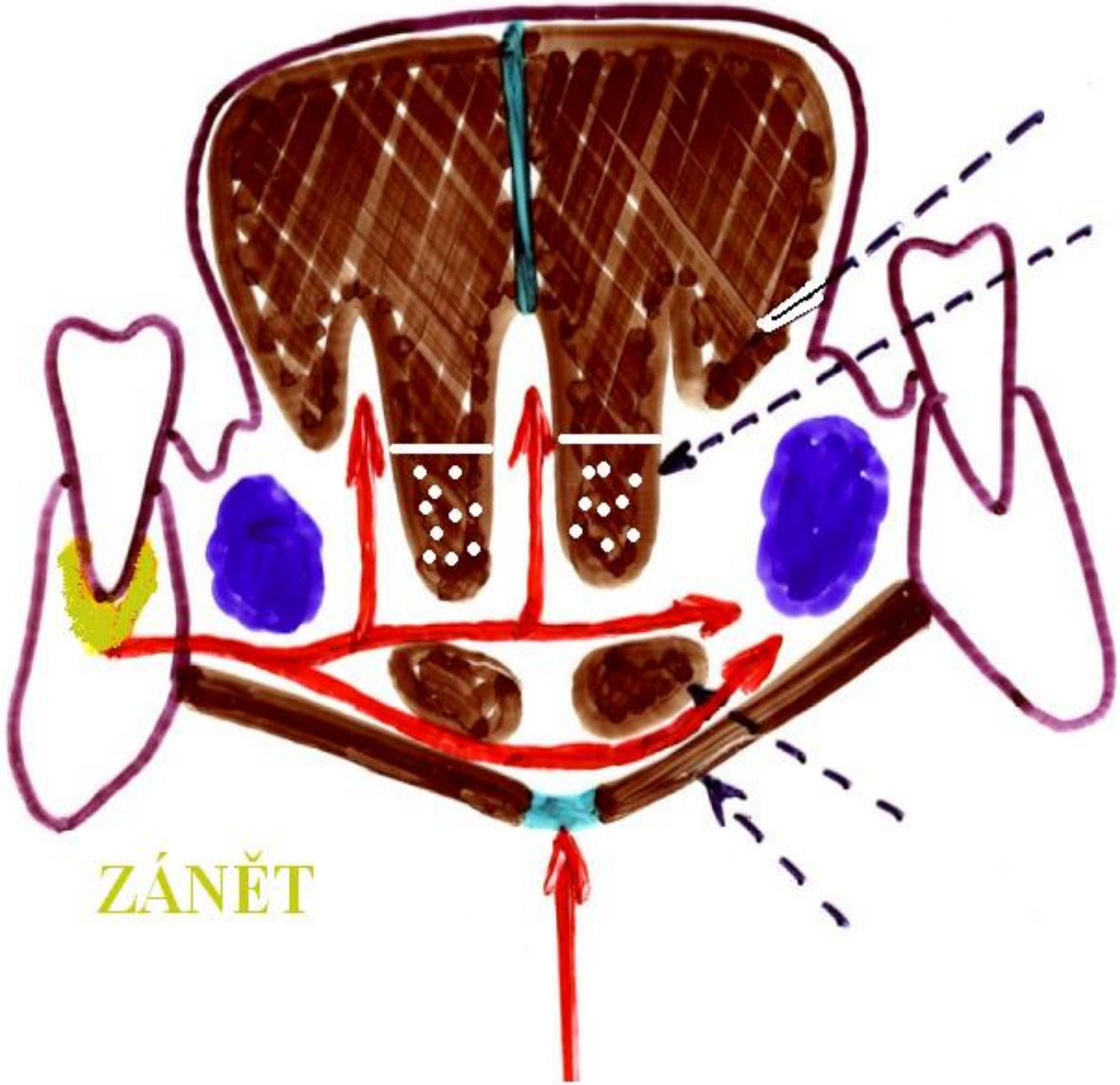
Ventrally: terminate to the chin part of the mandible.

The sublingual space contains

- Sublingual gland
- Submandibular duct
- Lingual nerve (crosses and runs under submandibular duct)
- Sublingual vesselse
- Hypoglossal nerve
- Vena comitans nervi hypoglossi (vein accompanying the hypoglossal nerve)
- Anterior process of the submandibular gland

Spaces under the tongue

- **Median basal intermuscular lingual space:** vertical space between left and right geniohyoideus and genioglossus muscles. The fissure caudally extends to the mylohyoid muscle and superiorly extends to the lingual septum.
- **Paralingual canals:** paired spaces between genioglossus muscle medially and hyoglossus muscle laterally. Cranially extends to the intraglossal muscles and caudally extends into the sublingual region.**Lingual artery** passes through this space and caudally gives **sublingual branch**.
- **Transverse fissures:** between two genioglossus muscles and two geniohyoideus muscles, also between geniohyoideus muscles and mylohyoideus muscles. They are laterally extend into the sublingual region.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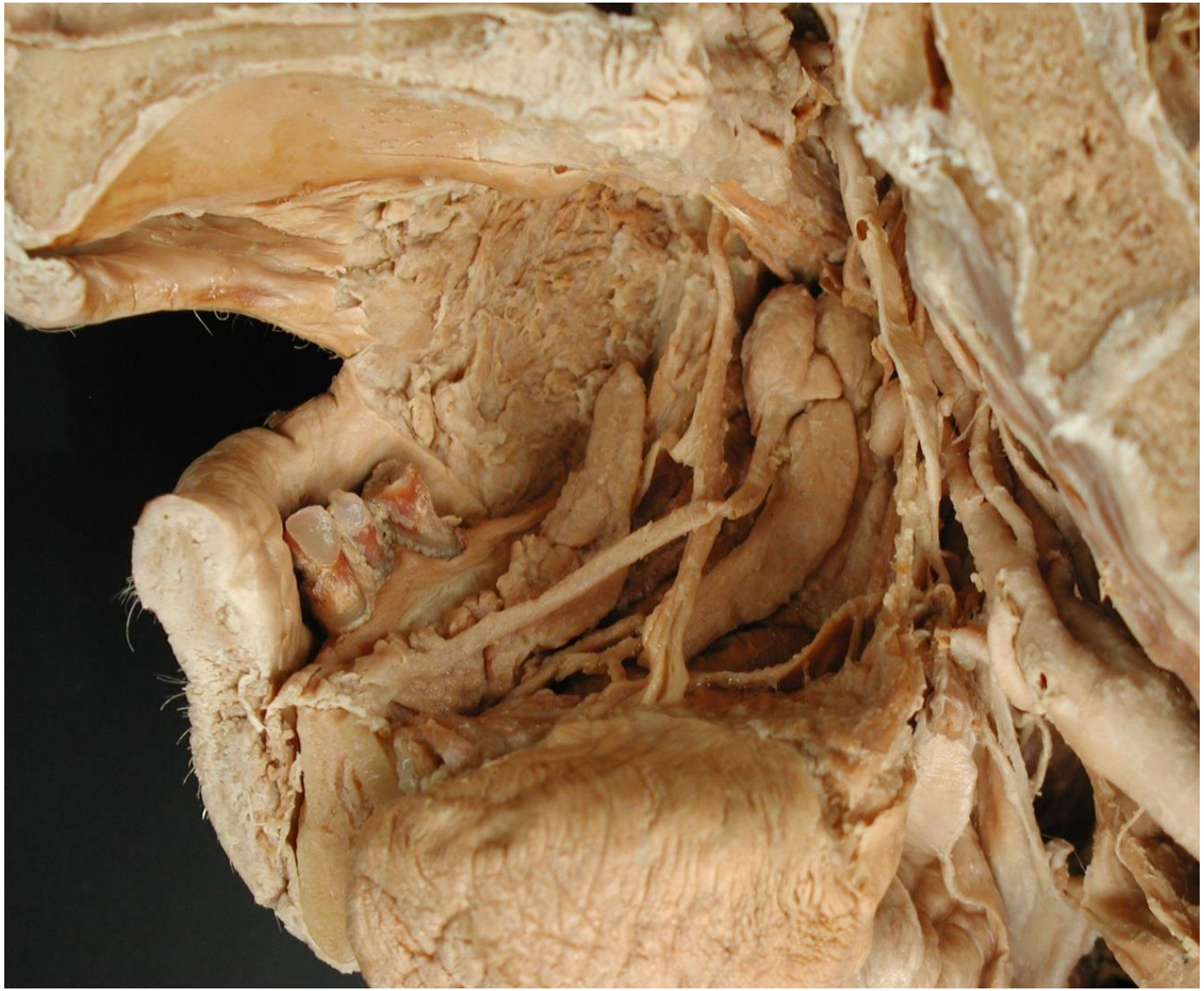
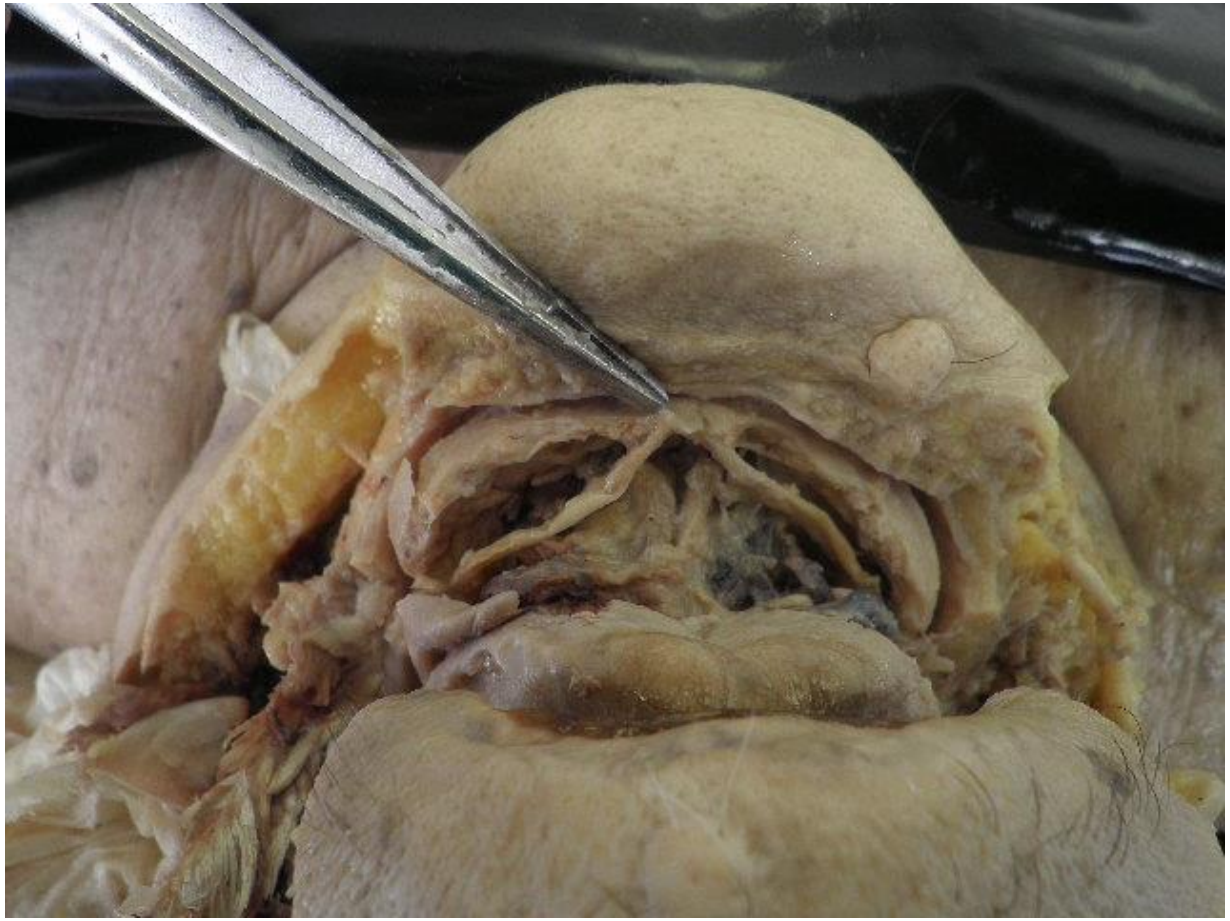
Median basal intermuscular lingual space

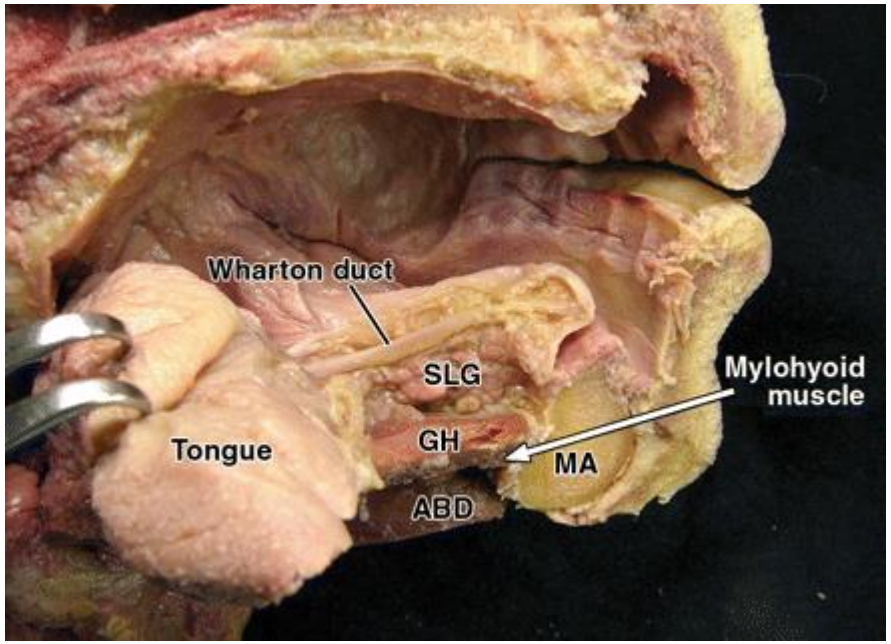
Sublingual region



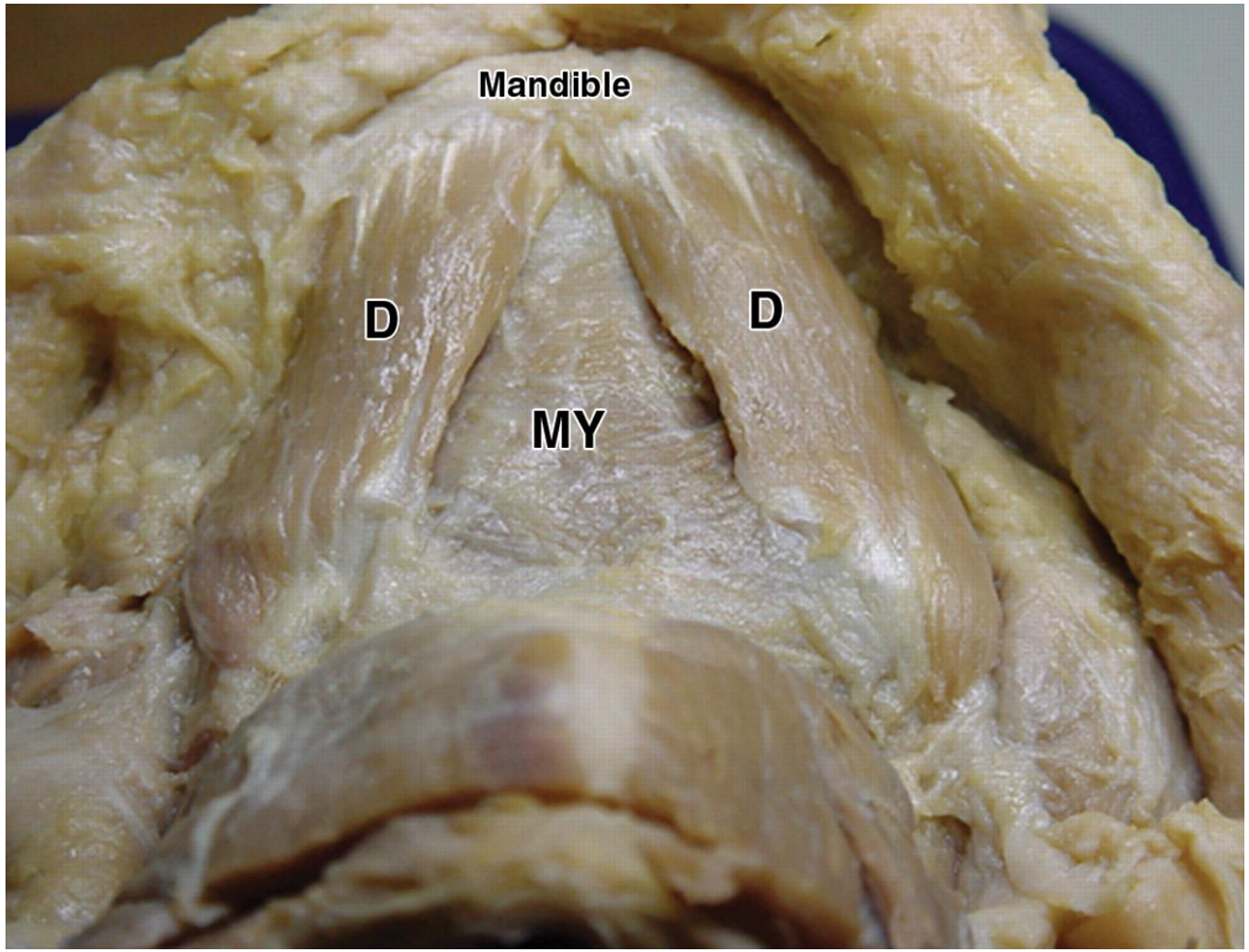
Submandibular duct



Submandibular duct or Wharton duct is 4-5 cm long, 3-4 mm wide, before its opening become slightly wide, at the level of sublingual caruncle the diameter is 1 mm.

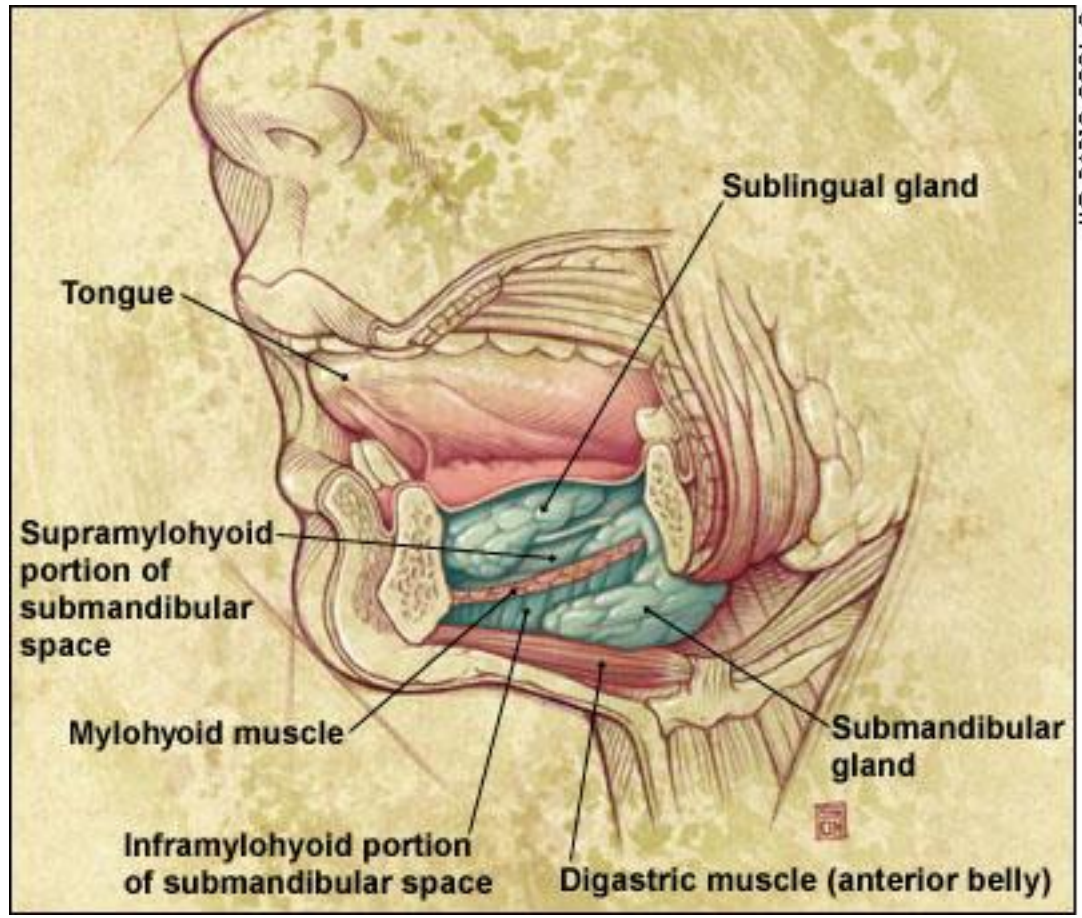


—Dissections of mylohyoid muscle.

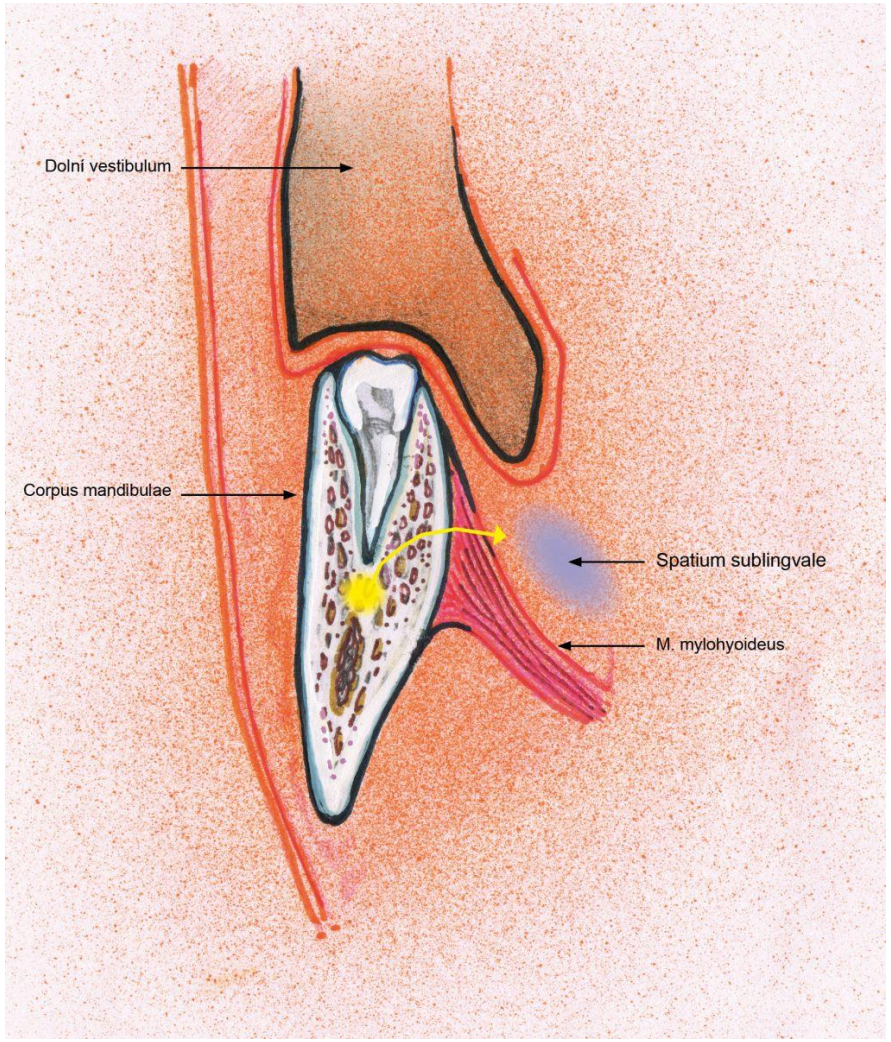


Otonari-Yamamoto M et al. AJR 2010;194:W431-W438

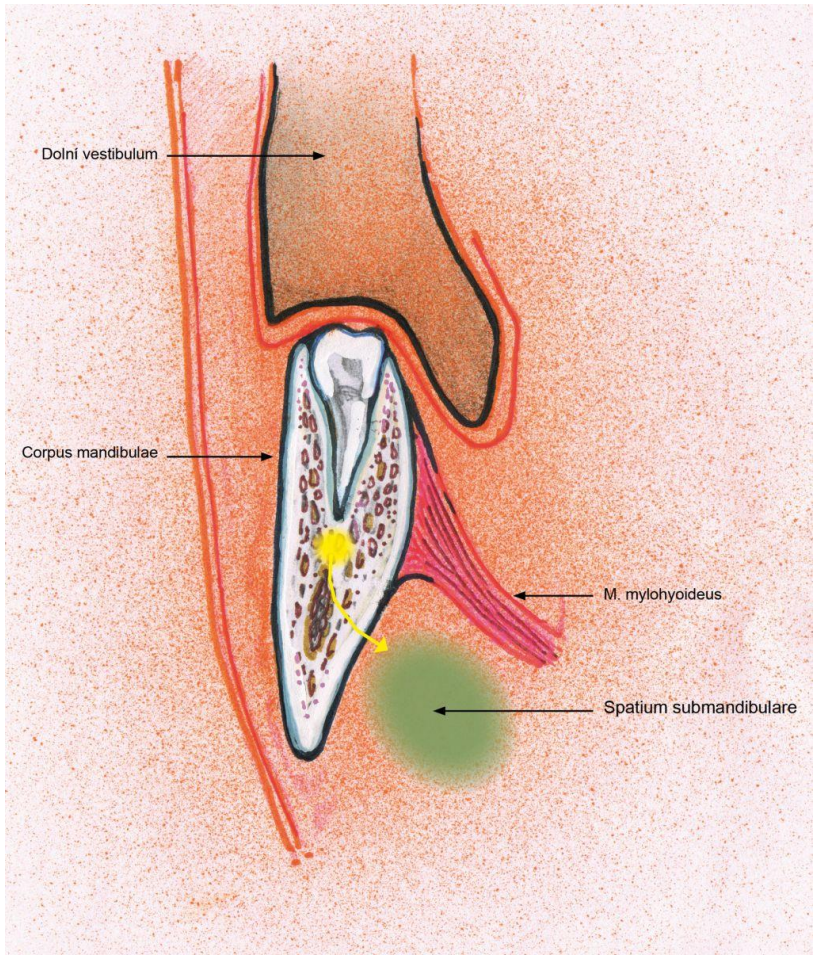
Sagittal section through oral cavity



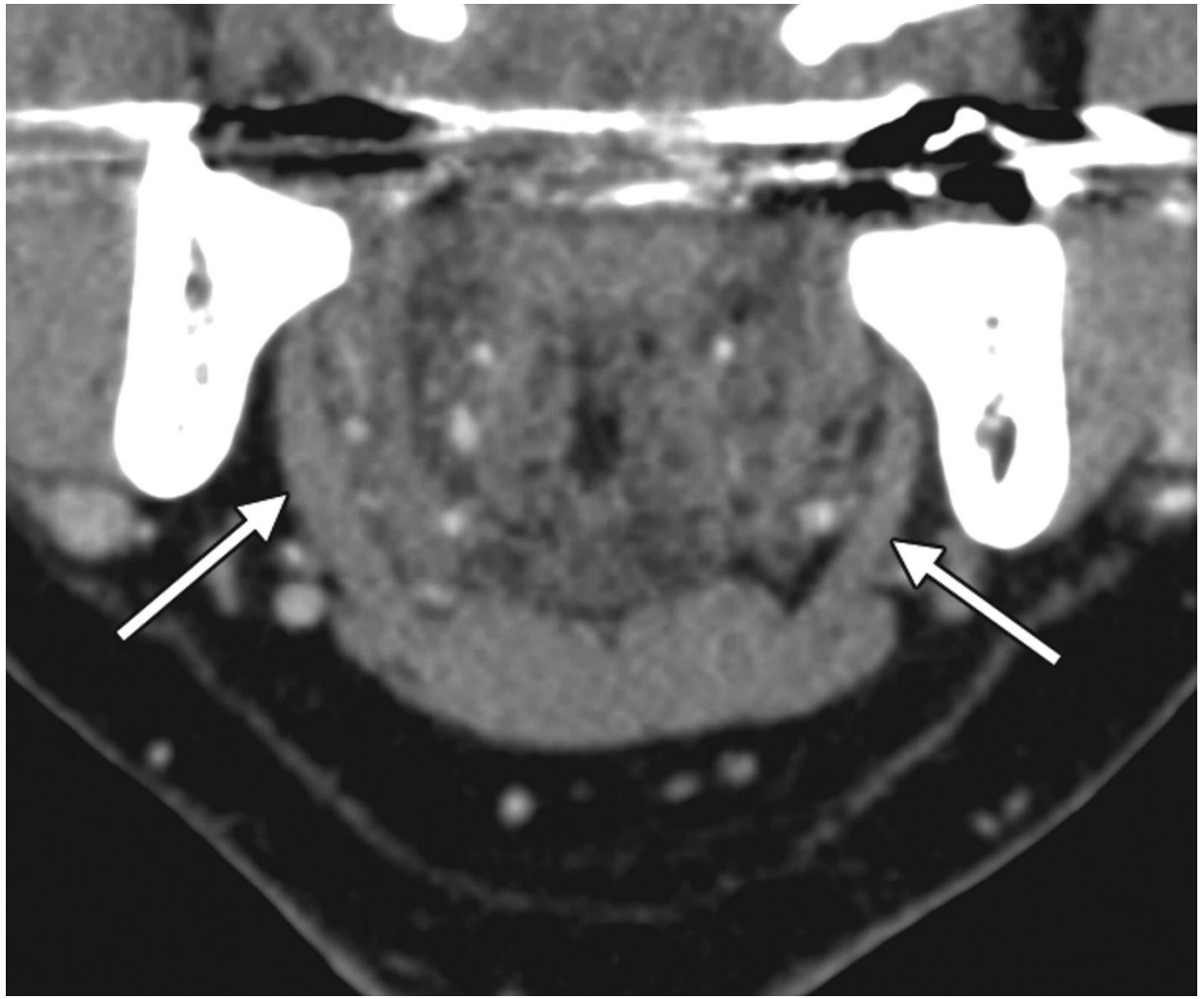
The apical part of the roots of the PM1, PM2, M1 and mesial root of the M2 in medial side are projecting above mylohyoid line, thats why the infection from subperiosteal abscess spread to the sublingual space.



The apical part of the roots of M3 and distal root of the M2 are projecting under the mylohyoid line, thats why the infection spread to the submandibular space.

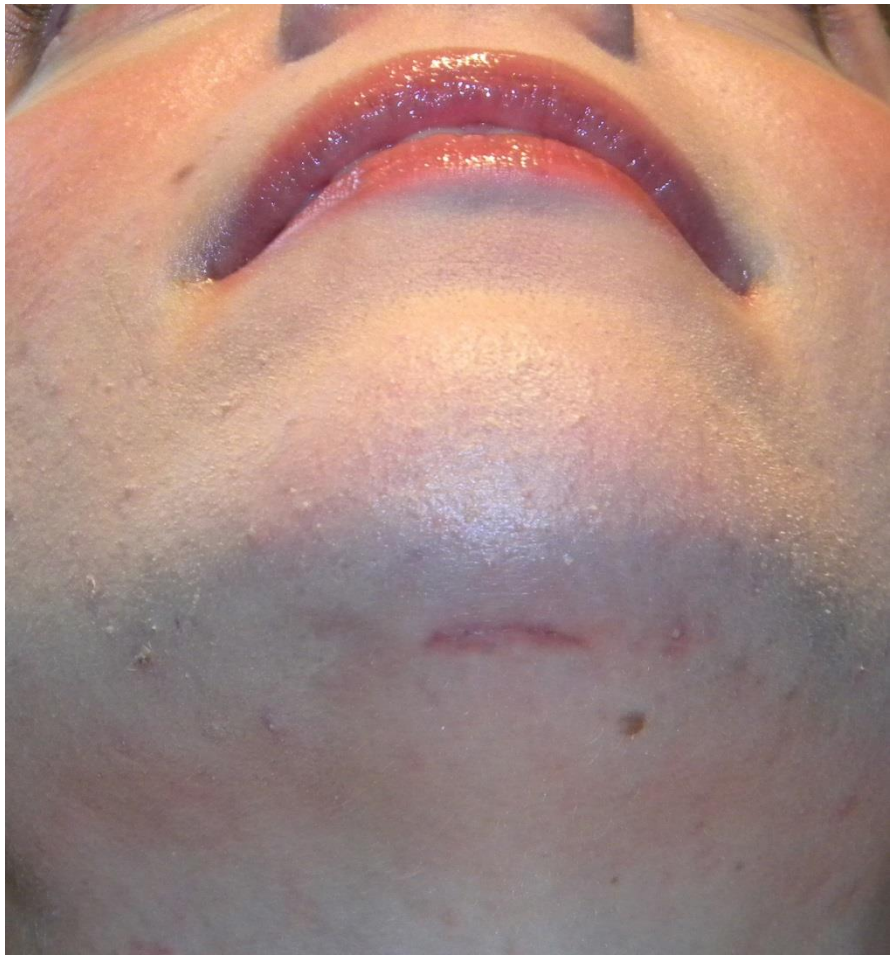


(a) Diagram shows the mylohyoid muscle (arrows), a muscular sling that separates the sublingual space superomedially from the submandibular space inferolaterally.



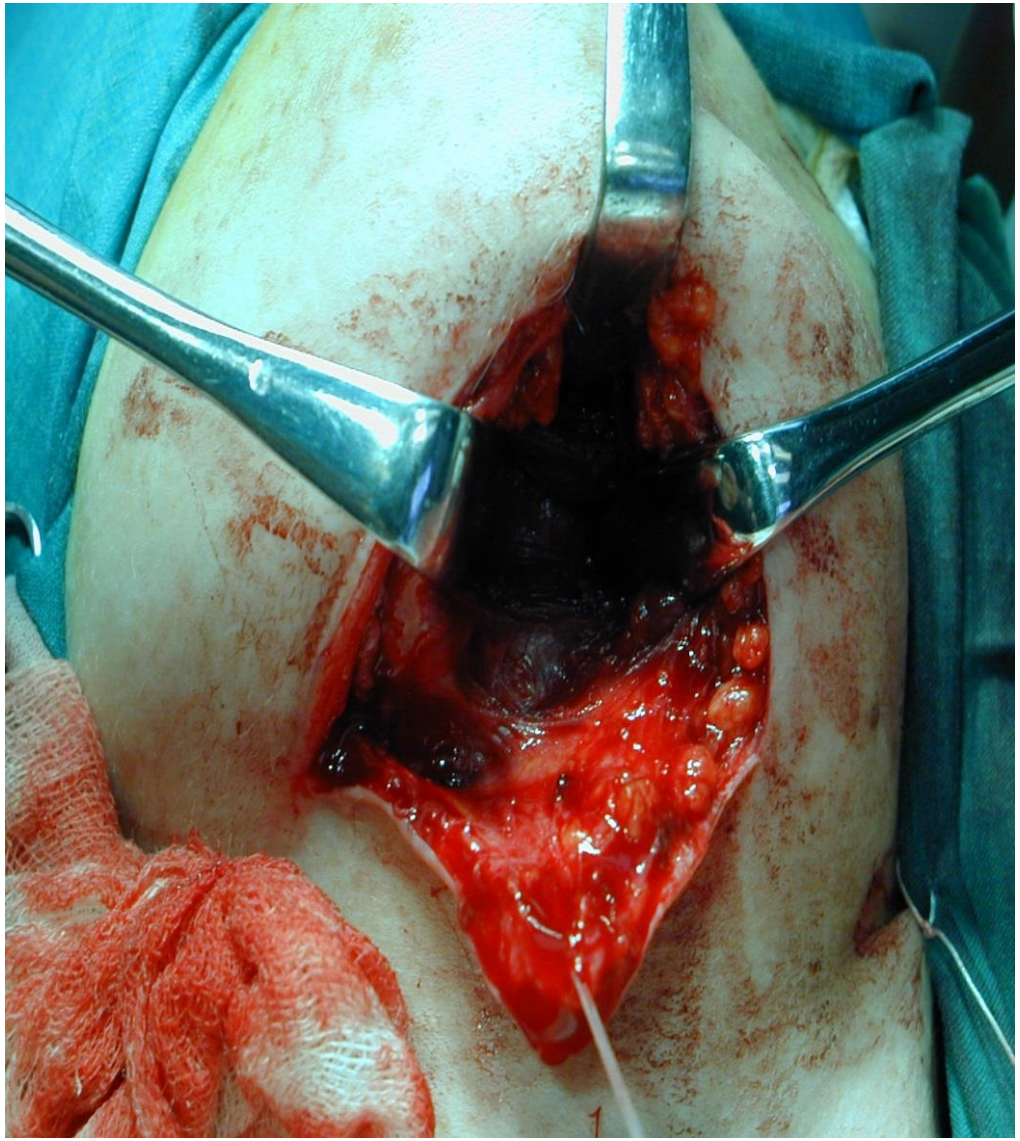
Trotta B M et al. Radiographics 2011;31:339-354

RadioGraphics



In vitro

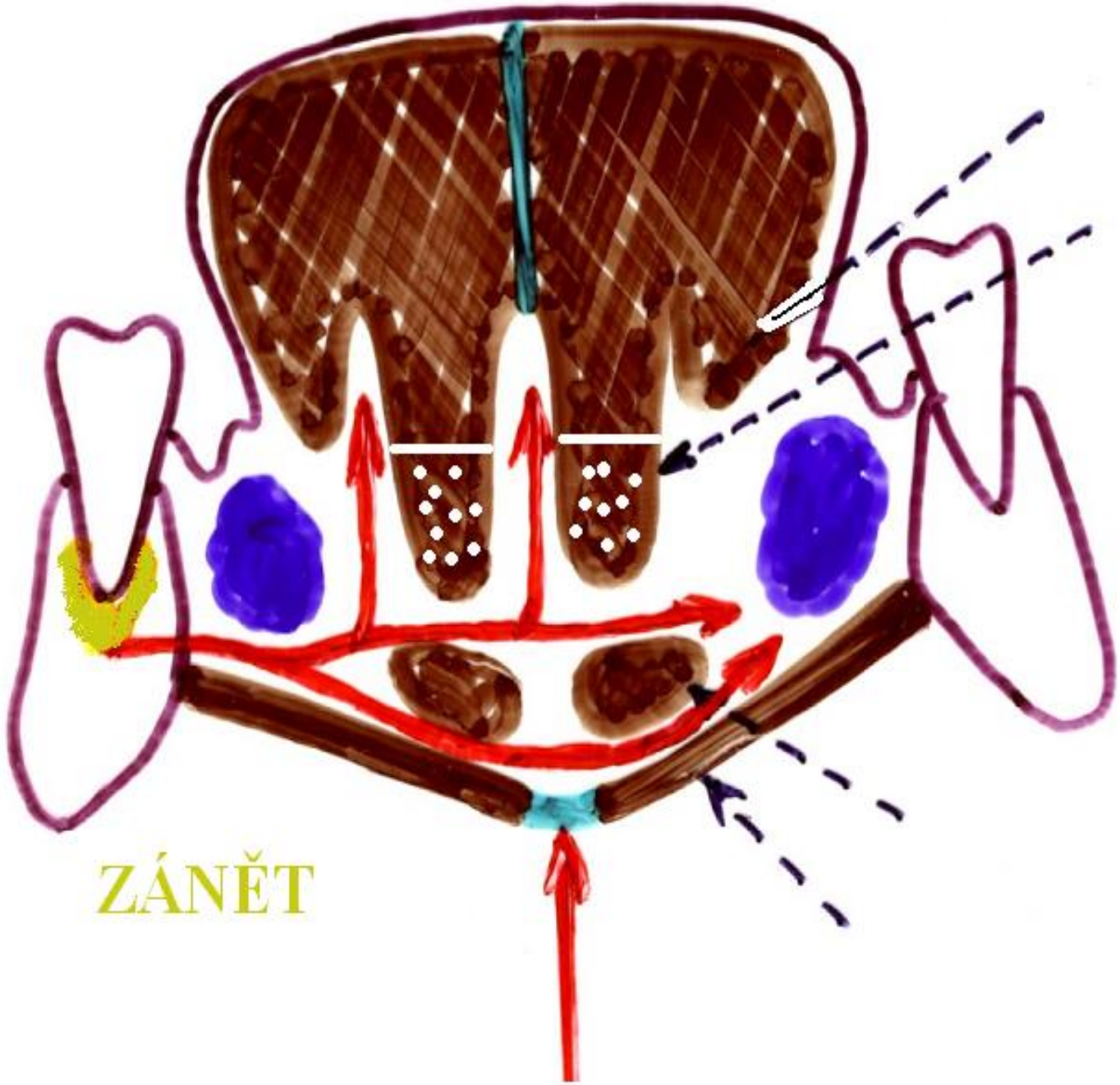
In vivo



Ludwig's angina is a form of severe diffuse cellulitis that presents an acute onset and spreads rapidly, bilaterally affecting the submandibular, sublingual and submental spaces resulting in a state of emergency.

Figure—Submandibular and sublingual erythema and swelling typical of Ludwig's angina.

Elevation of the floor of the mouth obstructing the airway which resulted in breathlessness and stridor.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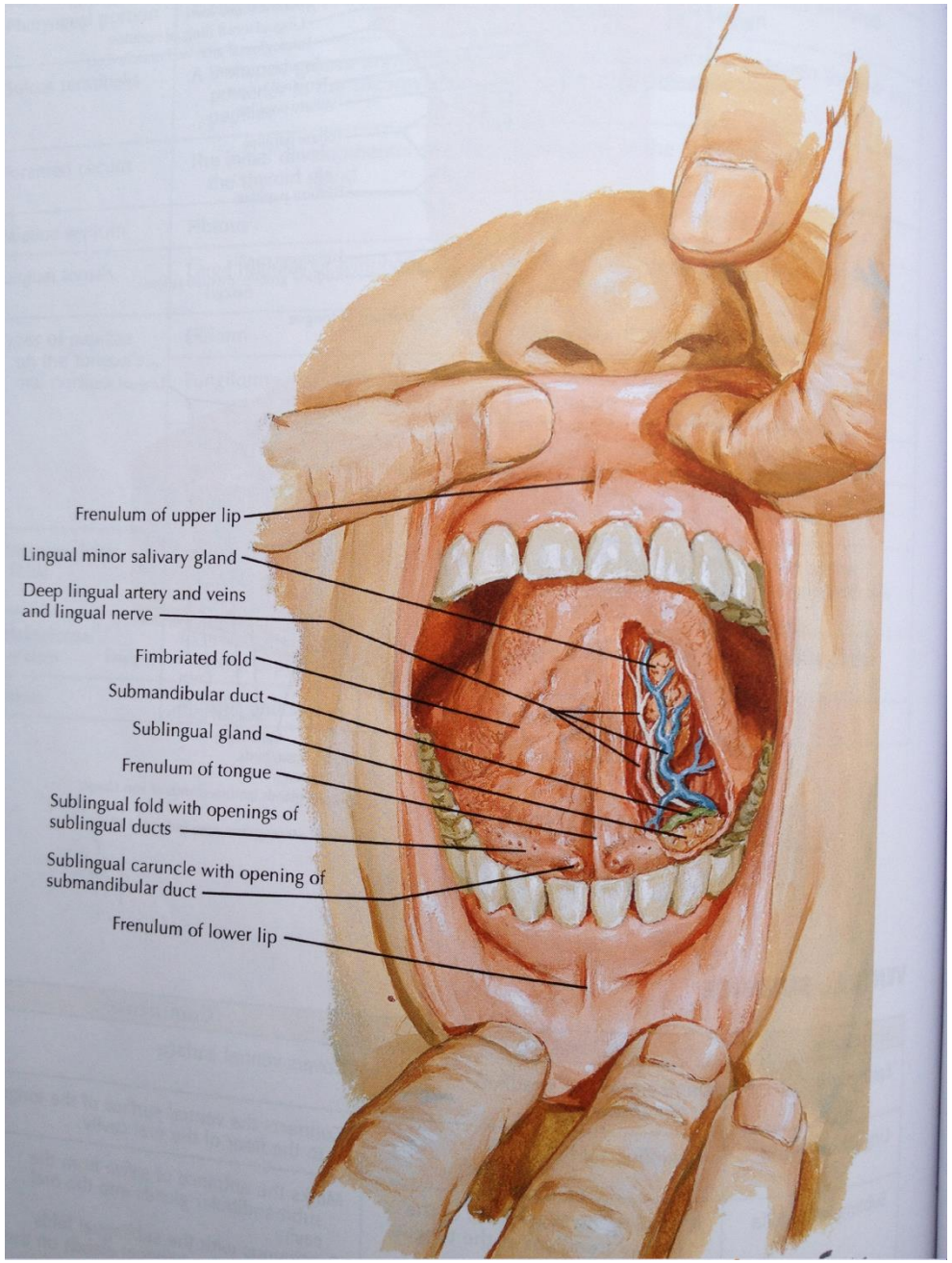
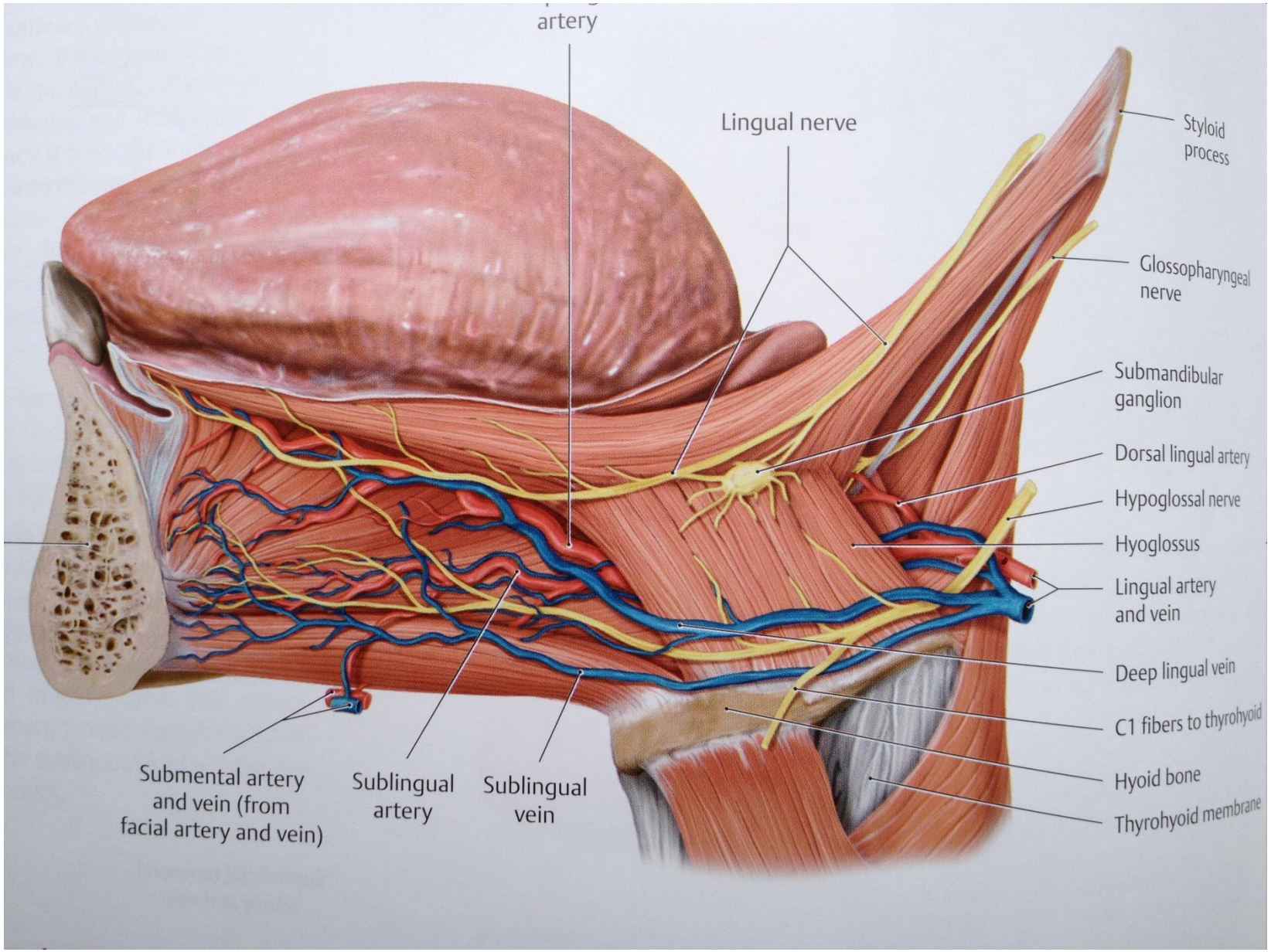
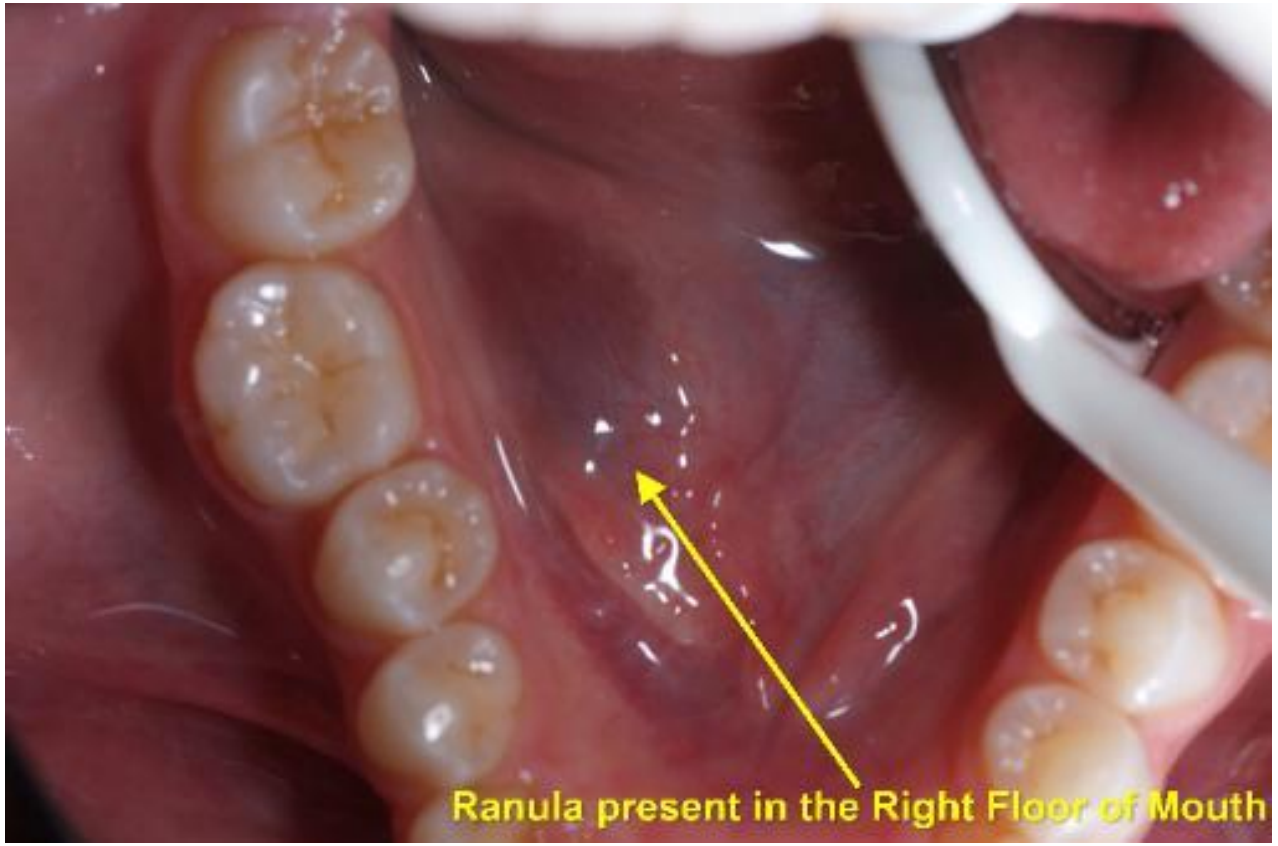
Gain access into the abscess is provided by the incision through mylohyoid raphe.


Frenulum of upper lip
Lingual minor salivary gland
Deep lingual artery and veins and lingual nerve
Fimbriated fold
Submandibular duct
Sublingual gland
Frenulum of tongue
Sublingual fold with openings of sublingual ducts
Sublingual caruncle with opening of submandibular duct
Frenulum of lower lip


artery
Lingual nerve
Styloid process
Glossopharyngeal nerve
Submandibular ganglion
Dorsal lingual artery
Hypoglossal nerve
Hyoglossus
Lingual artery and vein
Deep lingual vein
C1 fibers to thyrohyoid
Hyoid bone
Thyrohyoid membrane
Submental artery and vein (from facial artery and vein)
Sublingual artery
Sublingual vein

Ranula: is a type of mucocele found on the floor of the mouth. Ranulas present as a swelling of connective tissue consisting of collected mucin from a ruptured salivary gland duct, which is usually caused by local trauma.

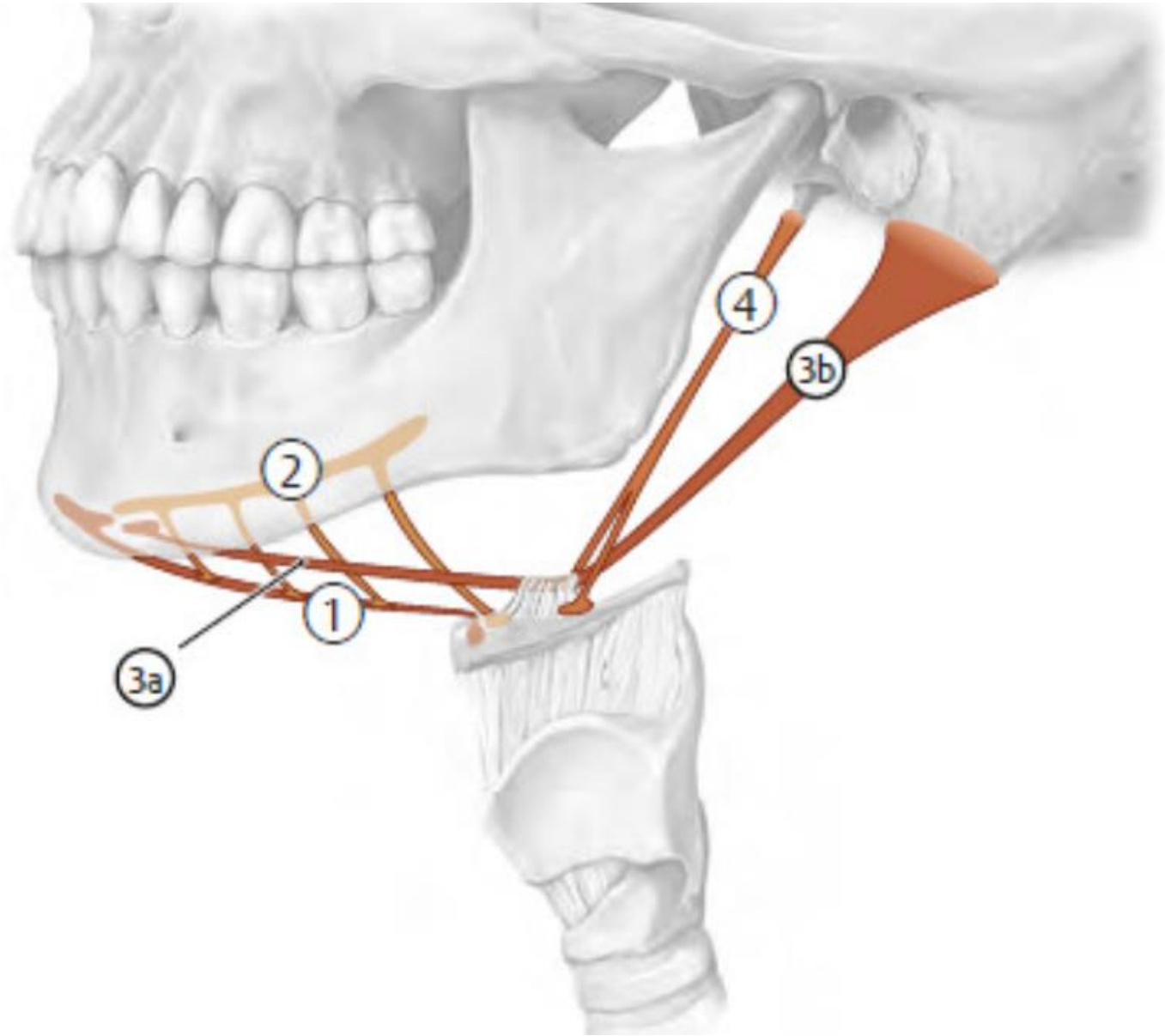


Thank you for your attention!

Suprahyoid muscles

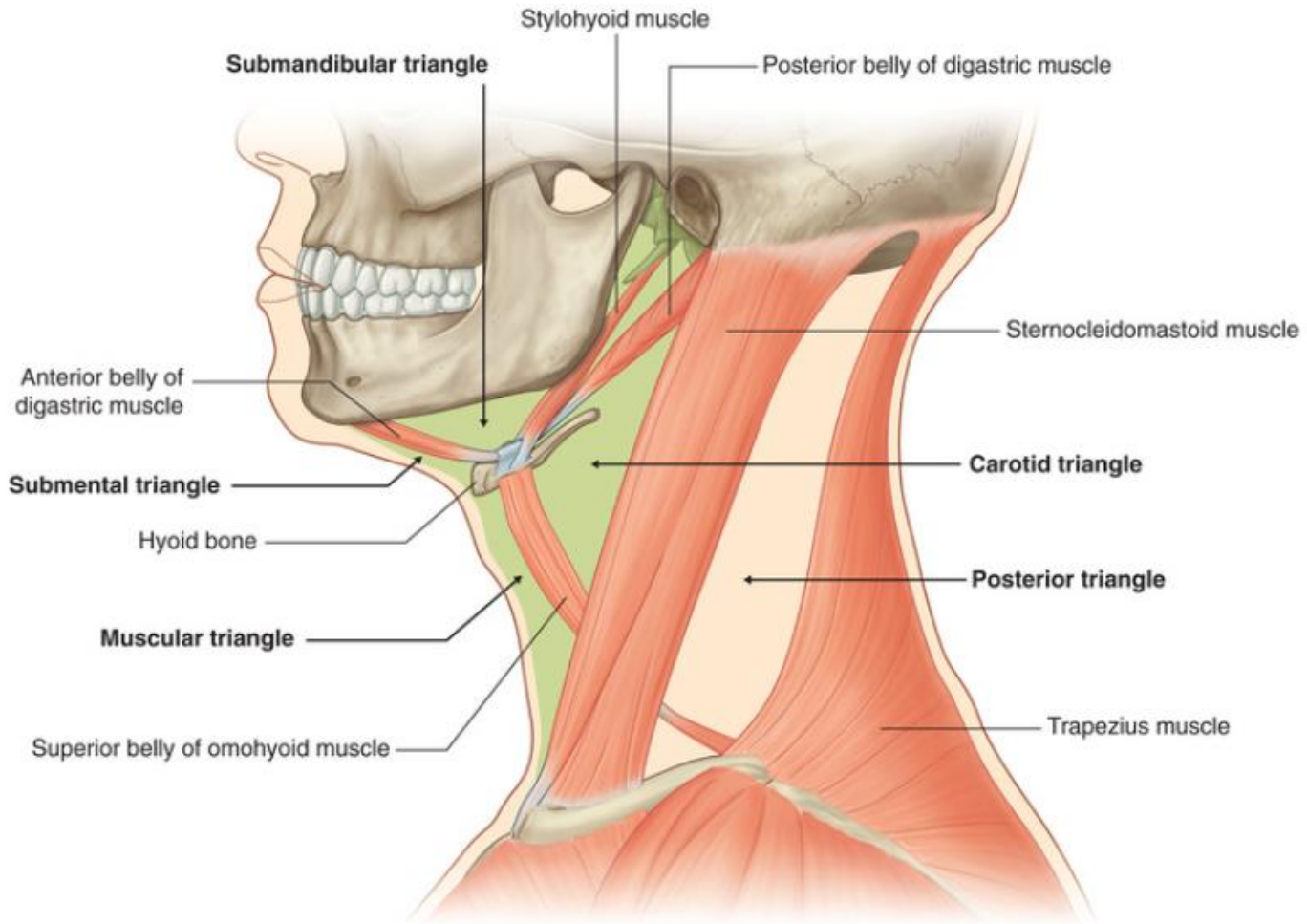
Muscles superior to the hyoid are classified as suprahyoid muscles and include the stylohyoid, digastric, mylohyoid, and geniohyoid.

They pass in a superior direction from the hyoid bone to the skull or mandible and raise the hyoid, as occurs during swallowing.



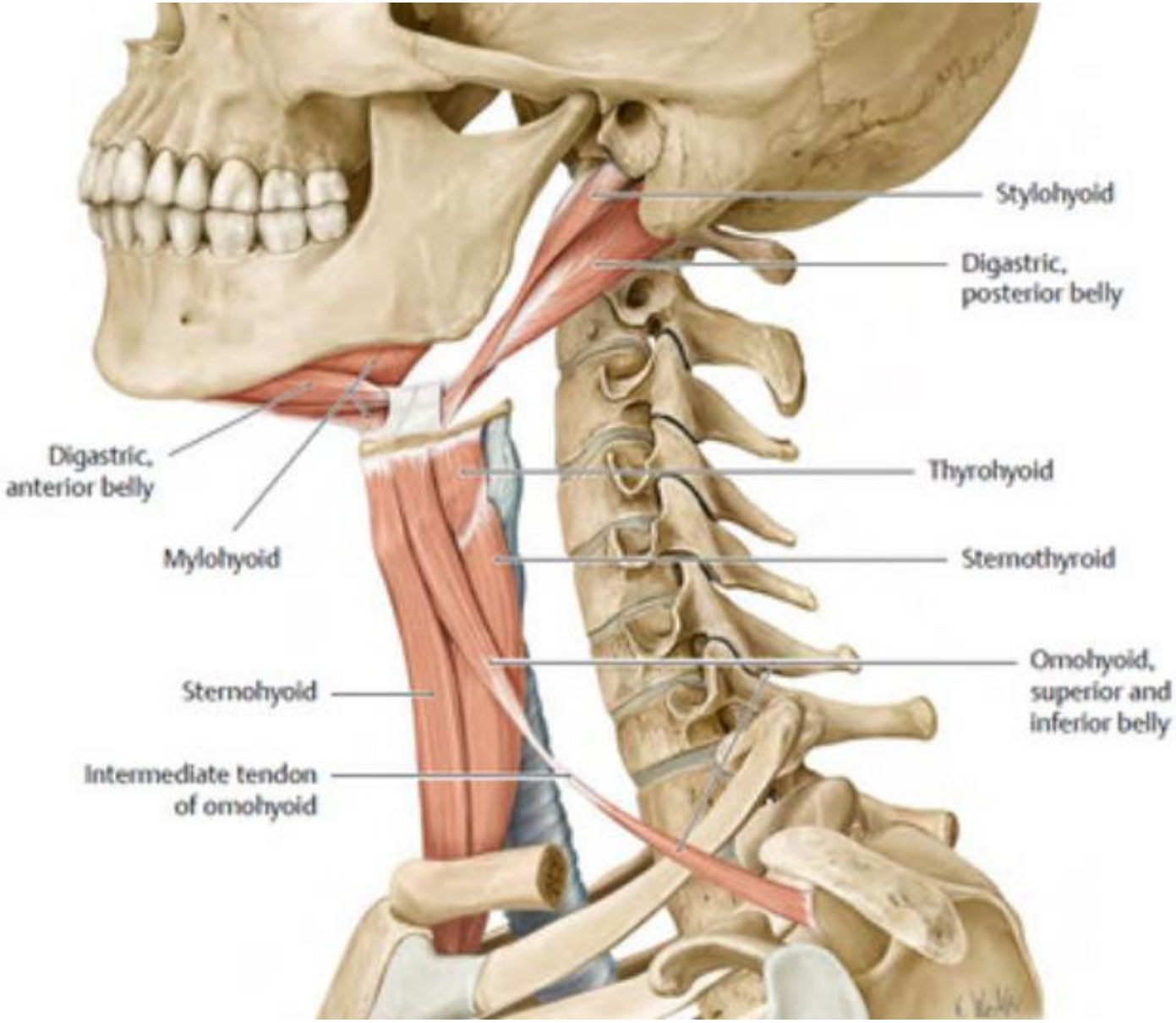
Suprahyoid muscles

The four pairs of suprahyoid muscles are related to the submental and submandibular triangles.



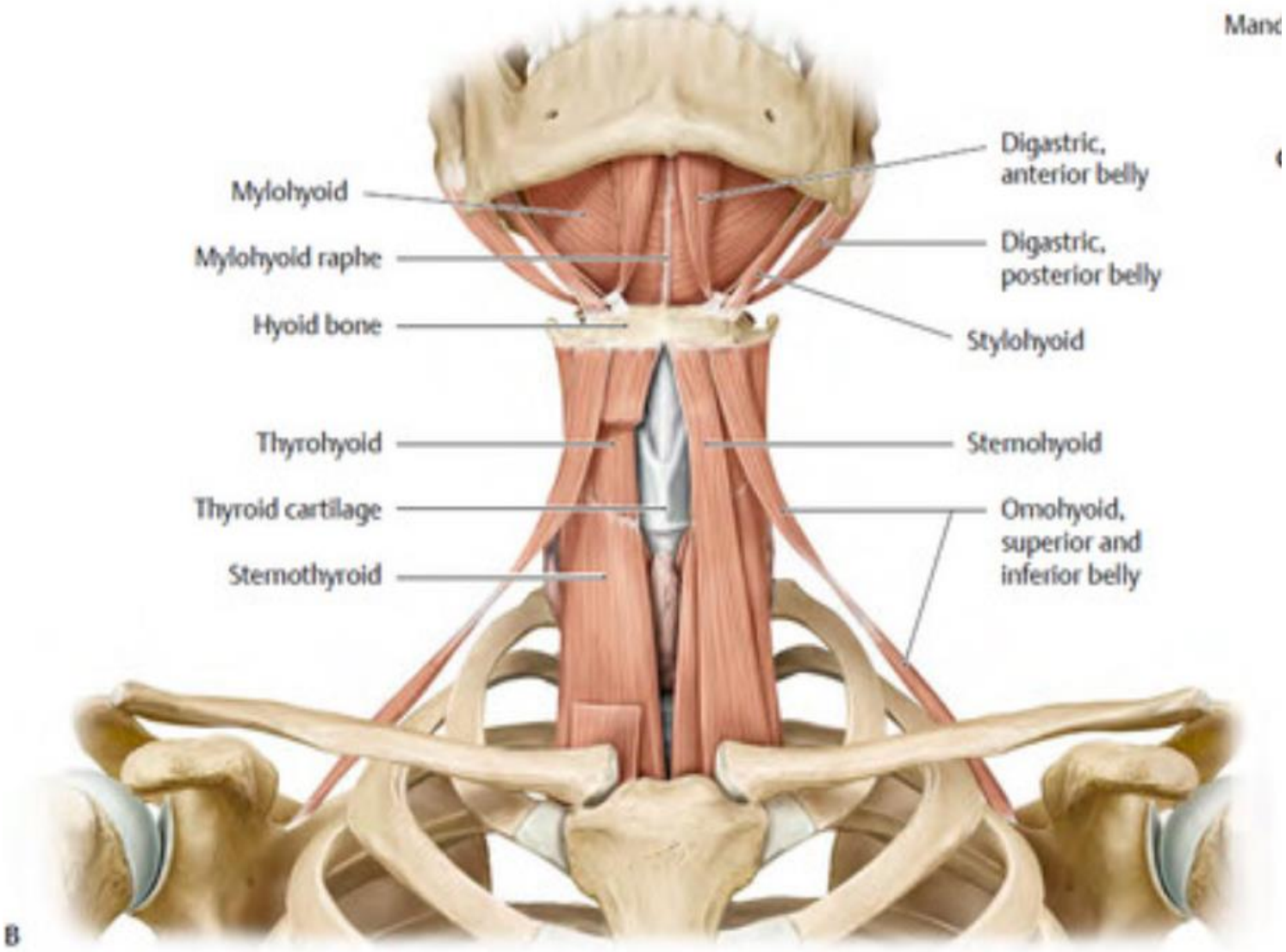
Muscle	Origin	Insertion	Innervation	Action
Suprahyoid muscles				
① Geniohyoid	Mandible (inferior mental spine)	Hyoid bone	Anterior ramus of C1 via hypoglossal n. (CN XII)*	Draws hyoid bone forward (during swallowing); assists in opening mandible
② Mylohyoid	Mandible (mylohyoid line)	Hyoid bone (via median tendon of insertion, the mylohyoid raphe)	Mylohyoid n. (from CN V_3)	Tightens and elevates oral floor; draws hyoid bone forward (during swallowing); assists in opening mandible and moving it side to side (mastication)
Digastric, anterior belly	Mandible (digastric fossa)	Hyoid bone (via an intermediate tendon with a fibrous loop)		Elevates hyoid bone (during swallowing); assists in opening mandible
Digastric, posterior belly	Temporal bone (mastoid notch, medial to mastoid process)		Facial n. (CN VII)	
④ Stylohyoid	Temporal bone (styloid process)	Hyoid bone (via a split tendon)		

The stylohyoid and posterior digastric are derived from the second pharyngeal arch and are therefore supplied by the facial nerve (CN VII).



The mylohyoid and anterior digastric are derived from the first pharyngeal arch and are therefore supplied by the trigeminal nerve (CN V). The mylohyoid nerve arises from the mandibular division of CN V before the majority of fibers enter the mandibular foramen as the inferior alveolar nerve.

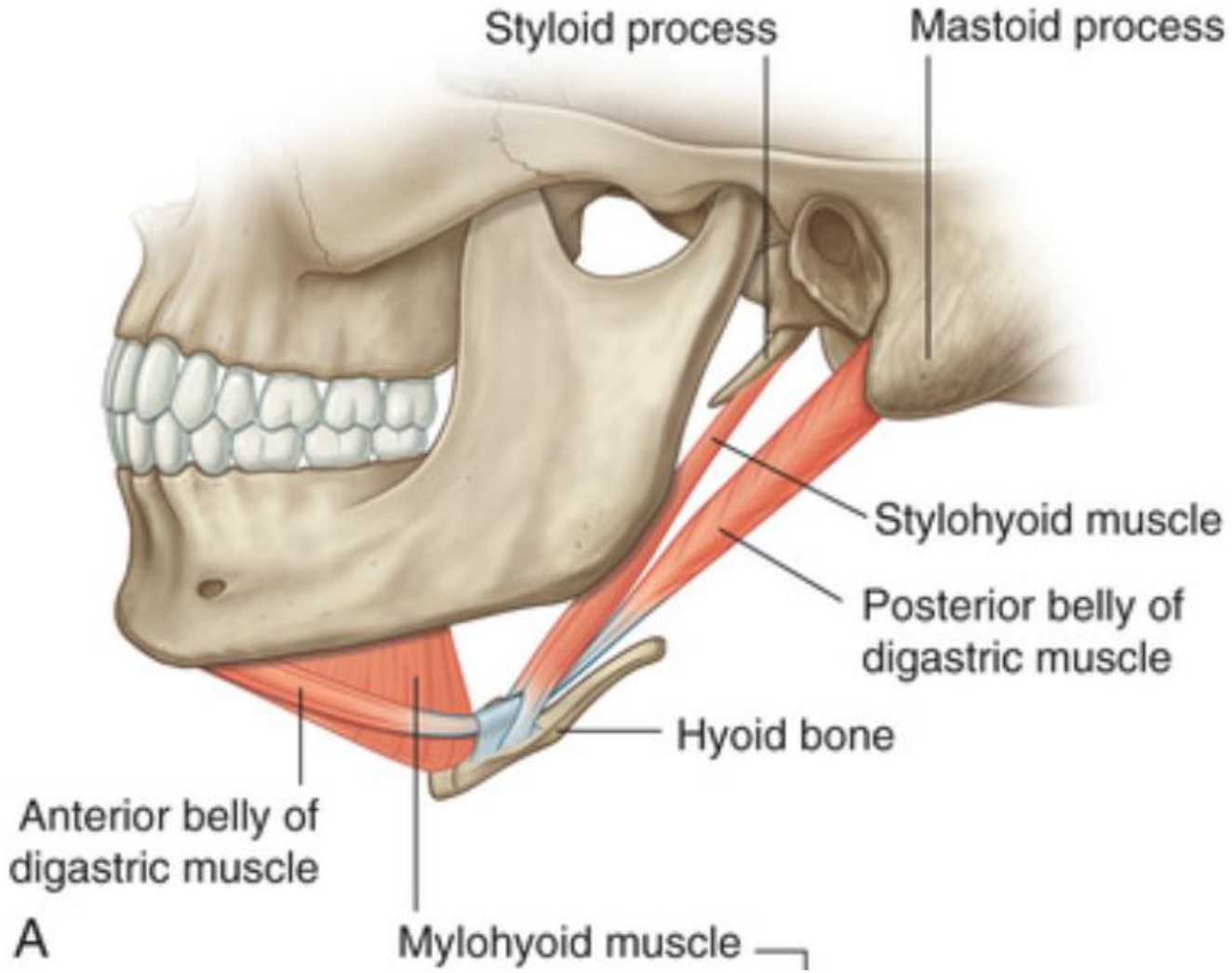
The remainder of the suprahyoid and infrahyoid muscles are supplied by the anterior rami of the cervical spinal nerves. Fibers from the anterior ramus of C1 travel with the hypoglossal nerve (CN XII) to the geniohyoid and thyrohyoid. Fibers from the anterior rami of C1–C3 combine to form the ansa cervicalis, which gives off branches to the omohyoid, sternohyoid, and sternothyroid.



Stylohyoid m.

The stylohyoid muscle arises from the base of the styloid process and passes anteroinferiorly to attach to the lateral area of the body of the hyoid bone.

During swallowing it pulls the hyoid bone posterosuperiorly and it is innervated by the facial nerve [VII].



Digastric m.

The digastric muscle has two bellies connected by a tendon, which attaches to the body of the hyoid bone:

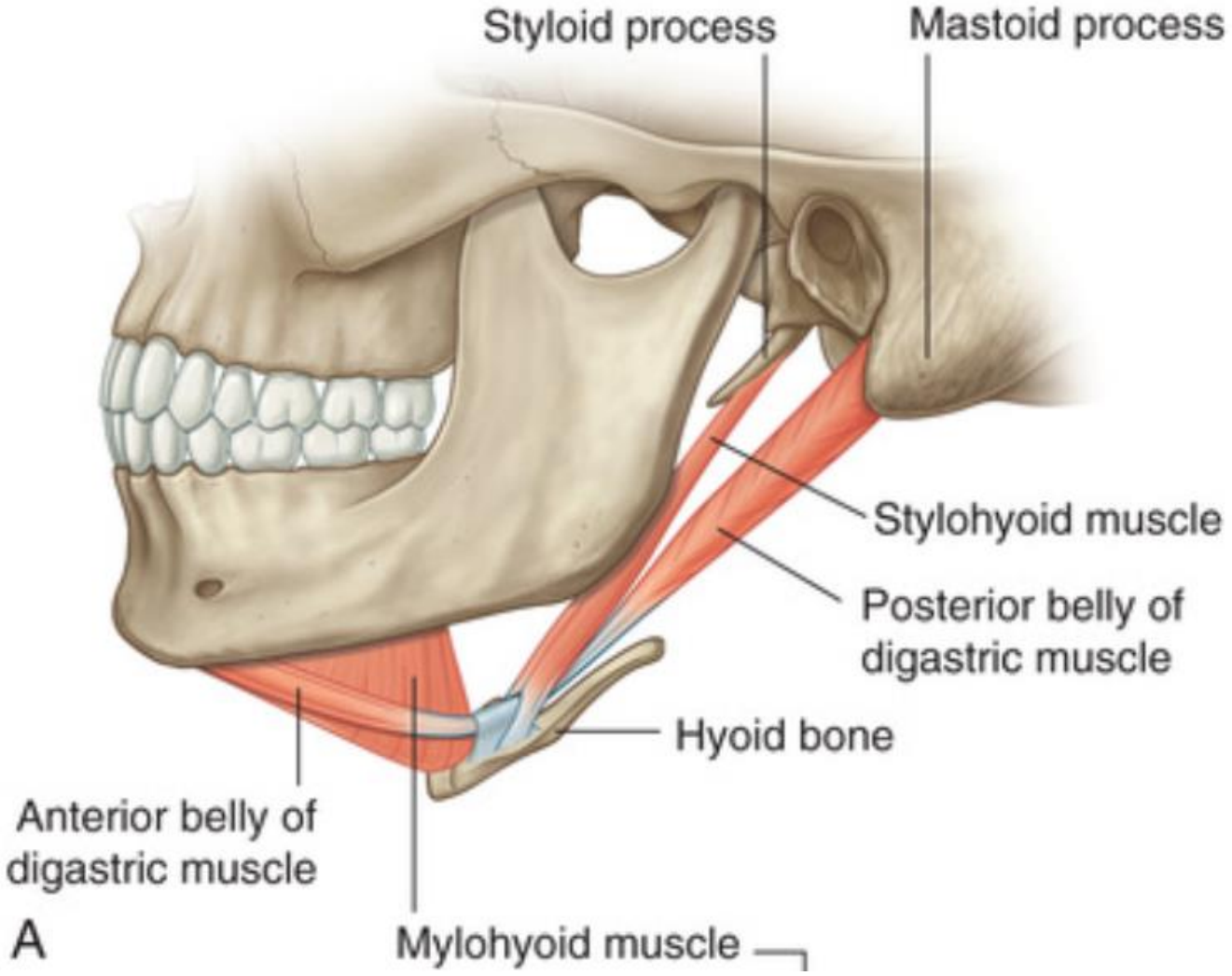
- The posterior belly arises from the mastoid notch on the medial side of the mastoid process of the temporal bone.
- The anterior belly arises from the digastric fossa on the lower inside of the mandible.

The tendon between the two bellies, which is attached to the body of the hyoid bone, is the point of insertion of both bellies. Because of this arrangement, the muscle has multiple actions depending on which bone is fixed:

- When the mandible is fixed, the digastric muscle raises the hyoid bone.
- When the hyoid bone is fixed, the digastric muscle opens the mouth by lowering the mandible.

Innervation of the digastric muscle is from two different cranial nerves.

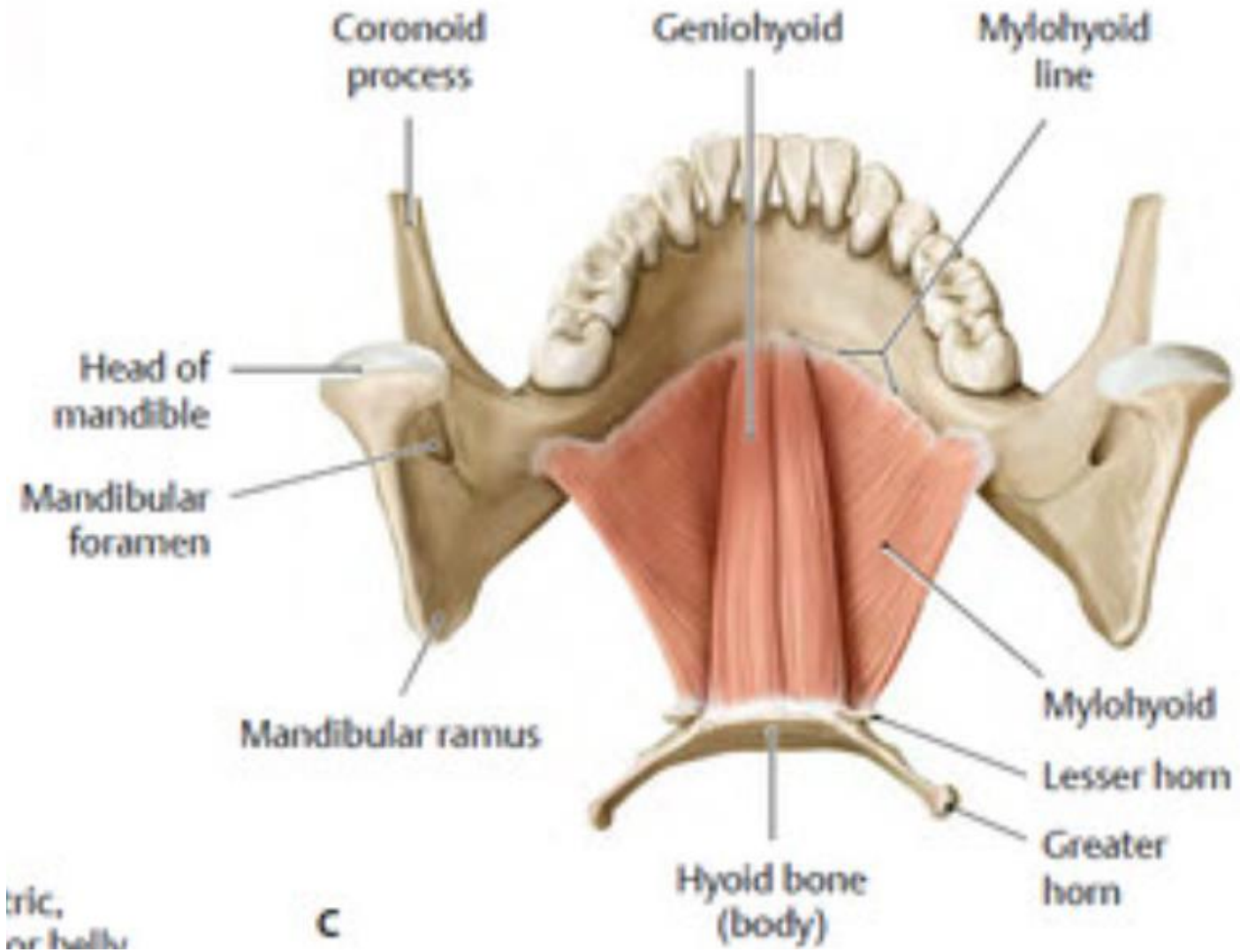
The innervation of the posterior belly of the digastric muscle is by the facial nerve [VII], whereas the anterior belly of the muscle is innervated by the mylohyoid branch of inferior alveolar branch of mandibular division [V3] of the trigeminal nerve [V].



Mylohyoid m.

The mylohyoid muscle is superior to the anterior belly of the digastric and, with its partner from the opposite side, forms the floor of the mouth. It originates from the mylohyoid line on the medial surface of the body of the mandible and inserts into the hyoid bone and also blends with the mylohyoid muscle from the opposite side.

This mylohyoid muscle supports and elevates the floor of the mouth and elevates the hyoid bone. It is innervated by the mylohyoid branch of inferior alveolar branch of mandibular division [V3] of the trigeminal nerve [V].



Geniohyoid m.

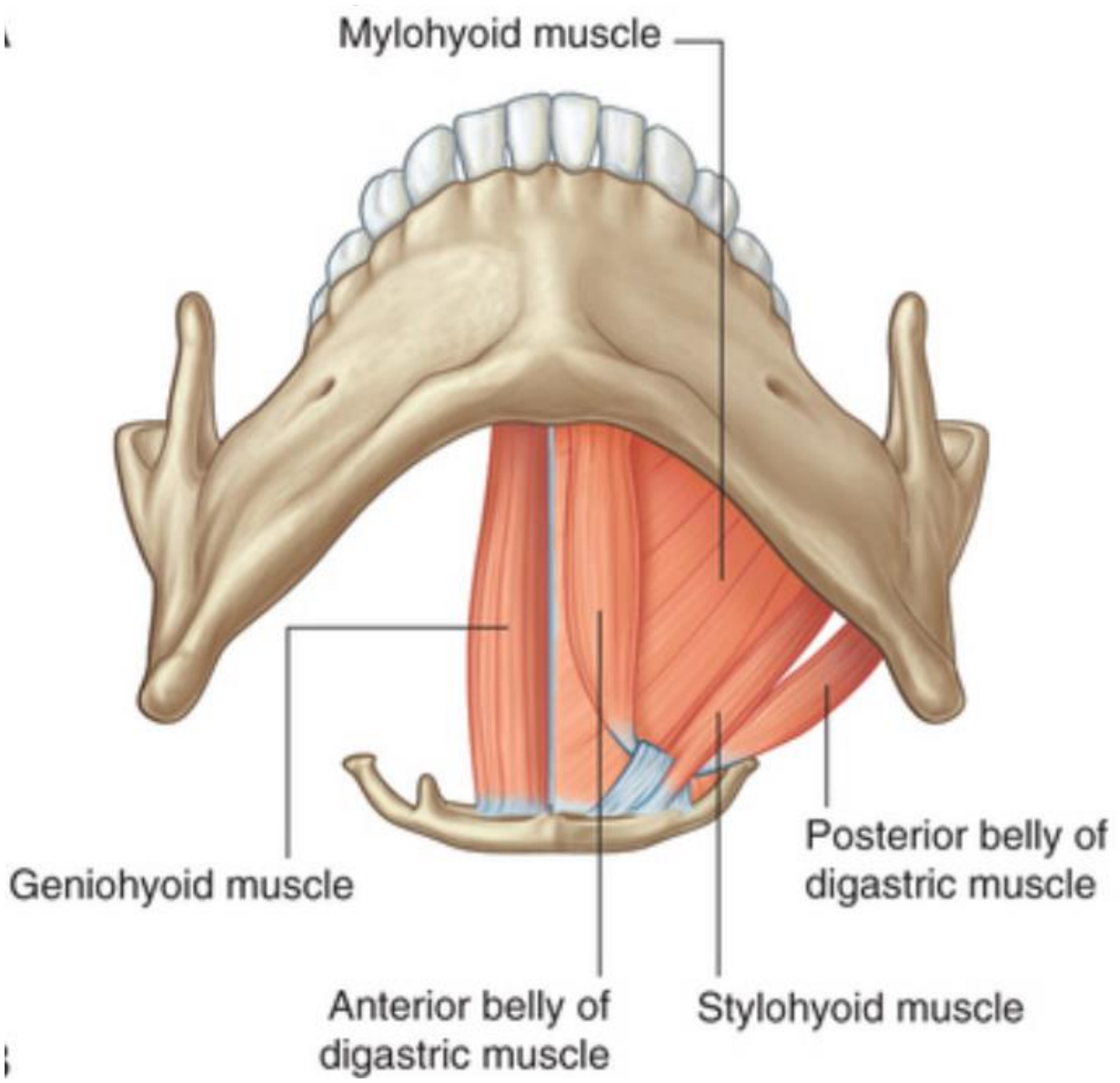
The geniohyoid muscle is superior to the floor of the oral cavity and is not generally considered a muscle of the anterior triangle of the neck; however, it can be regarded as a suprahyoid muscle. It is the final muscle in the suprahyoid group. A narrow muscle, it is superior to the medial part of each mylohyoid muscle. The muscles from each side are next to each other in the midline.

The geniohyoid arises from the inferior mental spine of the mandible and passes backward and downward to insert on the body of the hyoid bone.

It has two functions depending on which bone is fixed:

- **Fixation of the mandible elevates and pulls the hyoid bone forward.**
- **Fixation of the hyoid bone pulls the mandible downward and inward.**

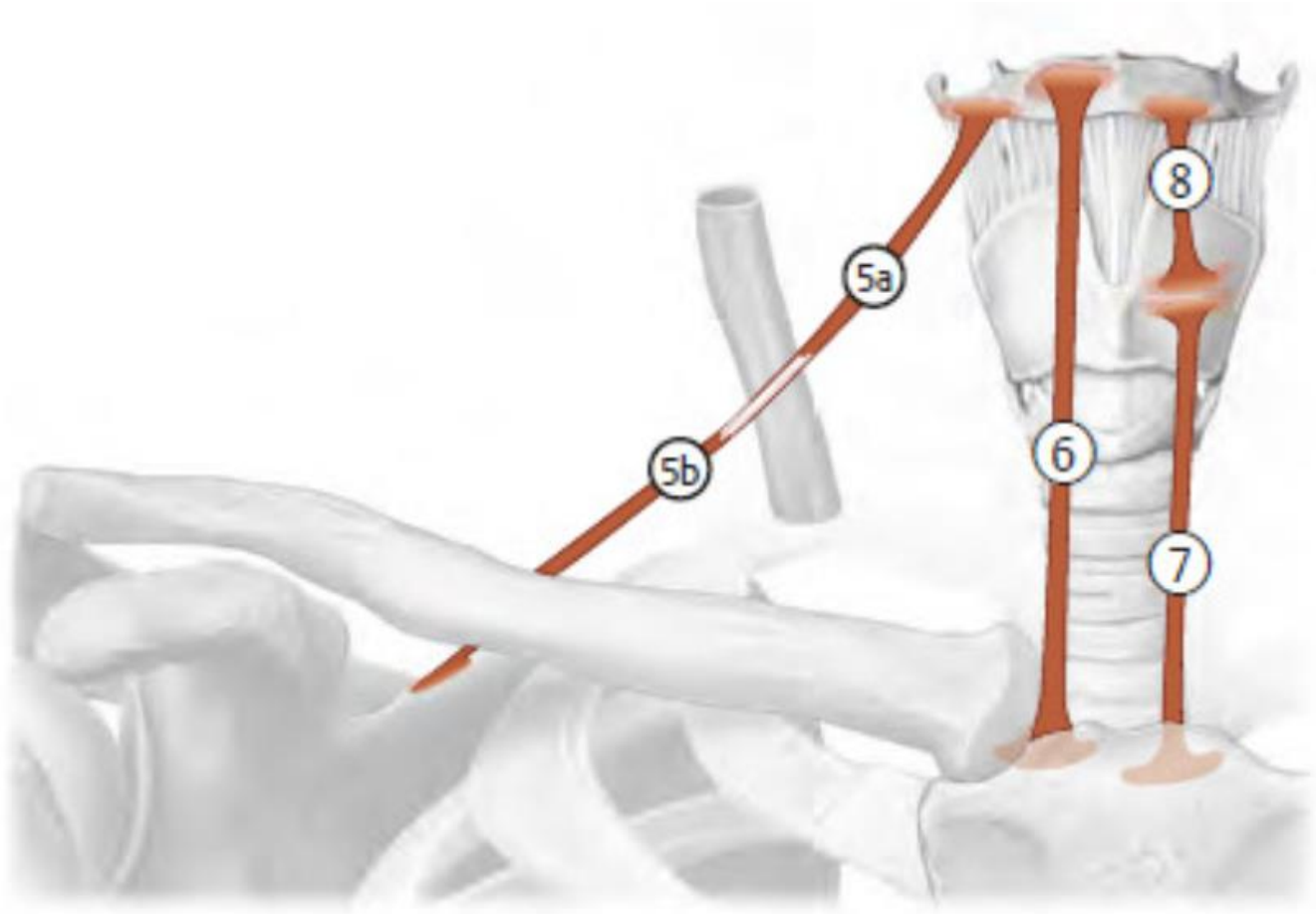
The geniohyoid is innervated by a branch from the anterior ramus of C1 carried along the hypoglossal nerve [XII].



Infrahyoid muscles

Muscles inferior to the hyoid are infrahyoid muscles and include the omohyoid, sternohyoid, thyrohyoid, and sternothyroid.

The four infrahyoid muscles are related to the muscular triangle. They attach the hyoid bone to inferior structures and depress the hyoid bone. They also provide a stable point of attachment for the suprahyoid muscles. Because of their appearance, they are sometimes referred to as the "strap muscles."

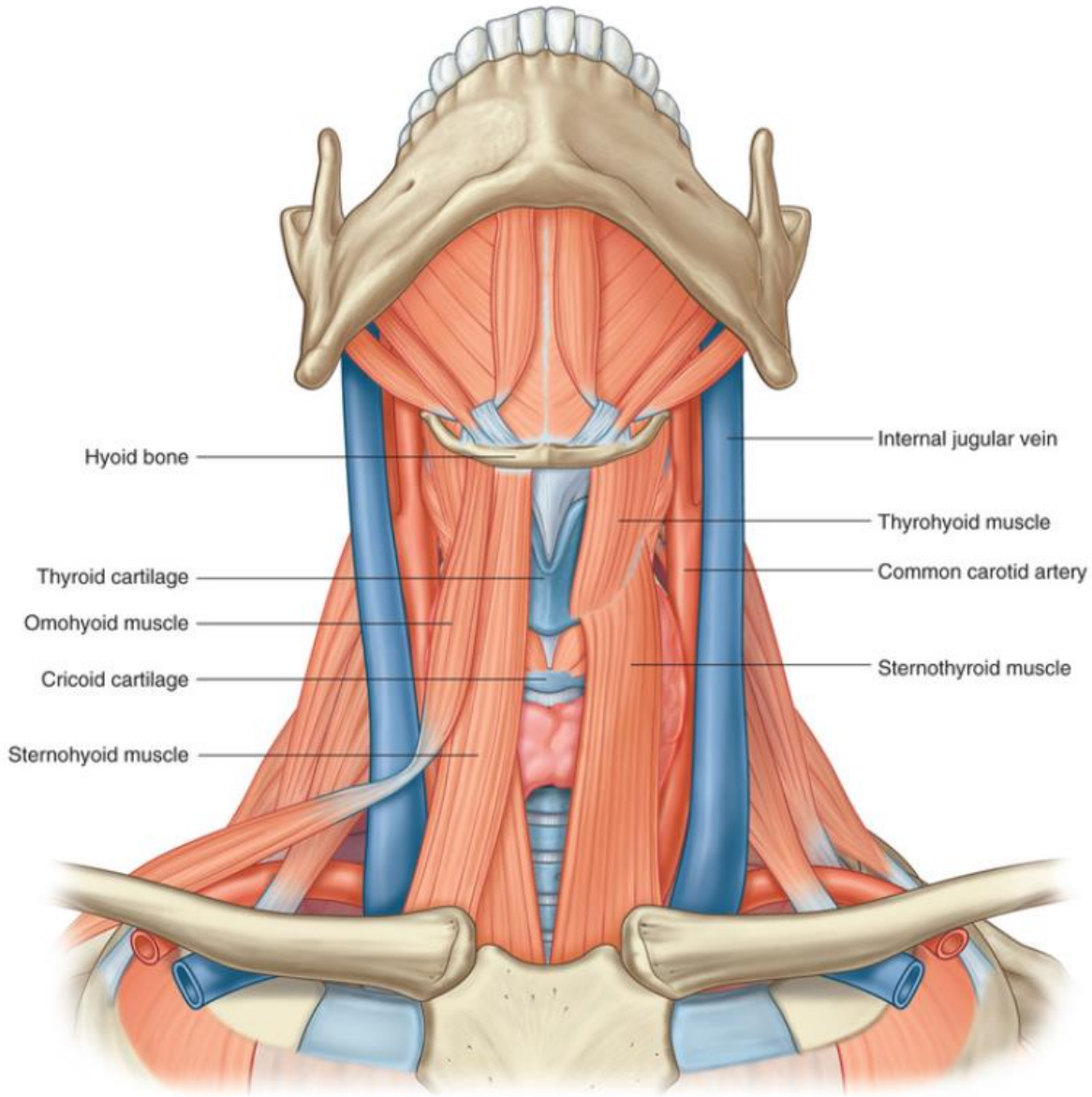


Muscle Infrahyoid muscles	Origin	Insertion	Innervation	Action
Omohyoid, superior belly	Intermediate tendon of omohyoid	Hyoid bone	Ansa cervicalis of cervical plexus (C1–C3)	Depresses (fixes) hyoid; draws larynx and hyoid down for phonation and terminal phases of swallowing**
Omohyoid, inferior belly	Scapula (superior border, medial to suprascapular notch)	Intermediate tendon of omohyoid		
⑥ Sternohyoid	Manubrium and sternoclavicular joint (posterior surface)	Hyoid bone		
⑦ Sternothyroid	Manubrium (posterior surface)	Thyroid cartilage (oblique line)	Ansa cervicalis C2, C3	
⑧ Thyrohyoid	Thyroid cartilage (oblique line)	Hyoid bone	Anterior ramus of C1 via hypoglossal n. (CN XII)	Depresses and fixes hyoid; raises the larynx during swallowing

Sternohyoid m.

The sternohyoid muscle is a long, thin muscle originating from the posterior aspect of the sternoclavicular joint and adjacent manubrium of the sternum.

It ascends to insert onto the body of the hyoid bone. It depresses the hyoid bone and is innervated by the anterior rami of C1 to C3 through the ansa cervicalis.

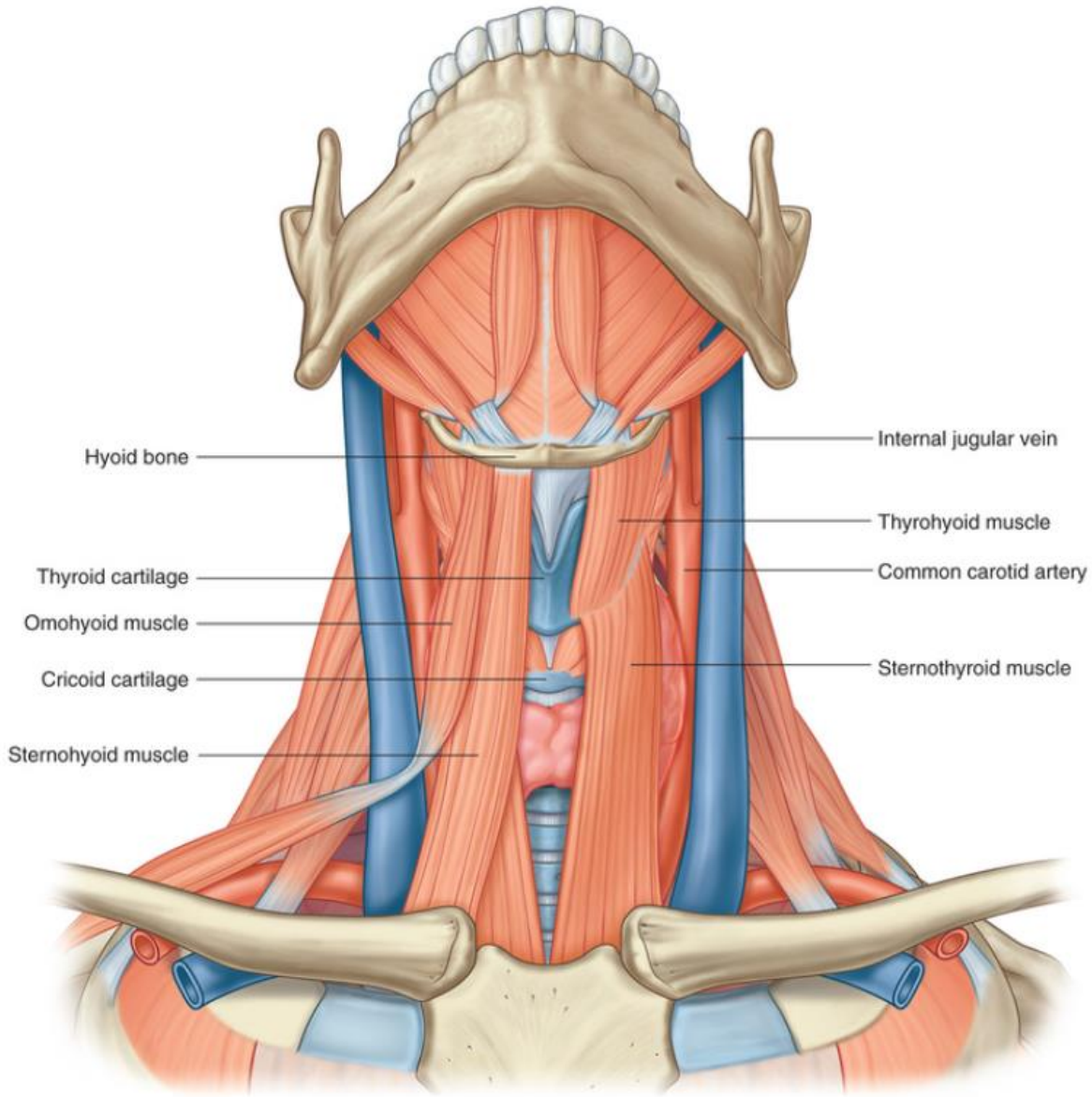


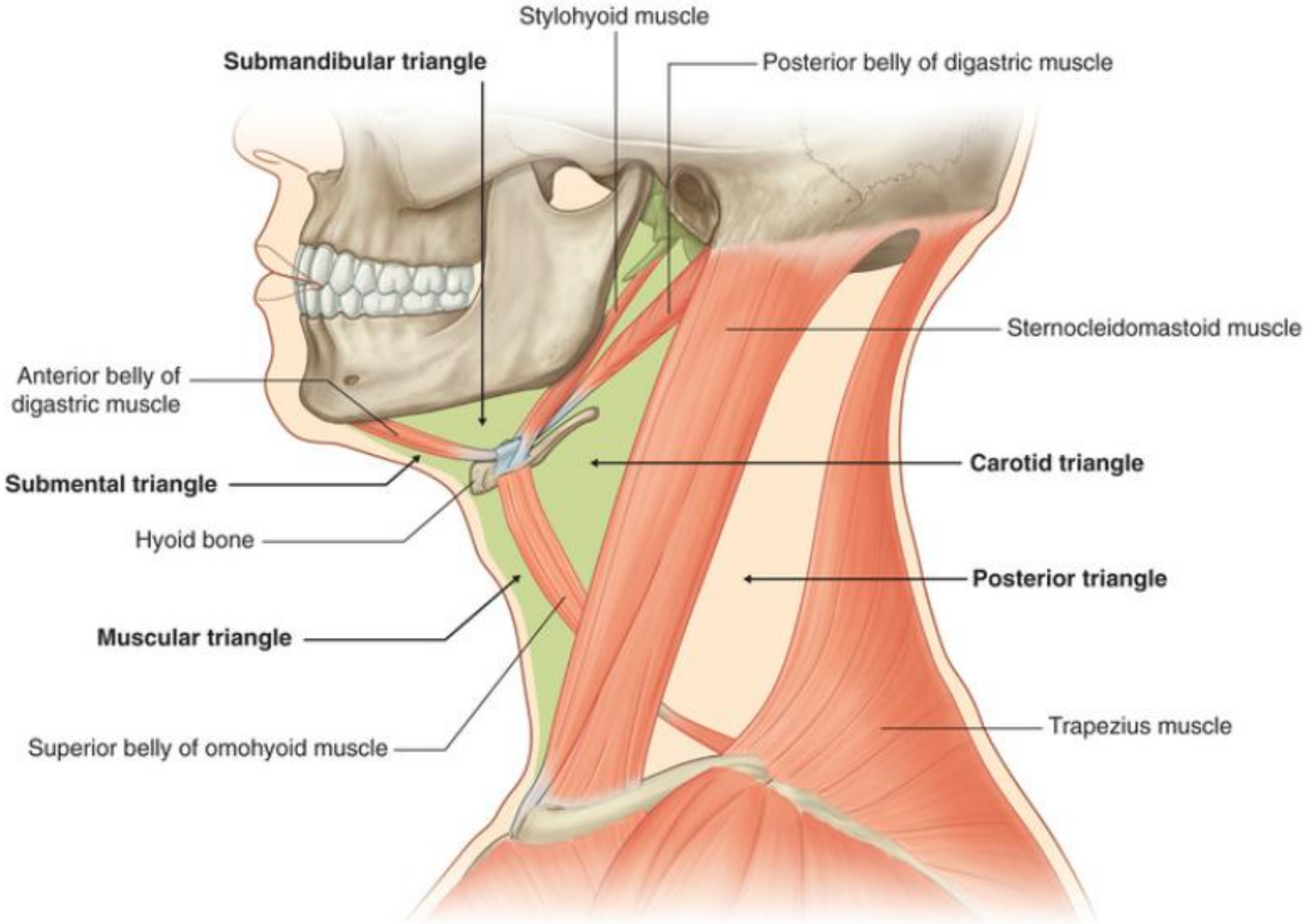
Omohyoid m.

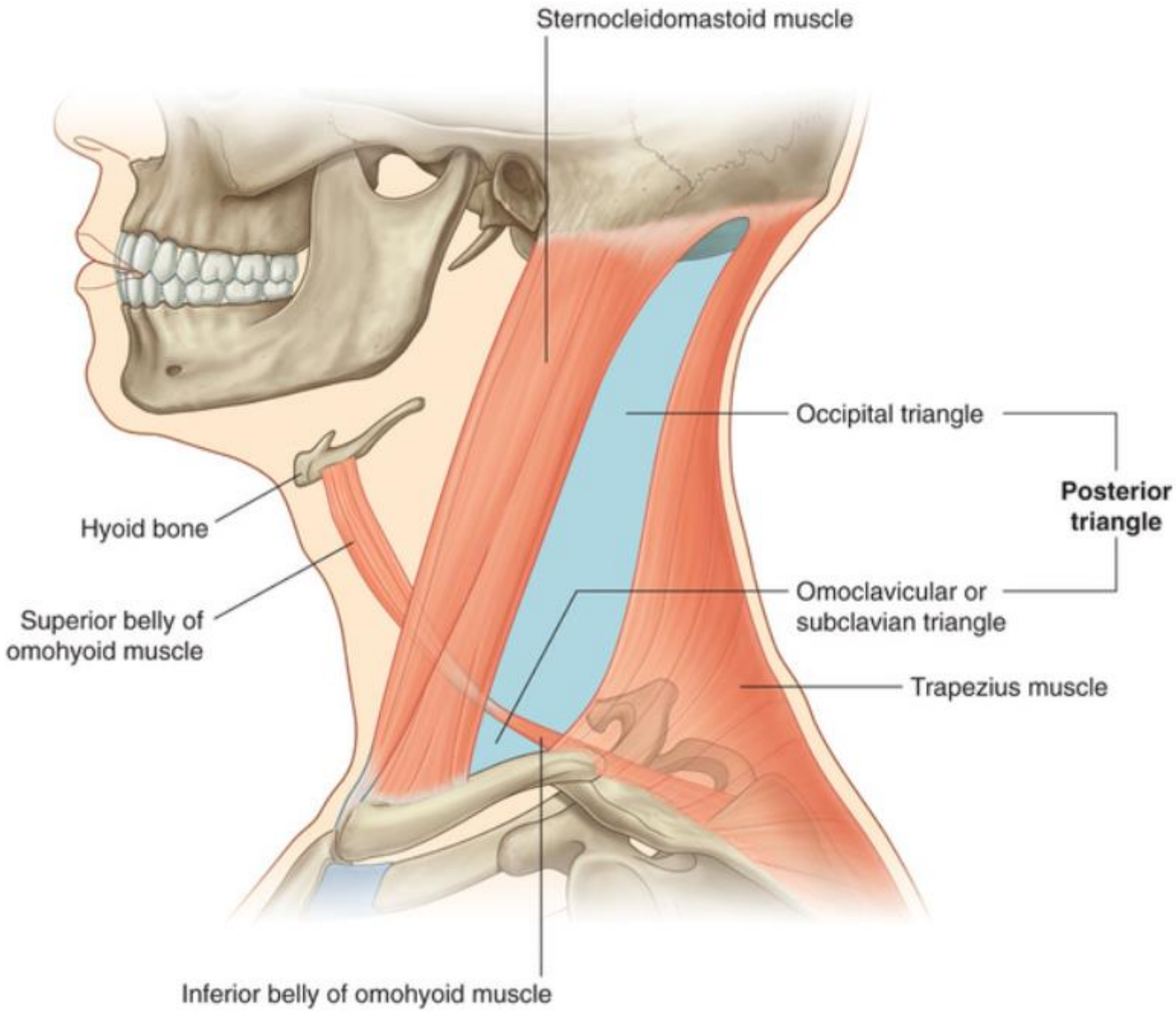
Lateral to the sternohyoid muscle is the omohyoid muscle. This muscle consists of two bellies with an intermediate tendon in both the posterior and anterior triangles of the neck:

- The inferior belly begins on the superior border of the scapula, medial to the suprascapular notch, and passes forward and upward across the posterior triangle ending at the intermediate tendon.
- The superior belly begins at the intermediate tendon and ascends to attach to the body of the hyoid bone just lateral to the attachment of the sternohyoid.
- The intermediate tendon is attached to the clavicle, near its medial end, by a fascial sling and tenses the cervical fascia.

The omohyoid depresses and fixes the hyoid bone. It is innervated by the anterior rami of C1 to C3 through the ansa cervicalis.




Stylohyoid muscle
Submandibular triangle
Posterior belly of digastric muscle
Sternocleidomastoid muscle
Anterior belly of digastric muscle
Carotid triangle
Submental triangle
Hyoid bone
Posterior triangle
Muscular triangle
Trapezius muscle
Superior belly of omohyoid muscle

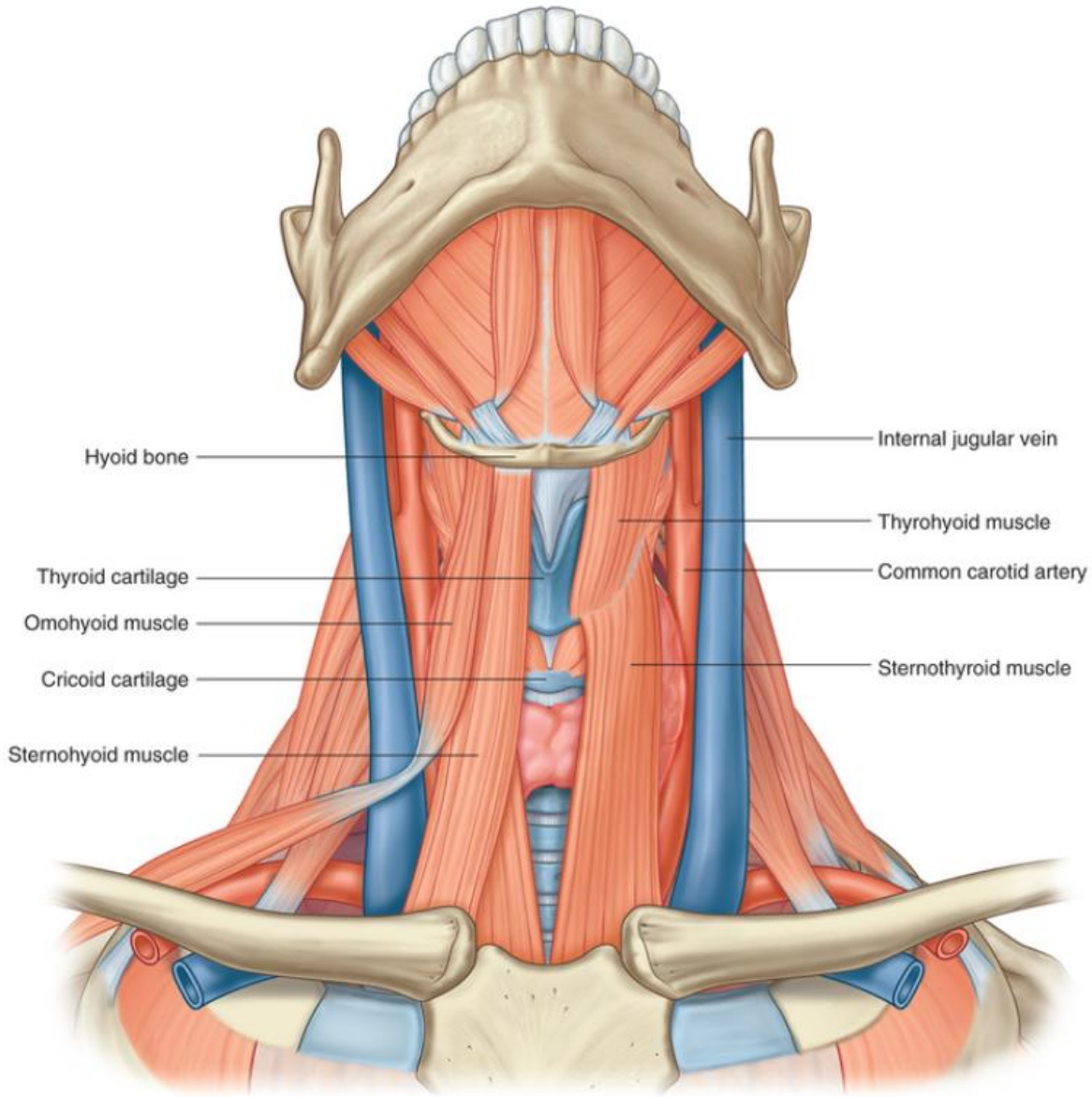

Sternocleidomastoid muscle
Occipital triangle
Posterior triangle
Hyoid bone
Omoclavicular or subclavian triangle
Superior belly of omohyoid muscle
Trapezius muscle
Inferior belly of omohyoid muscle

Thyrohyoid m.

The thyrohyoid muscle is deep to the superior parts of the omohyoid and sternohyoid. Originating at the oblique line on the lamina of the thyroid cartilage it passes upward to insert into the greater horn and adjacent aspect of the body of the hyoid bone.

The thyrohyoid muscle has variable functions depending on which bone is fixed. Generally, it depresses the hyoid, but when the hyoid is fixed it raises the larynx (e.g., when high notes are sung).

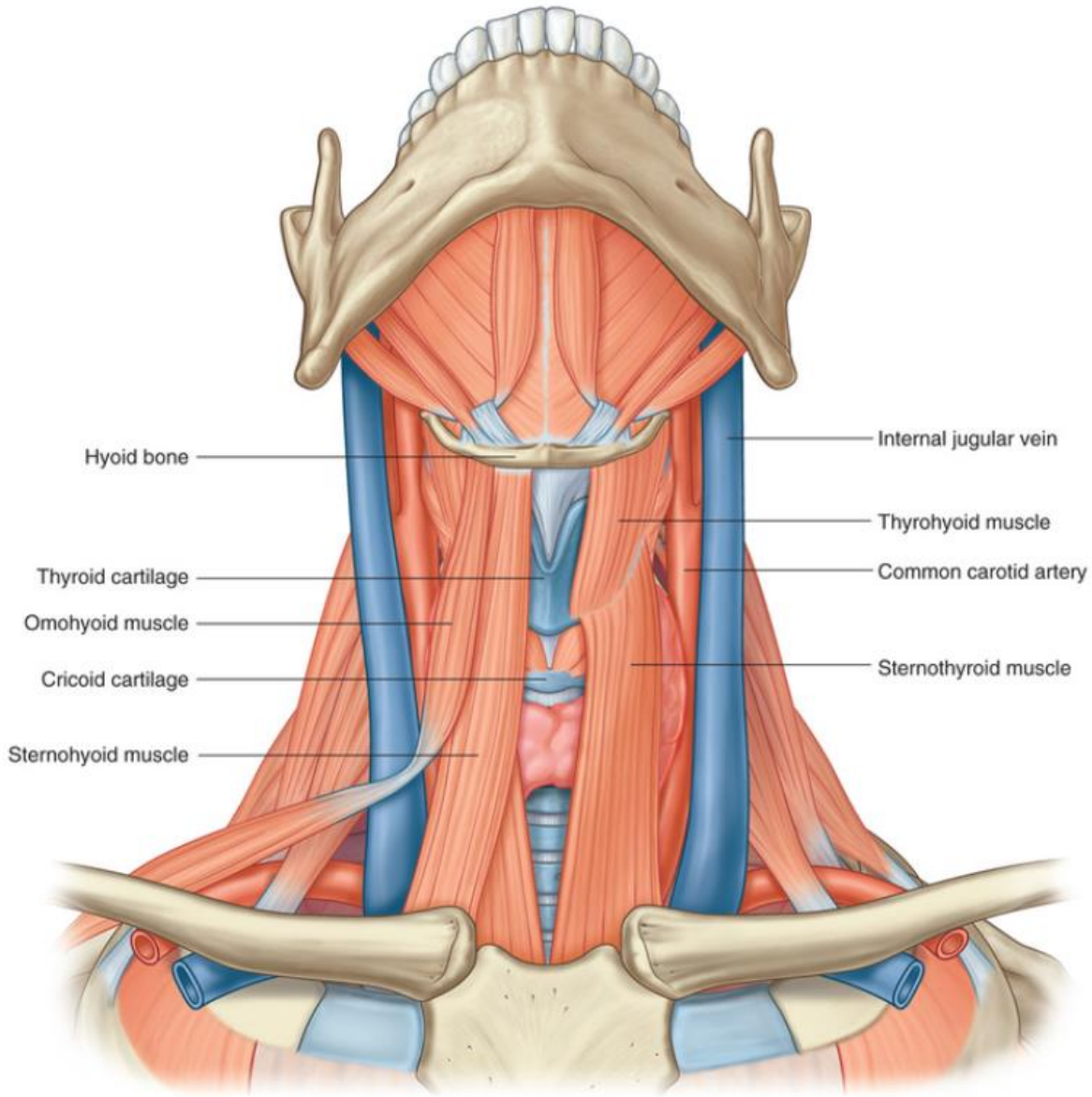
It is innervated by fibers from the anterior ramus of C1 that travel with the hypoglossal nerve [XII].



Sternothyroid m.

Lying beneath the sternohyoid and in continuity with the thyrohyoid, the sternothyroid is the last muscle in the infrahyoid group. It arises from the posterior surface of the manubrium of the sternum and passes upward to attach to the oblique line on the lamina of the thyroid cartilage.

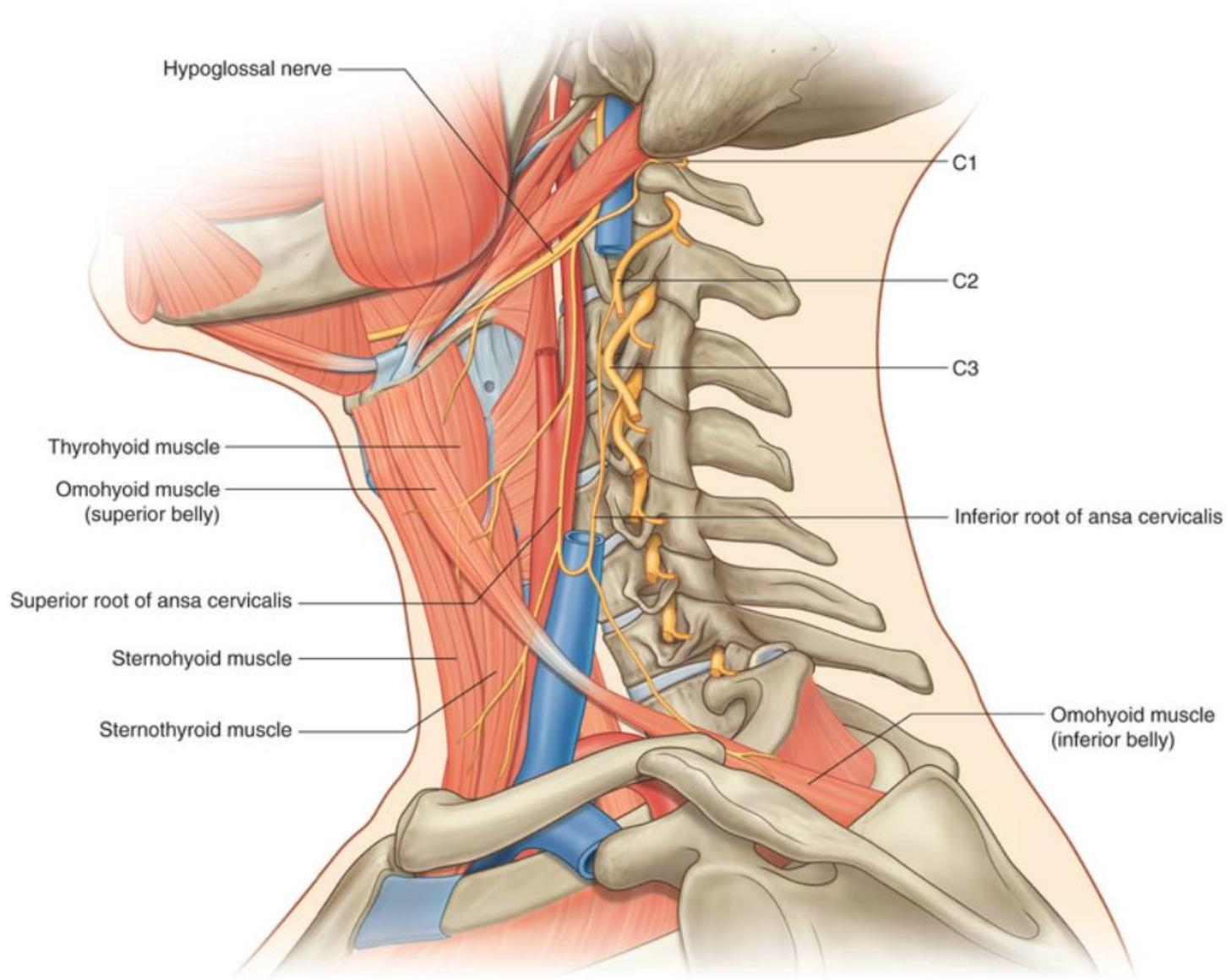
The sternothyroid muscle draws the larynx (thyroid cartilage) downward and is innervated by the anterior rami of C1 to C3 through the ansa cervicalis.

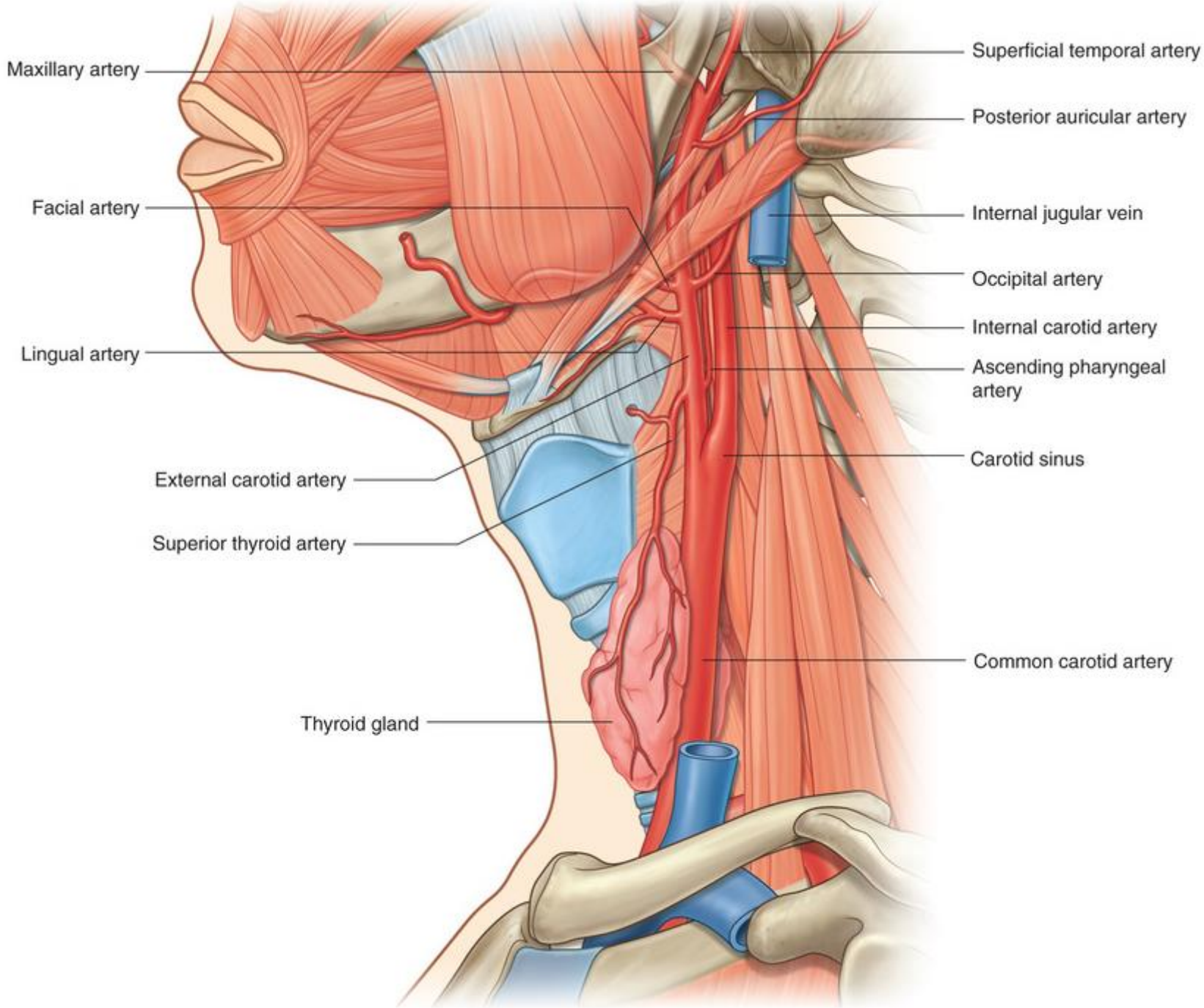


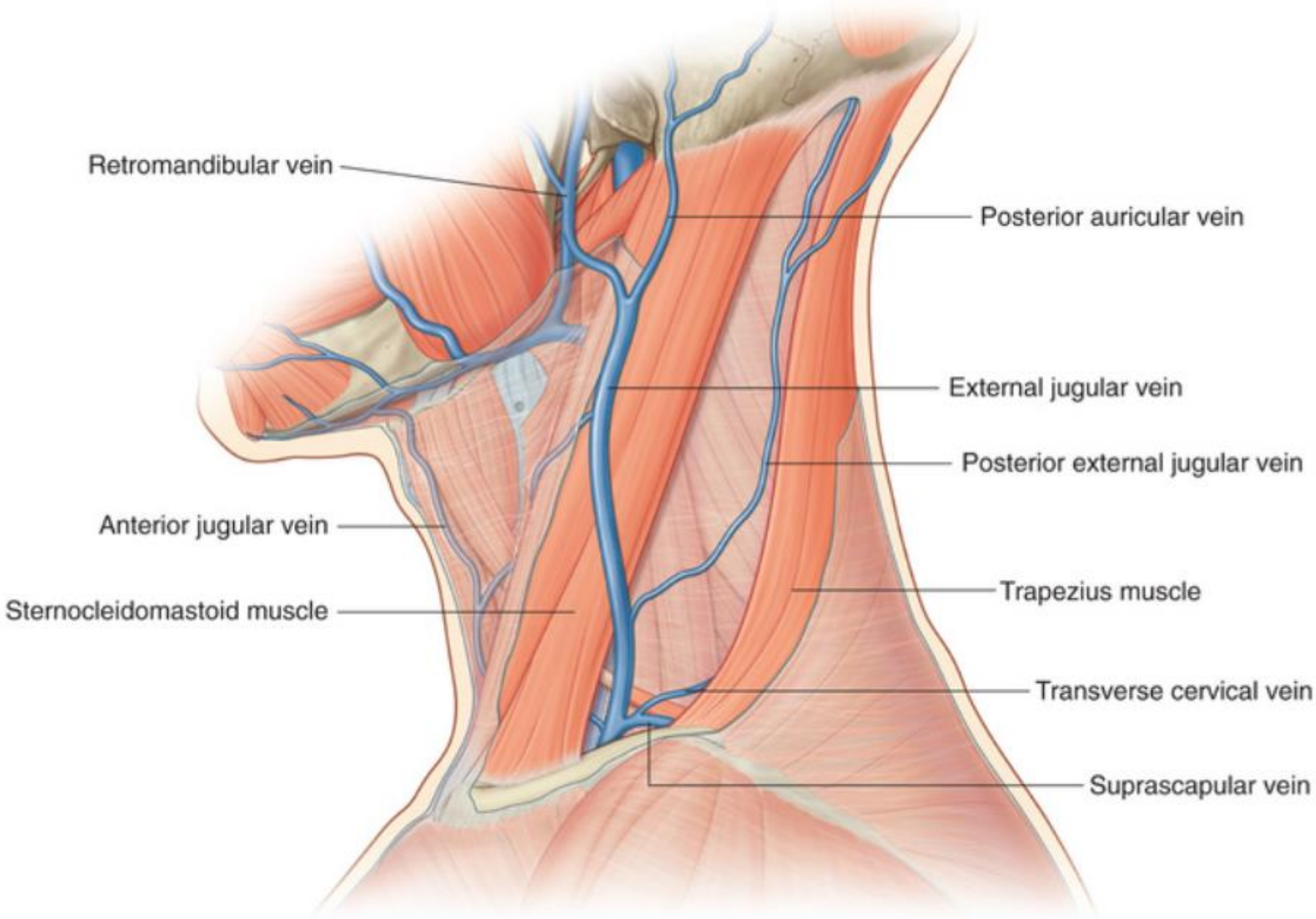
Deep ansa cervicalis

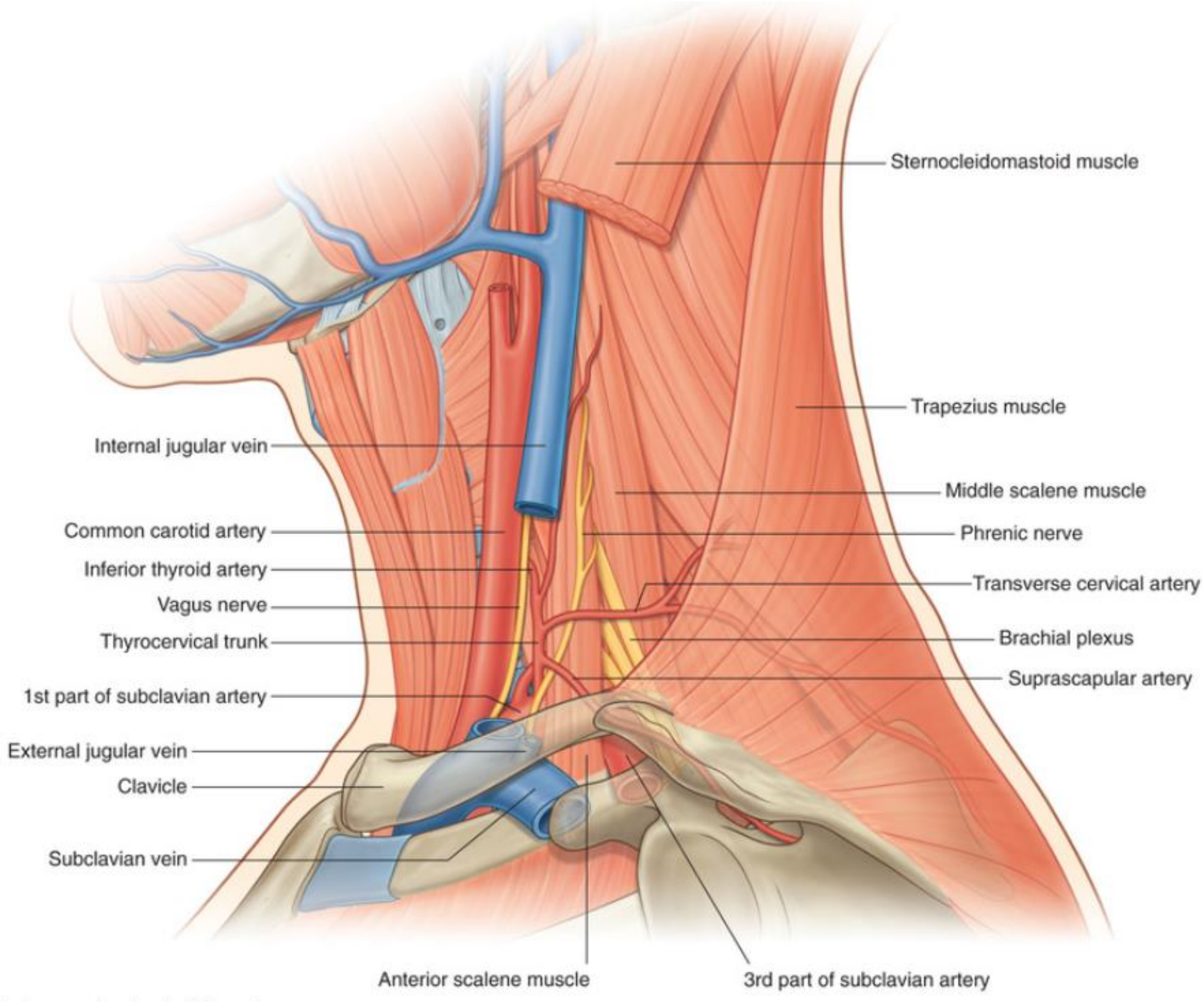
As the hypoglossal nerve [XII] completes its descent and begins to pass forward across the internal and external carotid arteries, some of the cervical nerve fibers leave it and descend between the internal jugular vein and the internal, and then common, carotid arteries. These nerve fibers are the superior root of the ansa cervicalis and innervate the superior belly of the omohyoid muscle, and the upper parts of the sternohyoid and sternothyroid muscles.

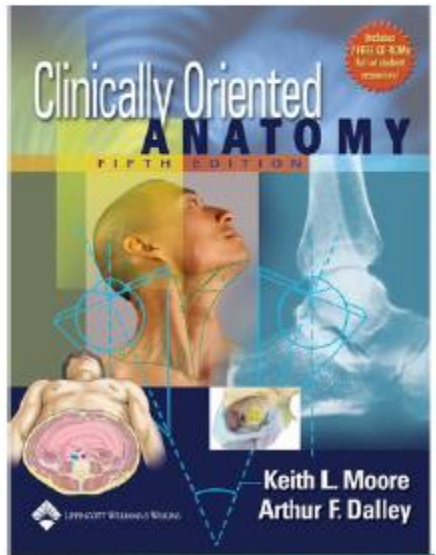
Completing the loop is a direct branch from the cervical plexus containing nerve fibers from the second and third cervical nerves C2 and C3 . This is the inferior root of the ansa cervicalis. It descends either medial or lateral to the internal jugular vein before turning medially to join the superior root. At this location, the ansa cervicalis gives off branches that innervate the inferior belly of the omohyoid, and the lower parts of the sternohyoid and sternothyroid muscles.

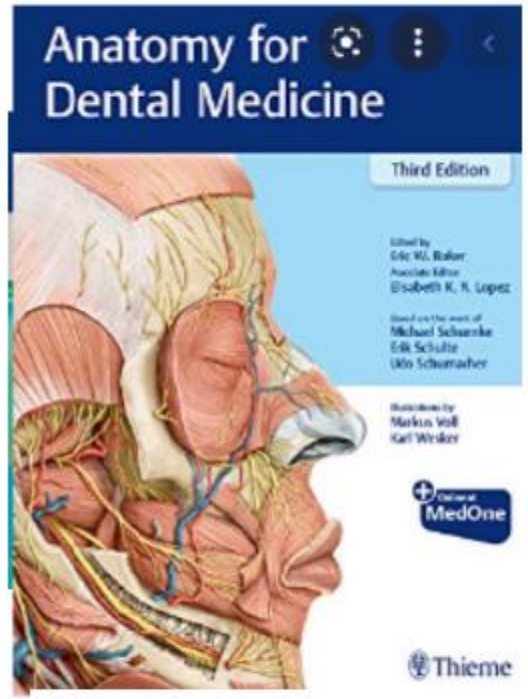



Maxillary artery
Facial artery
Lingual artery
External carotid artery
Superior thyroid artery
Thyroid gland
Superficial temporal artery
Posterior auricular artery
Internal jugular vein
Occipital artery
Internal carotid artery
Ascending pharyngeal artery
Carotid sinus
Common carotid artery


Retromandibular vein
Posterior auricular vein
External jugular vein
Posterior external jugular vein
Anterior jugular vein
Sternocleidomastoid muscle
Trapezius muscle
Transverse cervical vein
Suprascapular vein


Sternocleidomastoid muscle
Trapezius muscle
Internal jugular vein
Middle scalene muscle
Common carotid artery
Phrenic nerve
Inferior thyroid artery
Transverse cervical artery
Vagus nerve
Thyrocervical trunk
Brachial plexus
Suprascapular artery
1st part of subclavian artery
External jugular vein
Clavicle
Subclavian vein
Anterior scalene muscle
3rd part of subclavian artery





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