

❁ The Mandible ❁

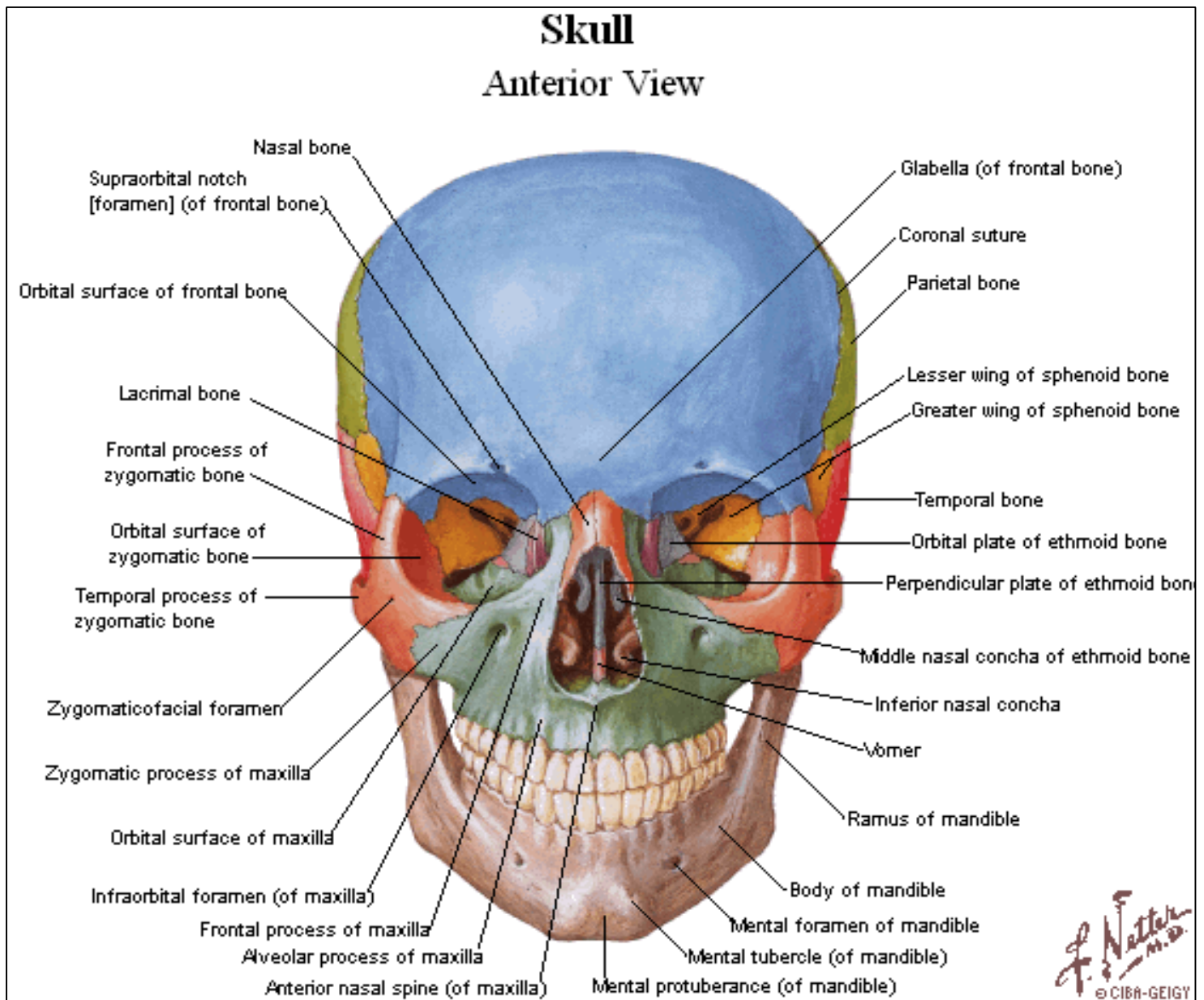
The mandible or the lower jaw is the largest and strongest bone of the face, and it articulates with the skull at the temporomandibular joint.

The mandible consists of a horseshoe-shaped body and a pair of rami.

The body of the mandible meets the ramus on each side at the angle of the mandible.

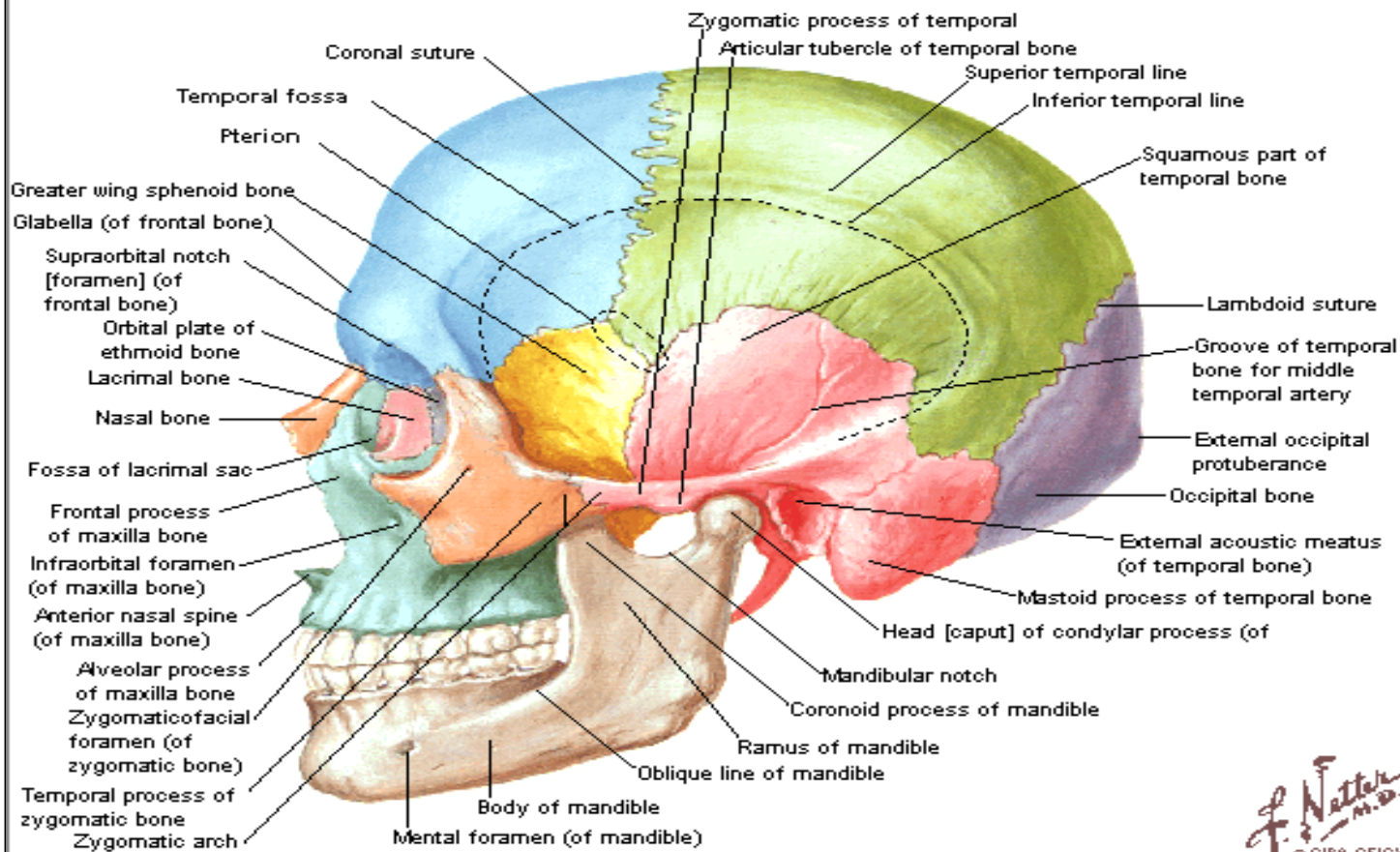
The body of the mandible, on its external surface in the midline, has a faint ridge indicating the line of fusion of the two halves during development at the symphysis menti.

The mental foramen can be seen below the second premolar tooth; it transmits the terminal branches of the inferior alveolar nerve and vessels.



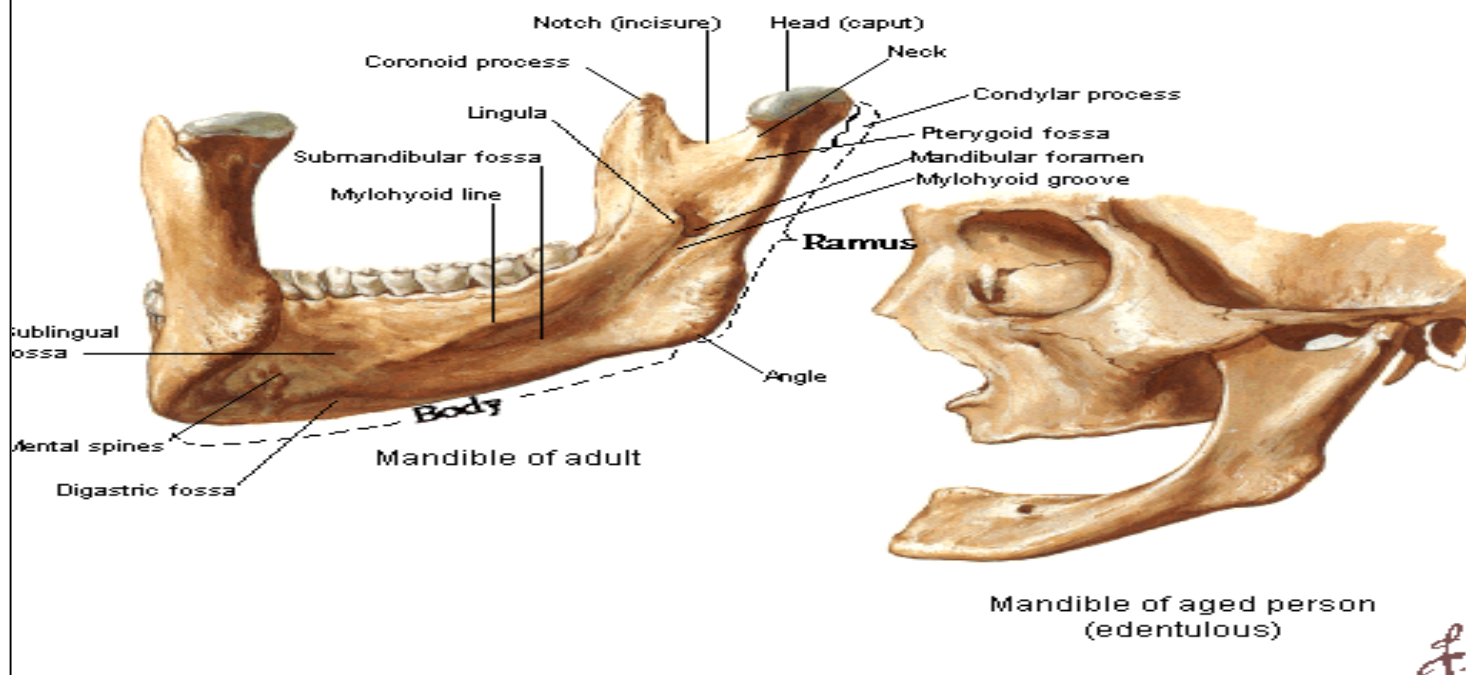
Skull

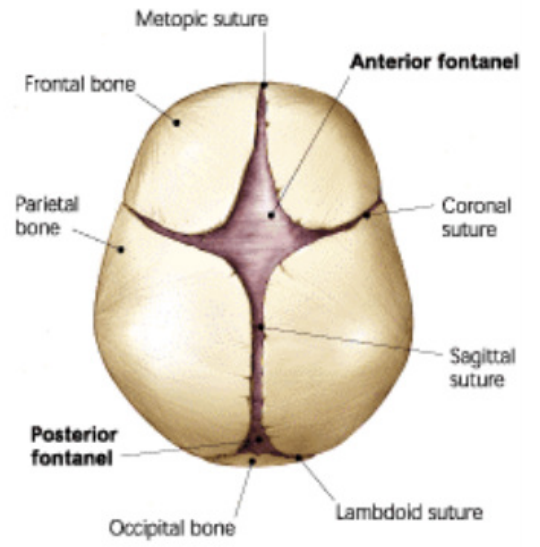
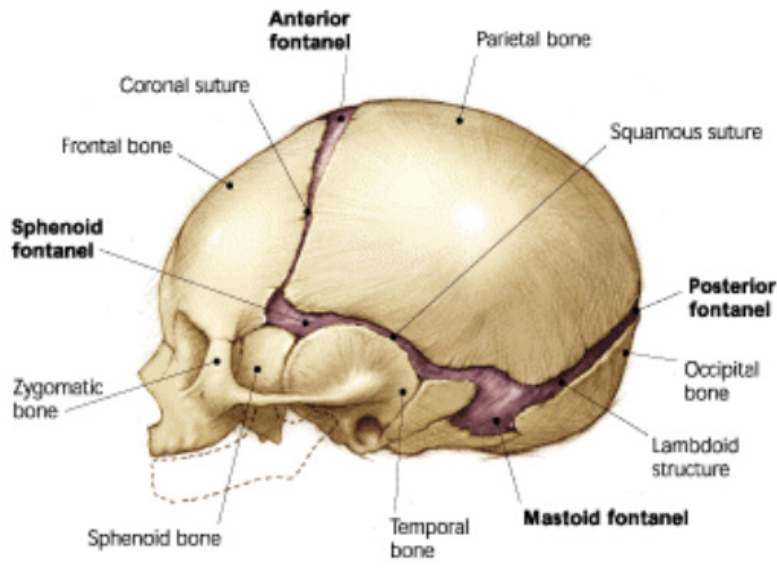
Lateral View



Mandible

Left Posterior View





On the medial surface of the body of the mandible in the median plane are seen the **mental spines**; these give origin to the genioglossus muscles above and the geniohyoid muscles below.

The **mylohyoid line** can be seen as an oblique ridge that runs backward and laterally from the area of the mental spines to an area below and behind the third molar tooth.

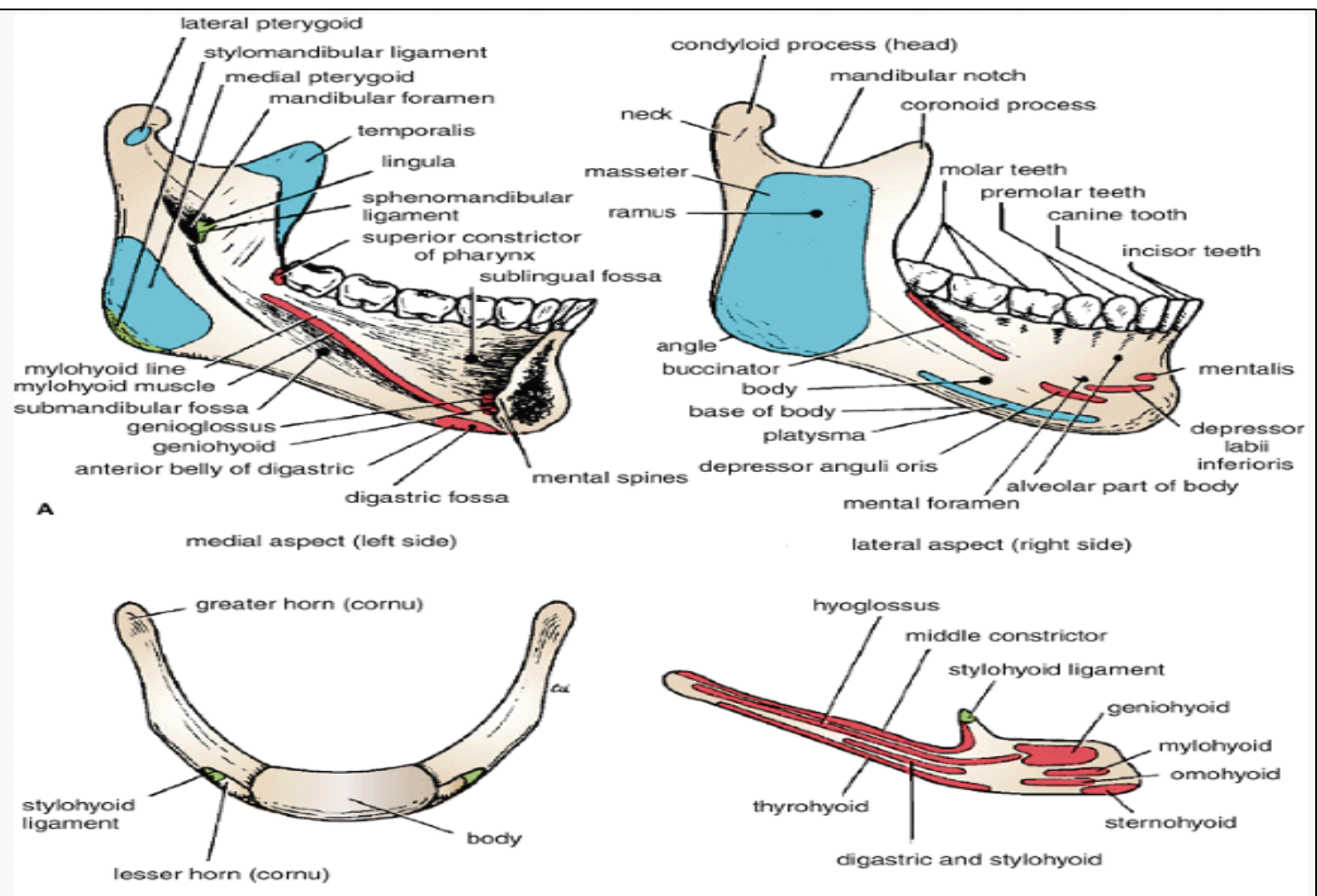
The **submandibular fossa**, for the superficial part of the submandibular salivary gland, lies below the posterior part of the mylohyoid line.

The **sublingual fossa**, for the sublingual gland, lies above the anterior part of the mylohyoid line .

The upper border of the body of the mandible is called **the alveolar part**; in the adult it contains 16 sockets for the roots of the teeth.

The lower border of the body of the mandible is called **the base**.

The digastric fossa is a small, roughened depression on the base, on either side of the symphysis menti . It is in these fossae that the anterior bellies of the digastric muscles are attached.



The ramus of the mandible is vertically placed and has an anterior **coronoid process** and a posterior **condyloid process**, or **head**; the two processes are separated by **the mandibular notch** .

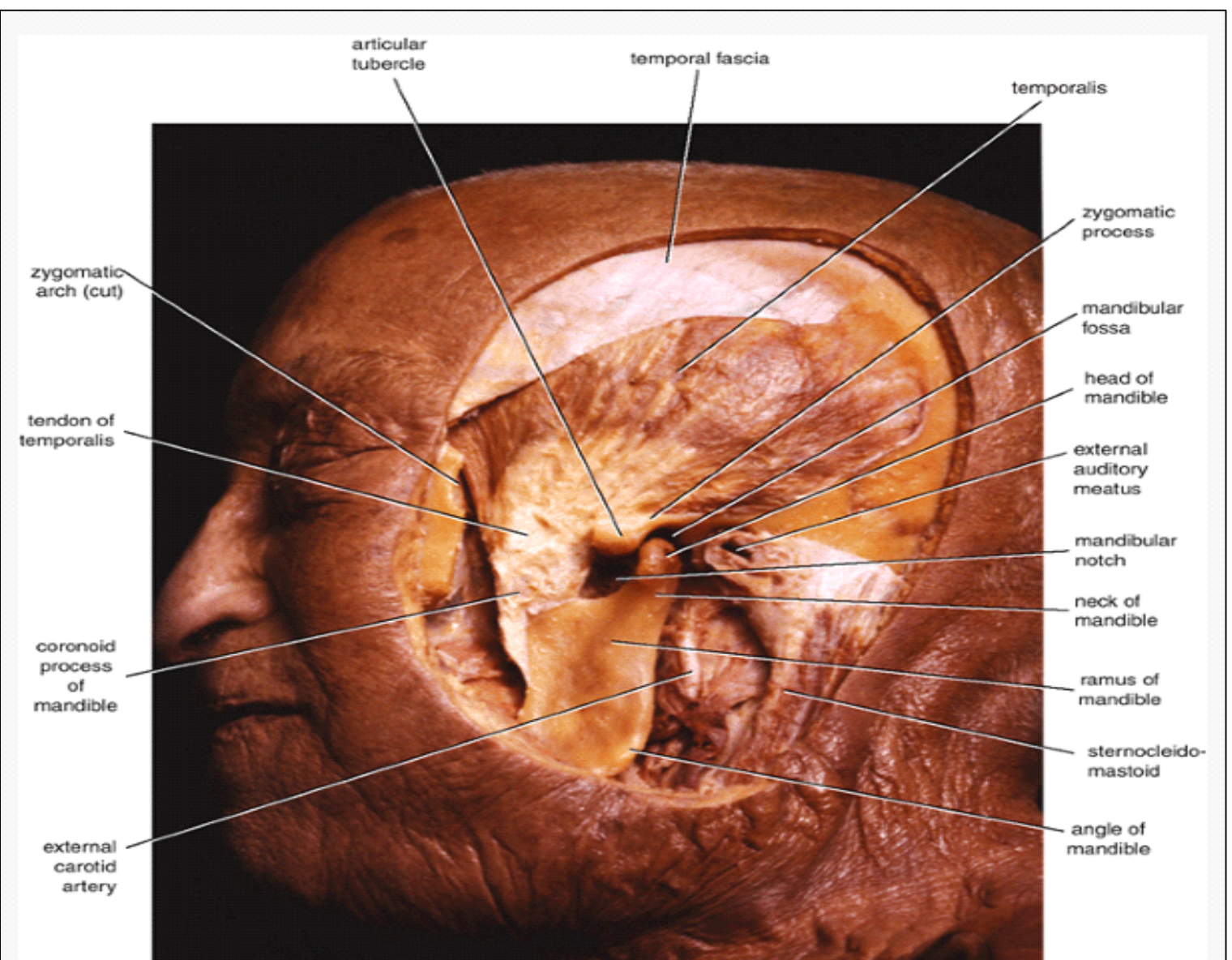
On the lateral surface of the ramus are markings for the attachment of the masseter muscle.

On the medial surface is the mandibular foramen for the inferior alveolar nerve and vessels. In front of the foramen is a projection of bone, called **the lingula**, for the attachment of the sphenomandibular ligament .

The foramen leads into the **mandibular canal**, which opens on the lateral surface of the body of the mandible at the **mental foramen** .

The incisive canal is a continuation forward of the mandibular canal beyond the mental foramen and below the incisor teeth.

The coronoid process receives on its medial surface the attachment of the temporalis muscle. Below the condyloid process, or head, is a short **neck**.



✿ Temporomandibular Joint ✿

♠ Articulation

Articulation occurs between the articular tubercle and the anterior portion of the mandibular fossa of the temporal bone above and the head (condyloid process) of the mandible below .

The articular surfaces are covered with fibrocartilage.

♠ Type of Joint

The temporomandibular joint is synovial.

The articular disc divides the joint into upper and lower cavities .

♠ Capsule

The capsule surrounds the joint and is attached above to the articular tubercle and the margins of the mandibular fossa and below to the neck of the mandible.

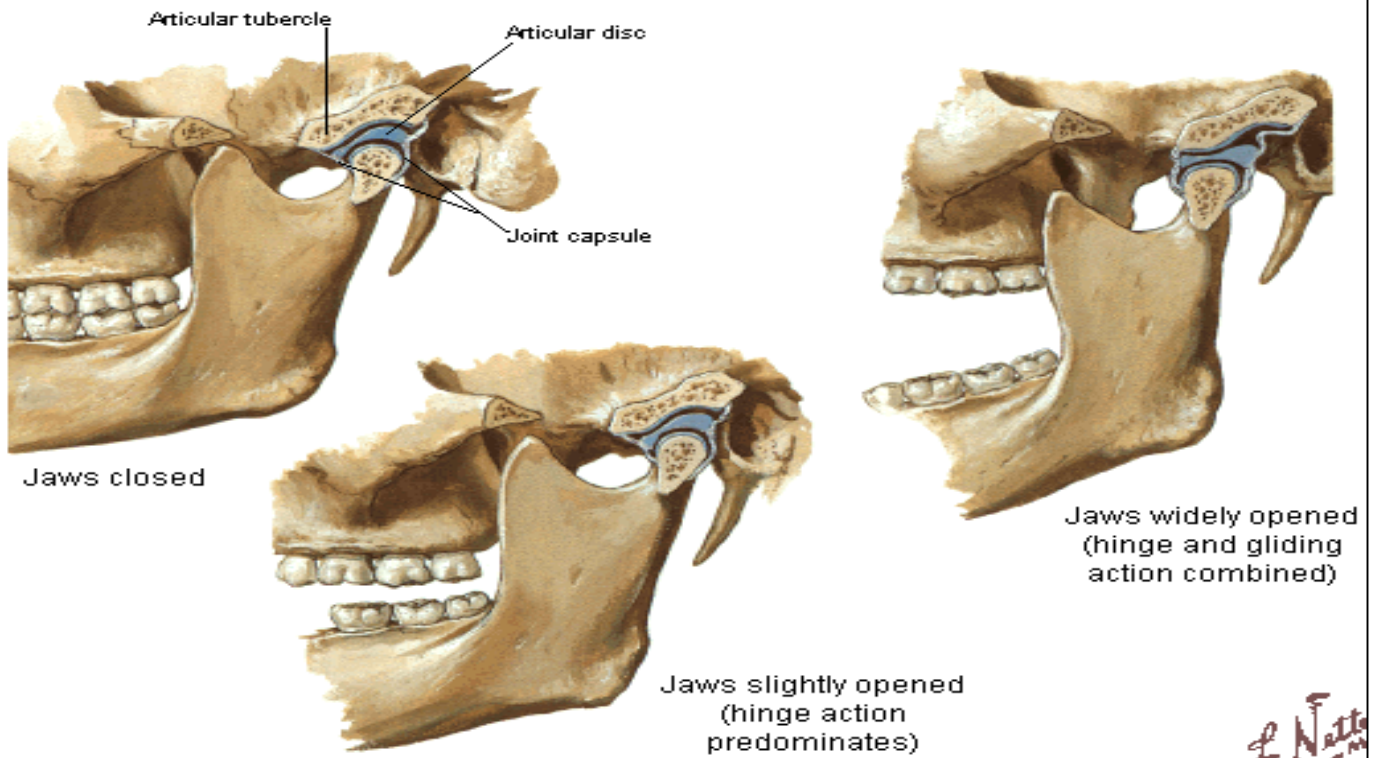
♠ Ligaments

The lateral temporomandibular ligament strengthens the lateral aspect of the capsule, and its fibers run downward and backward from the tubercle on the root of the zygoma to the lateral surface of the neck of the mandible . This ligament limits the movement of the mandible in a posterior direction and thus protects the external auditory meatus.

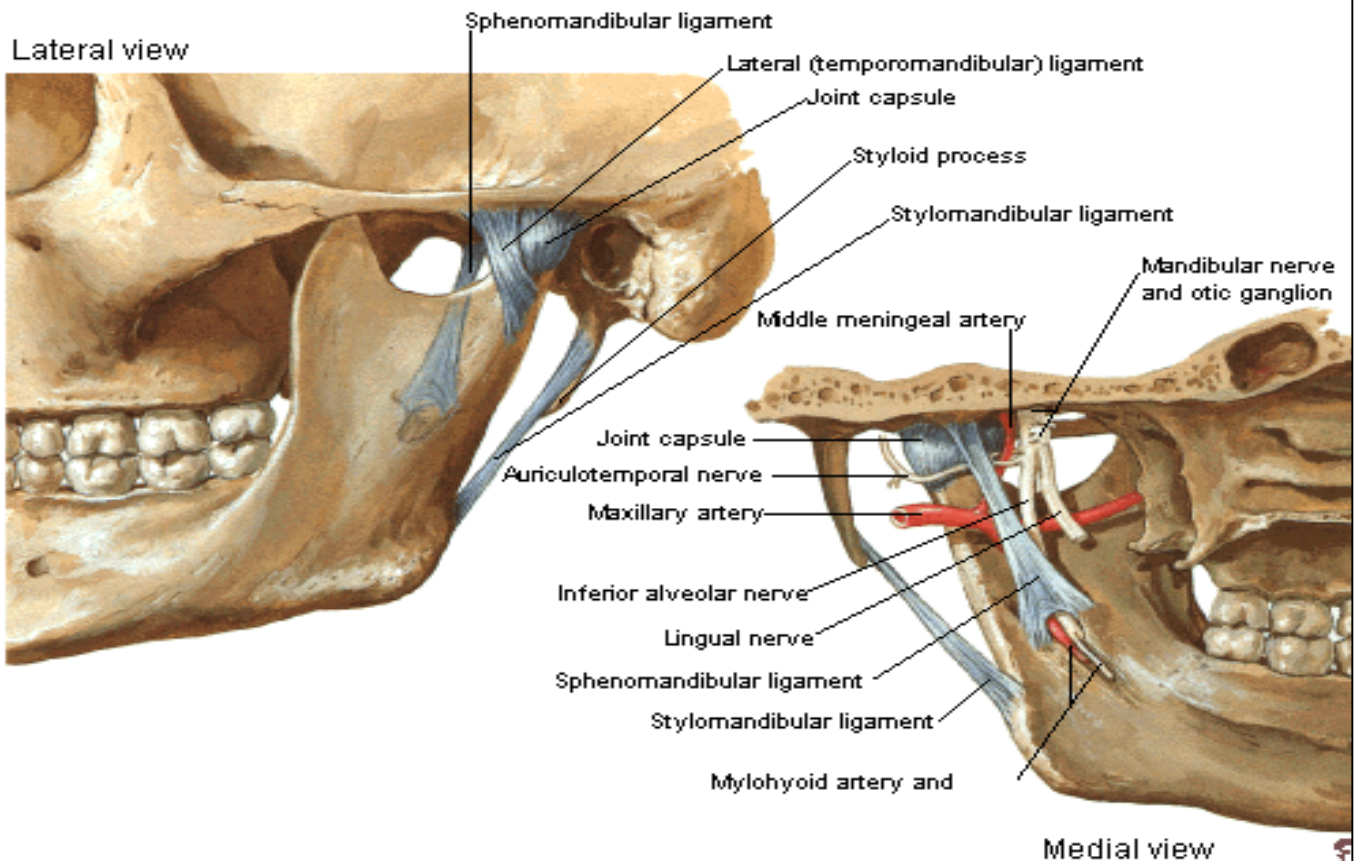
The sphenomandibular ligament lies on the medial side of the joint . It is a thin band that is attached above to the spine of the sphenoid bone and below to the lingula of the mandibular foramen. It represents the remains of the first pharyngeal arch in this region.

The stylomandibular ligament lies behind and medial to the joint and some distance from it. It is merely a band of thickened deep cervical fascia that extends from the apex of the styloid process to the angle of the mandible

Temporomandibular Joint Joint Action



Temporomandibular Joint Lateral and Medial Views



The articular disc divides the joint into upper and lower cavities . It is an oval plate of fibrocartilage that attached circumferentially to the capsule. It is also attached in front to the tendon of the lateral pterygoid muscle and by fibrous bands to the head of the mandible.

These bands ensure that the disc moves forward and backward with the head of the mandible during protraction and retraction of the mandible.

The **upper surface** of the disc is concavoconvex from before backward to fit the shape of the articular tubercle and the mandibular fossa; the **lower surface** is concave to fit the head of the mandible.

Synovial Membrane

This lines the capsule in the upper and lower cavities of the joint .

Nerve Supply

Auriculotemporal and masseteric branches of the mandibular nerve

☼ Movements of Temporomandibular Joint ☼

The mandible can be depressed or elevated, protruded or retracted. Rotation can also occur, as in chewing. In the position of rest, the teeth of the upper and lower jaws are slightly apart. On closure of the jaws, the teeth come into contact.

1- Depression of the Mandible :

As the mouth is opened, the head of the mandible rotates on the undersurface of the articular disc around a horizontal axis.

To prevent the angle of the jaw impinging unnecessarily on the parotid gland and the sternocleidomastoid muscle, the mandible is pulled forward.

This is accomplished by the contraction of the lateral pterygoid muscle, which pulls forward the neck of the mandible and the articular disc so that the latter moves onto the articular tubercle .

The forward movement of the disc is limited by the tension of the fibroelastic tissue, which tethers the disc to the temporal bone posteriorly.

Depression of the mandible is brought about by contraction of the digastrics, the geniohyoids, and the mylohyoids; the lateral pterygoids play an important role by pulling the mandible forward.

2- Elevation of the Mandible :

The movements in depression of the mandible are reversed.

First, the head of the mandible and the disc move backward, and then the head rotates on the lower surface of the disc.

Elevation of the mandible is brought about by contraction of the temporalis, the masseter, and the medial pterygoids.

The head of the mandible is pulled backward by the posterior fibers of the temporalis.

The articular disc is pulled backward by the fibroelastic tissue, which tethers the disc to the temporal bone posteriorly.

3- Protrusion of the Mandible :

The articular disc is pulled forward onto the anterior tubercle, carrying the head of the mandible with it.

All movement thus takes place in the upper cavity of the joint. In protrusion, the lower teeth are drawn forward over the upper teeth, which is brought about by contraction of the lateral pterygoid muscles of both sides, assisted by both medial pterygoids.

4- Retraction of the Mandible:

The articular disc and the head of the mandible are pulled backward into the mandibular fossa. Retraction is brought about by contraction of the posterior fibers of the temporalis.

5- Lateral Chewing Movements:

These are accomplished by alternately protruding and retracting the mandible on each side.

For this to take place, a certain amount of rotation occurs, and the muscles responsible on both sides work alternately and not in unison.

❁ Important Relations of the Temporomandibular Joint ❁

Anteriorly: The mandibular notch and the masseteric nerve and artery .

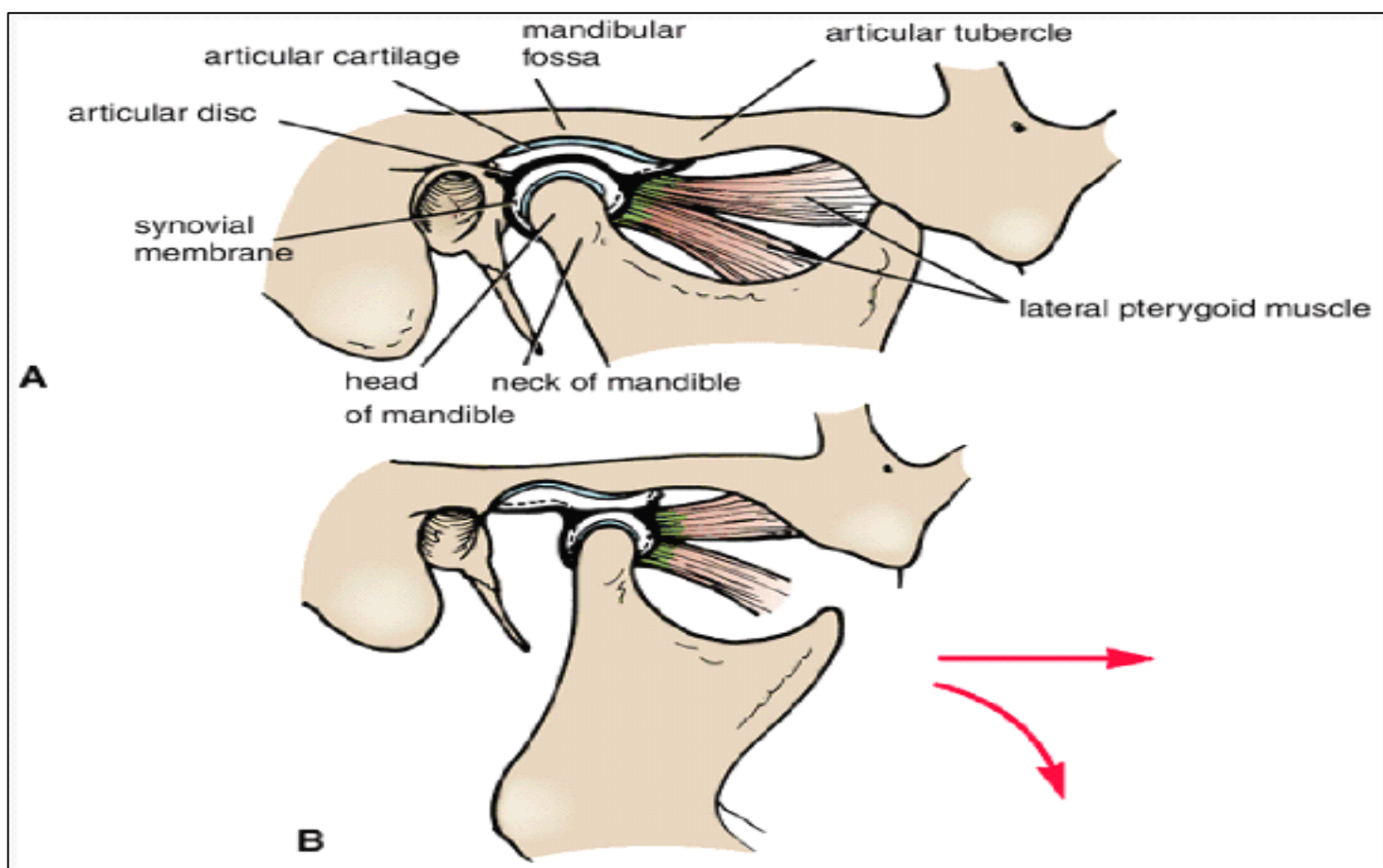
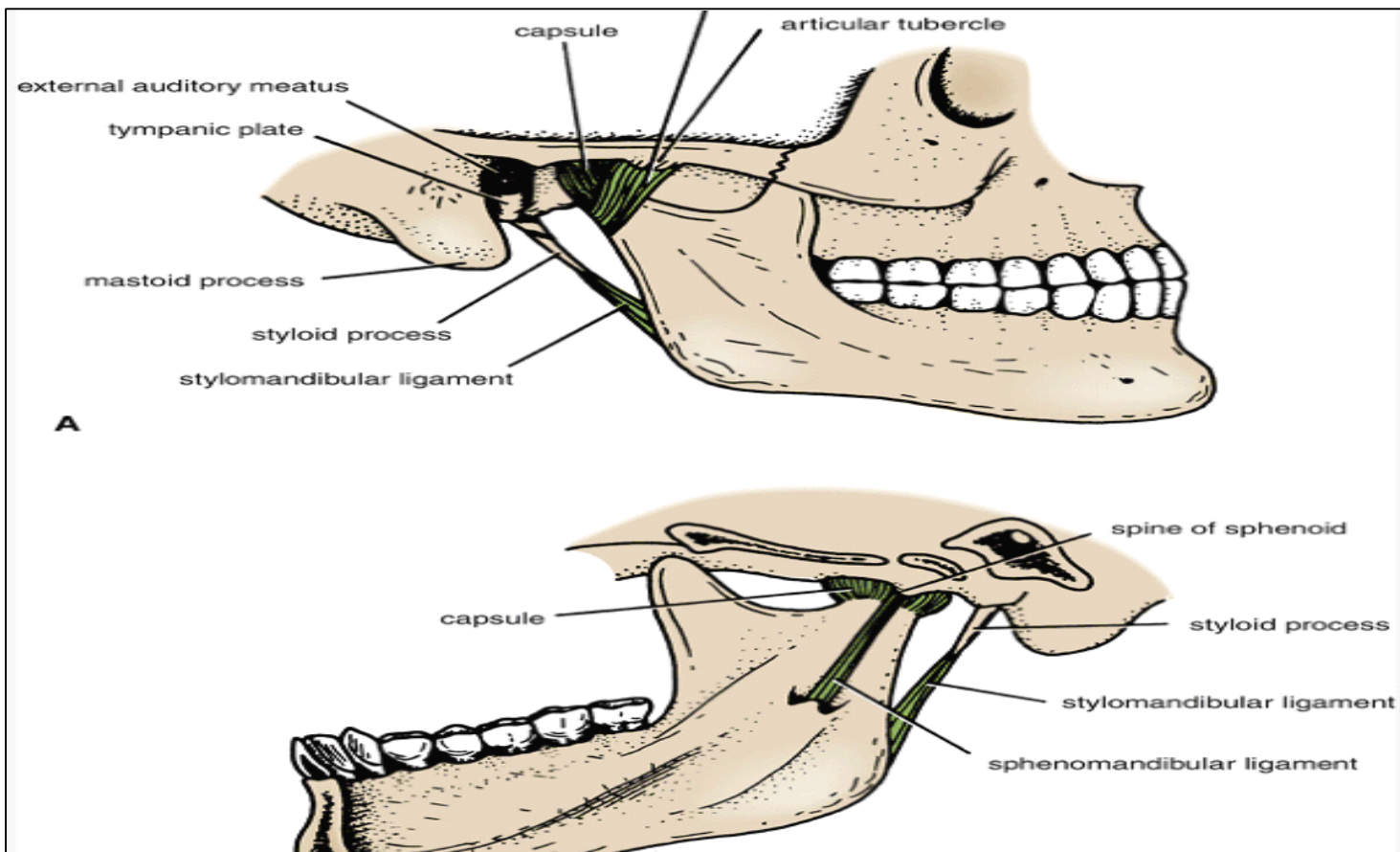
Posteriorly: The tympanic plate of the external auditory meatus and the glenoid process of the parotid gland.

Laterally: The parotid gland, fascia, and skin .

Medially: The maxillary artery and vein and the auriculotemporal nerve.

The muscles of mastication are summarized in the following:-

Muscle	Origin	Insertion	Nerve Supply	Action
Muscle of Scalp				
Occipitofrontalis				
Occipital belly	Highest nuchal line of occipital bone	Epicranial aponeurosis	Facial nerve	Moves scalp on skull and raises eyebrows
Frontal belly	Skin and superficial fascia of eyebrows			
Muscles of Facial Expression				
Orbicularis oculi				
Palpebral part	Medial palpebral ligament	Lateral palpebral raphe	Facial nerve	Closes eyelids and dilates lacrimal sac
Orbital part	Medial palpebral ligament and adjoining bone	Loops return to origin	Facial nerve	Throws skin around orbit into folds to protect eyeball
Corrugator supercillii	Superciliary arch	Skin of eyebrow	Facial nerve	Vertical wrinkles of forehead, as in frowning
Compressor nasi	Frontal process of maxilla	Aponeurosis of bridge of nose	Facial nerve	Compresses mobile nasal cartilages
Dilator naris	Maxilla	Ala of nose	Facial nerve	Widens nasal aperture
Procus	Nasal bone	Skin between eyebrows	Facial nerve	Wrinkles skin of nose
Orbicularis oris	Maxilla, mandible, and skin	Encircles oral orifice	Facial nerve	Compresses lips together
Dilator Muscles of Lips				
Levator labii superioris alaeque nasi	} Arise from bones and fascia around oral aperture and insert into substance of lips		Facial nerve	Separate lips
Levator labii superioris				
Zygomaticus minor				
Zygomaticus major				
Levator anguli oris				
Risorius				
Depressor anguli oris				
Depressor labii inferioris				
Mentalis				
Buccinator	Outer surface of alveolar margins of maxilla and mandible and pterygomandibular ligament		Facial nerve	Compresses cheeks and lips against teeth
Platysma	See Table 11-5			
Muscles of Mastication				
Masseter	Zygomatic arch	Lateral surface ramus of mandible	Mandibular division of trigeminal nerve	Elevates mandible to occlude teeth
Temporalis	Floor of temporal fossa	Coronoid process of mandible	Mandibular division of trigeminal nerve	Anterior and superior fibers elevate mandible; posterior fibers retract mandible
Lateral pterygoid (two heads)	Greater wing of sphenoid and lateral pterygoid plate	Neck of mandible and articular disc	Mandibular division of trigeminal nerve	Pulls neck of mandible forward
Medial pterygoid (two heads)	Tuberosity of maxilla and lateral pterygoid	Medial surface of angle of mandible	Mandibular division of trigeminal nerve	Elevates mandible



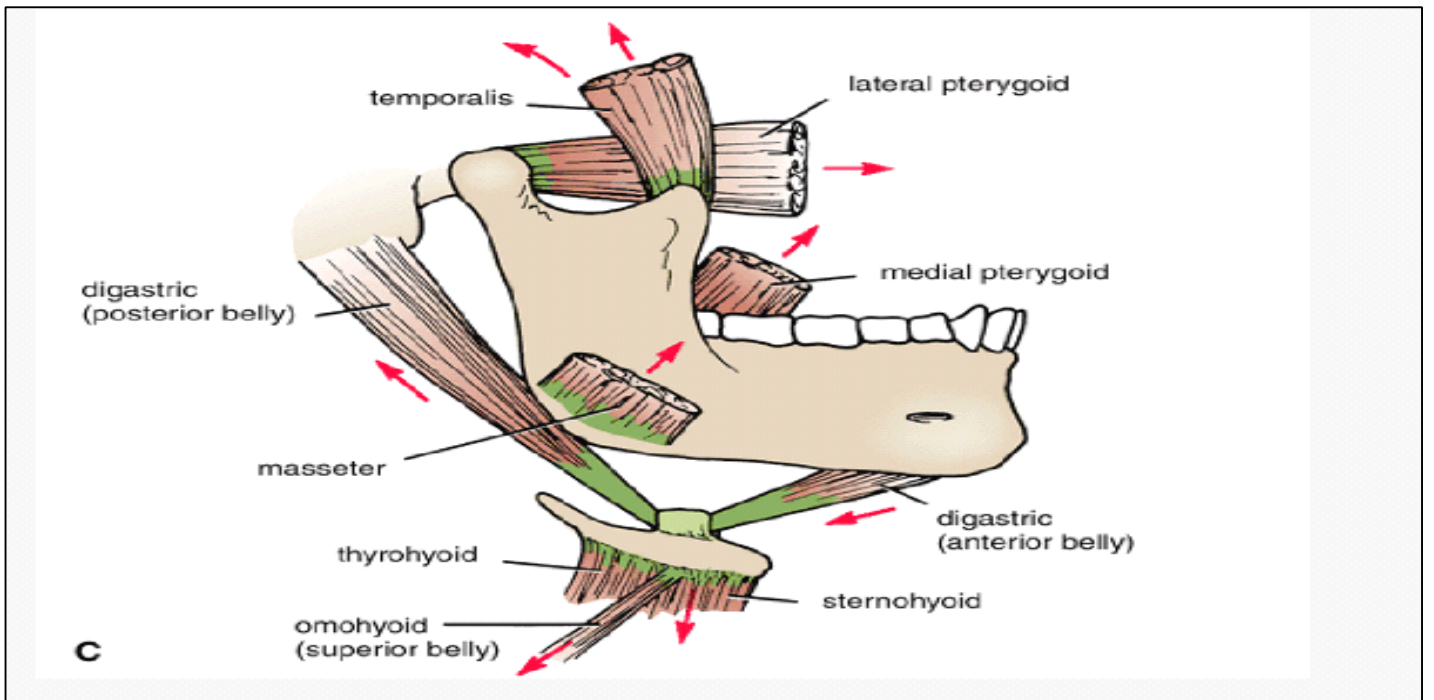
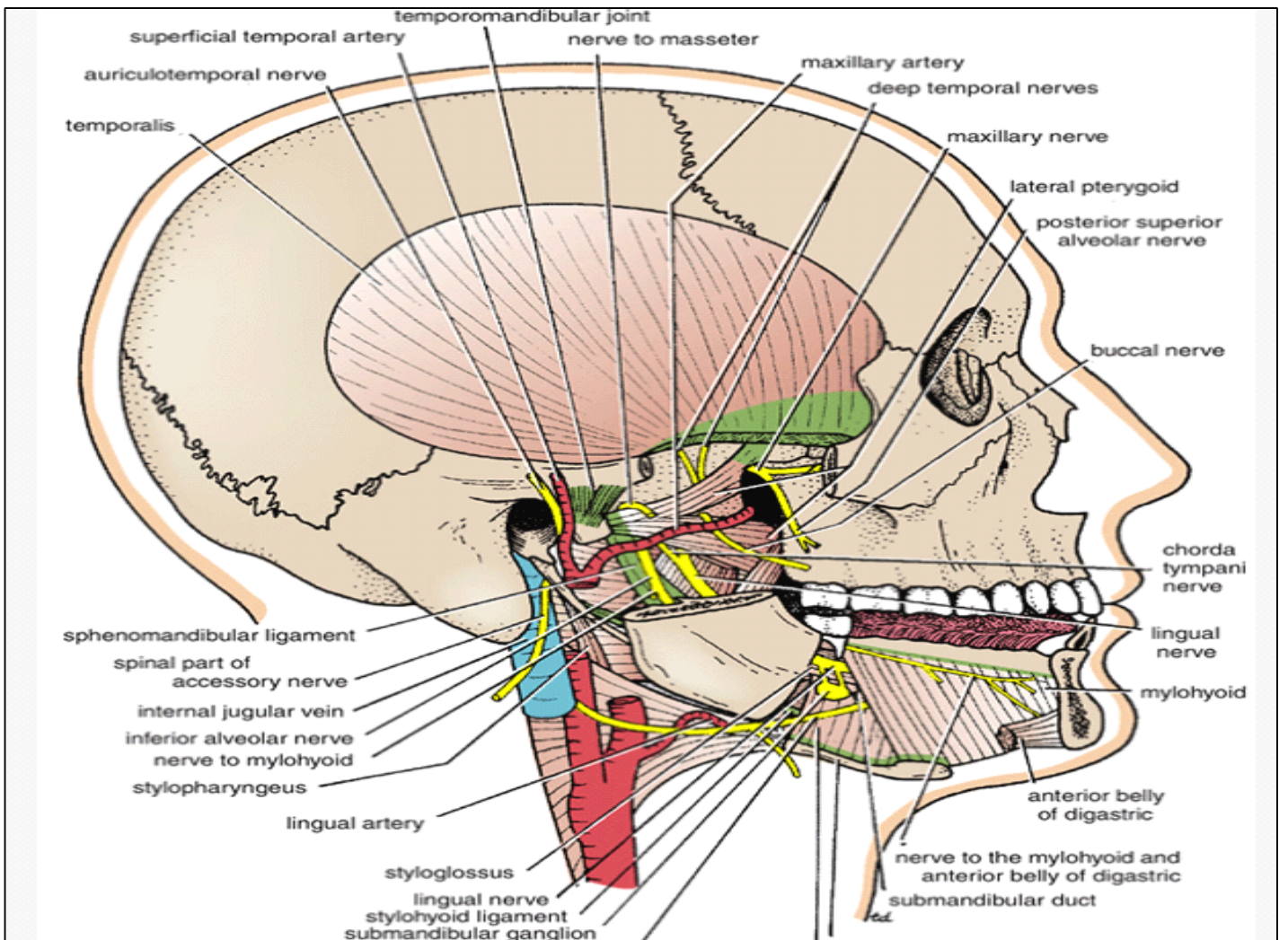


Figure 11-35 Temporomandibular joint with mouth closed (A) and with the mouth open (B). Note the position of the head of the mandible and articular disc in relation to the articular tubercle in each case. C. The attachment of the muscles of mastication to the mandible. The arrows indicate the direction of their actions.



♠ The Lips

The lips are two fleshy folds that surround the oral orifice .

They are covered on the outside by skin and are lined on the inside by mucous membrane.

The substance of the lips is made up by the **orbicularis oris** muscle and the muscles that radiate from the lips into the face.

Also included are the labial blood vessels and nerves, connective tissue, and many small salivary glands.

The philtrum is the shallow vertical groove seen in the midline on the outer surface of the upper lip.

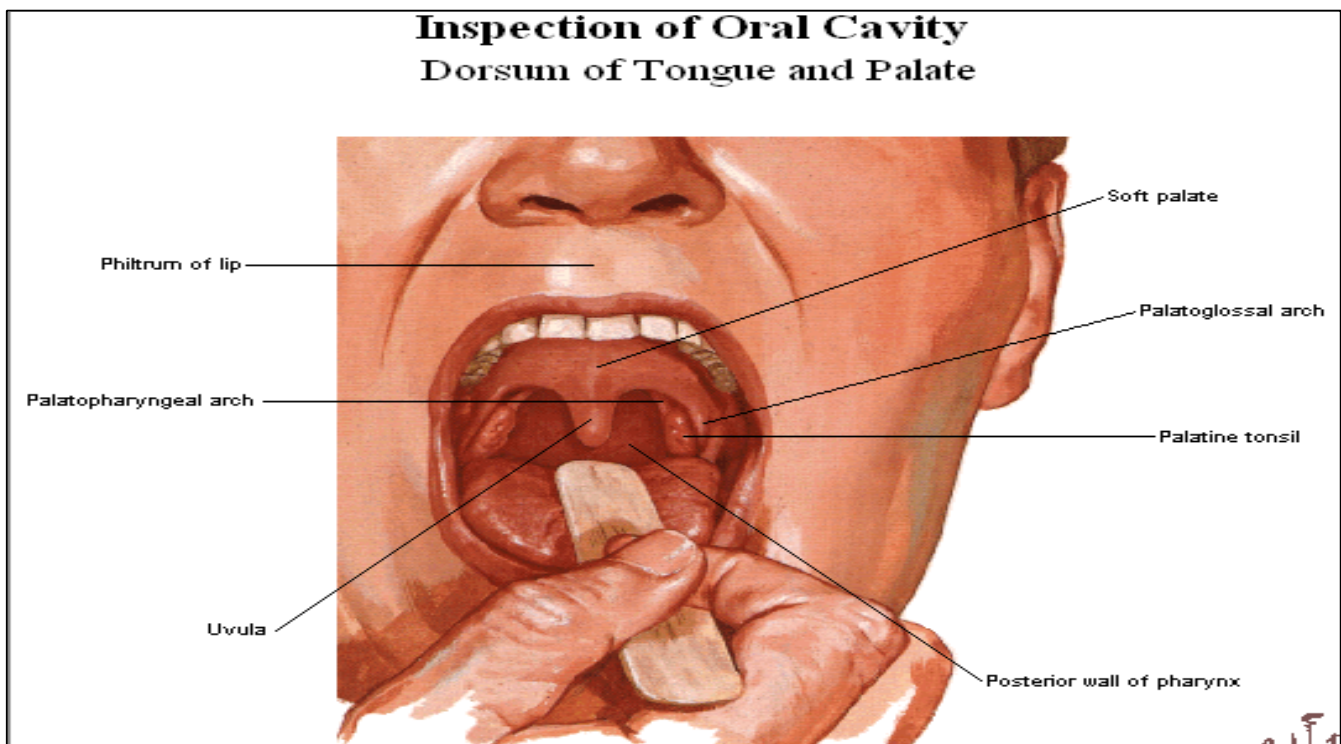
Median folds of mucous membrane ”**the labial frenulae**” connect the inner surface of the lips to the gums.

♠ The Mouth Cavity

The mouth extends from the lips to the pharynx.

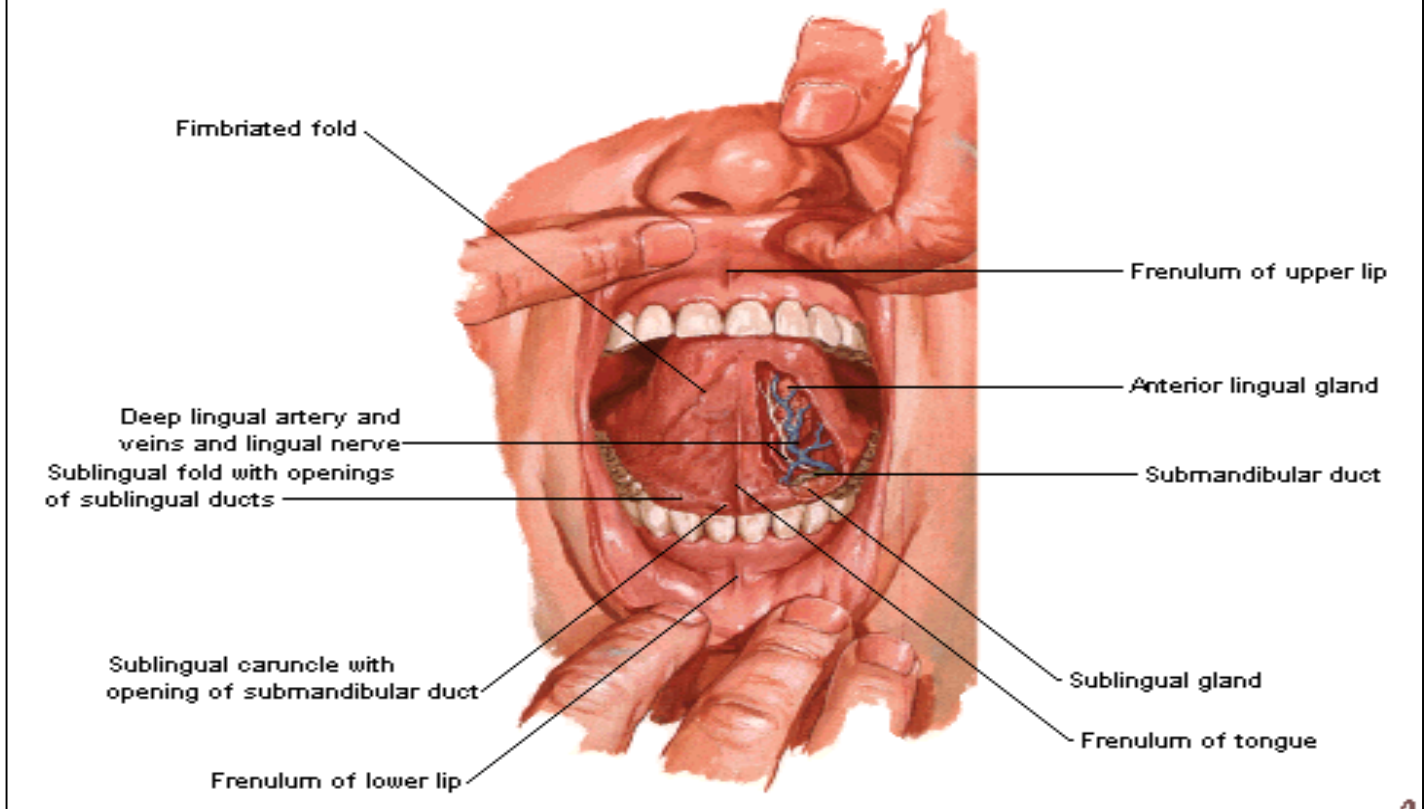
The entrance into the pharynx, the oropharyngeal isthmus, is formed on each side by the palatoglossal fold .

The mouth is divided into the vestibule and the mouth cavity proper.



Inspection of Oral Cavity

Sublingual Region - Anterior Vestibule



🌸 Vestibule 🌸

The vestibule lies between the lips and the cheeks externally and the gums and the teeth internally.

This slitlike space communicates with the exterior through the **oral fissure** between the lips.

When the jaws are closed, it communicates with the mouth proper behind the third molar tooth on each side.

The vestibule is limited above and below by the reflection of the mucous membrane from the lips and **cheeks** to the gums.

The lateral wall of the vestibule is formed by the cheek, which is made up by the **buccinator muscle** and is lined with mucous membrane.

The tone of the buccinator muscle and that of the muscles of the lips keeps the walls of the vestibule in contact with one another.

The duct of the parotid salivary gland opens on a small papilla into the vestibule opposite the upper second molar tooth.

🌸 Mouth Proper 🌸

The mouth proper has a roof and a floor.

♠Roof of Mouth

The roof of the mouth is formed by the hard palate in front and the soft palate behind .

♠Floor of Mouth

The floor is formed largely by the anterior two thirds of the tongue and by the reflection of the mucous membrane from the sides of the tongue to the gum of the mandible.

A fold of mucous membrane called the **frenulum of the tongue** connects the undersurface of the tongue in the midline to the floor of the mouth.

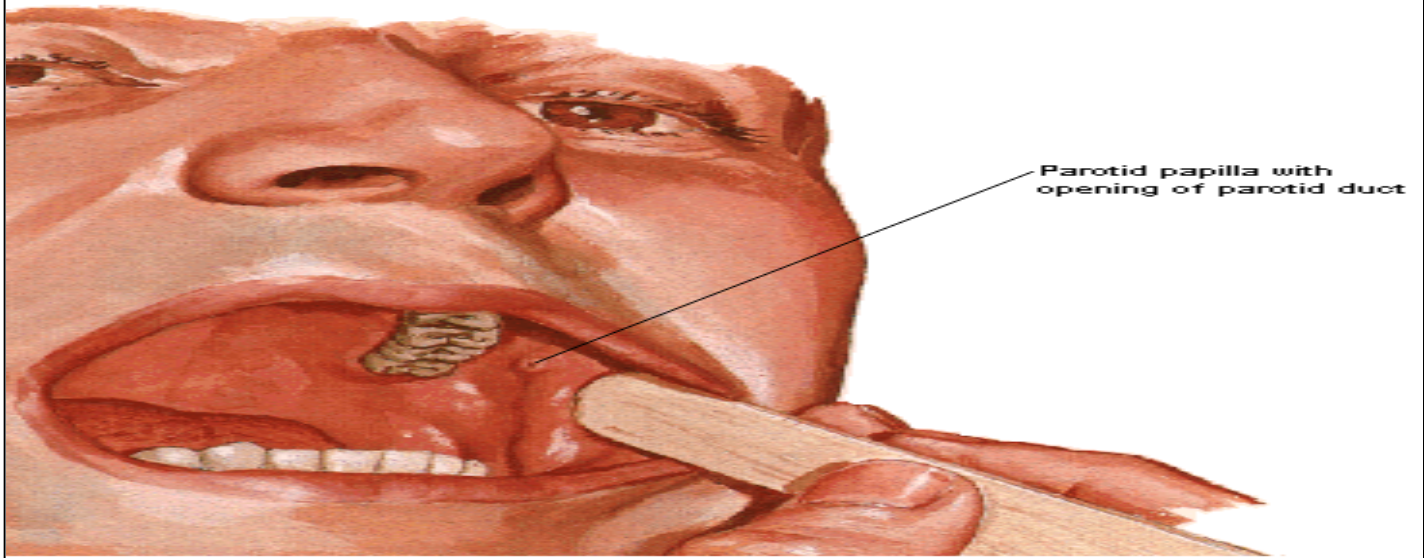
Lateral to the frenulum, the mucous membrane forms a fringed fold, the **plica fimbriata** .

The submandibular duct of the submandibular gland opens onto the floor of the mouth on the summit of a small **papilla** on either side of the frenulum of the tongue .

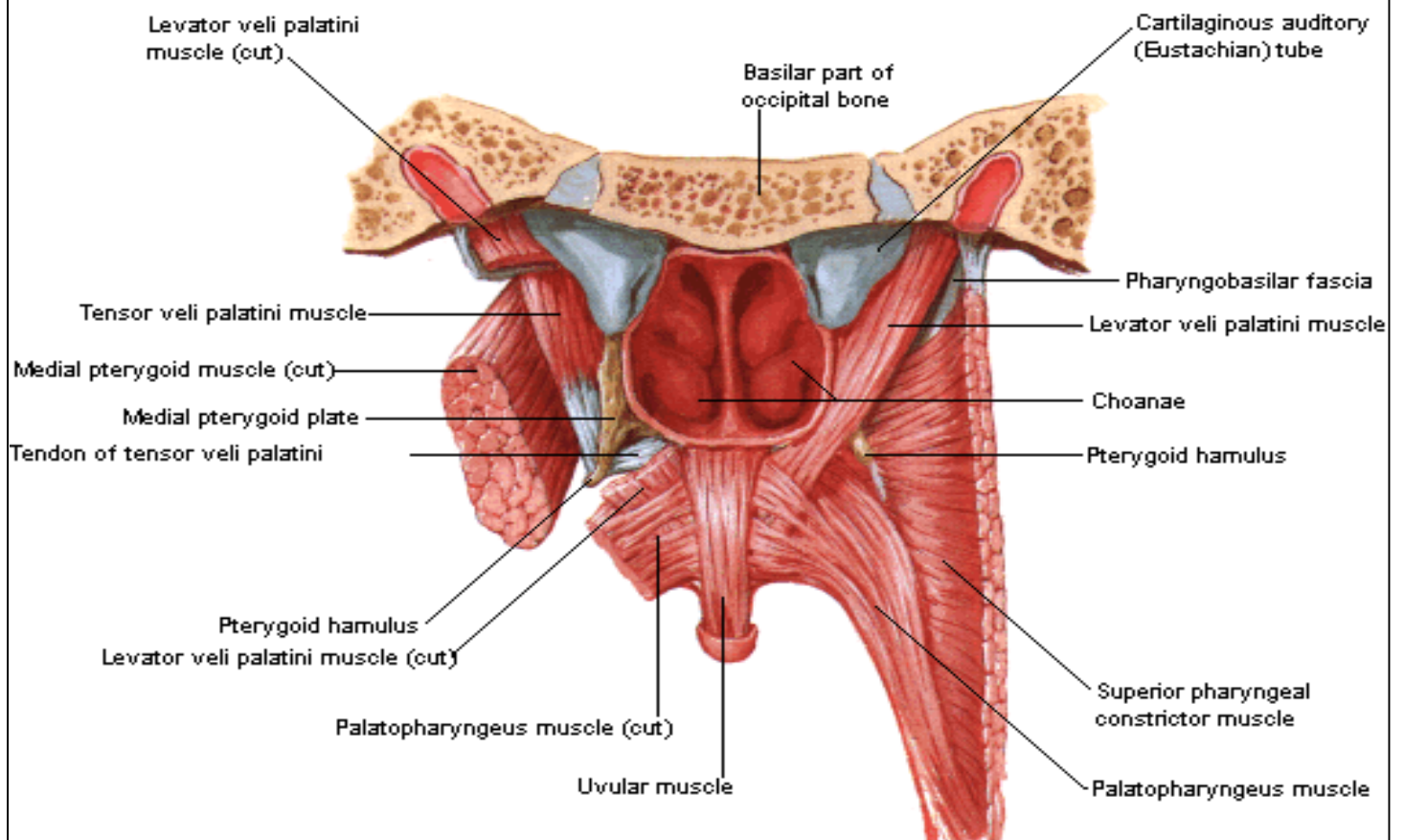
The sublingual gland projects up into the mouth, producing a low fold of mucous membrane, the **sublingual fold**.

Numerous ducts of the gland open on the summit of the fold.

Inspection of Oral Cavity Lateral Oral Vestibule

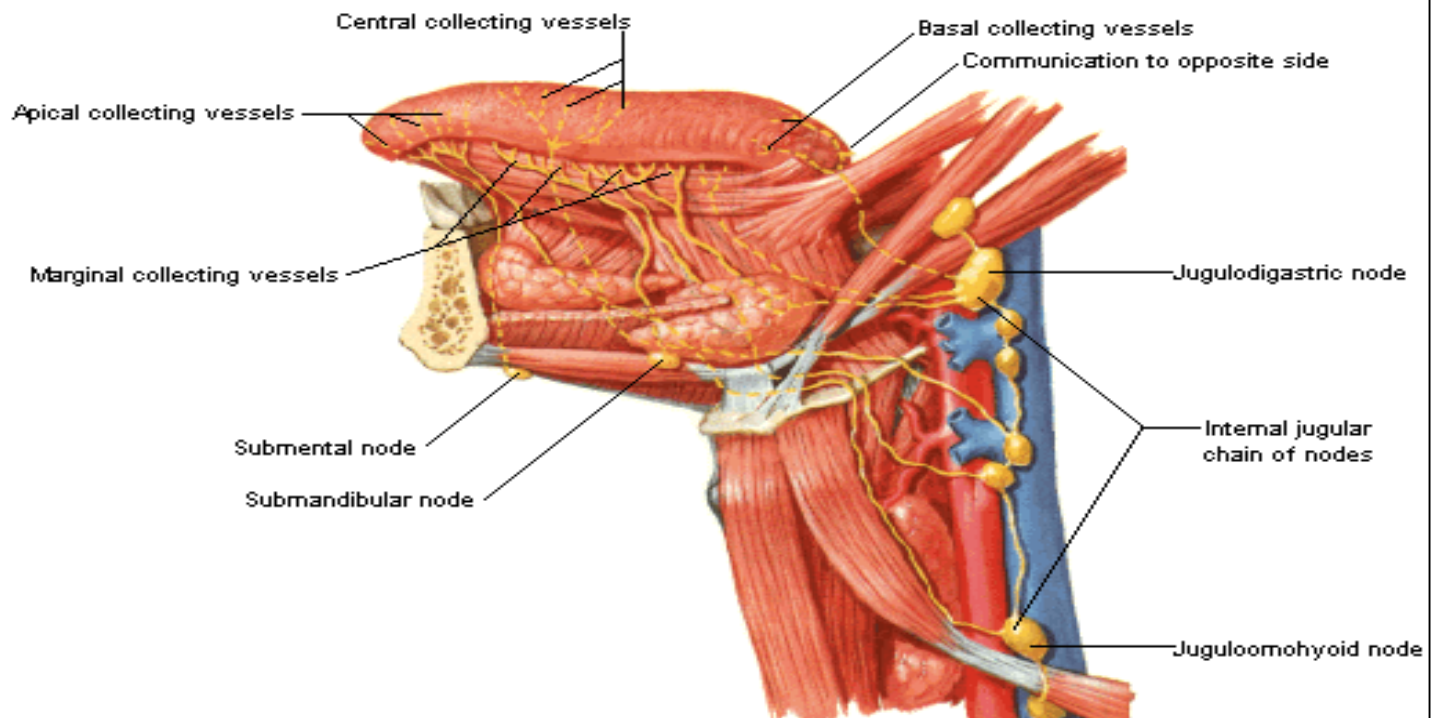


Roof of Mouth - Soft Palate Posterior View



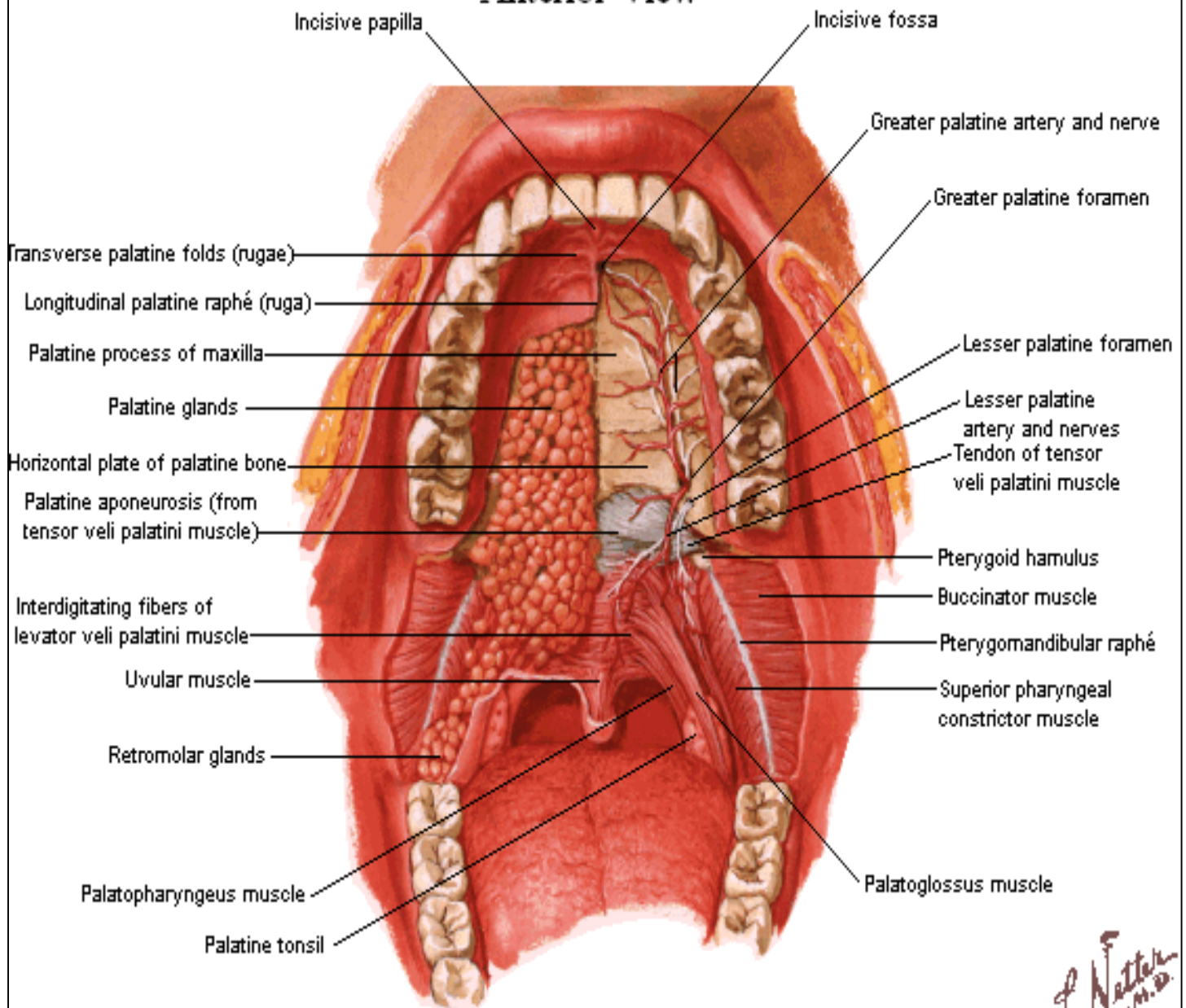
Lymphatic Drainage of Tongue

Lateral View



Roof of Mouth - Hard and Soft Palates

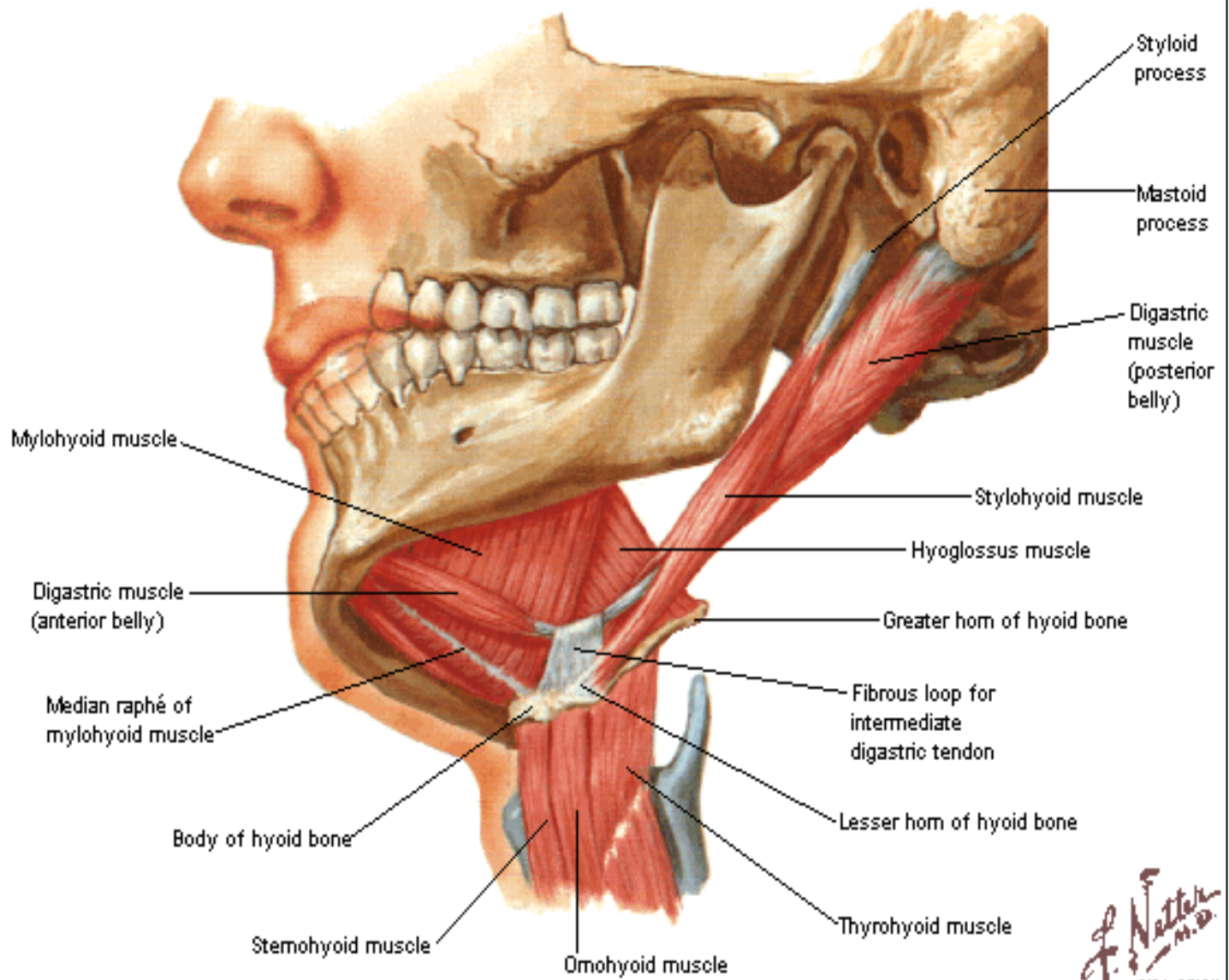
Anterior View



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Floor of Mouth - Musculature

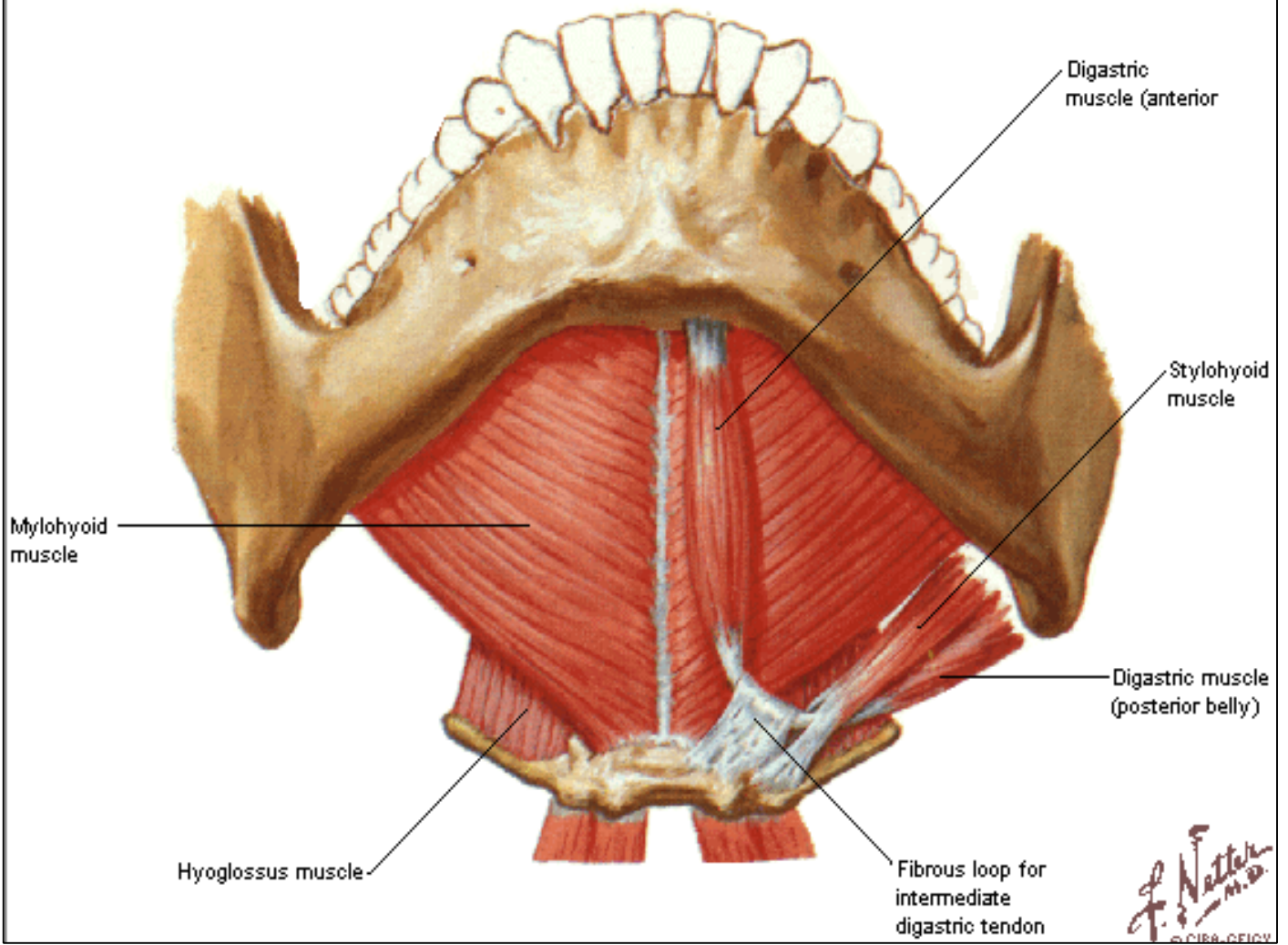
Lateral, Slightly Inferior View



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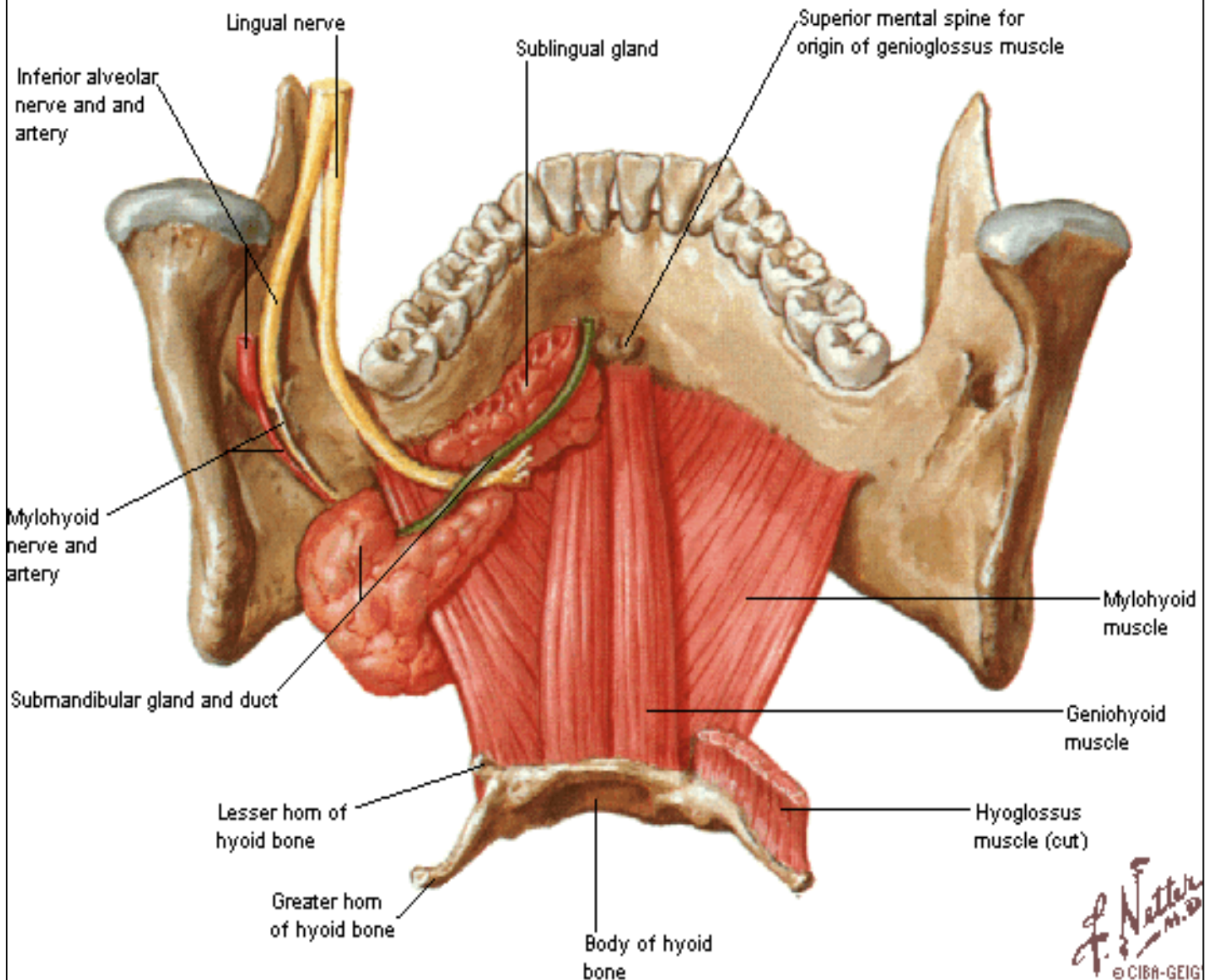
Floor of Mouth - Musculature

Anteroinferior View



Floor of Mouth - Musculature

Posterosuperior View



❀ Mucous Membrane of the Mouth ❀

In the vestibule the mucous membrane is tethered to the buccinator muscle by elastic fibers in the submucosa that prevent redundant folds of mucous membrane from being bitten between the teeth when the jaws are closed.

The mucous membrane of the gingiva, or gum, is strongly attached to the alveolar periosteum.

❀ Sensory Innervation of the Mouth ❀

Roof: The greater palatine and nasopalatine nerve from the maxillary division of the trigeminal nerve

Floor: The lingual nerve (**common sensation**), a branch of the mandibular division of the trigeminal nerve.

The **taste fibers** travel in the chorda tympani nerve, a branch of the facial nerve.

Cheek: The buccal nerve, a branch of the mandibular division of the trigeminal nerve (the buccinator muscle is innervated by the buccal branch of the facial nerve.)

❀ The Teeth ❀

♠ Deciduous Teeth :

There are 20 deciduous teeth: four incisors, two canines, and four molars in each jaw.

They begin to erupt about 6 months after birth and have all erupted by the end of 2 years. The teeth of the lower jaw usually appear before those of the upper jaw.

♠ Permanent Teeth

There are 32 permanent teeth: four incisors, two canines, four premolars, and six molars in each jaw . They begin to erupt at 6 years of age. The last tooth to erupt

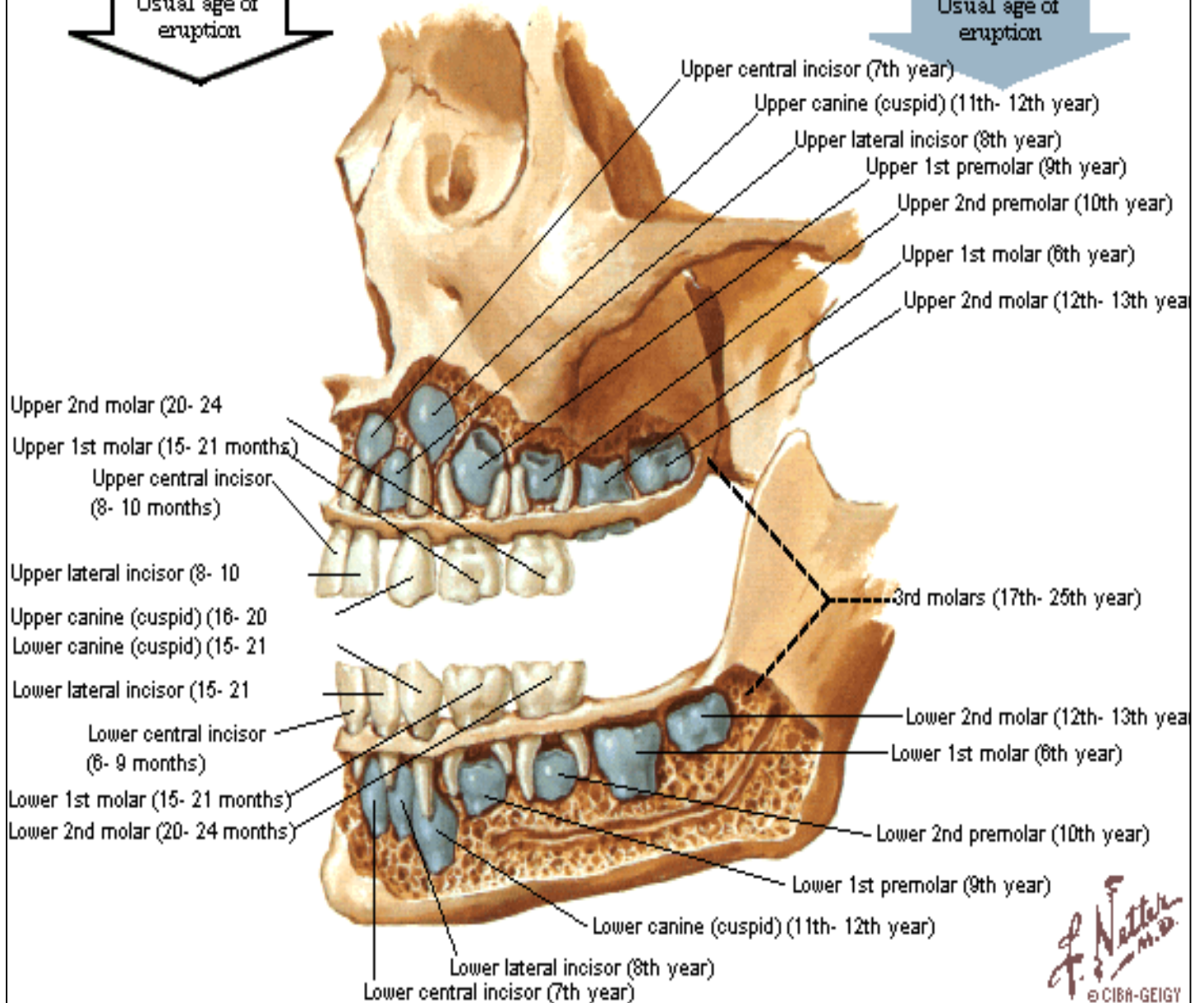
is the third molar, which may happen between the ages of 17 and 30. The teeth of the lower jaw appear before those of the upper jaw.

Teeth - Deciduous and Permanent

Age of Eruptions

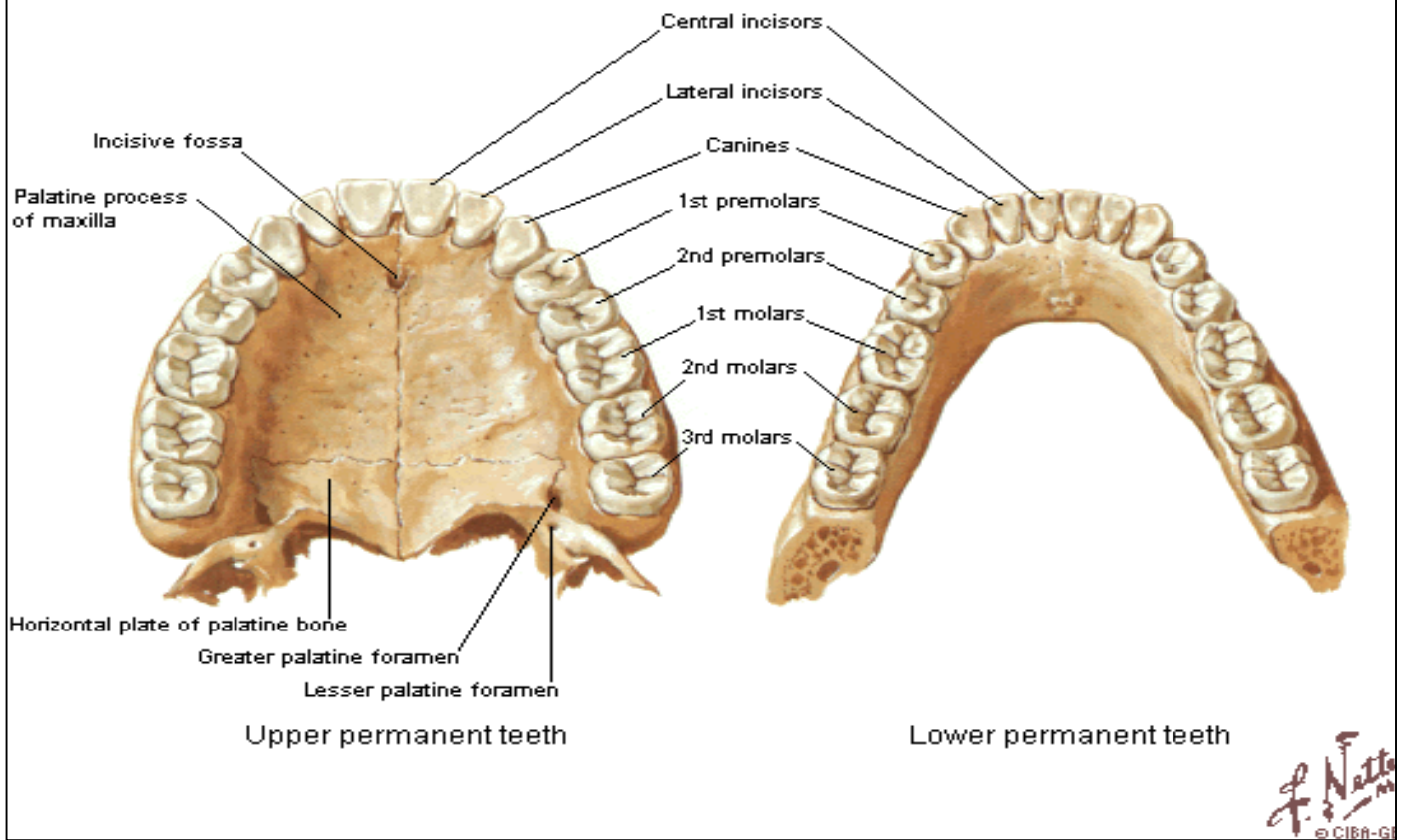
Deciduous
(primary)
Usual age of
eruption

Permanent
(colored blue)
Usual age of
eruption

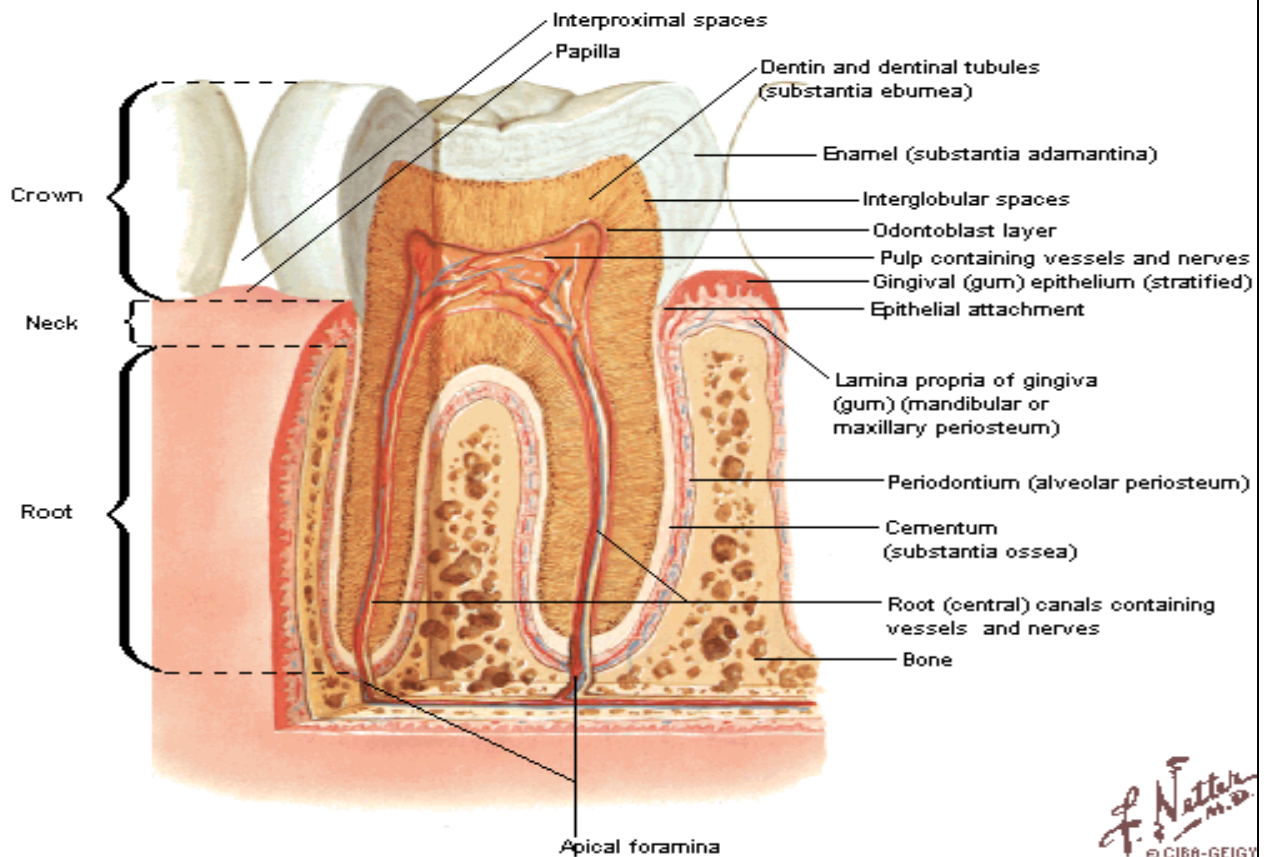


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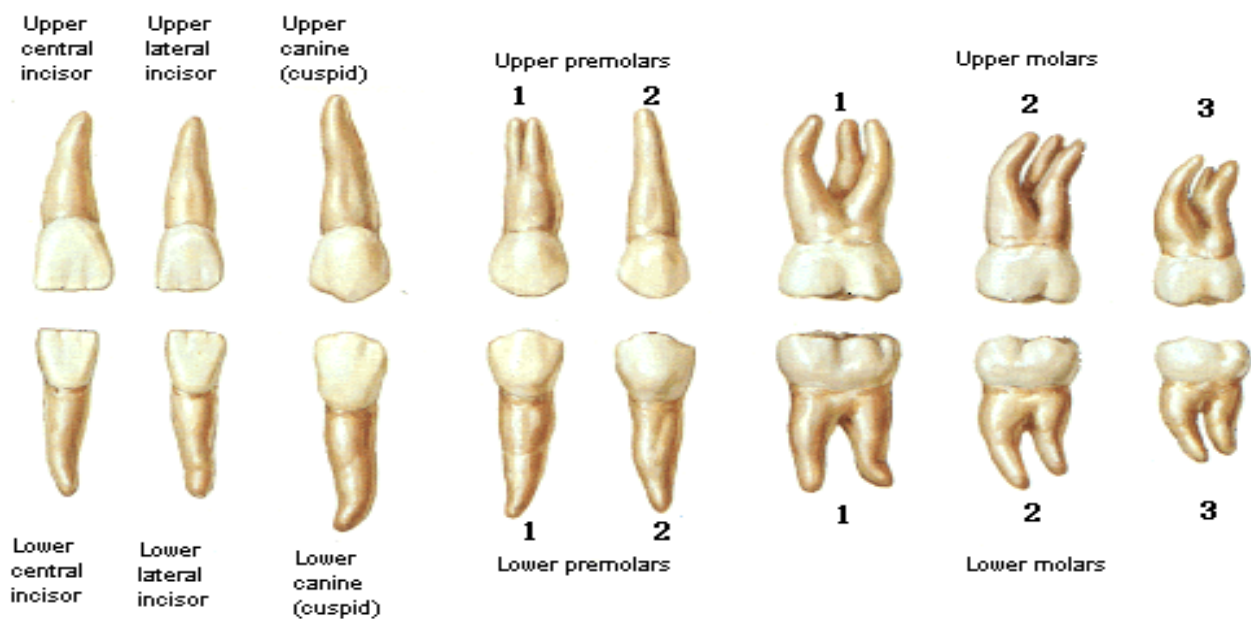
Teeth - Upper and Lower Permanent



Anatomy of a Tooth



Teeth - Left Upper and Left Lower Permanent Labiobuccal View



☼ The Tongue ☼

The tongue is a mass of striated muscle covered with mucous membrane.

The muscles attach the tongue to the styloid process and the soft palate above and to the mandible and the hyoid bone below.

The tongue is divided into right and left halves by a median fibrous septum.

♠ Mucous Membrane of the Tongue :

The mucous membrane of the upper surface of the tongue can be divided into anterior and posterior parts by a V-shaped sulcus, the sulcus terminalis .

The apex of the sulcus projects backward and is marked by a small pit, the foramen cecum.

The sulcus serves to divide the tongue into the anterior two thirds, or oral part, and the posterior third, or pharyngeal part.

The foramen cecum is an embryologic remnant and marks the site of the upper end of the thyroglossal duct .

♠ The tongue papillae:

Three types of papillae are present on the upper surface of the anterior two thirds of the tongue: the **filiform papillae**, the **fungiform papillae**, and the **vallate papillae**.

The mucous membrane covering the posterior third of the tongue is devoid of papillae but has an irregular surface, caused by the presence of underlying lymph nodules, the **lingual tonsil**.

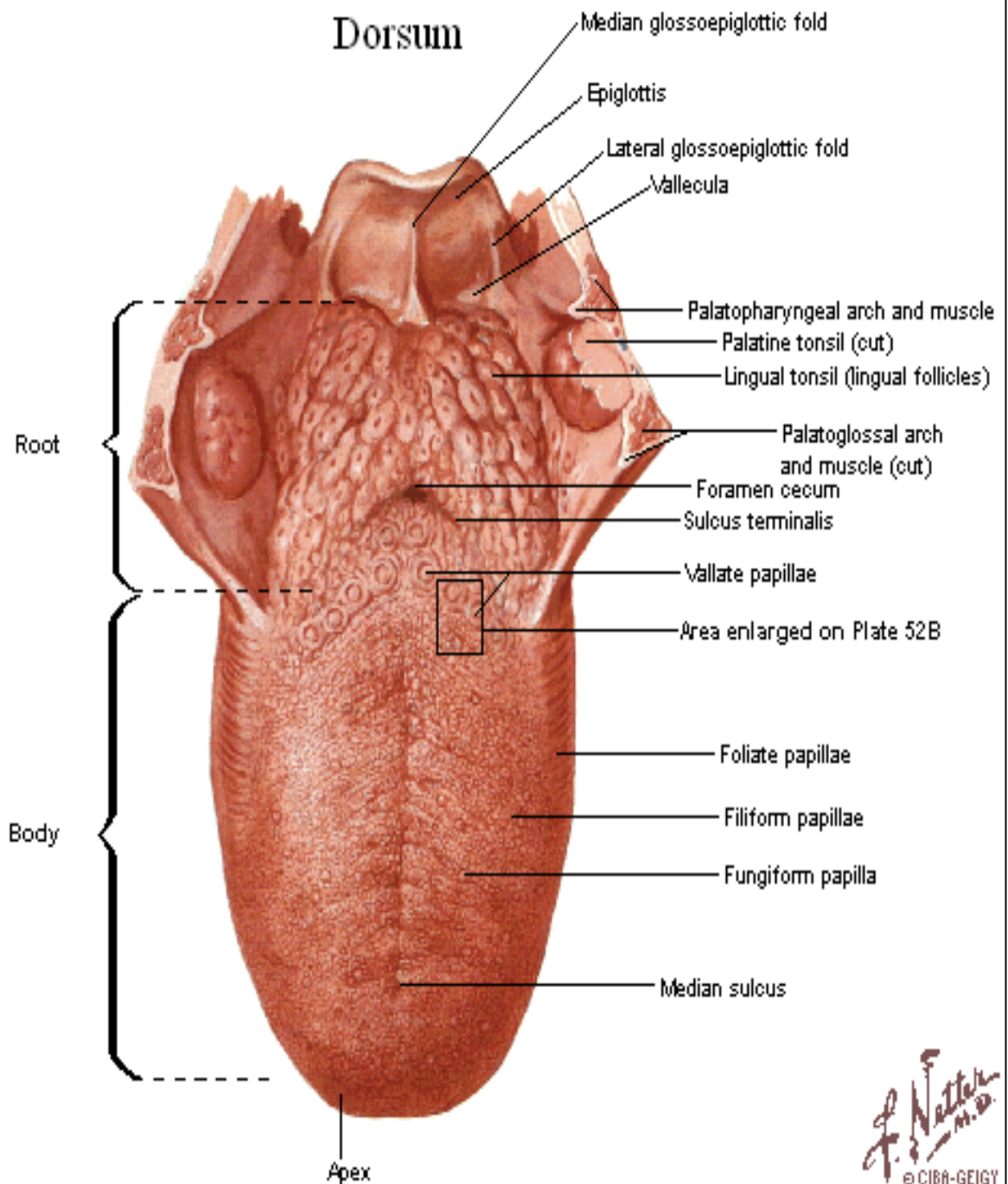
The mucous membrane on the inferior surface of the tongue is reflected from the tongue to the floor of the mouth.

In the midline anteriorly, the undersurface of the tongue is connected to the floor of the mouth by a fold of mucous membrane, **the frenulum of the tongue**. On the lateral side of the frenulum, the deep lingual vein can be seen through the mucous membrane.

Lateral to the lingual vein, the mucous membrane forms a fringed fold called **the plica fimbriata** .

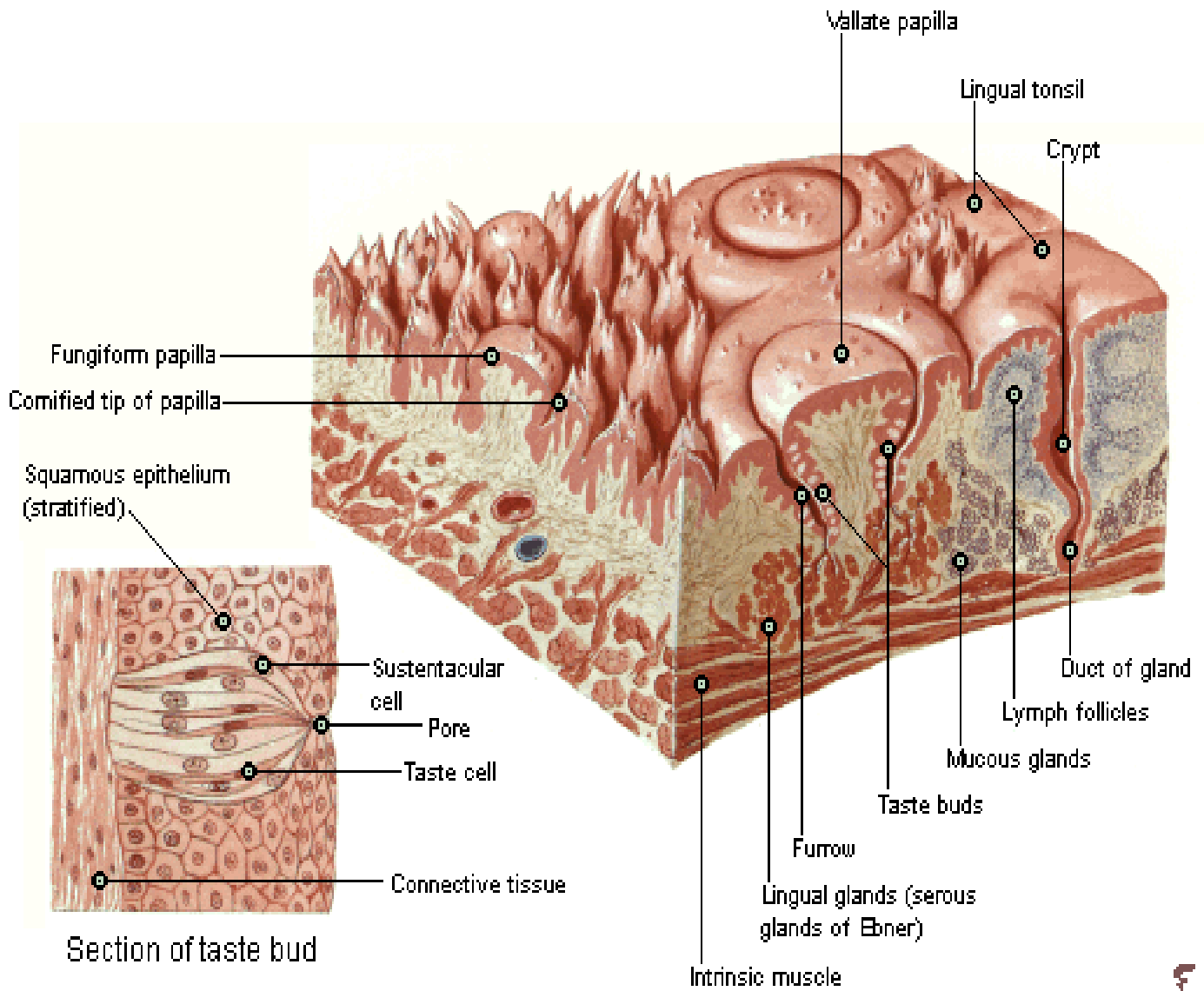
Tongue

Dorsum



Tongue - Schematic Stereogram

Area Indicated on Plate 52A



of Net

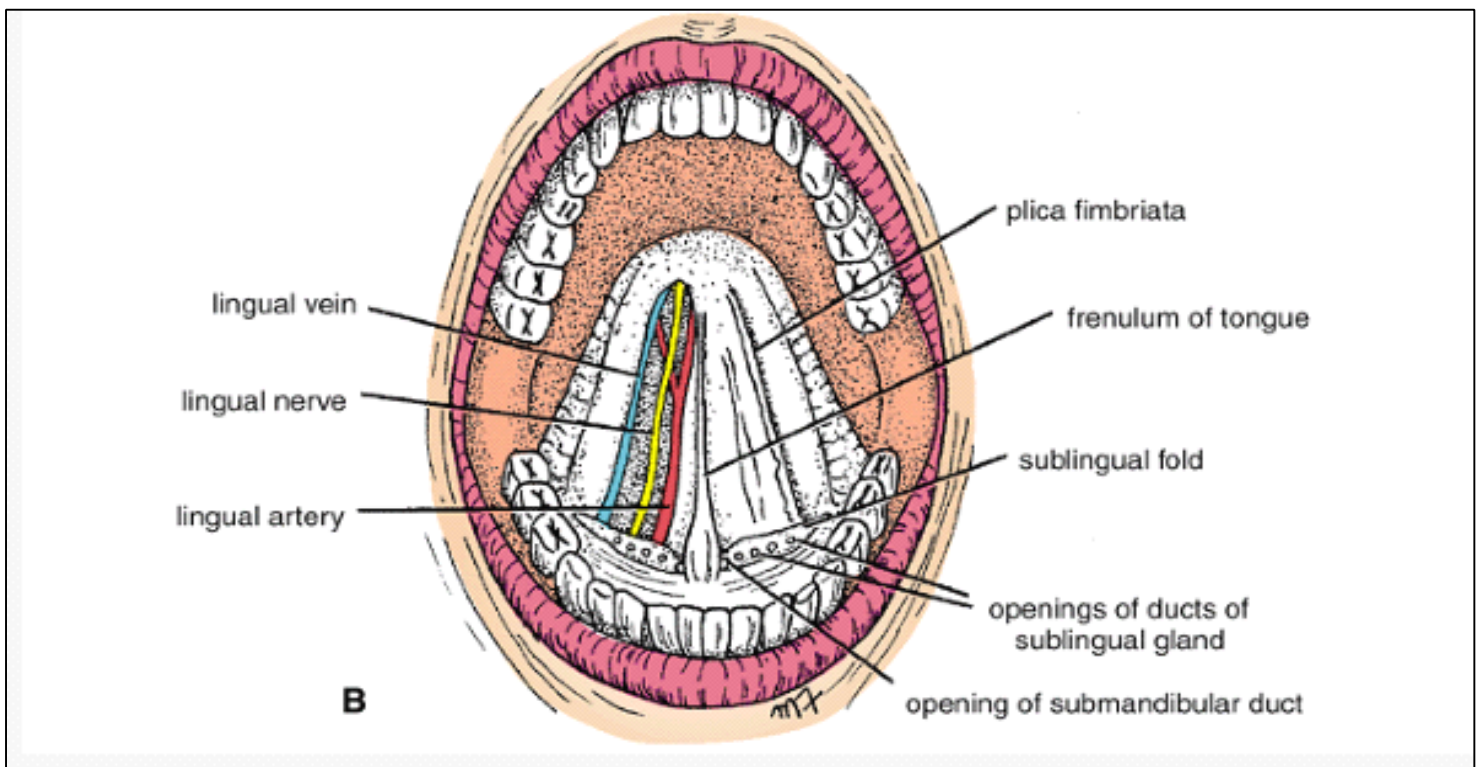
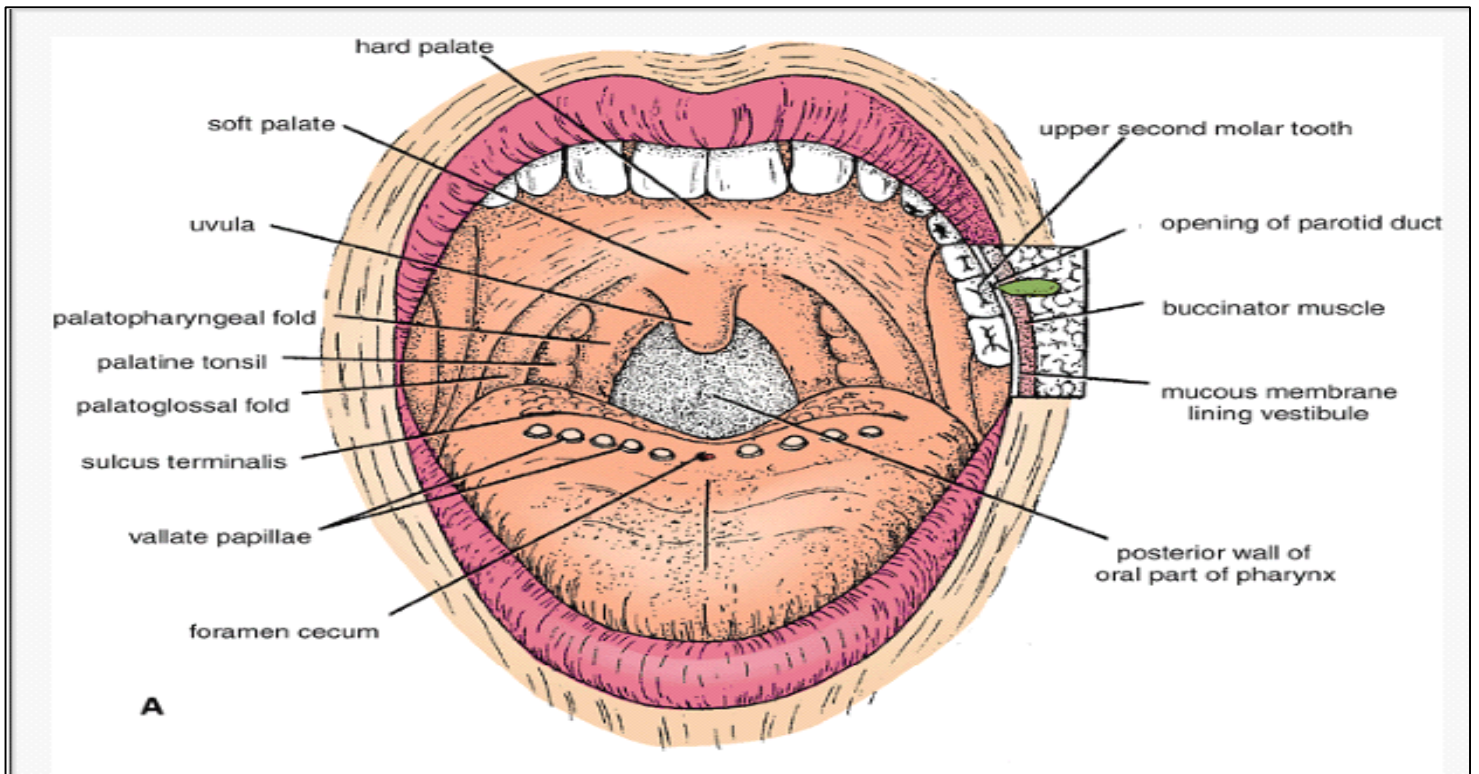


Figure 11-72 A. Cavity of the mouth. Cheek on the left side of the face has been cut away to show the buccinator muscle and the parotid duct. **B.** Undersurface of the tongue.

✿ Muscles of the Tongue ✿

The muscles of the tongue are divided into two types: intrinsic and extrinsic.

♠ Intrinsic Muscles :

These muscles are confined to the tongue and are not attached to bone. They consist of longitudinal, transverse, and vertical fibers.

Nerve supply: Hypoglossal nerve

Action: Alter the shape of the tongue

♠ Extrinsic Muscles :

These muscles are attached to bones and the soft palate.

They are the genioglossus, the hyoglossus, the styloglossus, and the palatoglossus.

Nerve supply: Hypoglossal nerve

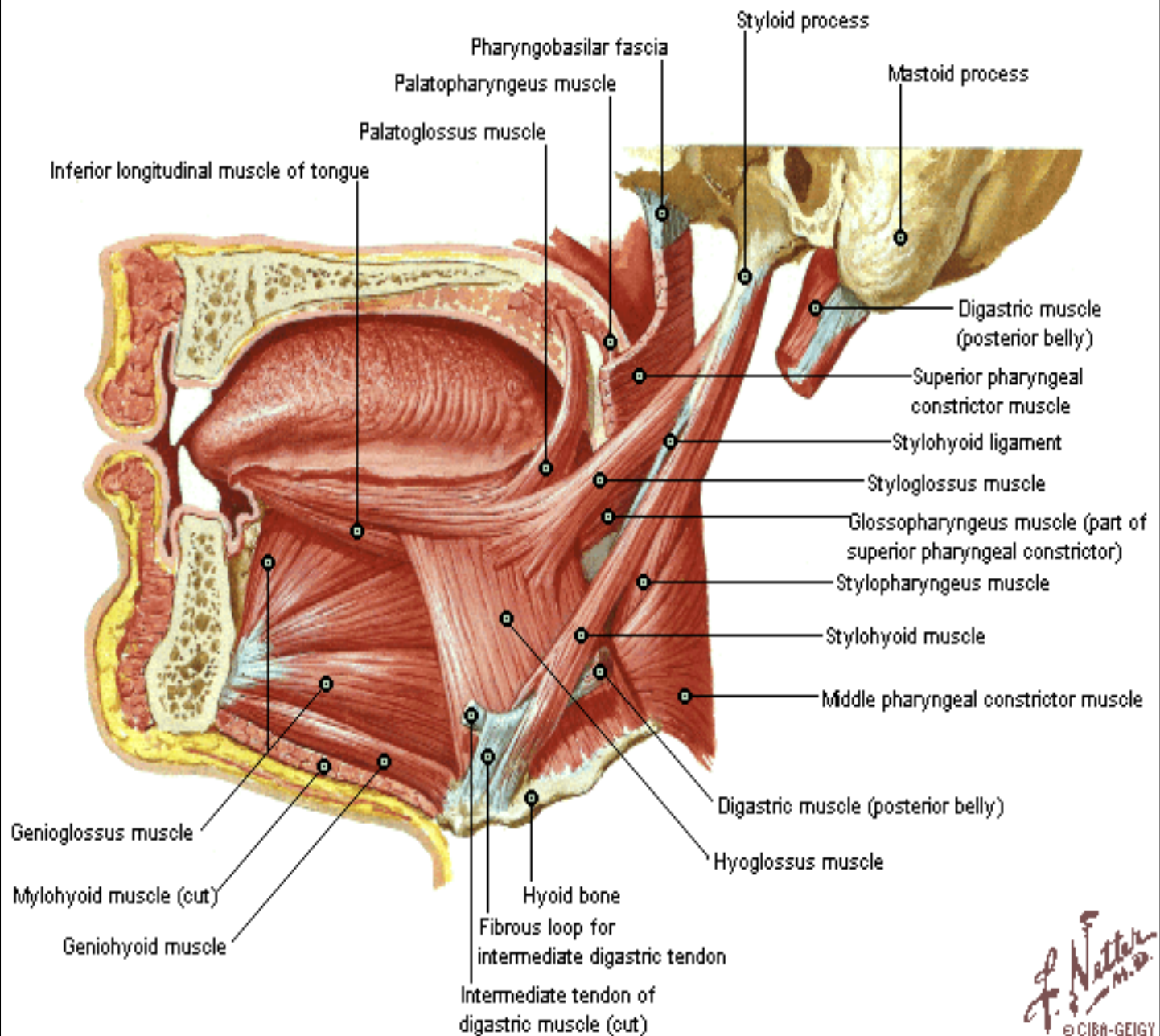
The origin, insertion, nerve supply, and action of the tongue muscles are summarized in the following:

Table 11-8 Muscles of Tongue

Muscle	Origin	Insertion	Nerve Supply	Action
Intrinsic Muscles				
Longitudinal	Median septum and submucosa	Mucous membrane	Hypoglossal nerve	Alters shape of tongue
Transverse Vertical				
Extrinsic Muscles				
Genioglossus	Superior genial spine of mandible	Blends with other muscles of tongue	Hypoglossal nerve	Protrudes apex of tongue through mouth
Hyoglossus	Body and greater cornu of hyoid bone	Blends with other muscles of tongue	Hypoglossal nerve	Depresses tongue
Styloglossus	Styloid process of temporal bone	Blends with other muscles of tongue	Hypoglossal nerve	Draws tongue upward and backward
Palatoglossus	Palatine aponeurosis	Side of tongue	Pharyngeal plexus	Pulls roots of tongue upward and backward, narrows oropharyngeal isthmus

Muscles of Tongue

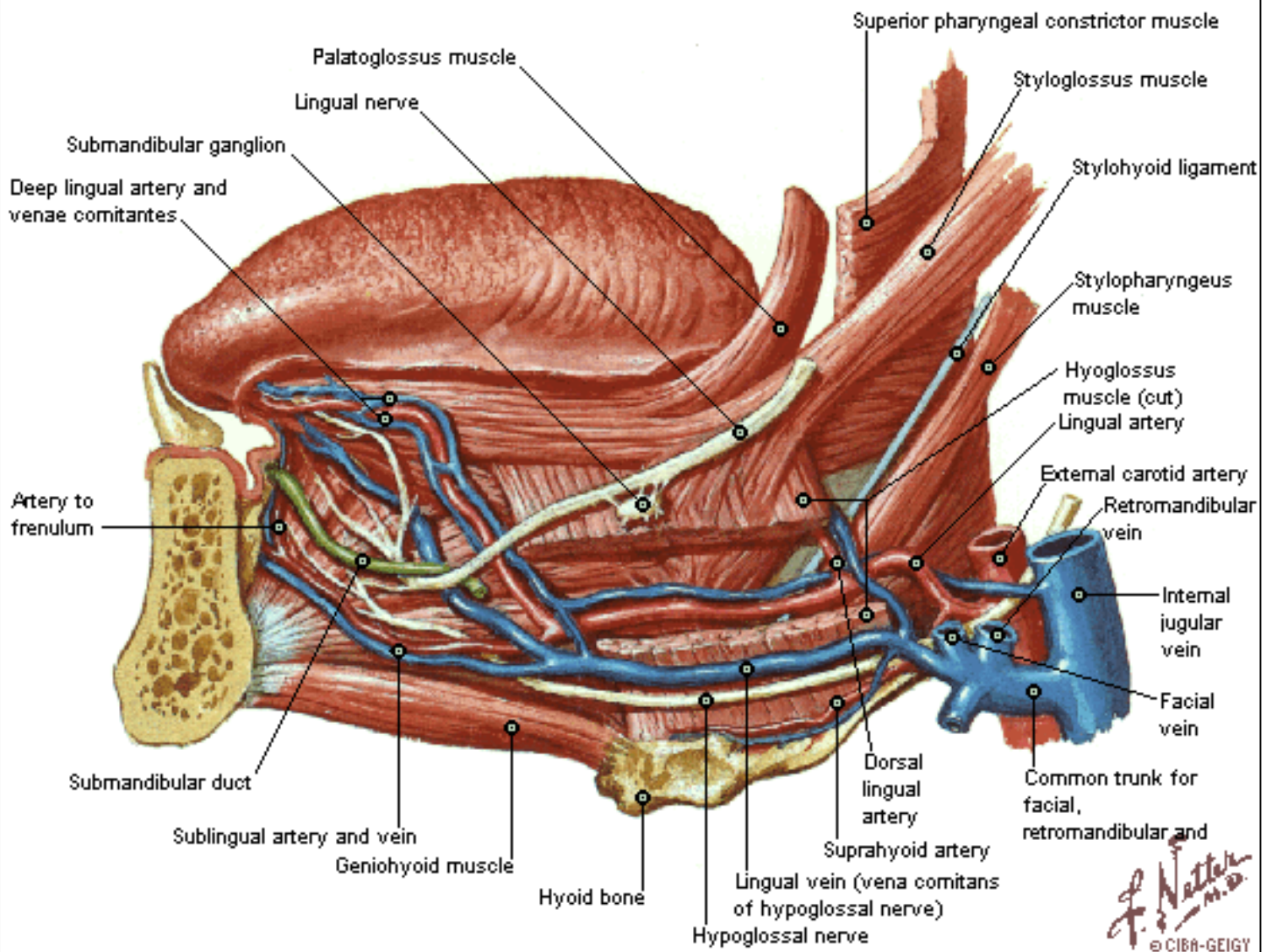
Sagittal Section



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Tongue and Related Structures

Sagittal Section



🌸 Blood Supply 🌸

-

The lingual artery, the tonsillar branch of the facial artery, and the ascending pharyngeal artery supply the tongue.

The veins drain into the internal jugular vein.

🌸 Lymph Drainage 🌸

Tip: Submental lymph nodes

Sides of the anterior two thirds: Submandibular and deep cervical lymph nodes

Posterior third: Deep cervical lymph nodes

🌸 Sensory Innervation 🌸

Anterior two thirds: Lingual nerve branch of mandibular division of trigeminal nerve (general sensation) and chorda tympani branch of the facial nerve (taste)

Posterior third: Glossopharyngeal nerve (general sensation and taste)

🌸 Movements of the Tongue 🌸

-

Protrusion: The genioglossus muscles on both sides acting together

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Retraction: Styloglossus and hyoglossus muscles on both sides acting together

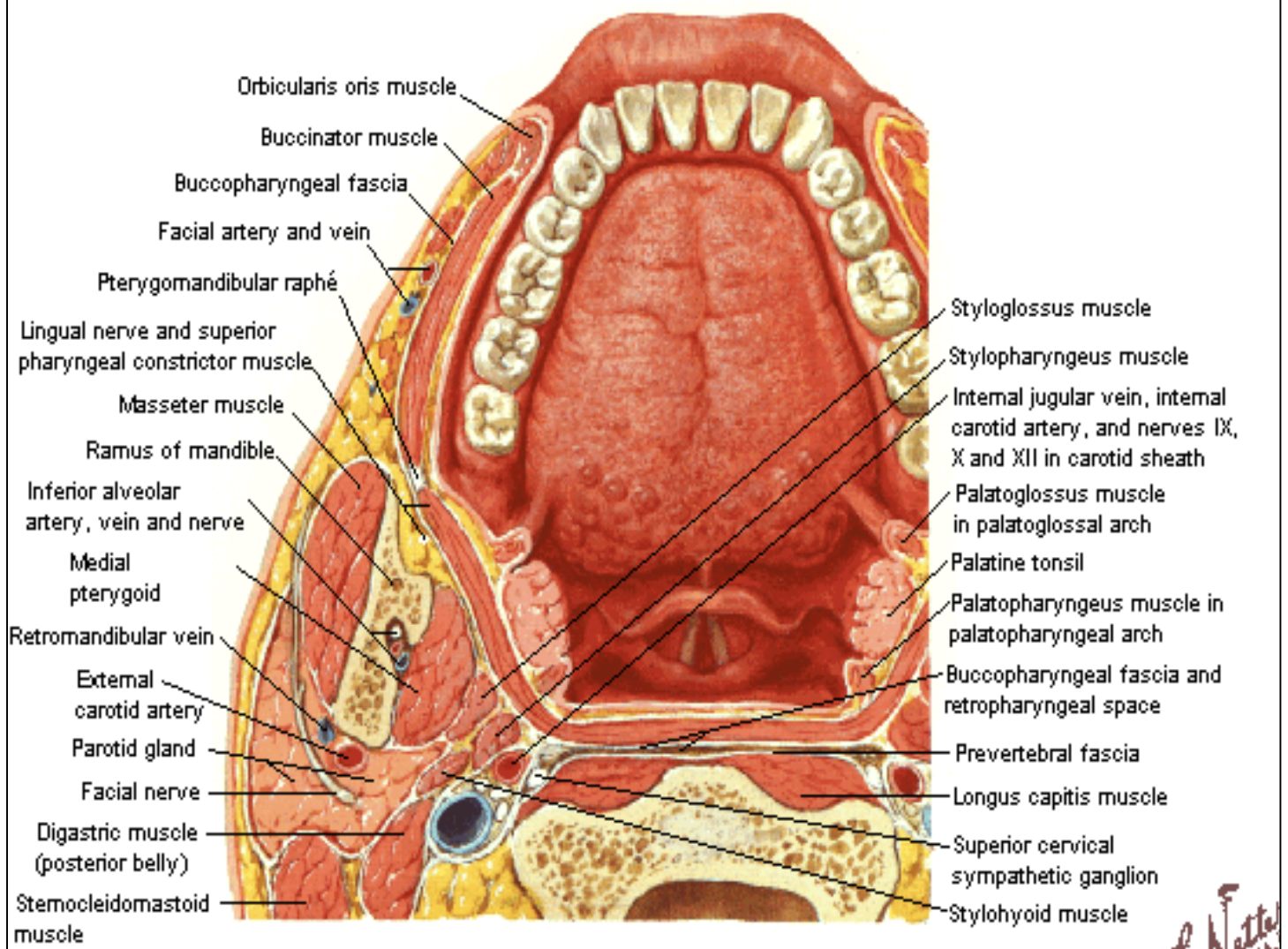
Depression: Hyoglossus muscles on both sides acting together

Retraction and elevation of the posterior third: Styloglossus and palatoglossus muscles on both sides acting together

Shape changes: Intrinsic muscles

Tongue and Mouth

Horizontal Section - Superior View



Sectioned below lingula of mandible

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