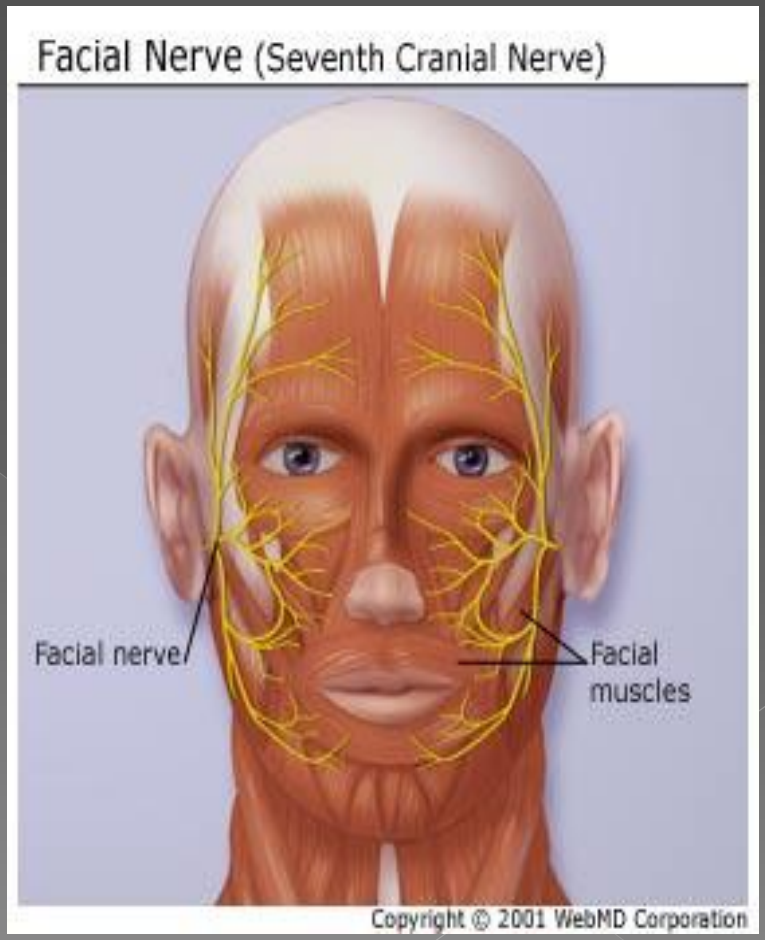
Sutures

- Sutures – Immovable joints that join skull bones together
- Form boundaries between skull bones
- Four sutures:
  - Coronal – between parietal and frontal
  - Sagittal– between parietal bones
  - Lambdoid – between the parietal and occipital
  - Squamous – between the parietal and temporal
  - ✓ Fontanels – usually ossify by 2 years of age

Skull Feature	Female Skull Characteristic	Male Skull Characteristic
General Size and Appearance	More gracile and delicate	More robust (big and bulky), more prominent muscle markings
Nuchal Lines and External Occipital Protuberance	External surface of occipital bone is relatively smooth, with no major bony projections	Well-demarcated nuchal lines and prominent bump or "hook" for external occipital protuberance
Mastoid Process	Relatively small	Large, may project inferior to external acoustic meatus
Squamous Part of Frontal Bone	Usually more vertically oriented and rounded than in males	Exhibits a sloping angle
Supraorbital Margin	Thin, sharp border	Thick, rounded, blunt border
Superciliary Arches	Little or no prominence	More prominent and bulky
Mandible (general features)	Smaller and lighter	Larger, heavier, more robust
Mental Protuberance (chin)	More pointed and triangular-shaped, less forward projection	Squarish, more forward projection
Mandibular Angle	Typically greater than 125 degrees	Flared, less obtuse, less than 125 degrees (typically about 90 degrees)
Sinuses	Smaller in total volume	Larger in total volume
Teeth	Relatively smaller	Relatively larger

Bell's Palsy:

- Inhibition of facial nerve (cranial nerve VII) → inability to control facial muscles (resultant flaccidity)
  - Most common cause of Acute Facial Nerve Paralysis
  - Symptoms: weakness on one side of face, facial droop, pain on affected side, headache, loss of taste
  - Cause: Inflammation of facial nerve (resultant pinching)
    - Infection or Virus



Muscles of Facial Expression

Table 11.1 Muscles of Facial Expression

Region/Muscle	Action	Origin/Insertion	Innervation
SCALP			
Epicranius (ep′ĭ-krā′nē-us) *epi* = over *cran* = skull		Composed of an epicranial aponeurosis and the occipitofrontalis muscle	
Frontal belly of occipitofrontalis (ok-sip′i-tō-fron-tā′lis) *front* = forehead	Moves scalp, eyebrows; wrinkles skin of forehead	O: Frontal bone I: Epicranial aponeurosis	CN VII (facial nerve)
Occipital belly of occipitofrontalis *occipito* = base of skull	Retracts scalp	O: Superior nuchal line I: Epicranial aponeurosis	CN VII (facial nerve)
NOSE			
Nasalis (nā′zā-lis) *nasus* = nose	Compresses bridge and depresses tip of nose; elevates corners of nostrils	O: Maxillae and alar cartilage of nose I: Dorsum of nose	CN VII (facial nerve)
Procerus (prō-sē′rŭs) *procerus* = long	Moves and wrinkles nose	O: Nasal bone and lateral nasal cartilage I: Aponeurosis at bridge of nose and skin of forehead	CN VII (facial nerve)

MOUTH

Buccinator (buk′sĭ-nā′tōr) *bucco* = cheek	Compresses cheek; holds food between teeth during chewing	O: Alveolar processes of mandible and maxillae I: Orbicularis oris	CN VII (facial nerve)
Depressor anguli oris (dē-pres′ōr ang′ū-lī ōr′ŭs) *depressor* = depresses *angul* = angle *or* = mouth	Draws corners of mouth inferiorly and laterally ("frown" muscle)	O: Body of mandible I: Skin at inferior corner (angle) of mouth	CN VII (facial nerve)
Depressor labii inferioris (dē-pres′ōr lā′bē-ī in-fēr′ē-ōr-is) *labi* = lip *infer* = below	Draws lower lip inferiorly	O: Body of mandible lateral to midline I: Skin at inferior lip	CN VII (facial nerve)
Levator anguli oris (lē-vā′tor, le-vā′ter ang′ū-lī ōr′ūs) *leva* = raise	Draws corners of mouth superiorly and laterally ("smile" muscle)	O: Lateral maxilla I: Skin at superior corner of mouth	CN VII (facial nerve)
Levator labii superioris (lē-vā′tor, le-vā′ter lā′bē-ī sū-pēr′ē-ōr-is)	Opens lips; raises and furrows the upper lip ("Elvis" lip snarl)	O: Zygomatic bone; maxilla I: Skin and muscle of superior lip	CN VII (facial nerve)
Mentalis (men-tā′lis) *ment* = chin	Protrudes lower lip ("pout"); wrinkles chin	O: Central mandible I: Skin of chin	CN VII (facial nerve)
Orbicularis oris (ōr-bik′ū-lā′ris ōr′is) *orb* = circular *or* = mouth	Compresses and purses lips ("kiss" muscle)	O: Maxilla and mandible; blend with fibers from other facial muscles I: Encircling mouth; skin and muscles at angles to mouth	CN VII (facial nerve)
Risorius (ri-sōr′ē-ŭs) *risor* = laughter	Draws corner of lip laterally; tenses lips; synergist of zygomaticus	O: Deep fascia associated with masseter muscle I: Skin at angle of mouth	CN VII (facial nerve)
Zygomaticus major (zī′gō-mat′i-kŭs) *zygomatic* = cheekbone *major* = greater	Elevates corner of the mouth ("smile" muscle)	O: Zygomatic bone I: Skin at superolateral edge of mouth	CN VII (facial nerve)
Zygomaticus minor (zī′gō-mat′i-kŭs) *minor* = lesser	Elevates corner of the mouth ("smile" muscle)	O: Zygomatic bone I: Skin of superior lip	CN VII (facial nerve)

Muscles of Facial Expression

Table 11.1 Muscles of Facial Expression *(continued)*

Region/Muscle	Action	Origin/Insertion	Innervation
EYE			
Corrugator supercilii (kōr′ŭ-gā-ter soo′per-sil′ē-ī) *corrugo* = to wrinkle *cilium* = eyelid	Pulls eyebrows inferiorly and medially; creates vertical wrinkles above nose	O: Medial end of superciliary arch I: Skin superior to supraorbital margin and superciliary arch	CN VII (facial nerve)
Levator palpebrae superioris (see figure 19.10) (le-vā′ter pal-pē′brā soo-pēr′ē-ōr-ĭs) *levo* = to lift *palpebra* = eyelid	Elevates superior eyelid	O: Lesser wing of sphenoid bone I: Superior tarsal plate and skin of superior eyelid	CN III (oculomotor nerve)
Orbicularis oculi (ōr-bik′ū-lā′ris ok′ū-lī) *orb* = circular *ocul* = eye	Closes eye; produces winking, blinking, squinting ("blink" muscle)	O: Medial wall or margin of orbit I: Skin surrounding eyelids	CN VII (facial nerve)
NECK			
Platysma (plă-tiz′mă) *platy* = flat	Pulls lower lip inferiorly; tenses skin of neck	O: Fascia of deltoid and pectoralis major muscles and acromion of scapula I: Skin of cheek and mandible	CN VII (facial nerve)

Characteristics of the facial muscles

1. The primary function is expression of the emotions.
2. The facial muscles are capable of performing 7000 expressions according to Coleman.
3. They are also responsible for the maintenance of the posture of the facial structures.
4. The facial muscle also contributes to stabilization of the mandible during the infantile swallowing and chewing and swallowing in the occlusally compromised adults.
5. It is also important for the visual and the spoken communications.

MUSCULES

Table 11.2 Extrinsic Eye Muscles

Group/Muscle	Action	Origin/Insertion	Innervation
RECTUS MUSCLES			
Medial rectus (mē′dē-ăl rek′tus) *rectus* = straight	Moves eye medially (adducts eye)	O: Common tendinous ring I: Anteromedial surface of eye	CN III (oculomotor nerve)
Lateral rectus (lat′er-ăl rek′tus)	Moves eye laterally (abducts eye)	O: Common tendinous ring I: Anterolateral surface of eye	CN VI (abducens nerve)
Inferior rectus (in-fē′rē-ōr rek′tus)	Moves eye inferiorly (depresses eye) and medially (adducts eye)	O: Common tendinous ring I: Anteroinferior surface of eye	CN III (oculomotor nerve)
Superior rectus (soo-pēr′ē-ōr rek′tus)	Moves eye superiorly (elevates eye) and medially (adducts eye)	O: Common tendinous ring I: Anterosuperior surface of eye	CN III (oculomotor nerve)
OBLIQUE MUSCLES			
Inferior oblique (in-fē′rē-ōr ob-lēk′) *obliquus* = slanting	Moves eye superiorly (elevates eye) and laterally (abducts eye)	O: Anterior orbital surface of maxilla I: Posteroinferior, lateral surface of eye	CN III (oculomotor nerve)
Superior oblique (soo-pēr′ē-ōr ob-lēk′)	Moves eye inferiorly (depresses eye) and laterally (abducts eye)	O: Sphenoid bone I: Posterosuperior, lateral surface of eye	CN IV (trochlear nerve)

Study Tip :

Study Tip!

Remembering the innervation of the eye muscles can be difficult. Use the following "chemical formula" to help you learn the eye muscle innervation:

$$[(SO_4)(LR_6)]_3$$

In other words, the superior oblique **(SO)** is innervated by cranial nerve IV **(4)**, the lateral rectus **(LR)** is innervated by cranial nerve VI **(6)**, and the rest of the eye muscles are innervated by cranial nerve III **(3)**.

Mastication

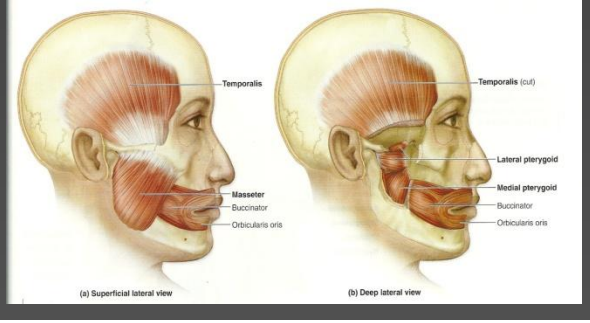
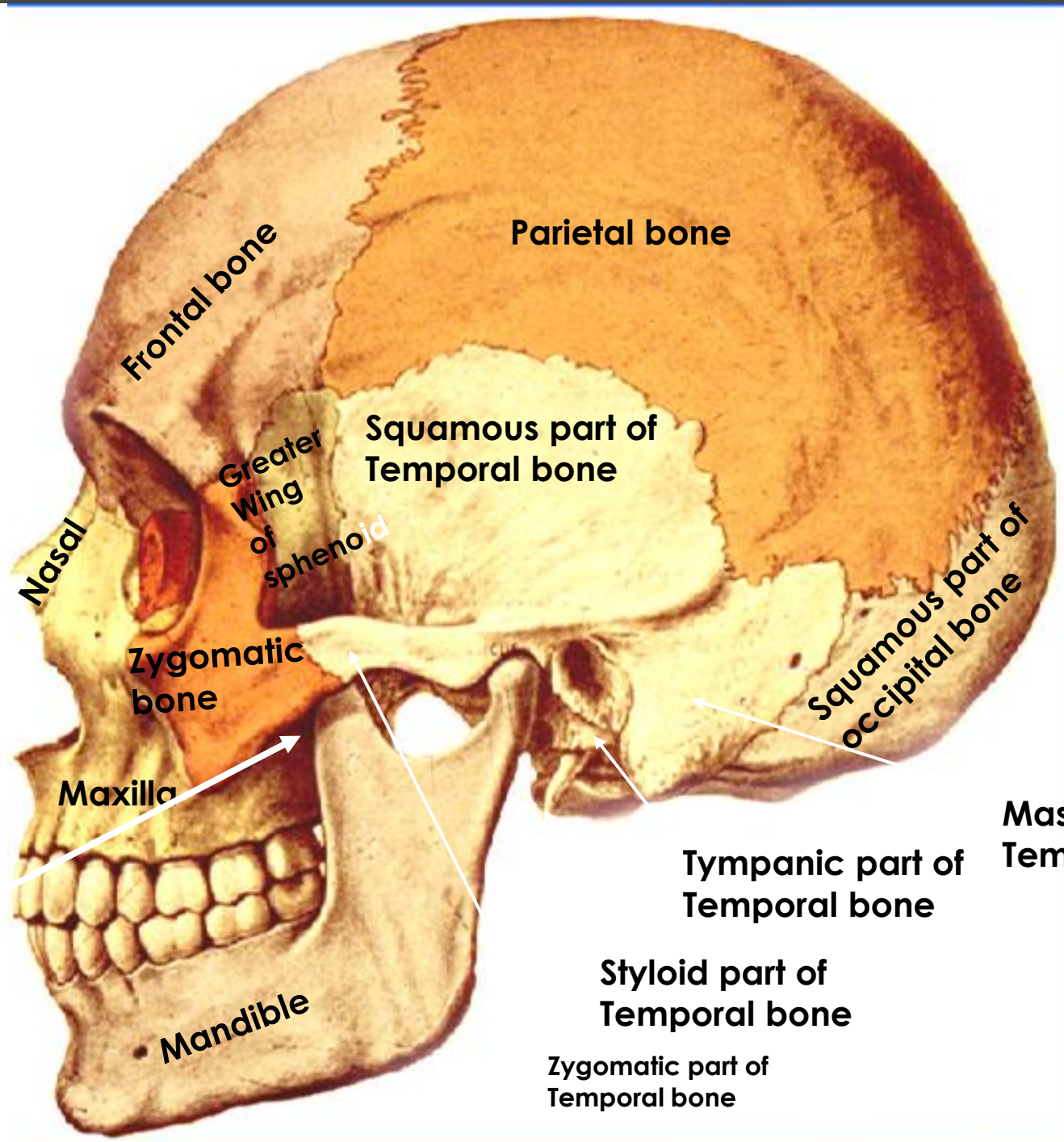


Table 11.3 Muscles of Mastication

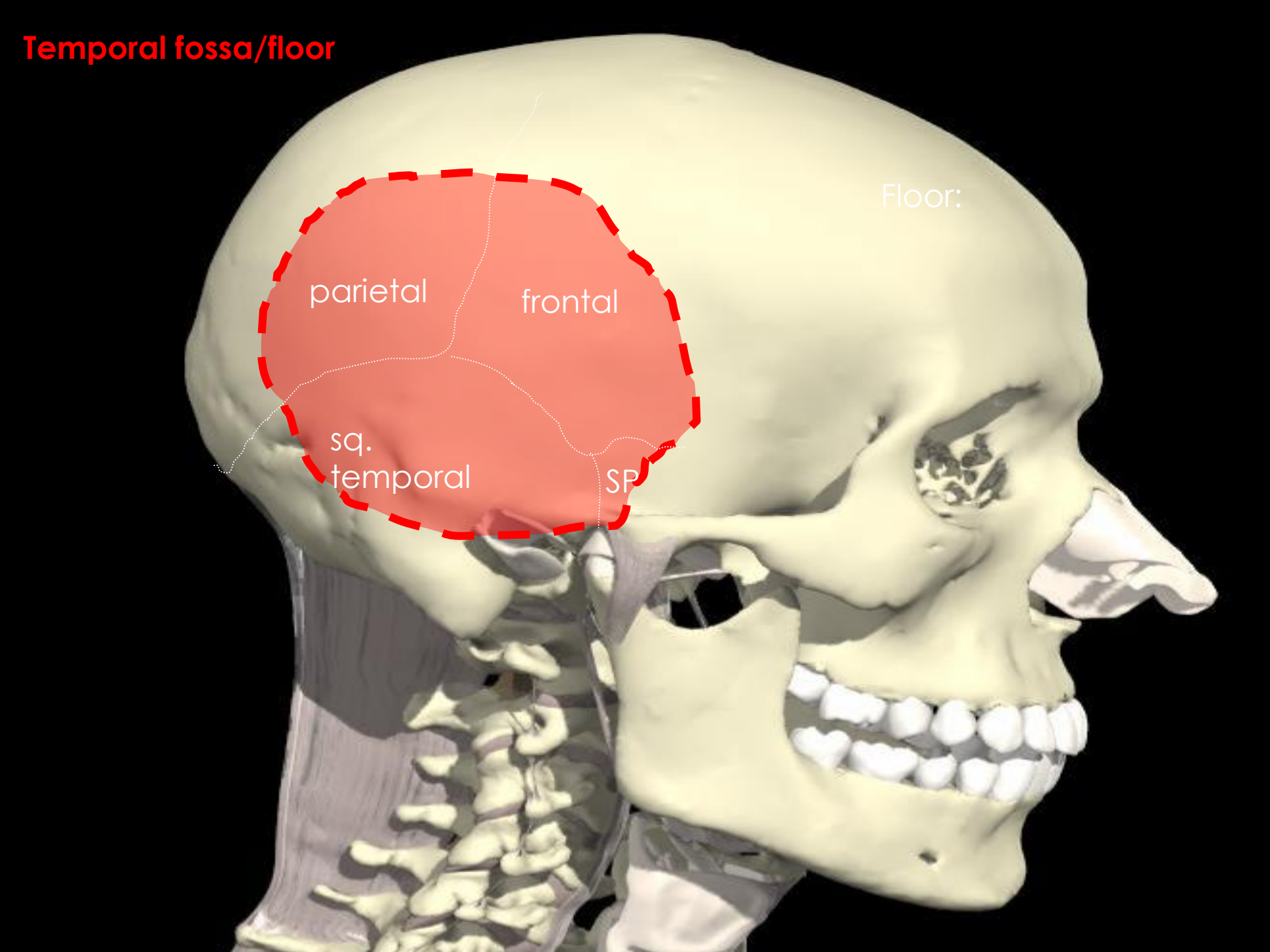
Muscle	Action	Origin/Insertion	Innervation
Temporalis (tem-pō-rā′lis) *tempora* = pertaining to temporal bone	Elevates and retracts mandible	O: Superior and inferior temporal lines I: Coronoid process of mandible	CN V_3 (trigeminal nerve, mandibular division)
Masseter (ma′se-ter) *maseter* = chewer	Elevates and protracts mandible; prime mover of jaw closure	O: Zygomatic arch I: Coronoid process, lateral surface and angle of mandible	CN V_3 (trigeminal nerve, mandibular division)
Medial pterygoid (mē′dē-ăl ter′i-goyd)	Elevates and protracts mandible; produces side-to-side movement of mandible	O: Maxilla, palatine, and medial surface of lateral pterygoid plate I: Medial surface of mandibular ramus	CN V_3 (trigeminal nerve, mandibular division)
Lateral pterygoid (lat′er-ăl ter′i-goyd) *pterygoid* = winglike	Protracts mandible; produces side-to-side movement of mandible	O: Greater wing of sphenoid and lateral surface of lateral pterygoid plate I: Condylar process of mandible	CN V_3 (trigeminal nerve, mandibular division)

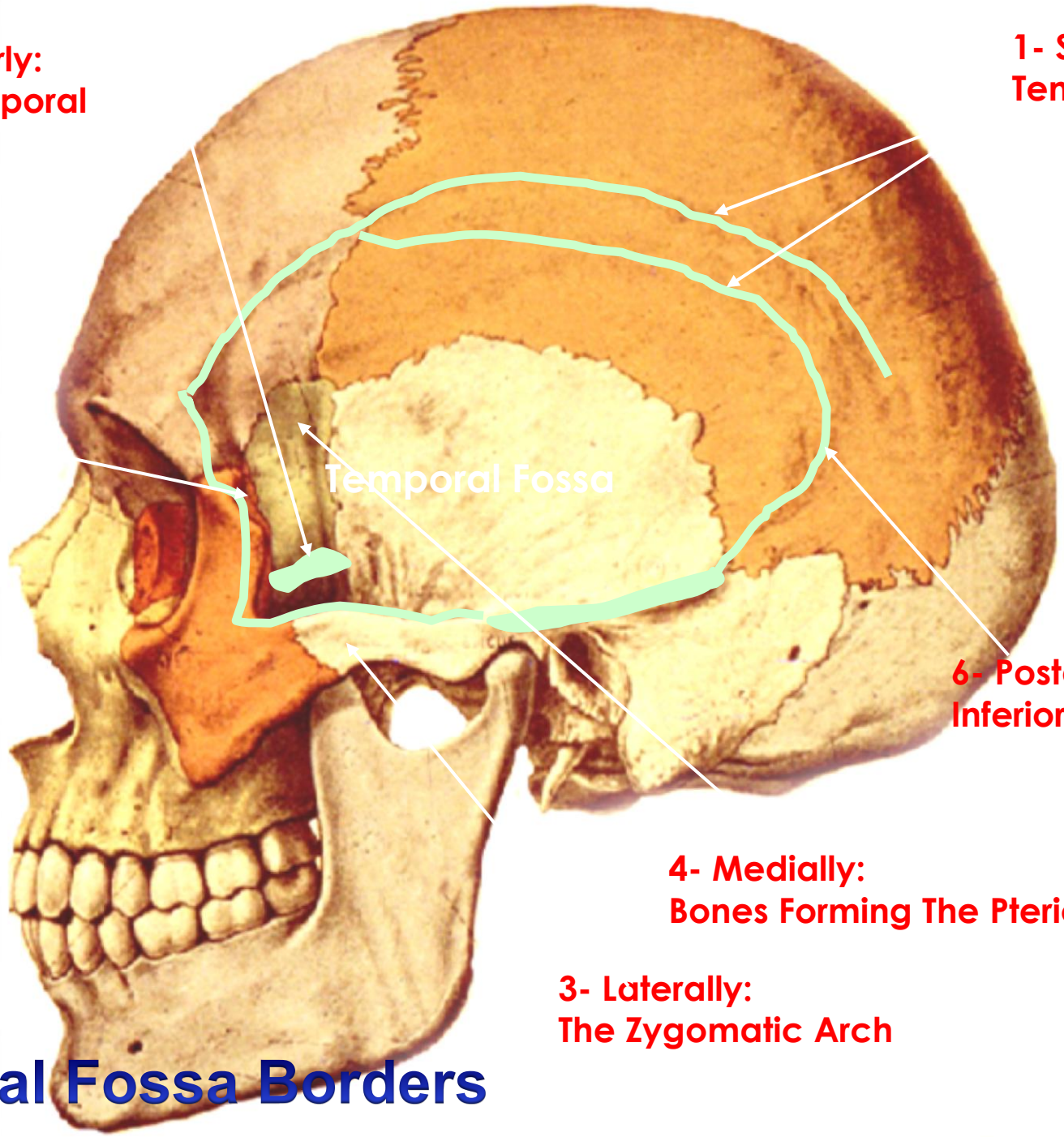
Mastication

- Movements of the mandible are classified as:
- • Elevation
- • Depression
- • Protrusion
- • Retrusion
- • Side-to-side (lateral) excursion


Parietal bone
Frontal bone
Squamous part of Temporal bone
Greater Wing of sphenoid
Nasal
Zygomatic bone
Squamous part of occipital bone
Maxilla
Palatine Bone
Mastoid part of Temporal bone
Tympanic part of Temporal bone
Styloid part of Temporal bone
Zygomatic part of Temporal bone
Mandible

Temporal fossa/floor





2- Inferiorly:
Infra-temporal

1- Superiorly:
Temporal

5- Anteriorly:
Zygomatic,
Frontal,
and
Greater Wing

6- Posteriorly:
Inferior Temporal line

4- Medially:
Bones Forming The Pterion

3- Laterally:
The Zygomatic Arch

Temporal Fossa Borders

- **Temporal fascia**

- **Muscles:**

A. Muscles of mastication:

1. Temporalis.
2. Masseter
3. Lateral pterygoid.
4. Medial pterygoid.

B. Muscles of the palate:

1. Tensor palati.
2. Levator palati.

- **Nerves**:

1. Mandibular nerve and its branches.
2. Maxillary nerve and its branches.
3. Chorda tympani.

•**Parasympathetic ganglia:**

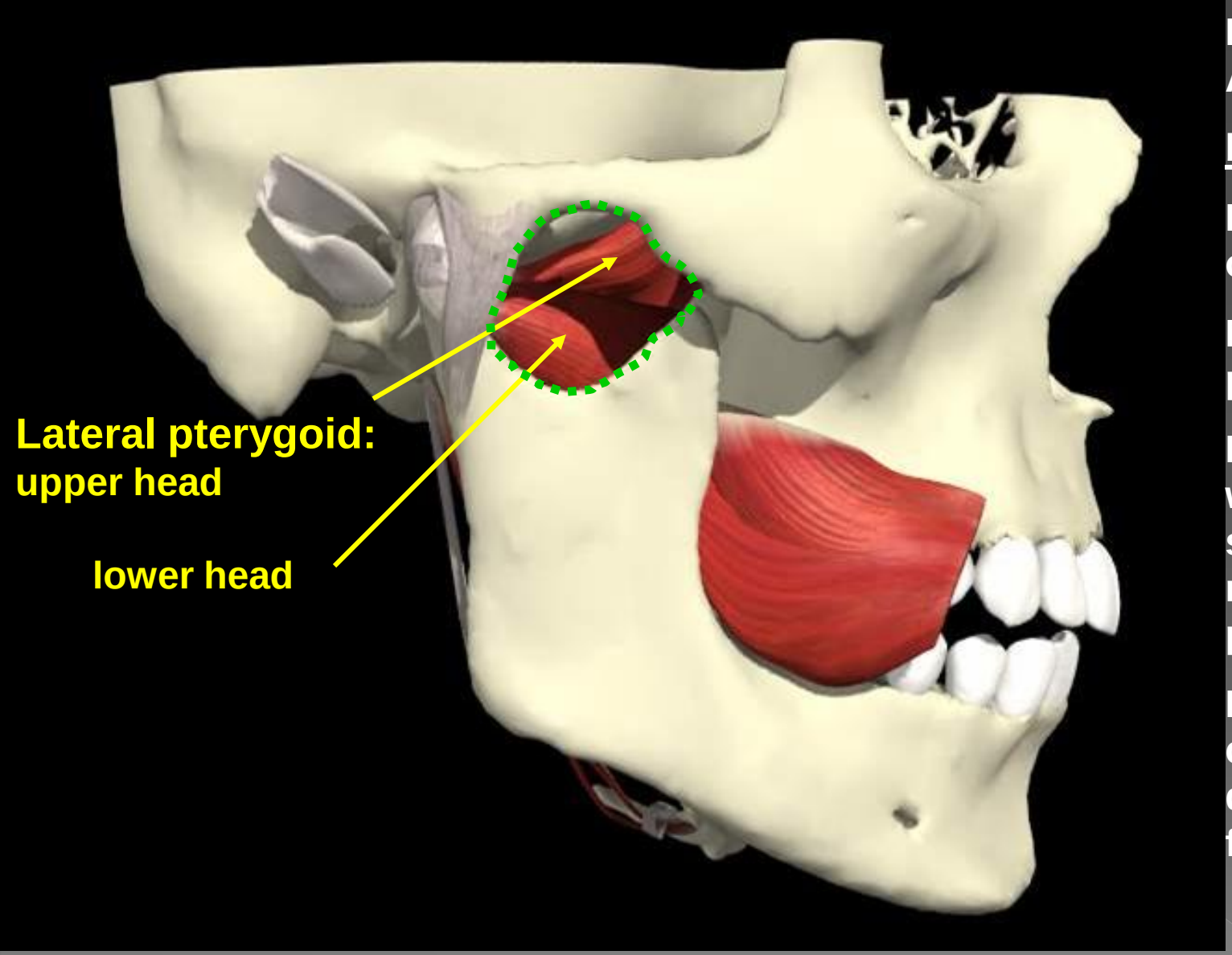
1. Otic ganglion.
2. Sphenopalatine ganglion.

•**Vessels:**

1. Maxillary artery and its branches.
2. Pterygoid venous plexus, tributaries and communications.

• **Joints:**

Temporomandibular joint.



INFRATEMPOR-AL FOSSA

borders:

Lateral: ramus of mandible

Medial: lateral pterygoid plate

Roof: greater wing of sphenoid, adj. maxilla & palatine bones

Inferior: continuous with deep cervical fascia

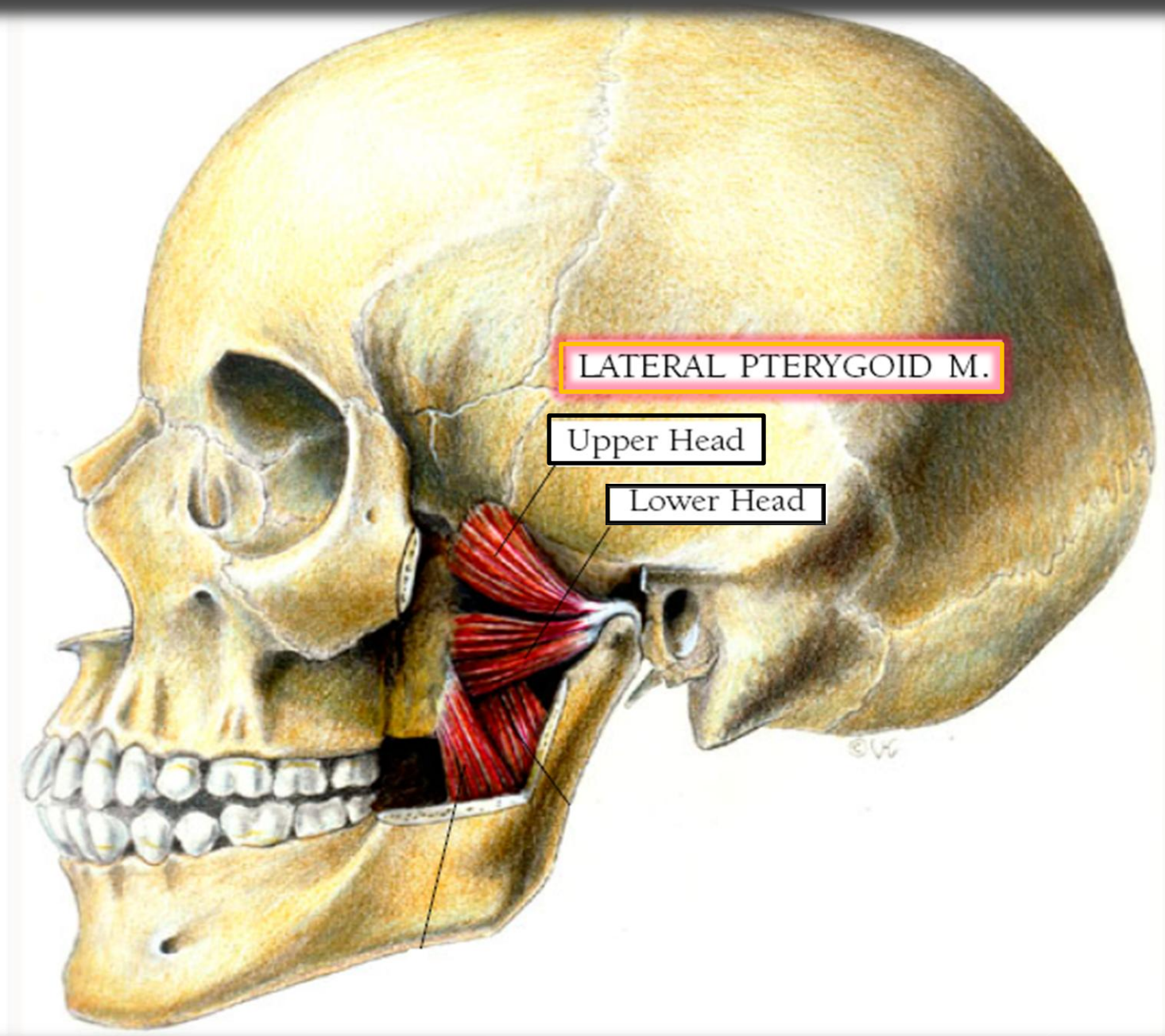
Line of action of lateral pterygoids is from anterior to posterior in horizontal plane. They PROTRACT or pull the mandible forward.

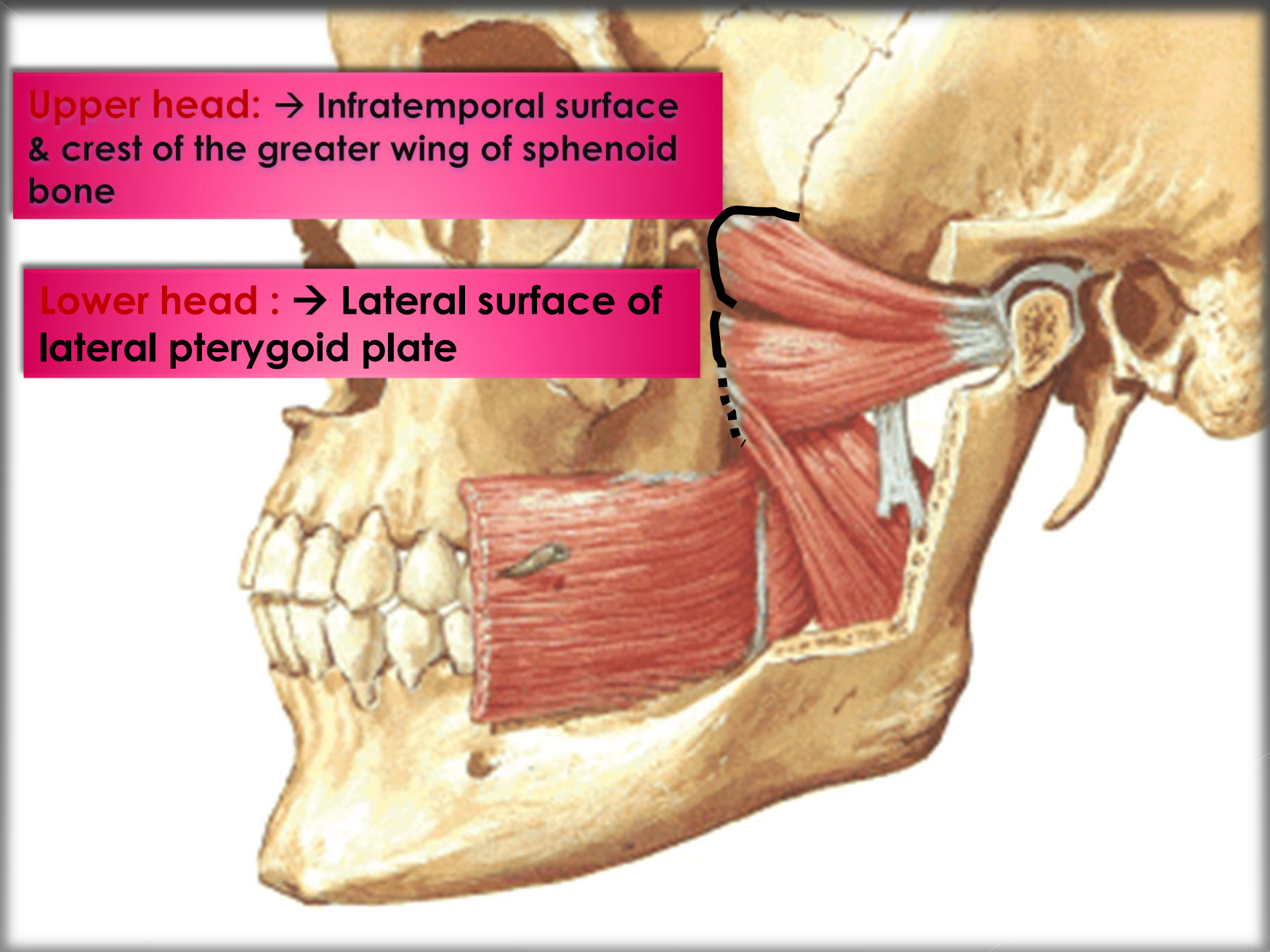
Muscles of mastication

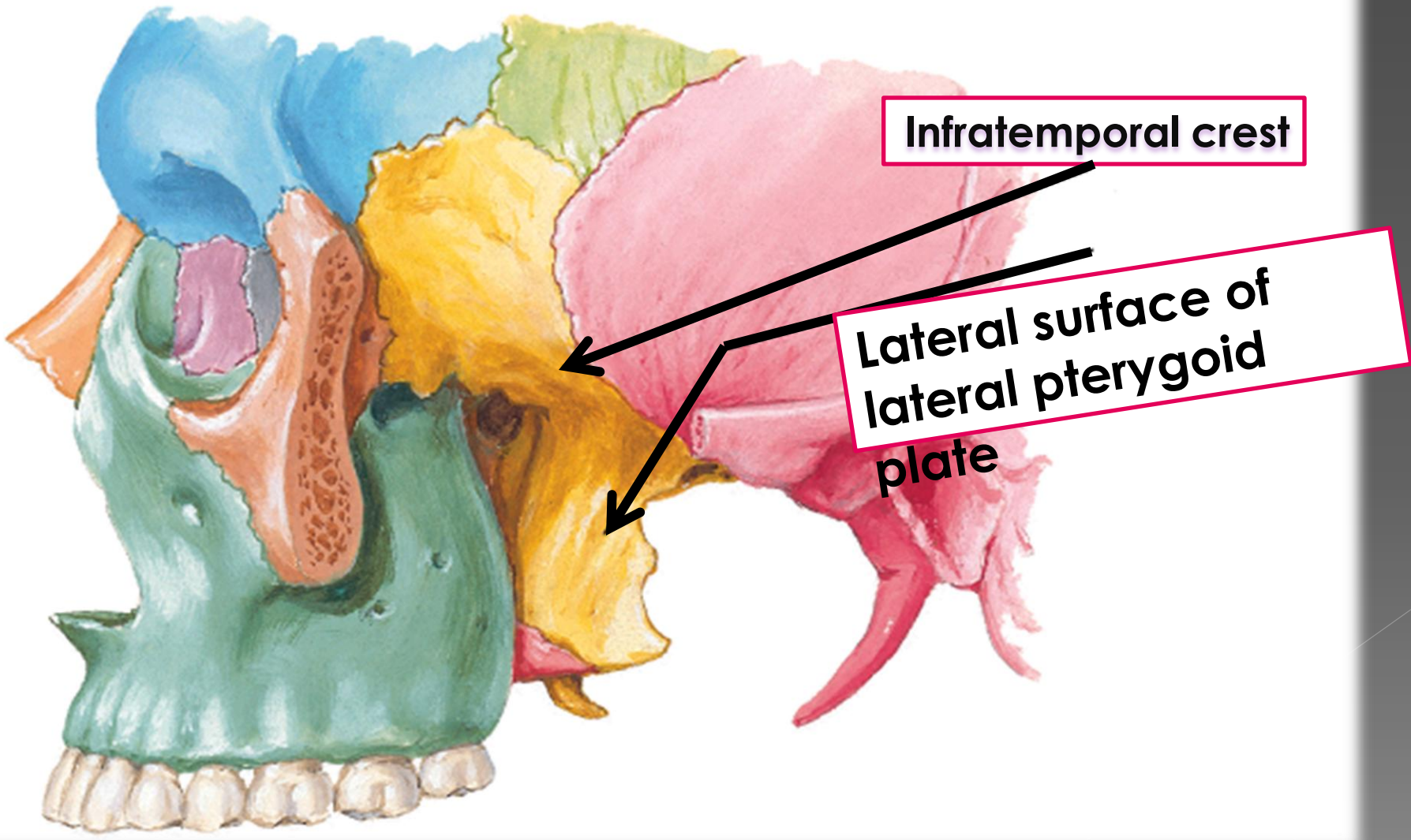
General scheme:-

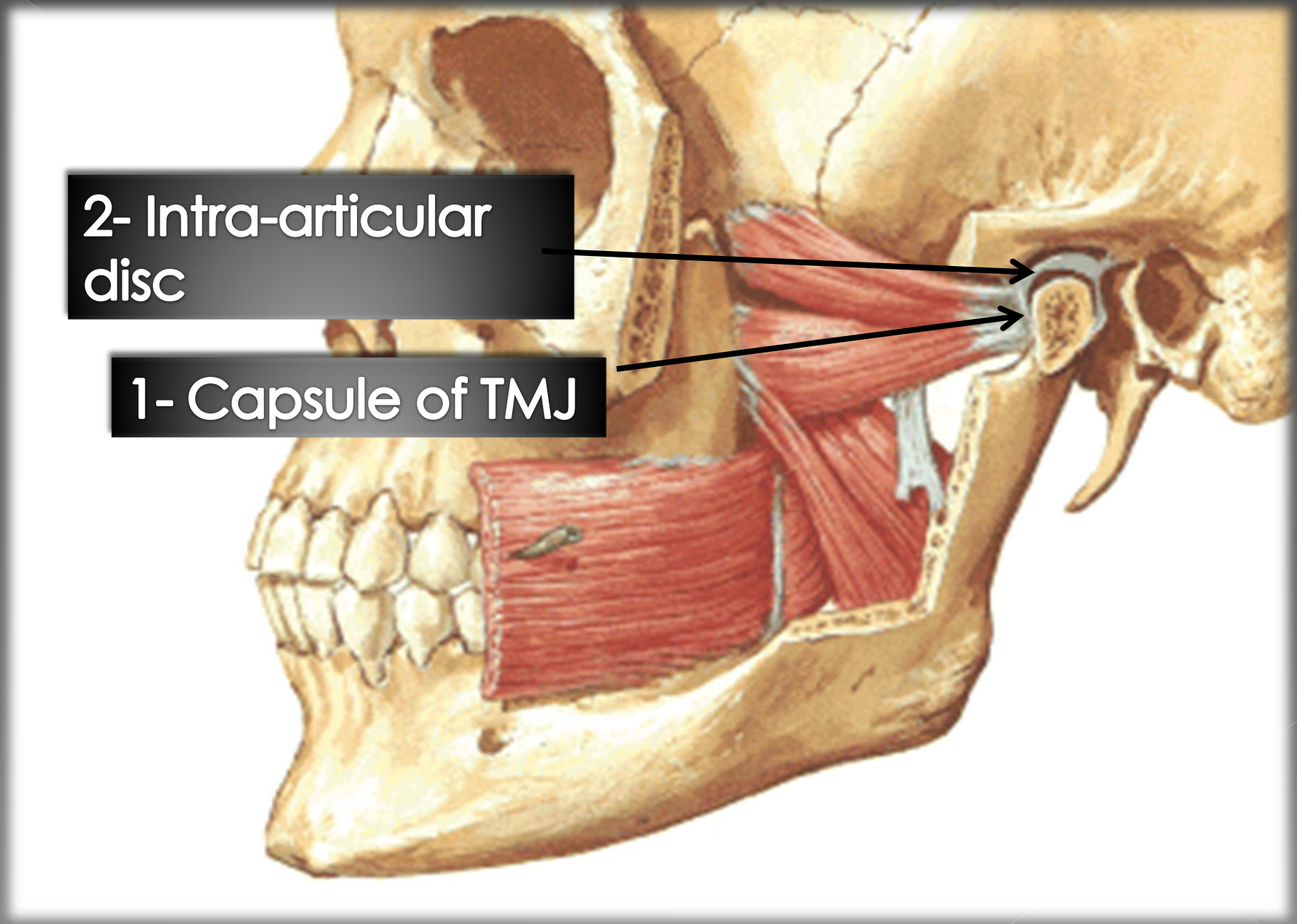
- **Origin:-**
  All arise from the **skull** (temporal and infratemoral region)
- **Insertion**: all are inserted in **mandible**
- **Nerve supply:-**all are supplied by **anterior division of mandibular nerve** except **medial pterygoid by trunk of mandibular nerve**
- **Action** :

1. all causes **protraction of mandible** except **temporalis** which cause **retraction**
2. All causes **elevation of the mandible** except **lateral pterygoid** which causes **depression**
3. **Lateral +Medial pterygoid** = side to side movement
4. **Masster + Medial pterygoid** =they regulate the position of the angle of the mandible in the vertical plane.

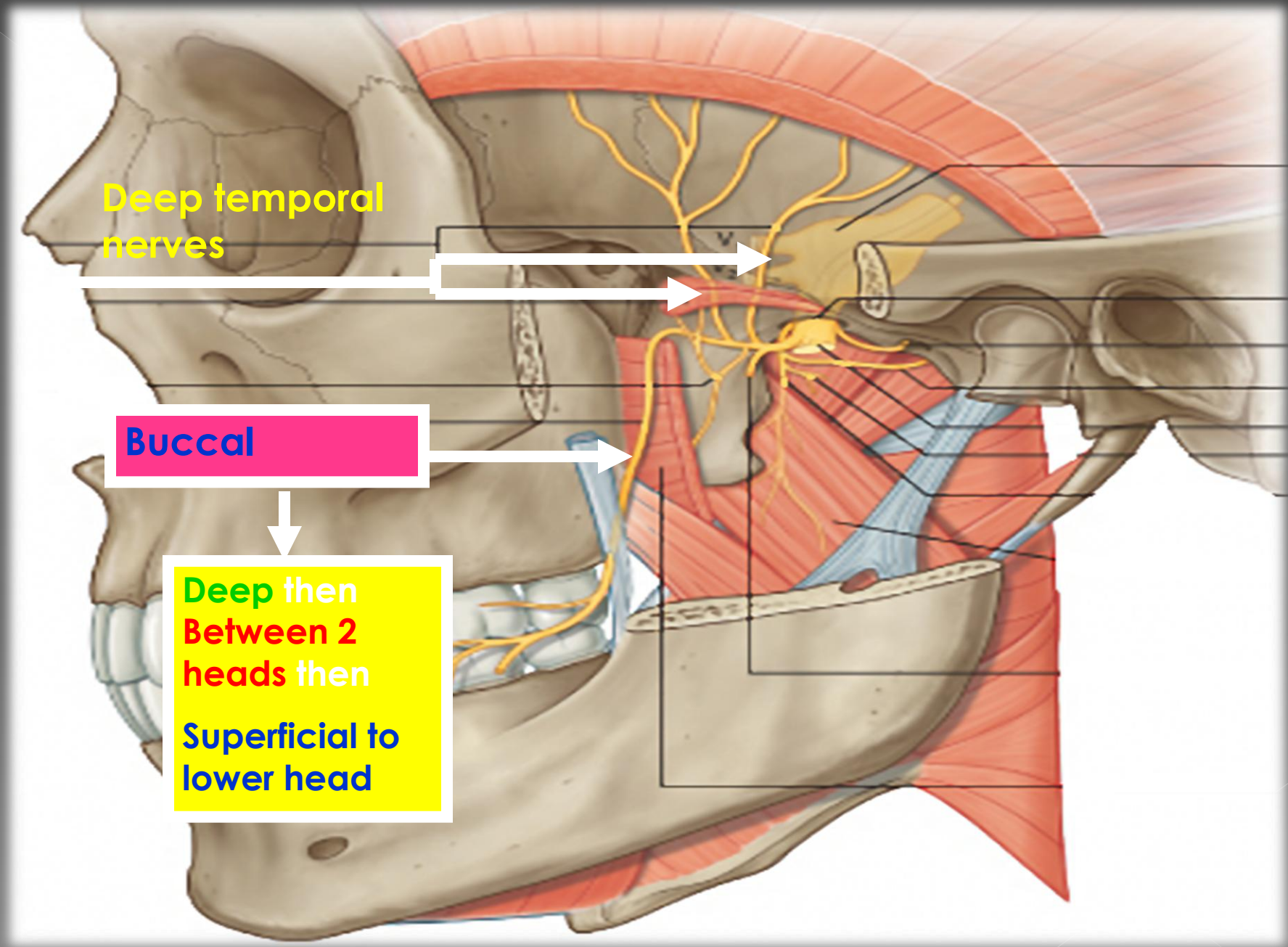

LATERAL PTERYGOID M.
Upper Head
Lower Head

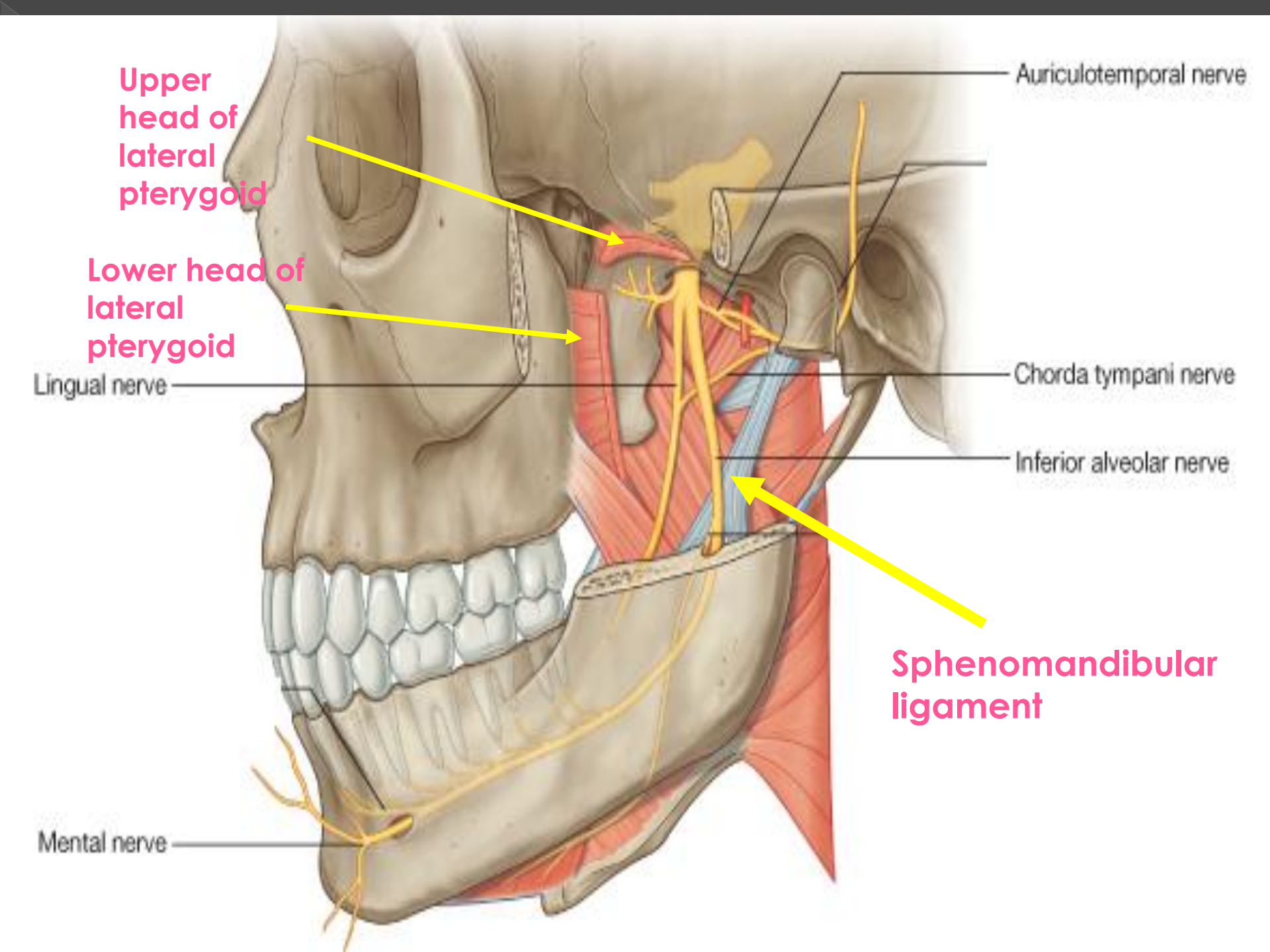

Upper head: → Infratemporal surface & crest of the greater wing of sphenoid bone
Lower head : → Lateral surface of lateral pterygoid plate


Infratemporal crest
Lateral surface of lateral pterygoid plate

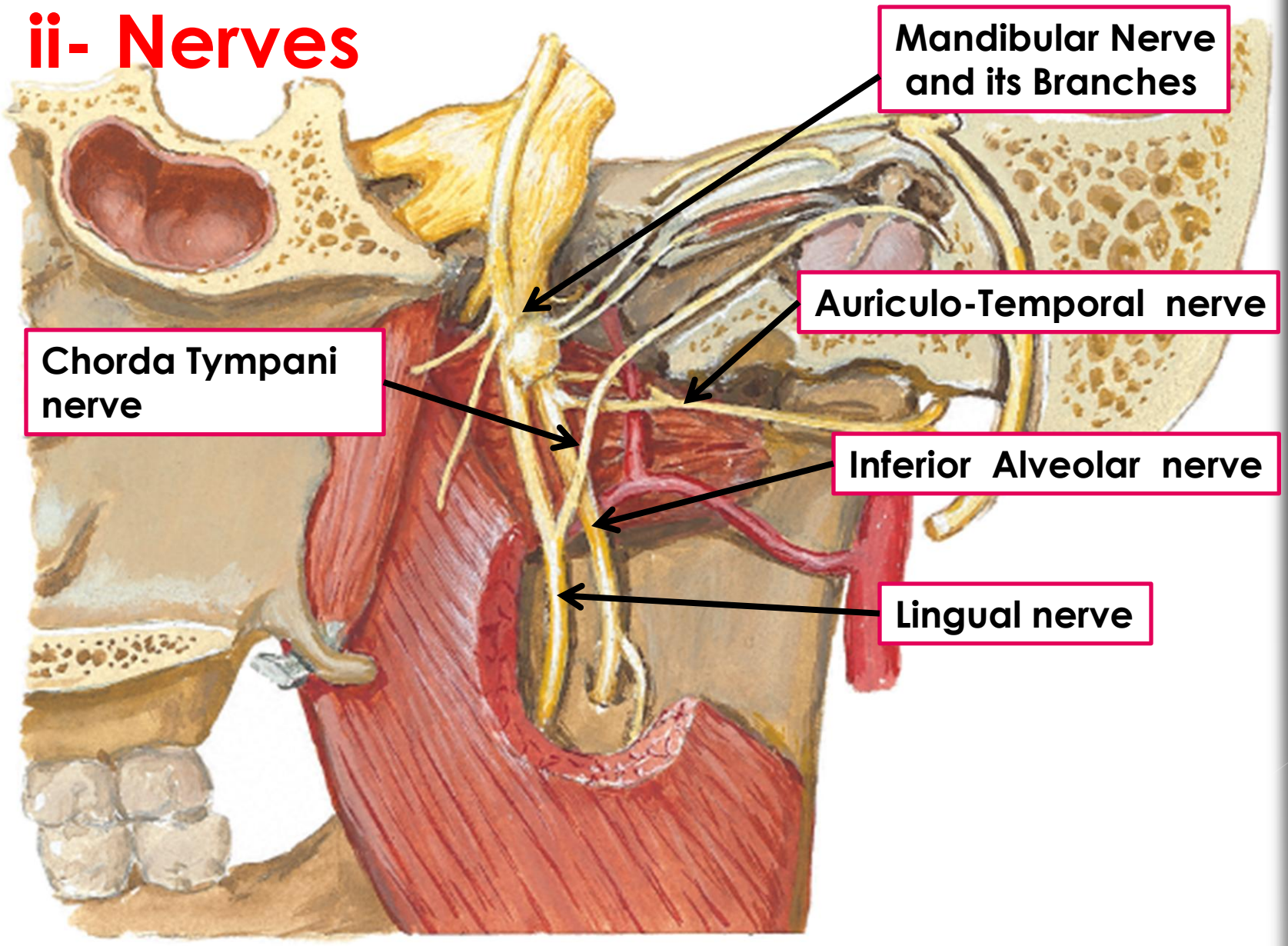

2- Intra-articular disc
1- Capsule of TMJ

3- Pterygoid Fovea

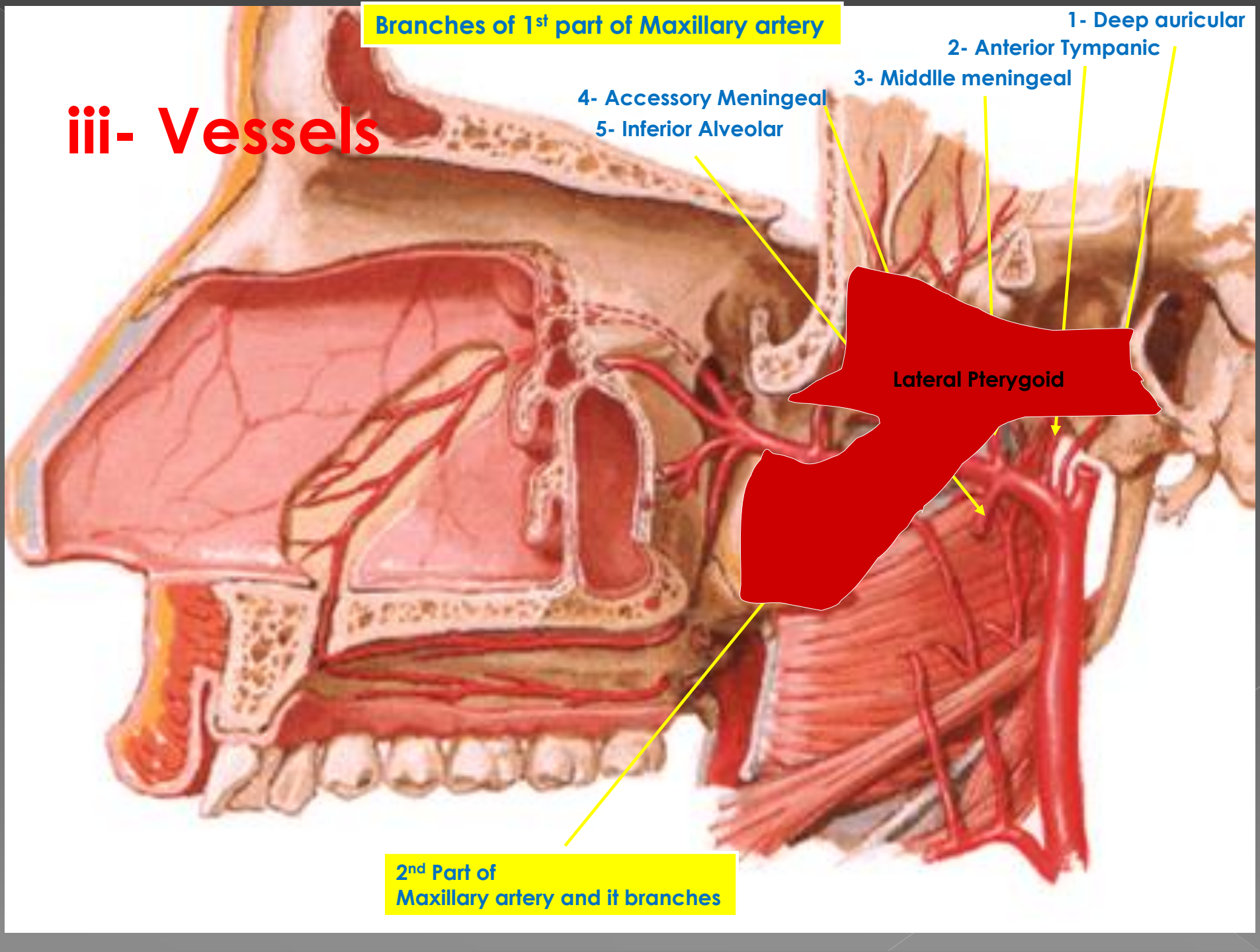

Deep temporal nerves
Buccal
Deep then
Between 2 heads then
Superficial to lower head

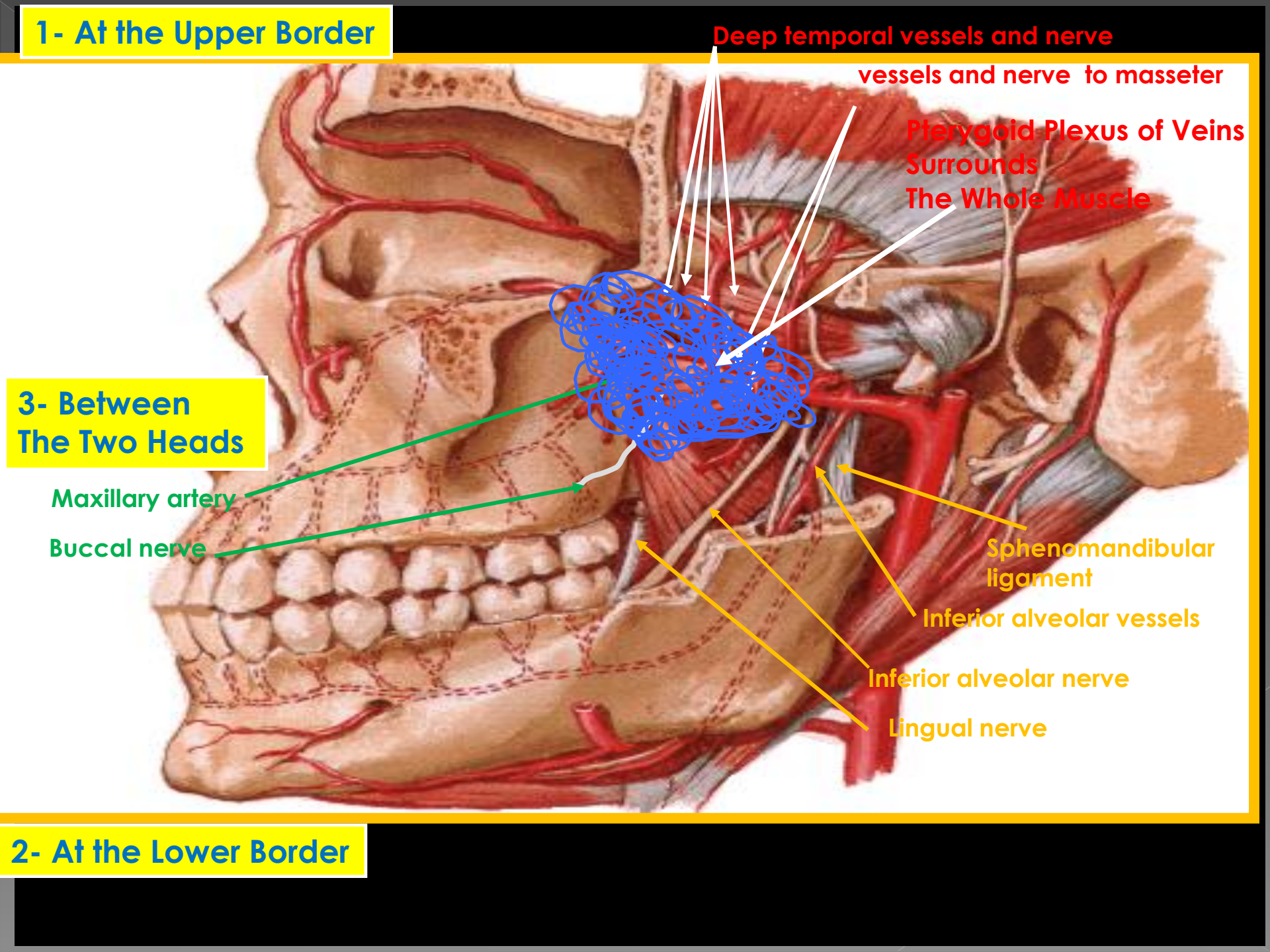

Upper head of lateral pterygoid
Lower head of lateral pterygoid
Auriculotemporal nerve
Chorda tympani nerve
Lingual nerve
Inferior alveolar nerve
Sphenomandibular ligament
Mental nerve

ii- Nerves


Mandibular Nerve and its Branches
Auriculo-Temporal nerve
Chorda Tympani nerve
Inferior Alveolar nerve
Lingual nerve

iii- Vessels

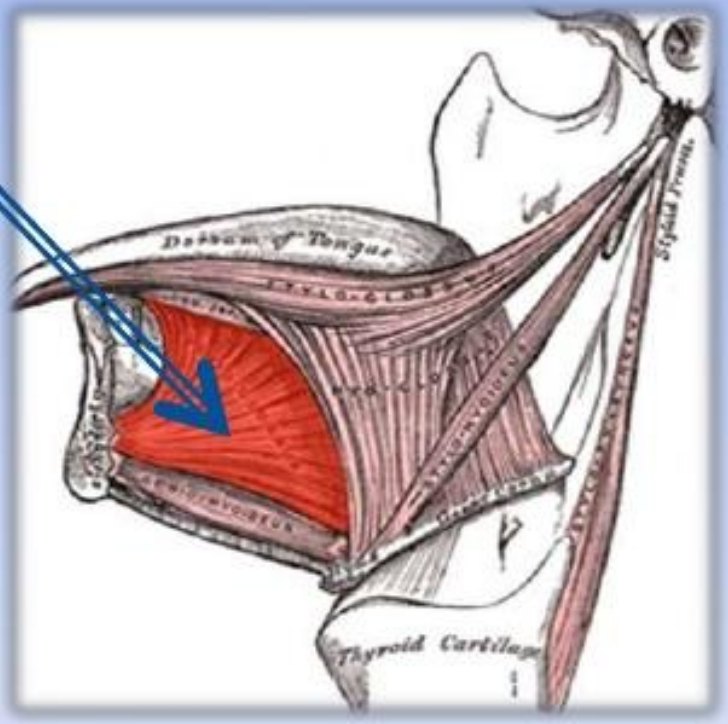

Branches of 1st part of Maxillary artery
1- Deep auricular
2- Anterior Tympanic
3- Middlle meningeal
4- Accessory Meningeal
5- Inferior Alveolar
Lateral Pterygoid
2nd Part of
Maxillary artery and it branches


1- At the Upper Border
Deep temporal vessels and nerve
vessels and nerve to masseter
Pterygoid Plexus of Veins
Surrounds
The Whole Muscle
3- Between
The Two Heads
Maxillary artery
Buccal nerve
Sphenomandibular
ligament
Inferior alveolar vessels
Inferior alveolar nerve
Lingual nerve
2- At the Lower Border

Extrinsic muscles

Genioglossus M.

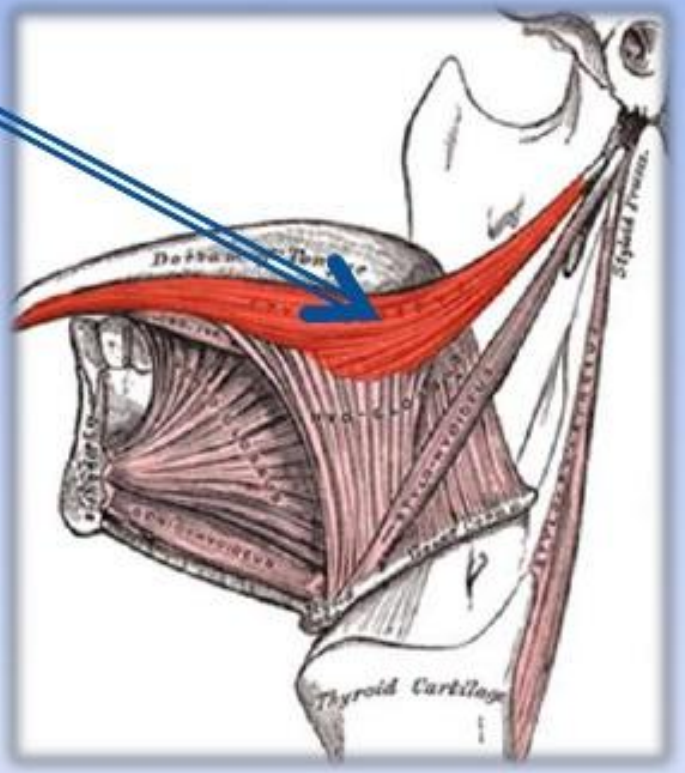
Origin	Superior part of mental spine of mandible (symphysis menti)
Insertion	Dorsum of tongue and body of hyoid
Artery	Lingual artery
Nerve	Hypoglossal nerve (CN XII)
Actions	Complex - Inferior fibers protrude the tongue, middle fibers depress the tongue, and its superior fibers draw the tip back and down



Extrinsic muscles

Styloglossus M.

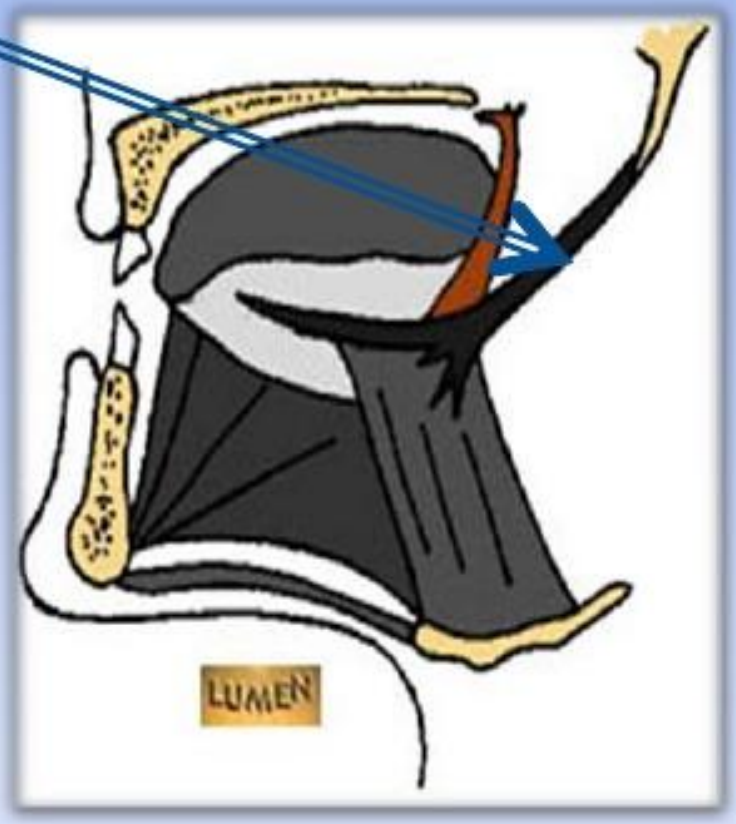
Origin	Styloid process of temporal bone
Insertion	tip and sides of tongue
Artery	lingual artery
Nerve	Hypoglossal nerve (CN XII)
Actions	retraction and elevation of tongue



Extrinsic muscles

Palatoglossus M.

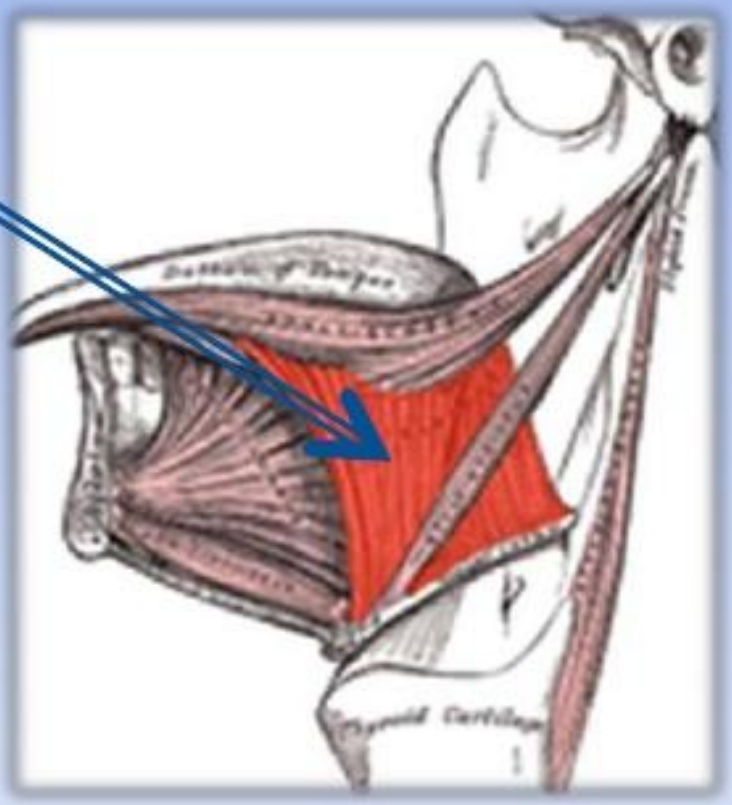
Origin	palatine aponeurosis
Insertion	tongue
Artery	lingual artery
Nerve	Vagus nerve (via pharyngeal branch to pharyngeal plexus)
Actions	raising the back part of the tongue



Extrinsic muscles

Hyoglossus M.

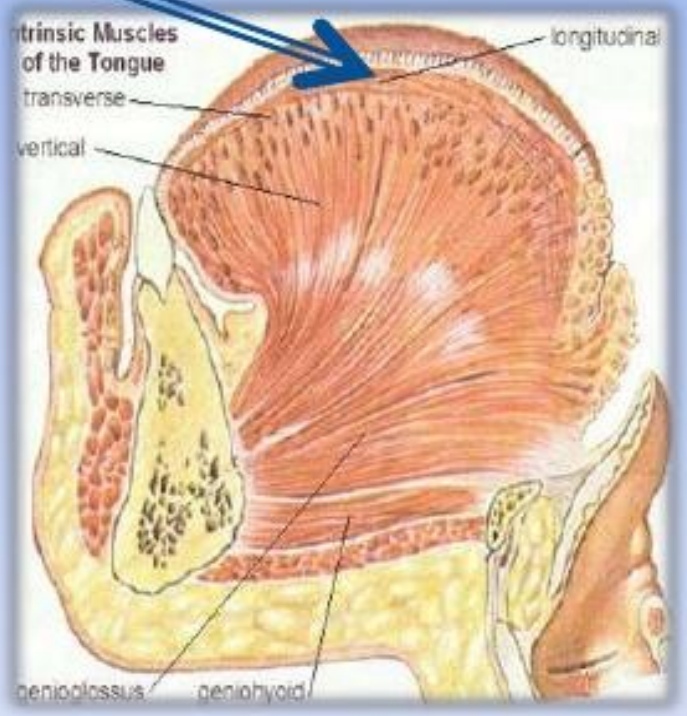
Origin	Hyoid
Insertion	side of the tongue
Artery	lingual artery
Nerve	Hypoglossal (CN XII)
Actions	depresses and retracts the tongue



Intrinsic muscles

Superior longitudinal M.

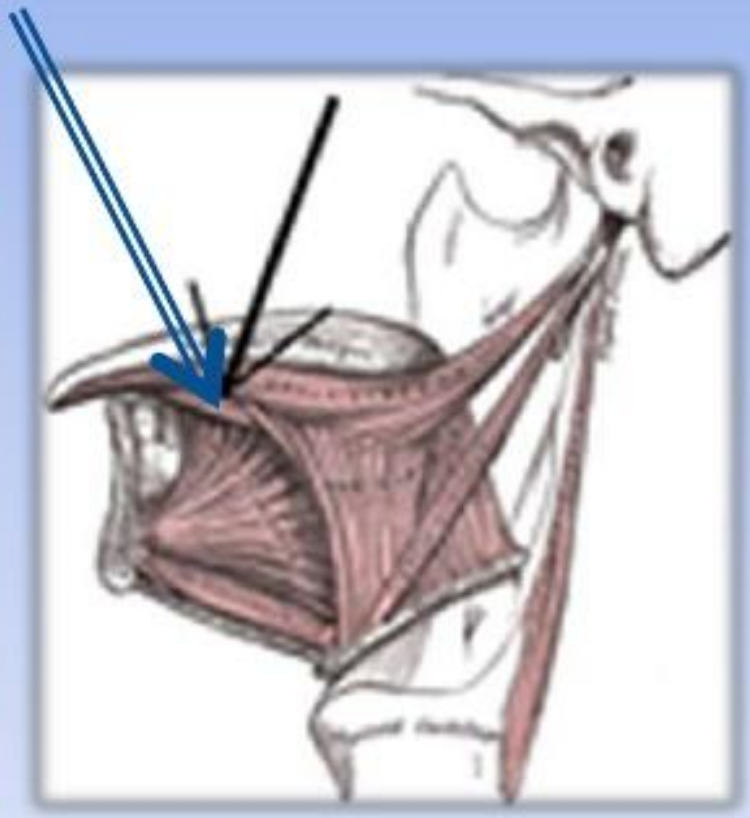
Origin	close to the epiglottis, from the median fibrous septum
Insertion	edges of the tongue
Artery	lingual artery
Nerve	hypoglossal nerve
Actions	retracts the tongue with the inferior longitudinal muscle, making the tongue short and thick



Intrinsic muscles

Inferior longitudinal M.

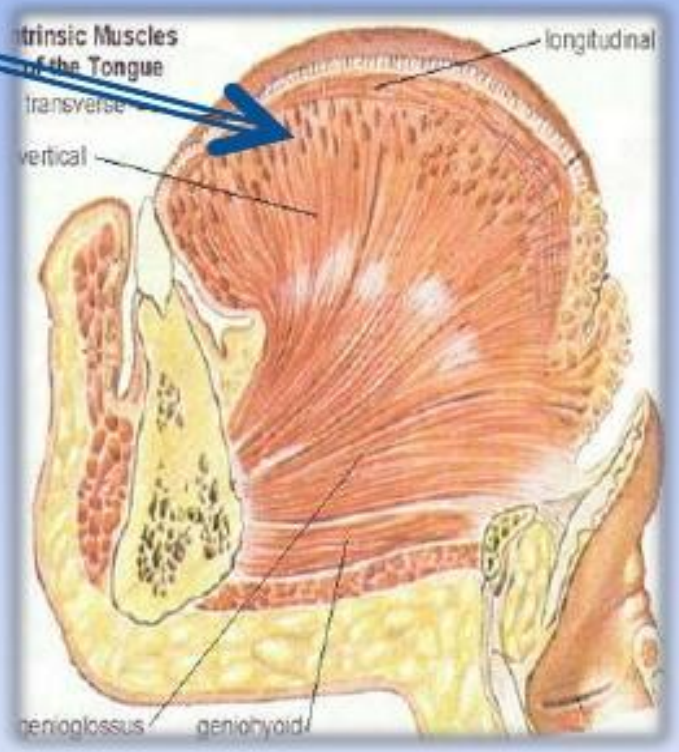
Origin	root of the tongue
Insertion	apex of the tongue
Artery	lingual artery
Nerve	Hypoglossal nerve
Actions	Shortens the tongue and turns the apex under.



Intrinsic muscles

Transverse M.

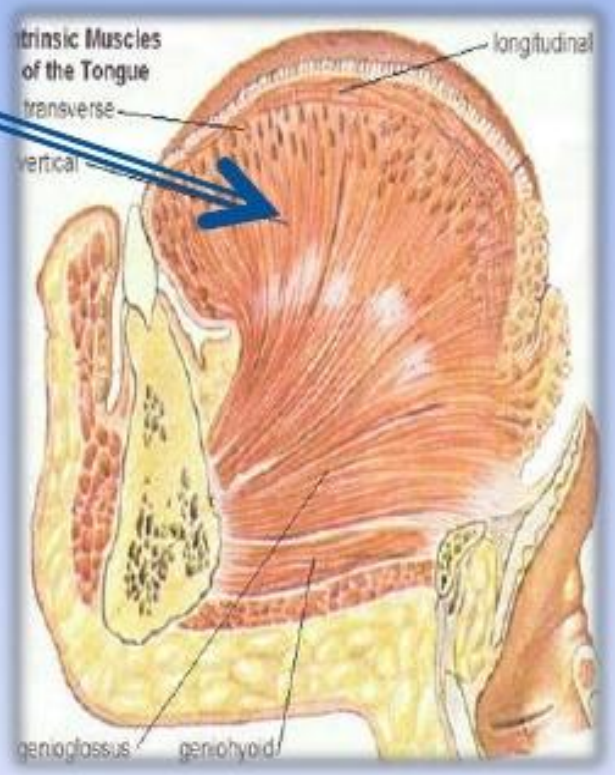
Origin	median fibrous septum
Insertion	sides of the tongue
Artery	lingual artery
Nerve	hypoglossal nerve
Actions	makes the tongue narrow and elongated



Intrinsic muscles

Vertical M.

Origin	Submucosal fibrous layer of dorsum of tongue
Insertion	Inferior surface borders of tongue
Artery	lingual artery
Nerve	Hypoglossal nerve
Actions	Flattens and broadens the tongue



Soft palate Muscles

The five muscles of the soft palate, play important roles in swallowing and breathing. The muscles are:

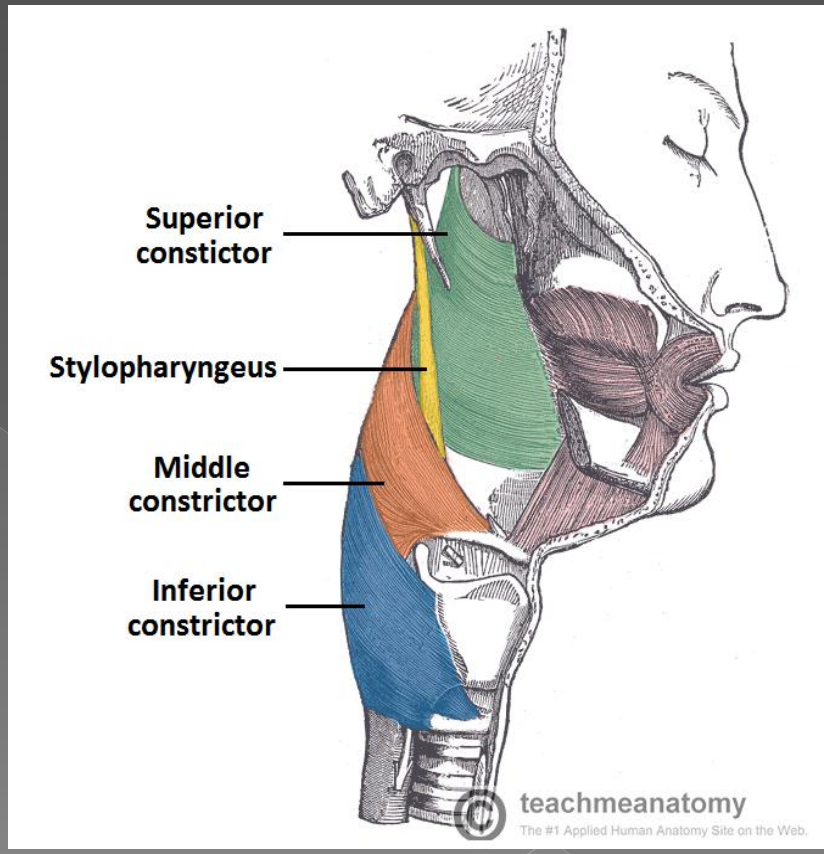
- **Tensor veli palatini,** which is involved in swalloing.
- **Palatoglossus**, involved in swallowing
- **Palatopharyngeus**, involved in breathing
- **Levator veli palatini**, involved in swallowing
- **Musculus uvulae**, which moves the uvula

These muscles are innervated by the pharyngeal plexus via the vagus nerve, with the exception of the tensor veli palatini. The tensor veli palatini is innervated by cranial nerve 5 branch V3 (which is the mandibular division of the trigeminal cranial nerve).

Circular Muscles

The circular muscles contract **sequentially** from superior to inferior to constrict the lumen and propel the bolus of food inferiorly into the oesophagus.
They are stacked like glasses and are an incomplete muscular circle, anteriorly attaching to structures in the neck.
They are all innervated by the vagus nerve (CN X):

Superior pharyngeal constrictor is found in the oropharynx.
Middle pharyngeal constrictor is found in the laryngopharynx.
Inferior pharyngeal constrictor is found in the laryngopharynx and has two components. The superior component (thyropharyngeus) has oblique fibres that attach to the thyroid cartilage and the inferior component (cricopharyngeus) has horizontal fibres that attach to the cricoid cartilage.

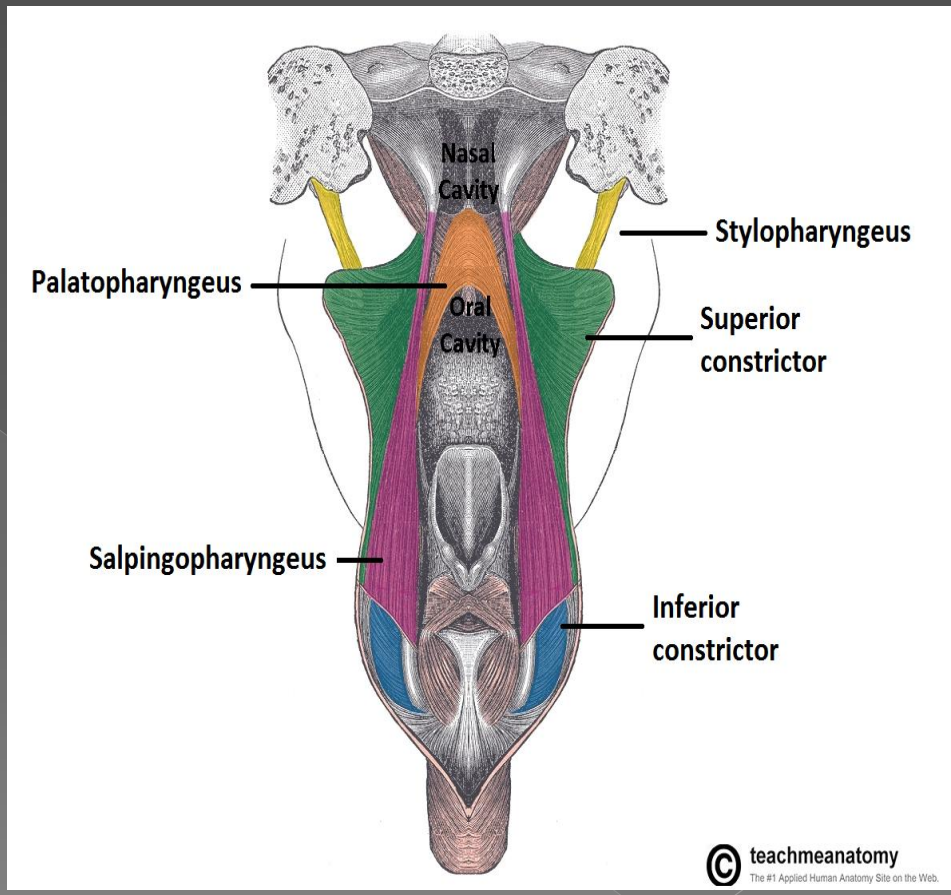


Lateral view of the deep structures of the pharynx. Visible are the circular muscles of the pharynx, and the stylopharyngeus.

Longitudinal Muscles

The longitudinal muscles shorten and widen the pharynx, and elevate the larynx during swallowing.

- **Stylopharyngeus**: from the styloid process of the temporal bone to the pharynx, innervated by the glossopharyngeal nerve (CN IX)
- **Palatopharyngeus**: from hard palate of the oral cavity to the pharynx, innervated by the vagus nerve (CN X)
- **Salpingopharyngeus**: from the Eustachian tube to the pharynx, innervated by the vagus nerve (CN X). In addition to contributing to swallowing, it also opens the Eustachian tube to equalize the pressure in the middle ear with the atmosphere



Posterior view of the pharynx. The pharynx has been split down the midline and opened, to show the longitundinal muscles

Lower Limit of	
Nasopharynx	Lower border of soft palate or Junction b/w hard & soft palate
Oropharynx	Tip of epiglottis or Body of hyoid bone or Base of vallecula
Hypopharynx	Lower border of cricoid or Lower border of C6 vertebra

Structures Passing

Between Skull Base & Superior Constrictor (Sinus of Morgagni)	Eustachian tube + Levator palatini + Tensor palatini + Ascending palatine artery
Between Superior & Middle Constrictors	Glossopharyngeal nerve & Stylopharyngeus muscle
Between Middle & Inferior Constrictors	Internal Laryngeal nerve & Superior Laryngeal artery
Below Inferior Constrictor	Recurrent Laryngeal nerve & Inferior Laryngeal artery

Innervation

Innervation of the majority of the pharynx is achieved by the **pharyngeal plexus**, which comprises of:

Branches of the **glossopharyngeal** nerve (CN IX)

Branches of the **vagus** nerve (CN X)

Sympathetic fibres of the superior cervical ganglion.

Sensory: Each of the three sections of the pharynx have a different innervation:

The **nasopharynx** is innervated by the maxillary nerve (CN V2).

The **oropharynx** by the glossopharyngeal nerve (CN IX).

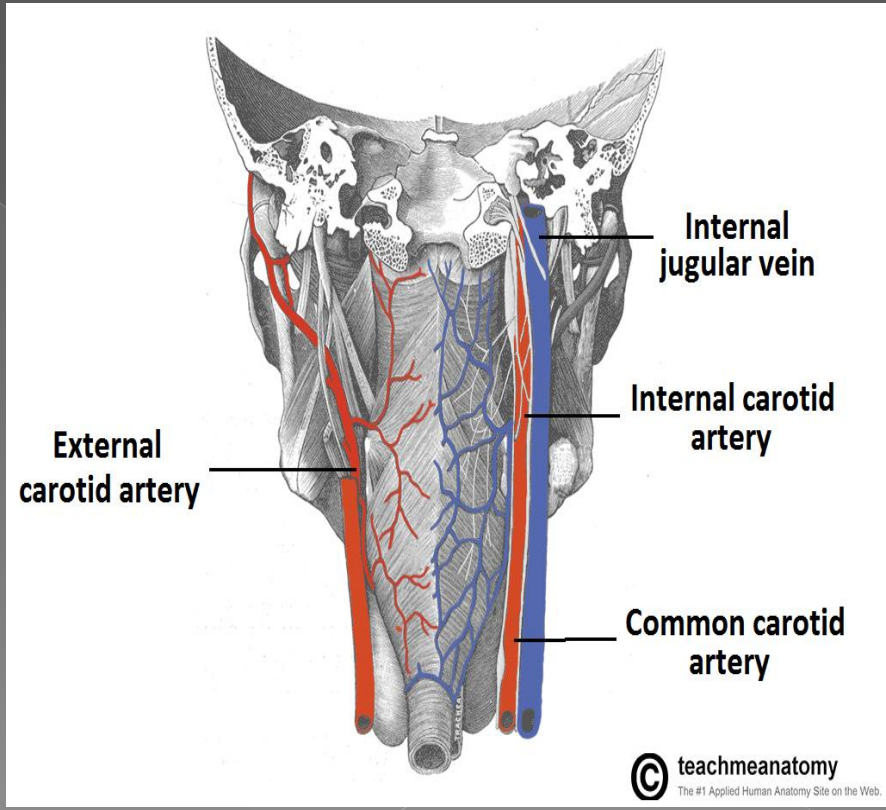
The **laryngopharynx** by the vagus nerve (CN X).

Motor: All the muscles of the pharynx are innervated by the vagus nerve (CN X), except for the stylopharyngeus, which is innervated by the glossopharyngeal nerve (CN IX).

Blood Supply

Arterial supply is via branches of the **external carotid** artery: ascending pharyngeal, lingual, facial and maxillary arteries.

Venous drainage is achieved by the **pharyngeal venous plexus**, which drains into the internal jugular vein.



Nerve Supply

- Nasopharynx: pterygo-palatine ganglion (V2)
- Oropharynx: glossopharyngeal & vagus nv
- Hypopharynx: Superior & recurrent laryngeal nv

All muscles by pharyngeal nerve plexus (vagus nv carrying cranial part of accessory nv) except stylopharyngeus (glossopharyngeal nv) & cricopharyngeus (also by recurrent laryngeal)

Arterial Supply

1) Facial artery
2) Lingual artery
3) Ascending pharyngeal artery
4) Ascending palatine artery
5) Greater palatine artery
6) Artery of pterygoid canal
7) Superior laryngeal artery

Venous Drainage

Upper pharynx:

- Pharyngeal venous plexus situated on middle constrictor → pterygoid venous plexus & internal jugular vein

Lower pharynx:

- Inferior thyroid veins

Lymphatic Drainage

- **Nasopharynx:** upper deep cervical + retro-pharyngeal + parapharyngeal + posterior triangle
- **Oropharynx:** upper deep cervical + retro-pharyngeal + parapharyngeal
- **Hypopharynx:** deep cervical + parapharyngeal + paratracheal + supraclavicular

III. Occulomotor Nerve

- Component: Motor

- Function:
  - Raises upper eyelid
  - Turns eyeball upward, downward and medially
  - Constricts pupil
  - Accommodates the eye
- Origin: Anterior surface of the midbrain
- Opening to the Skull: Superior orbital fissure

IV. Trochlear Nerve

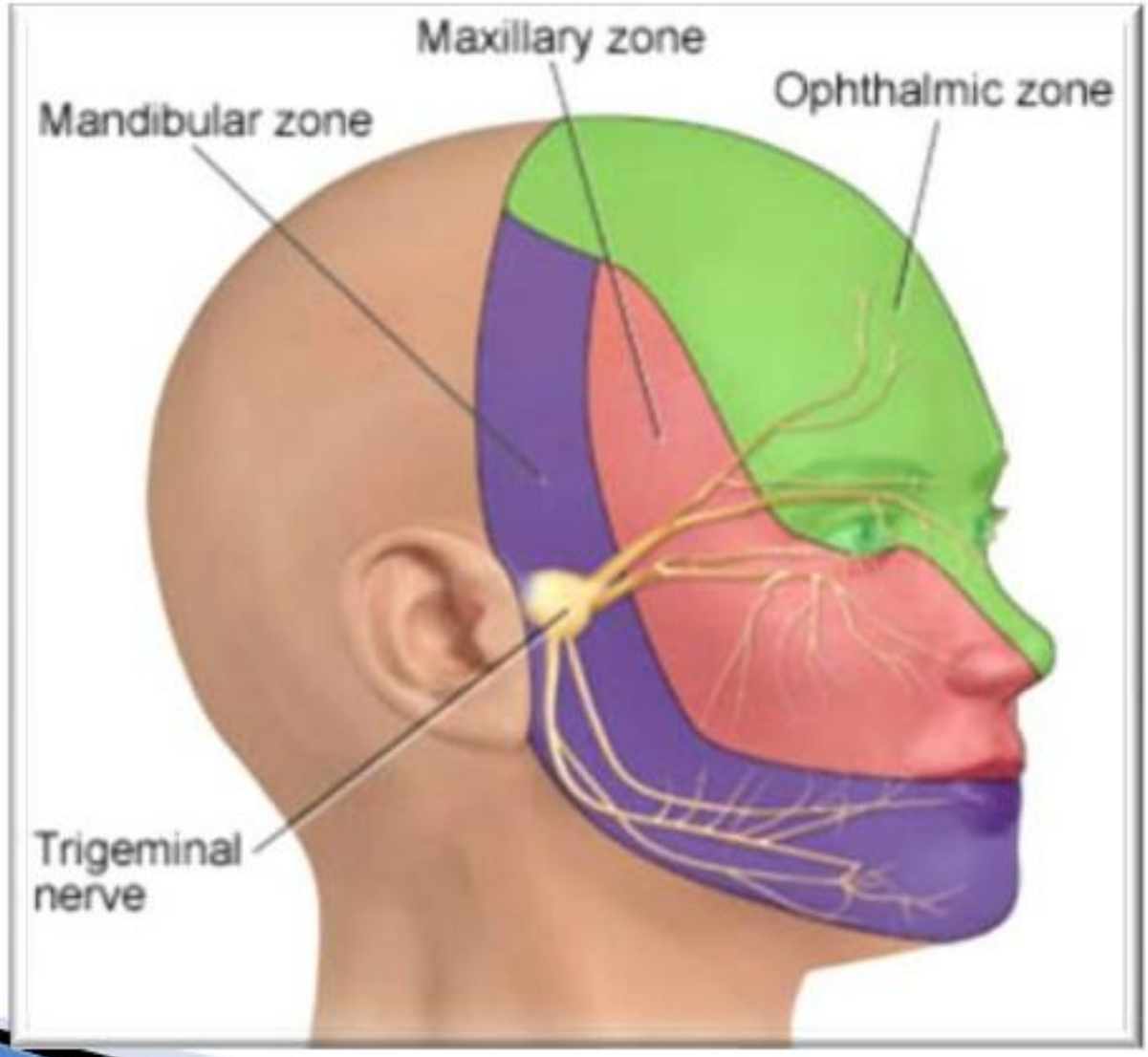
- ✓ Component: Motor

- ✓ Function: Assisting in turning eyeball downward and laterally

- ✓ Origin: Posterior surface of the midbrain

- ✓ Opening to the Skull: Superior orbital fissure

V. Trigeminal Nerve



Path V1

It passes forward along the *lateral wall of the cavernous sinus*, below the oculomotor and trochlear nerves; just before entering the orbit, through the *superior orbital fissure*, it divides into three branches, lacrimal, frontal, and nasociliary.

The lacrimal nerve passes through the orbit superiorly to innervate the lacrimal gland.

The frontal branch passes through the orbit superiorly, then reenters the frontal bone briefly before exiting above the orbit through the supraorbital foramen and the supratrochlear notch to provide sensory innervation for the skin of the forehead and scalp.

The nasociliary branch gives off several sensory branches to the orbit and then continues out through the *anterior ethmoidal foramen*, where it enters the nasal cavity and provides innervation for much of the anterior nasal mucosa. It also gives off a branch which exits through the nasal bones to form the *external nasal branch*.

Branches V1

Nasociliary nerve

1. Sensory root of ciliary ganglion
2. Posterior ethmoidal nerve
3. Long ciliary nerve
4. Infratrochlear nerve
5. Anterior ethmoidal nerve

Lacrimal nerve

Frontal nerve

1. Supratrochlear nerve
2. Supraorbital nerve

V2. Maxillary Nerve

- Component: Sensory

- Function:
  - Skin of the face over maxilla
  - Teeth of the upper jaw
  - Mucous membrane of the nose, the maxillary sinus and palate

- Origin: Anterior aspect of the pons

- Opening to the Skull: Foramen ovale

PATH V2 Maxillary nerve.

Anterior to the trigeminal ganglion, the maxillary nerve passes through the cavernous sinus and exits the skull through the *foramen rotundum*.

Thus it begins at the middle of the trigeminal ganglion as a flattened plexiform band, and, passing horizontally forward, it leaves the skull through the foramen rotundum , where it becomes more cylindrical in form, and firmer in texture.

It then crosses the pterygopalatine fossa, inclines lateralward on the back of the maxilla, and enters the orbit through the inferior orbital fissure. It traverses the infraorbital groove and canal in the floor of the orbit, and appears upon the face at the infraorbital foramen. There, it is called the infraorbital nerve, a terminal branch.

At its termination, the nerve lies beneath the quadratus labii superioris, and divides into a leash of branches that spread out upon the side of the nose, the lower eyelid, and the upper lip, joining with filaments of the facial nerve.

Branches Of Maxillary Nerve

"Men Gangs Are Maximum In Southern Zone"

Men - meningeal
Gangs - gangliar br to sphenopalatine ganglion
Maximum -maxillary
In - infra-orbital
Southern - superior alveolar, posterior, middle & anterior
Zone - zygomatic

Branches V2

Its branches may be divided into four groups, depending upon where they branch off:

1. in the cranium
2. in the pterygopalatine fossa
3. in the infraorbital canal
4. in the face.

A) In the cranium

1.Middle meningeal nerve in the meninges

B) From the pterygopalatine fossa

1. Infraorbital nerve *through Infraorbital canal*
2. Zygomatic nerve (zygomaticotemporal nerve, zygomaticofacial nerve) *through Inferior orbital fissure*
3. Nasal Branches (nasopalatine) *through Sphenopalatine foramen*
4. Superior alveolar nerves (Posterior superior alveolar nerve , Middle superior alveolar nerve, Anterior superior alveolar nerve)
5. Palatine Nerves (Greater palatine nerve, Lesser palatine nerve), including the Nasopalatine nerve
6. Pharyngeal nerve

C) In the infraorbital canal

1. Anterior superior alveolar nerve
2. Infraorbital nerve

D) In the face

1. Inferior palpebral nerve
2. Superior labial nerve

V3. Mandibular Nerve

- Component: a. Motor

- Function:
  - Muscles of mastication
  - Mylohyoid
  - Anterior belly of digastric
  - Tensor veli palatine
  - Tensor tympani

- Origin: Anterior aspect of the pons

- Opening to the Skull: Foramen Rotundum

V3. Mandibular Nerve

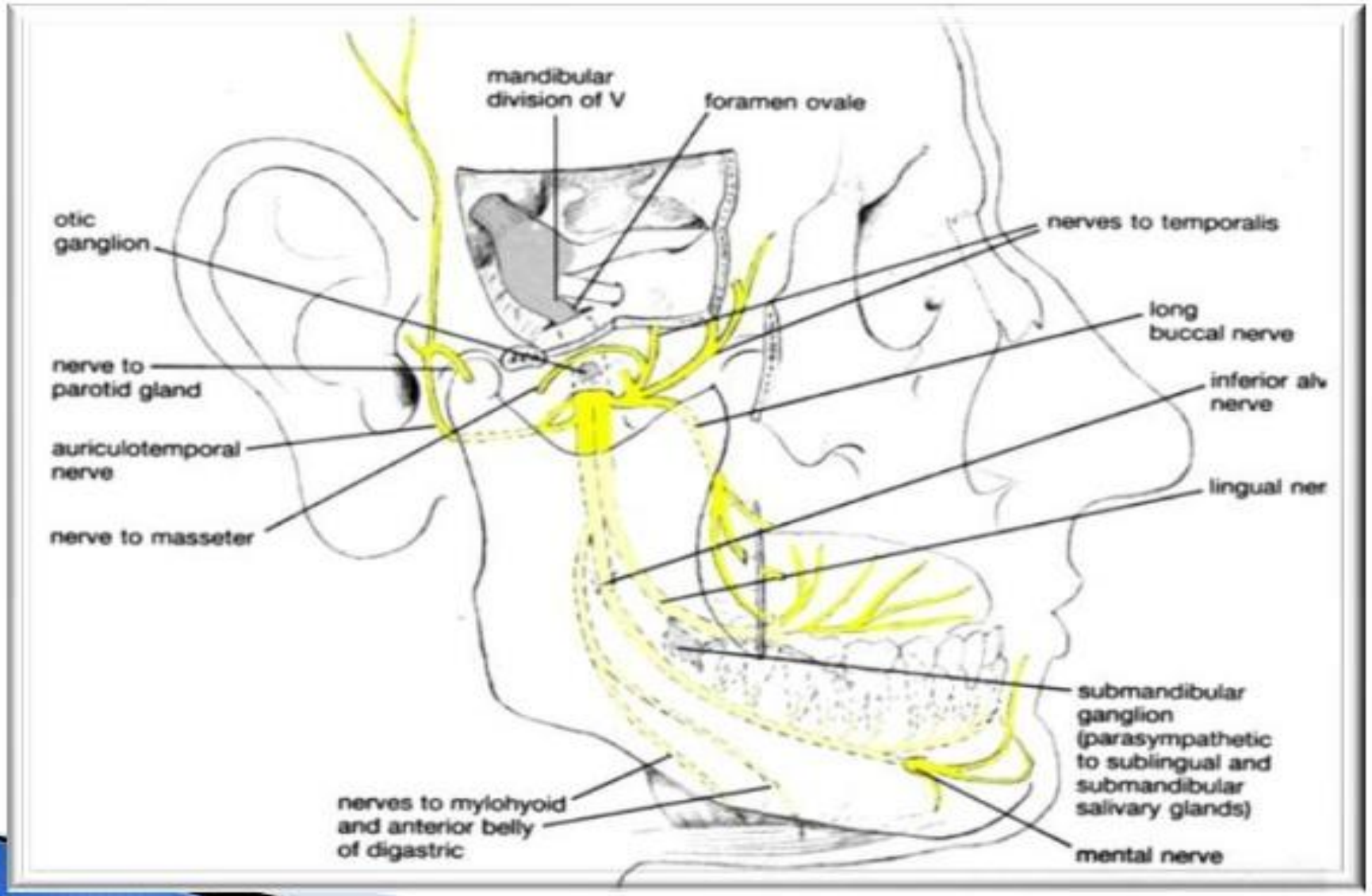
- Component: b. Sensory

- Function:
  - Skin of cheek
  - Skin over mandible and side of head
  - Teeth of lower jaw and TMJ
  - Mucous membrane of mouth and anterior part of tongue

- Origin: Anterior aspect of the pons

- Opening to the Skull: Foramen Rotundum

V3. Mandibular Nerve



Roots

It is made up of two roots:

1. a large ***sensory root*** proceeding from the inferior angle of the trigeminal ganglion
2. a small ***motor root*** (the motor part of the trigeminal), which passes beneath the ganglion, and unites with the sensory root, just after its exit through the *foramen ovale.*

Path

The two roots (sensory and motor) exit the *middle cranial fossa* through the *foramen ovale*.

The two roots then combine Immediately in the infratemporal fossa beneath the base of the skull, the nerve gives off two branches from its medial side: a recurrent branch (nervus spinosus) and the nerve to the medial pterygoid muscle. The mandibular nerve then divides into two trunks, an anterior and a posterior.

Branches of Mandibular Nerve

From the main trunk of the nerve (before the division)

1. muscular branches, which are efferent nerves for the medial pterygoid, tensor tympani, and tensor veli palatini muscles (motor)
2. meningeal branch (a sensory nerve)

From the anterior division

1. masseteric n.(motor)
2. deep temporal nerves , anterior and posterior (motor)
3. buccal n. (a sensory nerve)
4. lateral pterygoid n. (motor)

From the posterior division

1. auriculotemporal n. (a sensory nerve)
2. lingual n. (a sensory nerve)
3. inferior alveolar n. (a motor nerve and a sensory nerve)

Supplies V3 Anterior Division:

(Motor Innervation –Muscles of Mastications)

- Masseteric nerve
  - Masseter
- Medial pterygoid nerve
  - Medial Pterygoid
  - Tensor Tympani
  - Tensor Veli Palatini Nerve
    - Tensor Veli Palatini
- Lateral pterygoid nerve
  - Lateral pterygoid
- Deep temporal nerve
  - Temporalis

(Sensory Innervation)

- Buccal nerve
  - Inside of the Cheek (buccal mucosa)

Supplies V3 Posterior Division:

Lingual Split :

1- (Sensory Innervation - NOT Taste) Anterior 2/3 of Tongue (mucous membrane)

Inferior Alveolar Split:

(Motor Innervation)

- Mylohyoid
- Digastric (Anterior Belly)

(Sensory Innervation)

- Teeth and Mucoperiosteum of mandibular teeth
- Chin and Lower Lip

Auriculotemporal Split

- Scalp (auricula / temporal region)

VII. Facial Nerve

- Component: Mixed

- Function:

Motor

- muscles of the face and scalp
- Stapedius muscle
- Posterior belly of digastric
- Stylohyoid muscles

- Function:

Sensory

- Taste from ant. 2/3 of tongue, from the floor of the mouth and palate

VII. Facial Nerve

- **Function:**

Secretomotor

- Submandibular and sublingual salivary glands
- Lacrimal gland
- Glands of nose and palate

- **Origin:** Medulla oblongata

- **Opening to the Skull:** internal acoustic meatus, facial canal, stylomastoid foramen

Extracranial branches

Distal to stylomastoid foramen, the following nerves branch off the facial nerve:

- **Posterior auricular nerve** - controls movements of some of the scalp muscles around the ear
- Branch to Posterior belly of Digastric muscle as well as the **Stylohyoid muscle**

Five major facial branches (in parotid gland) - To Zanzibar By Motor Car:

1. **Temporal branch of the facial nerve**
2. **Zygomatic branch of the facial nerve**
3. **Buccal branch of the facial nerve**
4. **Marginal mandibular branch of the facial nerve**
5. **Cervical branch of the facial nerve**

1- The temporal branches run crosses the zygomatic arch to the temporal region, supplying the auriculares anterior and superior, and joining with the zygomaticotemporal branch of the maxillary nerve, and with the auriculotemporal branch of the mandibular nerve.

The more anterior branches supply the frontalis, the orbicularis oculi, and corrugator supercilii, and join the supraorbital and lacrimal branches of the ophthalmic. The temporal branch acts as the efferent limb of the corneal reflex.

2- The zygomatic branches run across the zygomatic bone to the lateral angle of the orbit , where they supply the Orbicularis oculi , and join with filaments from the lacrimal nerve and the zygomaticofacial branch of the maxillary nerve

3- Buccal Branches

larger size than the rest of the branches, pass horizontally forward to be distributed below the orbit and around the mouth.

BRANCHES :

- The superficial branches run beneath the skin and above the superficial muscles of the face, which they supply: some are distributed to the Procerus, joining at the medial angle of the orbit with the infratrochlear and nasociliary branches of the ophthalmic.
- The deep branches pass beneath the Zygomaticus and the Quadratus labii superioris, supplying them and forming an infraorbital plexus with the infraorbital branch of the maxillary nerve. These branches also supply the small muscles of the nose.
- The lower deep branches supply the Buccinato and Orbicularis oris, and join with filaments of the buccinator branch of the mandibular nerve.

4- The marginal mandibular branch passes forward beneath the platysma and depressor anguli oris, supplying the muscles of the lower lip and chin, and communicating with the mental branch of the inferior alveolar nerve.

- Depressor labii inferioris
- Depressor anguli oris
- Mentalis

5-The cervical branch runs forward beneath the Platysma, and forms a series of arches across the side of the neck over the suprahyoid region.

- One branch descends to join the cervical cutaneous nerve from the cervical plexus; others supply the Platysma. Also supplies the depressor anguli oris.

The posterior auricular nerve arises close to the stylomastoid foramen and runs upward in front of the mastoid process; here it is joined by a filament from the auricular branch of the vagus and communicates with the posterior branch of the great auricular as well as with the lesser occipital.

As it ascends between the external acoustic meatus and mastoid process it divides into auricular and occipital branches.

- The *auricular branch* supplies the auricularis posterior and the intrinsic muscles on the cranial surface of the auricula.
- The *occipital branch*, the larger, passes backward along the superior nuchal line of the occipital bone and supplies the occipitalis.

The digastric branch of facial nerve arises close to the stylomastoid foramen , and divides into several filaments, which supply the posterior belly of the Digastricus ; one of these filaments joins the glossopharyngeal nerve .

The stylohyoid branch of facial nerve frequently arises in conjunction with the digastric branch; it is long and slender, and enters the Stylohyoideus about its middle

Intracranial branches

- **Greater petrosal nerve** - provides parasympathetic innervation to several glands, including the nasal gland,palatine gland, lacrimal gland, and pharyngeal gland. It also provides parasympathetic innervation to thesphenoid sinus, frontal sinus, maxillary sinus, ethmoid sinus and nasal cavity.
- **Nerve to stapedius** - provides motor innervation for stapedius muscle in middle ear
- **Chorda tympani**
  - Submandibular gland
  - Sublingual gland
  - Special sensory taste fibers for the anterior 2/3 of the tongue.

IX. Glossopharyngeal Nerve

- ✓ Component: Mixed

- ✓ Function:
  - **Motor**
  - Stylopharyngeus muscle – assists swallowing

- ✓ Function:
  - **Sensory**
  - General sensation and taste from post. ½ of the tongue and pharynx
  - Carotis sinus and carotid body

- ✓ Function:
  - **Secretomotor**
  - Parotid gland

XII. Hypoglossal Nerve

- Component: Motor
- Function: Muscles of tongue (except palatoglossus controlling its shape and movement)
- Origin: Medulla oblongata
- Opening to the Skull: Hypoglossal canal

Carotid Sinus

At its point of division, the common carotid artery shows a localized dilatation, called carotid sinus

- It serves as a reflex pressoreceptor mechanism
- A rise in blood pressure causes a slowing of the heart rate and vasodilatation of the arterioles

Carotid Body

- It is a small structure lies posterior to the point of bifurcation of the common carotid artery
- It is innervated by glossopharyngeal nerve
- It serves as a chemoreceptor
- Sensitive to excess carbon dioxide and

Common Carotid Artery

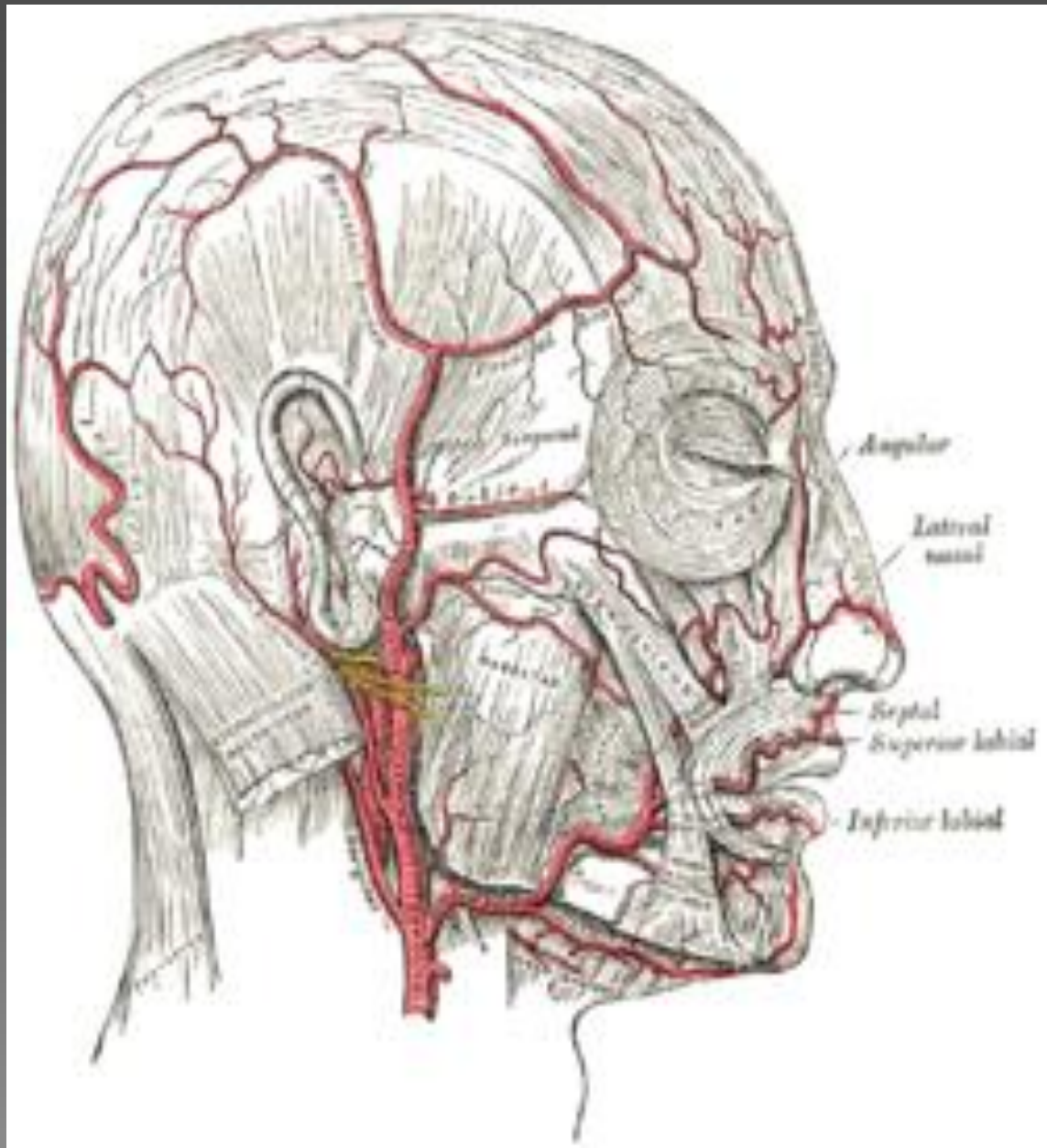
- It is embedded in the carotid sheath throughout its course
- Closely related with the internal jugular vein and vagus nerve
- Apart from the two terminal branches, the common carotid artery gives off no branch in the neck
- **Relations**
- Anterolaterally: The skin, fascia, sternocleidomastoid, sternohyoid, sternothyroid, and posterior belly of omohyoid
- Posteriorly: The transverse processes of lower four cervical vertebrae, the prevertebral muscles, sympathetic trunk, vertebral vessels in the lower part of the neck
- Medially: The larynx, pharynx, and below these, the trachea and esophagus, the lobe of thyroid gland

Branches

1) Superior thyroid artery
2) Ascending pharyngeal artery
3) Lingual artery
4) Facial artery
5) Occipital artery
6) Posterior auricular artery
7) Superficial temporal artery
8) Maxillary artery

4. FACIAL ARTERY

It arises in the carotid triangle from the external carotid artery a little above the lingual artery and, sheltered by the ramus of the mandible, passes obliquely up beneath the digastric and stylohyoid muscles, over which it arches to enter a groove on the posterior surface of the submandibular gland. It then curves upward over the body of the mandible at the antero-inferior angle of the masseter; passes forward and upward across the cheek to the angle of the mouth, then ascends along the side of the nose, and ends at the medial commissure of the eye, under the name of the angular artery.
The facial artery is remarkably tortuous. This is to accommodate itself to neck movements such as those of the pharynx in deglutition; and facial movements such as those of the mandible, lips, and cheeks.



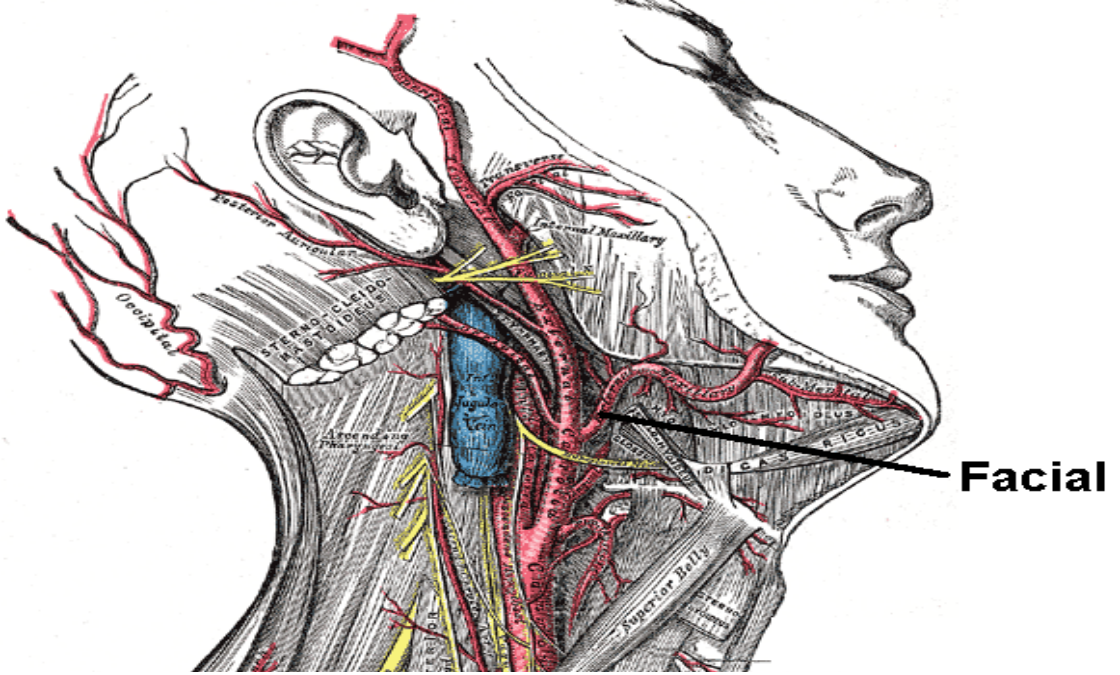
BRANCHES OF FACIAL ARTERY

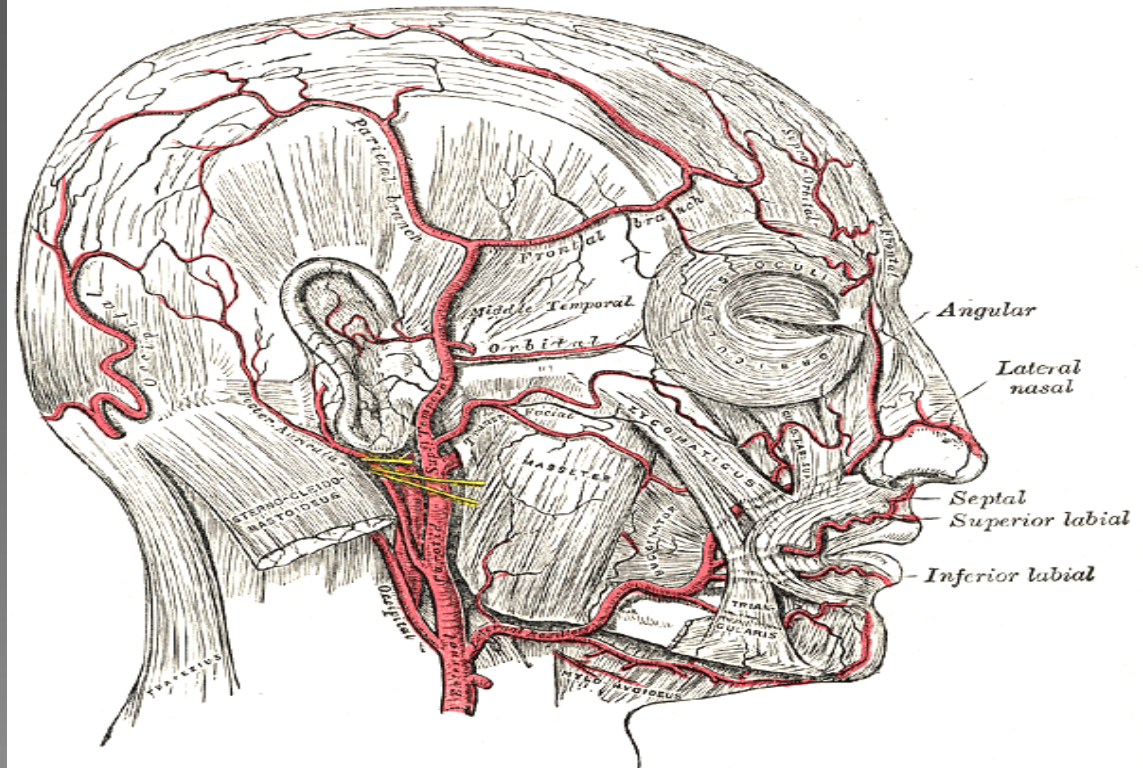
Cervical

1. Ascending palatine artery
2. Tonsillar branch
3. Submental artery
4. Glandular branches

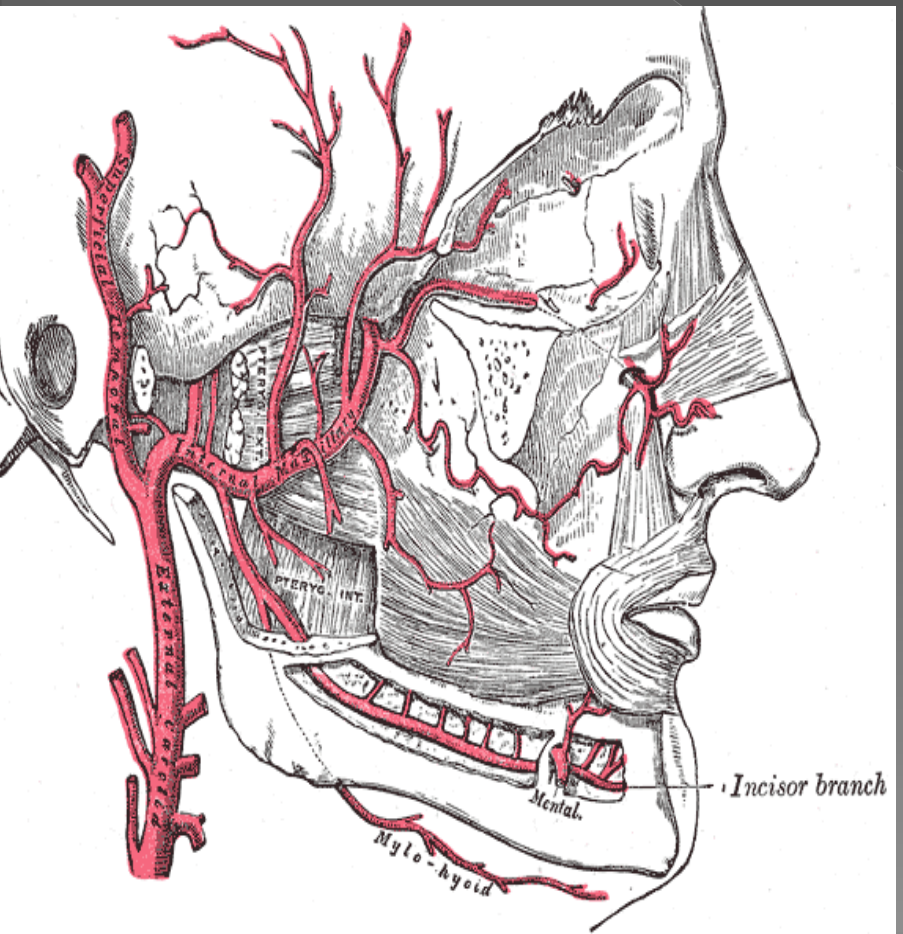
Facial

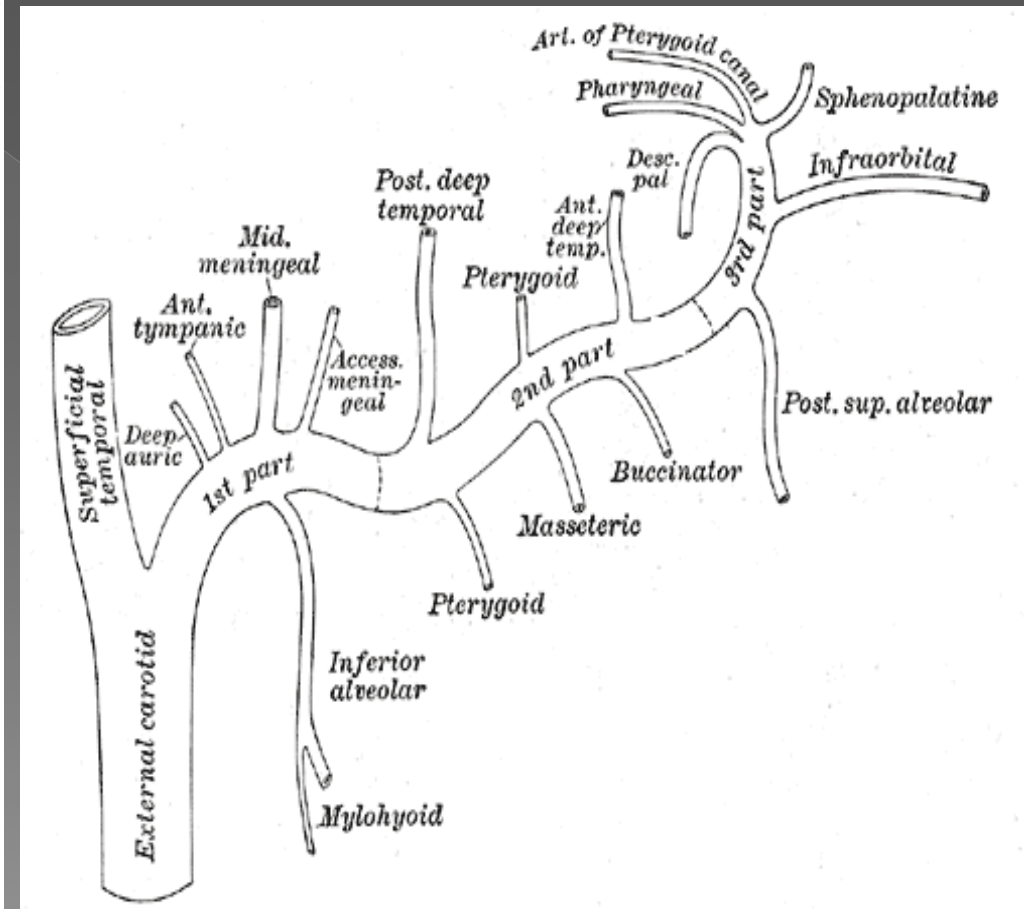
1. Inferior labial artery
2. Superior labial artery
3. Lateral nasal branch to nasalis muscle
4. Angular artery - the terminal branch





It is the larger terminal branch of the external carotid artery in the parotid gland ,It arises behind the neck of the mandible .It runs upward and forward, leaves the infratemporal fossa by entering the pterygopalatine fossa





Branches of Maxillary Artery

First portion

The **first or mandibular portion** passes horizontally forward, between the neck of the mandible and the sphenomandibular ligament, where it lies parallel to and a little below the auriculotemporal nerve; it crosses the inferior alveolar nerve, and runs along the lower border of the lateral pterygoid muscle.

Branches include:

1) Deep auricular artery
2) Anterior tympanic artery
3) Middle meningeal artery
4) Inferior alveolar artery which gives off its mylohyoid branch just prior to entering the mandibular foramen
5) Accessory meningeal artery

Second portion:

The **second or pterygoid portion** runs obliquely forward and upward under cover of the ramus of the mandible and insertion of the temporalis, on the superficial (very frequently on the deep) surface of the lateral pterygoid muscle; it then passes between the two heads of origin of this muscle and enters the fossa.

Branches include:

1) Masseteric artery
2) Pterygoid branches
3) Deep temporal arteries (anterior and posterior)
4) Buccal artery

Third portion

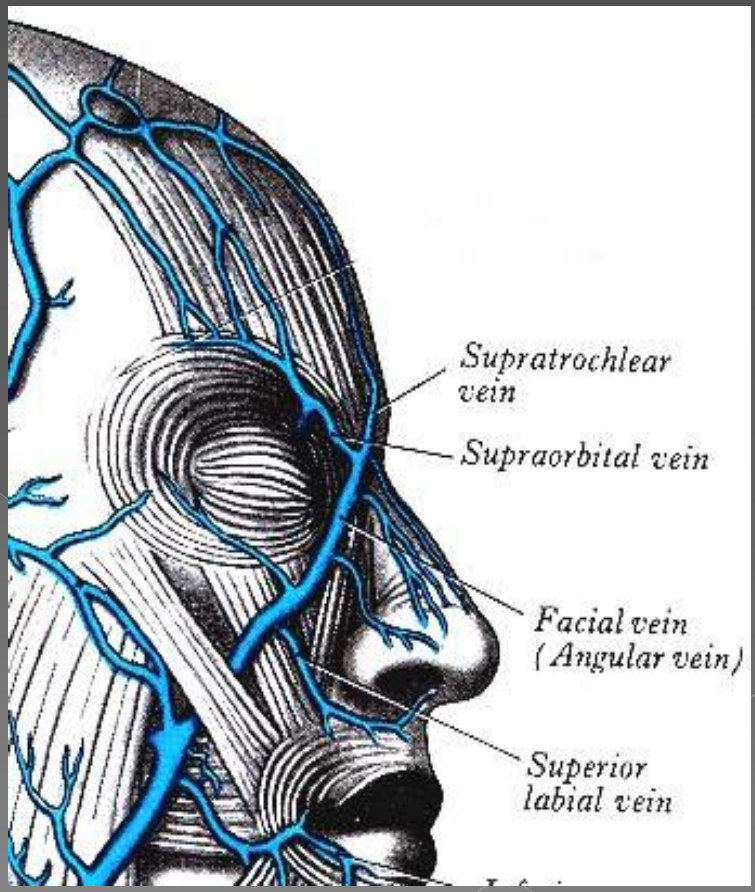
The **third or pterygomaxillary portion** lies in the pterygopalatine fossa in relation with the pterygopalatine ganglion. This is considered the terminal branch of the maxillary artery.

Branches include:

1) Sphenopalatine artery (Nasopalatine artery is the terminal branch of the Maxillary artery)
2) Descending palatine artery
3) Infraorbital artery
4) Posterior superior alveolar artery
5) Artery of pterygoid canal
6) Pharyngeal artery
7) Middle superior alveolar artery (a branch of the infraorbital artery)
8) Anterior superior alveolar arteries (a branch of the infraorbital artery)
9) Greater palatine artery

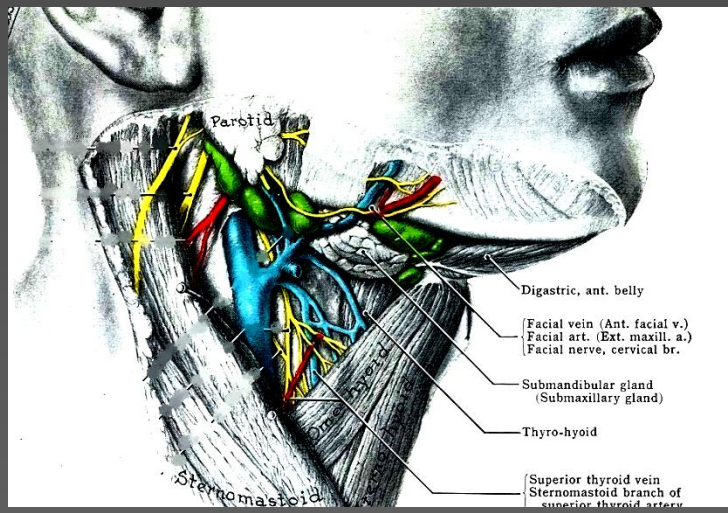
Facial vein:

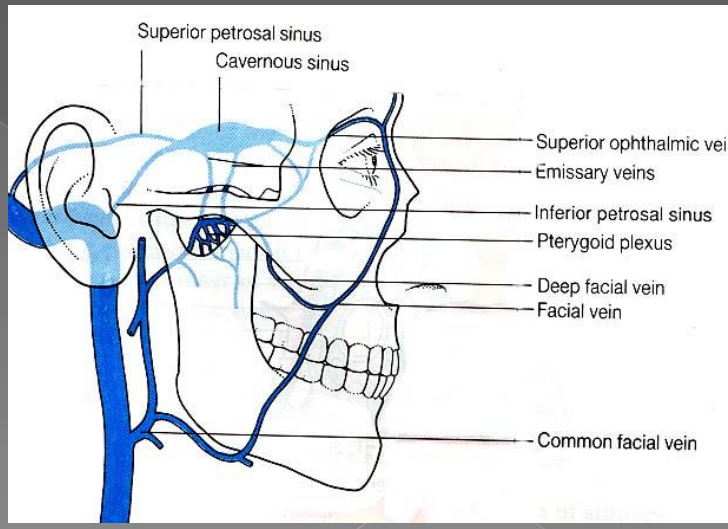
- is formed by the union of the supraorbital and supratrochlear veins the medial canthus to form the angular vein
- Communicate with the cavernous sinus through the ophthalmic vein via the supraorbital



Facial vein:

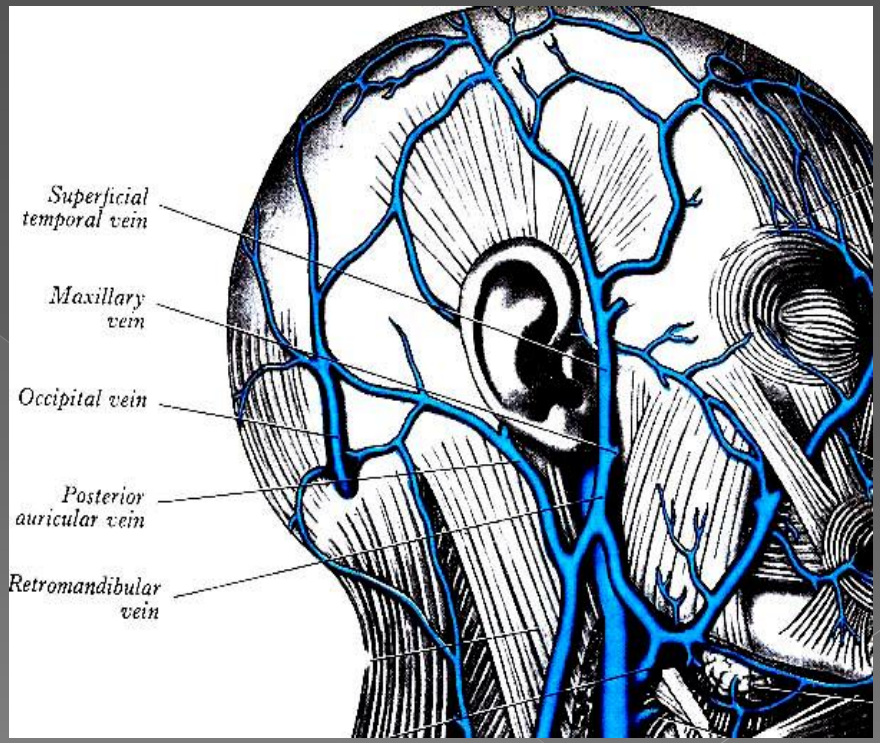
- descend on the face behind the facial artery to the lower border of the mandible
- to be joined by the anterior division of the *retomandibular vein*
- Joins the:
  - pterygoid plexus through *deep facial vein*
  - Cavernous sinus through *superior ophthalmic vein*





The maxillary vein:

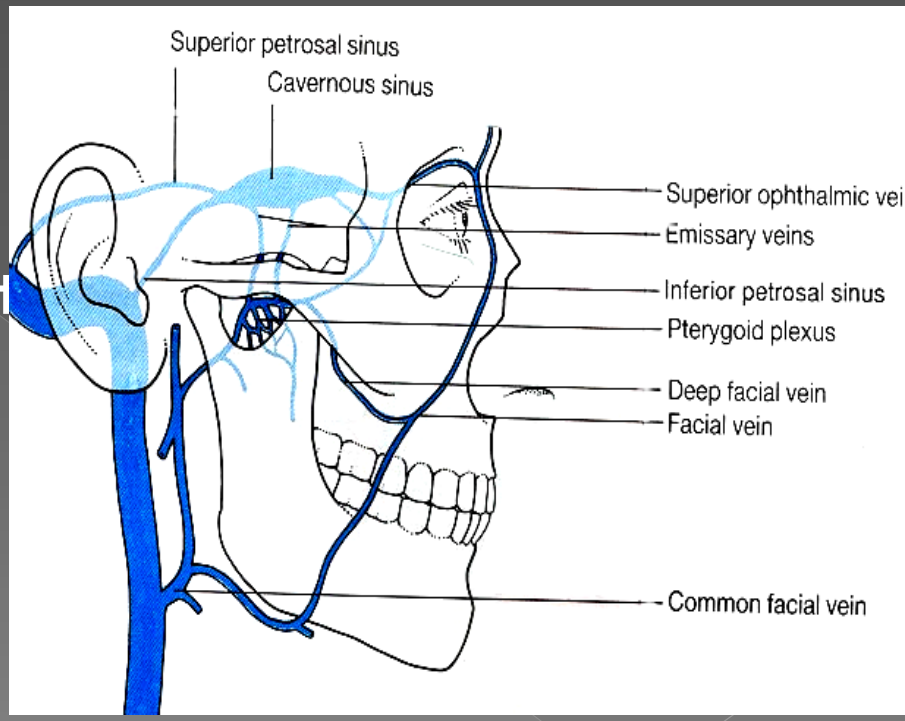
- A short trunk accompany the first part of the artery.
- Formed by confluence of the veins of the pterygoid plexus.
- It passes backward between the sphenomandibular ligament and the neck of the mandible
- Unite with the ***superficial temporal vein*** to form the ***retromadibular vein.***



Pterygoid plexus:

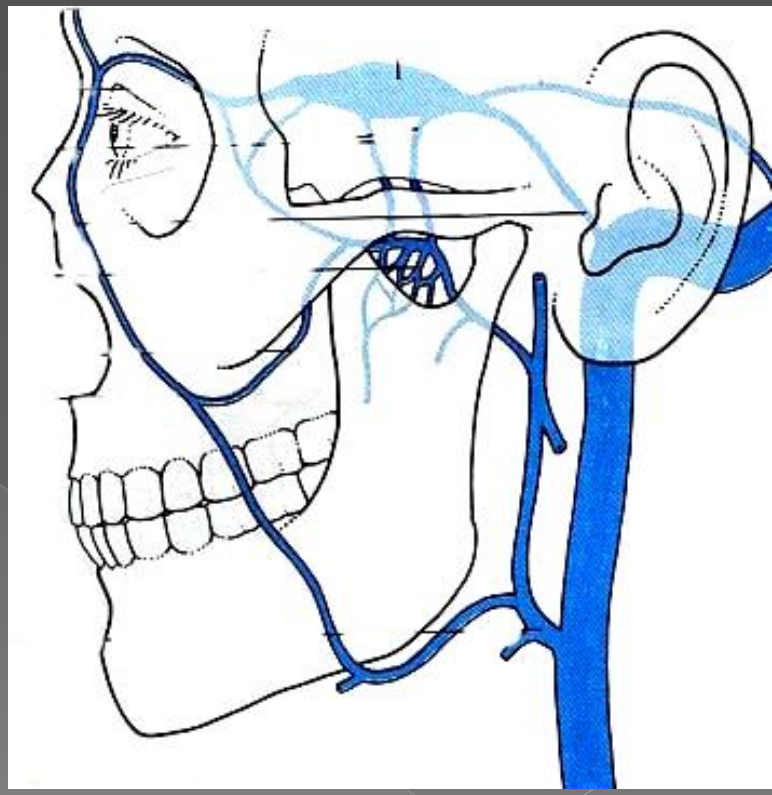
- A network of very small veins, lie around and within the lateral pterygoid muscle in the infratemporal region

- receive some of the veins that correspond to the maxillary artery, inferior ophthalmic vein (internal carotid blood) and the deep facial vein.



Pterygoid plexus:

- Drain into a pair of large, short maxillary veins which join the superficial temporal vein to form the ***retromandibular.***
- Deep facial vein drain the plexus into the ***facial vein*** if the maxillary is occluded



Pterygoid plexus:

- Act as ***peripheral pump***, to aid venous return by the pumping action of the muscle every time the mouth is opened.
- ***Yawing,*** a prolonged and forcible contraction of the lateral pterygoid to open the mouth, is accompanied by contraction of the diaphragm and stretching of limbs, is a reflex triggered by venous stagnation