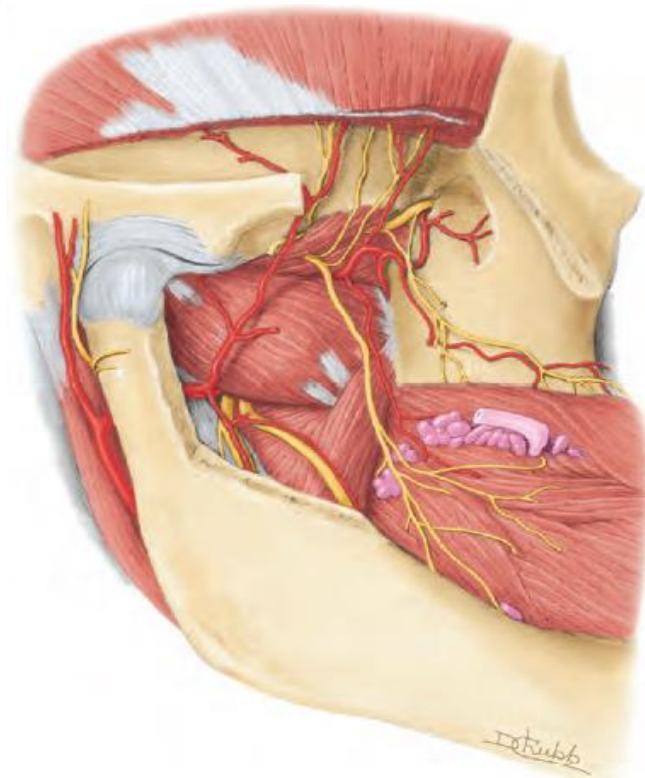
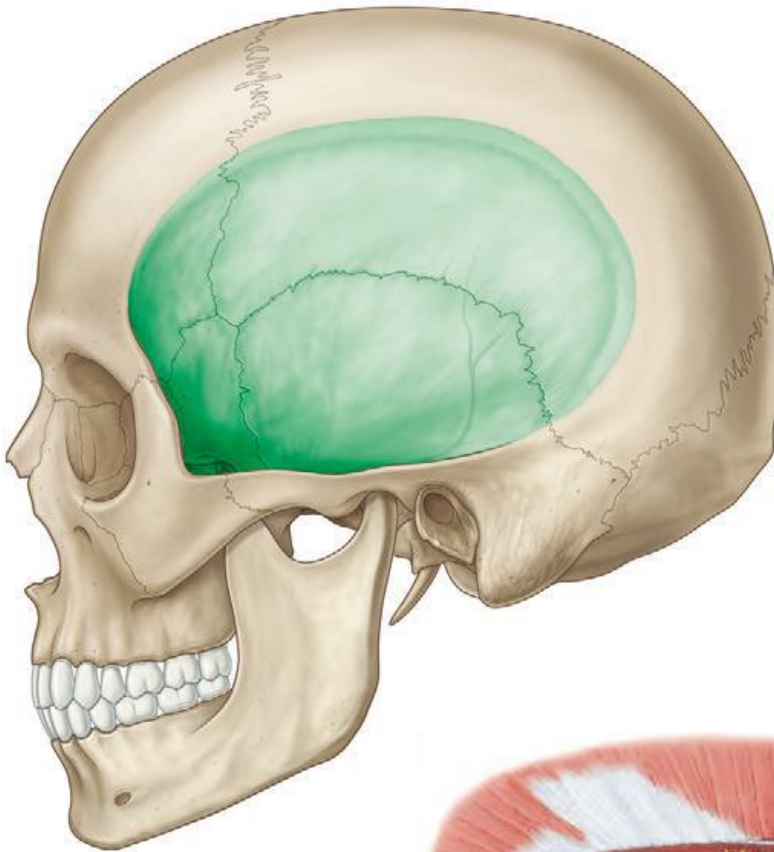


**TEMPORAL AND
INFRATEMPORAL FOSSAE**

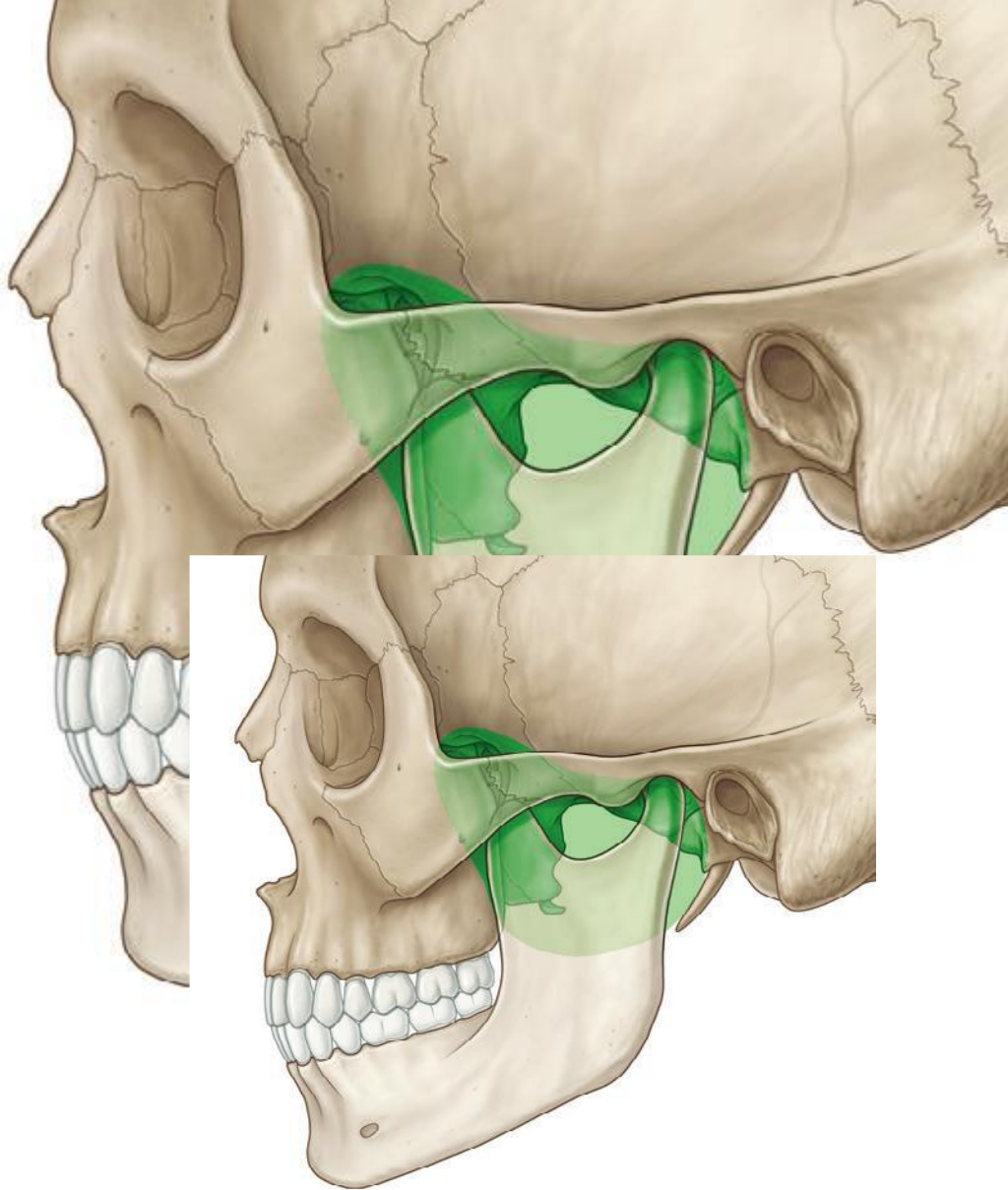
★**Temporal Fossa (or Temple):**

- It is the region on the **side** of the head which extends from **superior temporal line above** to the **zygomatic arch below**.
- **Contents:** temporalis muscle and deep temporal vessels and nerves.



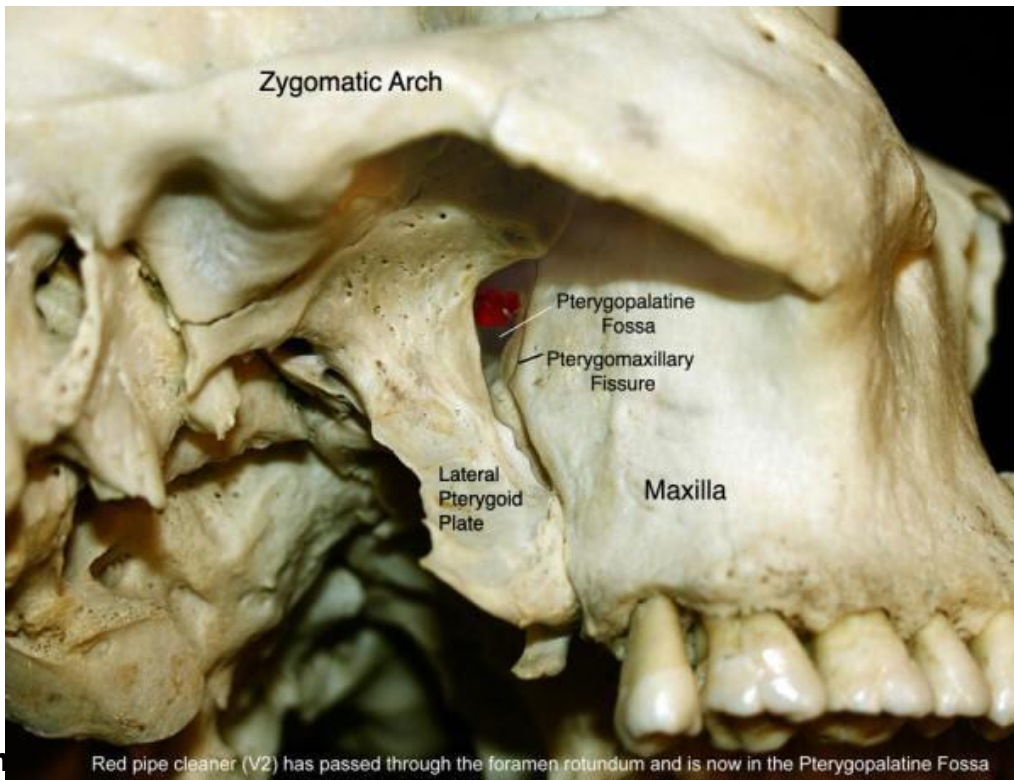
★**Infratemporal Fossa:**

:



Fossae

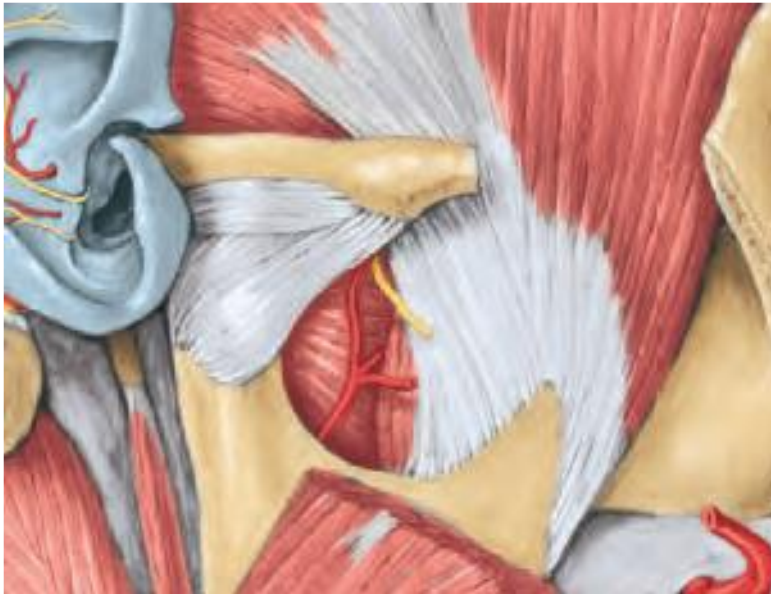
ounded



• **Con**

Red pipe cleaner (V2) has passed through the foramen rotundum and is now in the Pterygopalatine Fossa

1. **3 Muscles of mastication:** insertion of temporalis, medial and lateral pterygoid muscles.

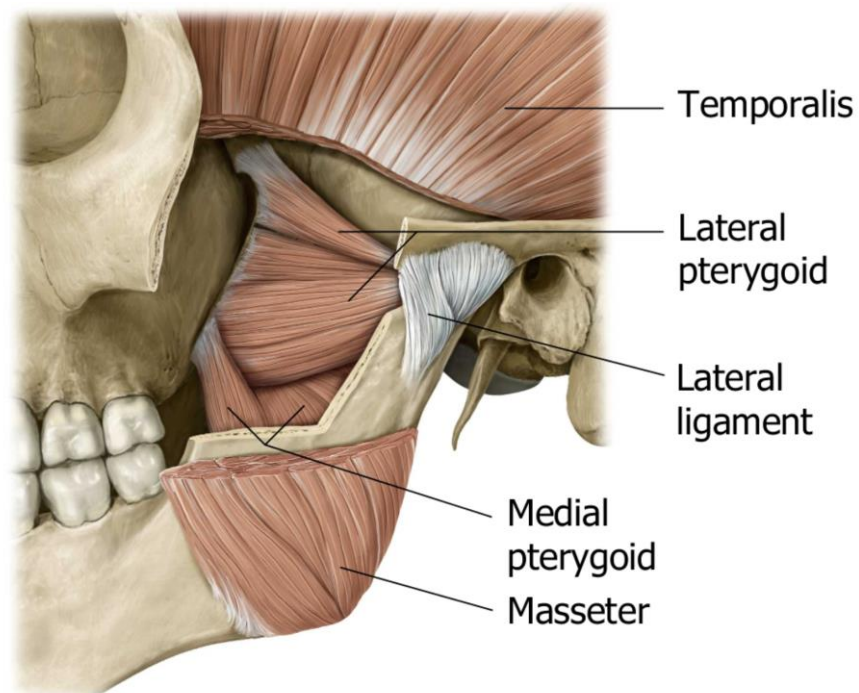


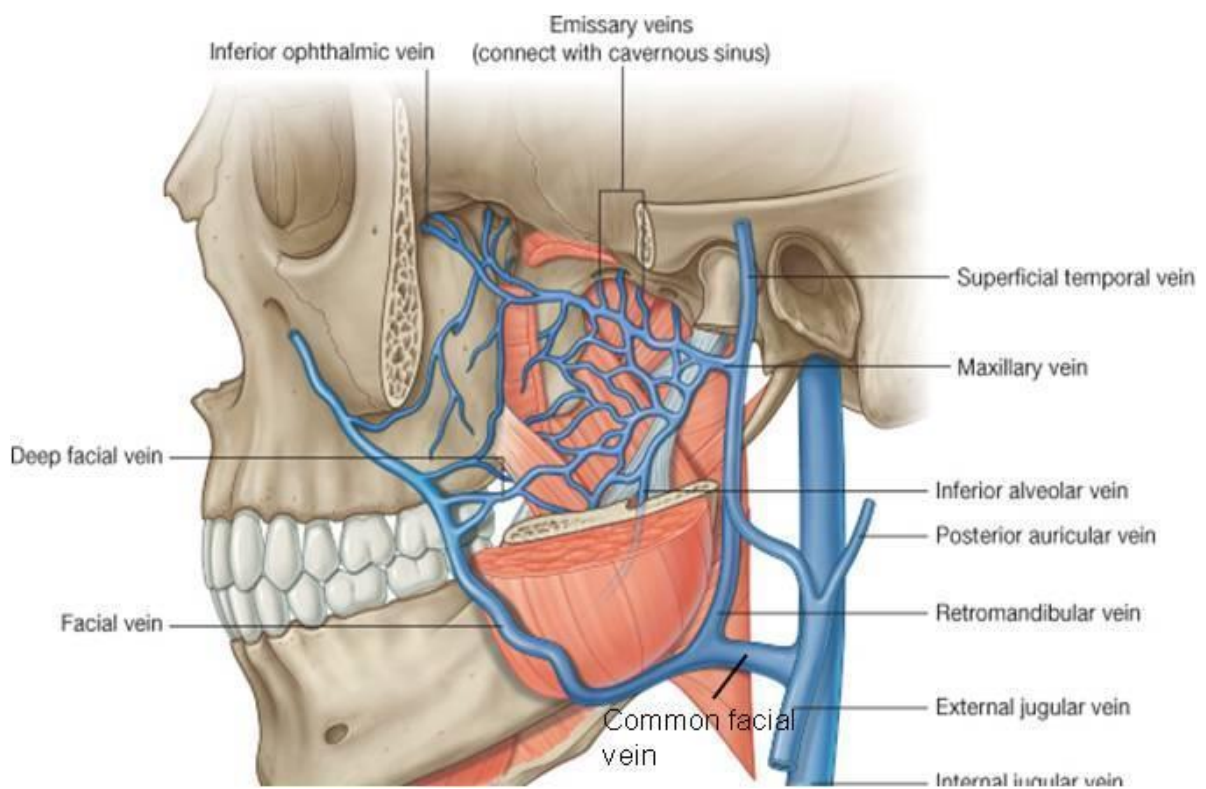
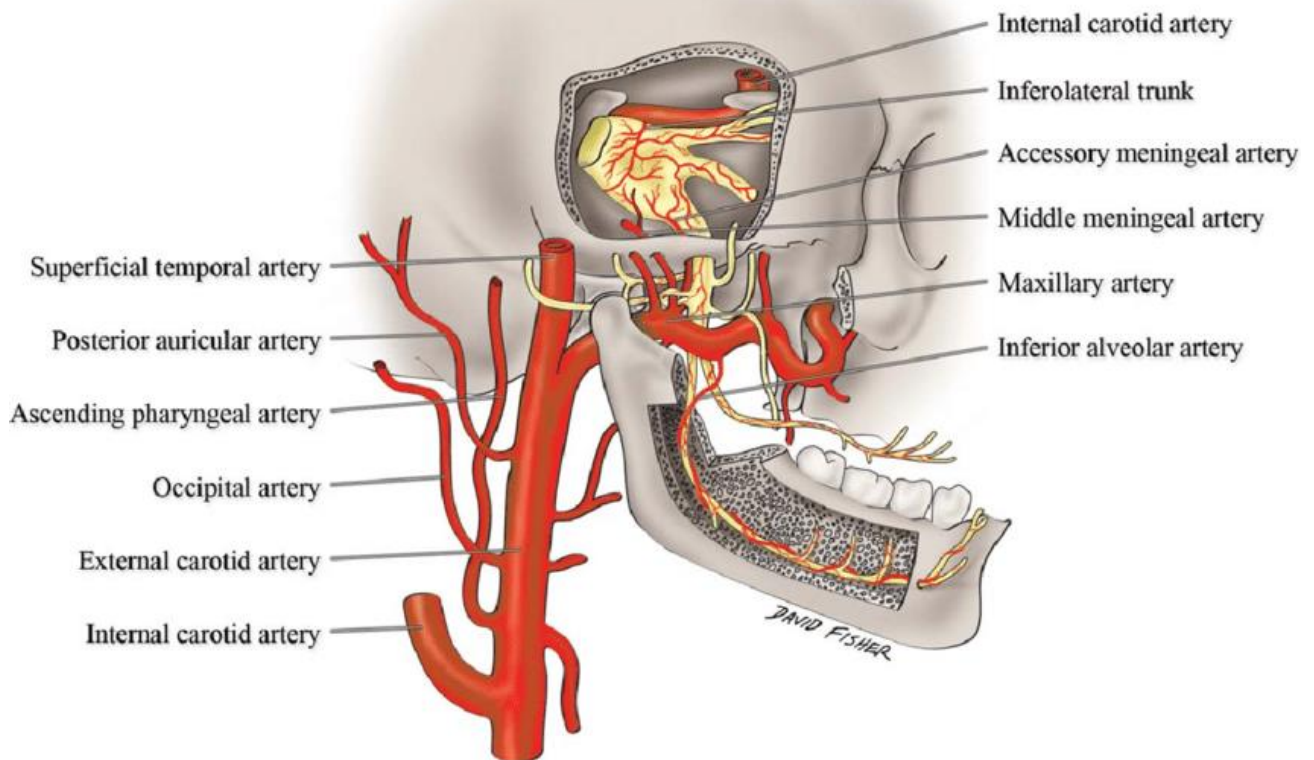
2. **Blood vessels:**

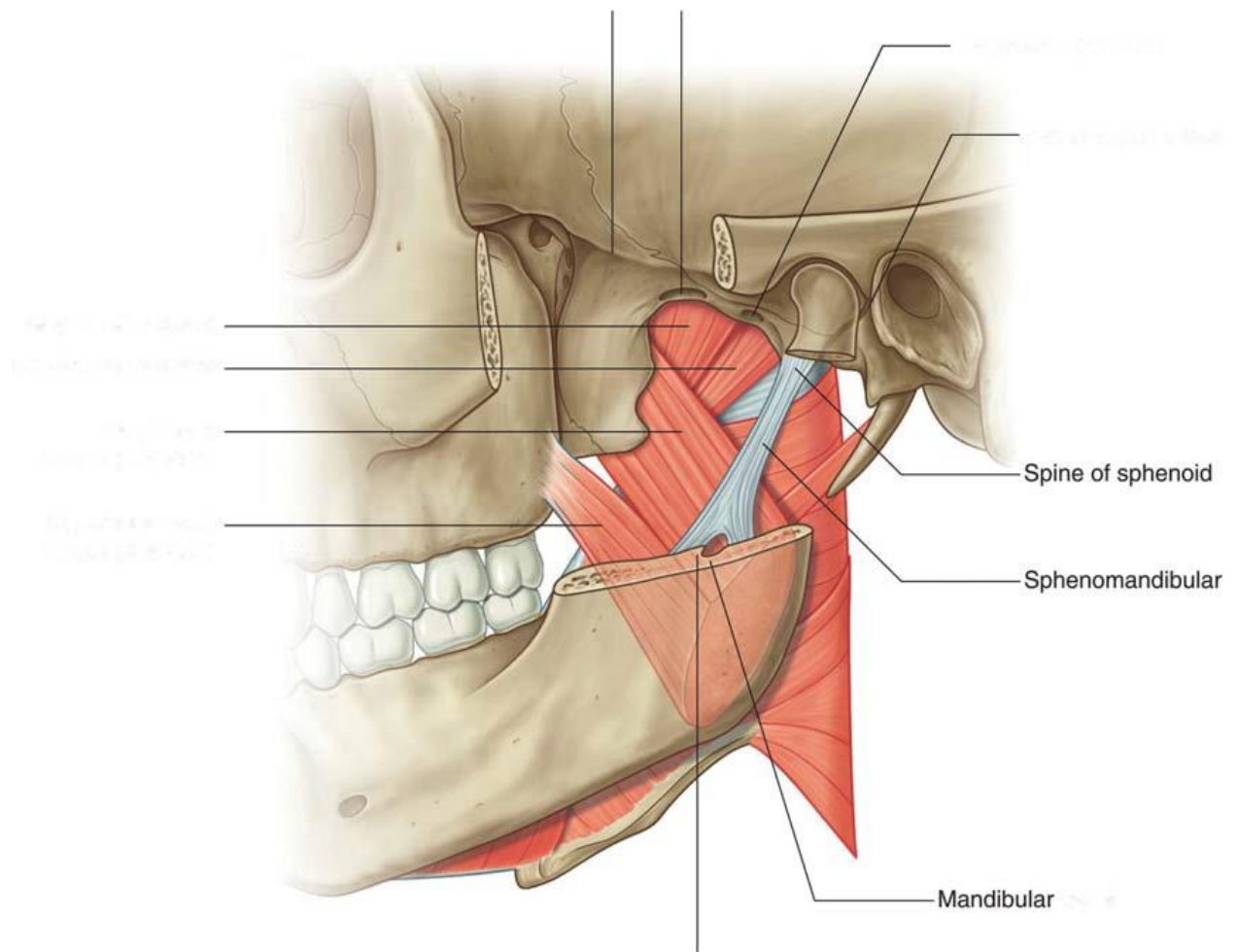
- a. First and second parts of maxillary artery and their corresponding branches.
- b. Pterygoid venous plexus.

3. **Nerves:** Mandibular nerve and its related otic ganglion , small part of maxillary nerve and chorda tympani.

4. **Ligaments:** Sphenomandibular ligament.





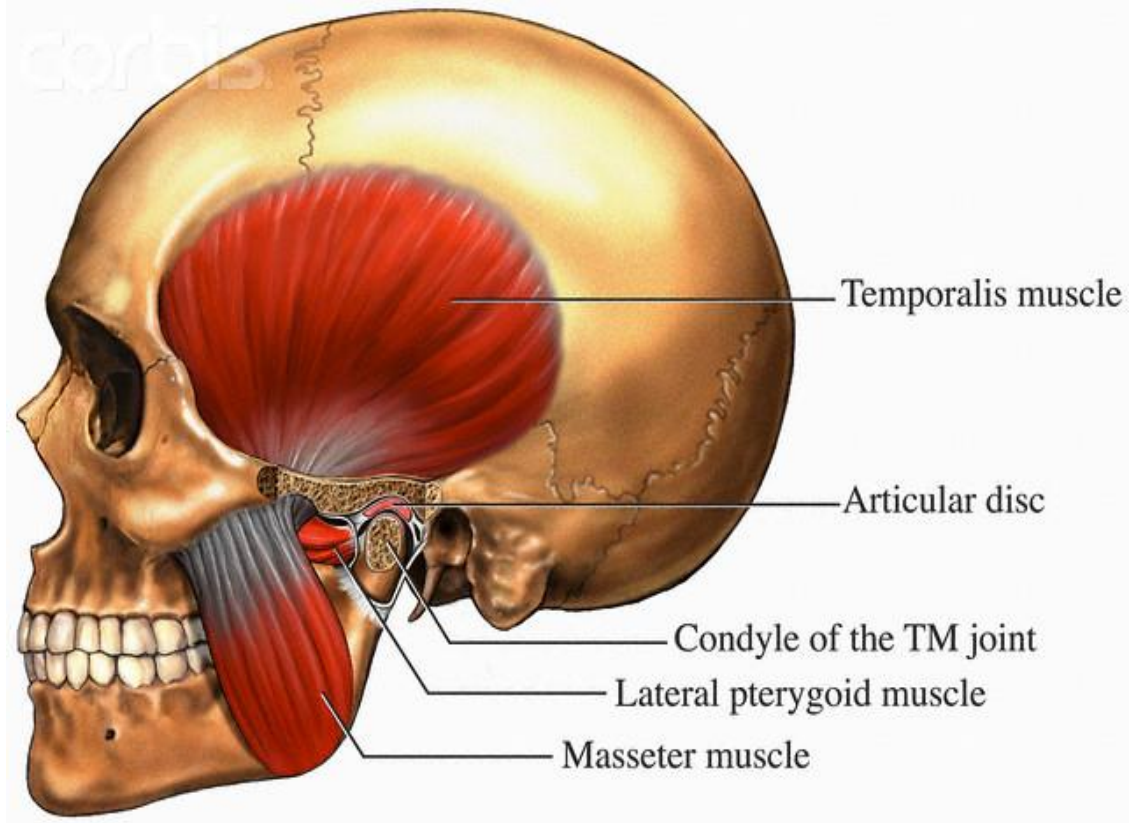


Sphenomandibular ligament

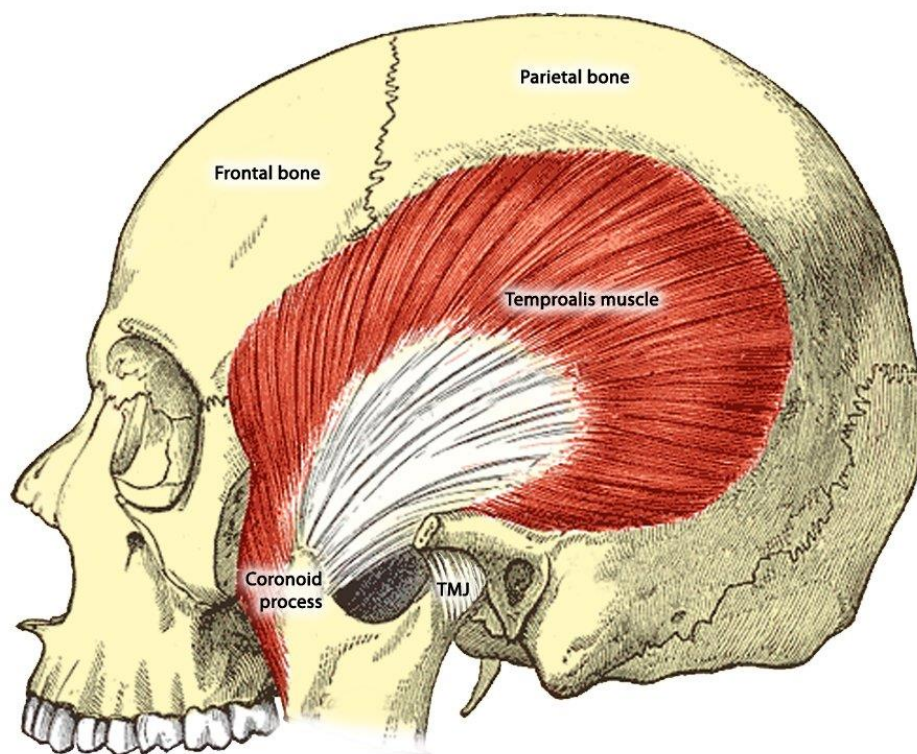
Muscles of mastication

★All are supplied by anterior division of mandibular nerve except medial pterygoid muscle which is supplied by main trunk of mandibular nerve.

Muscle	Origin	Insertion	Action
<p>1. Temporalis: Fan-shaped muscle has following fibers: a- Anterior: vertical b- Middle: oblique c- Posterior: horizontal</p>	<p>a- Inferior temporal line b- Temporal fossa c- Temporal fascia</p>	<p>a- Tip and medial surface of coronoid process b- Anterior border of ramus of mandible</p>	<p>1. Elevation of mandible by anterior fibers 2. Retraction by posterior fibers</p>
<p>2. Masseter has the following fibers a- Superficial: oblique b- Deep: vertical</p>	<p>a- Superficial fibers: from lower border of zygomatic arch b- Deep fibers: from deep surface of zygomatic arch</p>	<p>The lateral surface of ramus of mandible</p>	<p>1. Protraction of the mandible by superficial fibers 2. Elevation by deep fibers</p>
<p>3. Lateral pterygoid has 2 heads.</p>	<p>a- Upper head: from infra-temporal surface and crest of greater wing of sphenoid b- Lower head: from lateral surface of lateral pterygoid plate</p>	<p>1. Pterygoid fovea of neck of mandible 2. Articular disc & Capsule of temporomandibular joint</p>	<p>1. Lat. pterygoid of both sides produce depression of mandible 2. Med. pterygoid of both sides produce elevation of mandible 3. Lateral and medial pterygoid of one side protrude mandible to the opposite side 4. Lateral and medial pterygoid of both sides produce side to side movement during their alternate action.</p>
<p>5. Medial pterygoid has 2 heads.</p>	<p>a- Superficial head: from maxillary tuberosity b- Deep head: from medial surface of lateral pterygoid plate</p>	<p>Medial surface of angle and ramus of mandible below the mandibular foramen</p>	<p>1. Lat. pterygoid of both sides produce depression of mandible 2. Med. pterygoid of both sides produce elevation of mandible 3. Lateral and medial pterygoid of one side protrude mandible to the opposite side 4. Lateral and medial pterygoid of both sides produce side to side movement during their alternate action.</p>

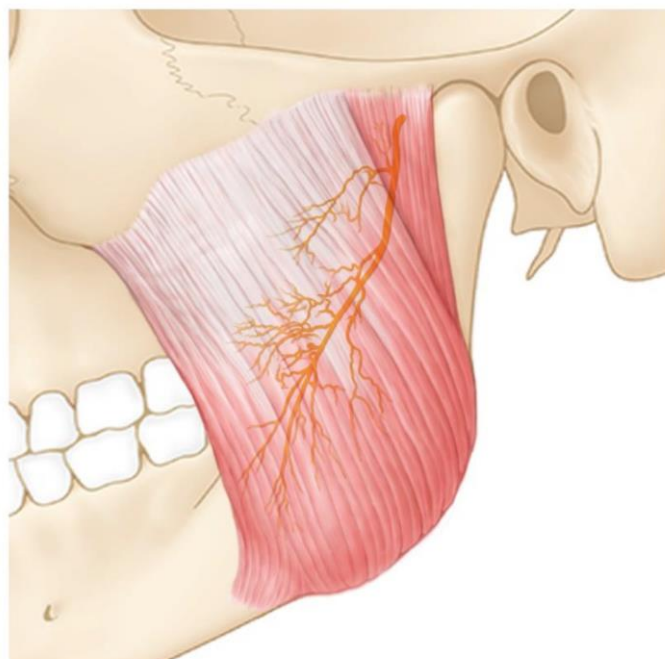
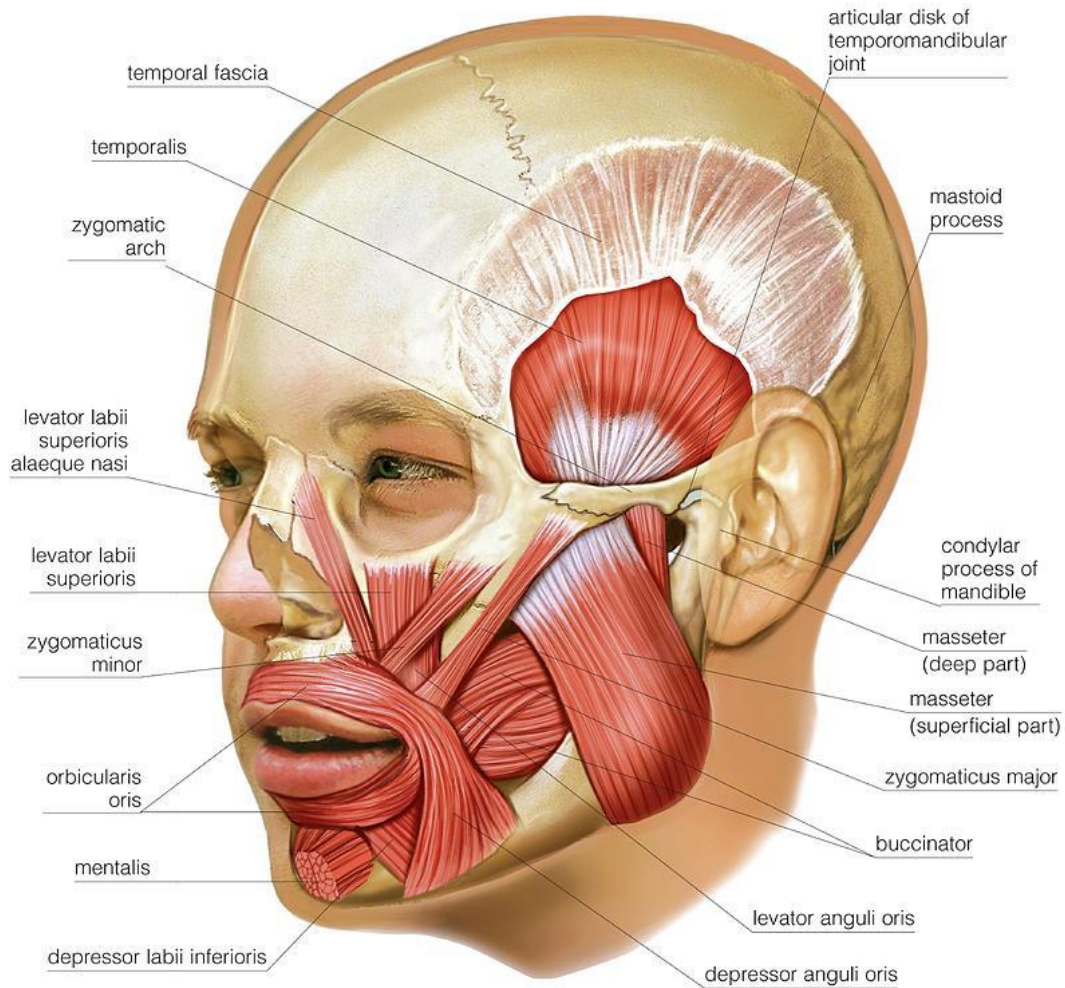


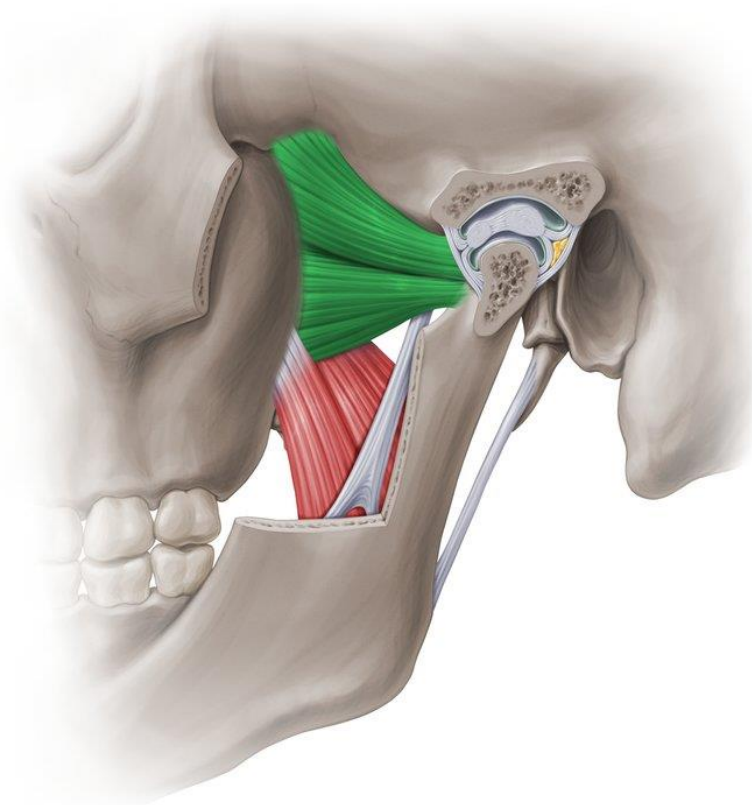
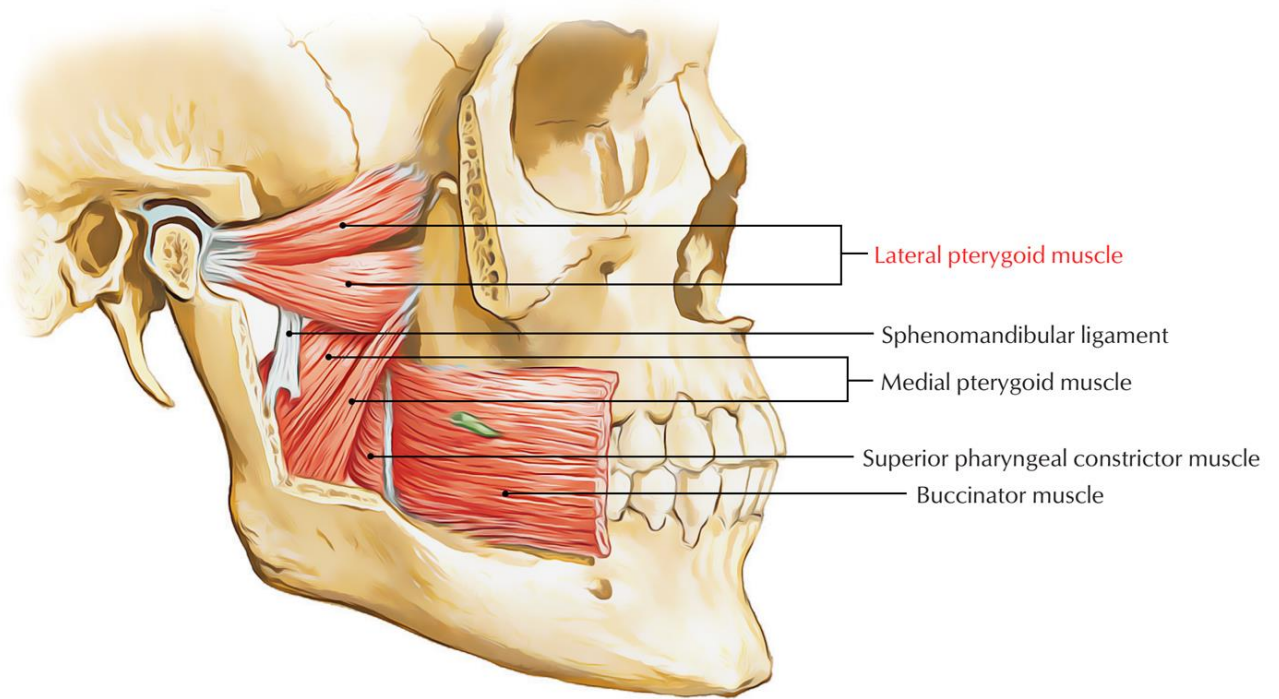
Temporalis muscle

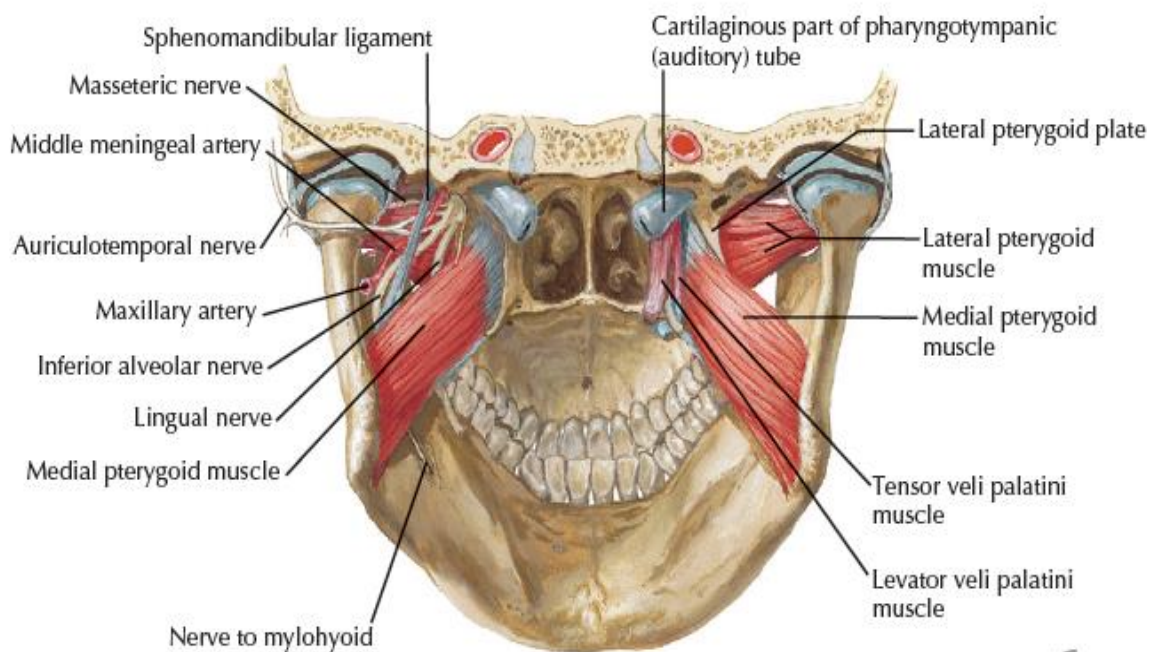
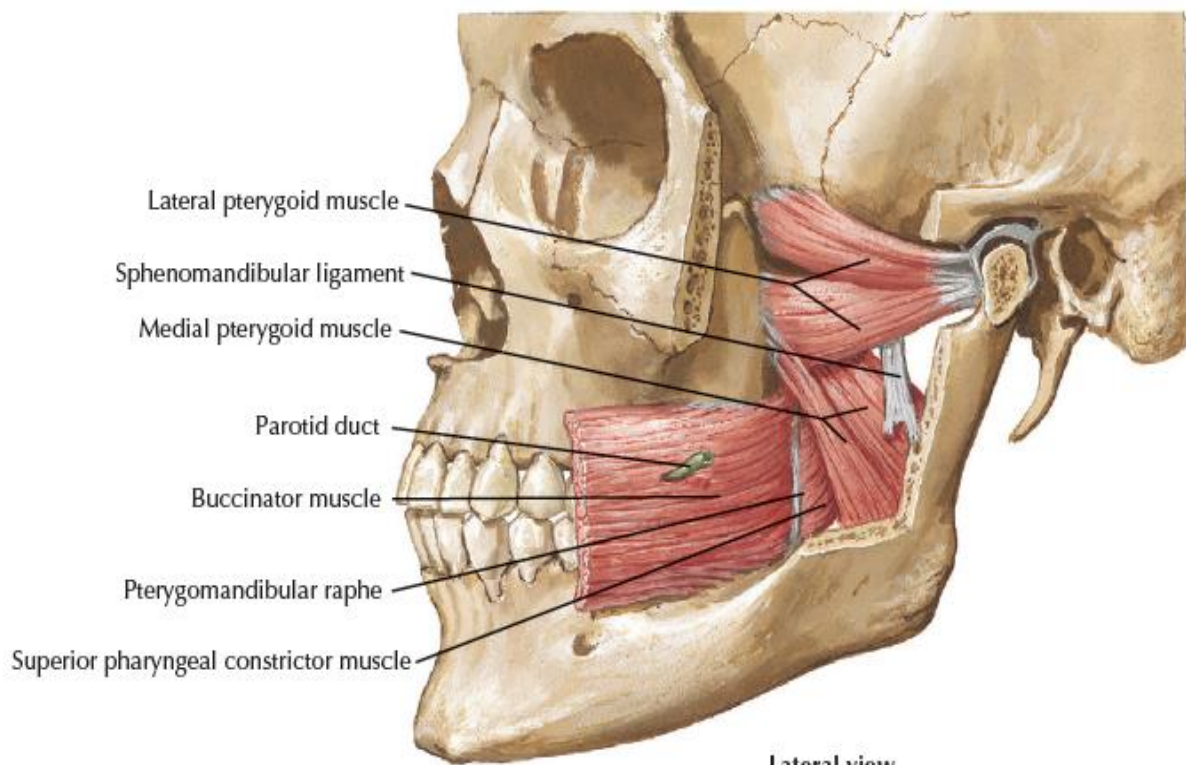


F. Gaillard
2009
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Temporalis & Masseter Muscles





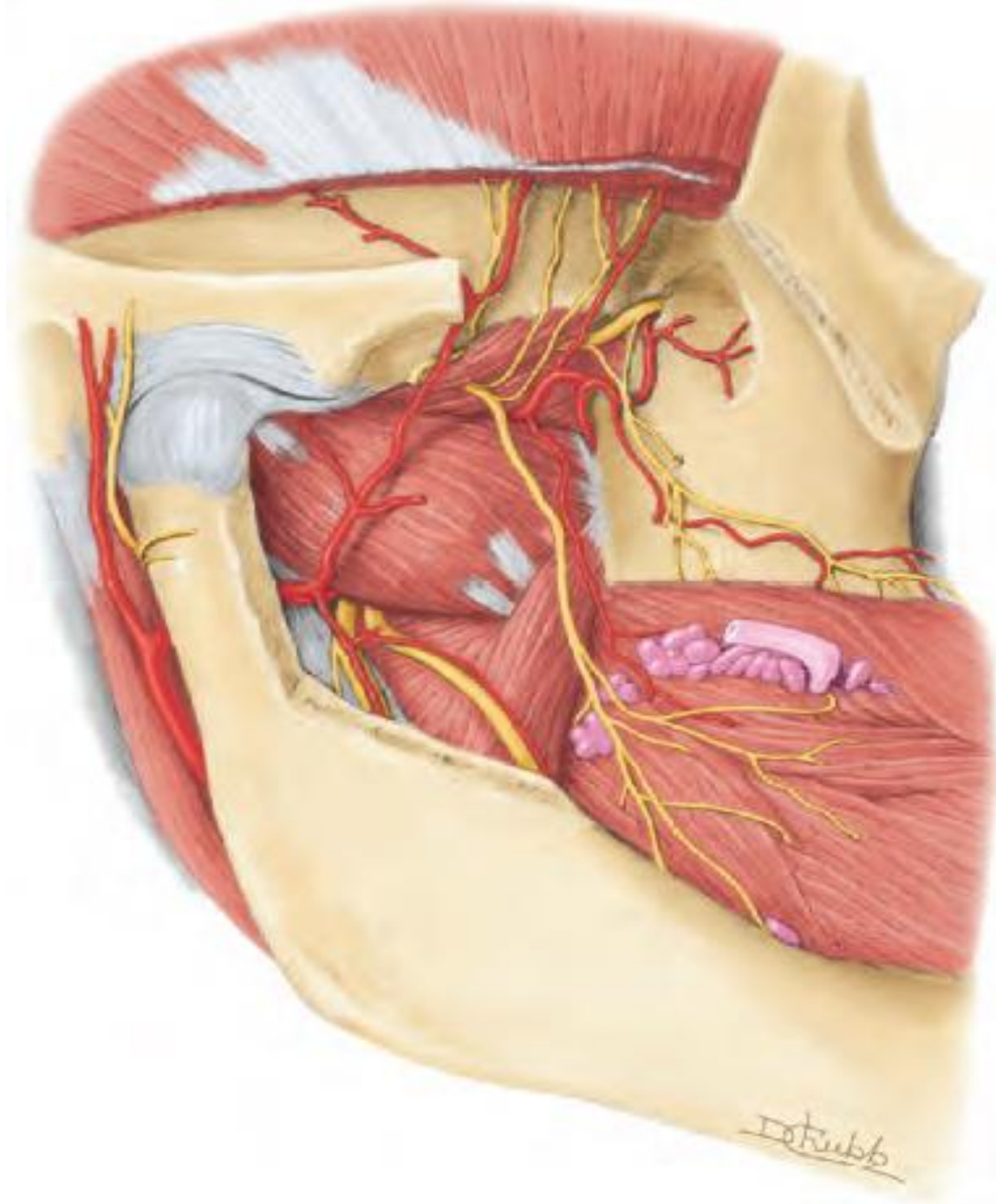


Posterior view

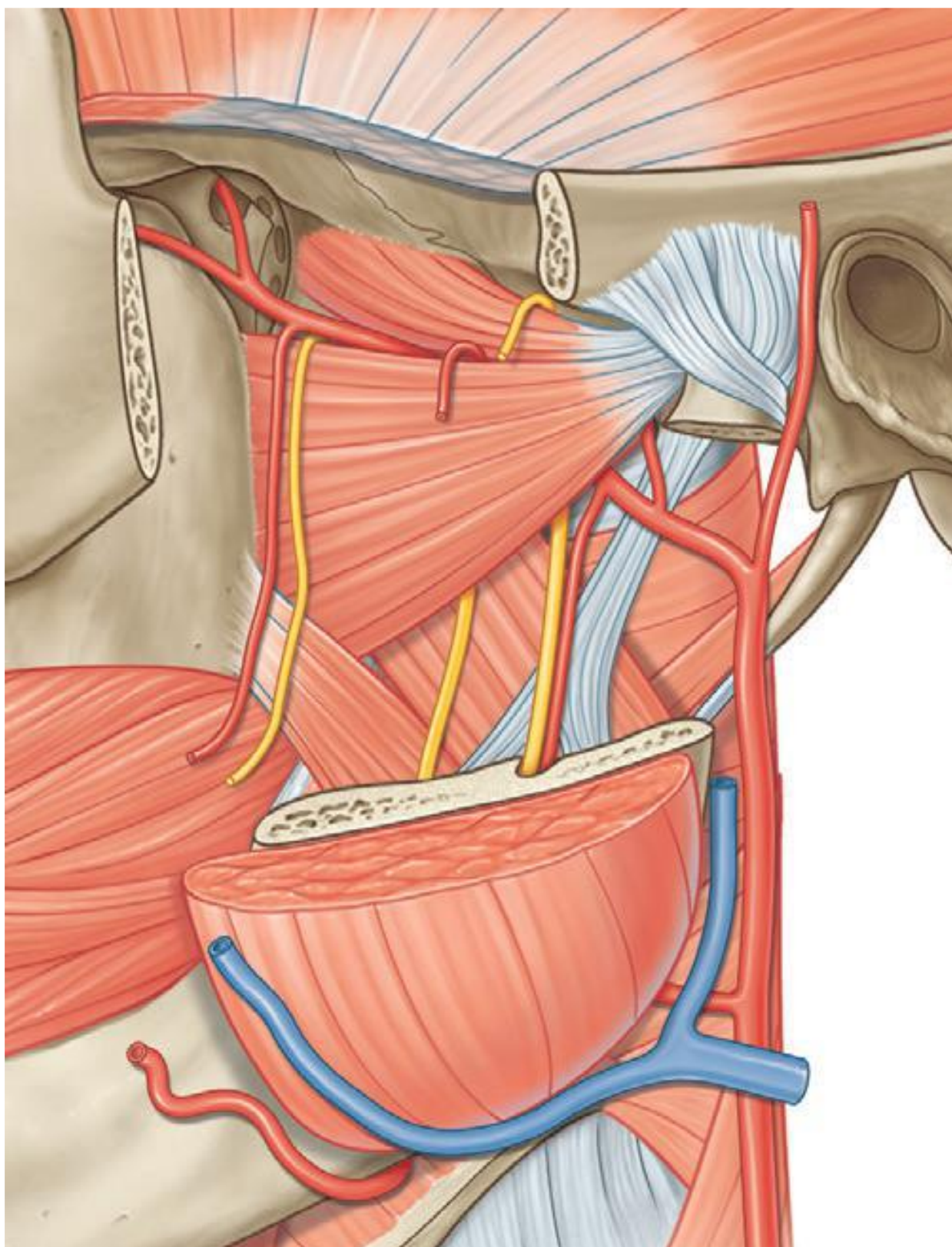
F. Netter M.D.

★ Relations of lateral Pterygoid:

- 1- Between its two heads:** Maxillary artery and buccal nerve.
- 2- At the upper border:** deep temporal nerves & vessels and nerve to masseter.
- 3- At the lower border:** Lingual nerve and inferior alveolar nerves & vessels.
- 4- Superficial relations:** 2nd part of maxillary artery, pterygoid venous plexus, buccal nerve (on the lower head), three muscles (temporalis, masseter and superficial head of medial pterygoid) and ramus of mandible.
- 5- Deep relations :**
 - a. **Two muscles:** Deep head of medial pterygoid and tensor palati.
 - b. **Two nerves:** Mandibular nerve & its branches and chorda tympani.
 - c. **Two arteries:** Middle and accessory meningeal arteries.
 - d. **One ligament:** sphenomandibular ligament.



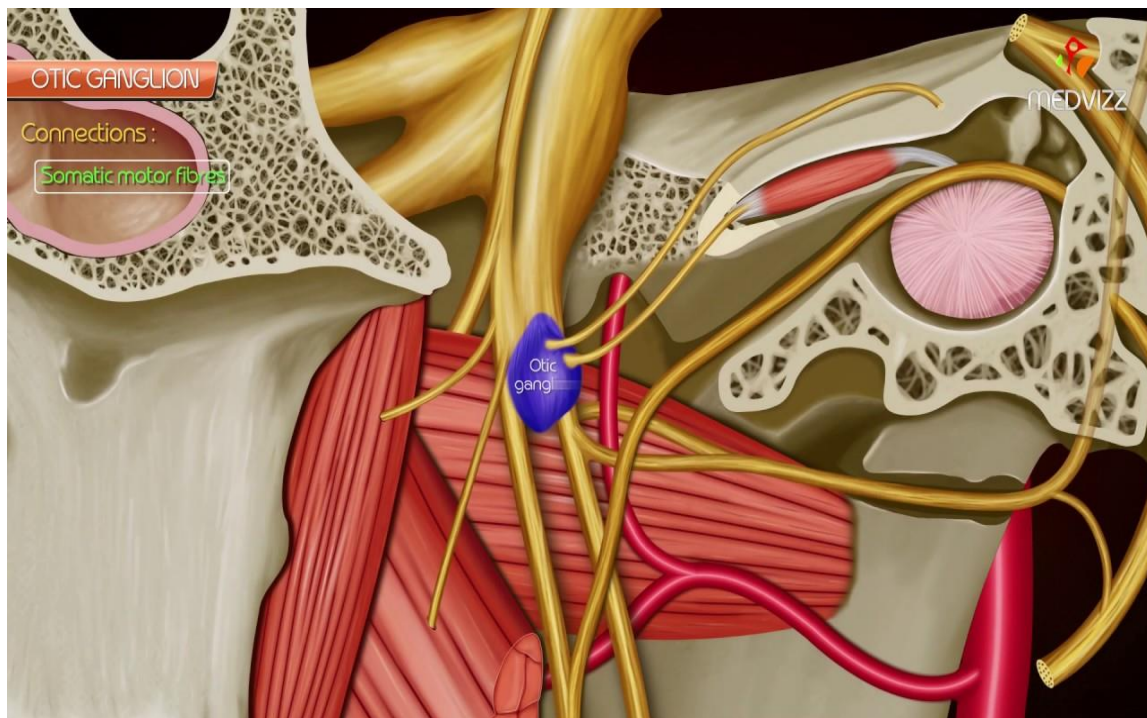
***Lateral Pterygoid (Superficial relations) ***



***Lateral Pterygoid (Superficial relations) ***



***Lateral Pterygoid (deep relations) ***

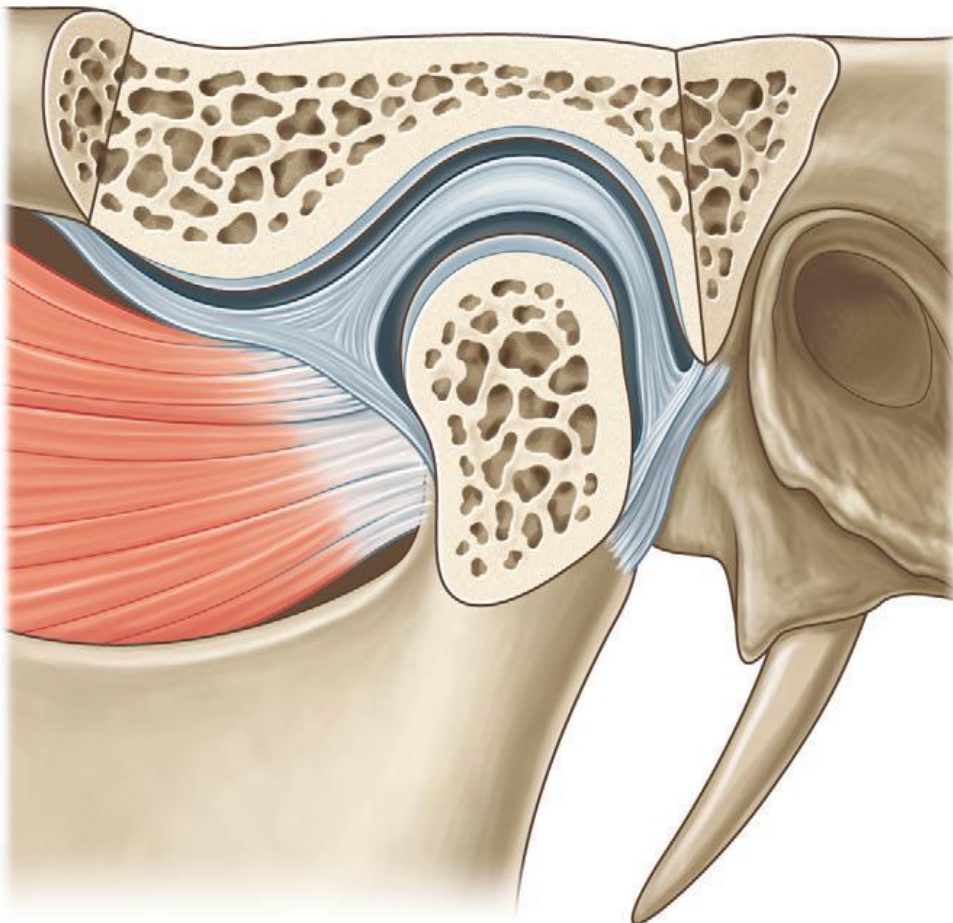


***Lateral Pterygoid (deep relations) ***

Temporo-mandibular Joint

★ Type and articular surfaces:

- It is a **modified hinge** synovial joint present **between** the head of mandible below, and **mandibular fossa & articular tubercle** of temporal bone above.



★ Fibrous capsule: It is attached to:

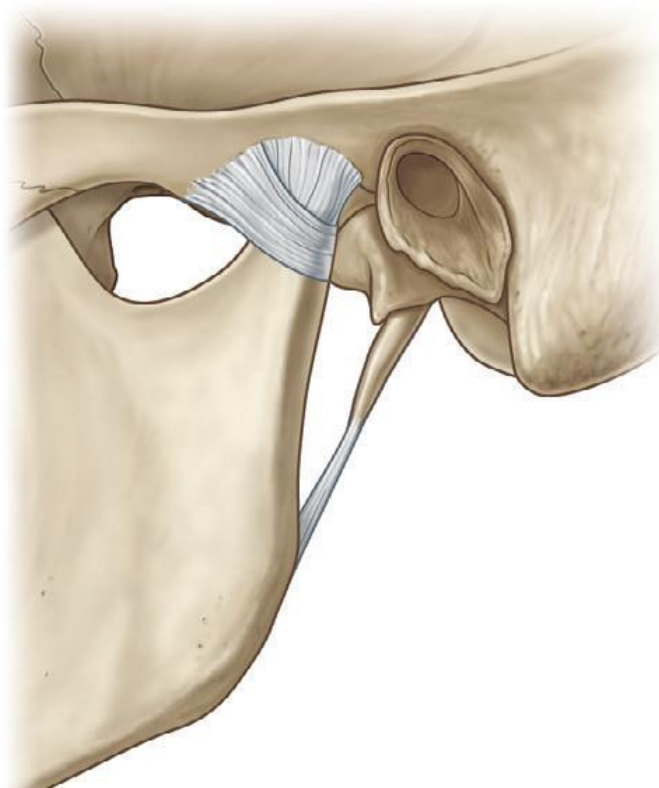
- **Above:** To the **margins** of the mandibular fossa and articular tubercle.
- **Below:** It is attached around the **neck of mandible**.
- The capsule is also attached to the margins of the **articular disc**.



★ **Ligaments:** There are 4 ligaments:

1. **Temporo-mandibular ligament:**

- Triangular thickened band of the **lateral part of the capsule**.
- **Above**, it is attached to the **tubercle** at the root zygomatic arch.
- **Below**, it is attached to the lateral and posterior surfaces of the **neck** of mandible.
- It is the **only proper** ligament which supports the joint.



2. **Stylo-mandibular ligament:**

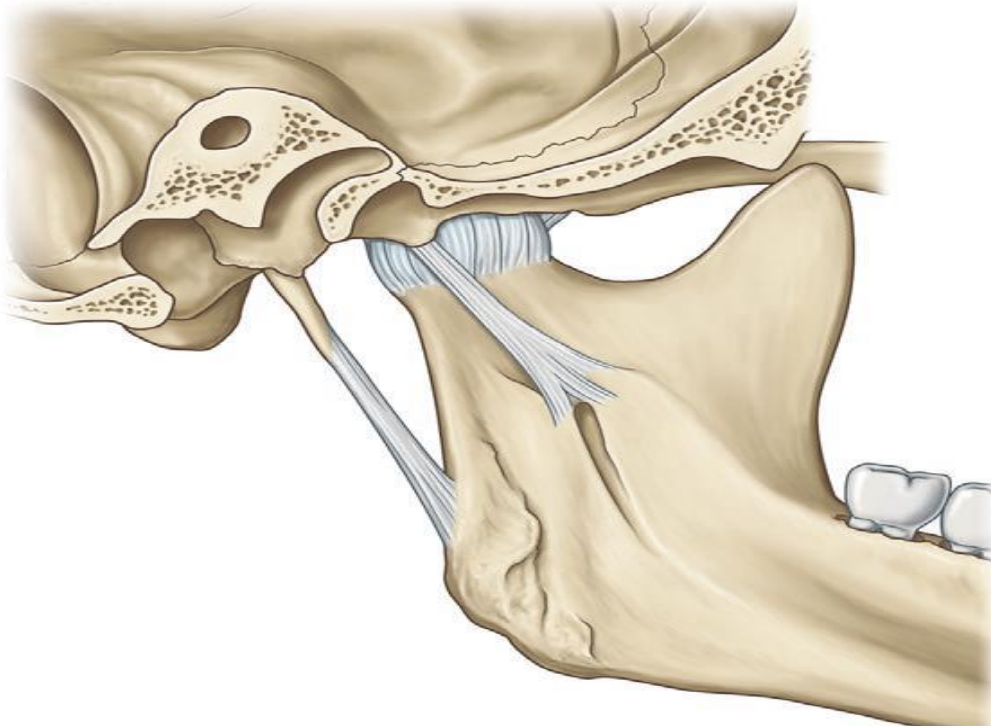
- ★ From the anterior border of styloid process near its tip, to the **angle** of mandible.
- ★ It **separates** the parotid from the submandibular gland.

3. **Spheno-mandibular ligament:**

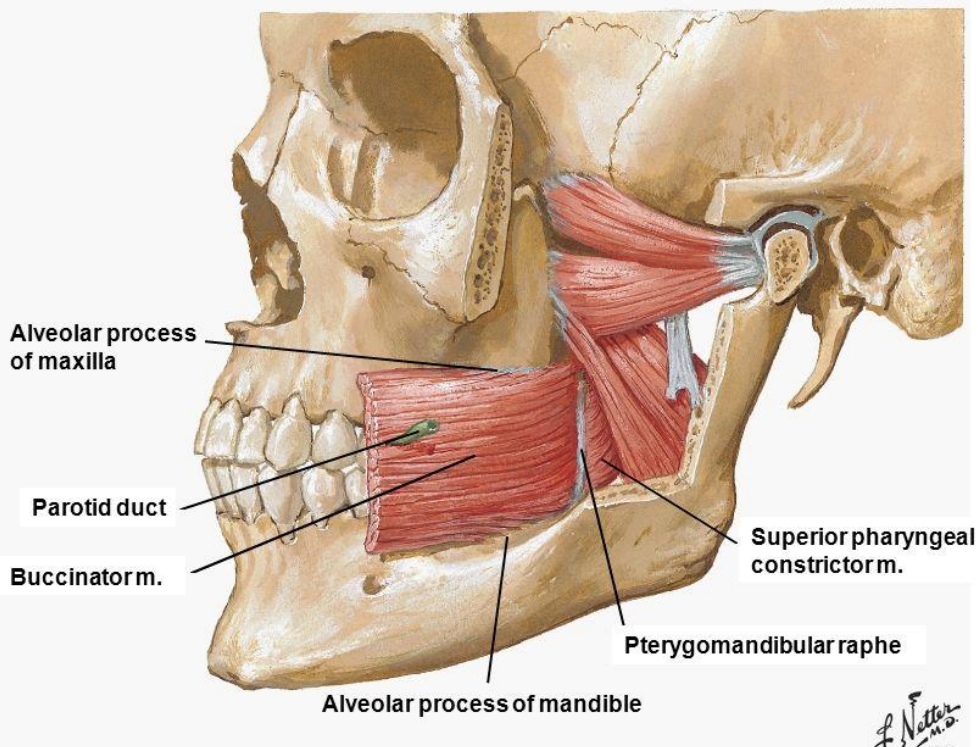
- ★ It extends from spine of sphenoid to **lingula** of mandible.

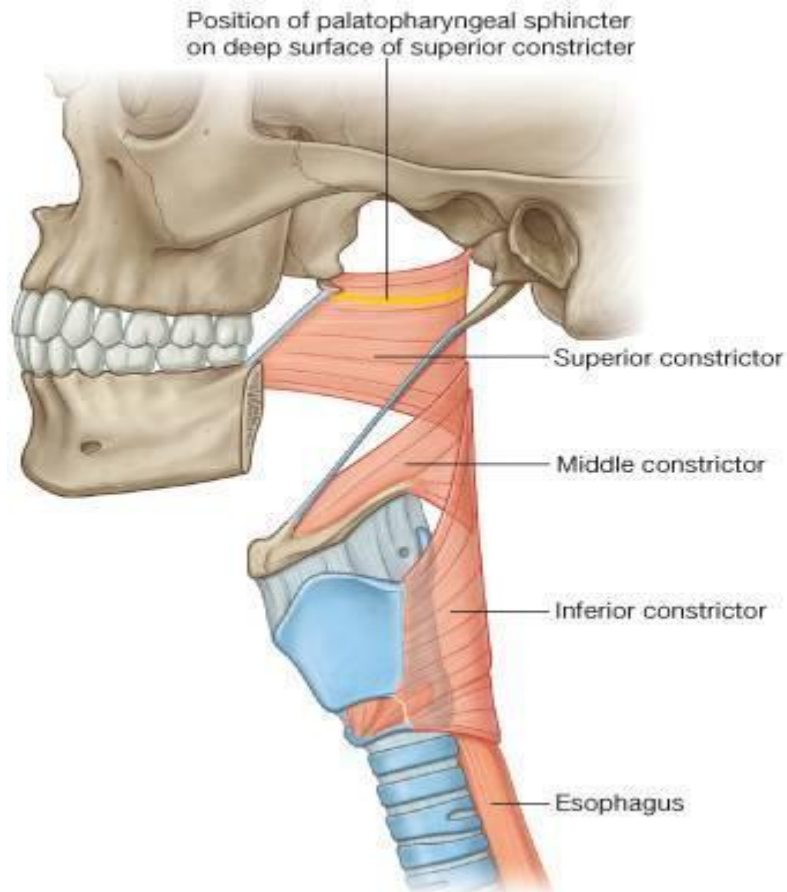
4. **Pterygo-mandibular ligament:**

- ★ From the pterygoid **hamulus** till the posterior end of the **mylohyoid line** of mandible.



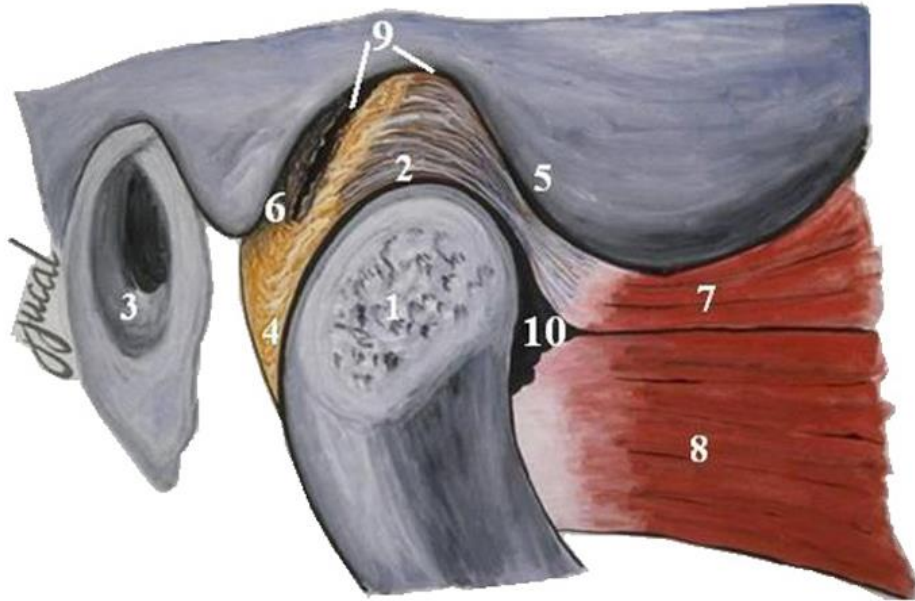
ORIGIN OF BUCCINATOR MUSCLE





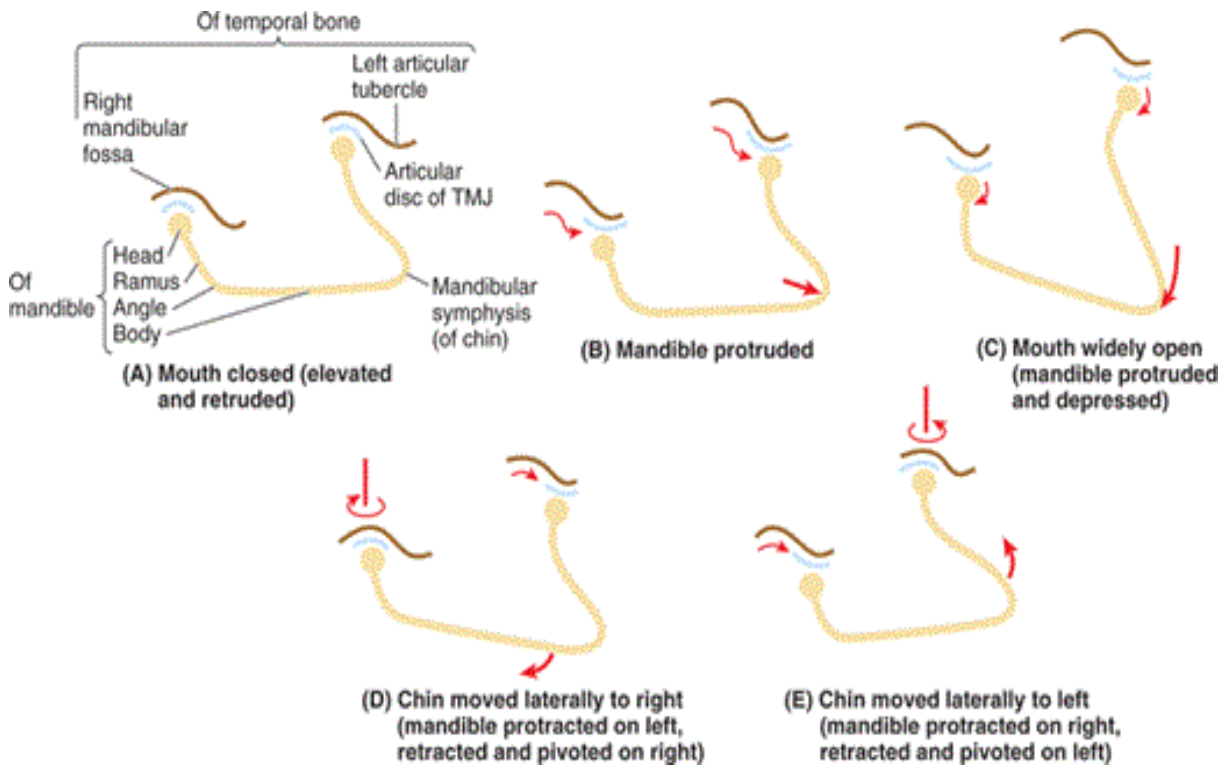
★ **Articular disc:**

- An oval plate of avascular dense fibrocartilage which **separates the joint cavity** into an upper and lower compartments with separate synovial membrane.
- Its **upper** surface is concavo-convex while its **lower** surface is concave.
- Its **periphery** is attached to the fibrous capsule all around and it receives the **insertion** of lateral pterygoid muscle.



Normal Anatomy of the TMJ

<p>1. Condyle</p> <p>2. Articular Disk</p> <p>3. External Auditory Meatus</p> <p>4. Posterior Articular Ligament</p> <p>5. Articular Eminence</p>	<p>6. Retrodiscal Tissue</p> <p>7. Superior Head of Lateral Pterygoid</p> <p>8. Inferior Head of Lateral Pterygoid</p> <p>9. Superior Joint Space</p> <p>10. Inferior Joint Space</p>
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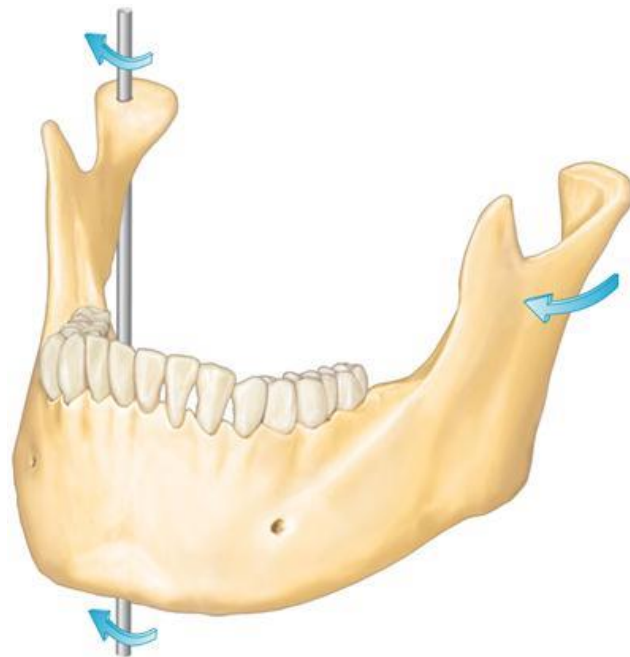
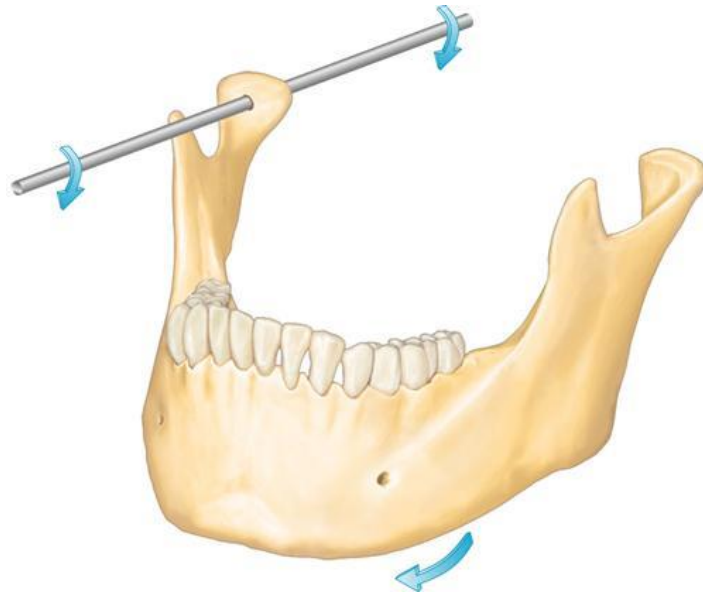
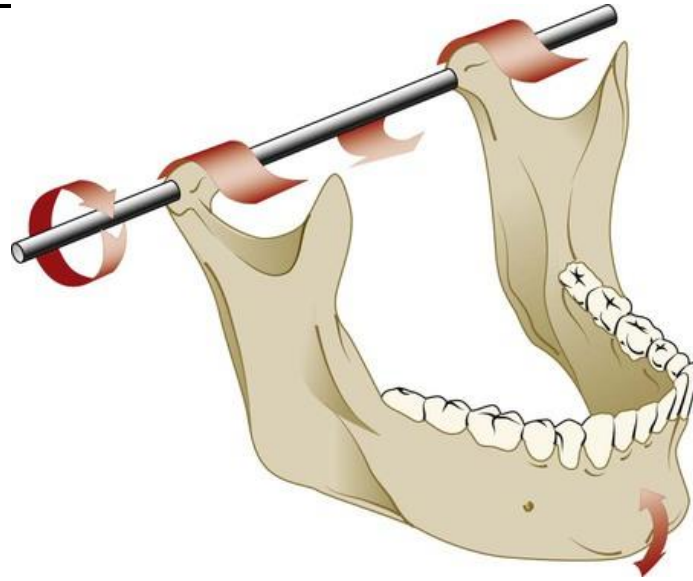


★ Movements of TM joint (mandible):

1. **Depression (opening the mouth):** Consists of **two combined movements; simple hinge** movement of the head (rotating downwards around a horizontal axis) followed by **gliding movement** of the head with the articular disc forwards and downwards to lie below the articular tubercle. Opening the mouth is produced mainly by **lateral pterygoid** muscles **assisted by** gravity. Anterior belly of digastrics, mylohyoid and geniohyoid muscles help lateral pterygoids if the movement occurs against resistance.
2. **Elevation (closing the mouth):** Produced by **reversed** movements to the depression. It occurs by **medial pterygoid, temporalis and masseter** muscles of both sides.
3. **Protraction (forwards movement):** The lower teeth are drawn forwards over the upper teeth by the **lateral and medial pterygoids** of **both sides** and superficial fibers of masseter muscle.
4. **Retraction (backwards movement):** The mandible is drawn backwards to the position of rest by the **posterior fibers of temporalis muscle**.
5. **Side to side movement (for grinding and chewing):** The head rotates (around a vertical axis i.e **pivots**) on the inferior surface of articular disc. Produced by **medial and lateral pterygoid muscles of both sides acting alternately**.

★ Nerve supply: Fine branches from the **auriculo-temporal nerve**.

★ Blood supply: **Maxillary** artery & **Superficial temporal** artery.



Trigeminal Nerve (5th Cranial Nerve)

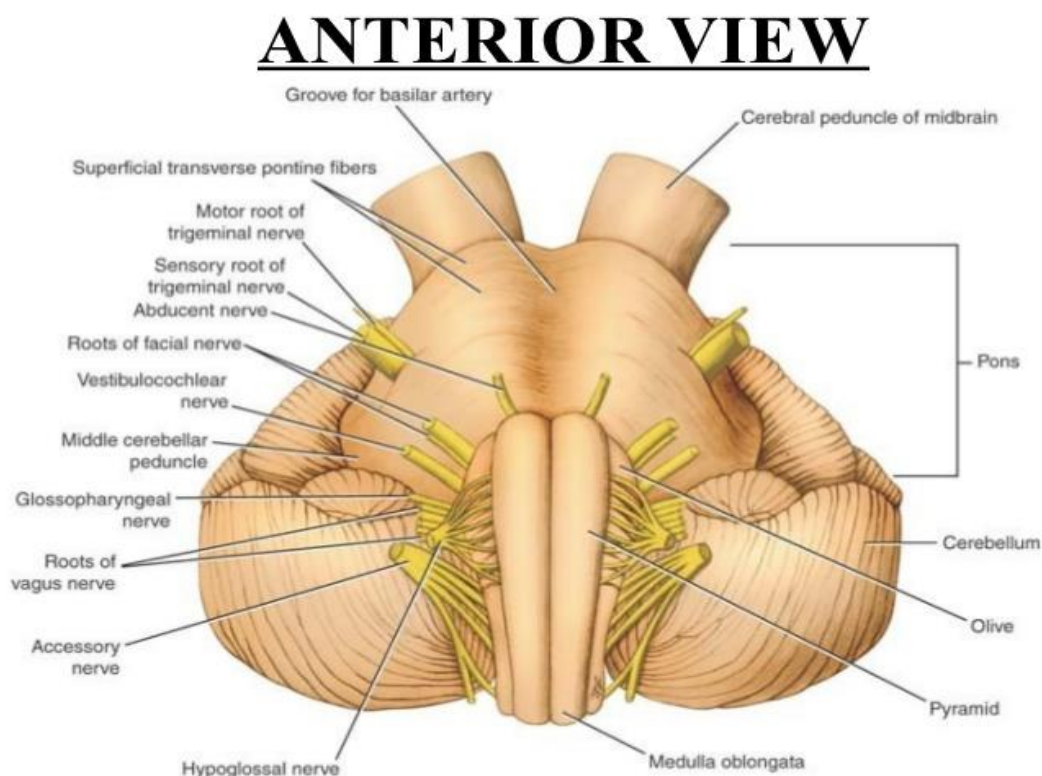
★ It arises from the **pons** by **2 roots** :

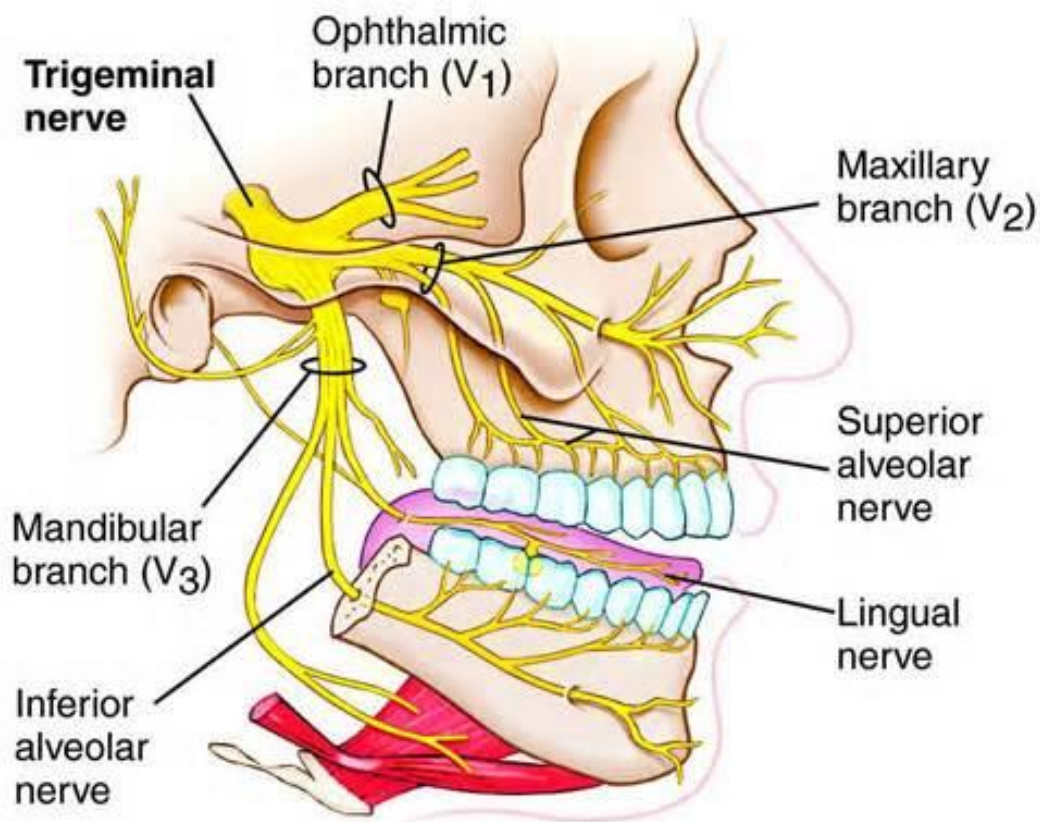
A- Sensory root:

- **The largest** root which has a ganglion called **trigeminal ganglion**, lying in a special depression in the petrous bone.
- The ganglion **gives** into 3 sensory branches supplying the skin of face and anterior part of scalp.
- They are: **ophthalmic, maxillary, and mandibular nerves**.

B- Motor root:

- The **smallest** root which joins the **mandibular nerve**.
- It **supplies 8 muscles**: 4 muscles of mastication, 2 tensor muscles (tensor palati and tensor tympani), and 2 other muscles: mylohyoid and anterior belly of digastric.



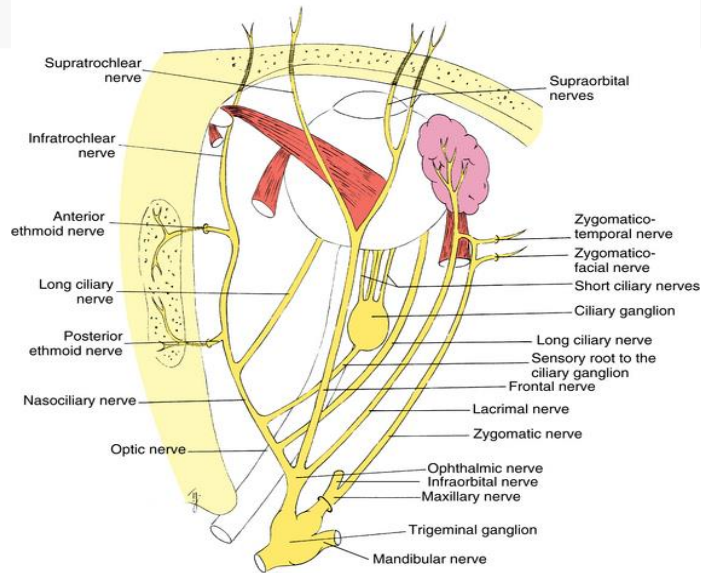
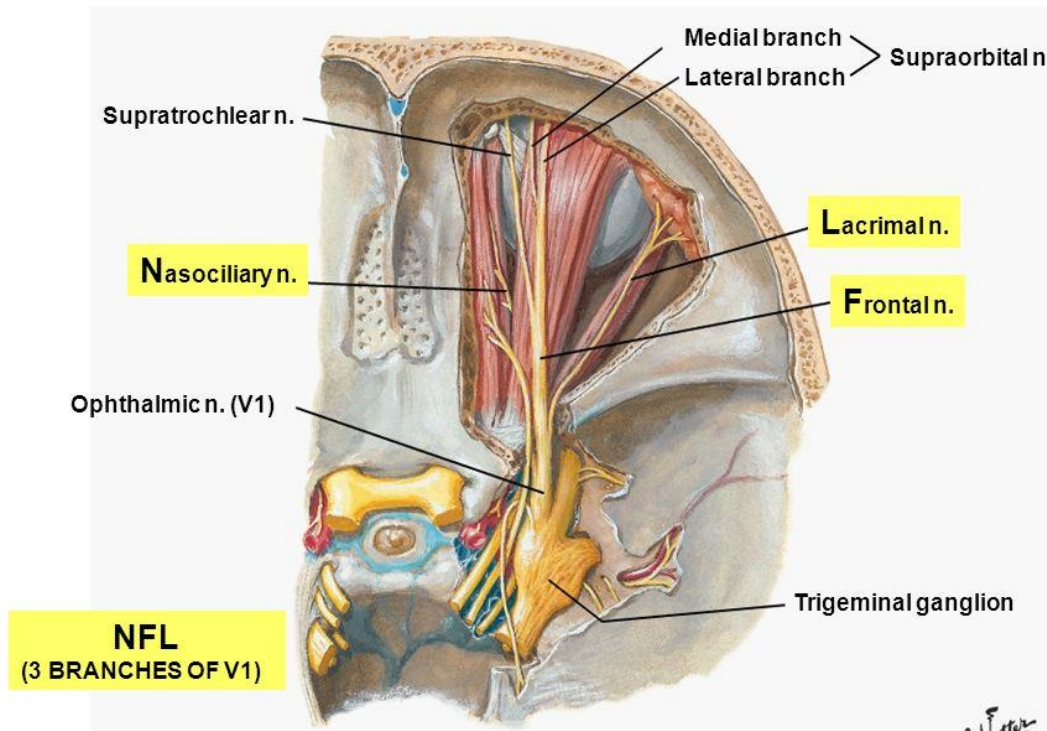


I) Ophthalmic Nerve

- ★ It arises as the **smallest pure sensory** branch of the trigeminal ganglion.
- ★ **Course & branches:** It passes forwards in the lateral wall of **cavernous sinus** and then it **divides before** the superior orbital fissure (**SOF**) into 3 branches, that **enter** the orbit through the SOF. They are:
 1. **Lacrimal nerve:** The **smallest** branch which enters the orbit through the **lateral end of SOF** and supplies:
 - The **lacrimal gland**.
 - Gives palpebral branch to skin of the lateral 1/3 of **upper eye lid**.
 2. **Frontal nerve:** The **largest** branch which enters the orbit through SOF and passes forwards **below** the middle of the **roof** of the **orbit** and divides into 2 terminal branches: **supra-trochlear and supra-orbital** branches which supply the skin of the anterior part of the scalp and upper eye lid.

3. **Nasociliary nerve:** It enters the orbit through the **medial part of SOF**. It **crosses optic** nerve and passes forwards along the **medial wall** of the orbit to give the following branches:
- a- **Anterior and posterior ethmoidal nerves.**
 - b- **Long ciliary nerves** (to the eyeball).
 - c- **Infratrochlear nerve:** Reaches the face and supplies the skin of the medial parts of eyelids and root of nose.
 - d- **Communicating branch to the ciliary ganglion.**

OPHTHALMIC NERVE (V1)



II) Maxillary Nerve

- ★ It **arises from** the trigeminal ganglion as **purely sensory** nerve.
- ★ It is **intermediate** in position and size between ophthalmic and mandibular nerves.
- ★ **Course and branches:** the course of maxillary nerve is divided into 4 parts:

A) Cranial part:

- ★ It passes forwards along in the **lateral wall of cavernous sinus**.
- ★ Then it leaves the skull through **foramen rotundum** to enter the **pterygo-palatine fossa**.
- ★ **Branches: meningeal** branch to dura mater.

B) In pterygo-palatine fossa :

- ★ It passes laterally to reach the back of maxilla and enters the orbit through the **inferior orbital fissure**.

★ Branches:

1-Two ganglionic branches: to **spheno-palatine ganglion**.

2-Posterior superior alveolar nerve:

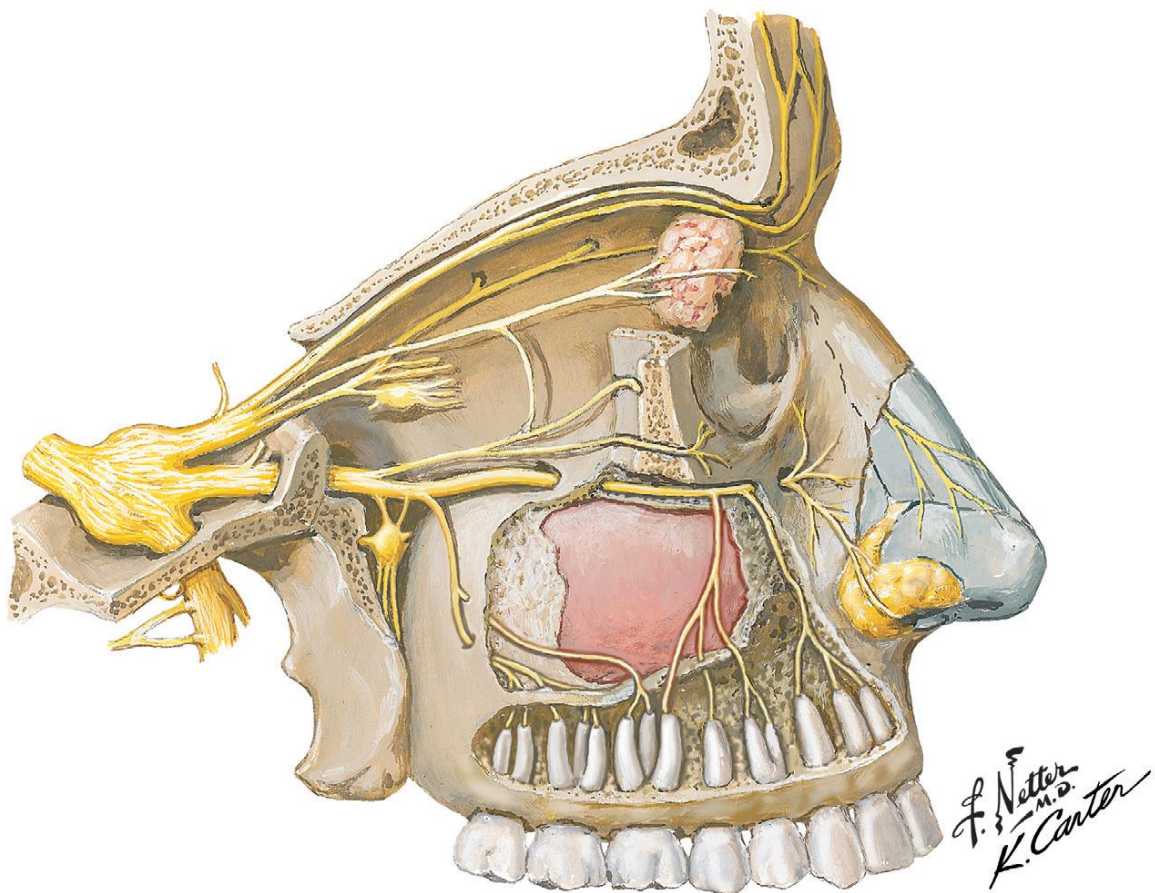
- It passes in **pterygo-maxillary fissure** to enter a **foramen** present in the back of maxilla
- It **supplies** the upper molar teeth, gum and maxillary sinus.

3-Zygomatic nerve:

- It enters the orbit through the inferior orbital fissure and divides into two branches:

a-Zygomatico-temporal nerve: Emerges from zygomatico-temporal foramen to supply the skin of anterior part of temple.

b-Zygomatico-facial nerve: Emerges from zygomatico-facial foramen to supply the skin over the body of zygomatic bone.



C) Floor of orbit:

★ It is now called **infra-orbital nerve**, which passes in the infra-orbital **groove**, infra-orbital **canal** and finally passes through the infra-orbital **foramen** to reach the face.

★ **Branches:**

1-Middle superior alveolar nerve: supply the upper premolars.

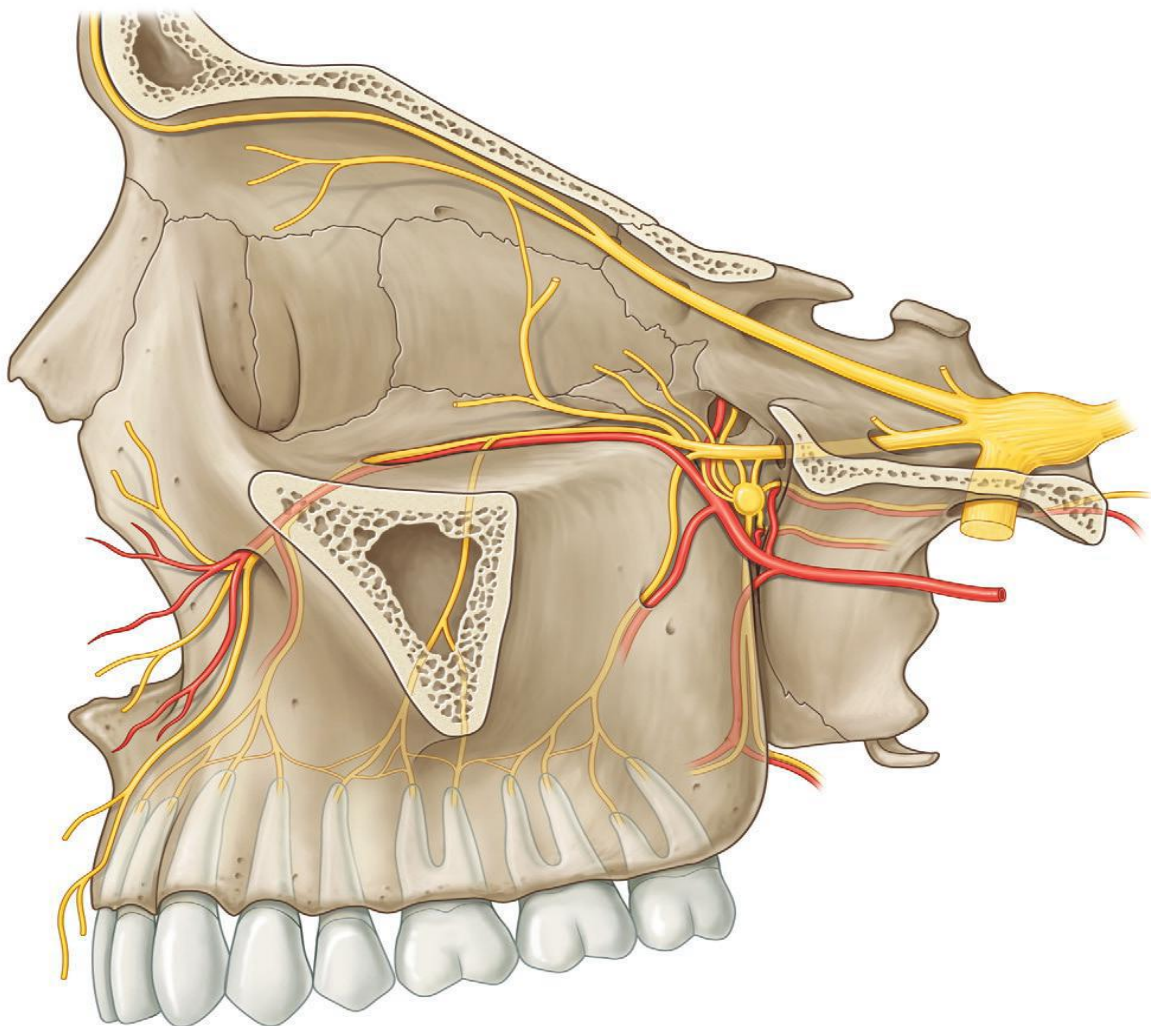
2-Anterior superior alveolar nerve : supply the upper incisors and canine.

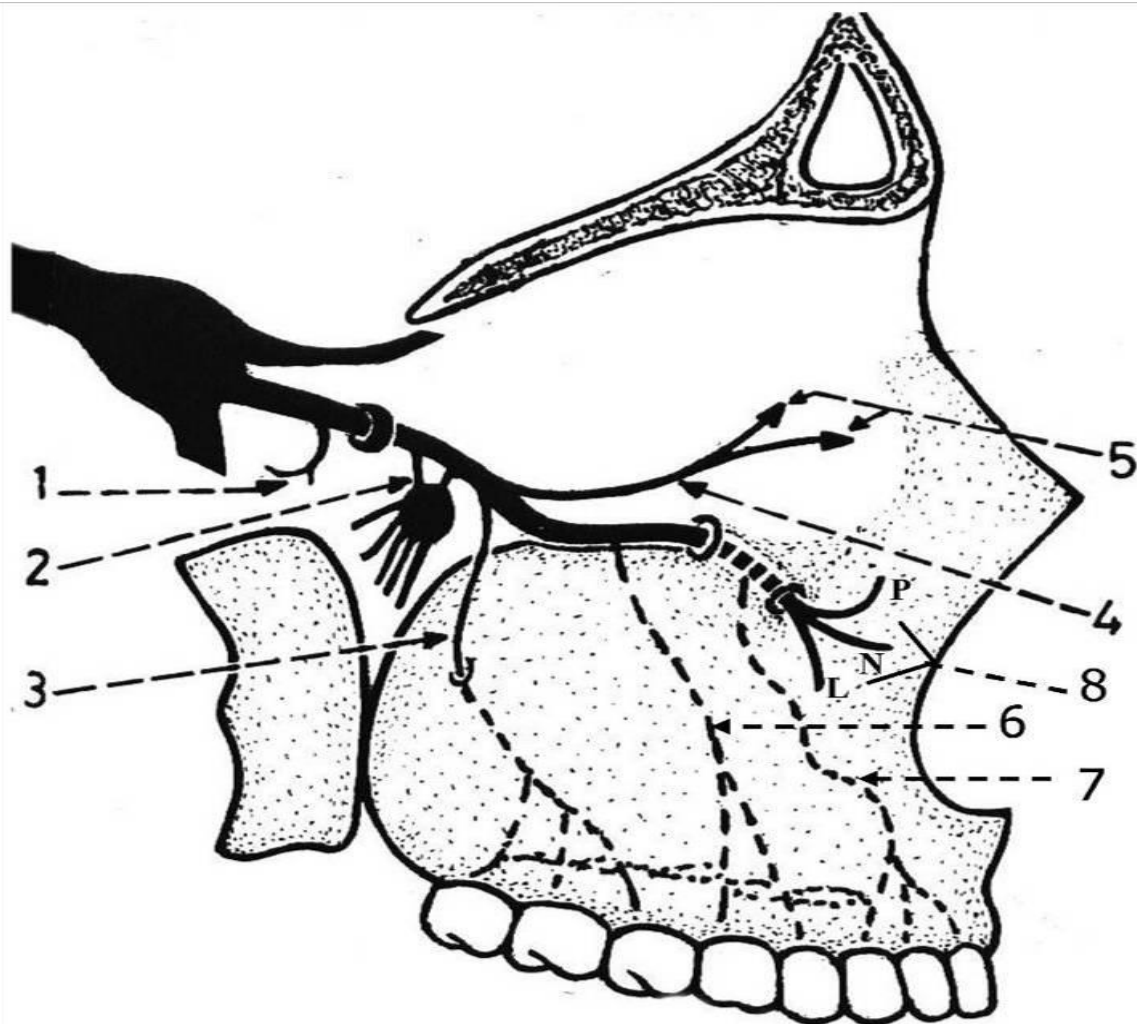
D)In the face : The infra-orbital nerve terminates by dividing into 3 branches:

1-Palpebral: Supplies the skin of lower eyelid.

2-Nasal: Supplies the skin of side of nose.

3-Labial branch: Supplies the skin of upper lip.





Branches of Maxillary Nerve

1. Meningeal branch in the middle cranial fossa.
2. Ganglionic branches for the sphenopalatine ganglion.
3. Posterior superior alveolar nerve.
4. Zygomatic nerve.
(2, 3 and 4 branches arise in the pterygopalatine fossa)
5. Zygomaticofacial and zygomaticotemporal nerves.
6. Middle superior alveolar nerve.
7. Anterior superior alveolar nerve.
(6 and 7 arise in the orbit)
8. Terminal branches present in the face:
P: Palpebral.
N: Nasal.
L: Labial.

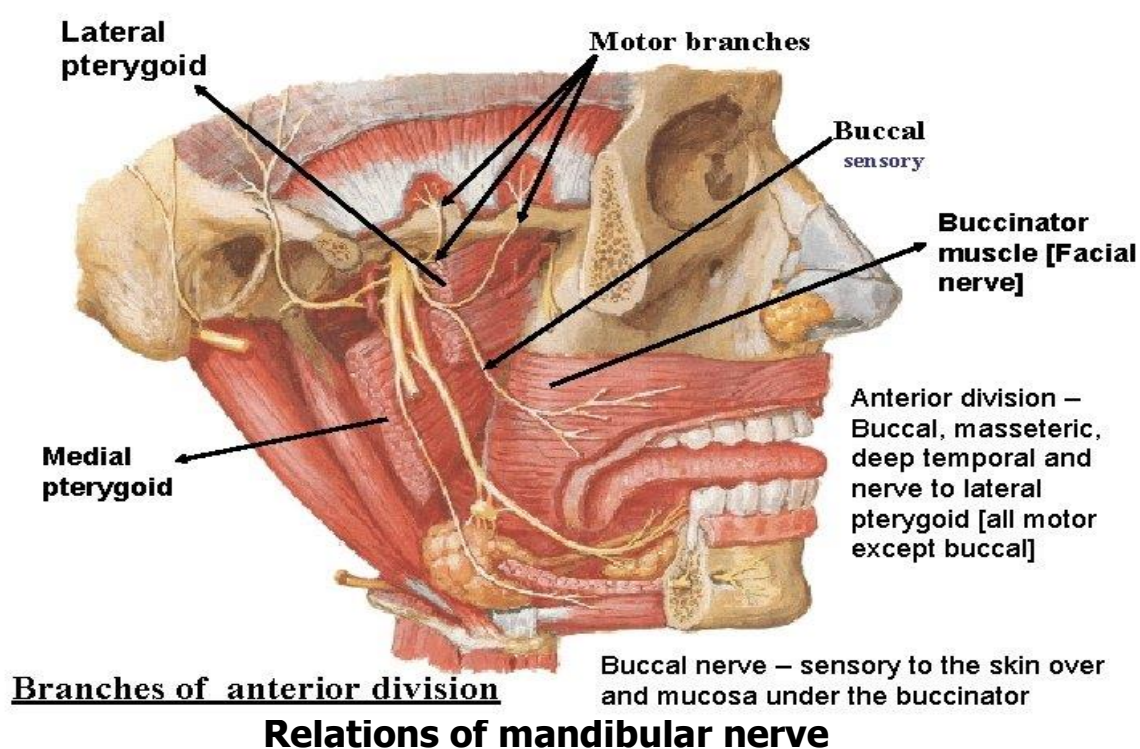
III) Mandibular Nerve

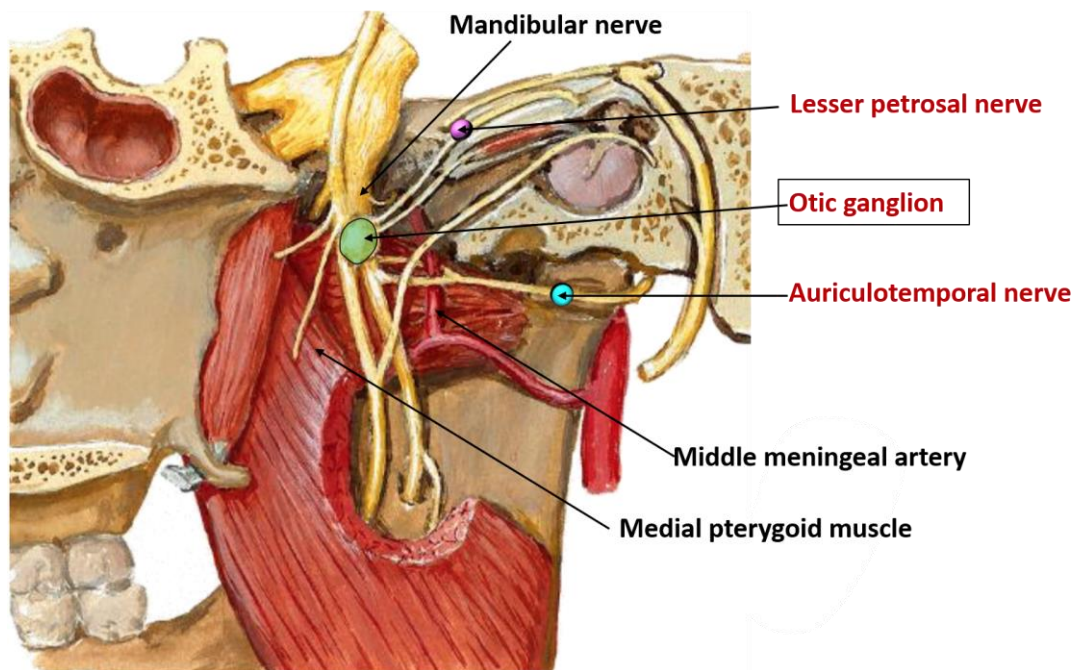
★ **Origin:** It has two roots:

1. **Small motor root:** The motor root of the trigeminal nerve arises from pons.
2. **Large sensory root** arises from the trigeminal **ganglion**.

★ **Course & relations:**

- The two roots leave the skull through the **foramen ovale** where they **unite** together just below the foramen, forming mandibular nerve **trunk** which is **1 cm** long and related to the followings:
 - **Superficial:** Lateral pterygoid muscle.
 - **Deep:** Otic ganglion and tensor palati muscle.
 - **Posterior:** Middle meningeal artery.
- Mandibular nerve trunk **ends** by dividing into small **anterior division** (mainly motor) and large **posterior division** (mainly sensory).





★ **Branches:**

I) From the trunk: (3 motor and 1 sensory branches) (Remember **M**)

a- Motor: nerve to medial pterygoid supply 3 muscles (Medial pterygoid, Tensor palati & Tensor tympani).

b-Sensory: Nervus spinosus passes through **foramen spinosum** to supply dura mater.

II) From the anterior division: (3 motor and 1 sensory branches)

a- Motor branches:

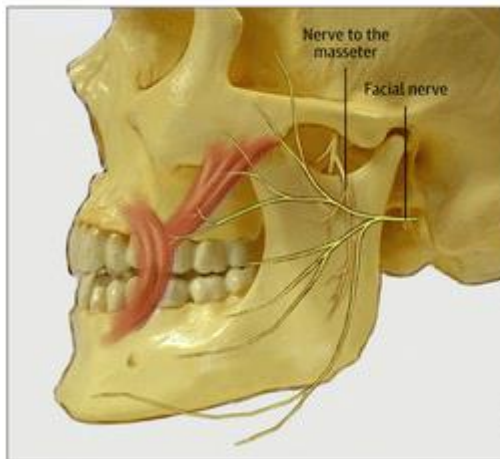
- Deep temporal nerves supply **temporalis** muscle.
- Masseteric nerve, passes through mandibular notch to supply **masseter**.
- Branch for **lateral pterygoid**.

b- Sensory branch:

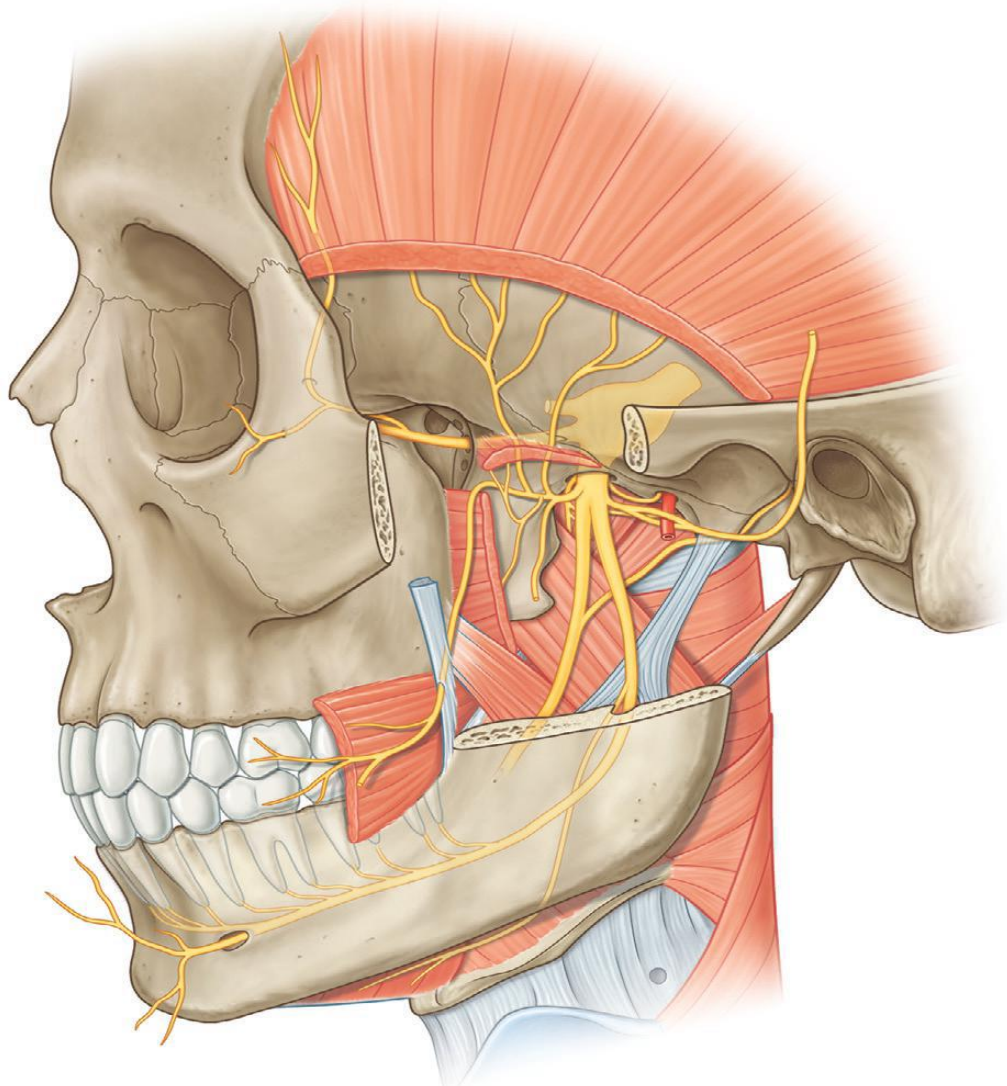
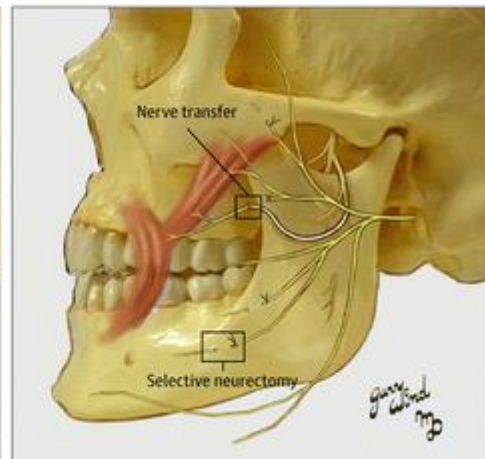
- **Buccal nerve** is the continuation of the anterior division of the mandibular nerve.

- It emerges between the 2 heads of **lateral pterygoid** muscle then descends on its lower head to reach and supply the skin covering and the mucosa lining the **buccinator** muscle.

A Preoperative anatomy



B Postoperative anatomy

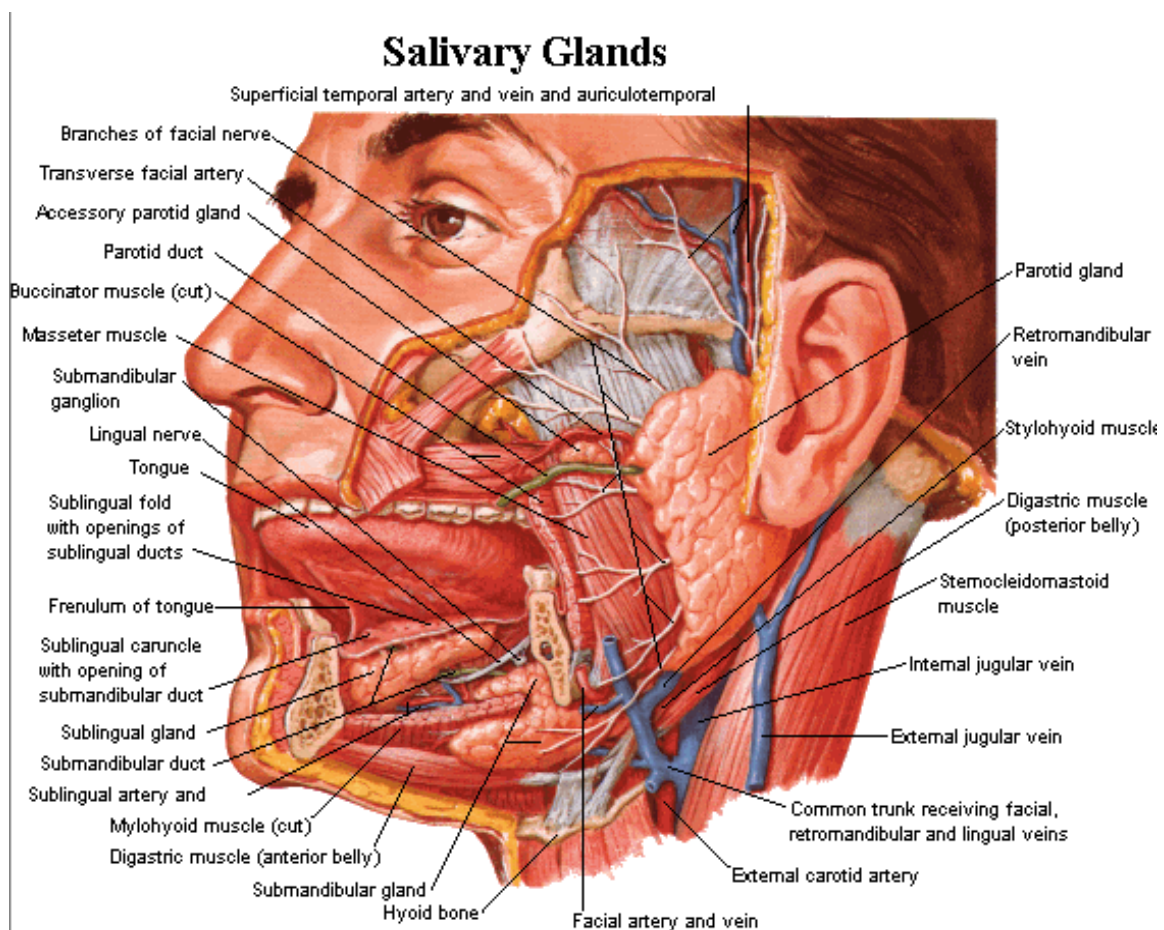


III) From the posterior division: (3 sensory and 1 motor branches)

- * The posterior division gives auriculo-temporal nerve, then it divides into 2 terminal branches which are lingual (smaller) and inferior alveolar nerves.

a) Auriculotemporal nerve:

- ★ It arises by **2 roots around** the middle meningeal artery **deep to lateral pterygoid muscle.**
- ★ It passes **backwards** deep to the **neck of mandible**, then it ascends **behind TM joint** within the upper part of **parotid gland.**
- ★ It leaves the **upper end** of the parotid gland behind the superficial temporal vessels to reach the scalp.



★ **Branches:**

1. **Sensory branches:** To skin of posterior part of temple, lateral surface of auricle, external auditory meatus and ear drum.
2. **Parotid branches:** It receives the postganglionic parasympathetic and sympathetic fibers from **otic ganglion** to the parotid gland.
3. **Articular branches:** To the temporo-mandibular **joint**.

b) Inferior alveolar nerve:

- ★ It arises as the **largest** branch of posterior division of mandibular nerve **deep to** lateral pterygoid muscles.
- ★ It passes vertically downwards **on medial pterygoid** muscle, **posterior** to the **lingual nerve**.
- ★ It enters the mandibular **foramen** & runs in the mandibular **canal**.
- ★ It **ends** by dividing at the **mental foramen** into mental and incisive branches.

★ **Branches:**

- a- **Nerve to mylohyoid:** (only motor branch from posterior division) runs in mylohyoid groove and supplies the mylohyoid and anterior belly of digastric muscles.
- b- **Dental branches:** supply the **lower teeth**, gums, and alveolar bone.
- c- **Mental nerve:** It comes out from the mental foramen to supply the skin of **chin and lower lip**.

c) Lingual nerve:

★ It is the **smaller of the 2 terminal** branches of posterior division of mandibular nerve.

★ **The course** of lingual nerve is divided into 3 parts:

1- Deep to the ramus of mandible:

- Near its origin it is **joined by chorda tympani** deep to **lateral pterygoid** muscle and is distributed with its branches.
- It **emerges** from under cover of **lateral pterygoid** muscle to lie on the **medial pterygoid** muscle in front of **inferior alveolar** nerve.

2- Deep to the body of mandible:

- It passes in a **faint groove** below socket of the **last molar tooth**, covered with mucous membrane of mouth (liable for **injury**).

3- At the side of the tongue:

- It crosses **styloglossus** and upper part of **hyoglossus muscles** deep to superficial part of **submandibular salivary gland & above hypoglossal nerve**.
- Then, it passes between **mylohyoid** (superficial) and **hyoglossus** (deep) with the submandibular **ganglion**, deep part of **submandibular gland and hypoglossal** nerve below the lingual nerve.

4- Finally, it passes superficial to **genioglossus** where it hooks around the submandibular **duct (triple relation** i.e lateral, below then medial), deep to **sublingual gland** to reach the tongue.

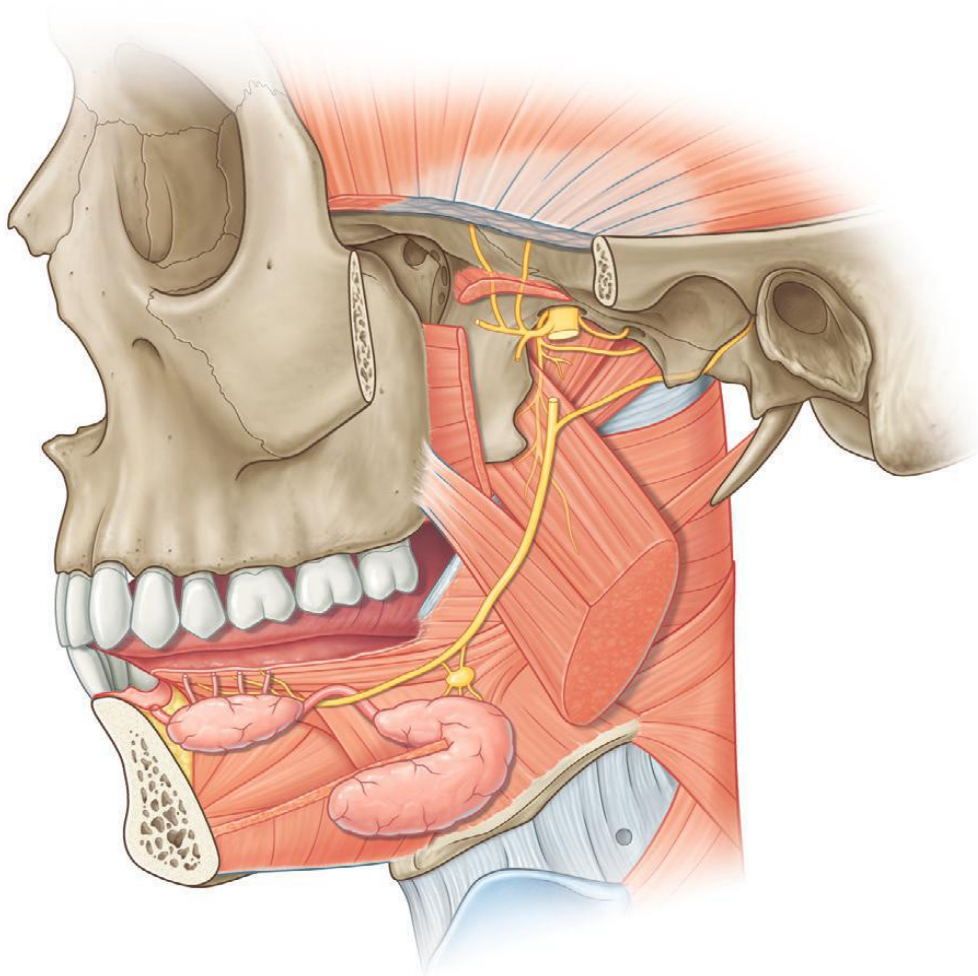
★ **Branches of lingual nerve and chorda tympani:**

a- **Lingual nerve receives general sensation** from the anterior 2/3 of tongue, mucosa of the floor of the mouth and gums and from submandibular and sublingual glands.

b- **Chorda tympani supply the followings:**

- **Taste sensation** of anterior 2/3 of tongue.
- **Parasympathetic fibers:** They relay in the submandibular ganglion and the postganglionic fibers supply submandibular and sublingual glands.

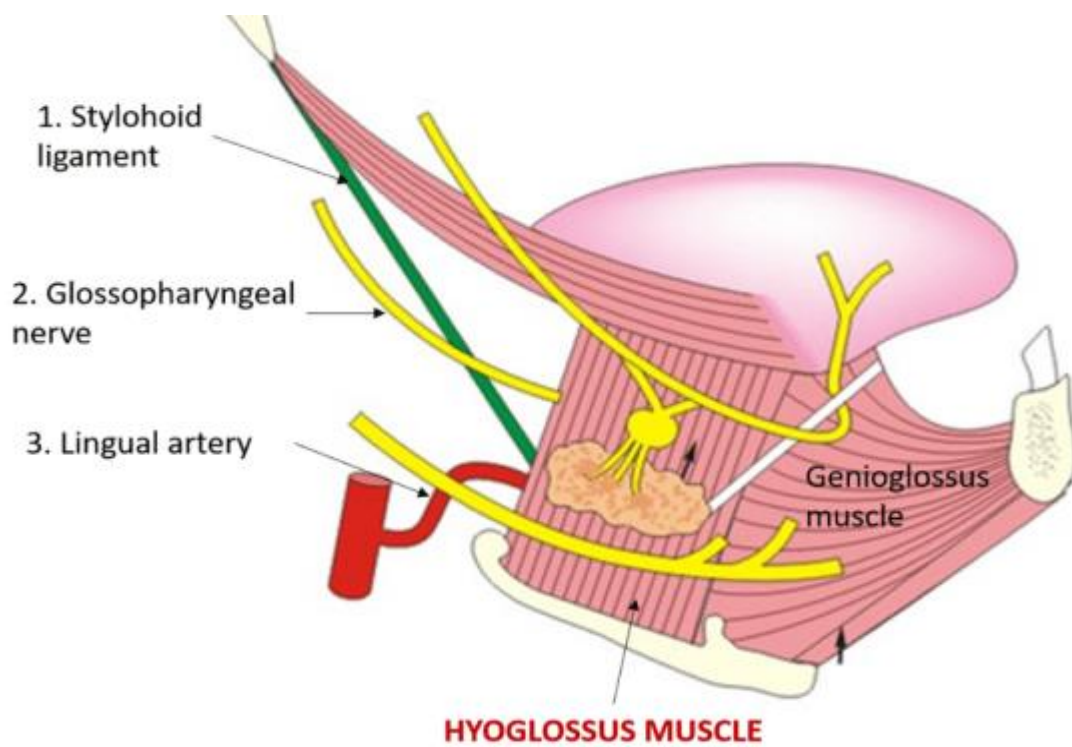
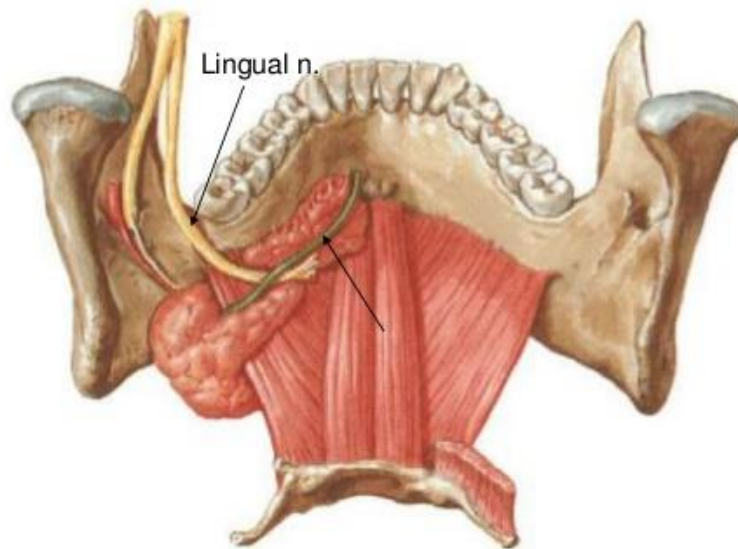
Relations of lingual nerve

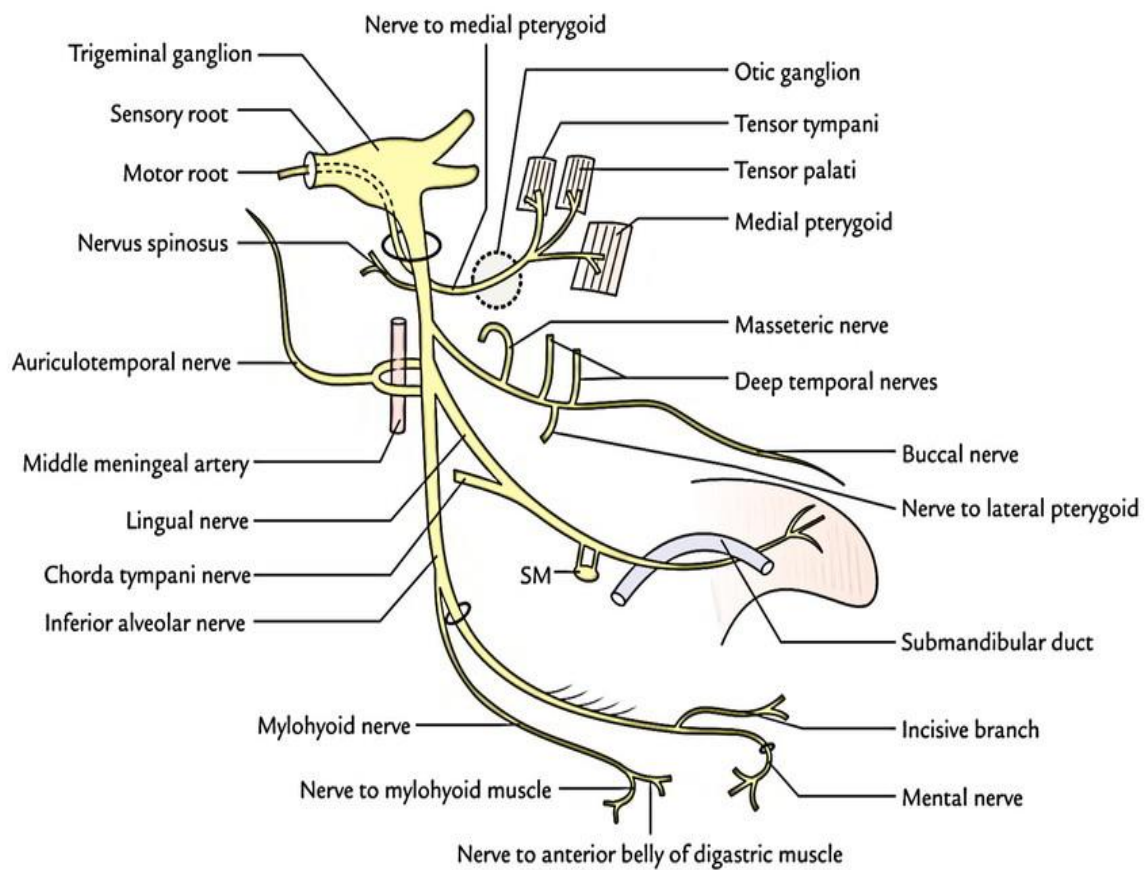
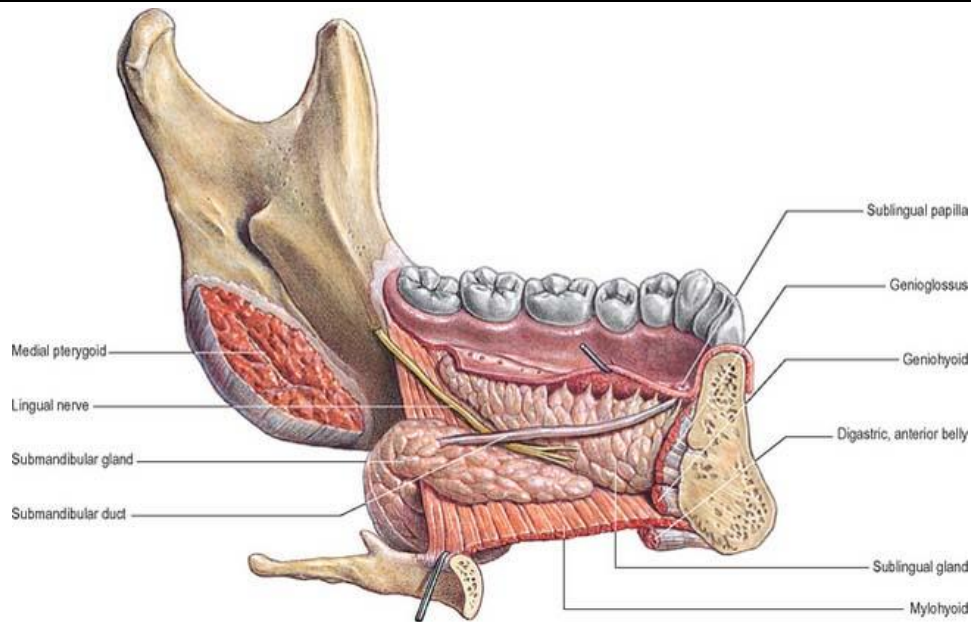


Submandibular Duct

5cm long

Triple relations with the lingual nerve

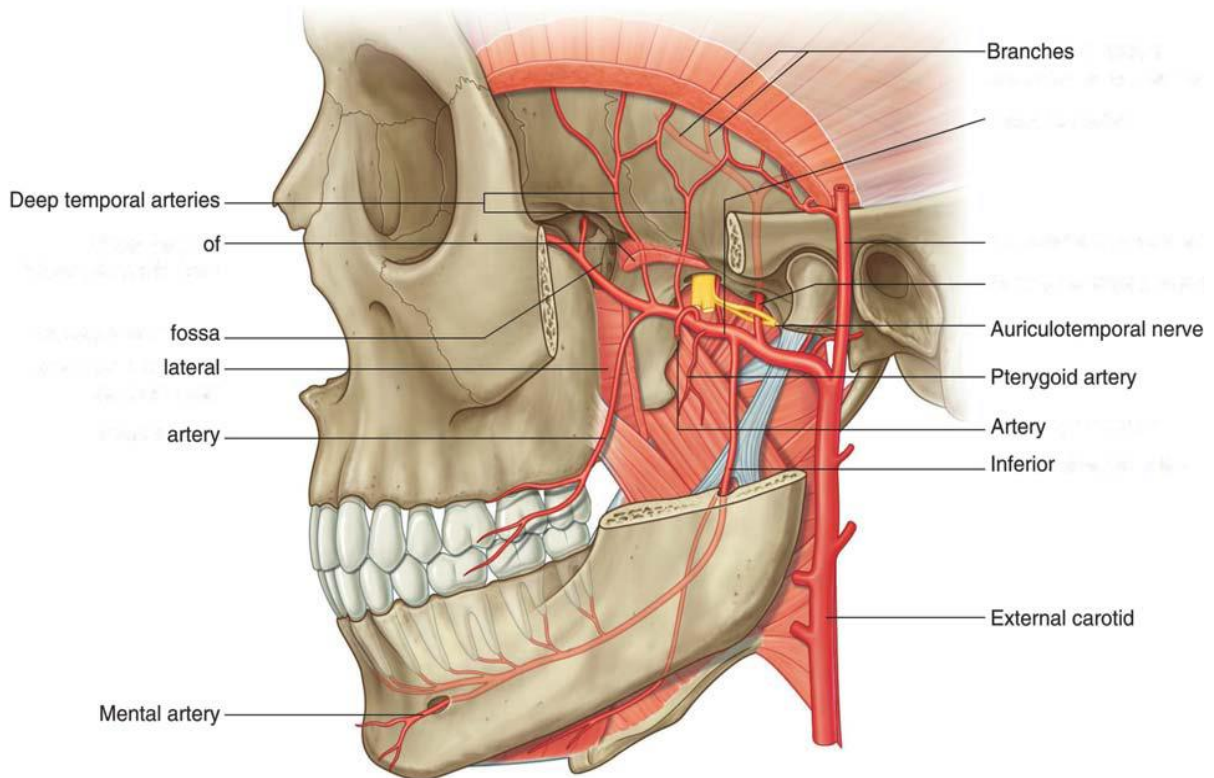
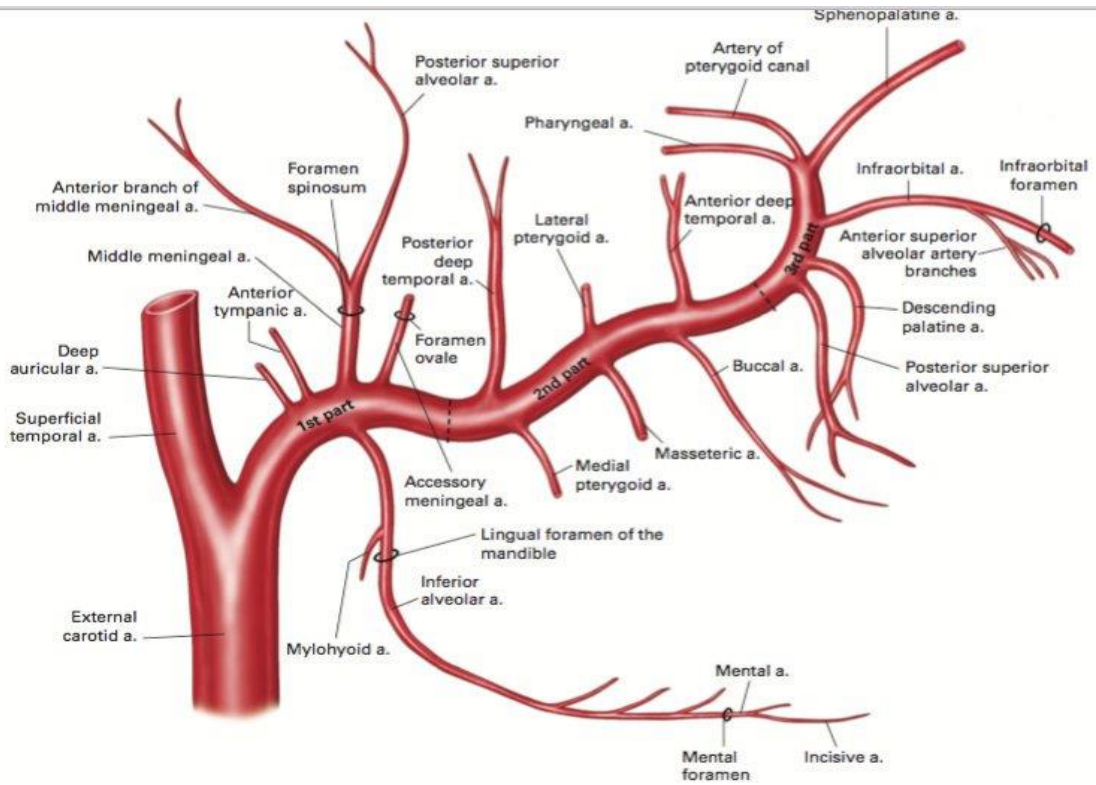




Summary of branches of mandibular nerve

Maxillary Artery

- ★ It **begins behind the neck** of the mandible, inside the parotid gland, as one of the larger of terminal branches of **external carotid artery**.
- ★ **Termination:** It passes forwards to reach the **pterygo-palatine fossa** where it ends by dividing into **many branches**.
- ★ It has **3 parts**:
 - 1) **1st part:**
 - It lies within **parotid** gland.
 - It passes horizontal from its **origin to the lower border** of lateral pterygoid muscle.
 - It lies **deep to the neck** of mandible and superficial to the **sphenomandibular ligament**.
 - 2) **2nd part:** It passes upwards & forwards superficial or deep to the **lateral pterygoid muscle**.
 - 3) **3rd part:** It passes through the pterygo-maxillary fissure to reach and end in the **pterygo-palatine fossa**.
- ★ **Branches:**
 - I) **Branches of 1st part:**(Remember **MAIDA**)
 1. **Middle meningeal artery (most important).**
 2. **Accessory meningeal artery:** It enters the foramen ovale to reach the middle cranial fossa where it supplies the trigeminal ganglion and the dura mater.
 3. **Inferior alveolar artery:** It descends with its nerve (follow the same course & gives braches carry the same names).
 4. **Deep auricular artery:** Supplies the external auditory meatus and ear drum.
 5. **Anterior tympanic artery:** Enters petro-tympanic fissure to reach the middle ear to supply the tympanic membrane.
 - II) **Branches of the 2nd part:**
 1. **Muscular** branches for the muscles of mastication.
 2. **Buccal** artery which accompanies the buccal nerve to reach the face.



★ **Branches of the 3rd part:**(2 anterior, 2 posterior & 2 inferior)

1. **Greater palatine artery:**

- It descends in greater palatine **canal & foramen** to reach the hard palate.
- It passes forwards **close to the alveolar margin** with its nerve to supply the hard palate.
- It ascends in the **incisive canal** to reach and supply the **nasal septum**.
- It gives 2 **lesser palatine** arteries for the **soft palate** and **palatine tonsils**.

2. **Posterior superior alveolar artery: Passes with the corresponding nerve** to supply the upper molars and maxillary sinuses.

3. **Spheno-palatine artery:** It passes through spheno-palatine foramen to enter the nasal cavity supplying it.

4. **Infra orbital artery:**

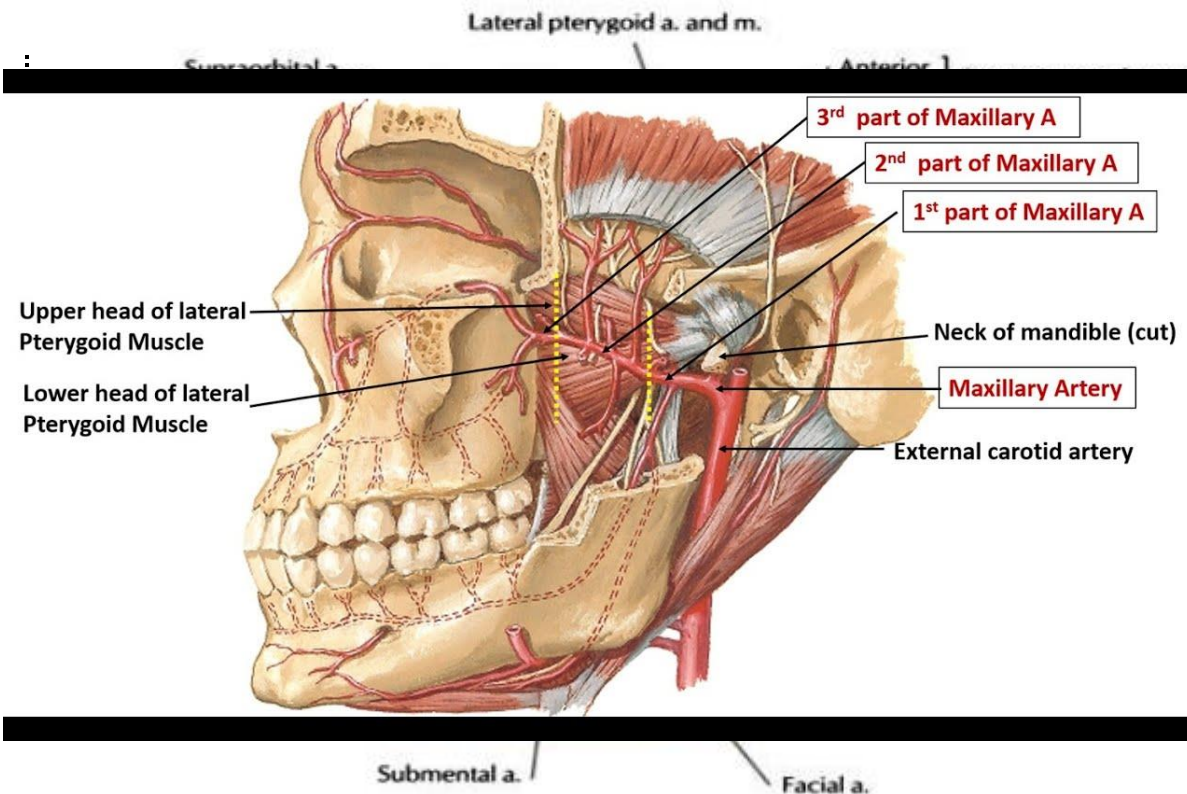
- It enters the orbit through the inferior orbital **fissure**, traverses the infra-orbital **groove** and **canal**.
- It emerges from the infra-orbital **foramen** to reach the face where it divides into **3 branches:** palpebral, nasal and labial.

5. In infra-orbital canal it gives **middle superior alveolar** supplying **premolars and anterior superior alveolar** artery supplying the incisors & canine teeth.

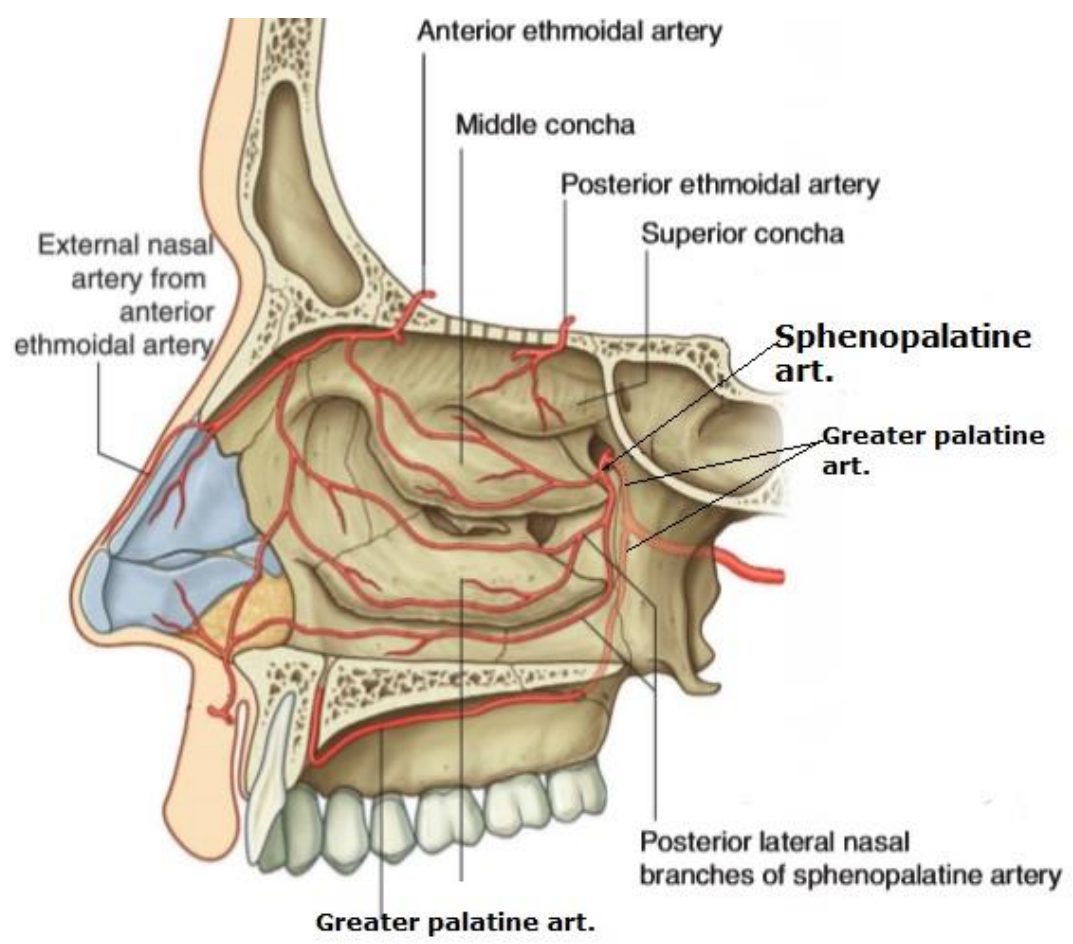
6. **Pharyngeal artery:** Passes through **palato-vaginal** canal to supply **nasopharynx**.

7. **Artery of pterygoid canal:** Passes through pterygoid canal to supply **nasopharynx**.

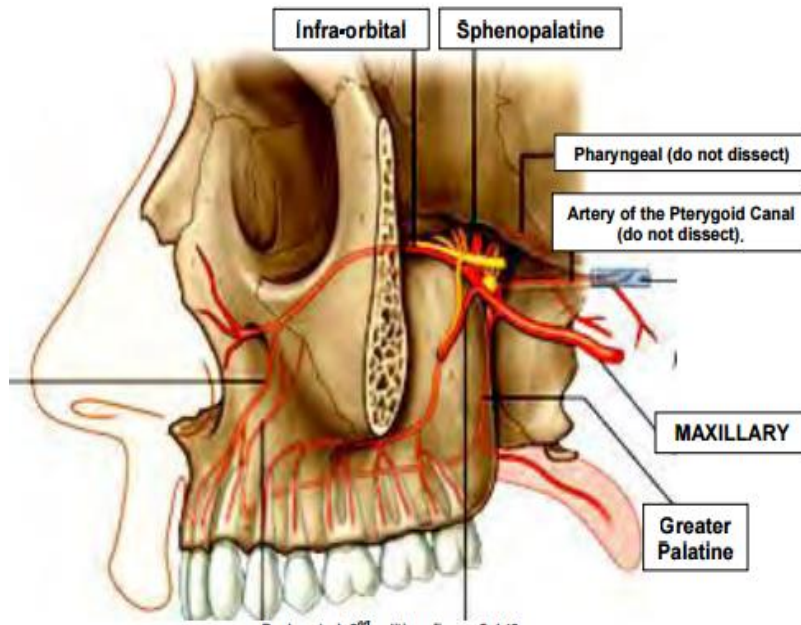
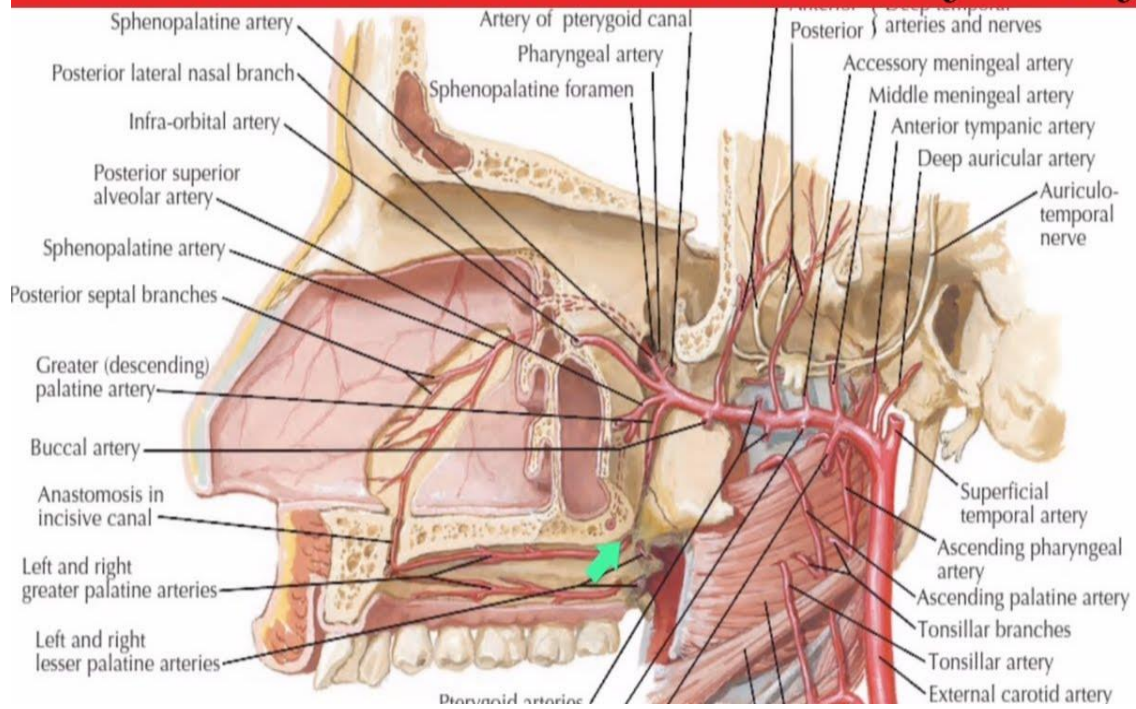
MAXILLARY ARTERY COURSE & BRANCHES IN INFRATEMPORAL FOSSA



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and n.
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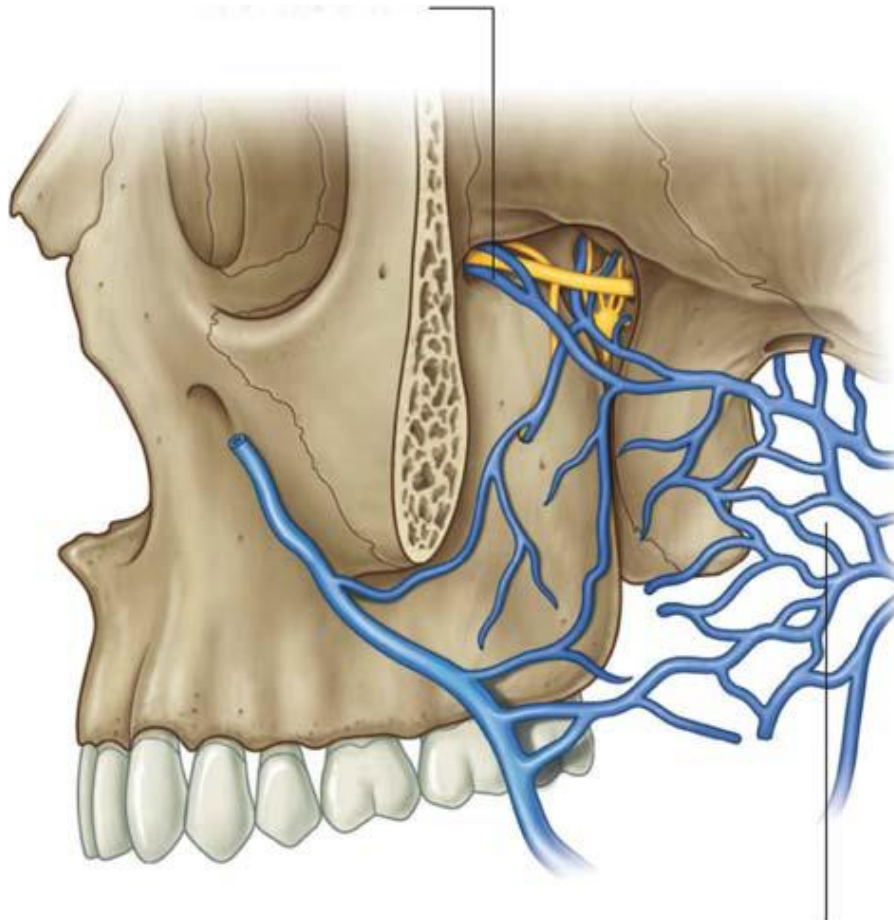
Branches from Third Part Of Maxillary Artery



Branches of the 3rd part of maxillary artery

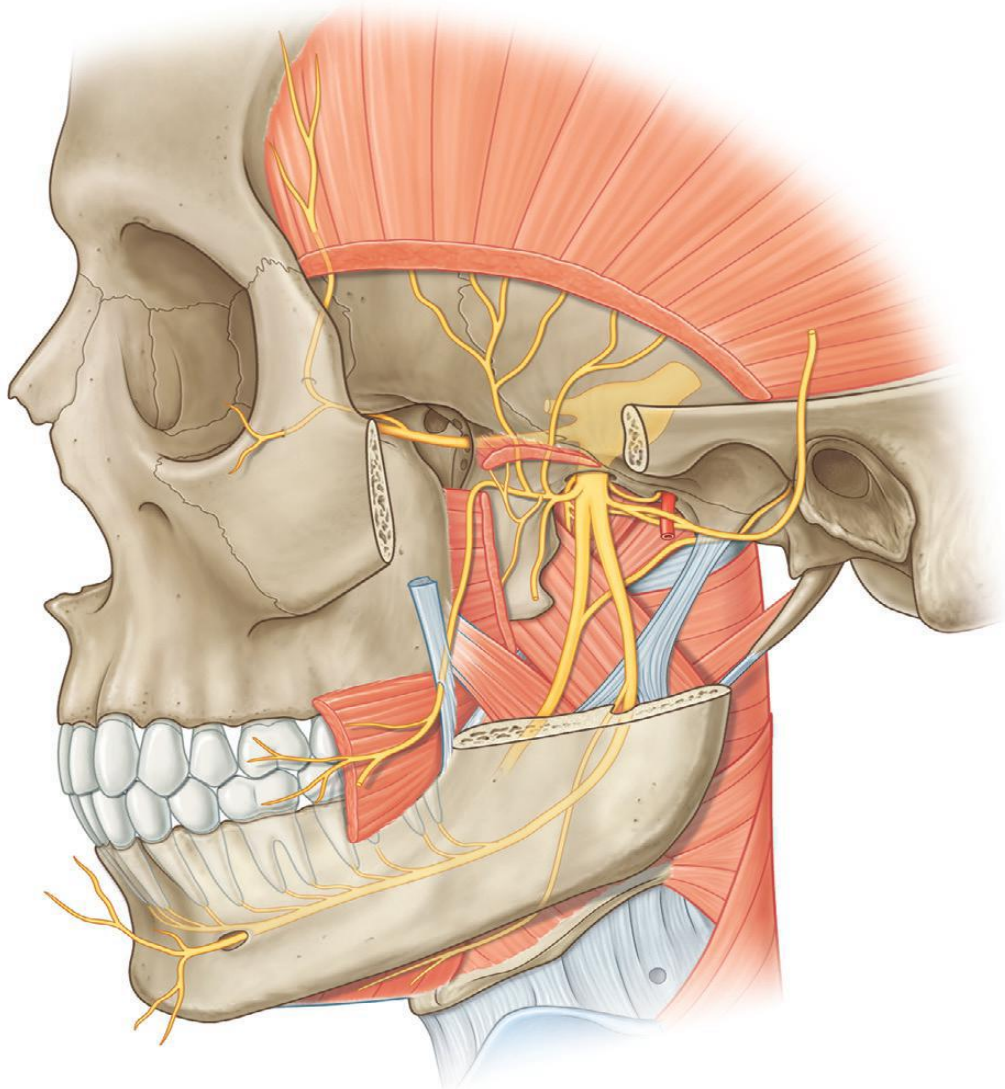
Pterygoid Venous Plexus

- ★ It is a rich plexus of veins, lying **superficial and deep to the lateral pterygoid muscle**.
- ★ It receives the **veins corresponding** to the branches of the **maxillary artery**.
- ★ It **ends** posteriorly by forming **maxillary vein** which passes backwards through the **parotid gland** to join the **superficial temporal vein** forming the **retromandibular vein**.
- ★ **Communications:**
 1. **In front:** It communicates with **anterior facial vein** by deep facial vein (**dangerous area** of face).
 2. **Above:** It communicates with **cavernous sinus** by emissary vein passing through the foramen **ovale**.
 3. **In front and above:** It communicates with **inferior ophthalmic vein** by a vein that passes through the **inferior orbital fissure**.



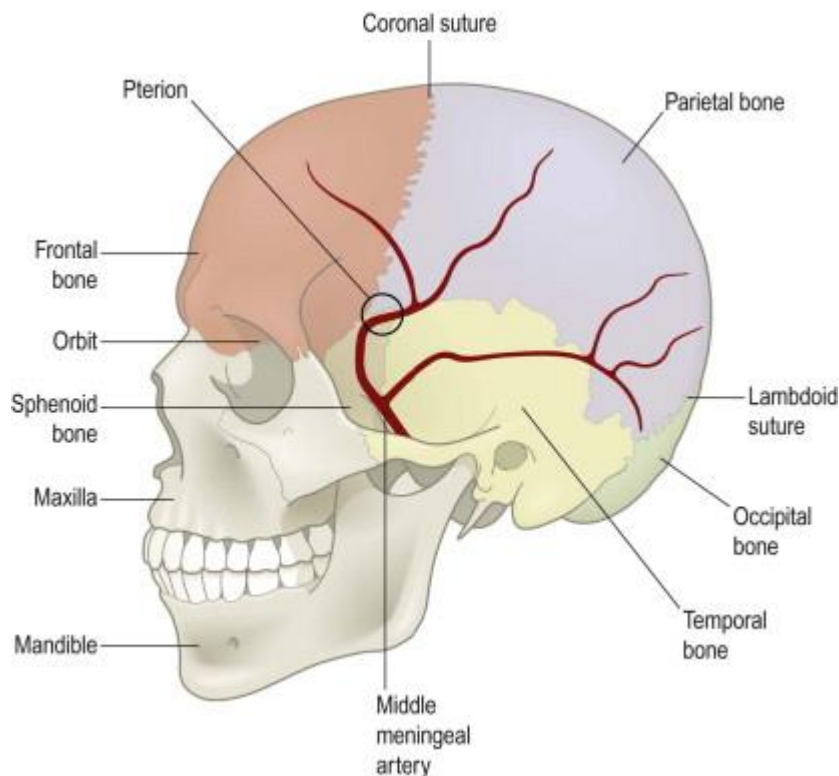
Middle Meningeal Artery

- ★ It **arises** as a branch from the **1st part of maxillary** artery.
- ★ **Course & termination:**
 - It runs upwards deep to lateral pterygoid muscle surrounded by the two roots of auriculo-temporal nerve.
 - It ascends behind the trunk of mandibular nerve, then passes through foramen spinosum to reach the middle cranial fossa.
 - It runs forwards and laterally in a groove on the floor of middle cranial fossa for short course where it divides into two terminal branches: anterior and posterior.



★ **Surface anatomy:**

- **The main trunk:** draw a 2 cm line directed upwards and forwards from a point at the middle of zygomatic arch.
- Then it divides into 2 separate lines representing the 2 branches of the artery:
 - 1) Anterior branch:** A pass upwards and forwards to pass in a bony canal at the pterion.
 - **Surface anatomy:** 4 cm above the middle of the zygomatic arch & 4 cm behind the fronto-zygomatic suture.
 - 2) Posterior branch:** A line drawn backwards and upwards towards the lambda.
 - **Surface anatomy:** 4 cm above the base of mastoid process.



★ **Branches:** All the branches arise inside the cranial cavity. They are:

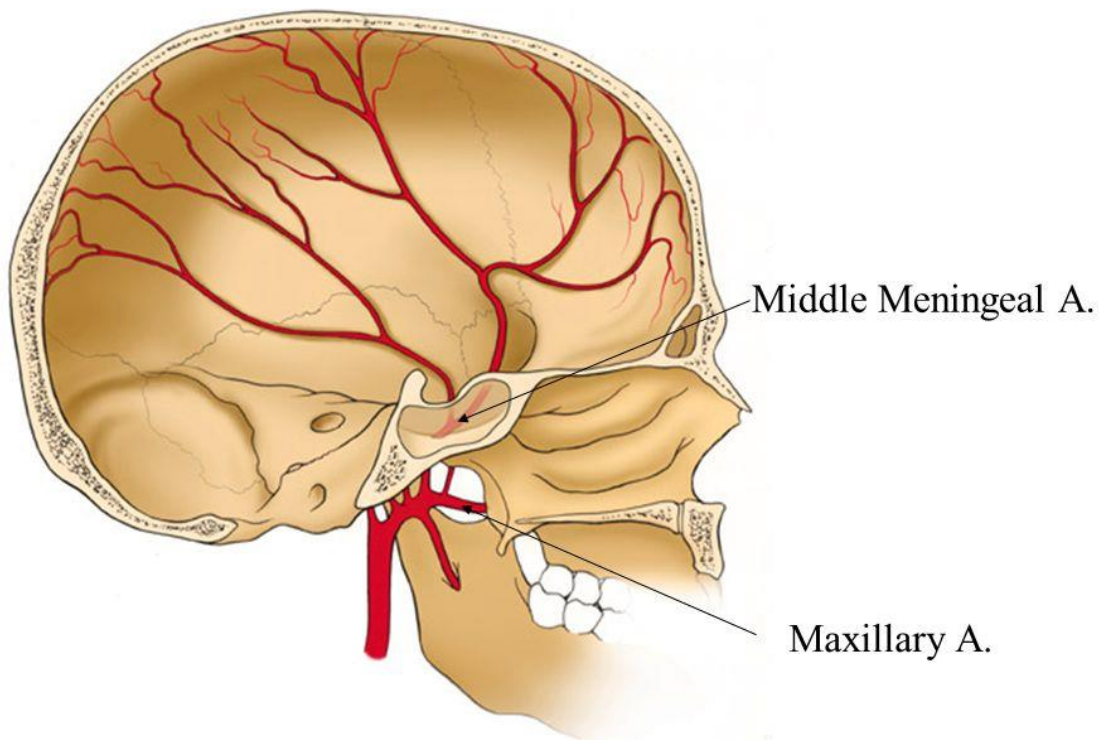
- 1) Meningeal branches for the dura mater.
- 2) Small branches to the bones of skull and the covering periosteum.
- 3) Branches to trigeminal ganglion and its roots.

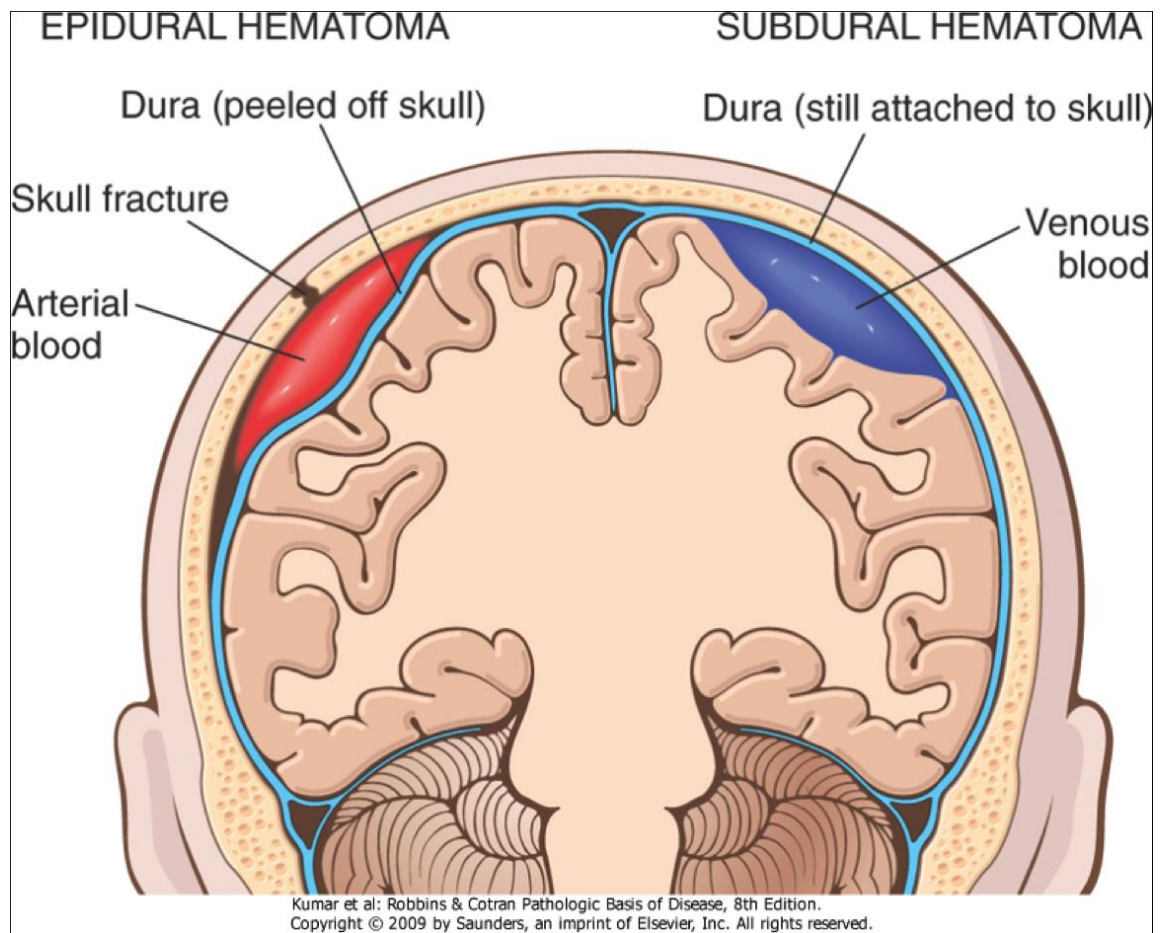
- 4) Petrosal branch: It enters the tympanic cavity via the hiatus for the greater petrosal nerve and supplies the facial nerve, geniculate ganglion and the tympanic cavity.
- 5) Superior tympanic artery it enters the tympanic cavity via the canal for tensor tympani supplying the muscle and the membrane lining its canal and tympanic cavity.
- 6) Orbital branch enters the lateral part of the superior orbital fissure to supply the orbit, and anastomoses with the recurrent branch of the lacrimal artery.

★ **Applied Anatomy:**

- The middle meningeal artery may be torn in temporal fractures or by injuries separating the dura mater from the bone, followed by haemorrhage between them (**extradural hemorrhage**).
- Trephining may be necessary to reduce cerebral compression.

Middle Meningeal Artery





Extradural and subdural haemorrhage