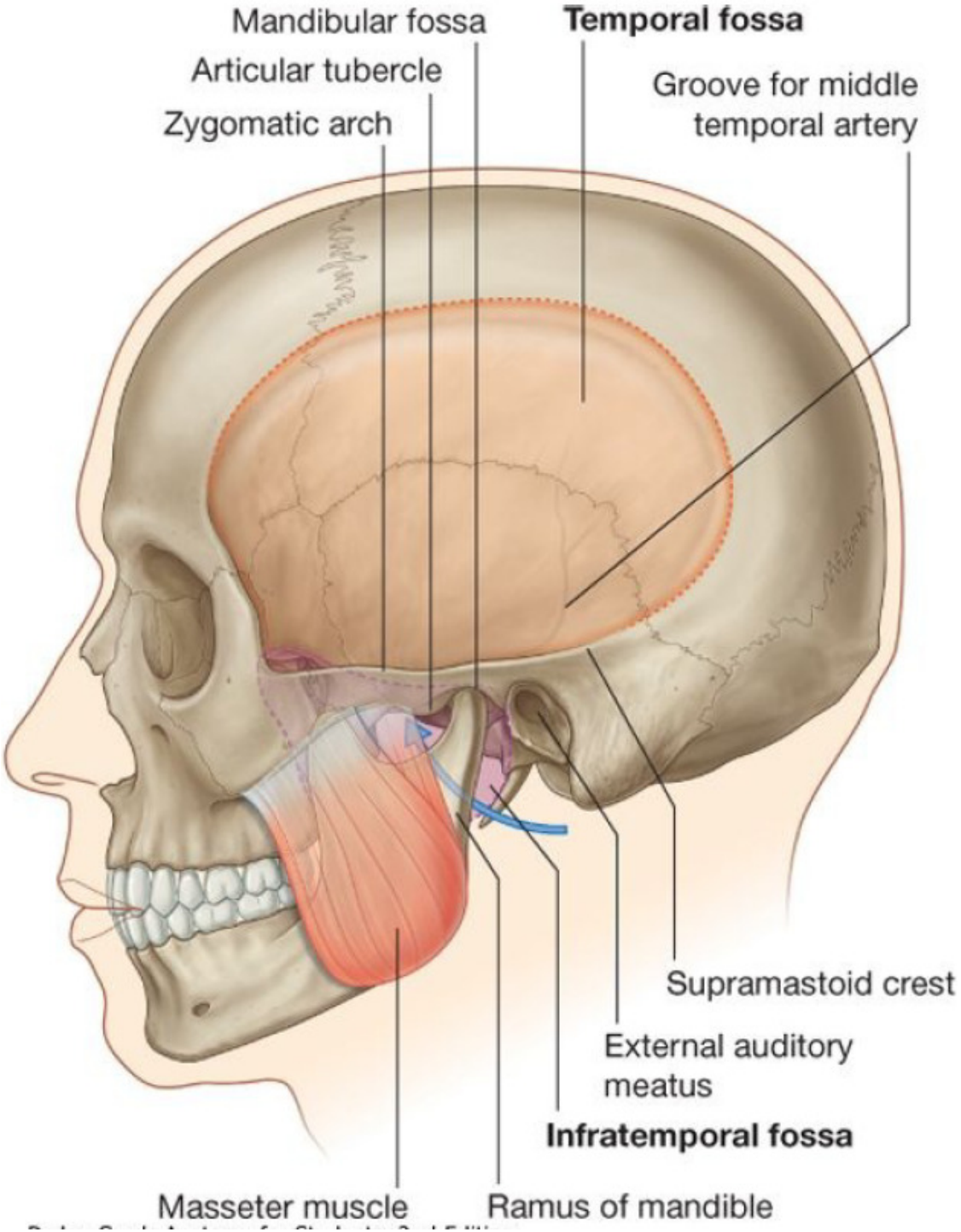
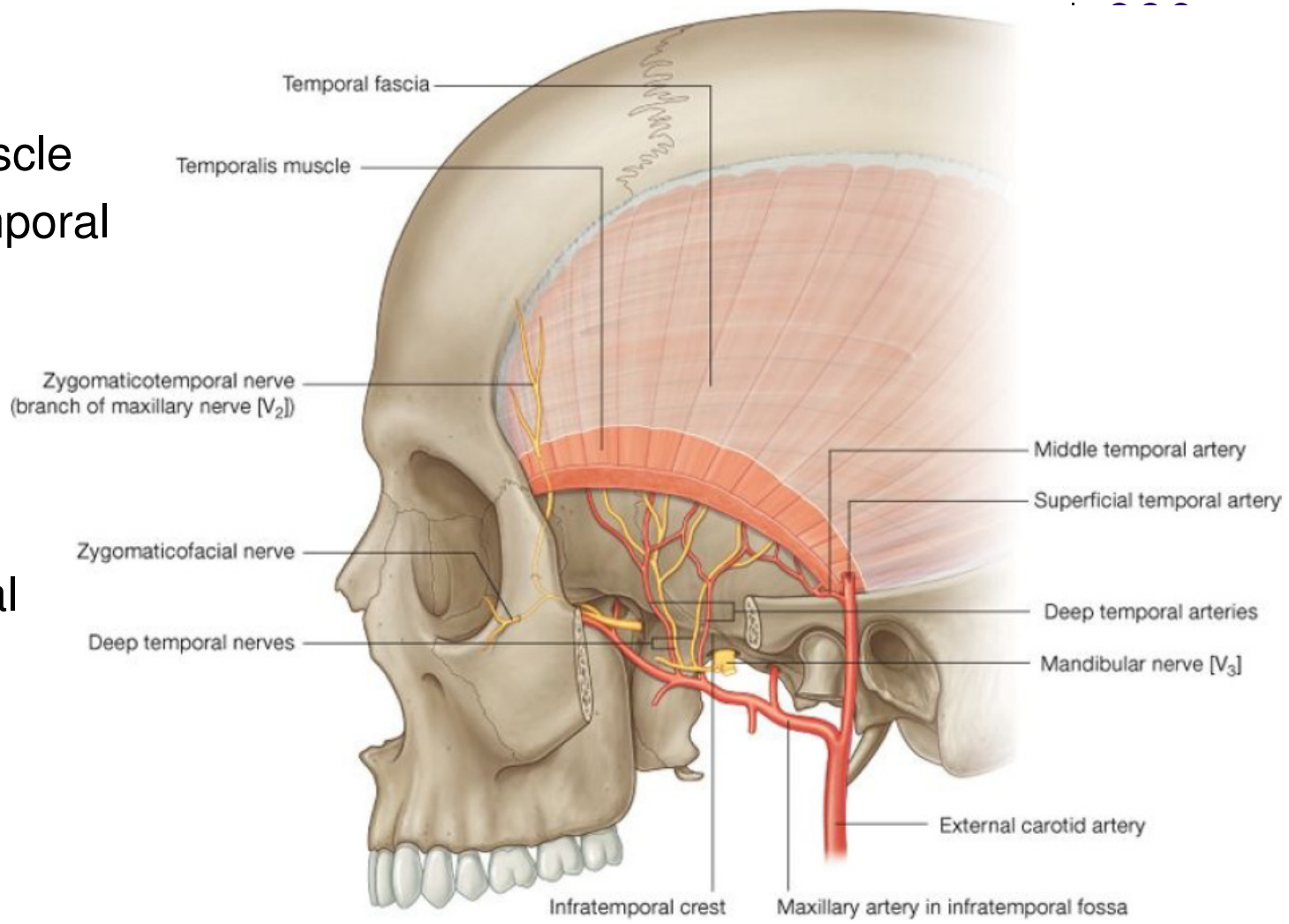
Temporal Fossa

- Narrow fan-shaped space
- Borders:
- **Superior**: pair of temporal lines
- **Lateral**: temporal fascia
- **Anterior**: posterior surface of the frontal and zygomatic bones
- **Inferior**: laterally, zygomatic arch. Medially, infratemporal crest of the greater wing of the sphenoid



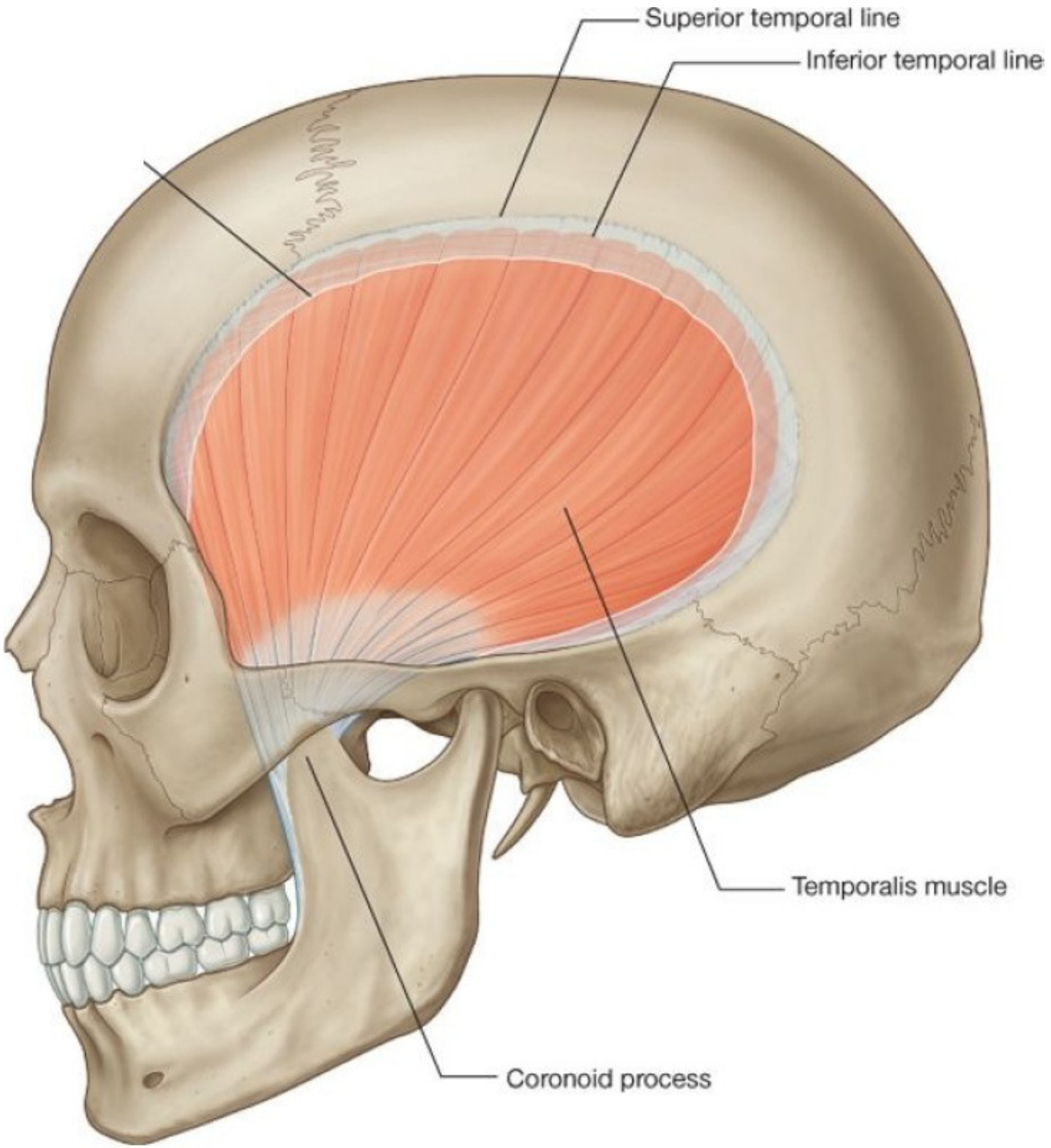
Contents of Temporal Fossa

- Temporalis muscle
- Zygomaticotemporal nerve
- Deep temporal nerves
- Deep temporal arteries
- Middle temporal artery



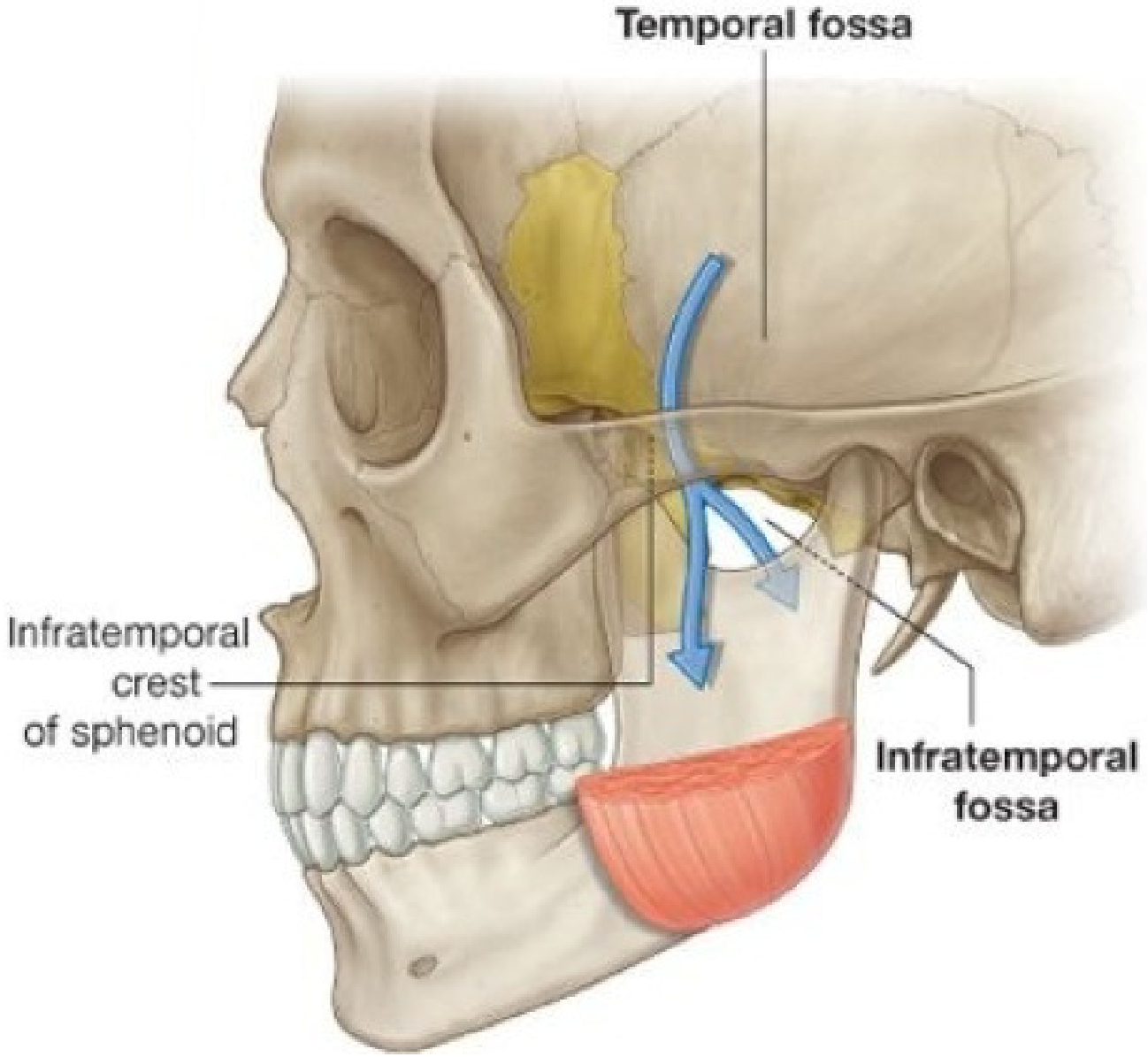
Temporalis muscle

- **Origin**: Bone of temporal fossa and temporal fascia
- **Insertion:** Coronoid process of mandible and anterior margin of ramus of mandible almost to last molar tooth
- **NS**: Deep temporal nerves from the anterior trunk of the mandibular nerve
- **Action**: Elevation and retraction of mandible



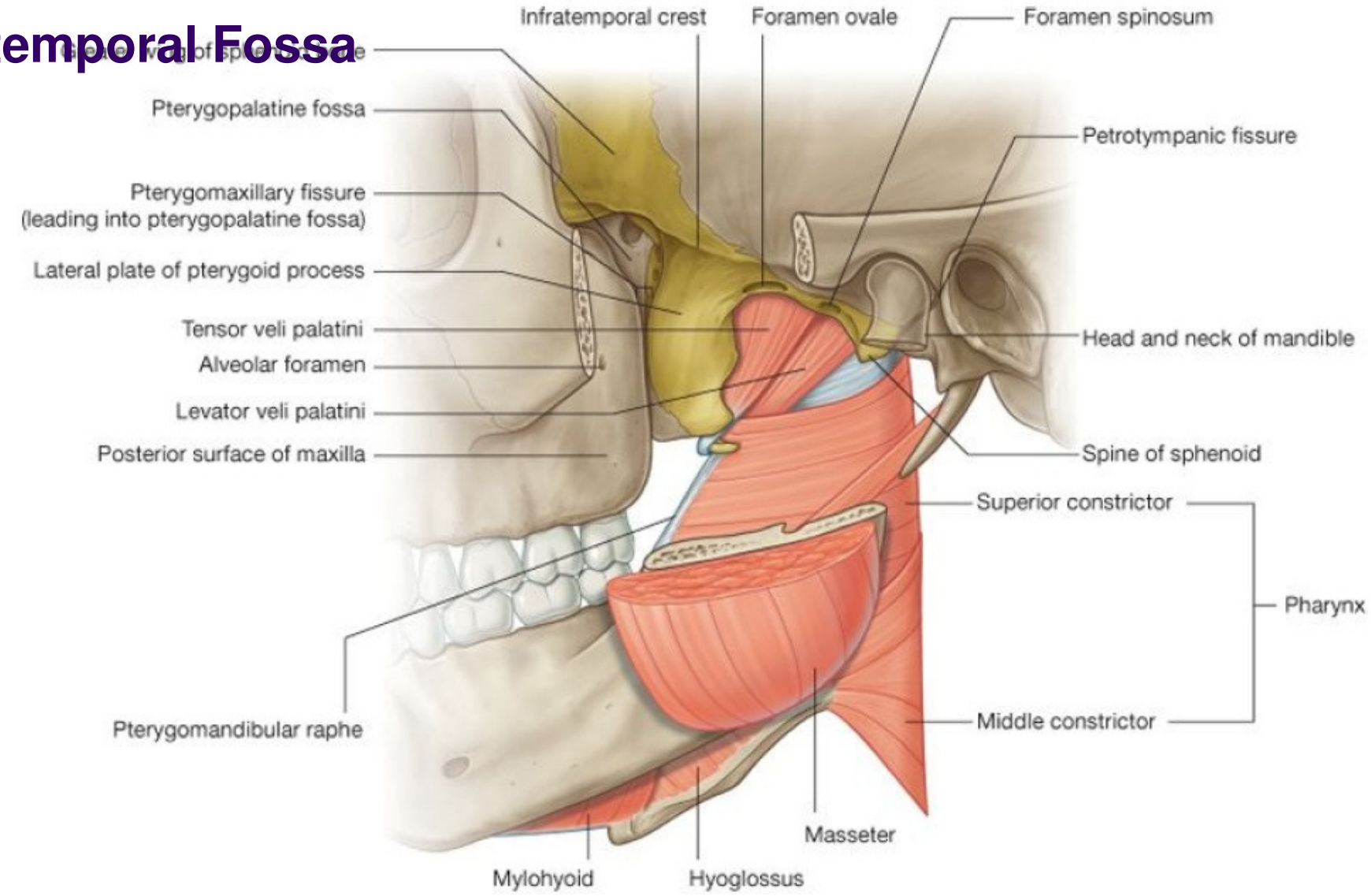
Infratemporal Fossa

- wedge-shaped
- **Roof:** inferior surfaces of the greater wing of the sphenoid and the temporal bone, contains the foramen spinosum, foramen ovale, and the petrotympanic fissure



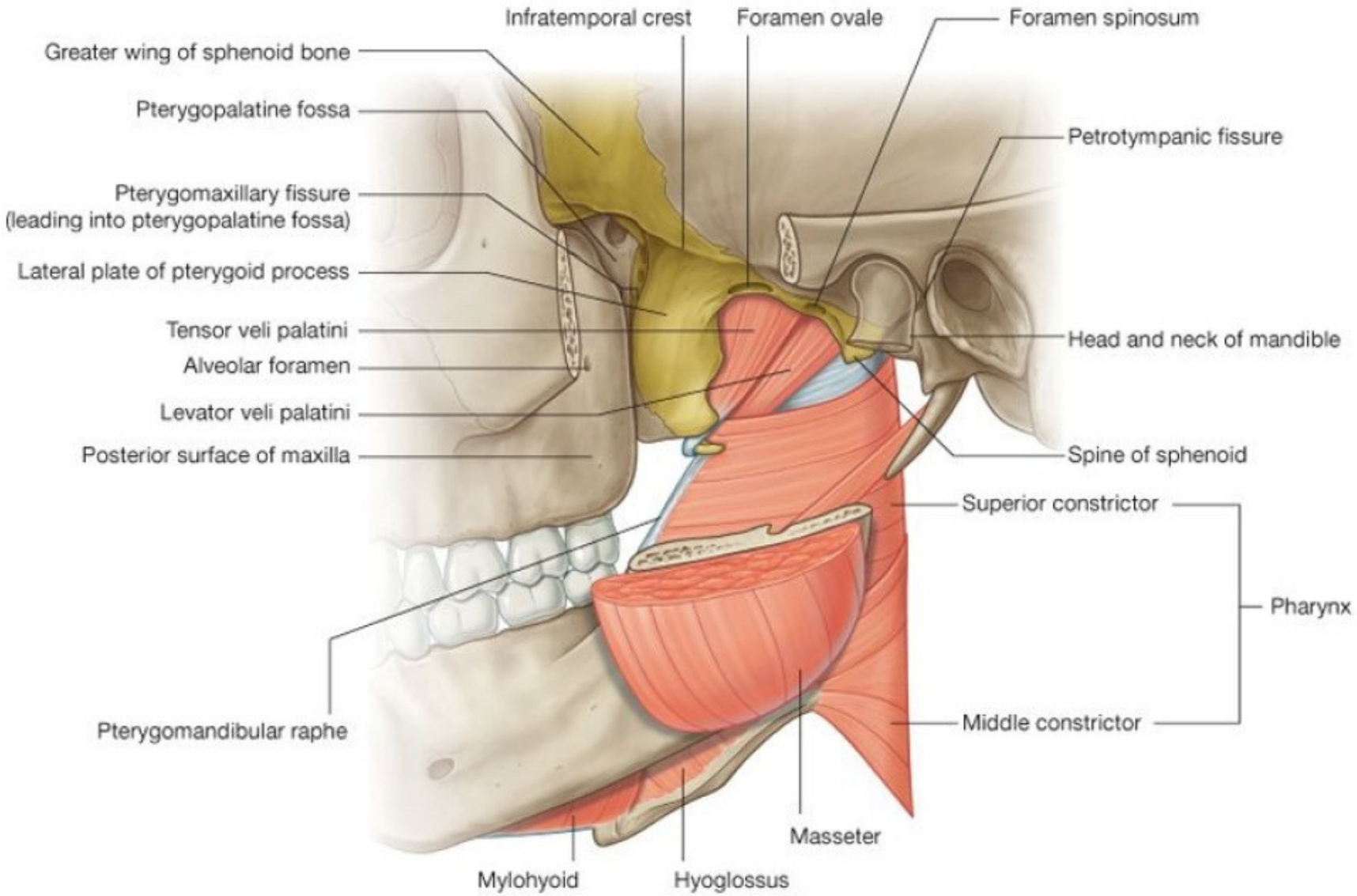
- **lateral wall:** medial surface of the ramus of mandible, contains the opening to the mandibular canal

Infratemporal Fossa



- **Medial wall:** anteriorly, lateral plate of the pterygoid process, posteriorly; pharynx and two muscles of the soft palate (tensor and levator veli palatini muscles), pterygomaxillary fissure anteriorly, which allows structures to pass between the infratemporal and pterygopalatine fossae

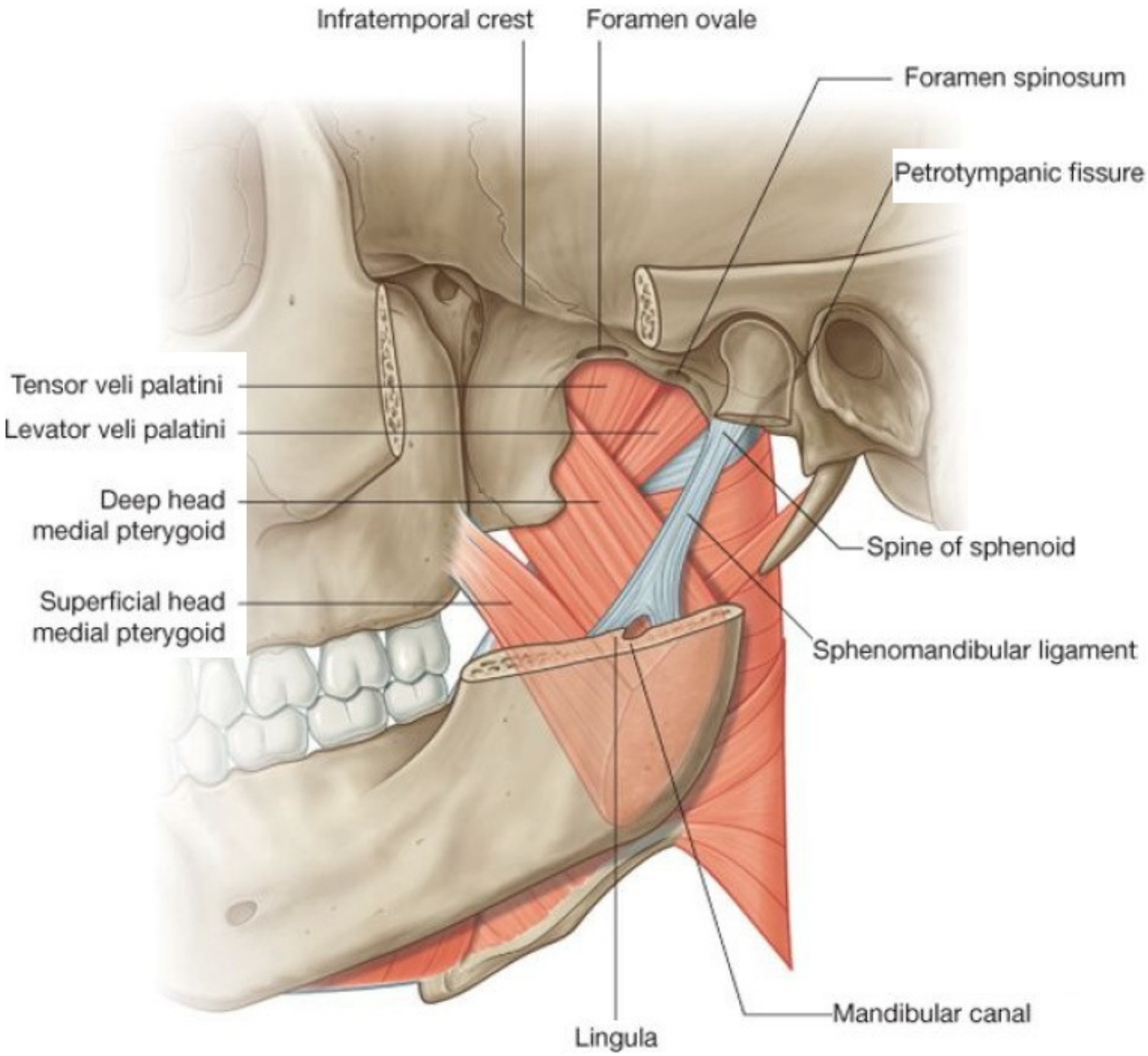
Infratemporal Fossa



- **Anterior wall:** posterior surface of the maxilla, contains the alveolar foramen, and the upper part opens as the inferior orbital fissure into the orbit.

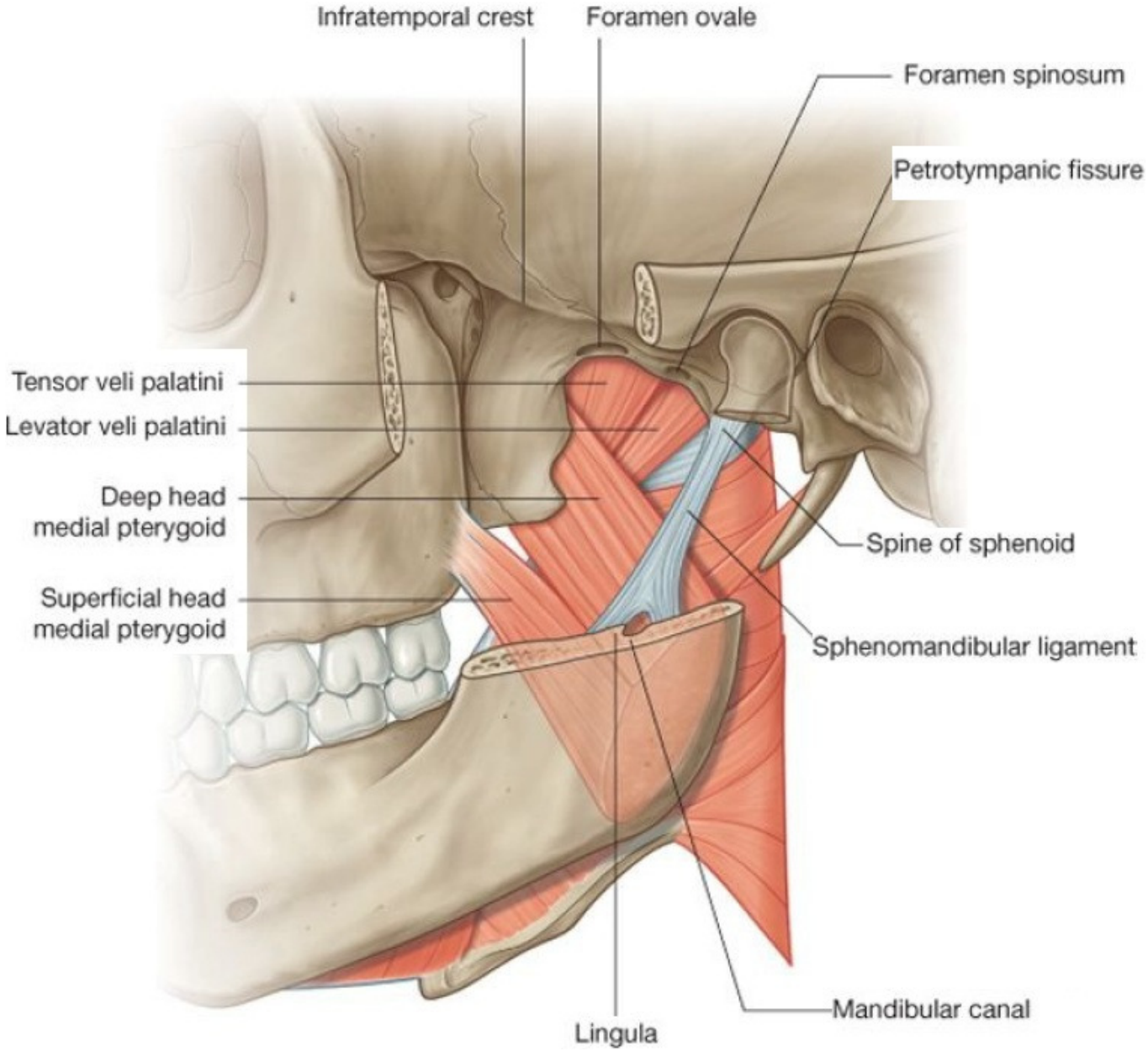
Infratemporal Fossa contents

- Sphenomandibular ligament
- Medial pterygoid muscle
- Lateral pterygoid muscle
- Maxillary artery
- Mandibular nerve [V3] (branches)
- Chorda tympani of the facial nerve [VII]
- Lesser petrosal (glossopharyngeal nerve)
- Otic ganglion
- Pterygoid plexus of veins



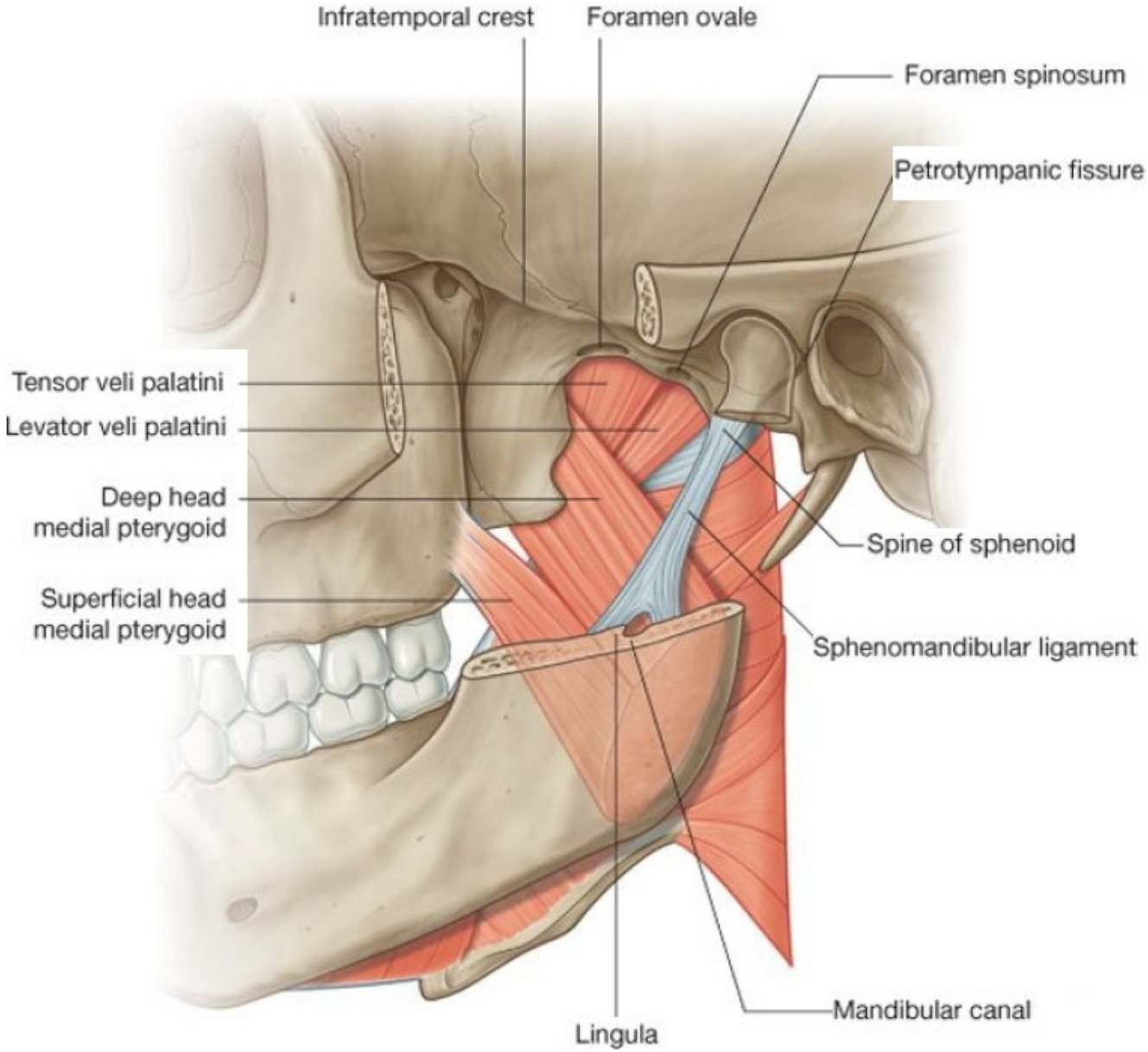
Infratemporal Fossa contents

- Sphenomandibular ligament:
- Extracapsular ligament of the temporomandibular joint
- Attachments:
  - Superiorly: spine of the sphenoid bone
  - inferiorly to attach to the lingula of the mandible



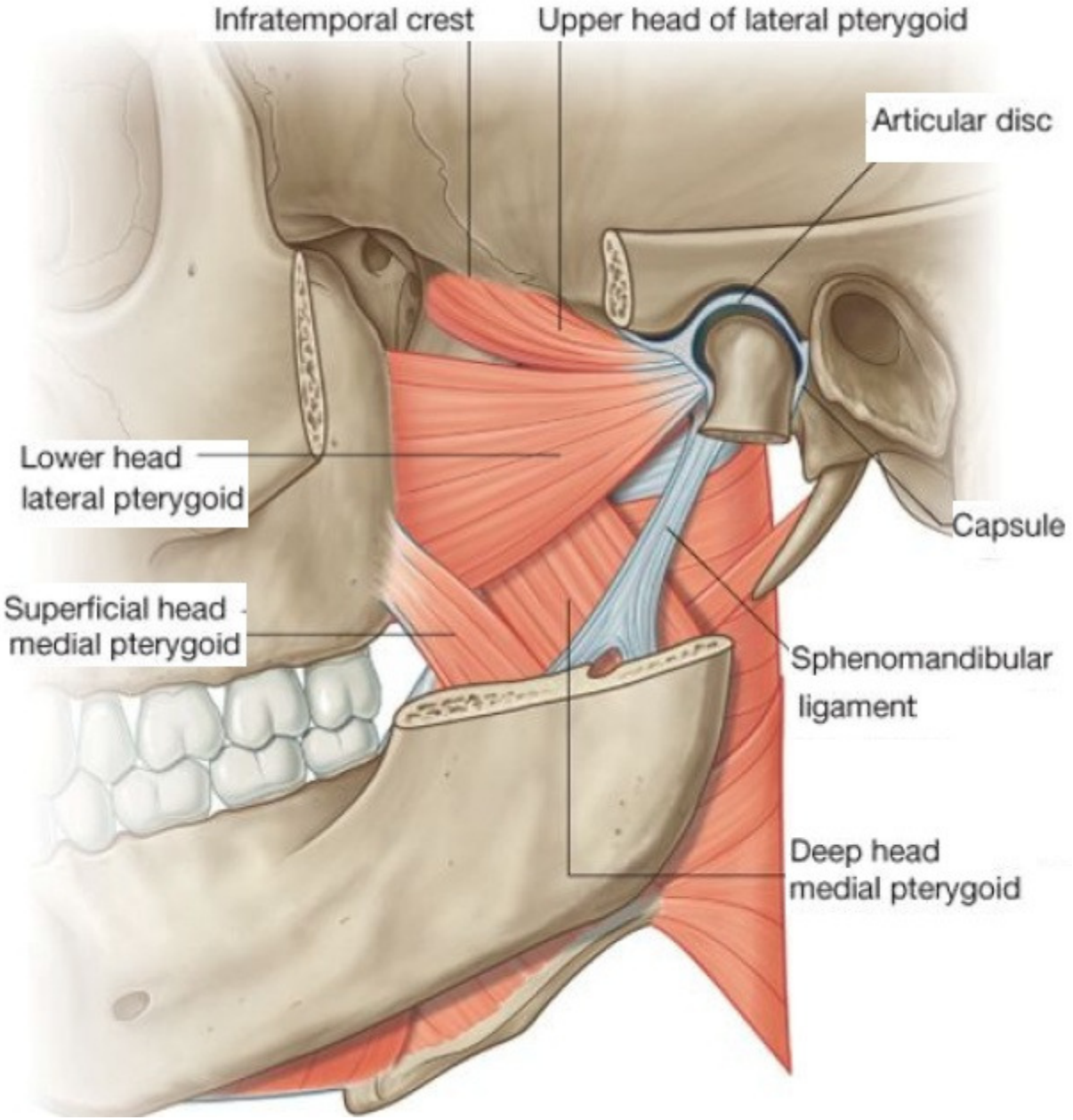
Medial pterygoid muscle

- **Origin**:
  - **Deep head:** medial surface of lateral plate of pterygoid process
  - **Superficial head**: tuberosity of maxilla and pyramidal process of palatine
- **Insertion:** Medial surface of mandible angle
- **NS**: Nerve to medial pterygoid from the mandibular nerve
- **Action**: Elevation side to-side movement



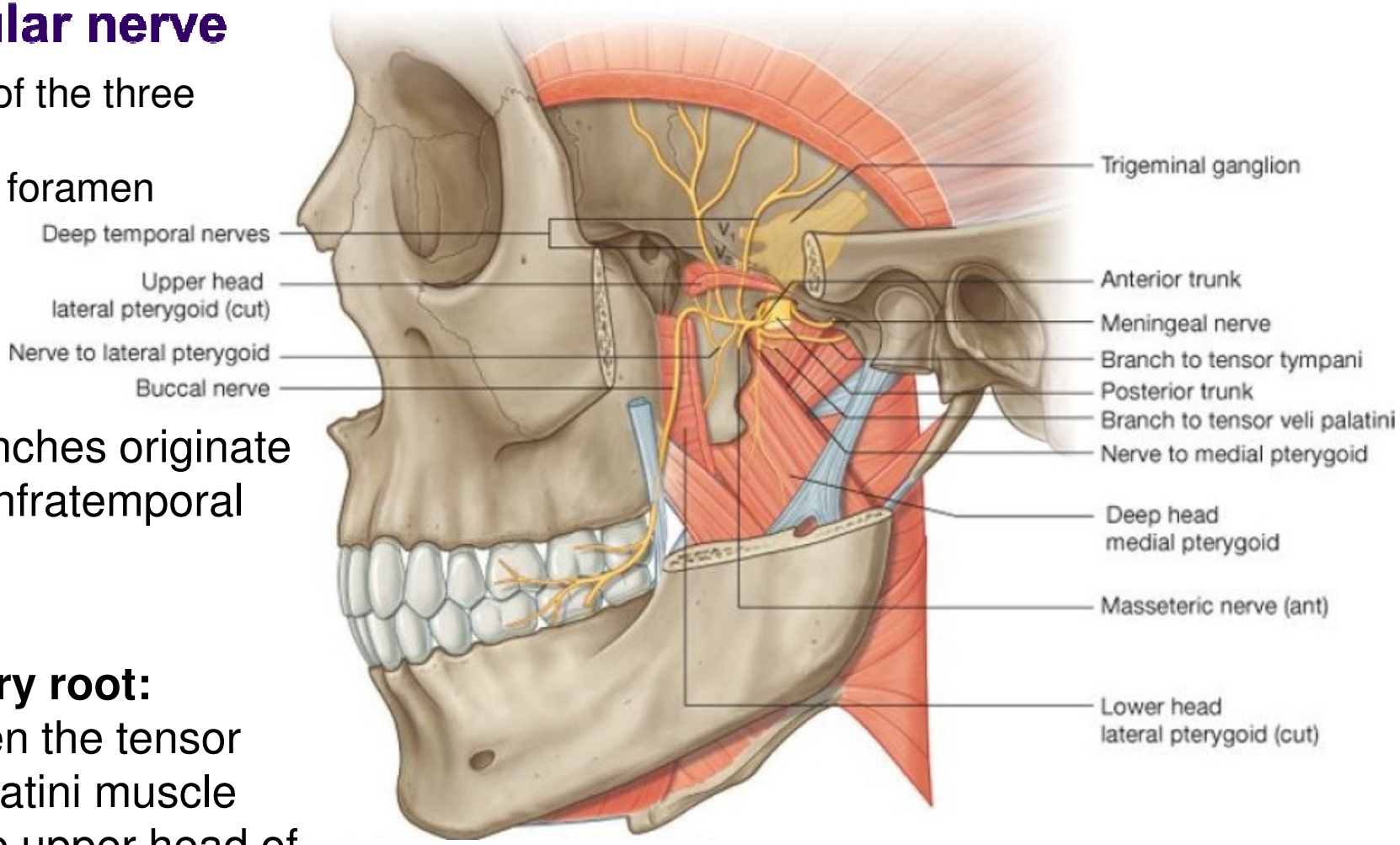
Lateral pterygoid muscle

- **Origin**:
  - **Upper head:** roof of infratemporal fossa
  - **lower head:** Lateral surface of lateral plate of the pterygoid process
- **Insertion:** Capsule of temporomandibular joint in the region of attachment to the articular disc
- **NS**: nerve to lateral pterygoid from anterior trunk of the mandibular nerve
- **Action**: Protrusion and sideto-side movements



Mandibular nerve

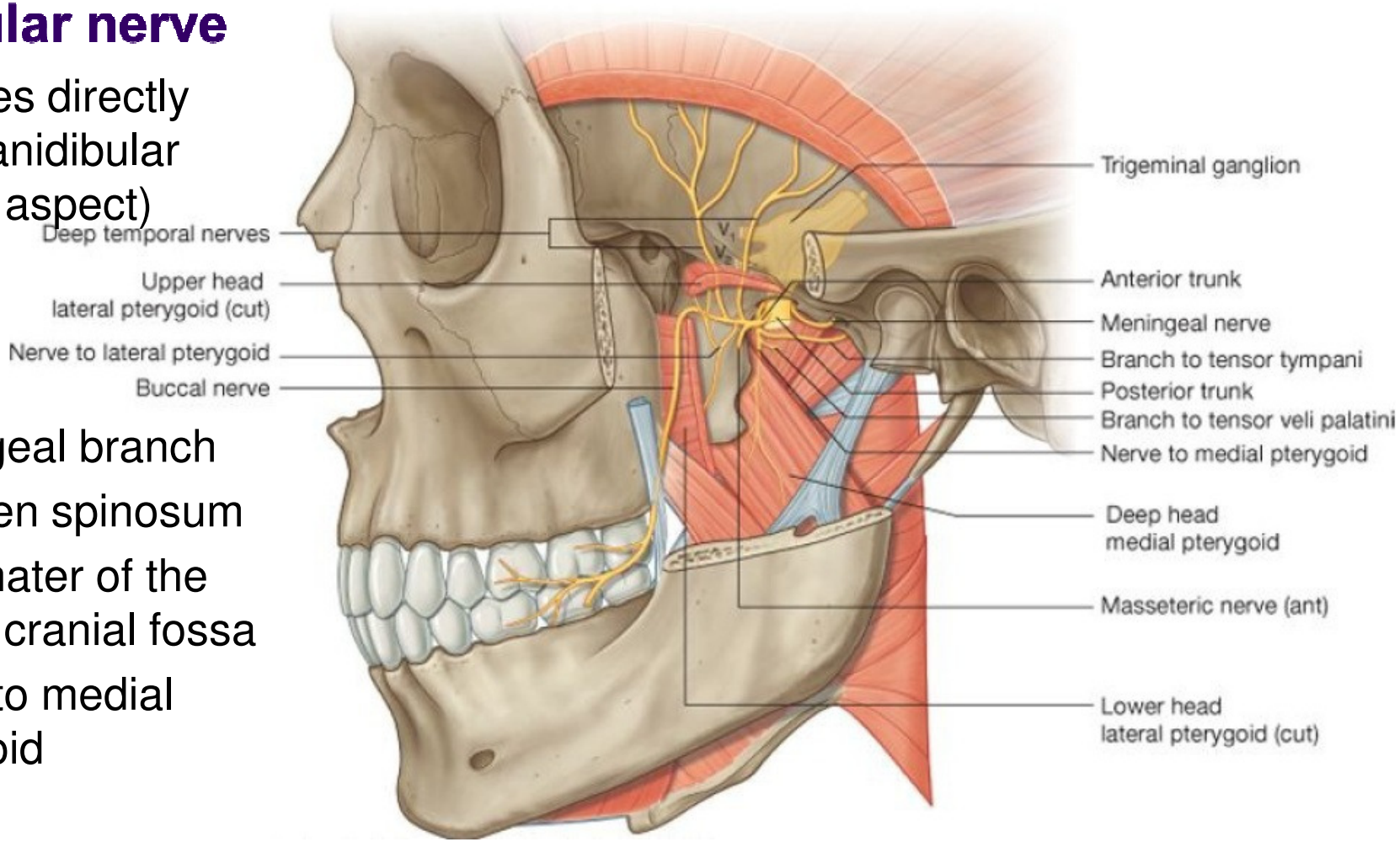
- Largest of the three divisions
- Through foramen ovale



- All branches originate in the infratemporal fossa
- Mixed:
  - **Sensory root:** between the tensor veli palatini muscle and the upper head of the lateral pterygoid muscle
  - **Motor root:** passes through the foramen ovale and immediately joins the sensory part of the mandibular nerve
- **Two Trunks**: Anterior and posterior

Mandibular nerve

- Branches directly from manidibular (medial aspect)

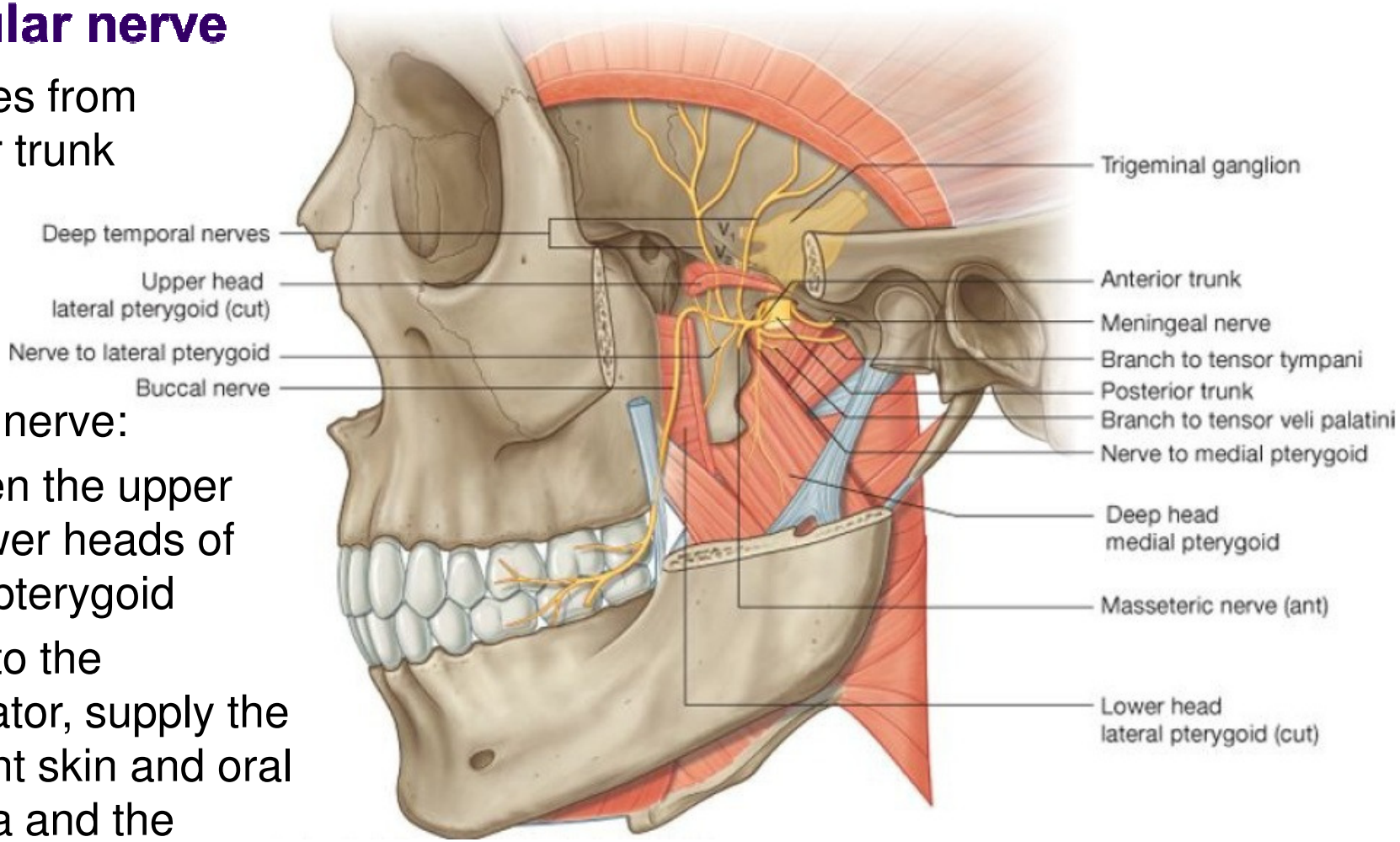


- Meningeal branch
- Foramen spinosum
- Dura mater of the middle cranial fossa
- Nerve to medial pterygoid

- Branch to tensor veli palatini
- Branch to tensor tympani muscle
  - Through bony canal in temporal bone

Mandibular nerve

- Branches from Anterior trunk

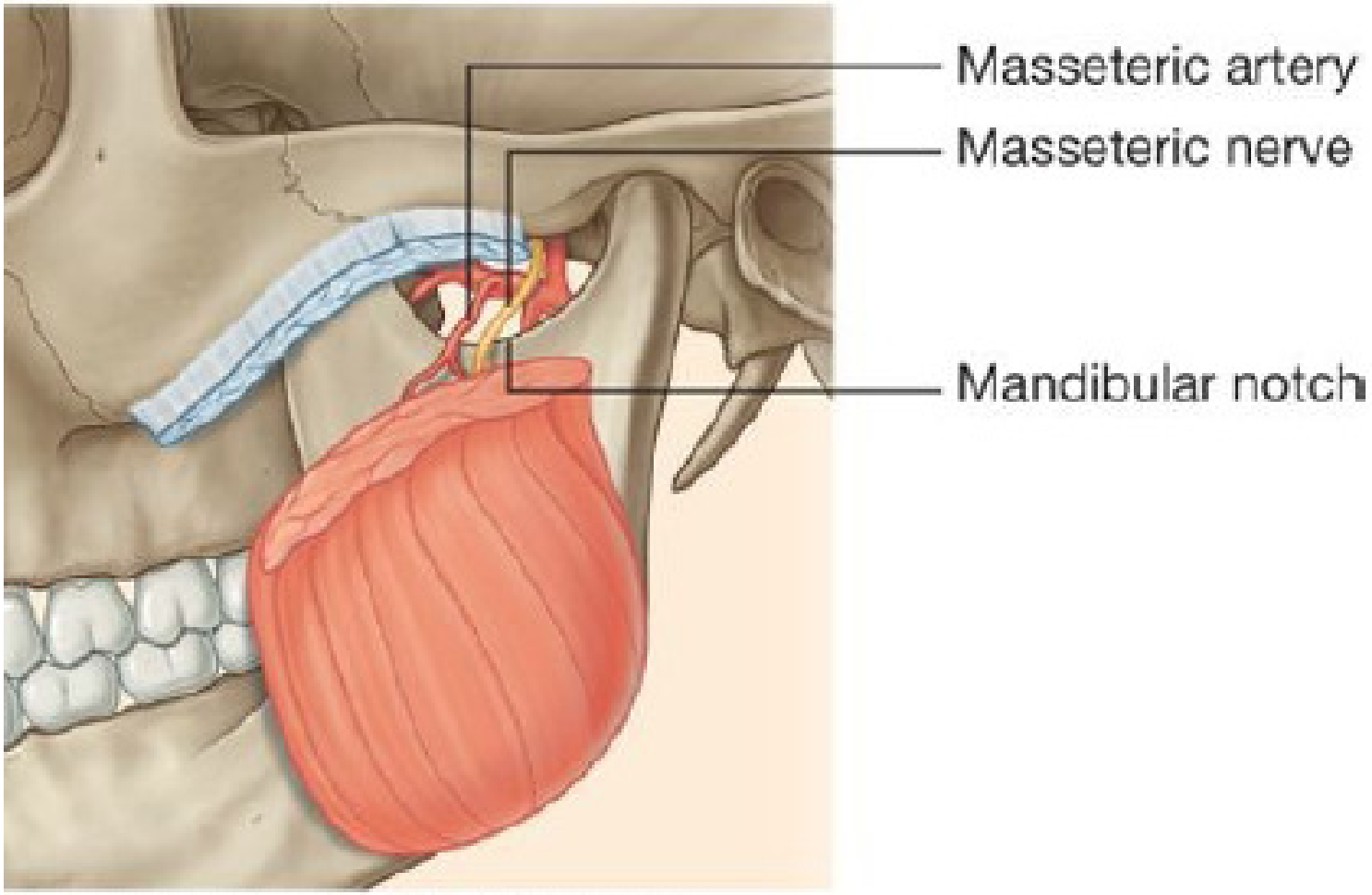


- Buccal nerve:
  - Between the upper and lower heads of lateral pterygoid
  - lateral to the buccinator, supply the adjacent skin and oral mucosa and the buccal gingivae of the lower molars

- Masseteric nerve: Pass laterally over the lateral pterygoid muscle and through the mandibular notch, on the deep surface of masseter M

Mandibular nerve

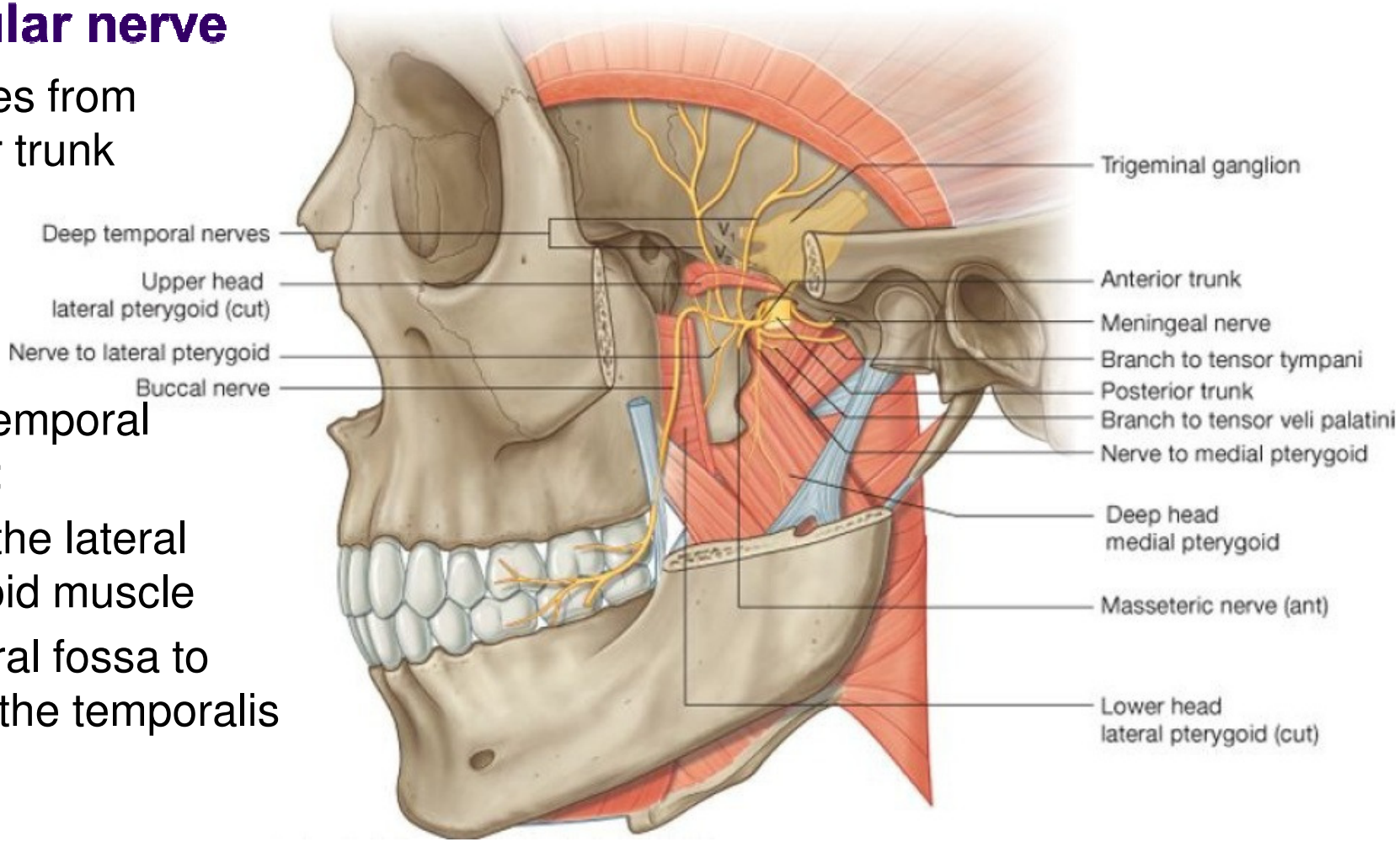
- Branches from Anterior trunk



- Masseteric nerve: Pass laterally over the lateral pterygoid muscle and through the mandibular notch, on the deep surface of masseter M

Mandibular nerve

- Branches from Anterior trunk



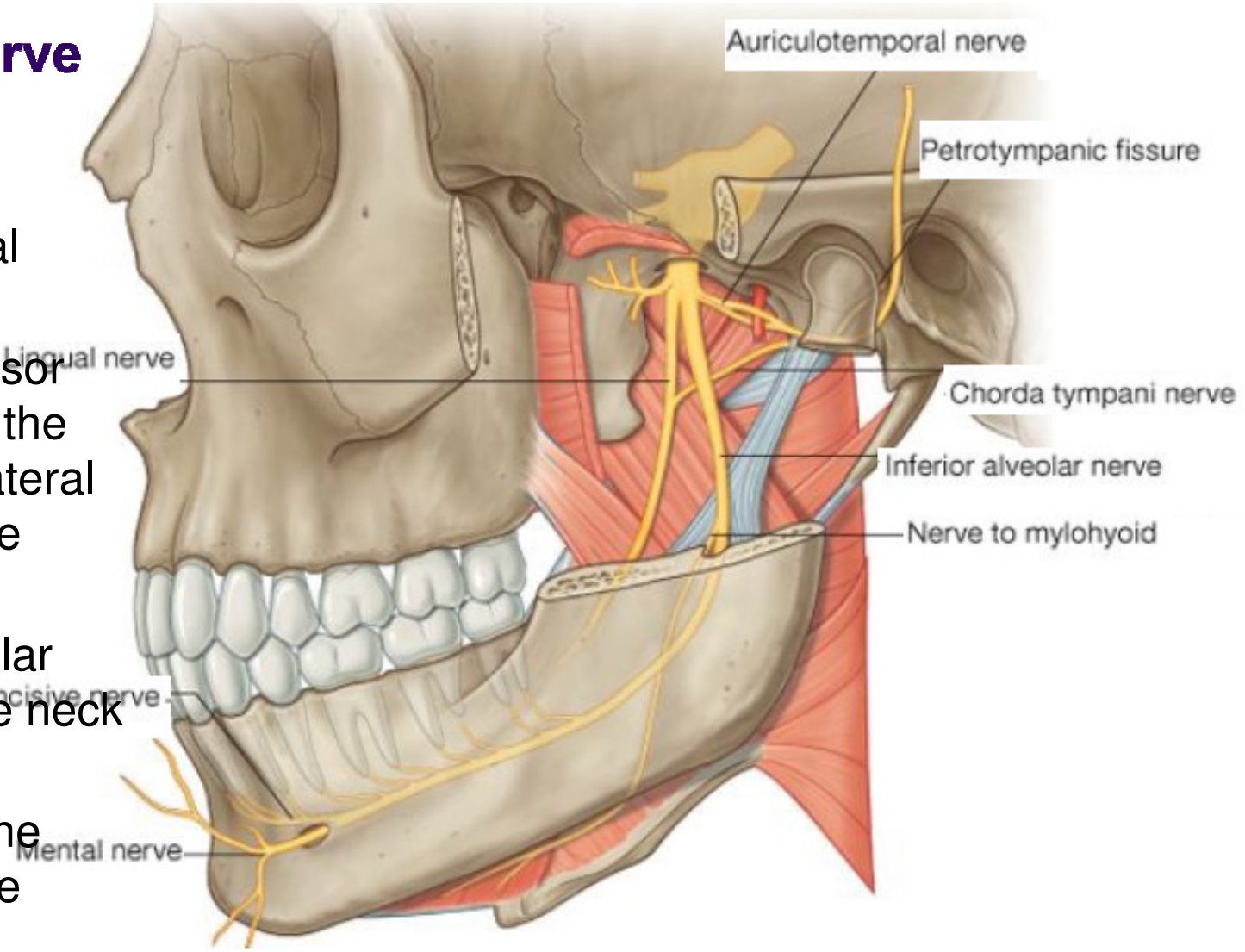
- Deep temporal nerves:
  - above the lateral pterygoid muscle
  - Temporal fossa to supply the temporalis muscle

- Nerve to lateral pterygoid
  - Directly to deep surface of the lateral pterygoid muscle

Mandibular nerve

➢ Branches from Posterior trunk

- Auriculotemporal nerve:
  - ❖ between the tensor veli palatini and the upper head of lateral pterygoid muscle
  - ❖ between the sphenomandibular ligament and the neck of mandible
  - ❖ curves around the neck of mandible

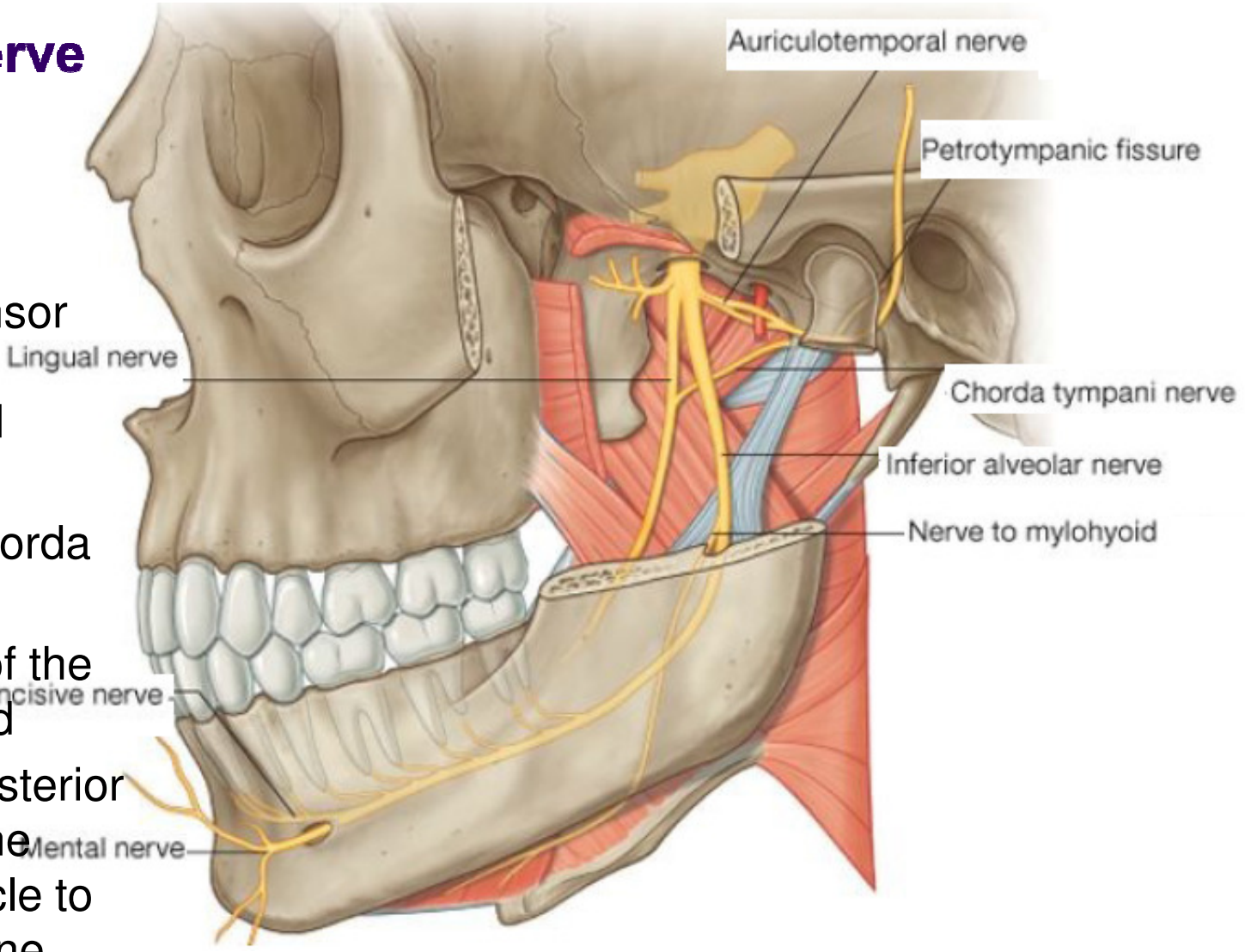


- **Supply:** area of the temple, external ear, the external auditory meatus, tympanic membrane, and temporomandibular joint delivers postganglionic parasympathetic nerves from the glossopharyngeal nerve [IX] to the parotid gland

Mandibular nerve

- Branches from Posterior trunk

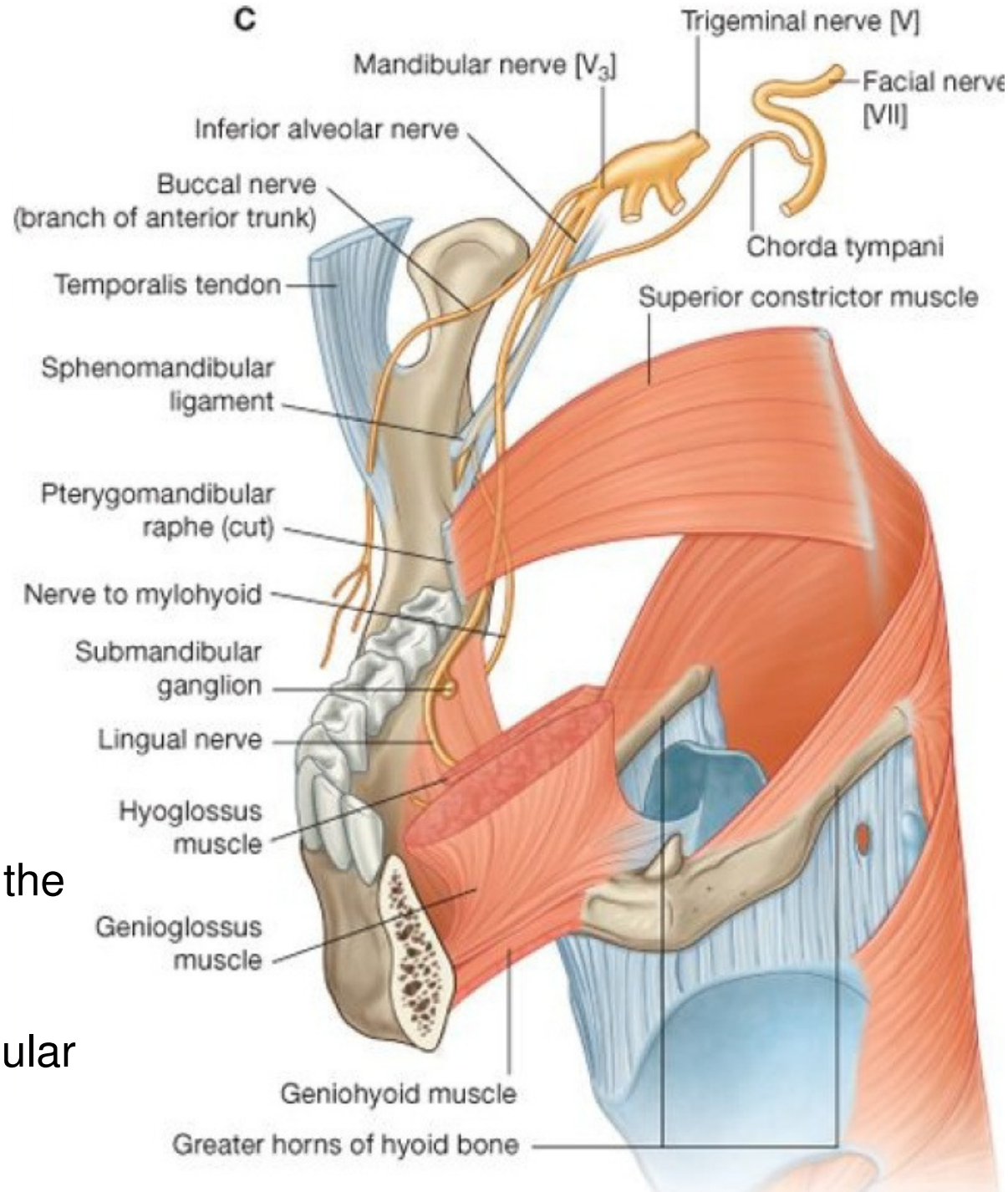
- Lingual nerve:
  - between the tensor veli palatini and lateral pterygoid muscle
  - joined by the chorda tympani nerve
  - lateral surface of the medial pterygoid
  - Between the posterior attachment of the mylohyoid muscle to the mylohyoid line and the attachment of the superior constrictor of the pharynx



Mandibular nerve

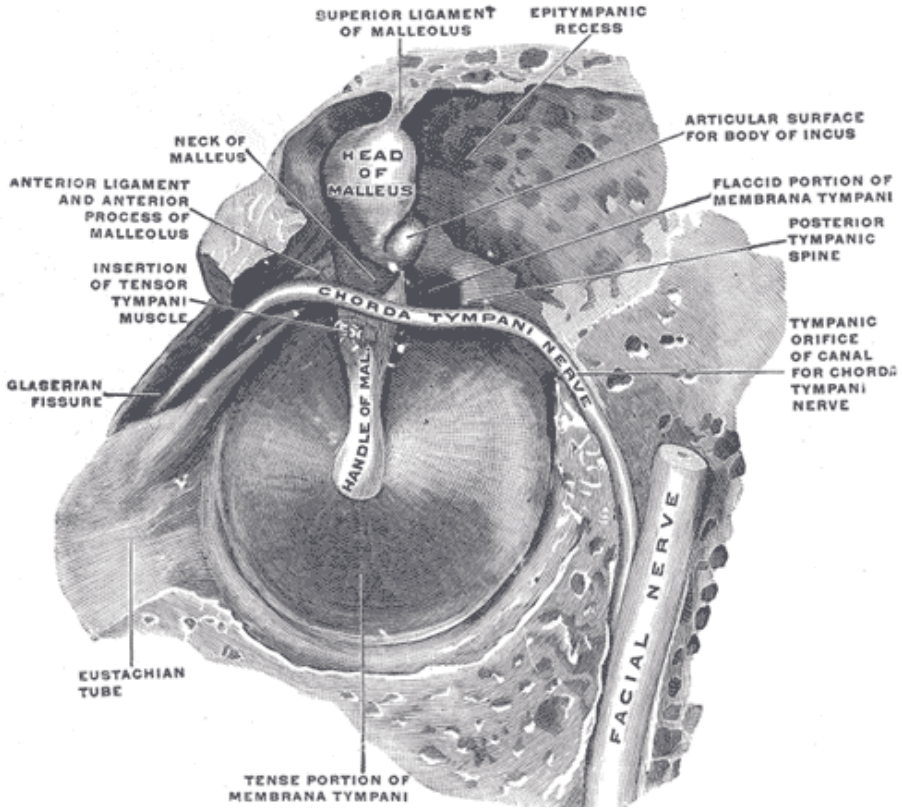
- Branches from Posterior trunk

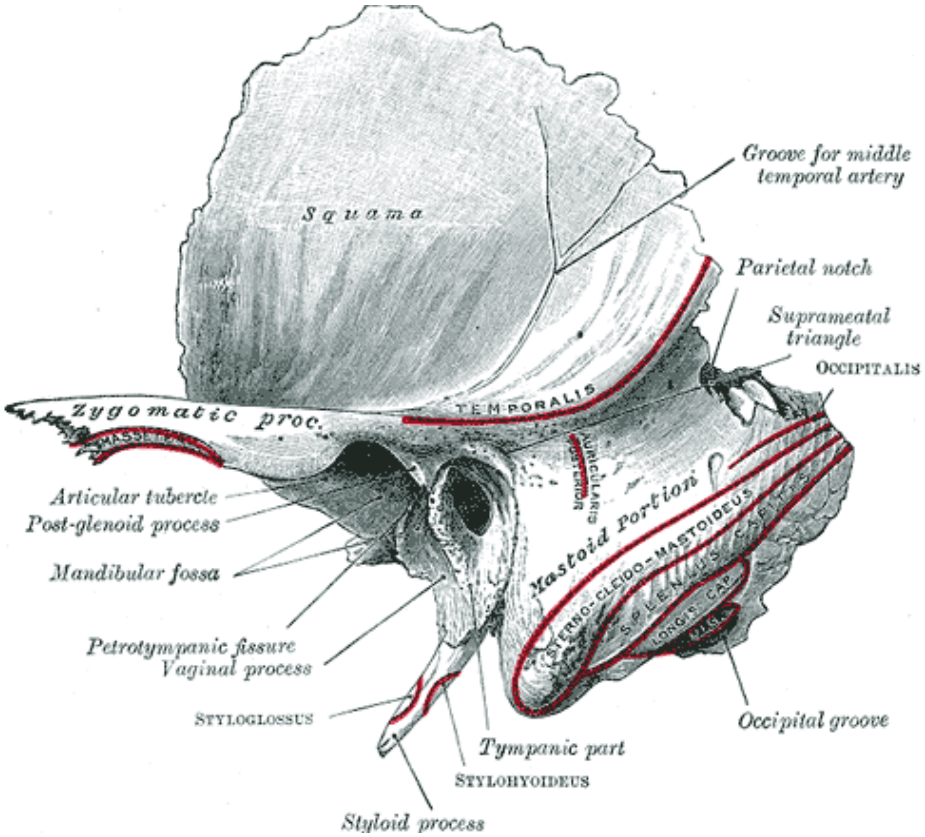
- Lingual nerve:
  - enters the floor of the oral cavity
  - groove on the medial surface of the mandible immediately inferior to the last molar tooth
  - At risk when operating on the molar teeth
  - Passes into the tongue on the lateral surface of the hyoglossus muscle
  - attached to the submandibular ganglion



The chorda tympani nerve

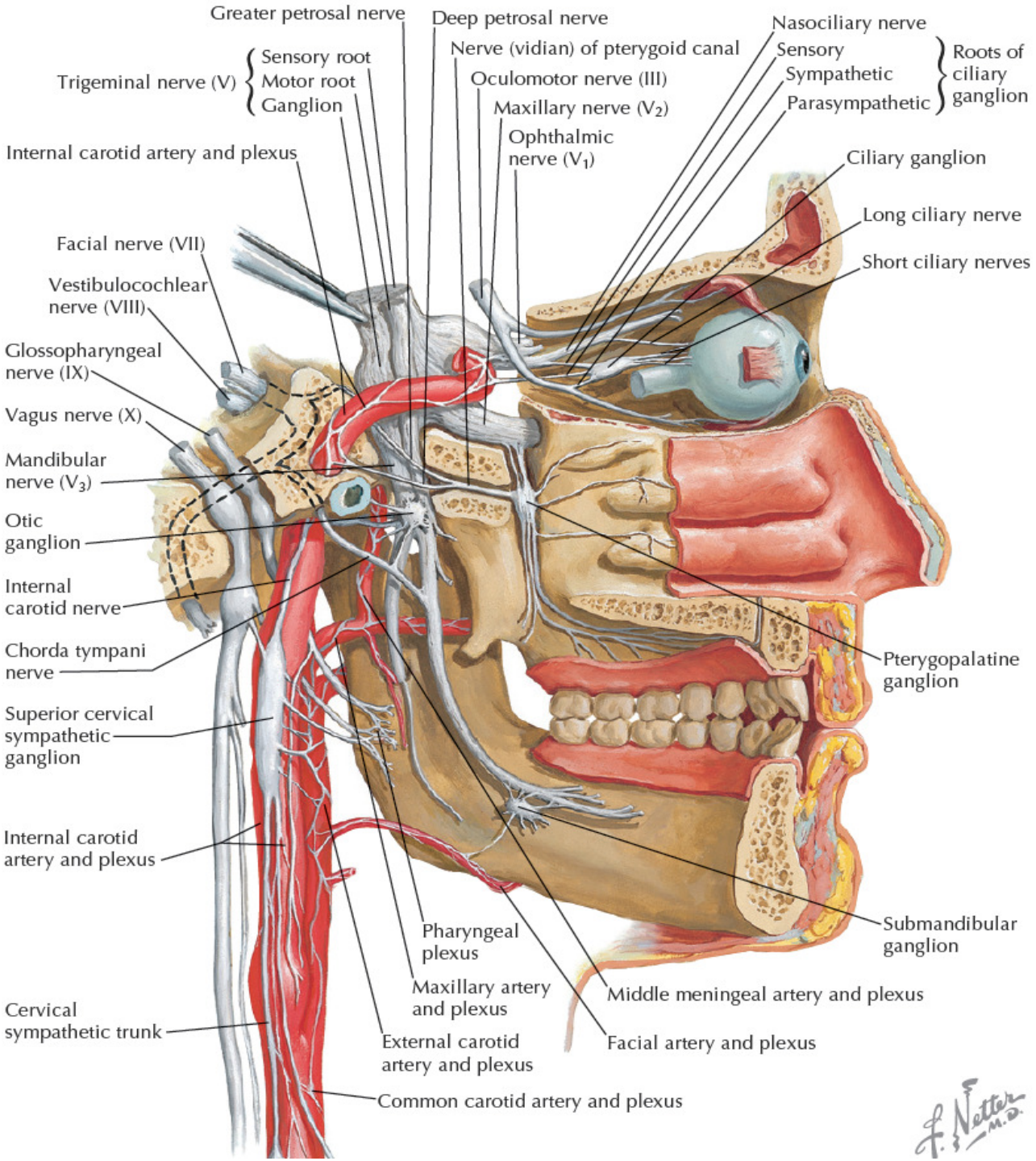
- Originates from the facial nerve
- Mastoid wall of the middle ear
- Passes through a small canal
- Separated from the tympanic membrane by the handle of malleus





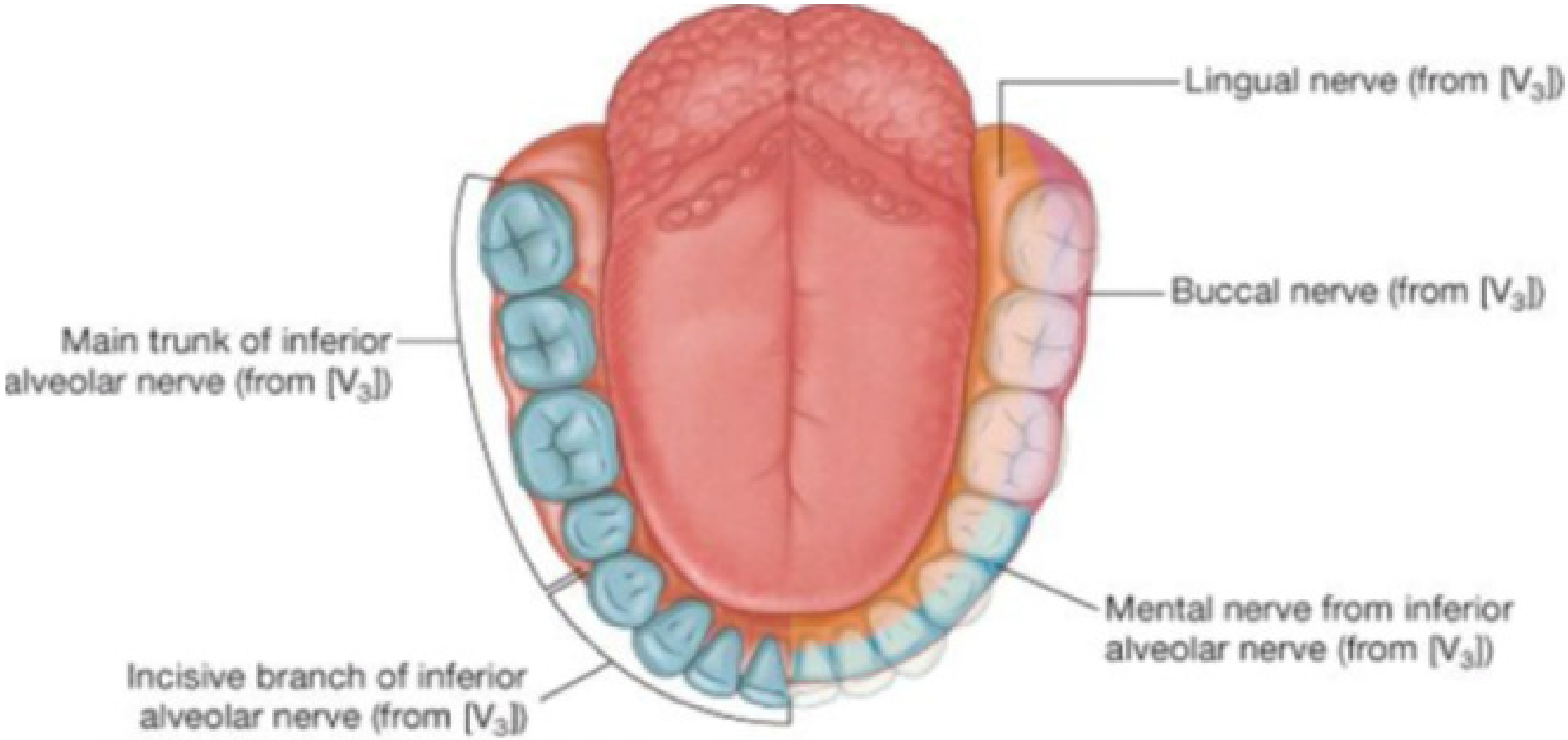
- continues through the petrotympanic fissure, it emerges from the skull into the infratemporal fossa. It soon combines with lingual nerve
  - Taste Anterior 2/3 of tongue
  - Preganglionic parasympathetic fibers to submandibular ganglion

Lingual nerve



Lingual nerve

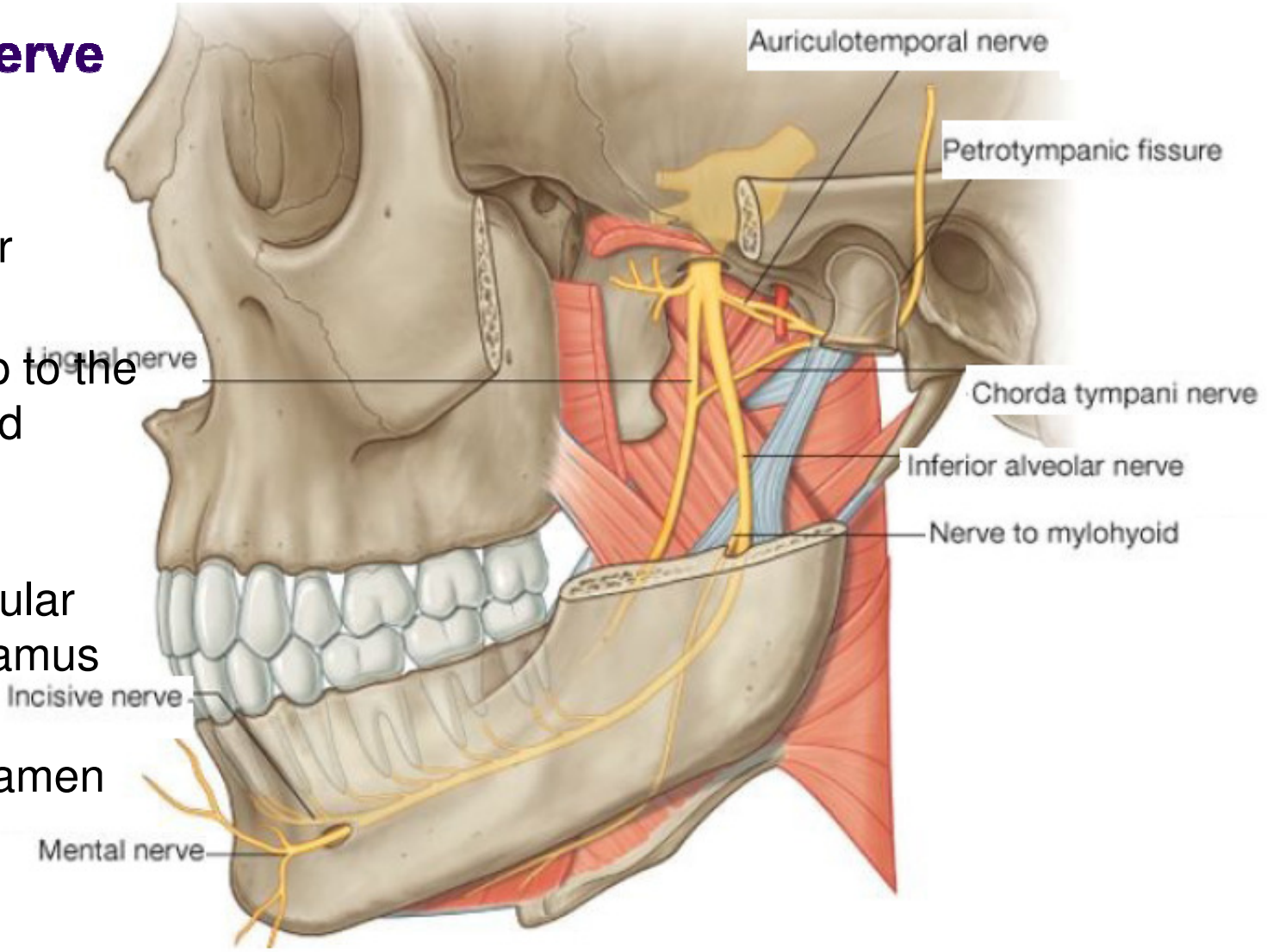
- General sensation from the anterior two-thirds of the tongue, oral mucosa on the floor of the oral cavity, and lingual gingivae associated with the lower teeth



Mandibular nerve

- Branches from Posterior trunk

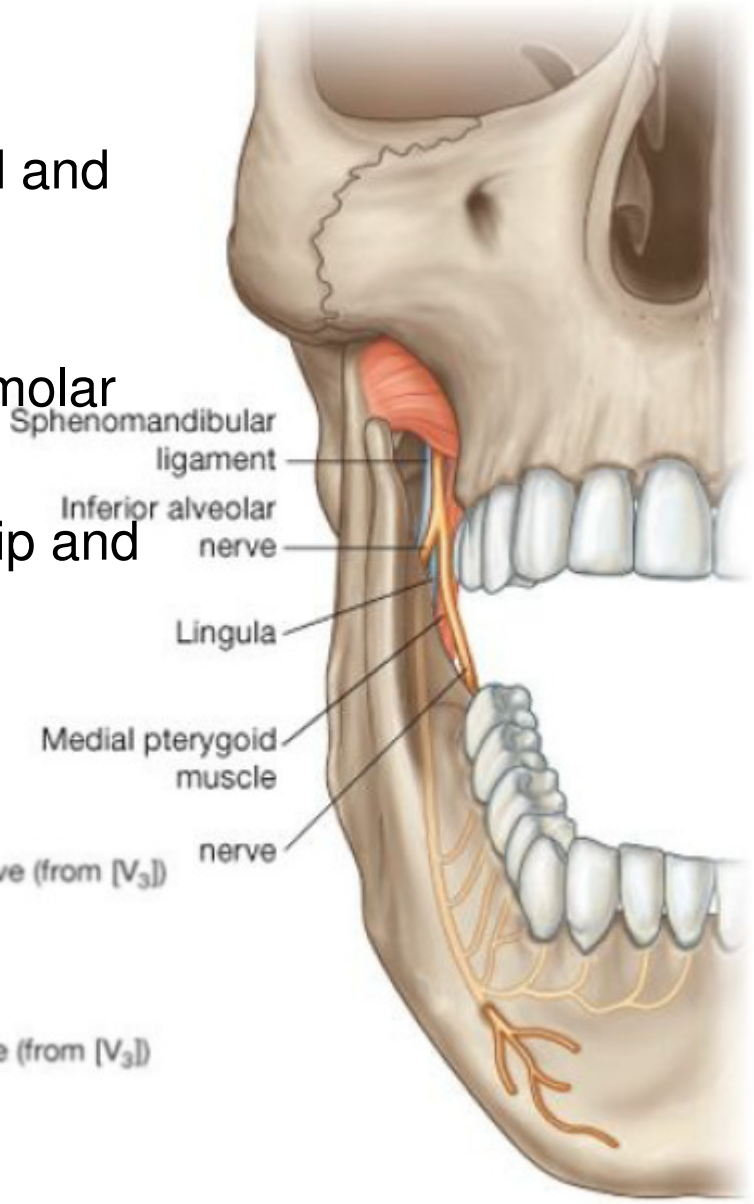
- Inferior alveolar nerve:
- originates deep to the lateral pterygoid muscle
- between the sphenomandibular ligament and ramus of mandible
- mandibular foramen and canal

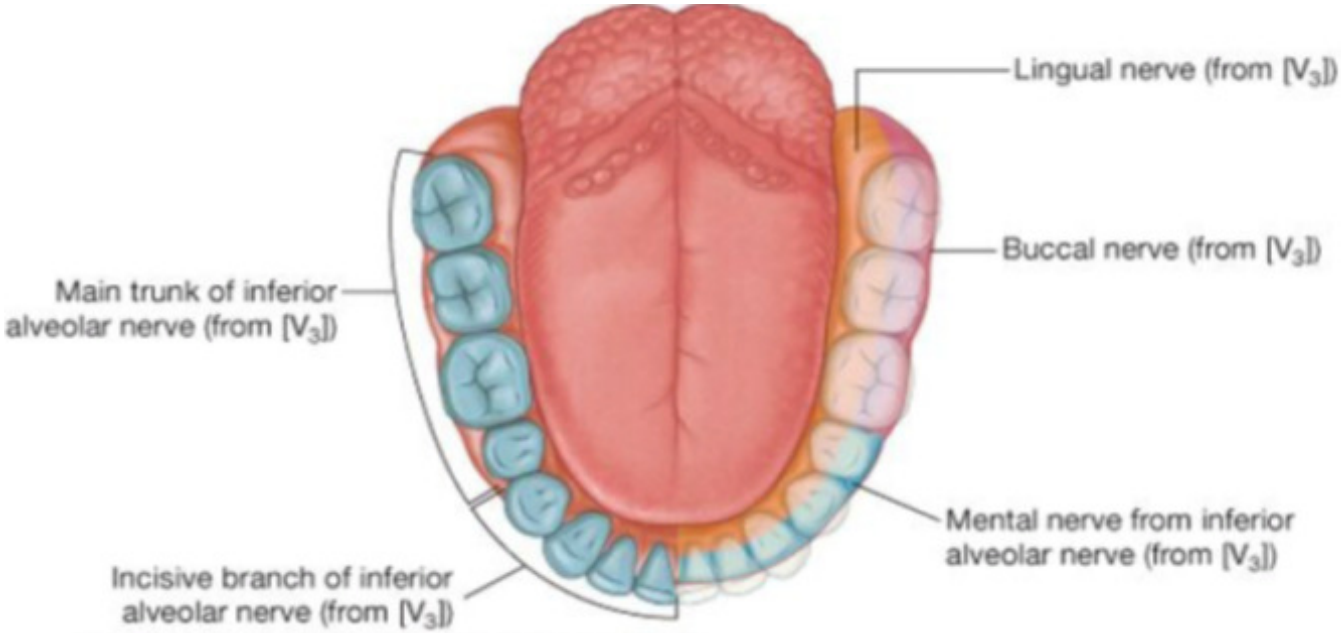


- Before entering mandibular foramen, it gives nerve to mylohyoid
- incisive nerve
- mental nerve

Inferior alveolar nerve

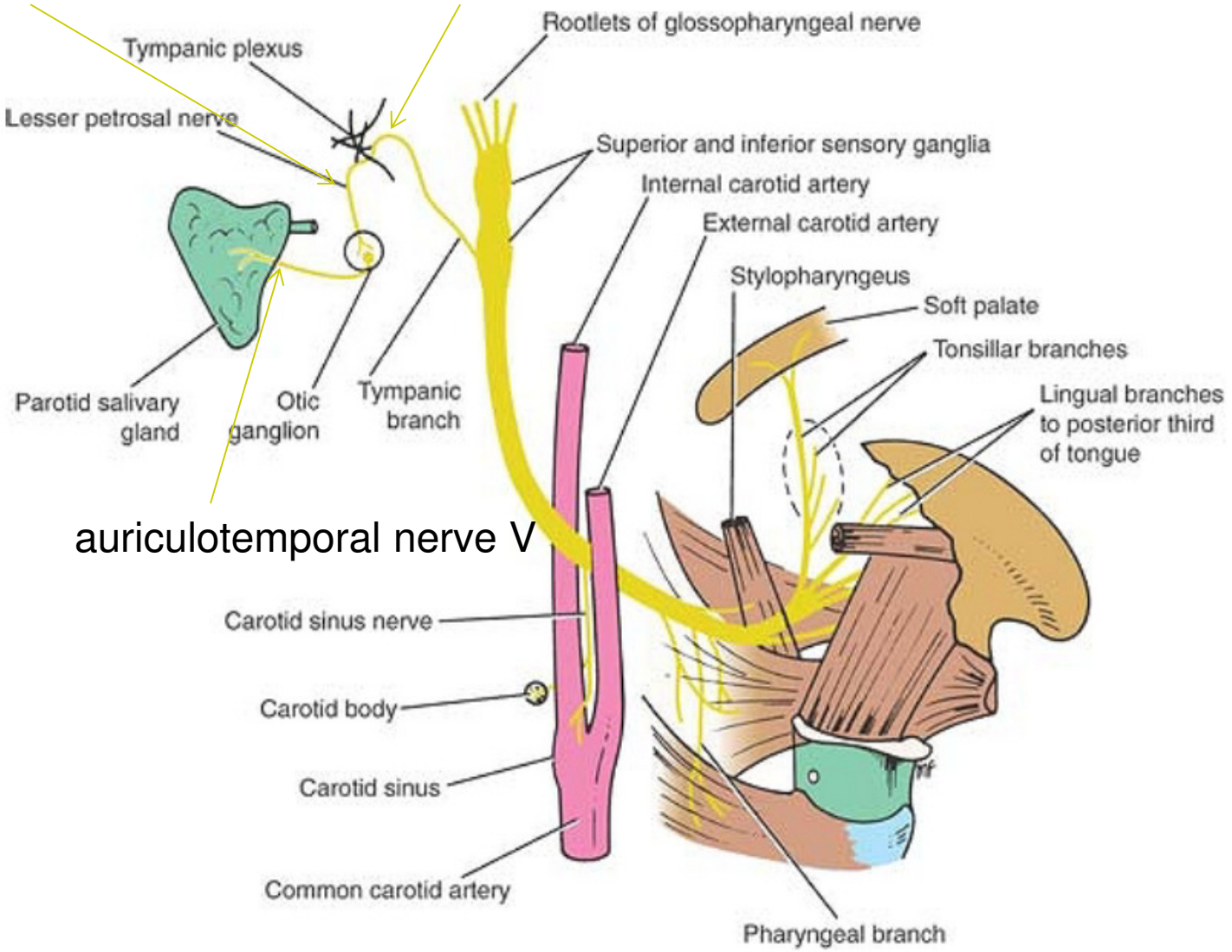
- Motor : nerve to mylohyoid, supply mylohyoid and anterior belly of digastric
- Sensory:
  - Main trunk: molars teeth and the second premolar
  - Incisive branch: rest of lower teeth
  - Mental nerve: mucosa and skin of the lower lip and skin of the chin

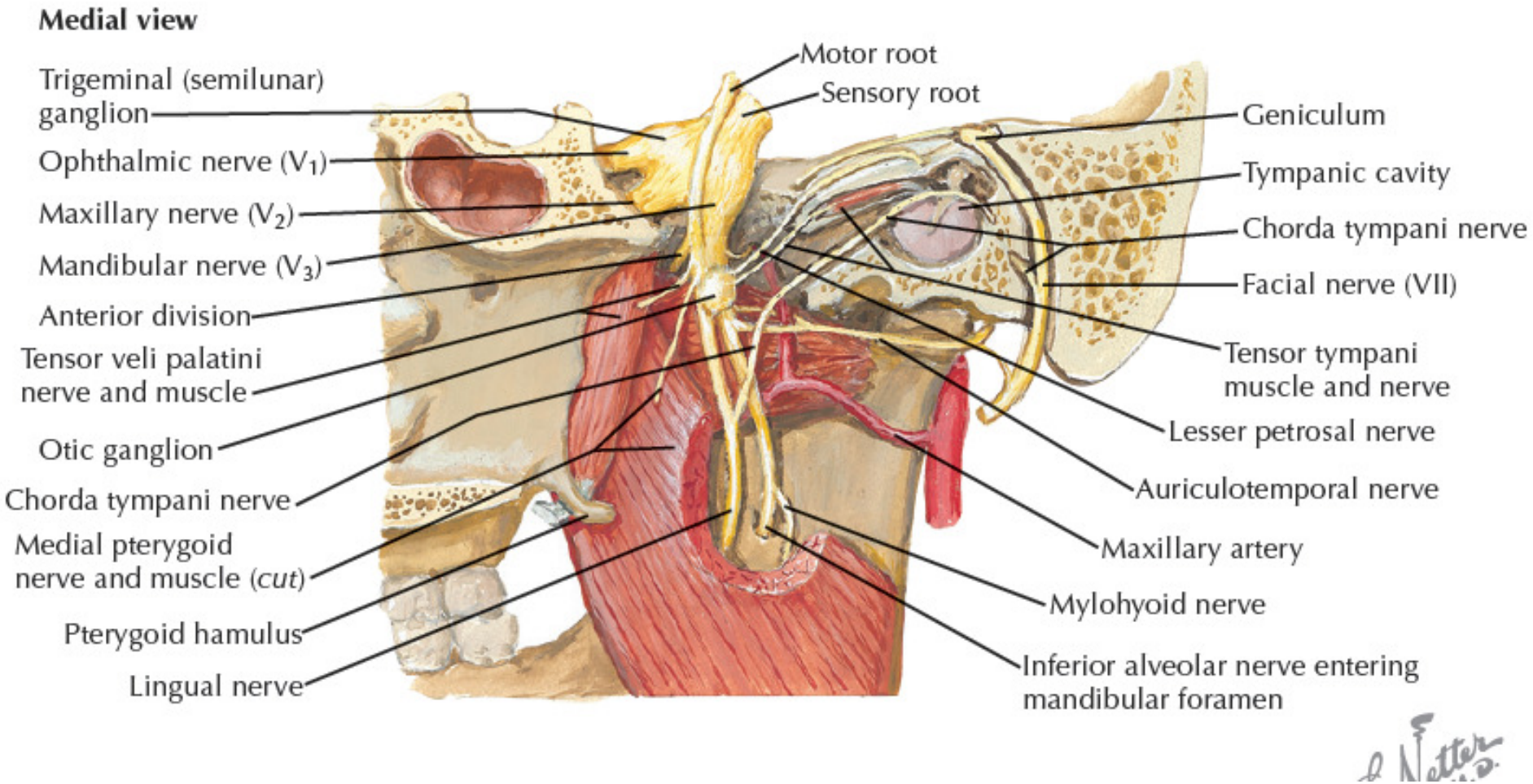




Lesser petrosal nerve

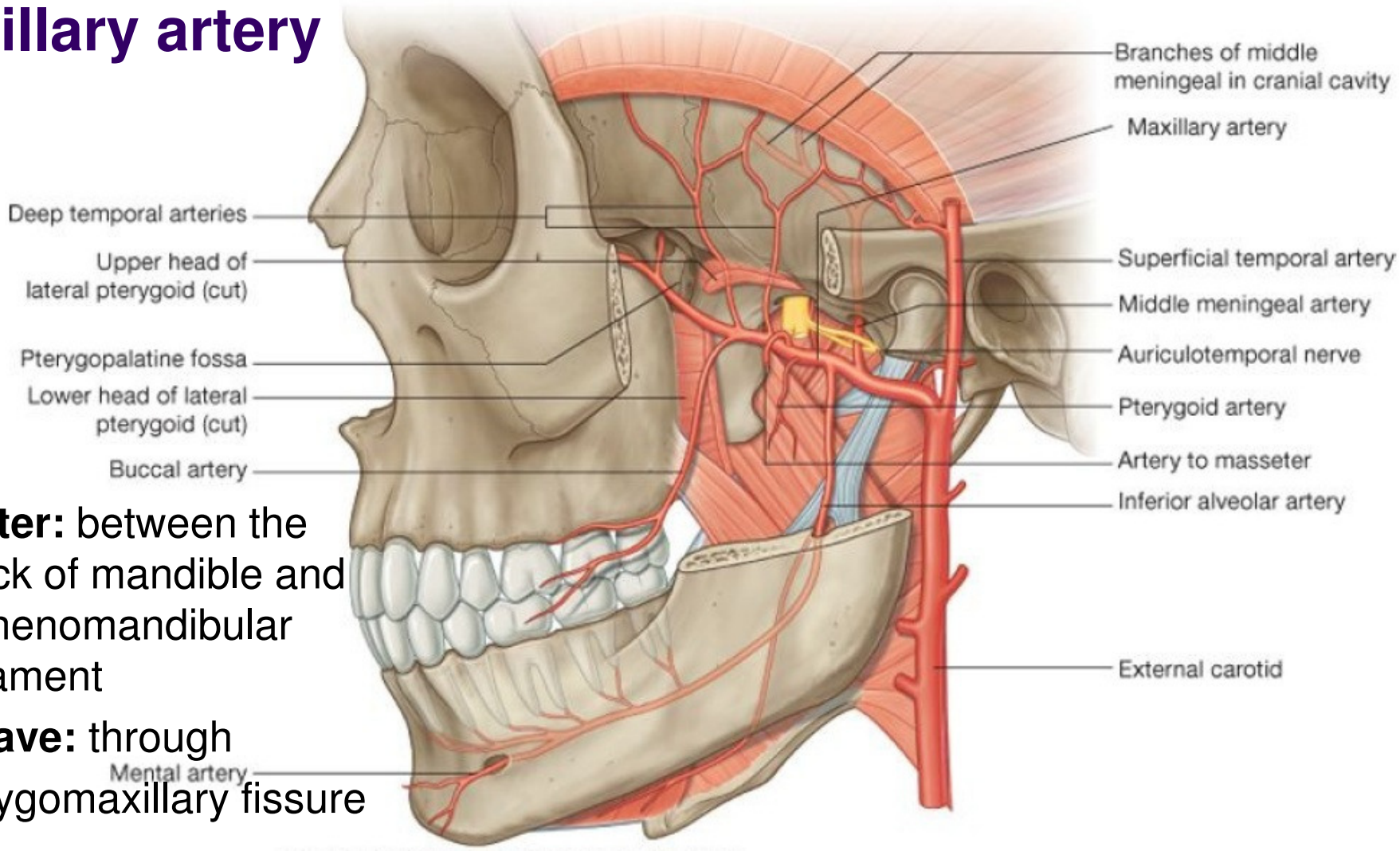
- The tympanic plexus, and the lesser petrosal nerve
- Middle cranial fossa, then through foramen ovale to infratemporal fossa
- Postganglionic fibers pass to the parotid salivary gland.





- Otic ganglion: small stellate-shaped ganglion inferior to the foramen ovale and medial to the mandibular division of the trigeminal n.
- lesser petrosal nerve contains mainly preganglionic parasympathetic fibers for the parotid gland

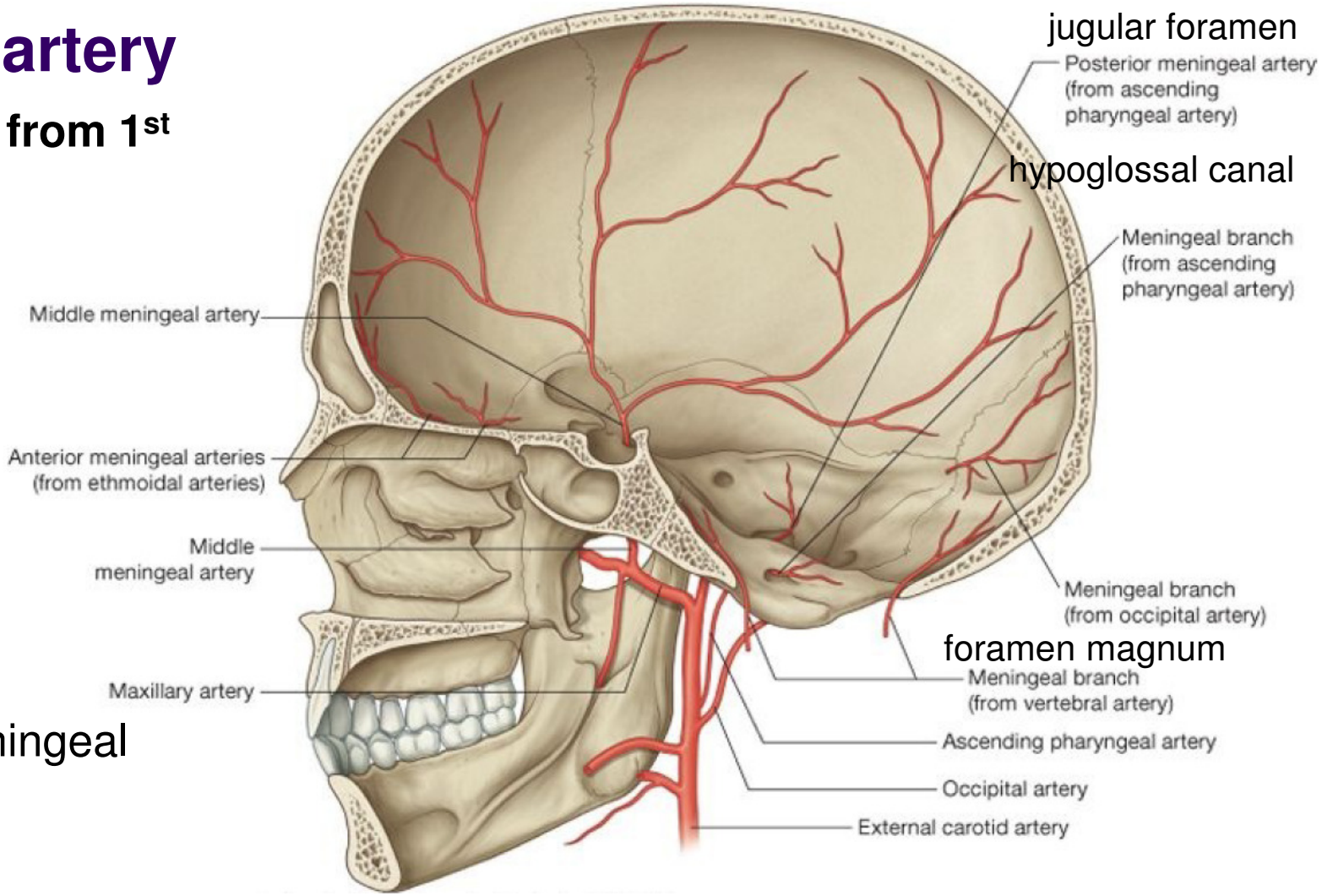
Maxillary artery



- **Enter:** between the neck of mandible and sphenomandibular ligament
- **Leave:** through pterygomaxillary fissure
- Three parts:
  - 1st: between the neck of mandible and sphenomandibular ligament
  - 2nd: related to the lateral pterygoid muscle
  - 3rd: in the pterygopalatine fossa

Maxillary artery

- **Branches from 1st part:**



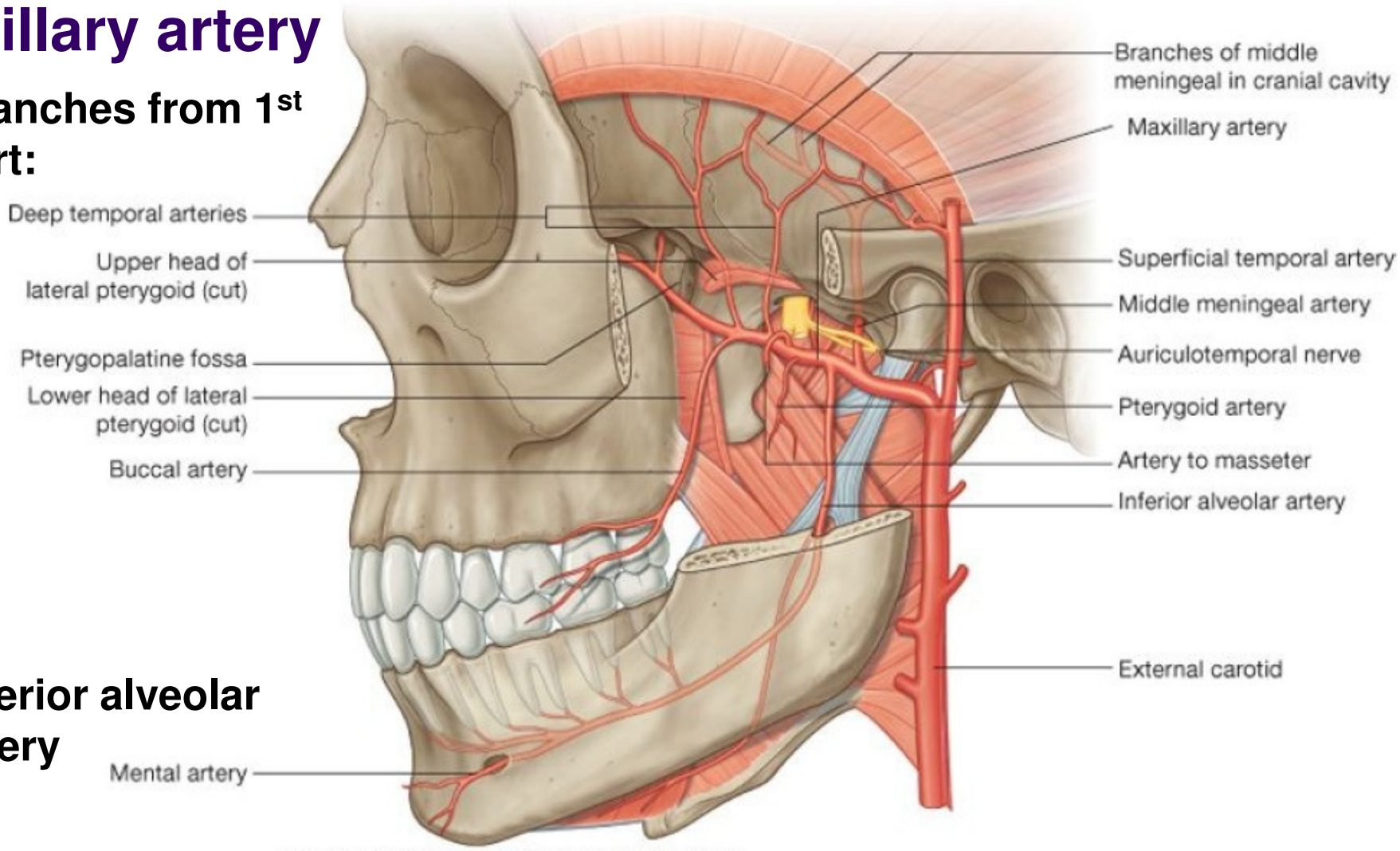
- Middle meningeal artery

Course

- Between the sphenomandibular ligament and the lateral pterygoid
- Between the two roots of auriculotemporal nerve
- Enters through the foramen spinosum

Maxillary artery

- **Branches from 1st part:**

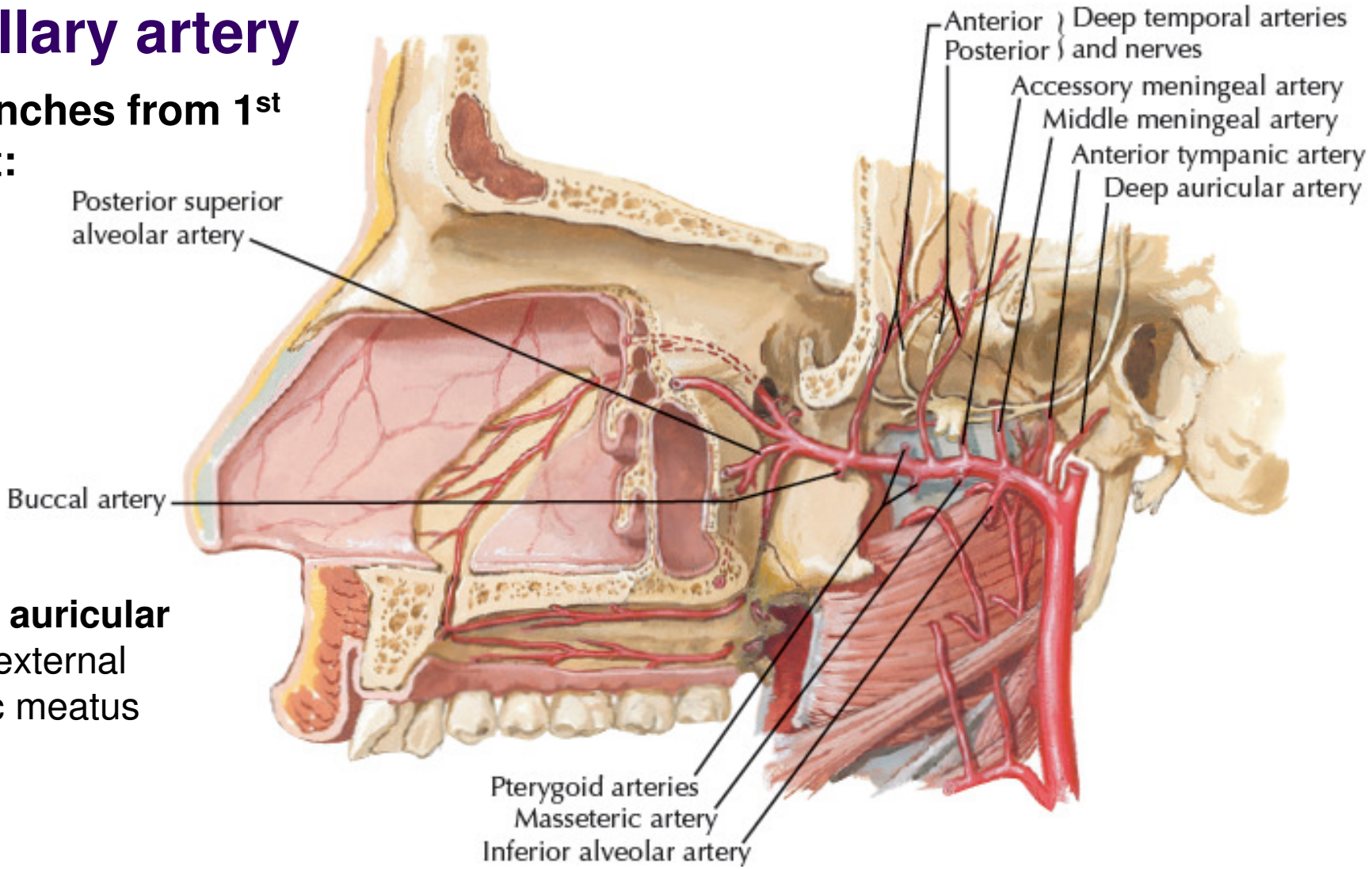


- **Inferior alveolar artery**

  - Enter the mandibular foramen
  - Supplies all lower teeth, buccal gingivae, chin, and lower lip
  - Gives mental artery

Maxillary artery

- **Branches from 1st part:**



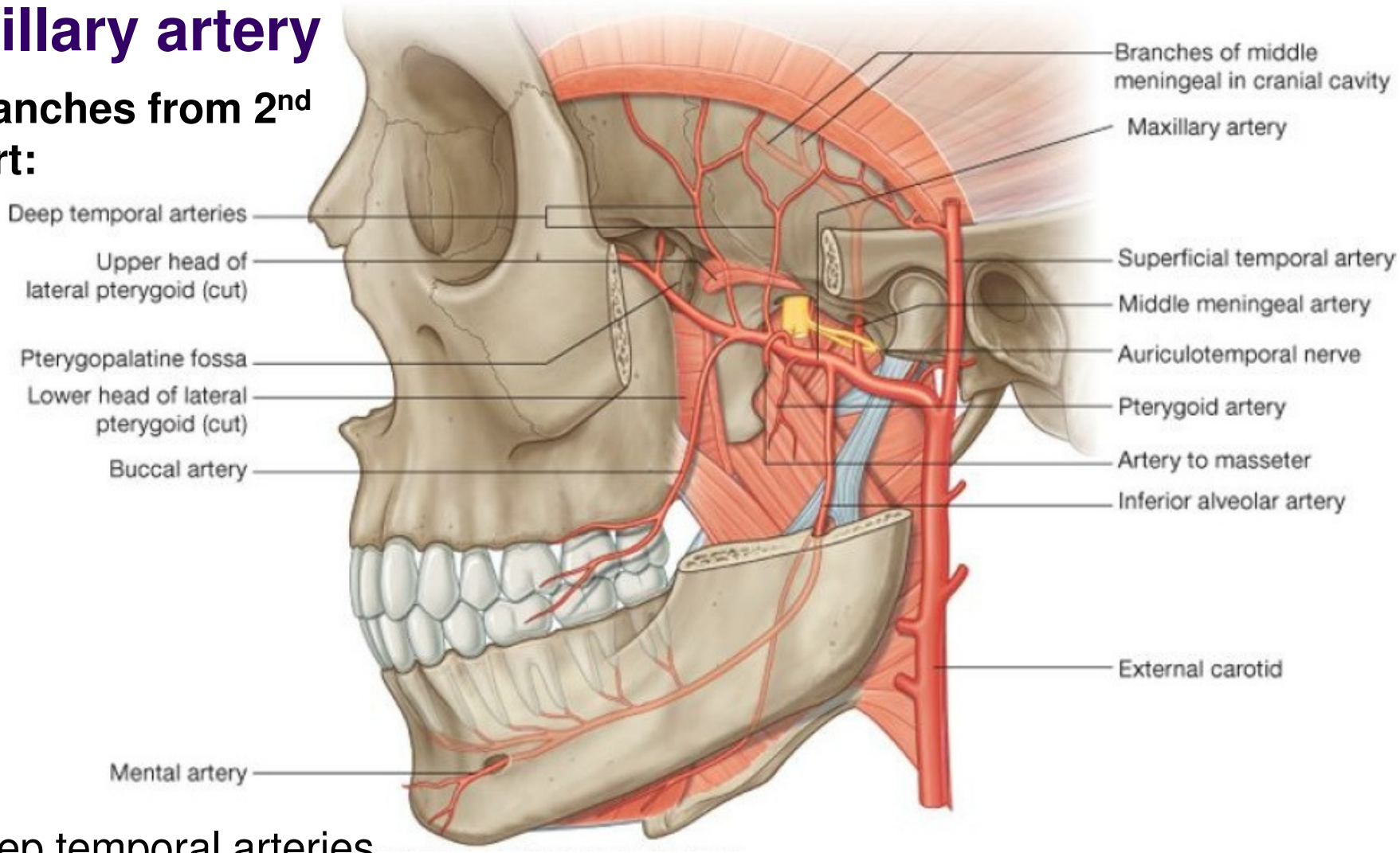
➢ **Deep auricular artery**: external acoustic meatus

➢ **Anterior tympanic artery**: (Through petrotympanic fissure), supplies deep surface of the tympanic membrane

➢ **Accessory meningeal artery**: (Through foramen ovale) supplies dura mater

Maxillary artery

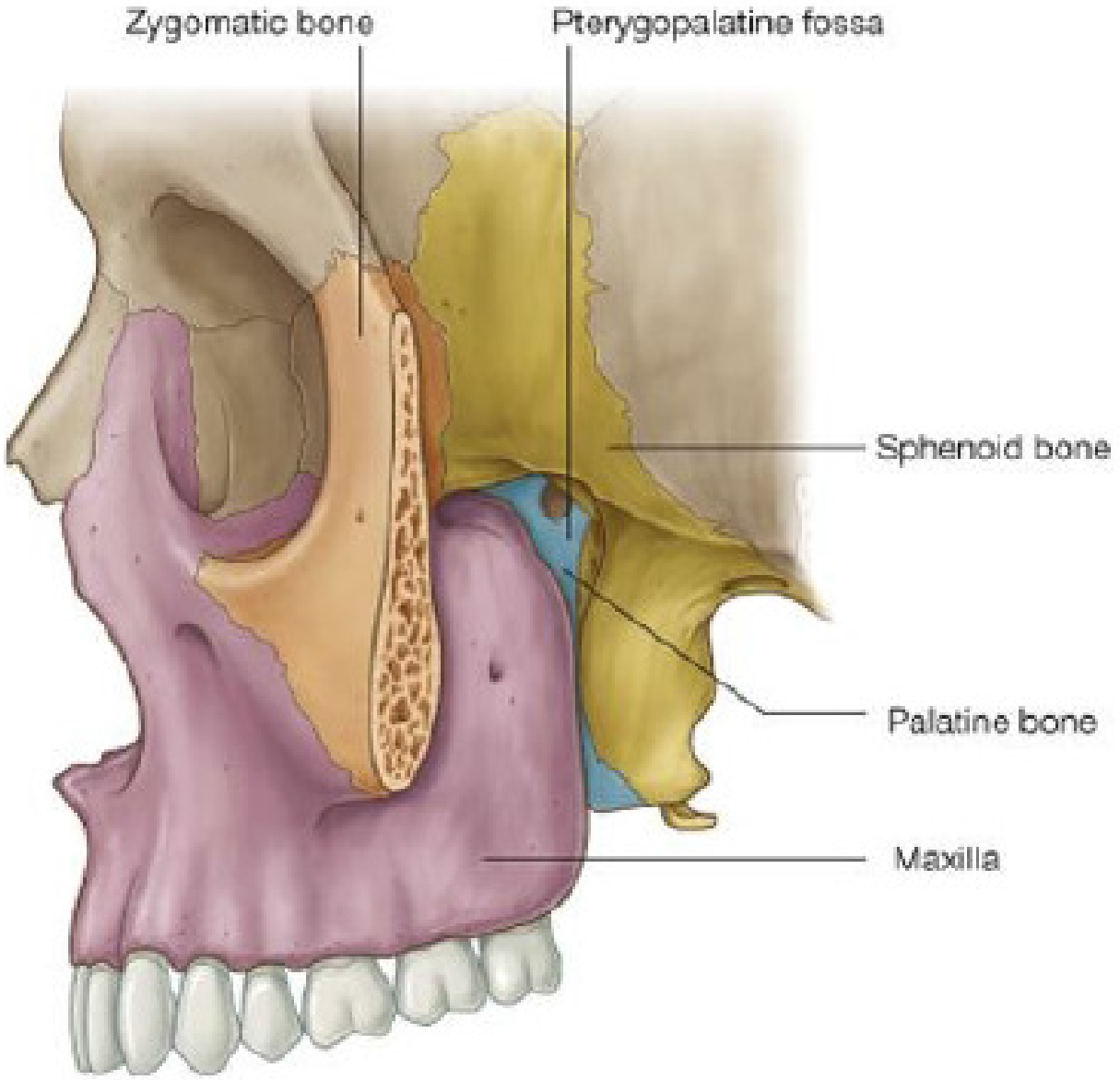
- **Branches from 2nd part:**



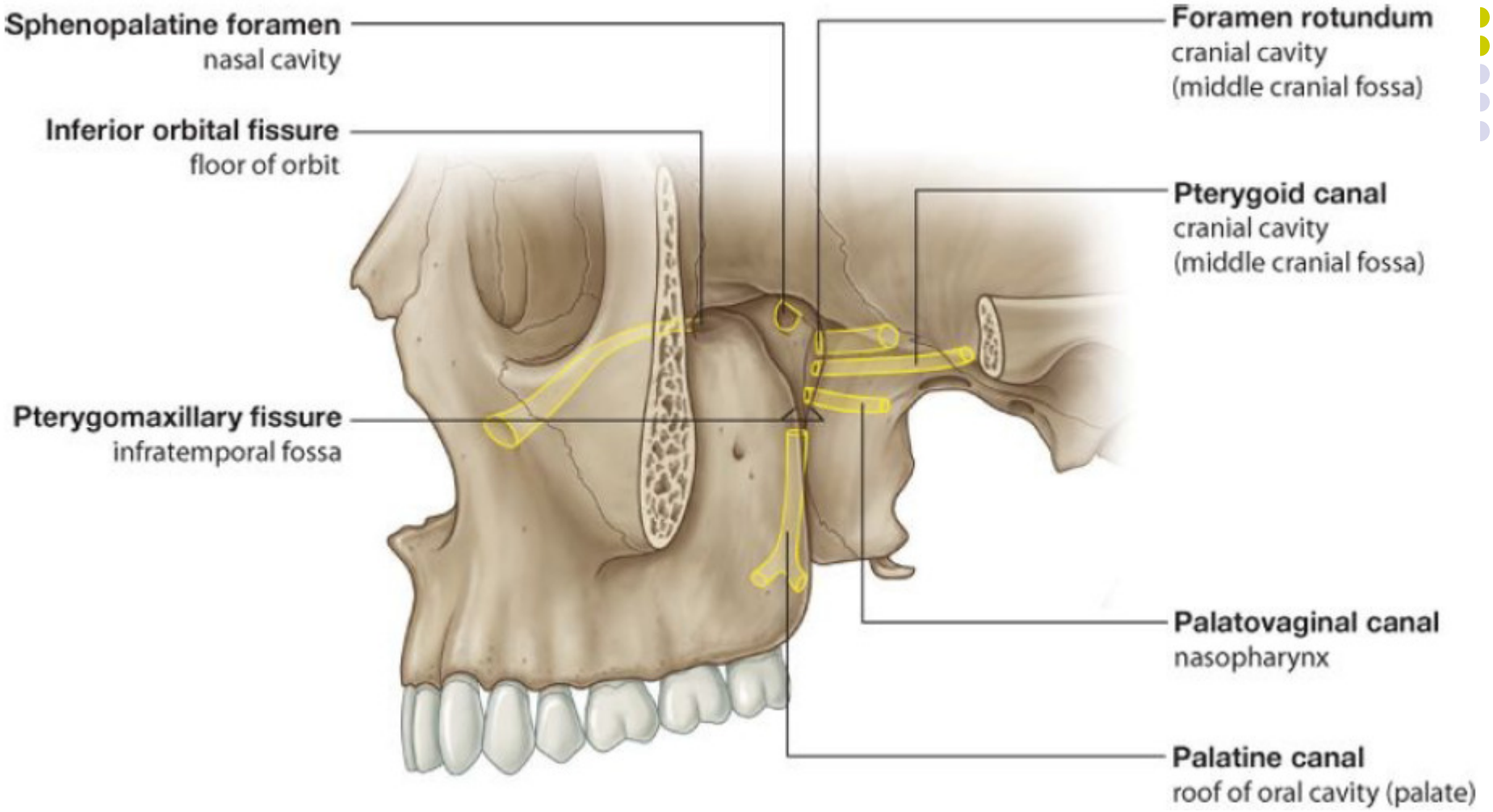
- Deep temporal arteries
- Pterygoid arteries
- Buccal artery
- Masseteric artery

Pterygopalatine Fossa

- Inverted teardrop-shaped space
- lateral side of skull
- Walls:
  - **Anterior**: posterior surface of the maxilla
  - **Medial**: Perpendicular plate of the palatine bone
  - **Posterior**: Pterygoid process of sphenoid bone
  - **Roof**: sphenoid bone

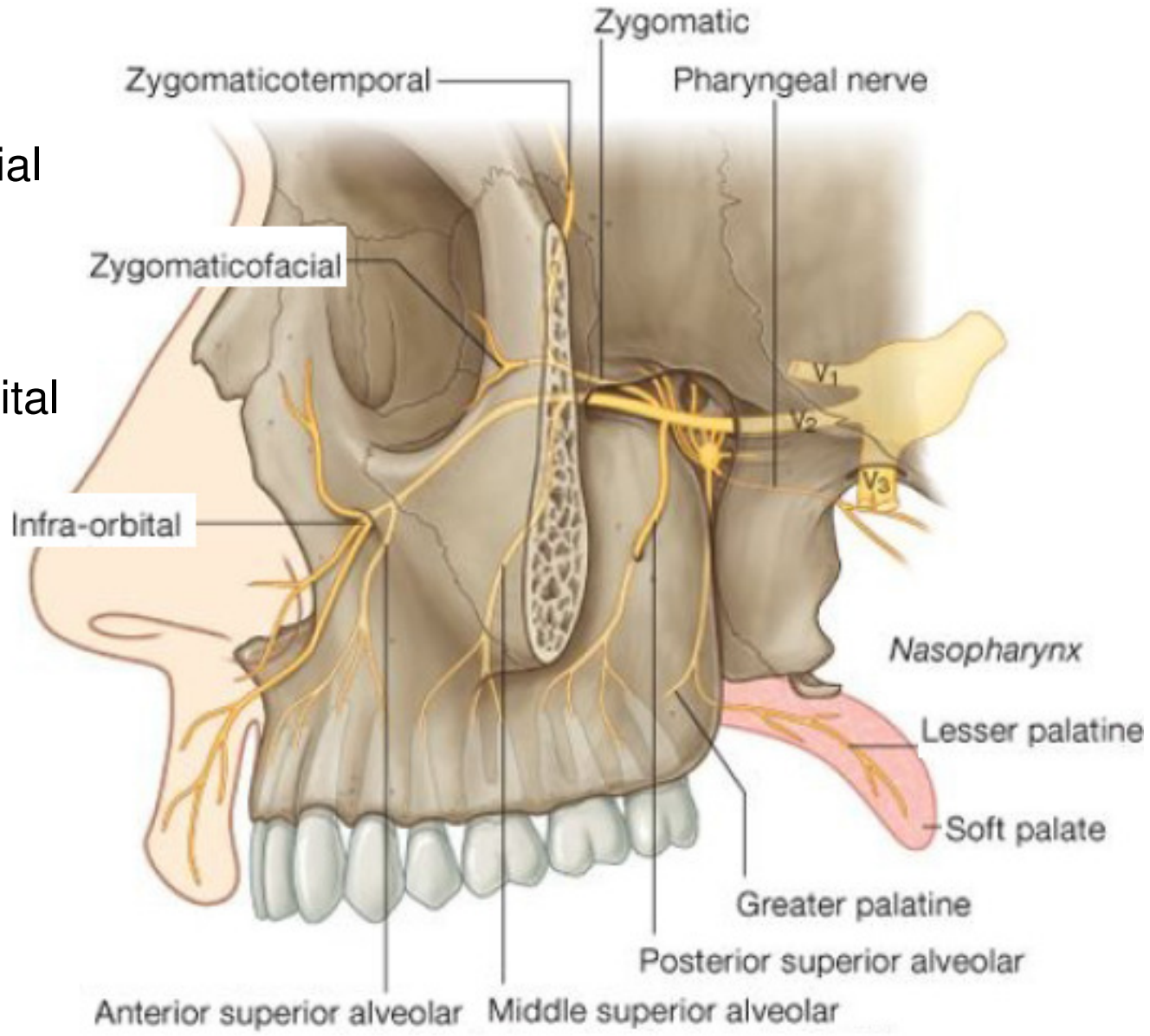


Pterygopalatine Fossa Gateways



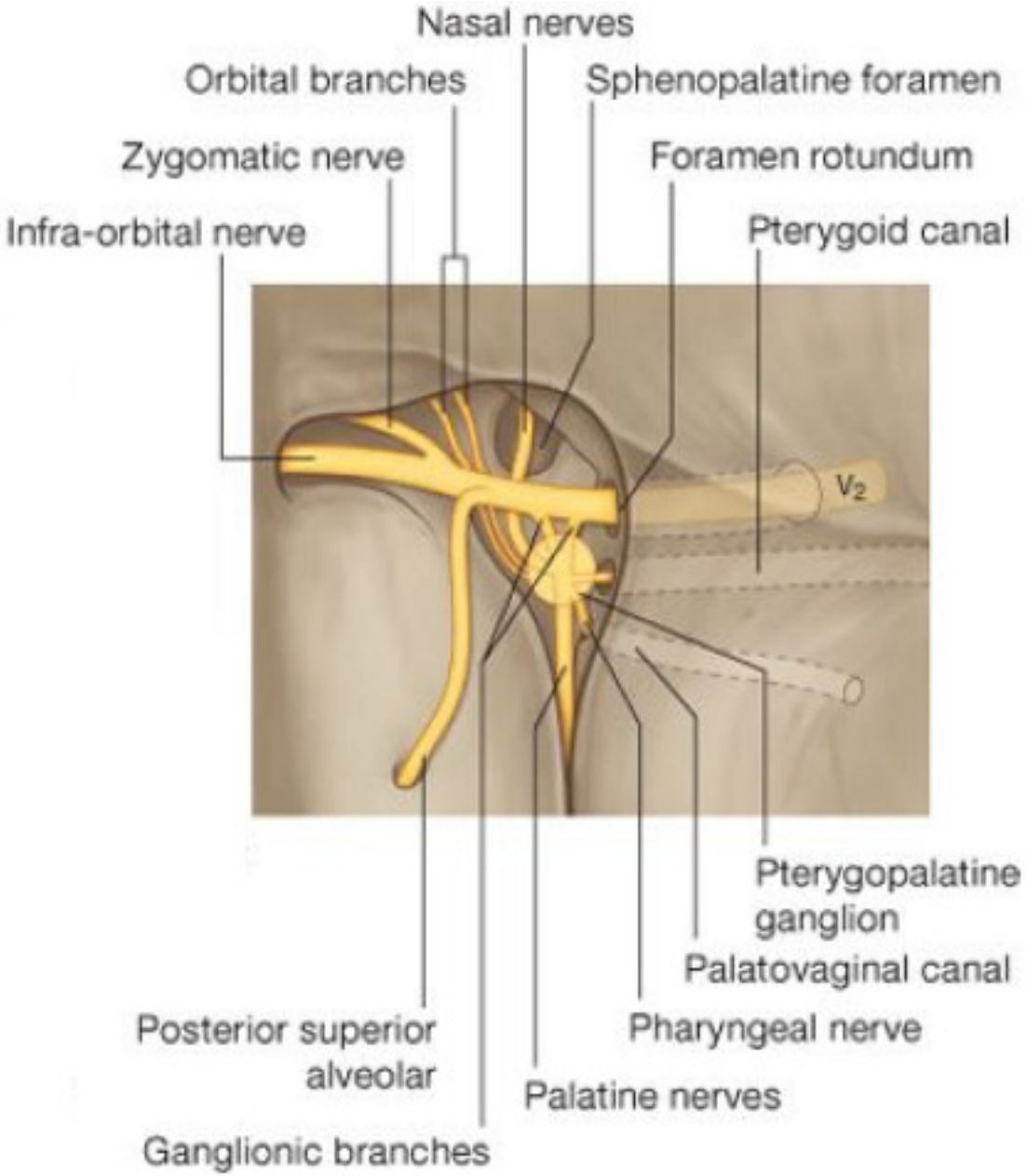
Maxillary nerve

- Exits the middle cranial fossa through the foramen rotundum
- Exits pterygopalatine fossa as the infra-orbital nerve through the inferior orbital fissure



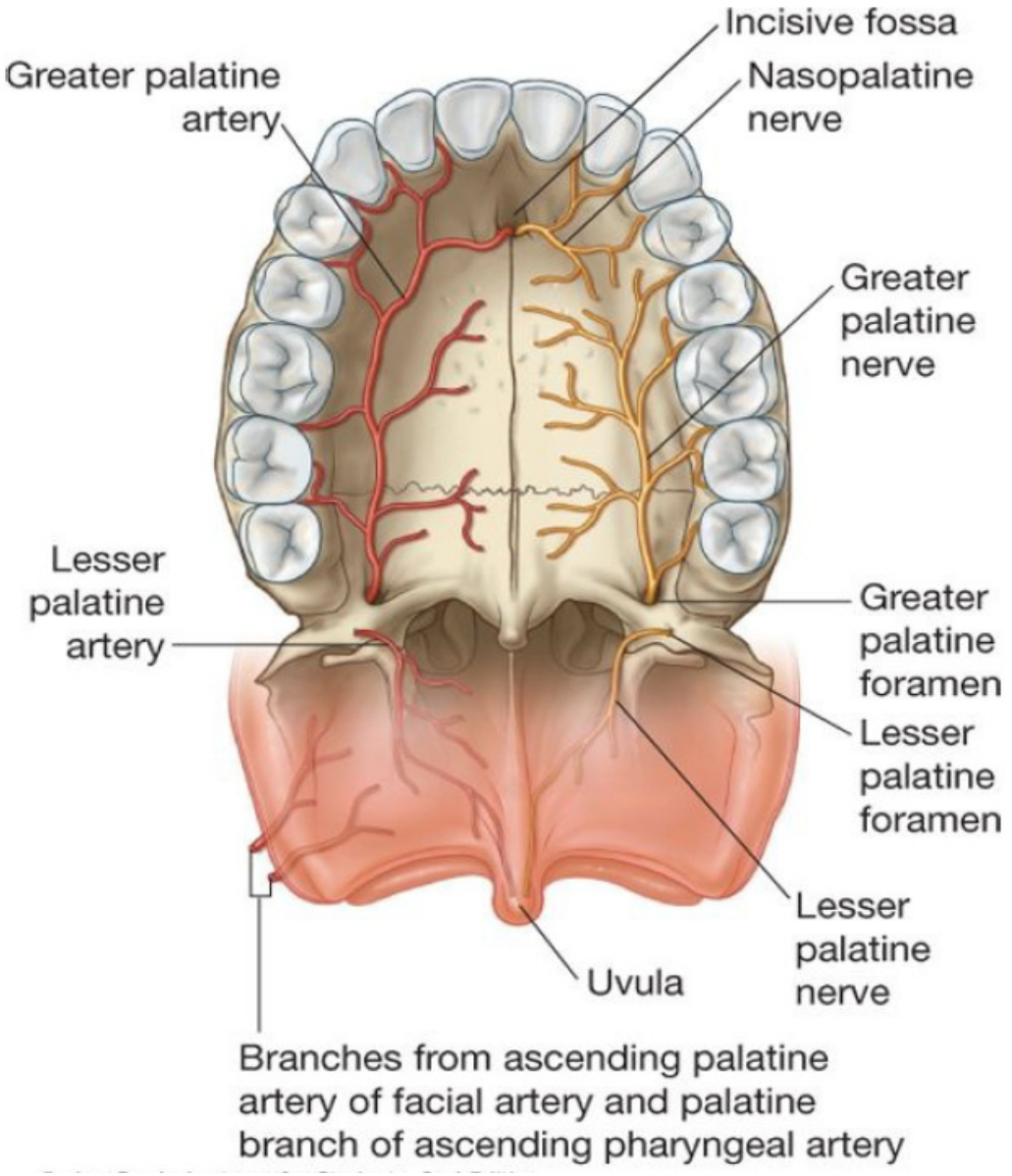
Maxillary nerve branches

- Orbital branches
- Greater palatine nerve
- Lesser palatine nerve
- Nasal nerves
- pharyngeal nerve
- Zygomatic nerve
- Posterior superior alveolar nerve
- Infra-orbital nerve

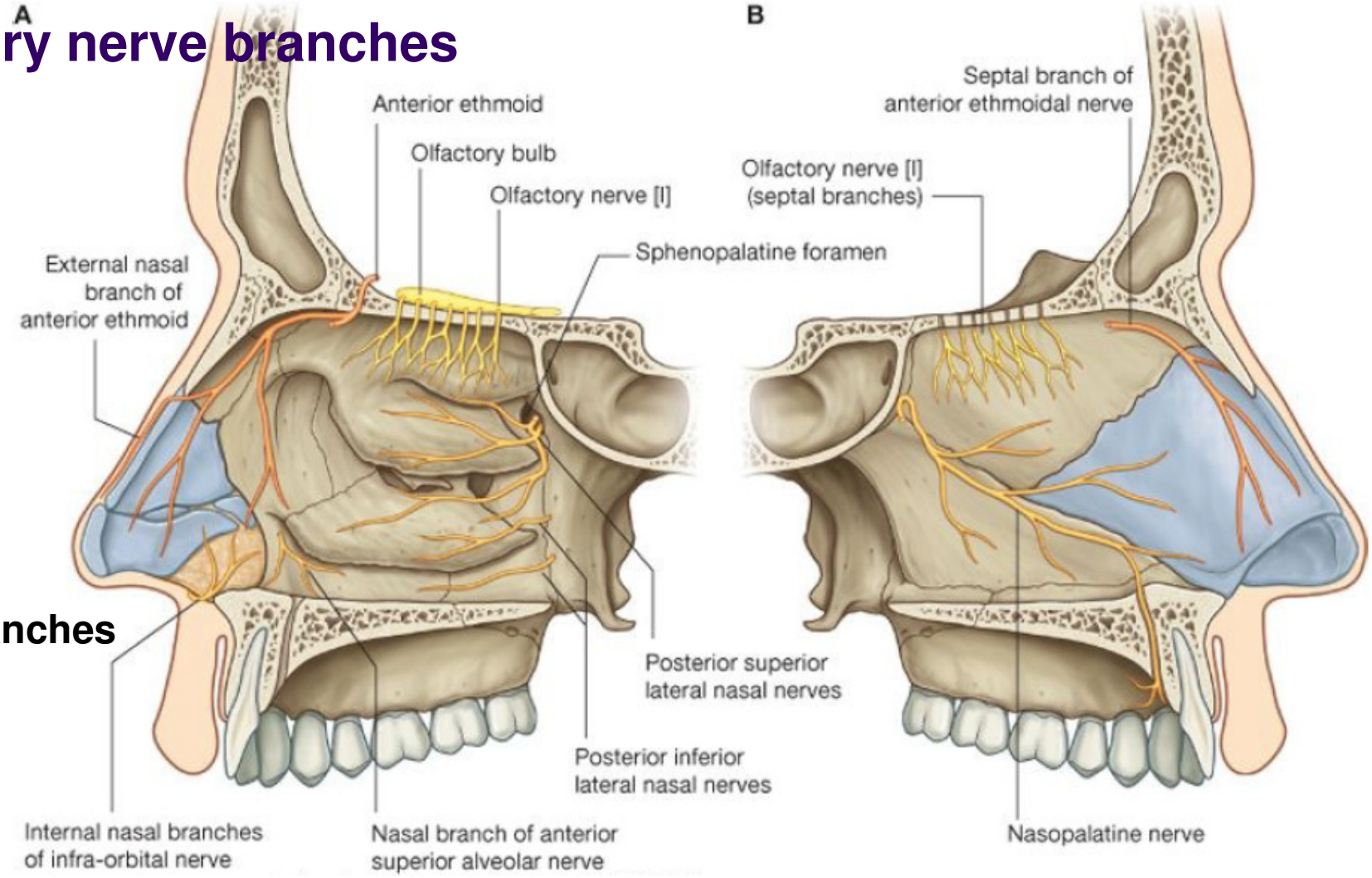


Maxillary nerve branches

- **Greater palatine nerve**
- **Lesser palatine nerve**
  - Pass inferiorly from the pterygopalatine ganglion
  - Through the palatine canal
  - Through small foramina
  - **Greater:**
    - Roof of the oral cavity to innervate mucosa as far as premolars
    - **Posterior inferior nasal nerves**
  - **Lesser**: supply the soft palate

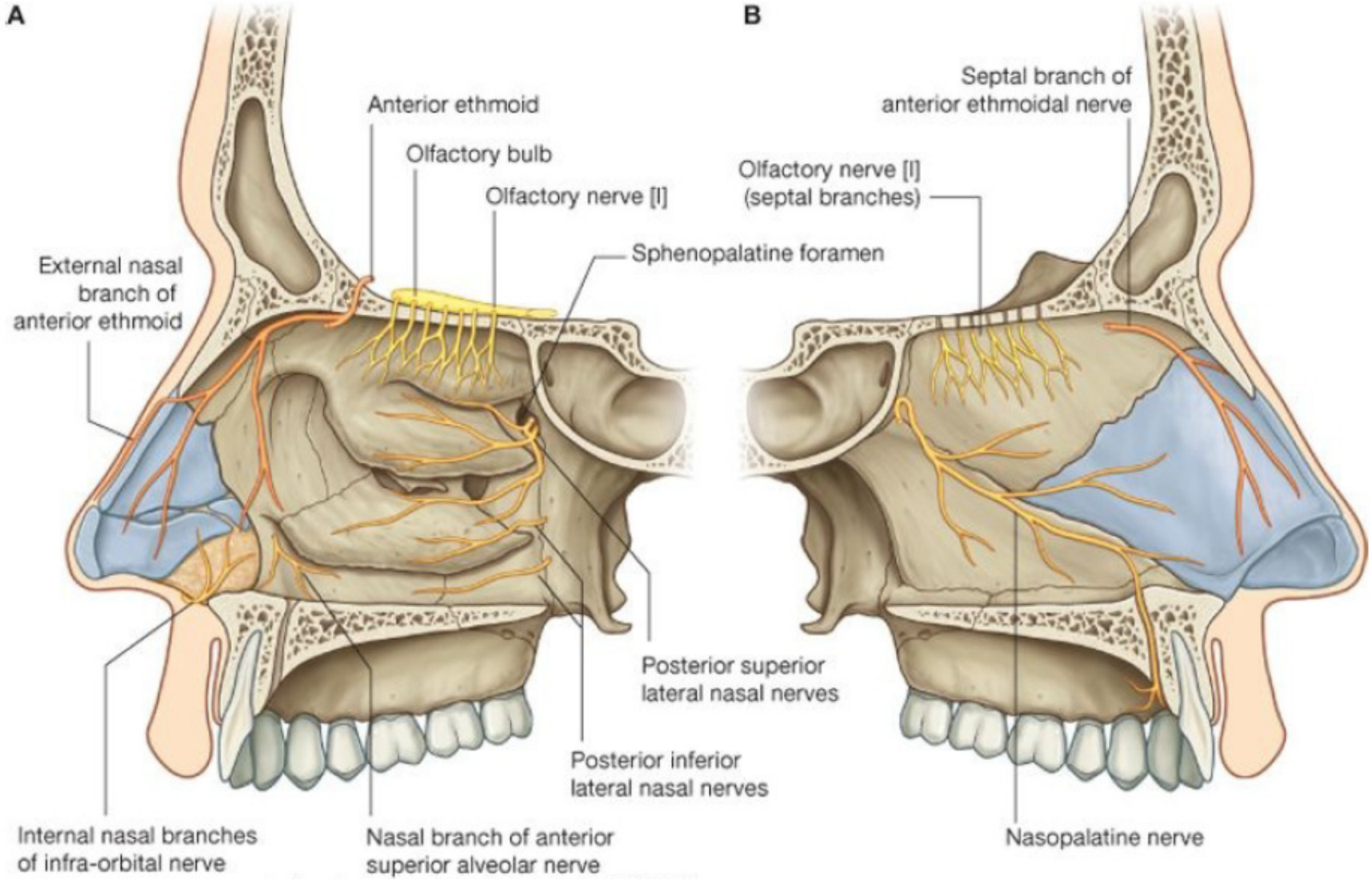


Maxillary nerve branches



Nasal branches

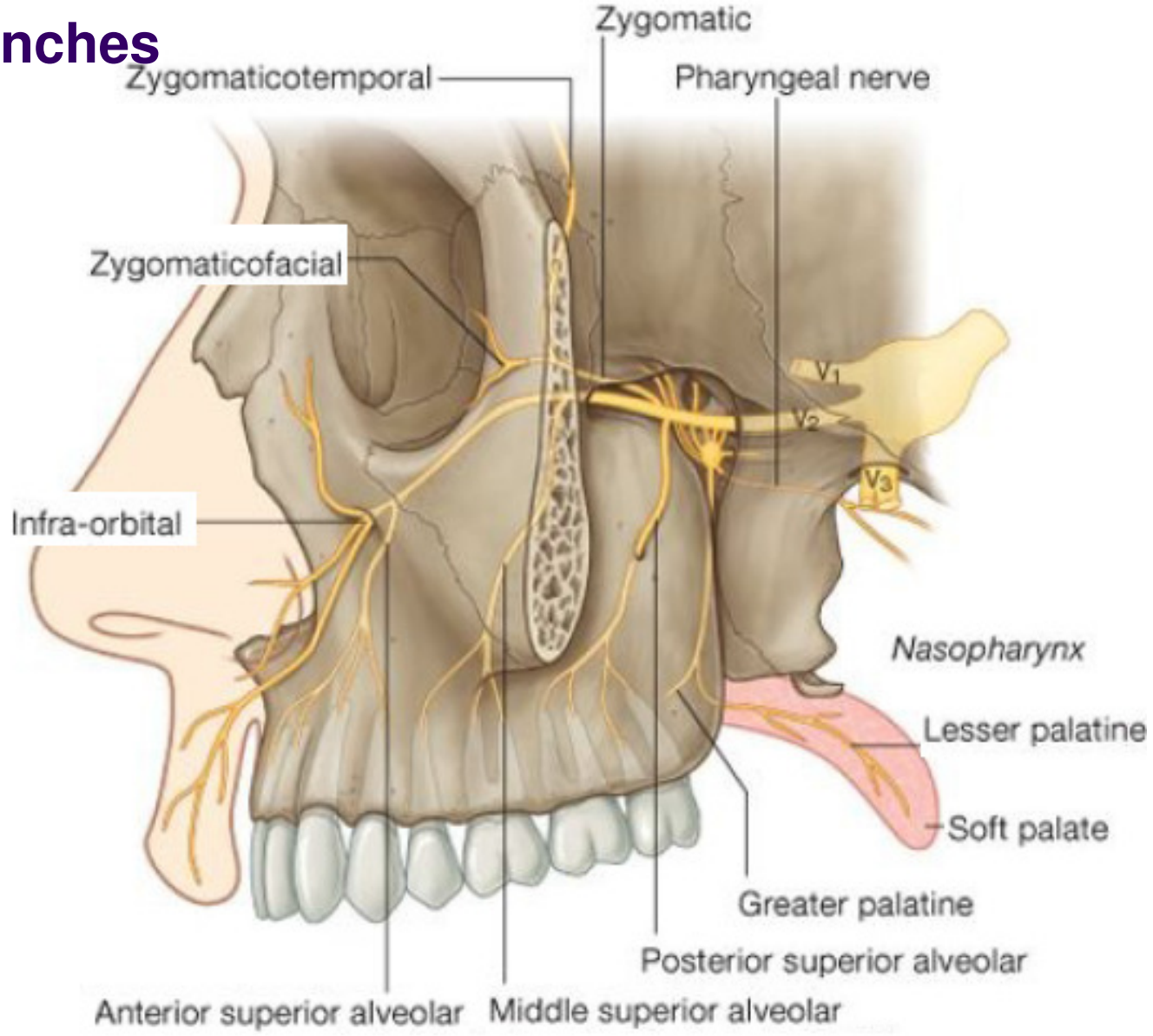
- **Posterior superior lateral nasal nerves:** (through the sphenopalatine foramen, supply the lateral wall of the nasal cavity)
- **Posterior superior medial nasal nerves:** supplies the roof and the nasal septum



- **Nasal branches from the maxillary nerve:**
- **Nasopalatine nerve:** (largest) passes forward and down the medial wall of the nasal cavity to pass through the incisive canal onto the roof of the oral cavity, and terminates by supplying the oral mucosa posterior to the incisor teeth

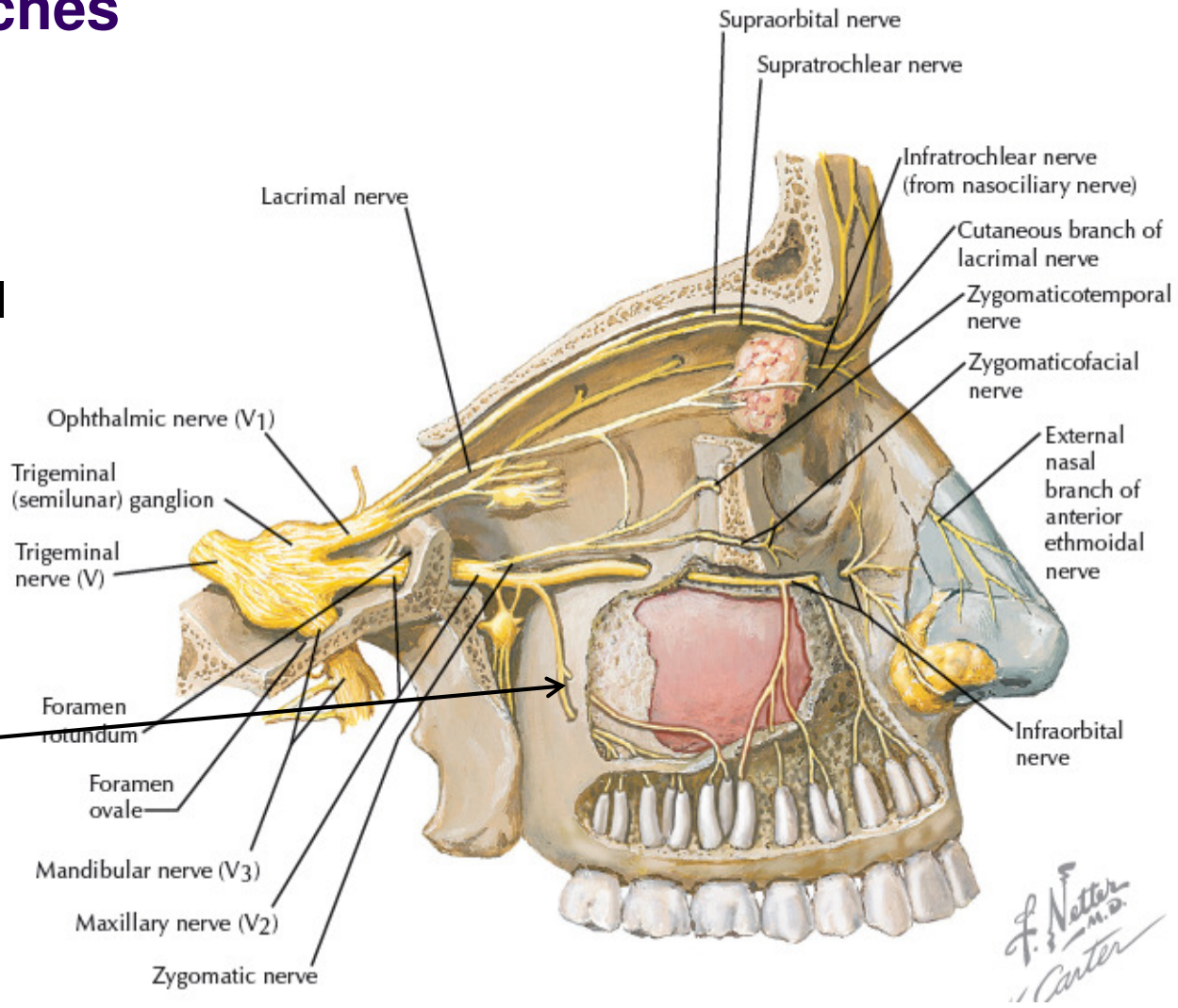
Maxillary nerve branches

- **Pharyngeal nerve**
  - Passes posteriorly from the pterygopalatine ganglion
  - Leaves through the palatovaginal canal
  - Supply the mucosa and glands of the nasopharynx



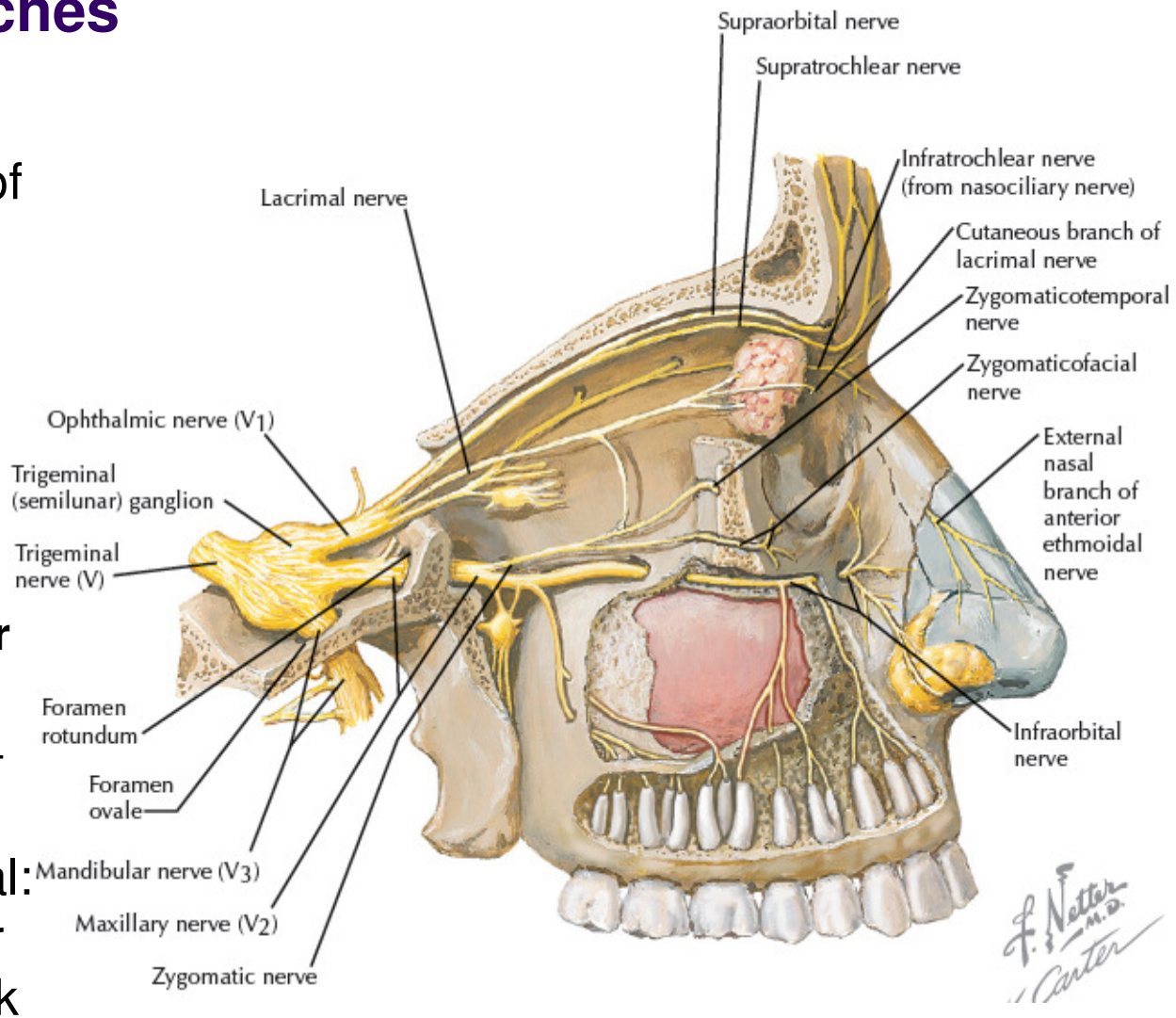
Maxillary Nerve branches

- **Zygomatic nerve**:
  Pteyrgopalatine fossa
  Inferior orbital fissure
  - Zygomaticotemporal nerve: skin over the temple
  - Zygomaticofacial N: skin over the prominence of the cheek
- **Posterior superior alveolar nerve:**
  - through the pterygomaxillary fissure
    - through a small alveolar foramen:
    - supplies the molar teeth and adjacent buccal gingivae and maxillary sinus



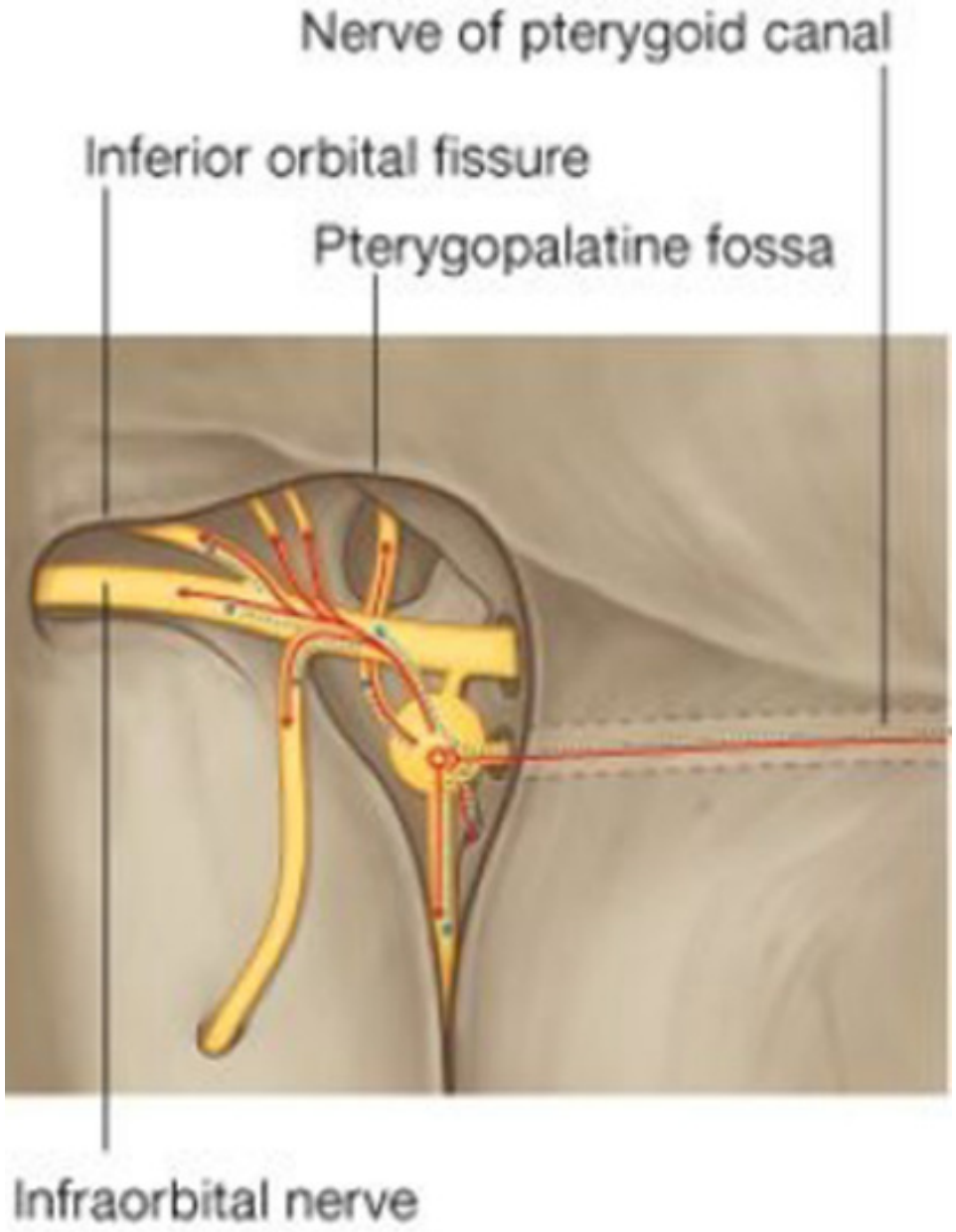
Maxillary Nerve branches

- **Infraorbital nerve:**
  - Direct continuation of the maxillary nerve
  - through the inferior orbital fissure
  - infra-orbital canal
    - **Middle superior alveolar**
    - **Anterior superior alveolar**
  - Exits through the infra-orbital foramen
    - Inferior palpebral: skin of the lower eyelid and cheek
    - Nasal: the side of the nose (ala)
    - Superior labial: upper lip



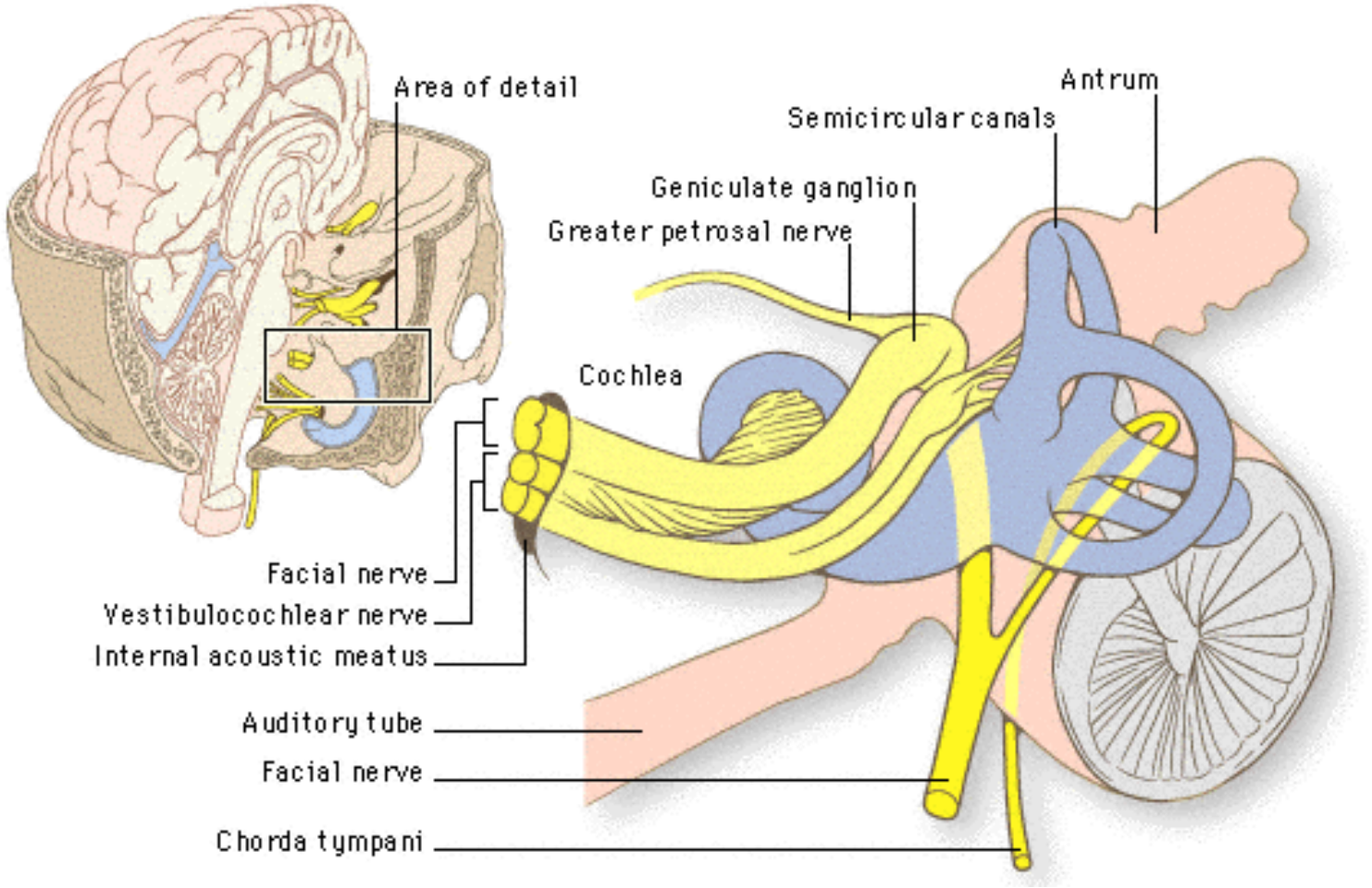
Nerve of the pterygoid canal

- Formed in the middle cranial fossa by the union of:
  - Greater petrosal nerve (branch of the facial nerve)
  - Deep petrosal nerve (branch of the internal carotid plexus).
- Enters through pterygoid canal
- Join pterygopalatine ganglion
- Caries:
  - preganglionic parasympathetic fibers from greater petrosal
  - postganglionic sympathetic fibers from deep petrosal



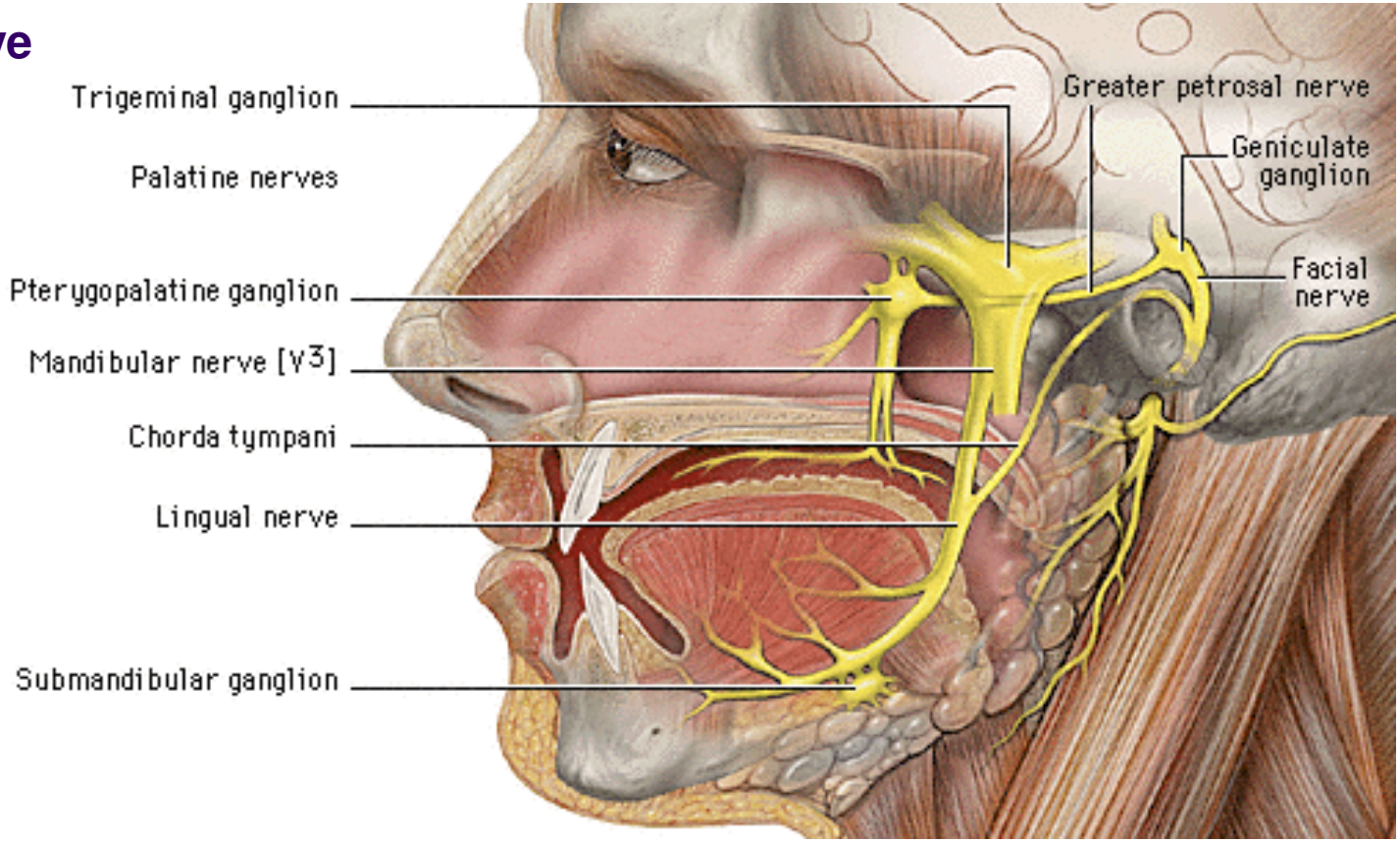
Greater petrosal nerve

- Branch from facial in middle ear cavity
- Medial wall of the tympanic cavity from **geniculate ganglion**
- Leave to Middle cranial fossa through the greater petrosal foramen



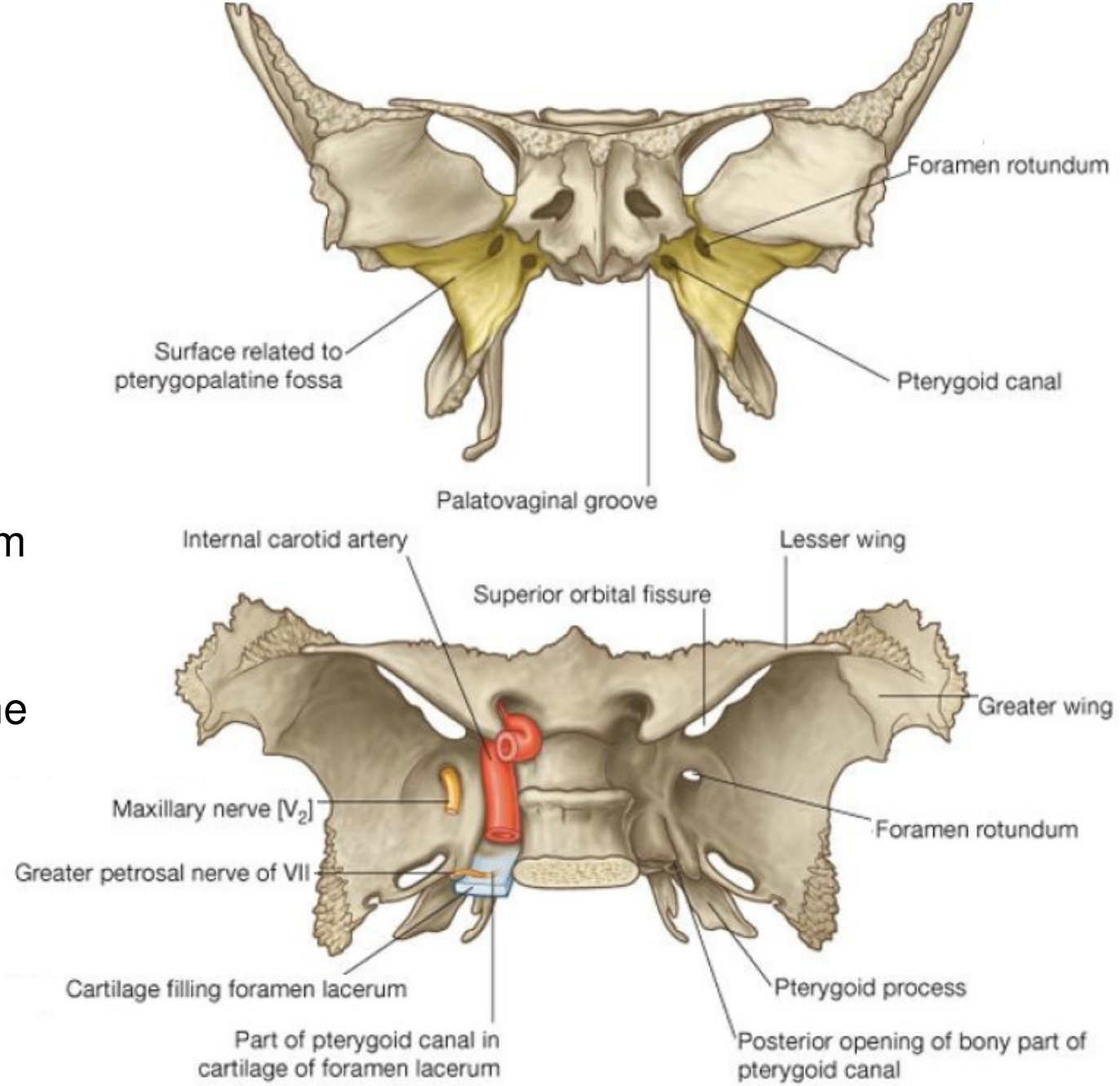
Greater petrosal nerve

- Passes over **Foramen lacerum**, where it joins deep **petrosal nerve** to form the nerve to pterygoid canal
- Pterygoid canal
- Pterygopalatine gangilion
- Maxillary nerve



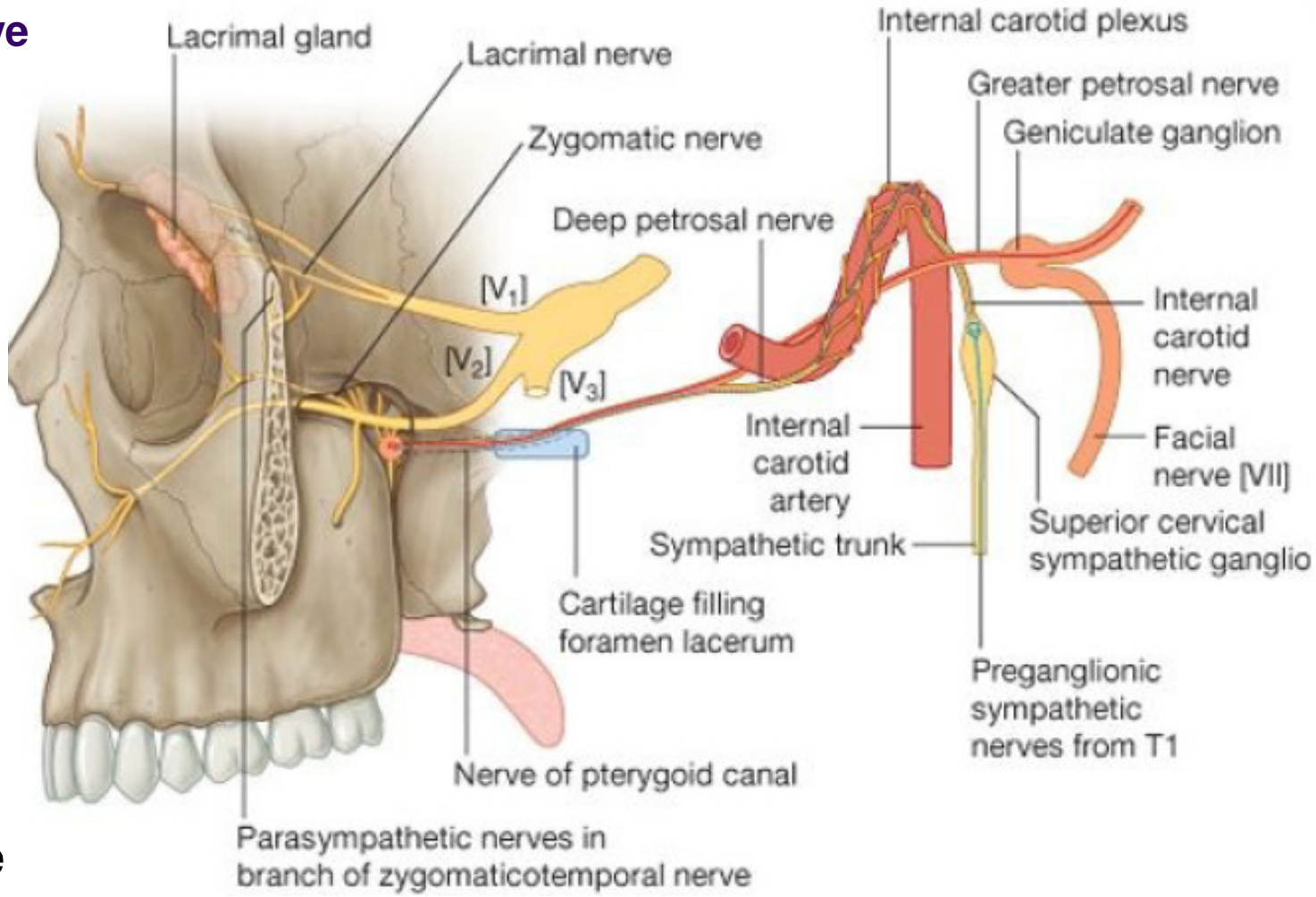
Greater petrosal nerve

- Posterior margin of the middle cranial fossa
- Under the internal carotid artery
- Superior surface of the cartilage filling the foramen lacerum
- Joined by the deep petrosal nerve to form the nerve of the pterygoid canal



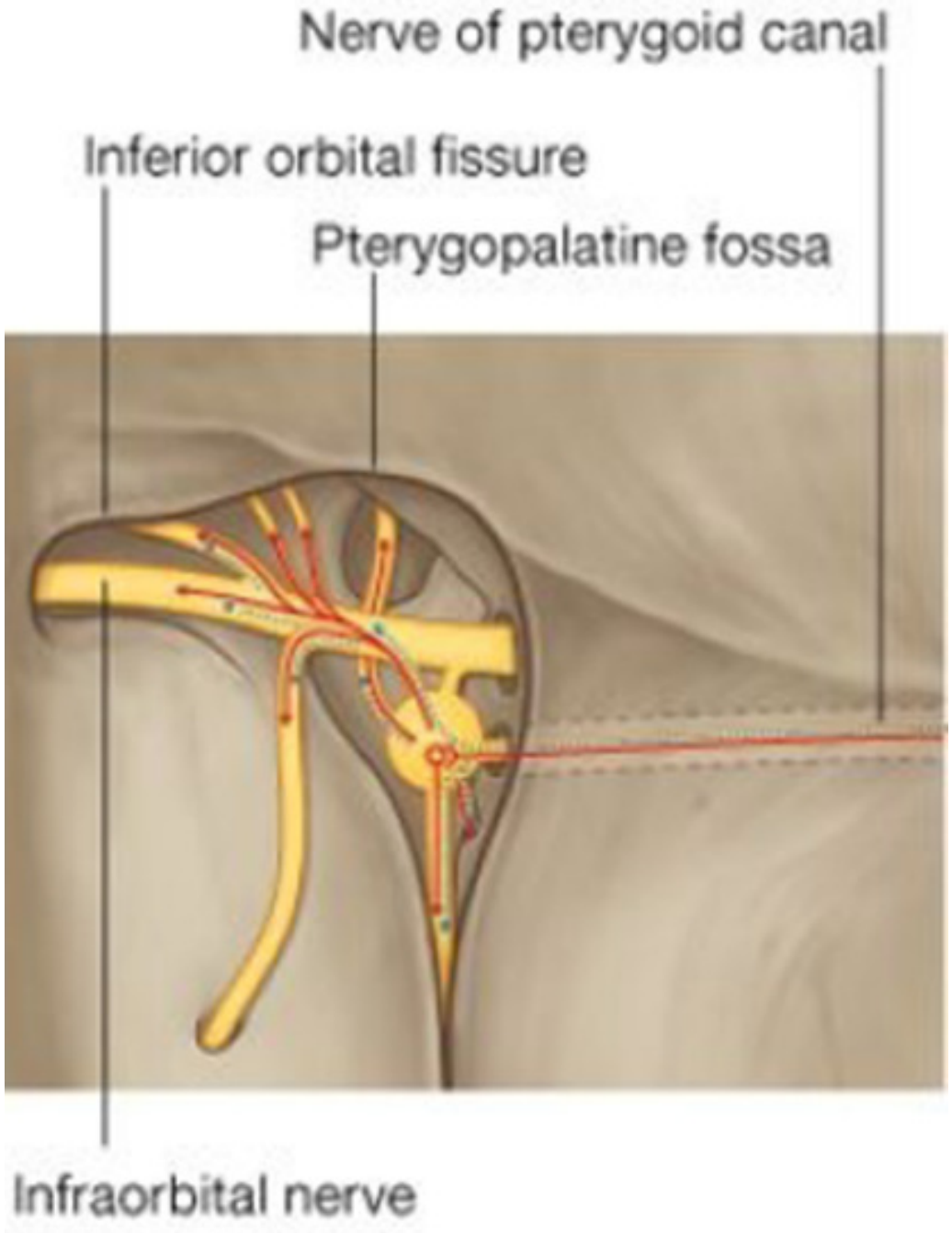
Deep petrosal nerve

- Postganglionic sympathetic fibers
- originate in the superior cervical sympathetic ganglion in the neck
- leave the ganglion (superior cervical) as the internal carotid nerve



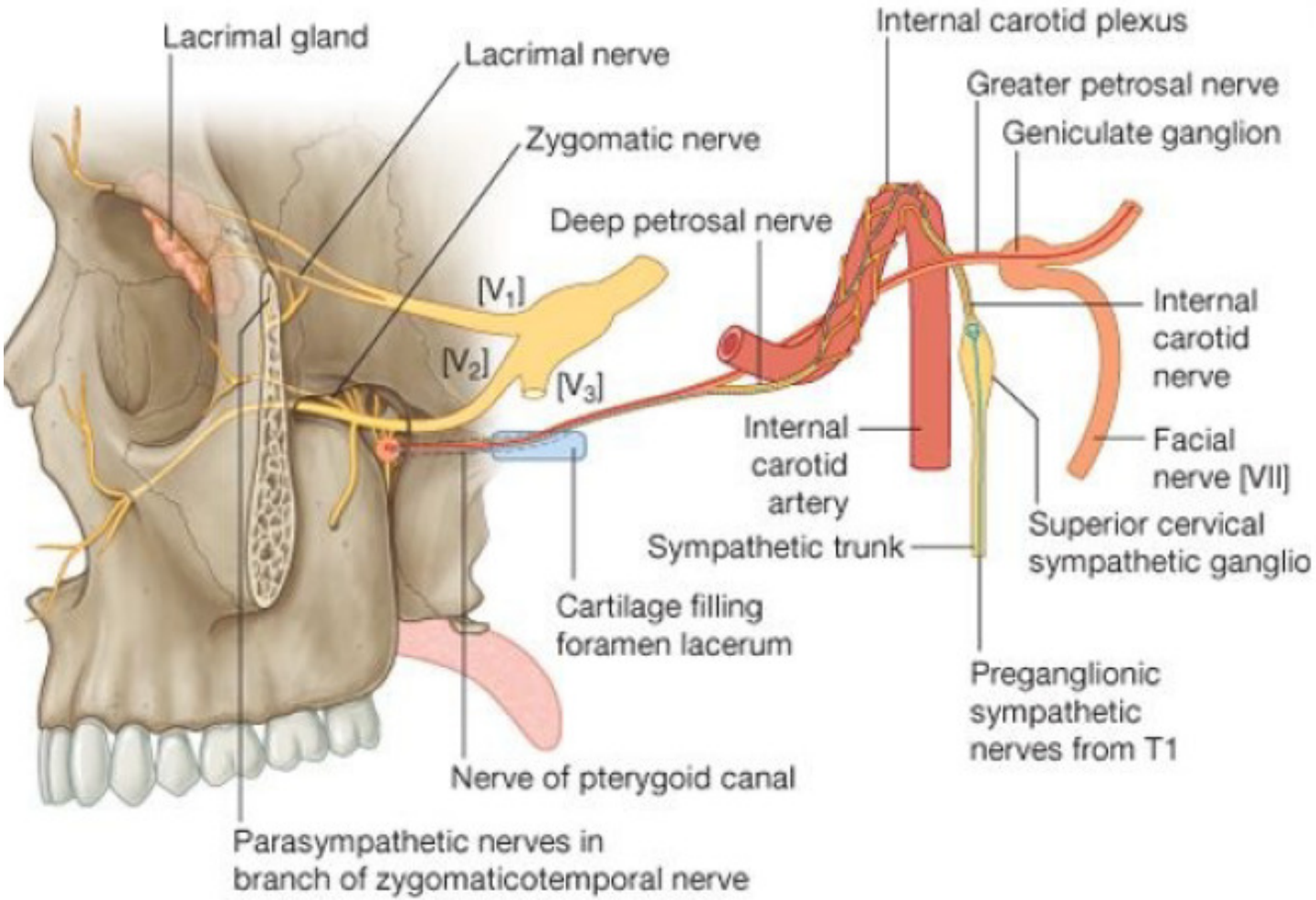
Pterygopalatine ganglion

- largest of the four parasympathetic ganglia in the head
- postganglionic parasympathetic fibers originate in the pterygopalatine ganglion + postganglionic sympathetic fibers passing through the ganglion
- Distribute with
  - orbital, palatine, nasal, and pharyngeal branches
- Supplies:
  - Mucous glands in the nasal cavity
  - Salivary glands in the upper half of the oral cavity
  - lacrimal gland in the orbit.

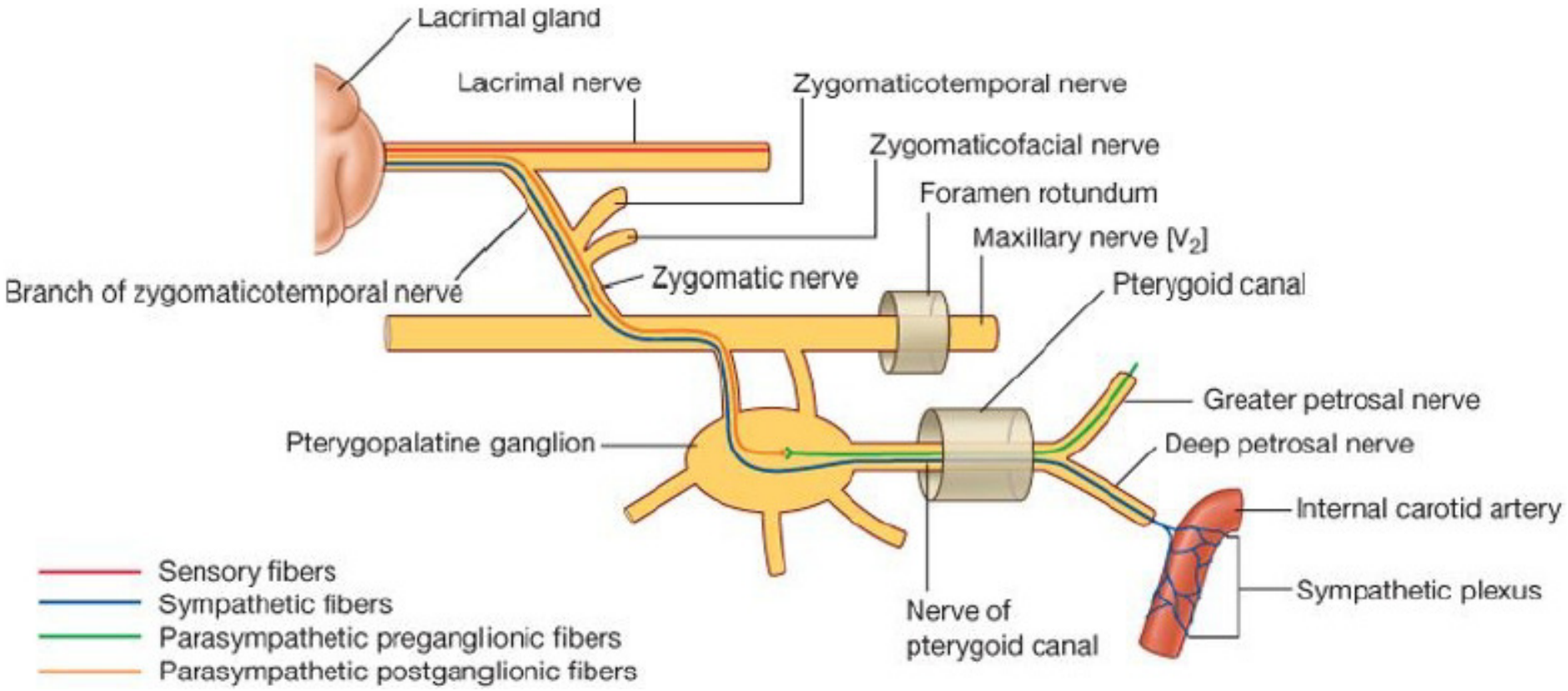


Deep petrosal nerve

- Fibers from pterygopalatine ganglion join main trunk of the maxillary nerve and distributed with:
  - Zygomatic
  - Posterior superior alveolar
  - Infra-orbital

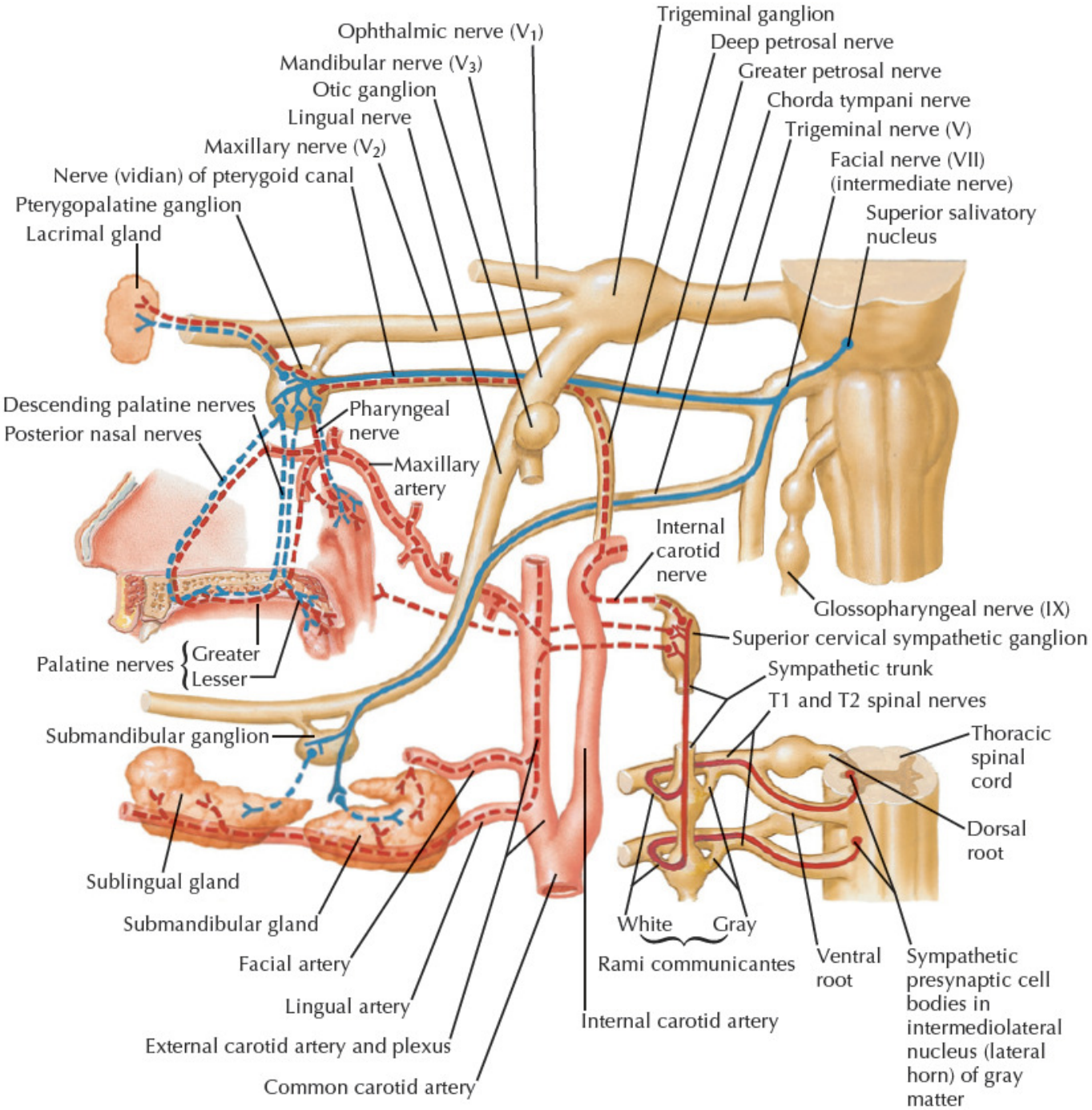


➢ Fibers leave the zygomaticotemporal branch of the zygomatic nerve travels up the lateral orbital wall to join the lacrimal nerve



❖ Nerve supply of lacrimal gland

- The lacrimal nerve is a major general sensory branch of the ophthalmic nerve
- Parasympathetic innervation: originally from great petrosal nerve branch of facial
- Sympathatic innervation : originally from deep petrosal nerve from carotid plexus, superior cervical ganglia

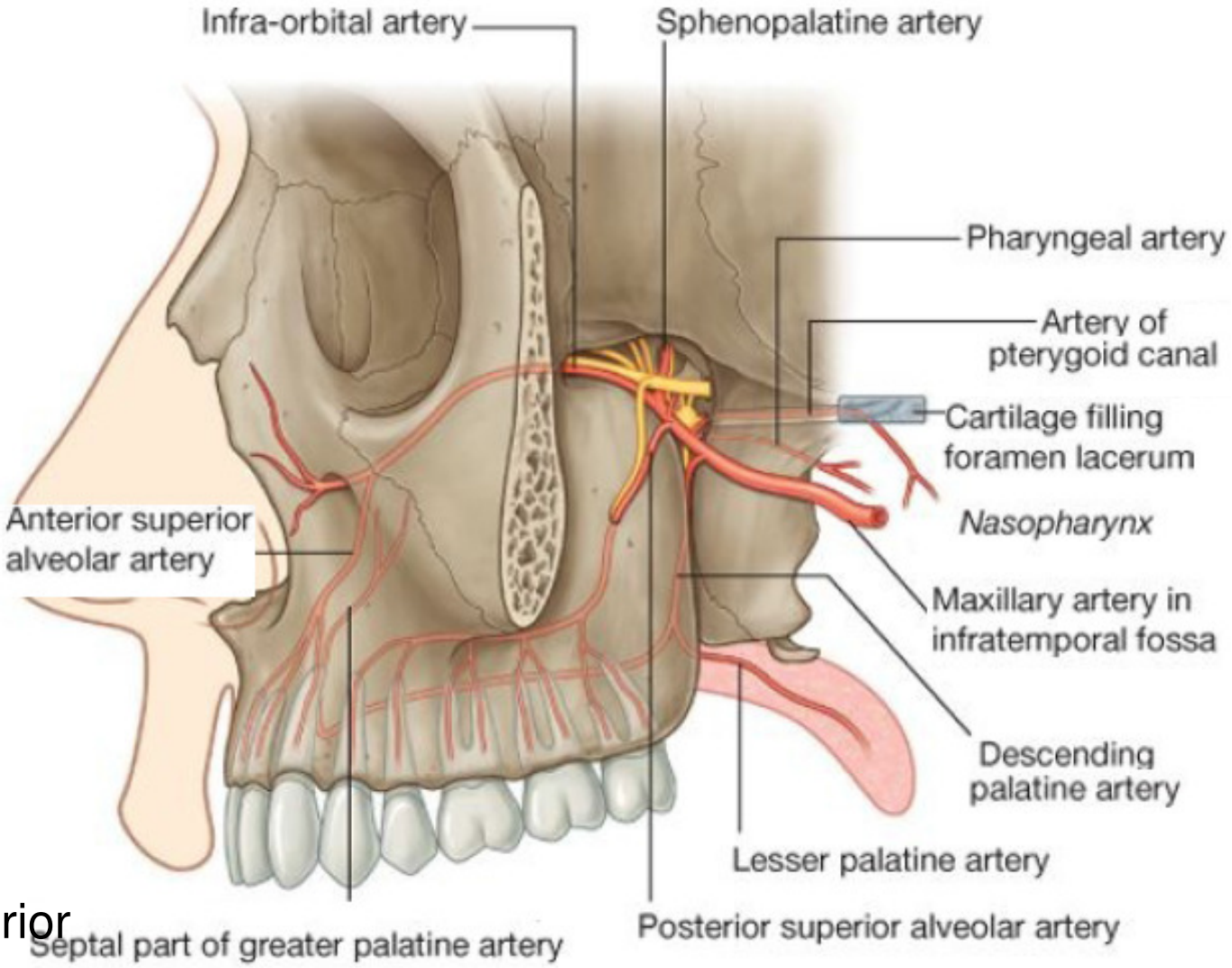

Ophthalmic nerve (V_1)
Mandibular nerve (V_3)
Otic ganglion
Lingual nerve
Maxillary nerve (V_2)
Nerve (vidian) of pterygoid canal
Pterygopalatine ganglion
Lacrimal gland
Trigeminal ganglion
Deep petrosal nerve
Greater petrosal nerve
Chorda tympani nerve
Trigeminal nerve (V)
Facial nerve (VII) (intermediate nerve)
Superior salivatory nucleus
Descending palatine nerves
Posterior nasal nerves
Pharyngeal nerve
Maxillary artery
Internal carotid nerve
Glossopharyngeal nerve (IX)
Superior cervical sympathetic ganglion
Palatine nerves
Greater
Lesser
Sympathetic trunk
T1 and T2 spinal nerves
Submandibular ganglion
Thoracic spinal cord
Dorsal root
Sublingual gland
Submandibular gland
Facial artery
Lingual artery
External carotid artery and plexus
Common carotid artery
White
Gray
Rami communicantes
Ventral root
Internal carotid artery
Sympathetic presynaptic cell bodies in intermediolateral nucleus (lateral horn) of gray matter

Maxillary artery

- **Branches from 3rd part:** (pterygopalatine fossa)
- Anterior to pterygopalatine ganglion

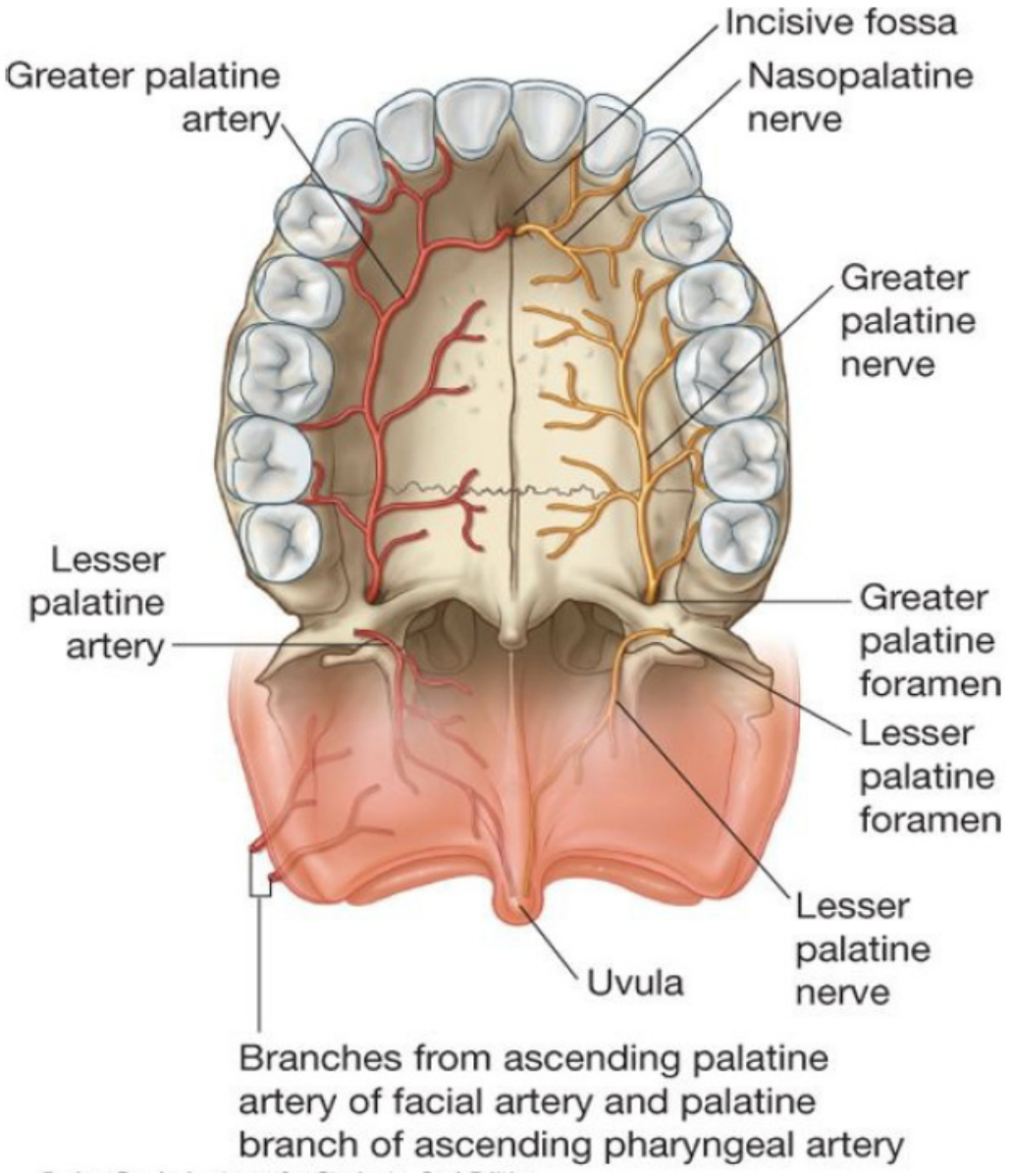
➢ **Posterior superior alveolar artery**
  - molar and premolar

➢ **Infra-orbital artery**
  - through the inferior orbital fissure
  - through the infra-orbital foramen
  - **Anterior superior alveolar arteries:** incisor and canine teeth

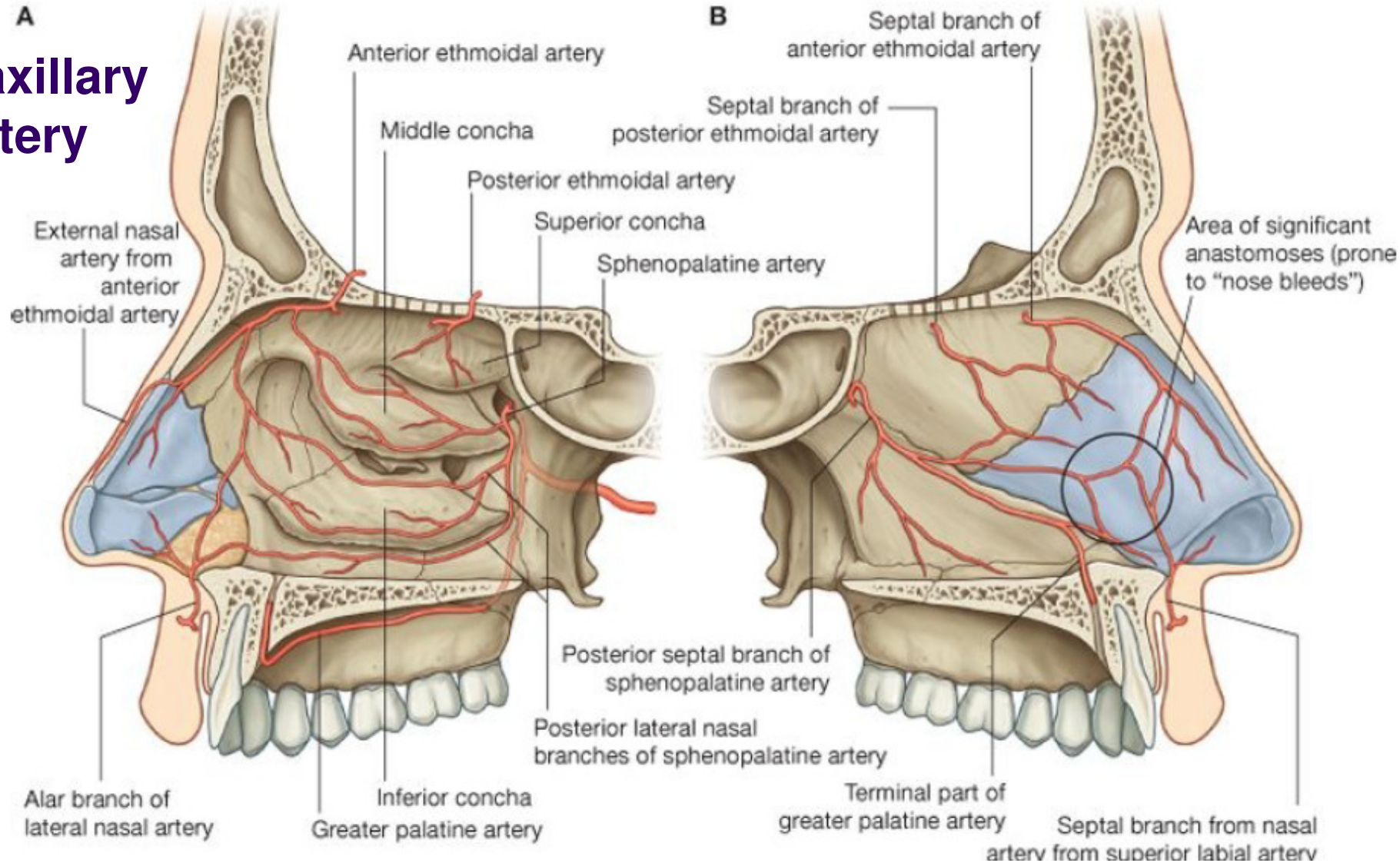


Maxillary artery

- **Greater palatine artery**
  - Into the palatine canal
  - Gives **lesser palatine branch (**soft palate)
  - Then superiorly through the incisive canal
  - supply the anterior aspect of the septal wall of the nasal cavity



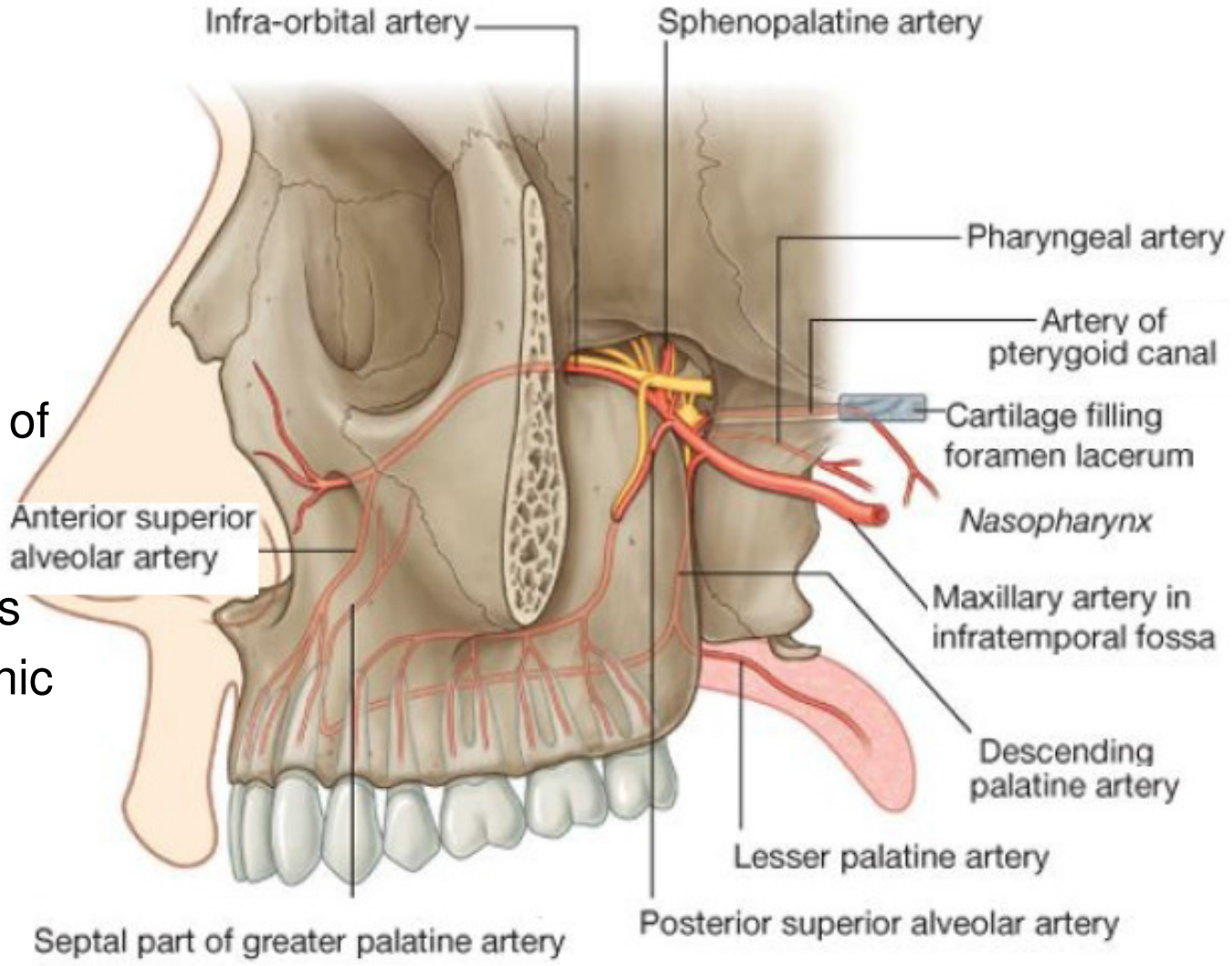
Maxillary artery

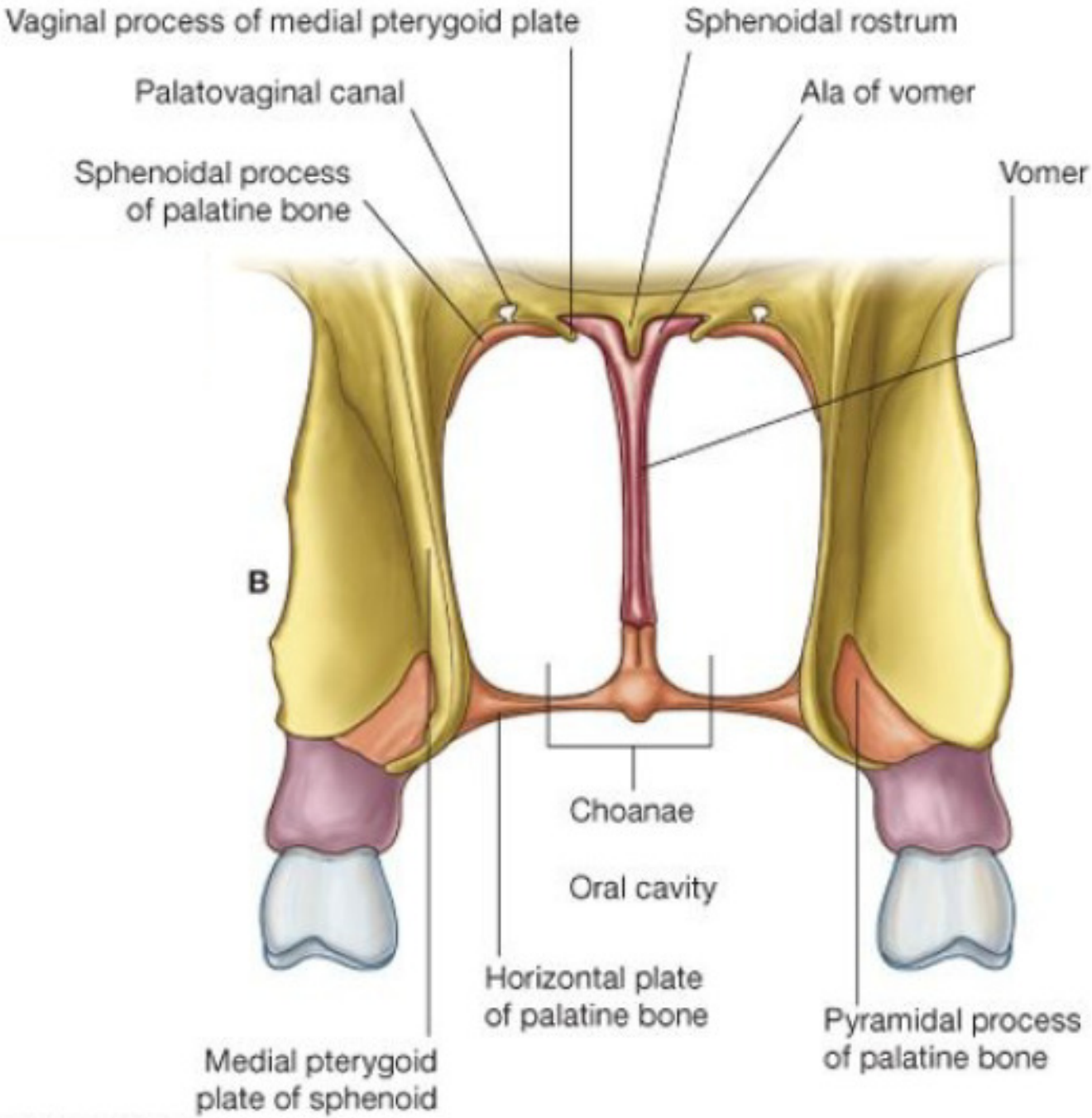


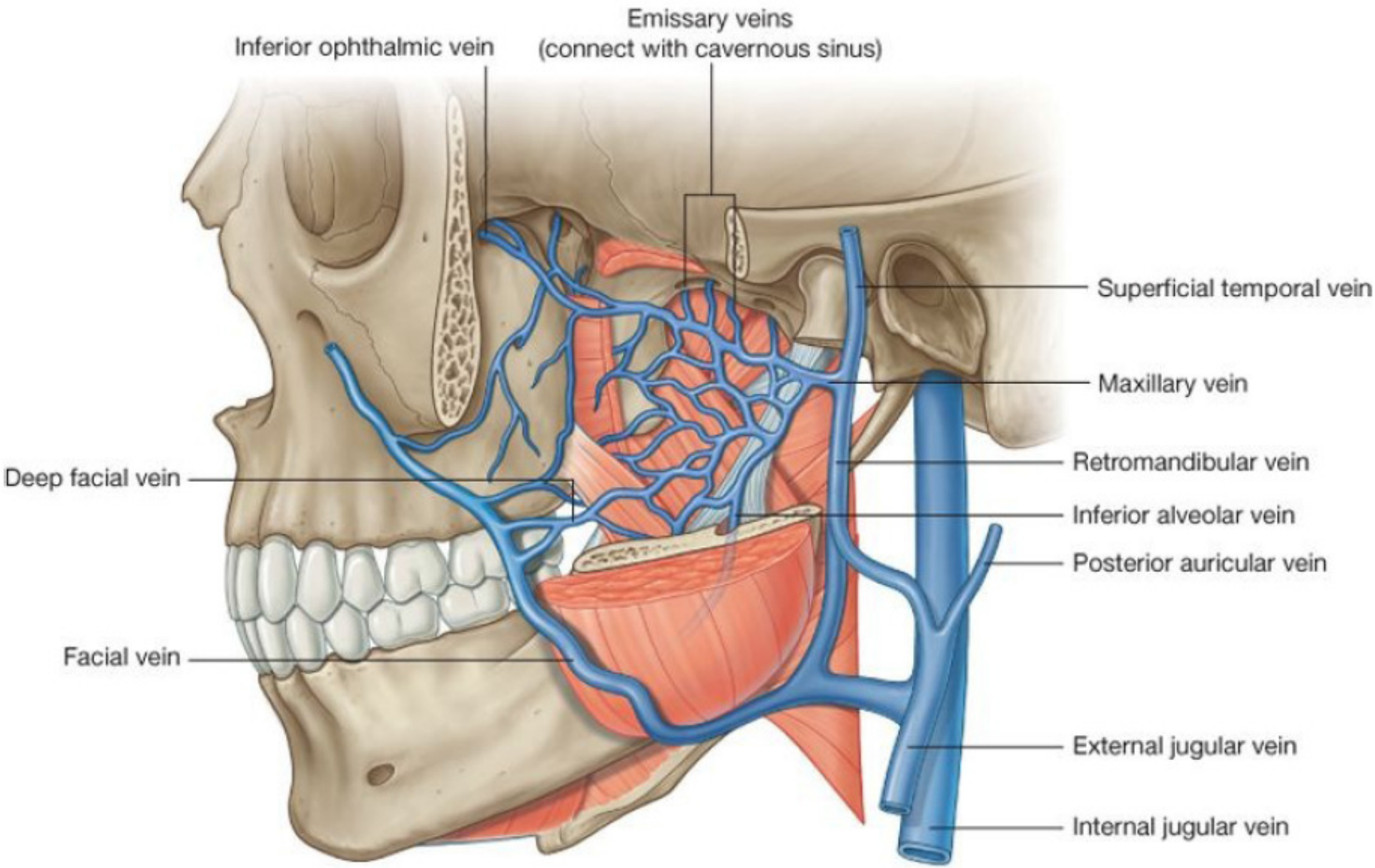
- **Sphenopalatine artery**: (largest) terminal branch of the maxillary artery
- **Branches**
  - **Posterior lateral nasal branches**
  - **Posterior septal branches**

Maxillary artery

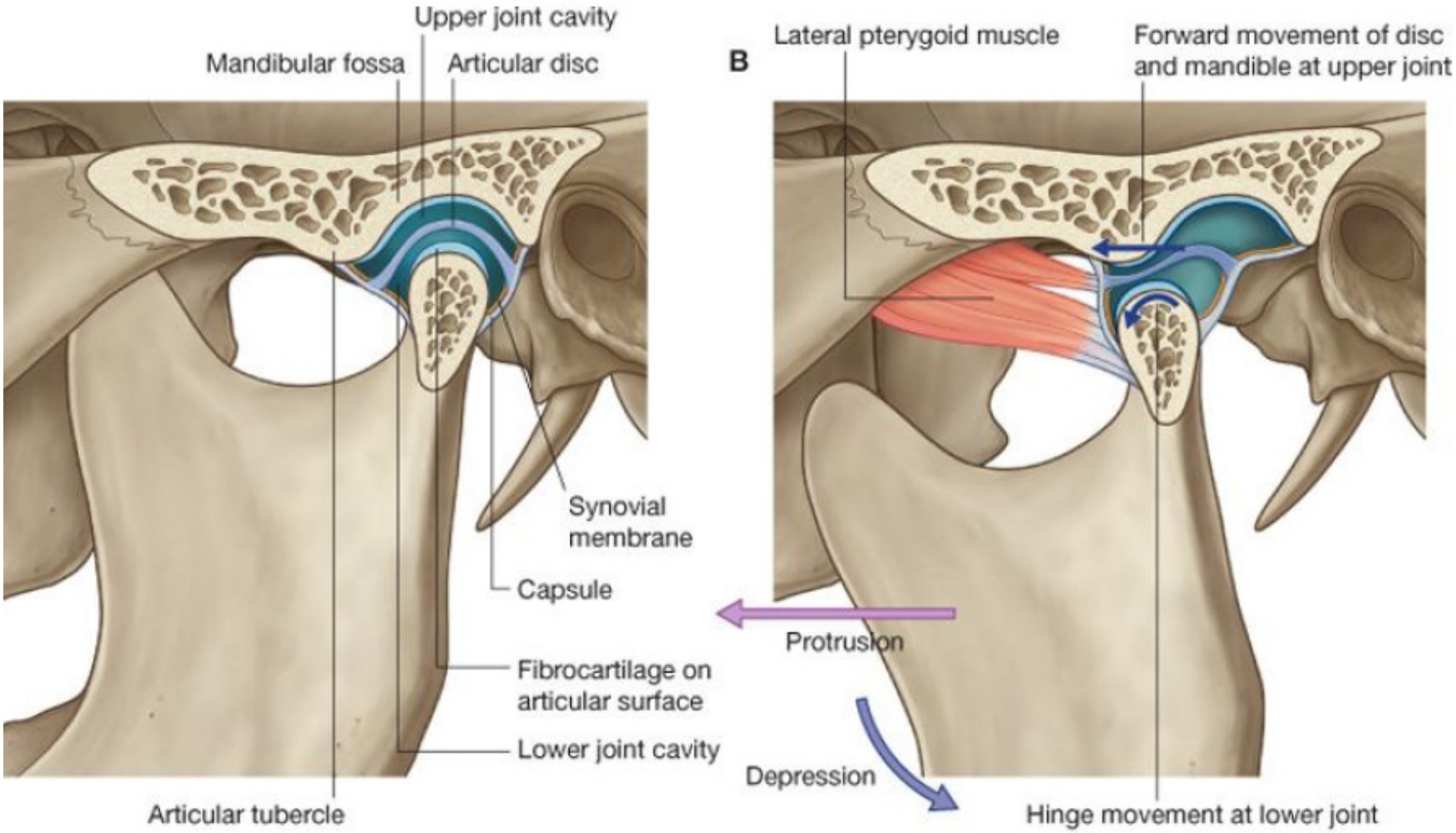
- **Pharyngeal branch**
  - Through the palatovaginal canal
  - Supplies:
    - posterior aspect of the roof of the nasal cavity
    - Sphenoidal sinus
    - Pharyngotympanic tube
- **Artery of pterygoid canal**
  - Passes into the pterygoid canal
  - Foramen lacerum
  - Terminates in nasopharynx




Vaginal process of medial pterygoid plate
Sphenoidal rostrum
Palatovaginal canal
Ala of vomer
Sphenoidal process of palatine bone
Vomer
B
Choanae
Oral cavity
Horizontal plate of palatine bone
Pyramidal process of palatine bone
Medial pterygoid plate of sphenoid


Inferior ophthalmic vein
Emissary veins
(connect with cavernous sinus)
Superficial temporal vein
Maxillary vein
Retromandibular vein
Deep facial vein
Inferior alveolar vein
Posterior auricular vein
Facial vein
External jugular vein
Internal jugular vein

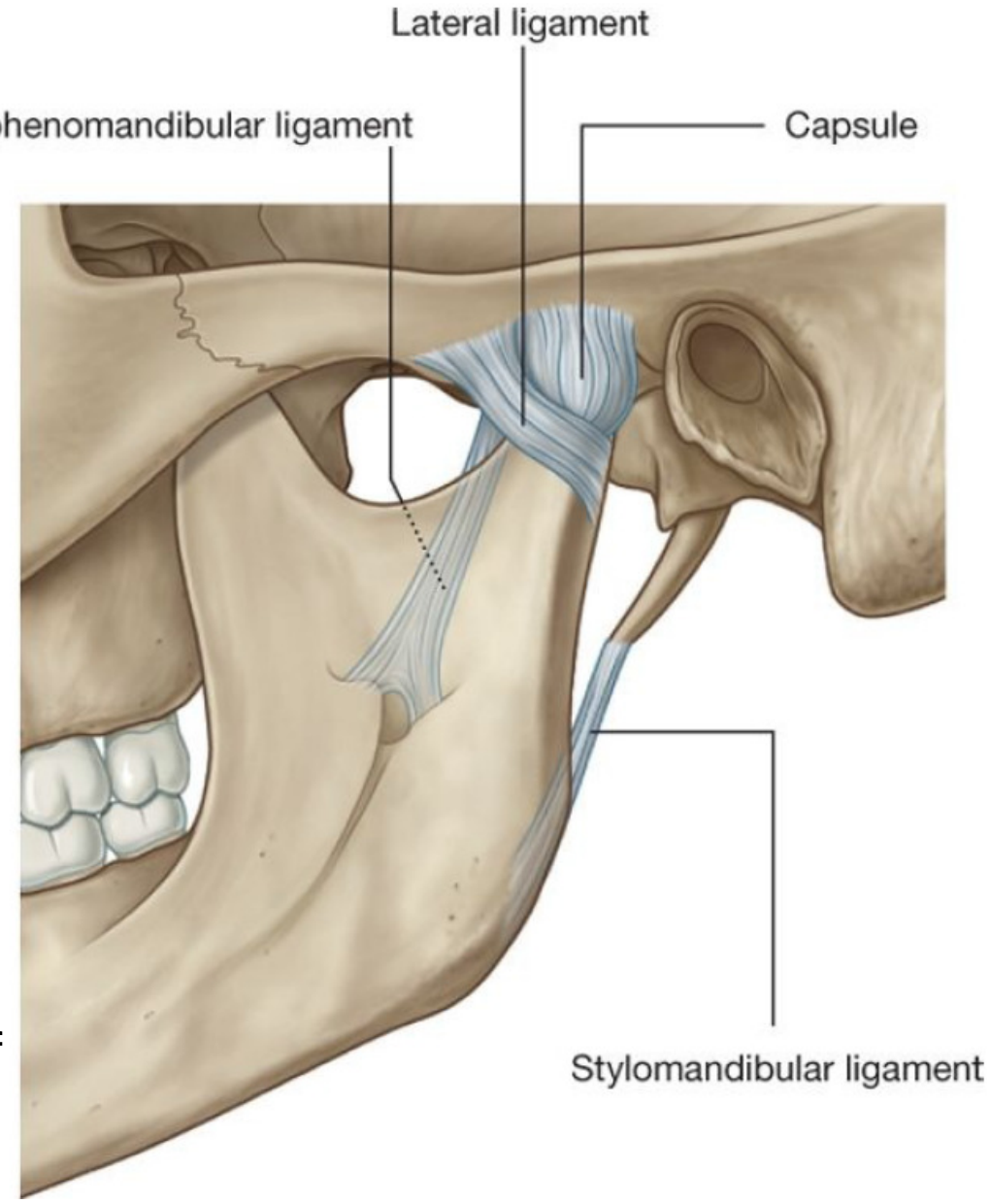
TMJ



- **Type:** Synovial (*hinge and sliding)*
- **Articulation:** Articular tubercle and the anterior portion of the mandibular fossa above and the head (condyloid process) of the mandible below
  - The articular surfaces are covered by **fibrocartilage**
- **Articular disc:** divides the joint into upper and lower cavities
  - attached to the capsule and tendon of the lateral pterygoid

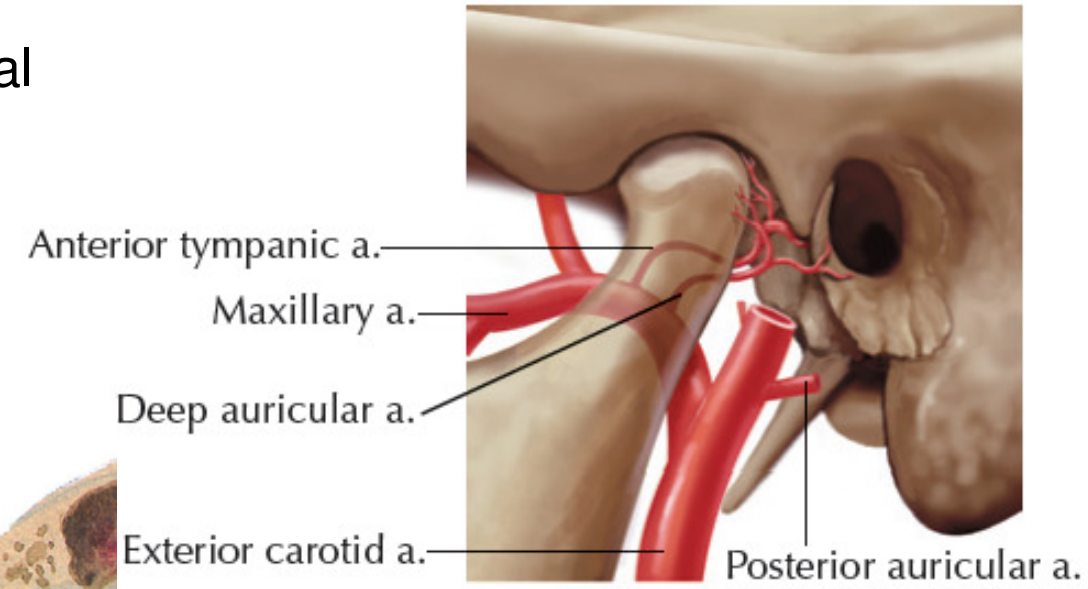
TMJ

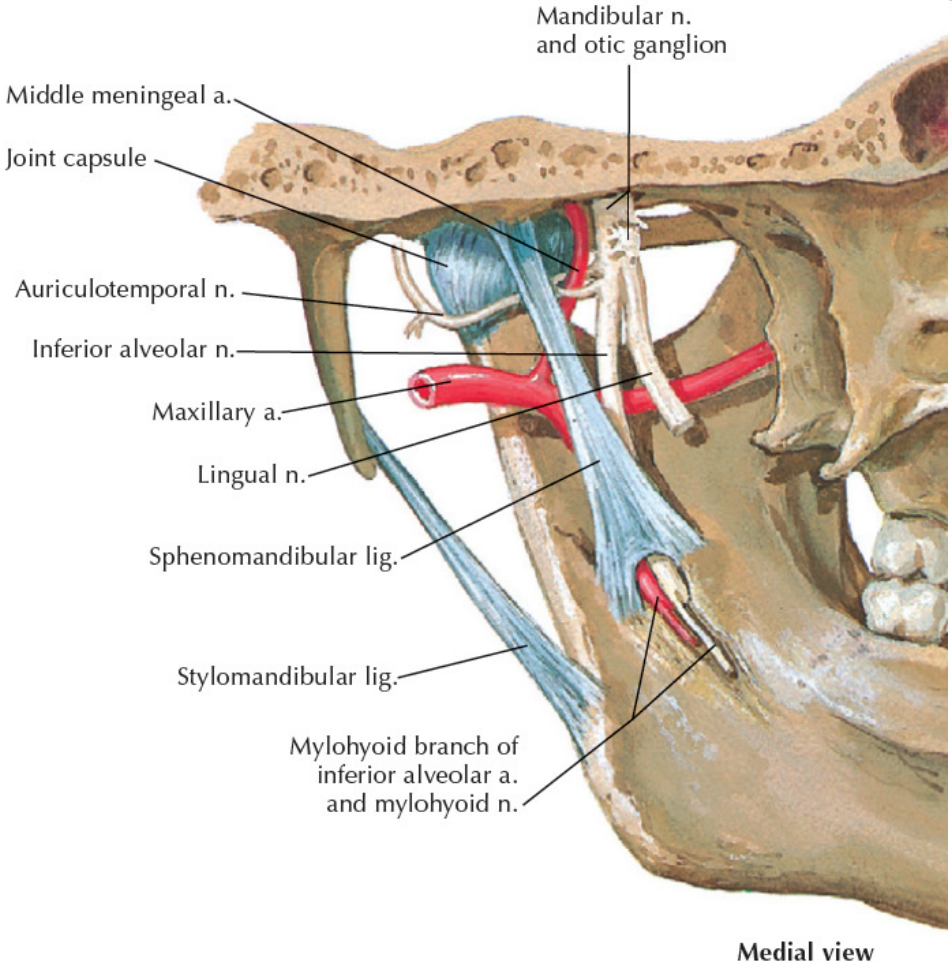
- **Capsule:** attached above to the articular tubercle and the margins of the mandibular fossa and below to the neck of the mandible.
- **Synovial membrane**: lines both compartments of the joint and attached to the margins of the articular disc
- **Ligaments:**
  - **Lateral ligament**
    - Prevents lateral and posterior displacement of the condyle
  - **Sphenomandibular ligament**
    - Keeps same amount of tension during both opening and closing of the mouth
  - **Stylomandibular ligament**
    - Limit anterior protrusion of the mandible



TMJ

- **Nerve supply:** Auriculotemporal and masseteric
- **Blood supply:** Deep auricular, Anterior tympanic, Superficial temporal



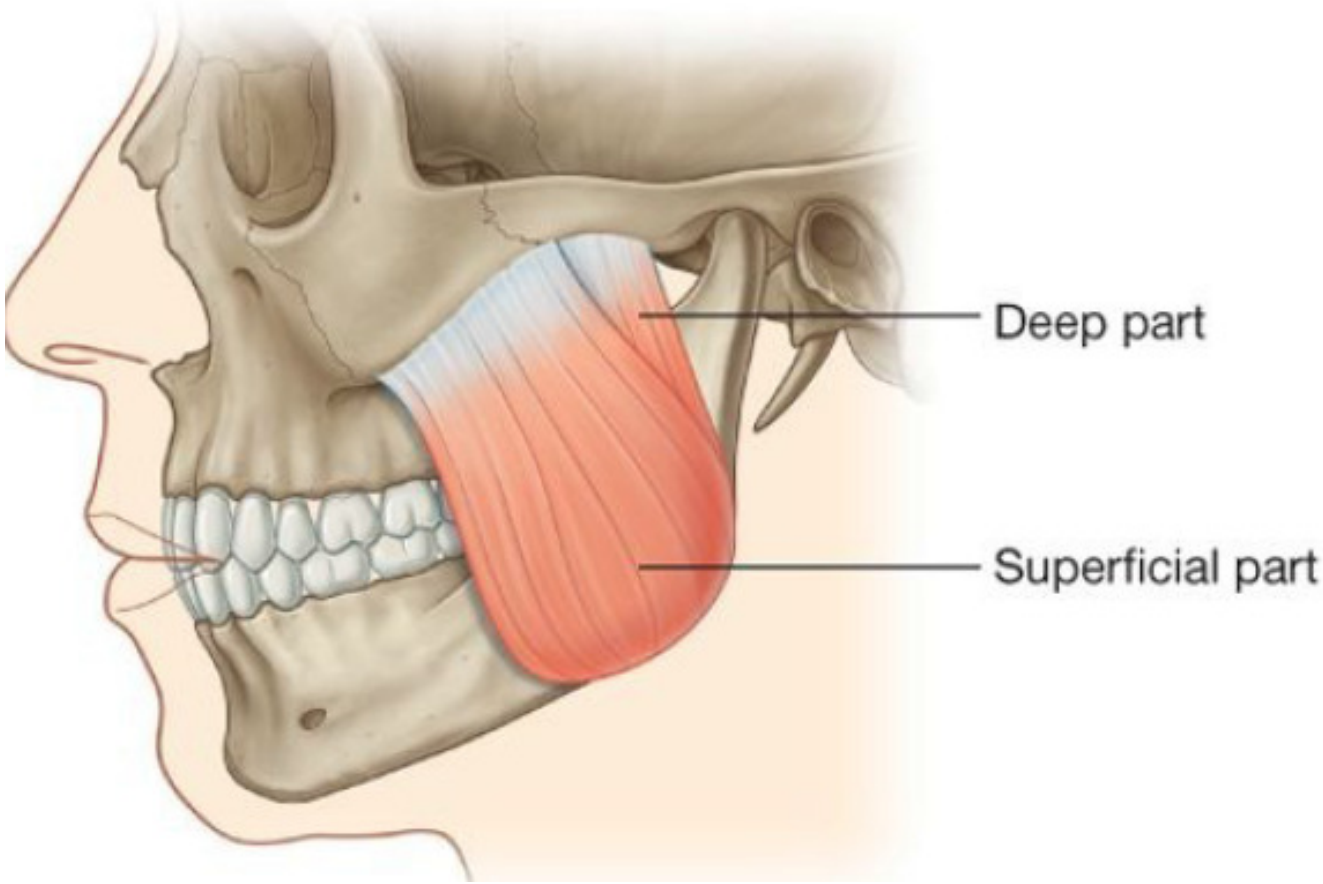


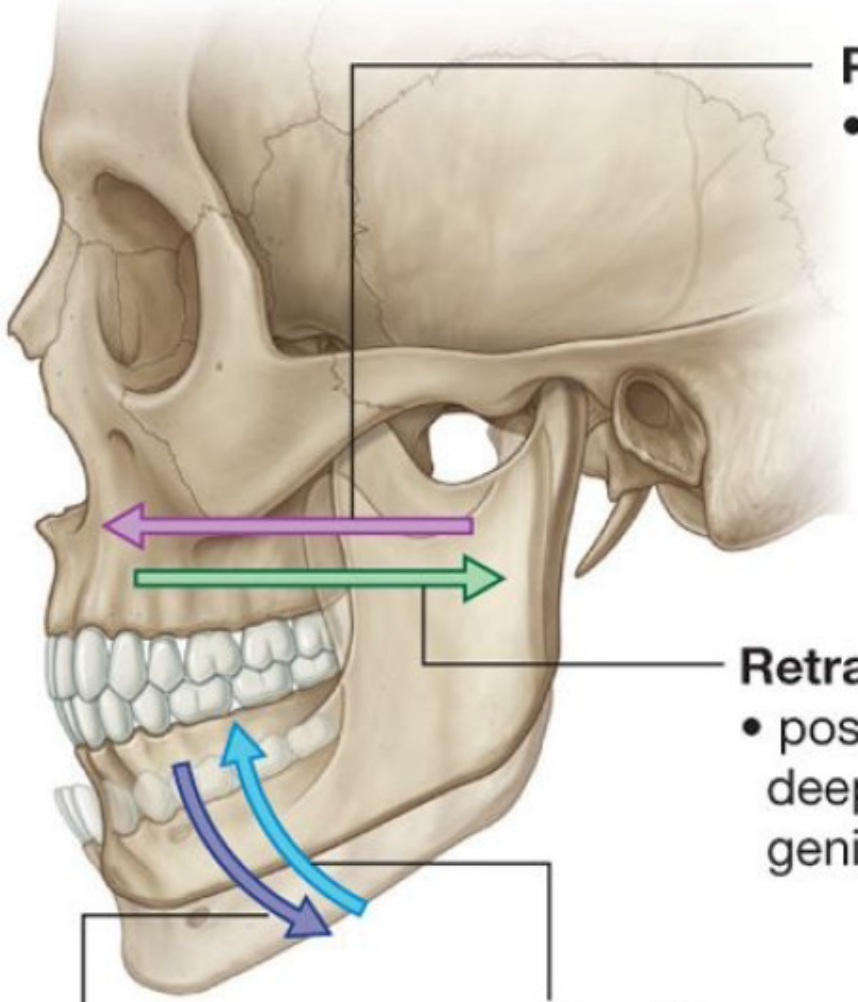
Medial view

- **Relations:**
  - **Anteriorly:** Mandibular notch, masseteric nerve and artery
  - **Posteriorly:** external auditory meatus, glenoid process of the parotid gland
  - **Laterally:** parotid gland, fascia, and skin
  - **Medially:** maxillary artery and vein and the auriculotemporal nerve

Masseter muscle

- **Origin**:
  - **Superficial part:** maxillary process of the zygomatic, zygomatic process of the maxilla
  - **Deep part**: medial aspect of the zygomatic arch
- **Insertion:** Lateral surface of mandible ramus
- **NS**: Masseteric nerve from anterior trunk of mandibular nerve
- **Action**: Elevation of mandible





Protrusion
- lateral pterygoid assisted by medial pterygoid

Retraction
- posterior fibers of temporalis, deep part of masseter, and geniohyoid and digastric

Elevation
- temporalis, masseter, medial pterygoid

Depression
- gravity
- digastric, geniohyoid, and mylohyoid muscles

➢ Opening the mouth involves both depression and protrusion

❖ When the lateral and medial pterygoids contract on only one side, the chin moves to the opposite side. Chewing movement results