# Maxilla, ORBIT and infratemporal fossa

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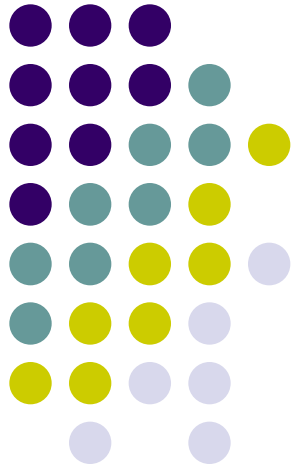
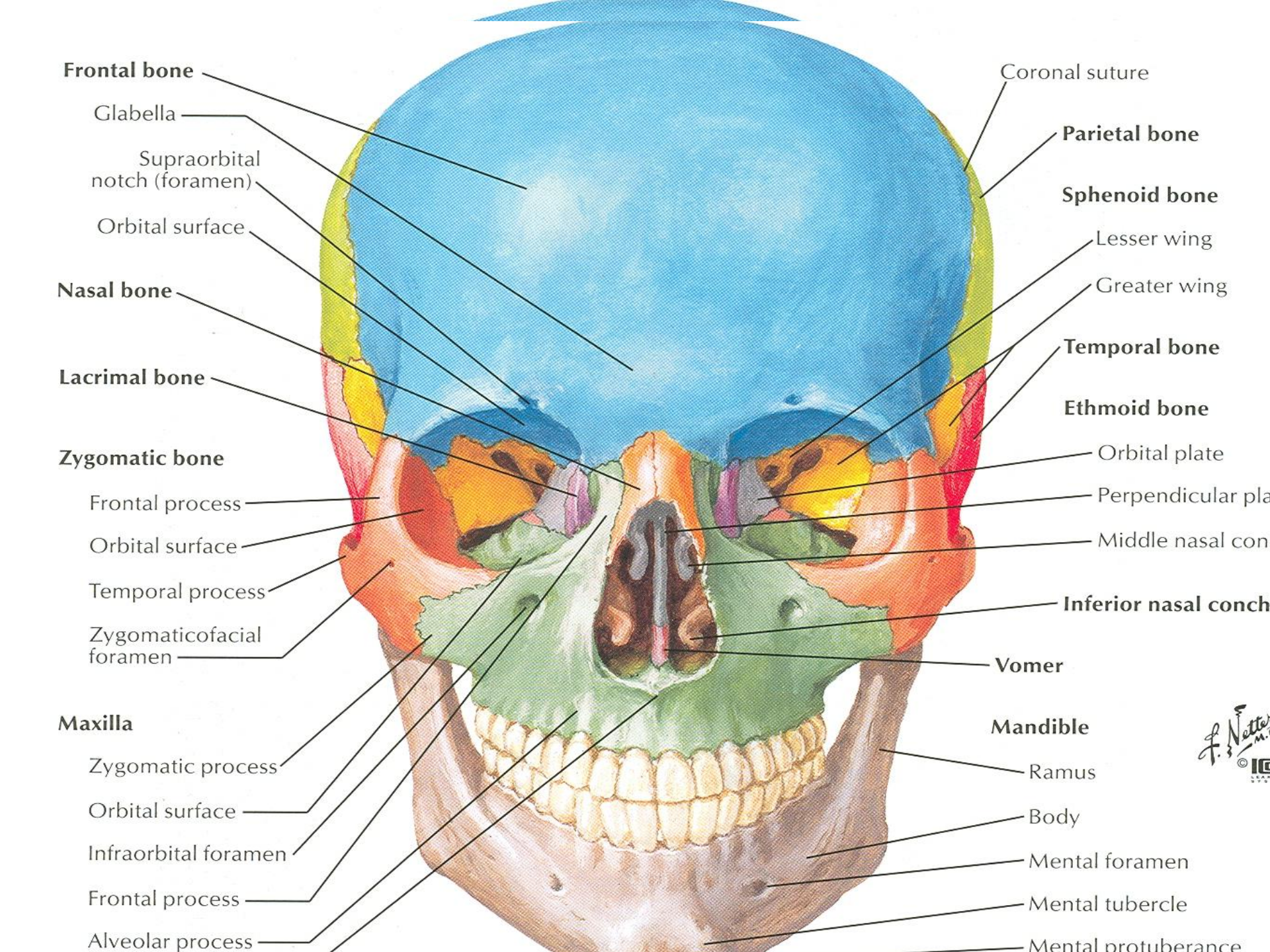
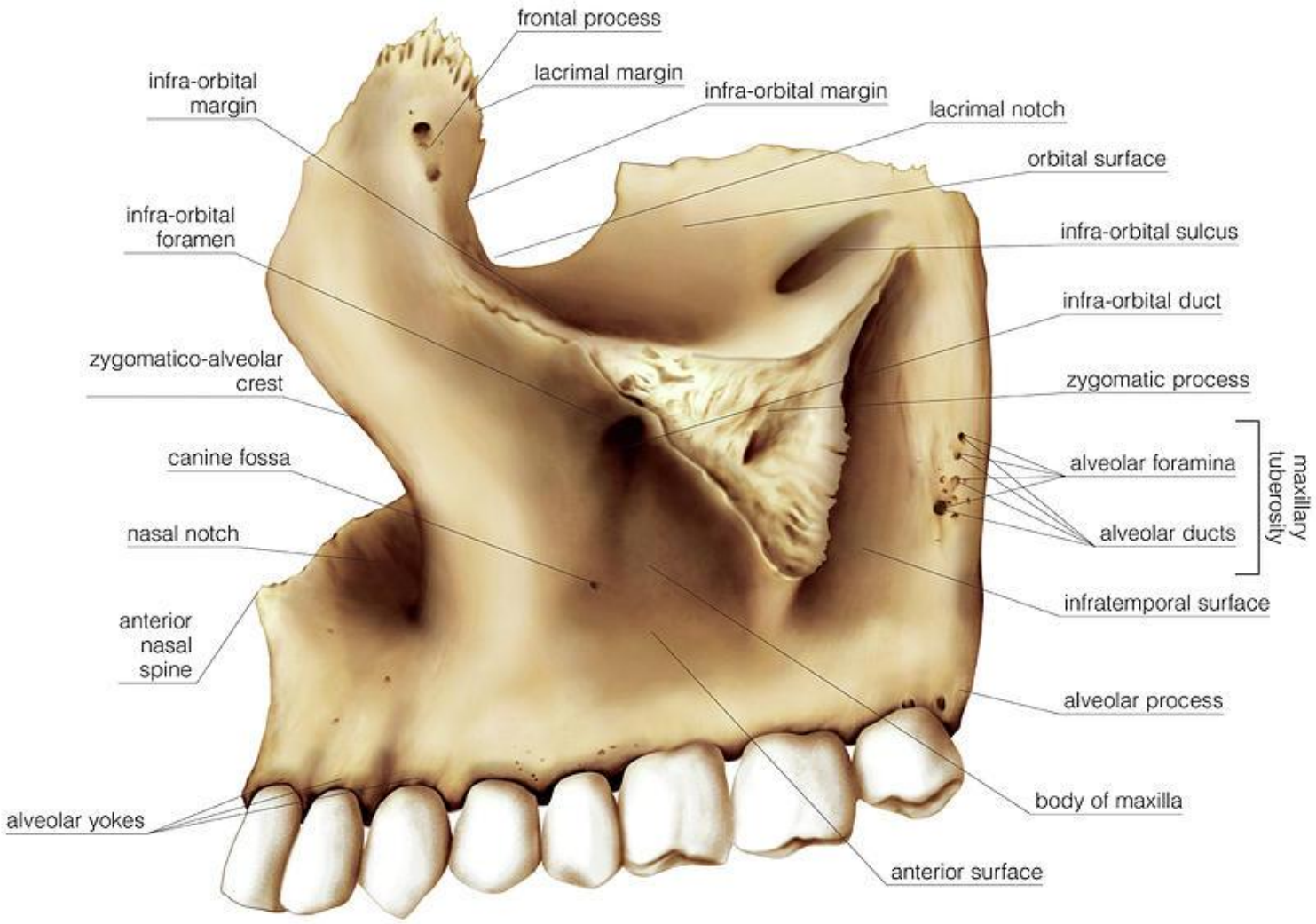
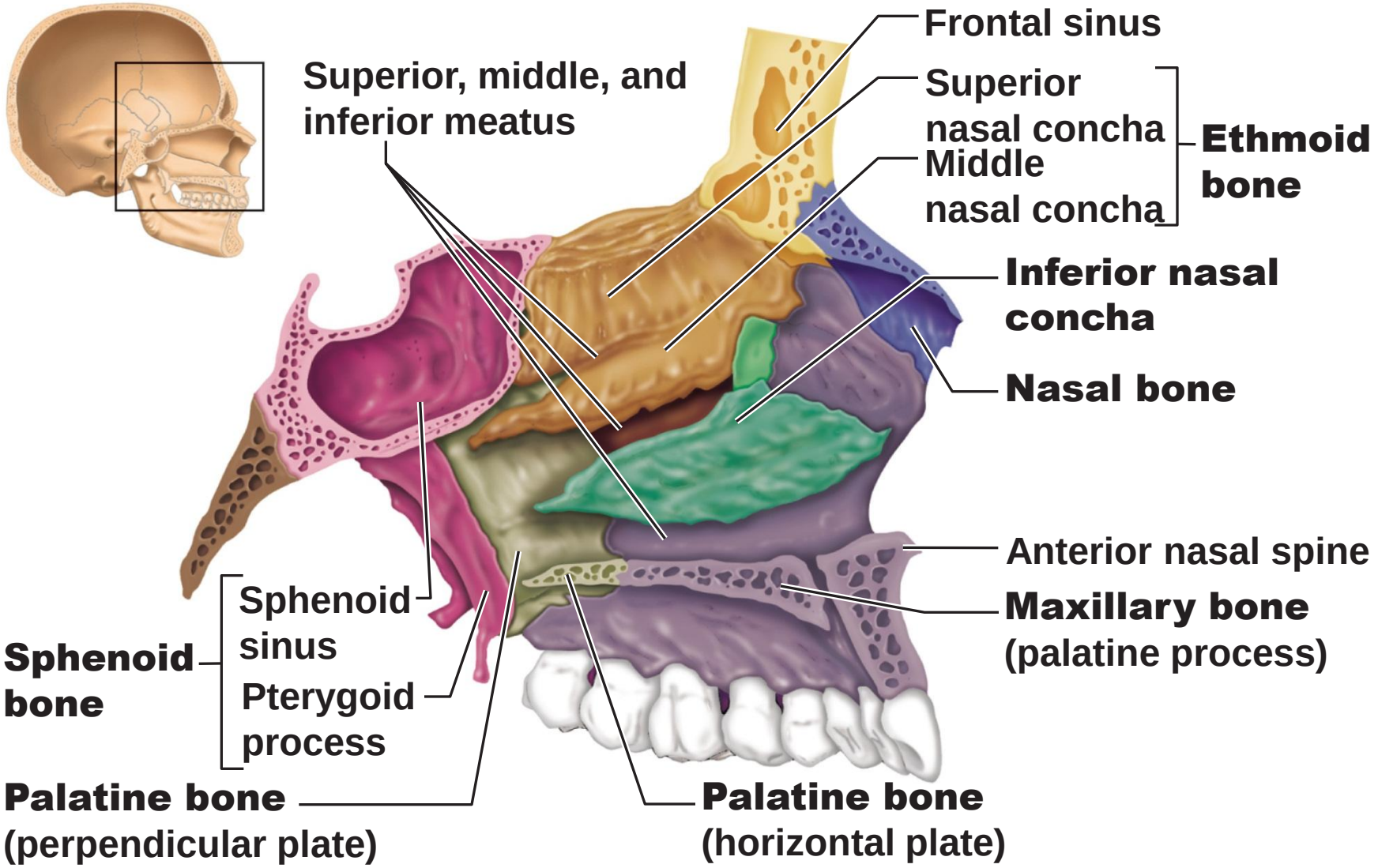



Frontal bone
Glabella
Supraorbital notch (foramen)
Orbital surface
Nasal bone
Lacrimal bone
Zygomatic bone
Frontal process
Orbital surface
Temporal process
Zygomaticofacial foramen
Maxilla
Zygomatic process
Orbital surface
Infraorbital foramen
Frontal process
Alveolar process
Coronal suture
Parietal bone
Sphenoid bone
Lesser wing
Greater wing
Temporal bone
Ethmoid bone
Orbital plate
Perpendicular pla
Middle nasal con
Inferior nasal conch
Vomer
Mandible
Ramus
Body
Mental foramen
Mental tubercle
Mental protuberance

# MAXILLA

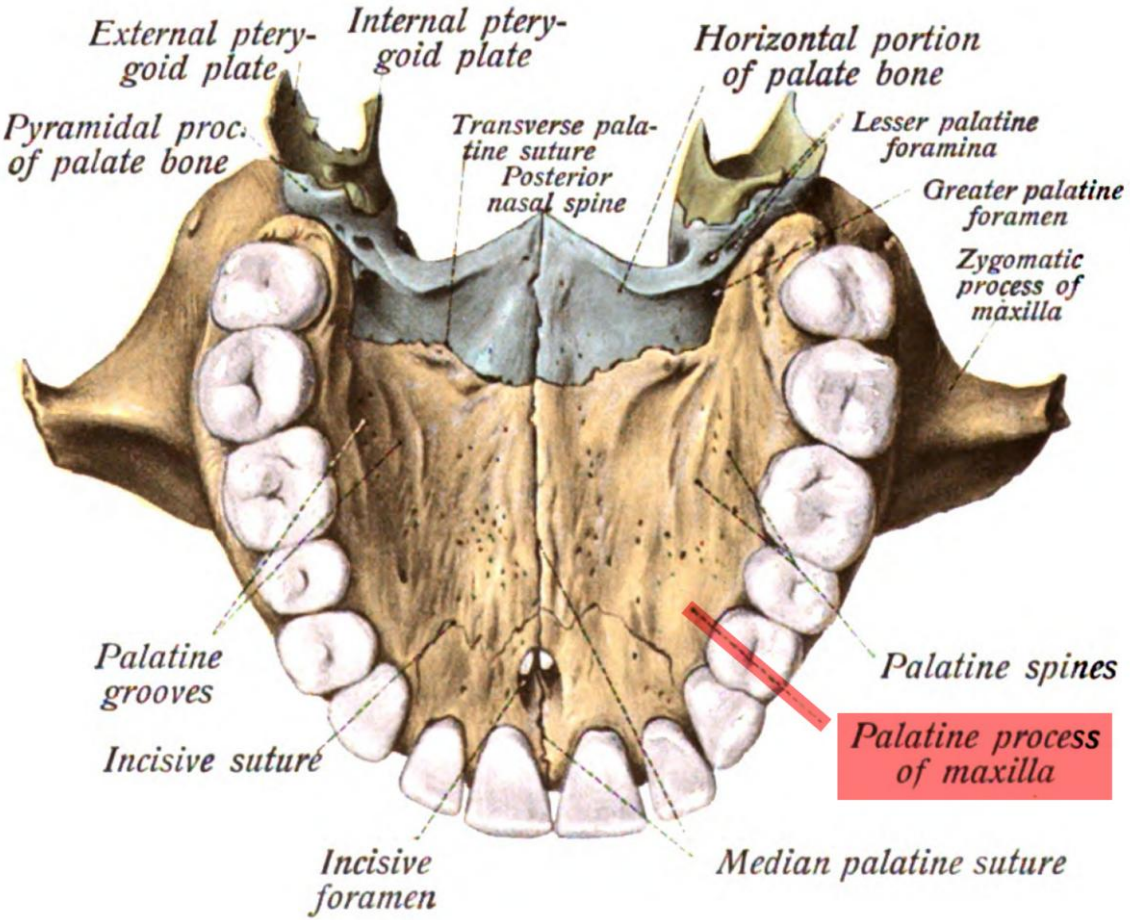

frontal process
lacrimal margin
infra-orbital margin
lacrimal notch
infra-orbital margin
orbital surface
infra-orbital foramen
infra-orbital sulcus
infra-orbital duct
zygomatico-alveolar crest
zygomatic process
canine fossa
alveolar foramina
maxillary tuberosity
nasal notch
alveolar ducts
infratemporal surface
anterior nasal spine
alveolar process
body of maxilla
alveolar yokes
anterior surface




**(a) Bones forming the left lateral wall of the nasal cavity (nasal septum removed)**

Figure 7.14a

# Maxilla

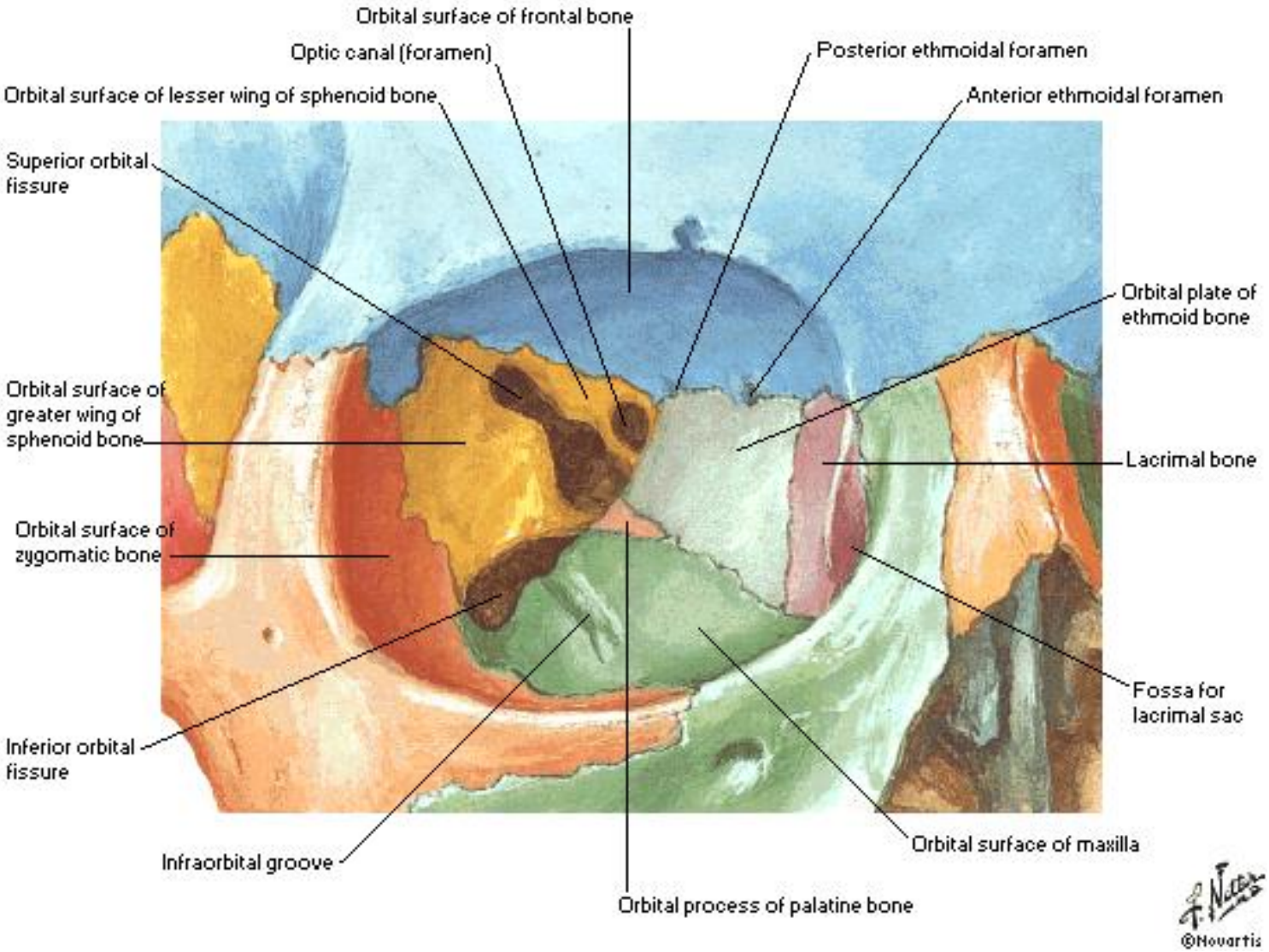

External ptery-goid plate
Internal ptery-goid plate
Horizontal portion of palate bone
Pyramidal proc. of palate bone
Transverse pala-tine suture
Posterior nasal spine
Lesser palatine foramina
Greater palatine foramen
Zygomatic process of maxilla
Palatine grooves
Palatine spines
Palatine process of maxilla
Incisive suture
Incisive foramen
Median palatine suture

# ORBIT
# SALIENT ANATOMICAL FEATURES

- 7 bones
- 4 walls
- 4 margins
- 4 important openings
- 6 contents
- 5 important relationships

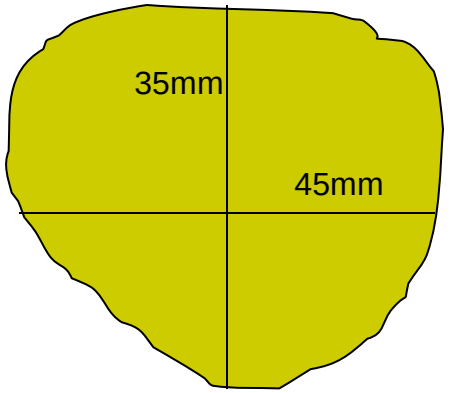
# Boundaries

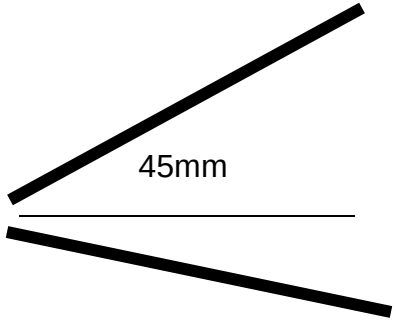
- Roof: Is formed by orbital plate of frontal bone
- Lateral wall: Composed of zygomatic bone & greater wing of sphenoid bone
- Floor: Formed by the orbital plate of maxilla
- Medial wall: Frontal process of maxilla, Lacrimal bone, orbital plate of ethmoid & body of sphenoid bone


Orbital surface of frontal bone
Optic canal (foramen)
Posterior ethmoidal foramen
Orbital surface of lesser wing of sphenoid bone
Anterior ethmoidal foramen
Superior orbital fissure
Orbital plate of ethmoid bone
Orbital surface of greater wing of sphenoid bone
Lacrimal bone
Orbital surface of zygomatic bone
Fossa for lacrimal sac
Inferior orbital fissure
Orbital surface of maxilla
Infraorbital groove
Orbital process of palatine bone
©Novartis

# Adult orbital dimensions

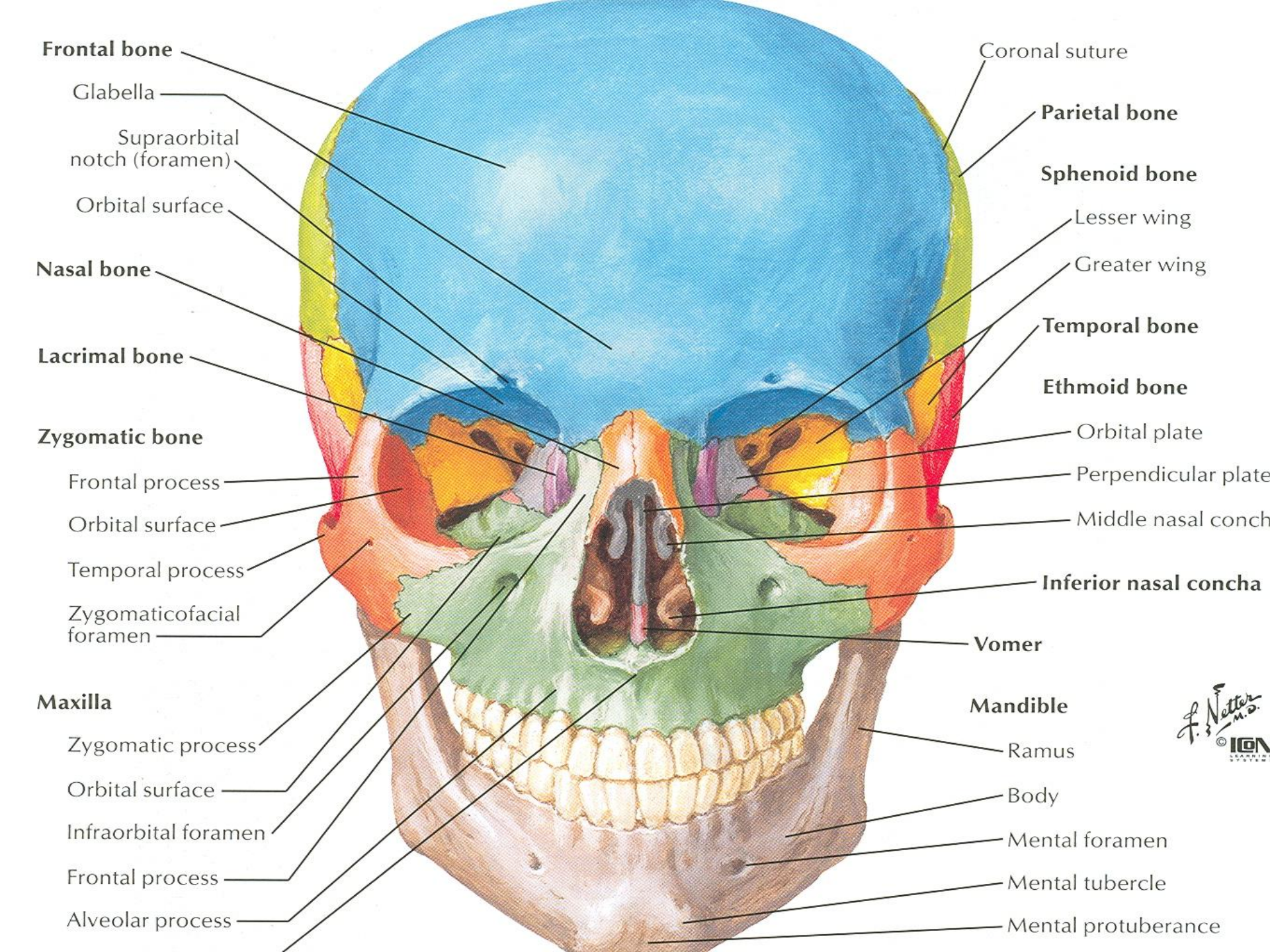
| | |
|---|---|
| Entrance height | 35 mm |
| Entrance width | 40 mm |
| Medial wall length / depth | 45 mm |
| Volume | 30 cc |
| Distance from the back of the globe to the optic foramen | 18 mm |



# Supraorbital Notch

- The supraorbital notch is situated on the superior orbital margin
- It transmits the supraorbital nerve and blood vessels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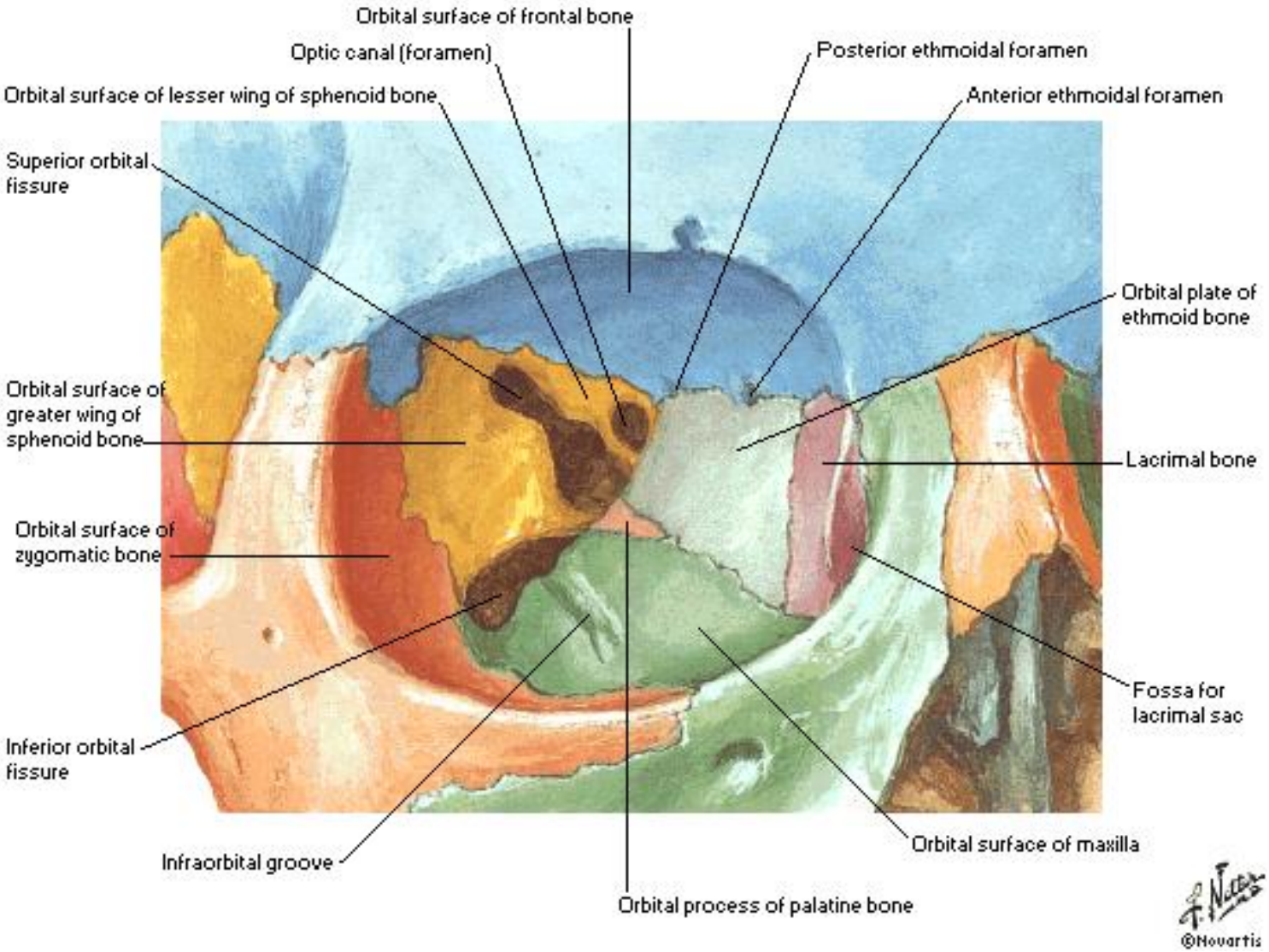
Orbital plate
Perpendicular plate
Middle nasal conch
Inferior nasal concha
Vomer
Mandible
Ramus
Body
Mental foramen
Mental tubercle
Mental protuberance
F. Netter M.D.
©

# Infraorbital Groove & Canal

- Situated on the floor of the orbit in the orbital plate of the maxilla

- They transmit the infraorbital nerve (a continuation of the maxillary nerve) and blood vessels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Optic canal (foramen)
Posterior ethmoidal foramen
Orbital surface of lesser wing of sphenoid bone
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Superior orbital fissure
Orbital plate of ethmoid bone
Orbital surface of greater wing of sphenoid bone
Lacrimal bone
Orbital surface of zygomatic bone
Fossa for lacrimal sac
Inferior orbital fissure
Orbital surface of maxilla
Infraorbital groove
Orbital process of palatine bone
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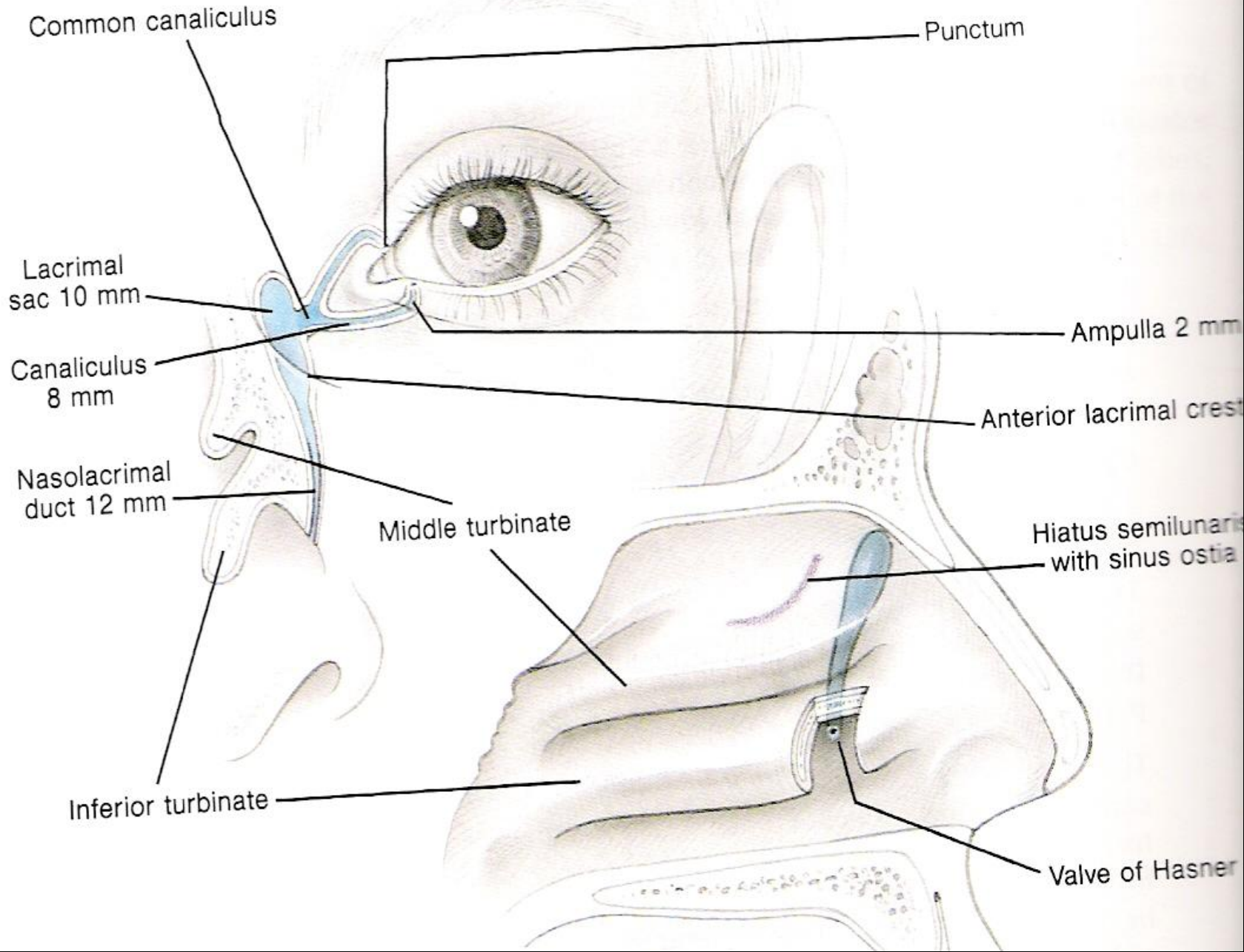
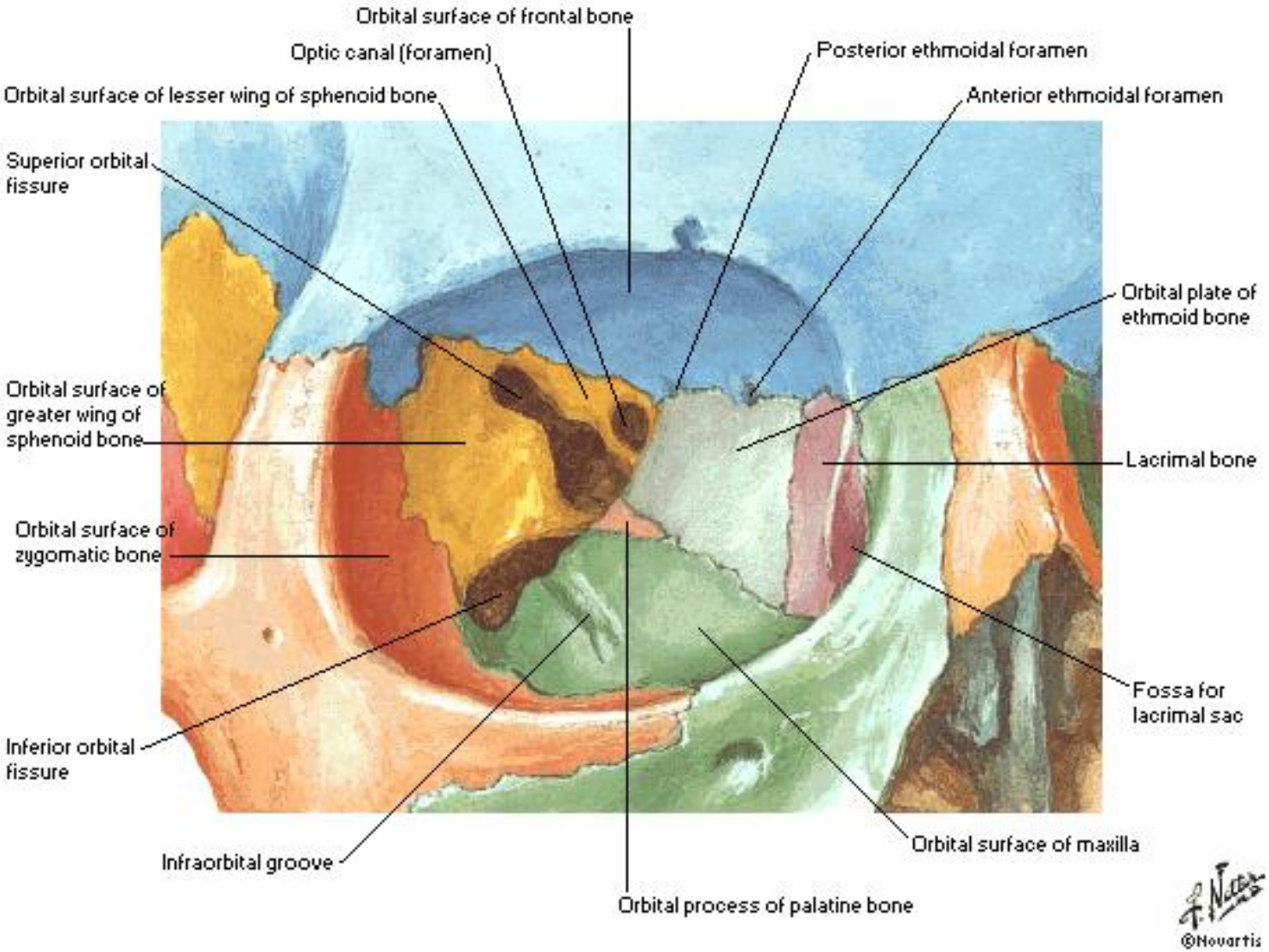
# Nasolacrimal Canal

- Located anteriorly on the medial wall
- It communicates with the inferior meatus of the nose
- It transmits the nasolacrimal duct


Common canaliculus
Punctum
Lacrimal sac 10 mm
Ampulla 2 mm
Canaliculus 8 mm
Anterior lacrimal crest
Nasolacrimal duct 12 mm
Middle turbinate
Hiatus semilunaris with sinus ostia
Inferior turbinate
Valve of Hasner

# Inferior Orbital Fissure

- Located posteriorly between the maxilla and the greater wing of the sphenoid
- It communicates with the pterygopalatine fossa
- It transmits the maxillary nerve and its zygomatic branch, the inferior ophthalmic vein, and sympathetic nerves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Posterior ethmoidal foramen
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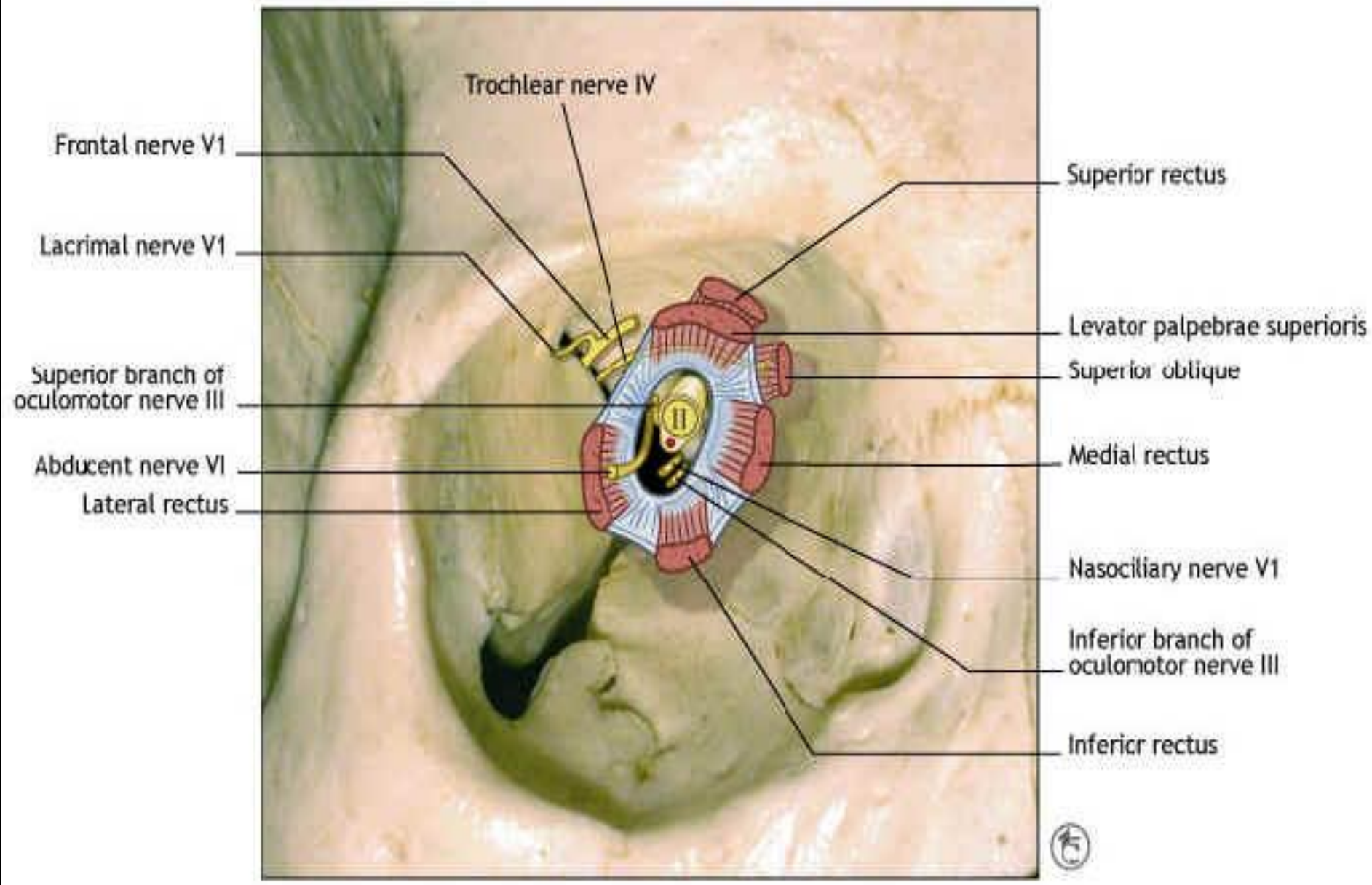
Lacrimal bone
Orbital surface of zygomatic bone
Fossa for lacrimal sac
Inferior orbital fissure
Orbital surface of maxilla
Infraorbital groove
Orbital process of palatine bone
©Novartis

# Superior Orbital Fissure

- Located posteriorly between the greater and lesser wings of the sphenoid
- It communicates with the middle cranial fossa
- It transmits the lacrimal nerve, the frontal nerve, the trochlear nerve, the oculomotor nerve (upper and lower divisions), the abducent nerve, the nasociliary nerve, and the superior ophthalmic vein


Trochlear nerve IV
Frontal nerve V1
Lacrimal nerve V1
Superior branch of oculomotor nerve III
Abducent nerve VI
Lateral rectus
Superior rectus
Levator palpebrae superioris
Superior oblique
Medial rectus
Nasociliary nerve V1
Inferior branch of oculomotor nerve III
Inferior rectus

# Optic Canal

- Located posteriorly in the lesser wing of the sphenoid
- It communicates with the middle cranial fossa
- It transmits the optic nerve and the ophthalmic artery

# Optic nerve

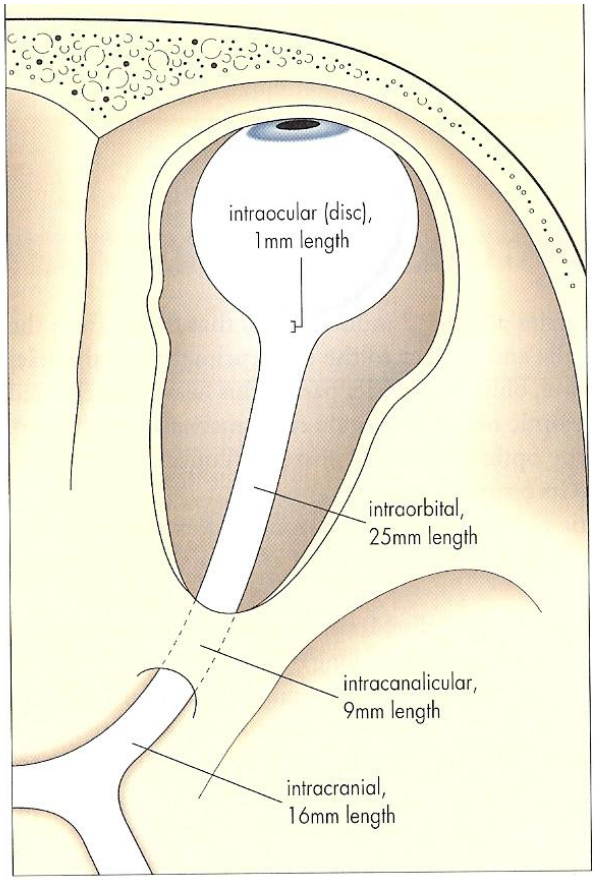
**The optic nerve may be divided into the following topographic areas**:

Intraocular portion of the optic nerve: optic disc, or nerve head; prelaminar; and laminar portions

Intraorbital portion (located within the muscle cone)

Intracanalicular portion (located within the optic canal)

Intracranial portion (ending in the optic chiasm)



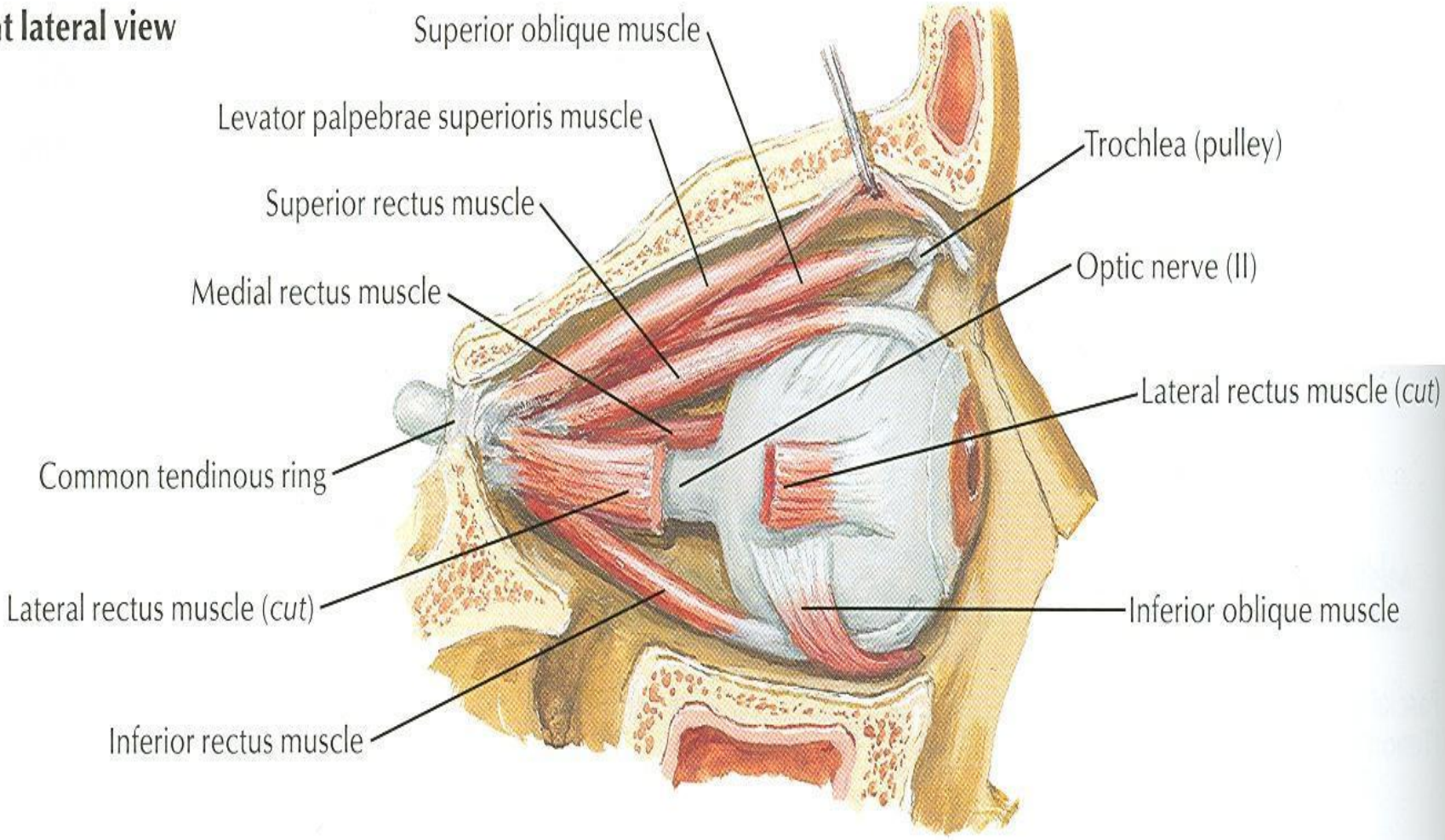
# Muscles of Orbit

Muscles of the orbit are the levator palpebrae superioris, the four recti and two oblique muscles

# Levator Palpebrae Superioris

- Origin: Undersurface of lesser wing of sphenoid bone
- Insertion: Splits into 2 lamellae, superior into tarsal plate & skin of upper lid, inferior into upper margin of superior tarsal plate
- NS: Oculomotor nerve
- Action: Raises the upper lid

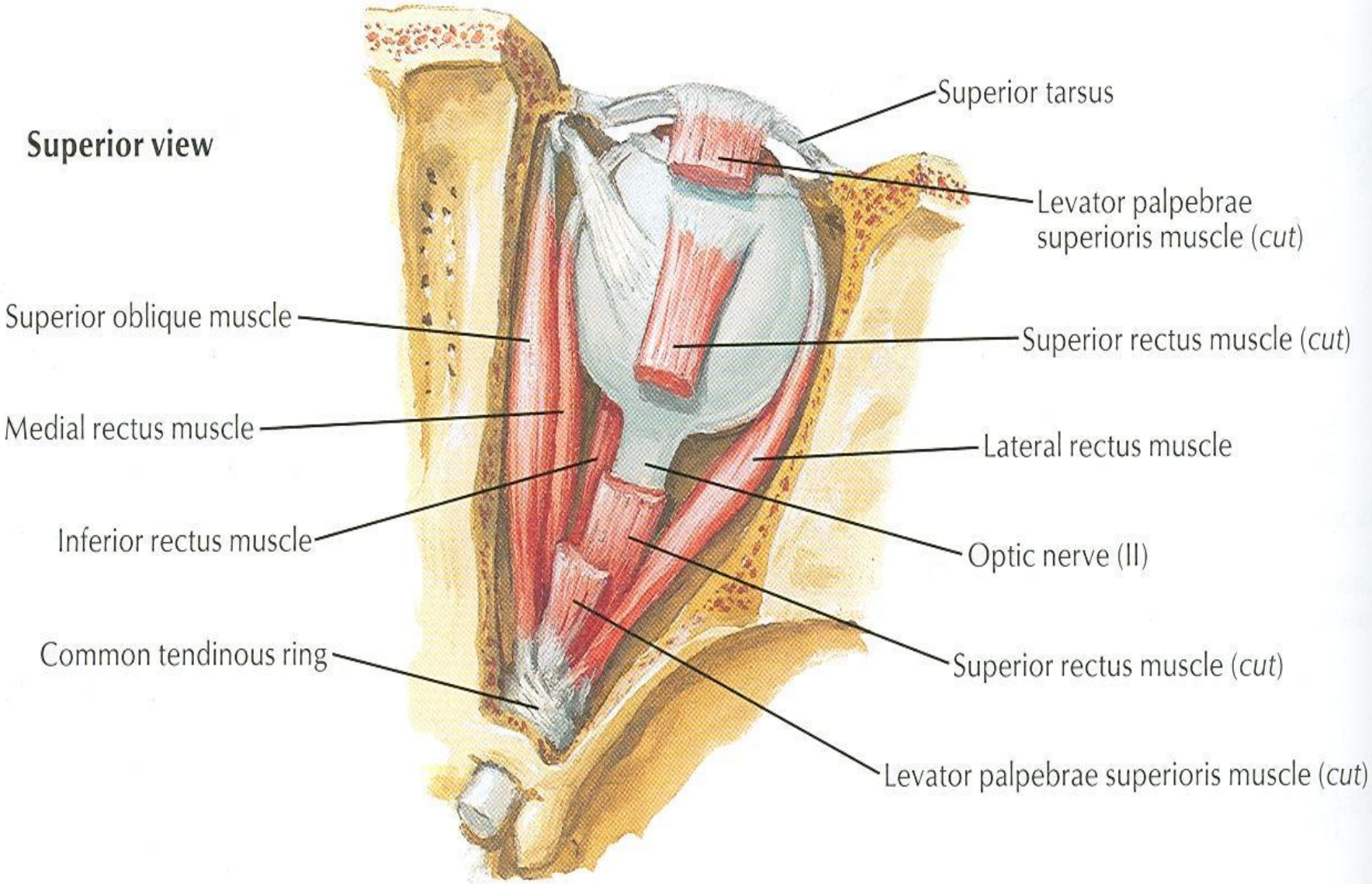
**Right lateral view**



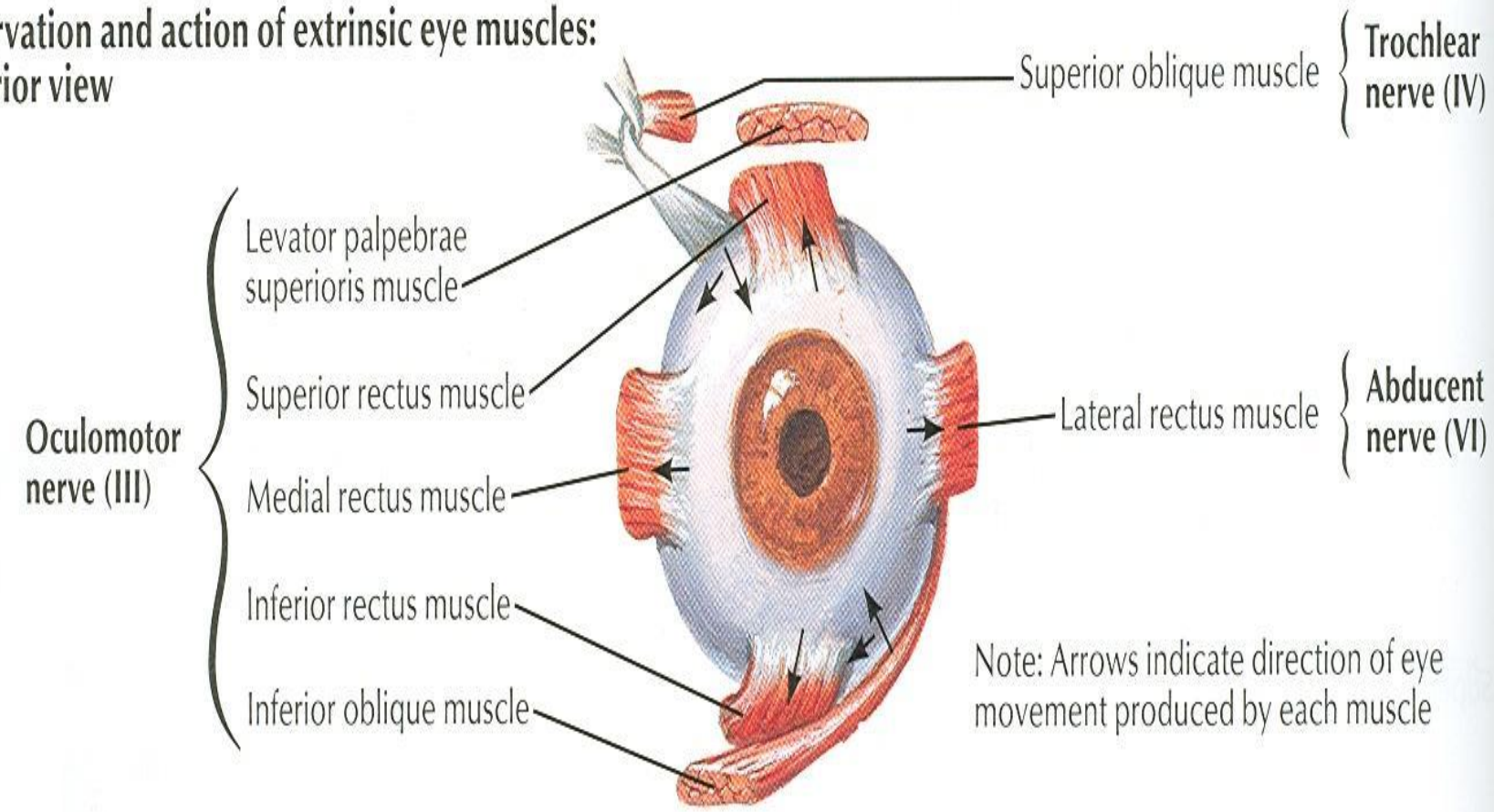
# The Recti

- Arise from a fibrous ring called common tendinous ring

- Insertion: form the muscular cone that encloses the optic nerve, pierces the facial sheath of the eyeball, in the sclera about 6 mm behind the margin of cornea


Superior view
Superior tarsus
Levator palpebrae superioris muscle (*cut*)
Superior oblique muscle
Superior rectus muscle (*cut*)
Medial rectus muscle
Lateral rectus muscle
Inferior rectus muscle
Optic nerve (II)
Common tendinous ring
Superior rectus muscle (*cut*)
Levator palpebrae superioris muscle (*cut*)

## Innervation and action of extrinsic eye muscles: anterior view



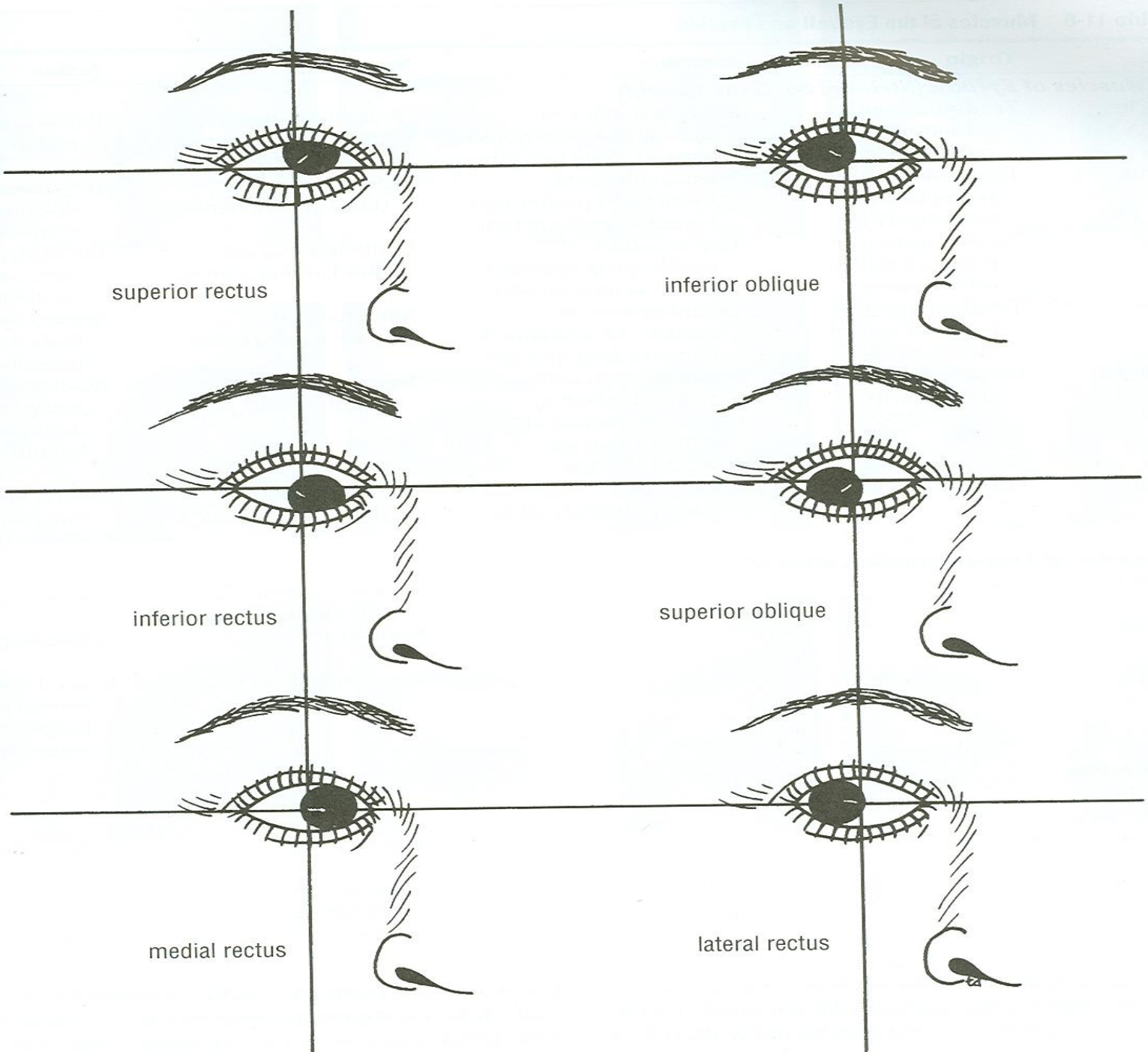
| Muscle | Innervation | Movement |
|---|---|---|
| Lateral rectus | Abducens (VI) | Abduction |
| Medial rectus | Oculomotor (III) | Adduction |
| Superior rectus | Oculomotor (III) | Elevation and intorsion |
| Inferior rectus | Oculomotor (III) | Depression and extorsion |
| Inferior oblique | Oculomotor (III) | Extorsion and elevation |
| Superior oblique | Trochlear (IV) | Intorsion and depression |

# The Recti

- NS: Lateral by abducent, all others by oculomotor

- Action: lateral rectus rotates the eyeball so that the cornea looks laterally

  Medial rectus rotates the eyeball so that the cornea looks medially


superior rectus
inferior oblique
inferior rectus
superior oblique
medial rectus
lateral rectus

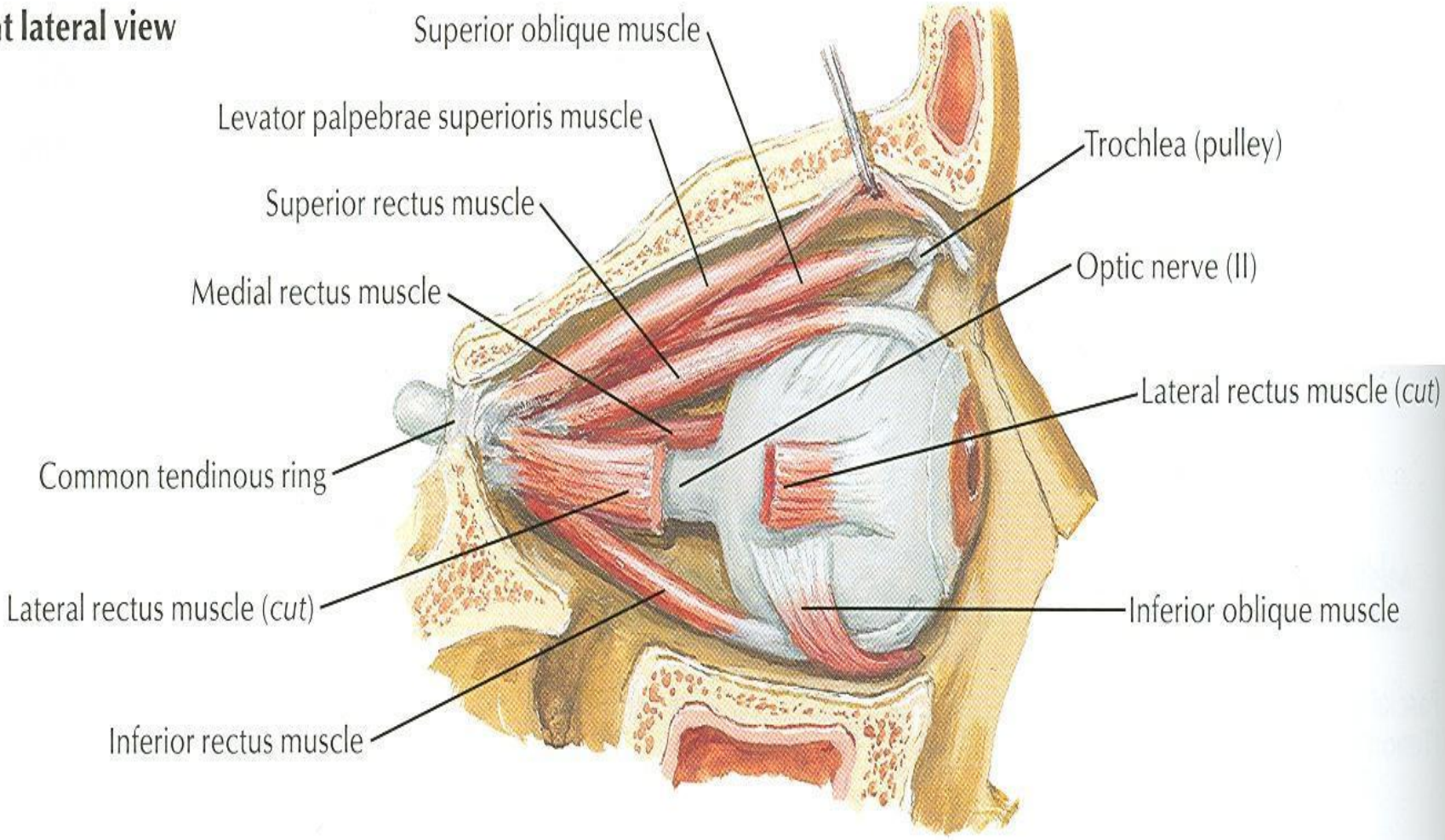
# The Recti

- Superior and inferior recti are inserted on the medial side of the vertical axis of the eyeball
- Superior rectus raises the cornea and rotates it medially
- Inferior rectus depresses the cornea and rotates it medially

# Superior Oblique

- Origin: From body of the sphenoid bone
- Insertion: into the sclera beneath the superior rectus after passing through the fibrocartilaginous pulley
- NS: Trochlear nerve
- Action: Rotates the eyeball so that the cornea looks downward & laterally

**Right lateral view**



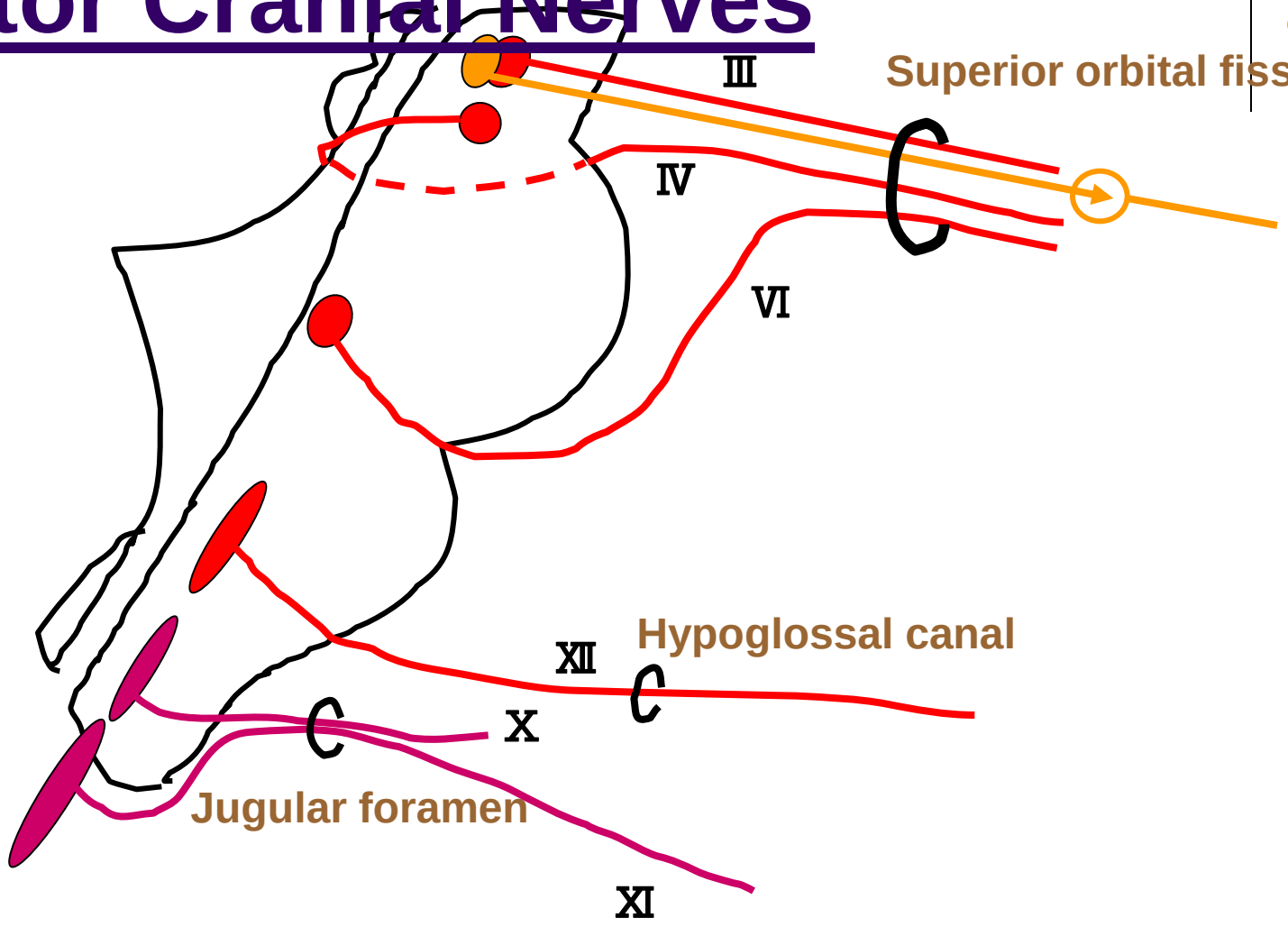
# Inferior Oblique

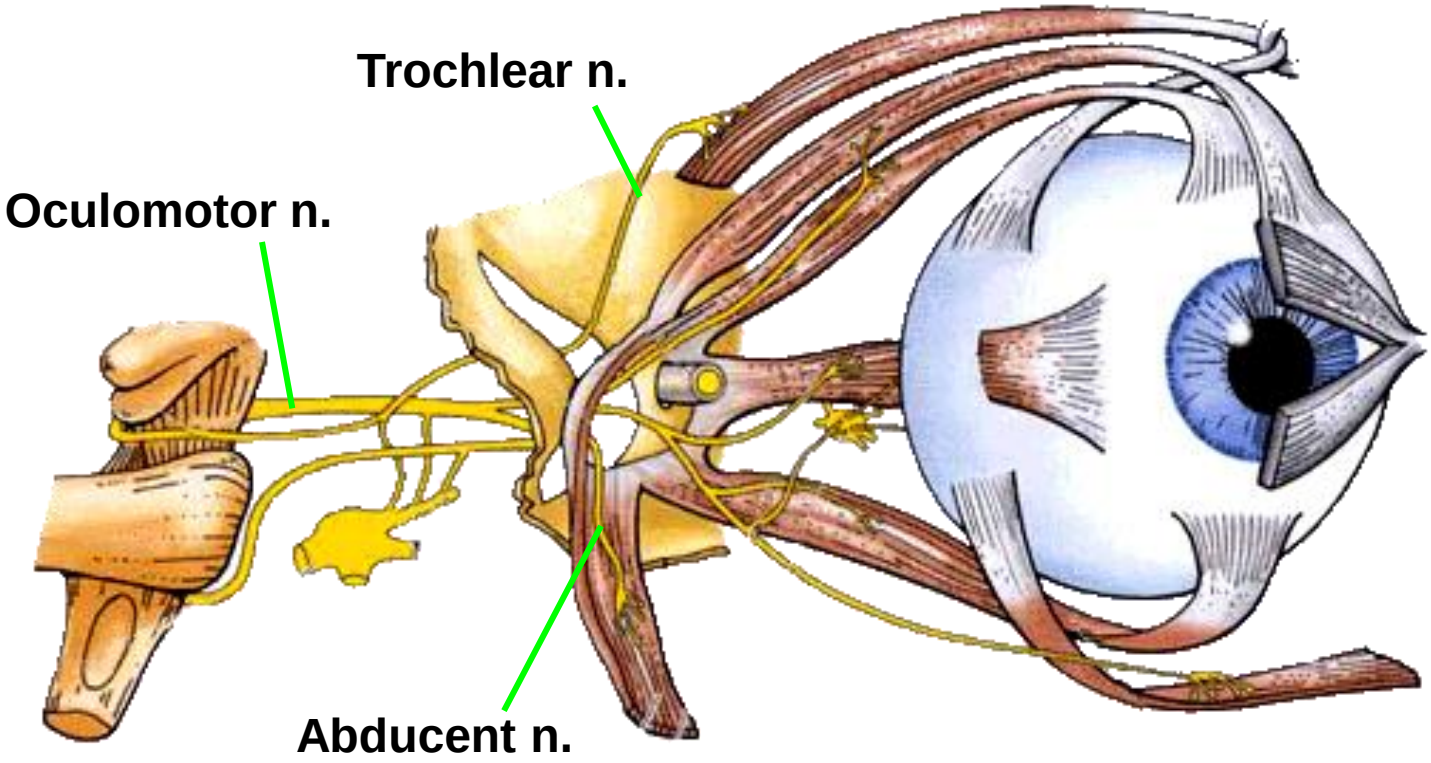
- Origin: Anterior part of floor of the orbit
- Insertion: In the sclera behind the coronal equator
- NS: Oculomotor
- Action: Rotates the eyeball so that the cornea looks upward and laterally

# Motor Supply

- Lacrimal Nerve
- Frontal Nerve
- Trochlear Nerve
- Oculomotor Nerve
- Abducent Nerve

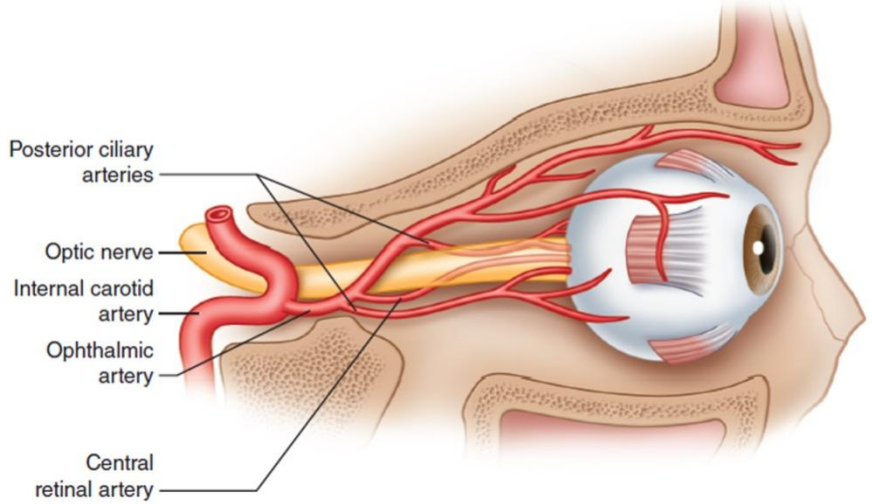
# Motor Cranial Nerves

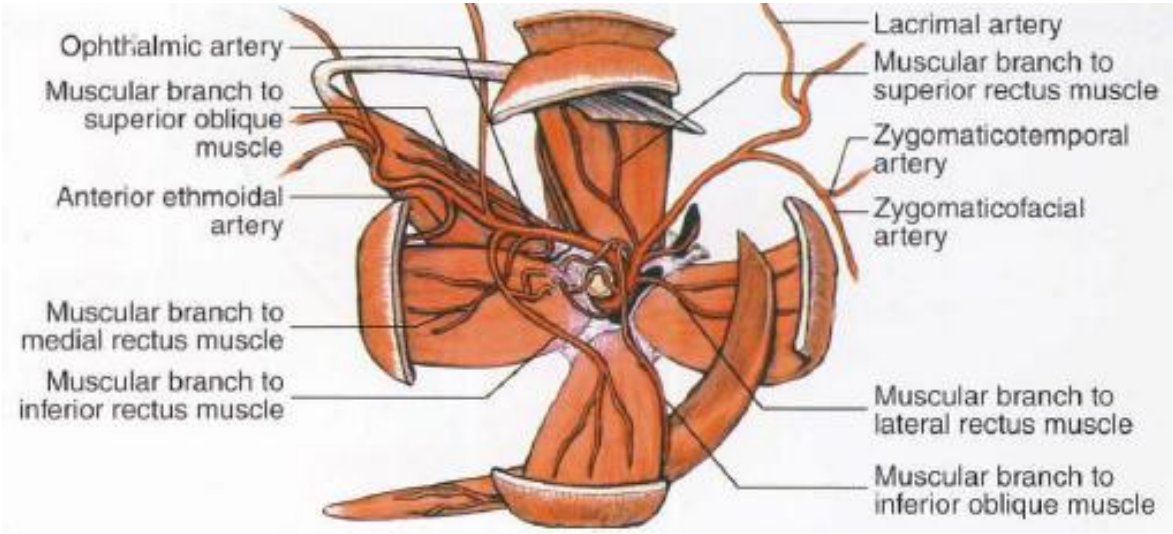



Trochlear n.
Oculomotor n.
Abducent n.

# Vascular Supply and Drainage of the Orbit

- The posterior ciliary vessels supply the whole uveal tract, the cilioretinal arteries, the sclera, the margin of the cornea, and the adjacent conjunctiva.
- The anterior ciliary arteries supply the rectus muscles.



# Infratemporal Fossa

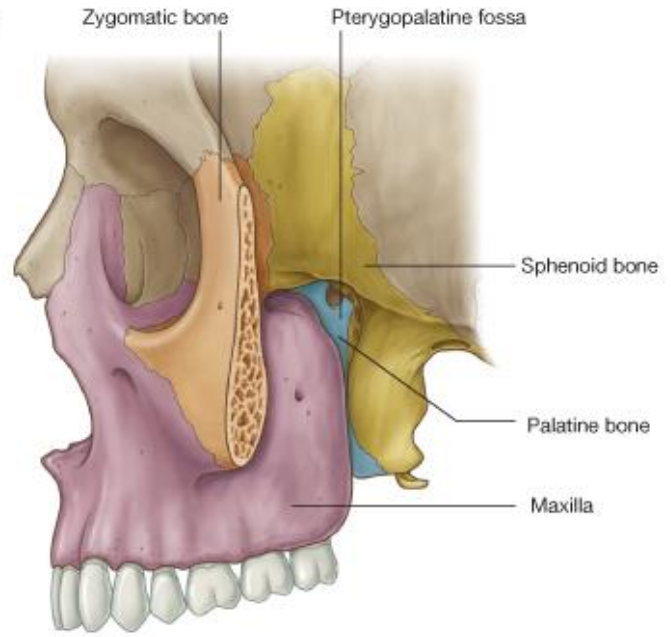
- Irregularly shaped space deep and inferior to the zygomatic arch, deep to the ramus of the mandible and posterior to the maxilla.

- Communicates with the temporal fossa through the interval between (deep to) the zygomatic arch and (superficial to) the cranial bones.

Temporal fossa is superior to the zygomatic arch,
The infratemporal fossa is inferior to the zygomatic arch.

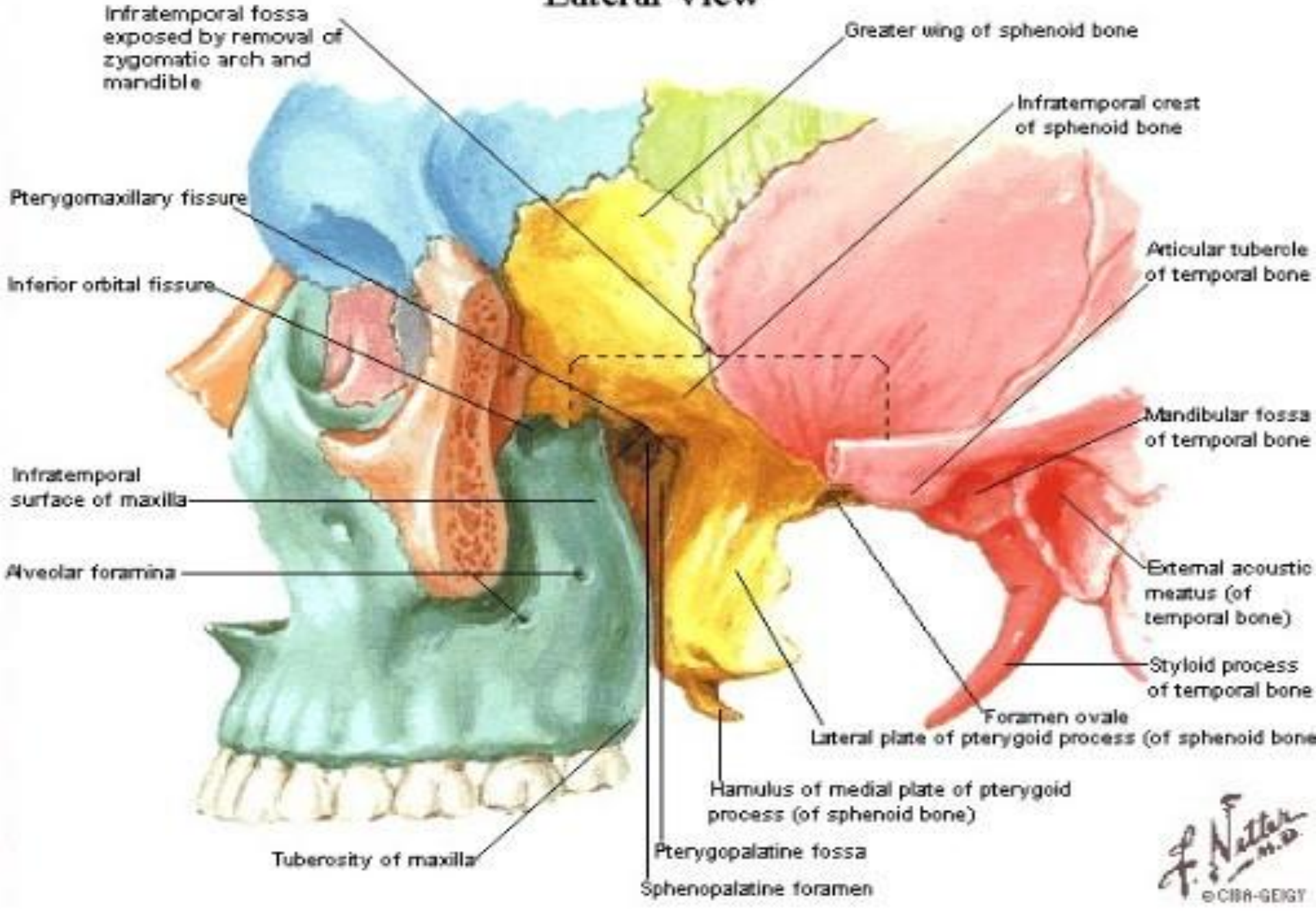
# Skeletal framework

- The walls of the pterygopalatine fossa are formed by:
- The anterior wall is formed by the posterior surface of the **maxilla;**
- The medial wall is formed by the lateral surface of the **palatine bone;**
- The posterior wall and roof are formed by parts of the **sphenoid bone.**



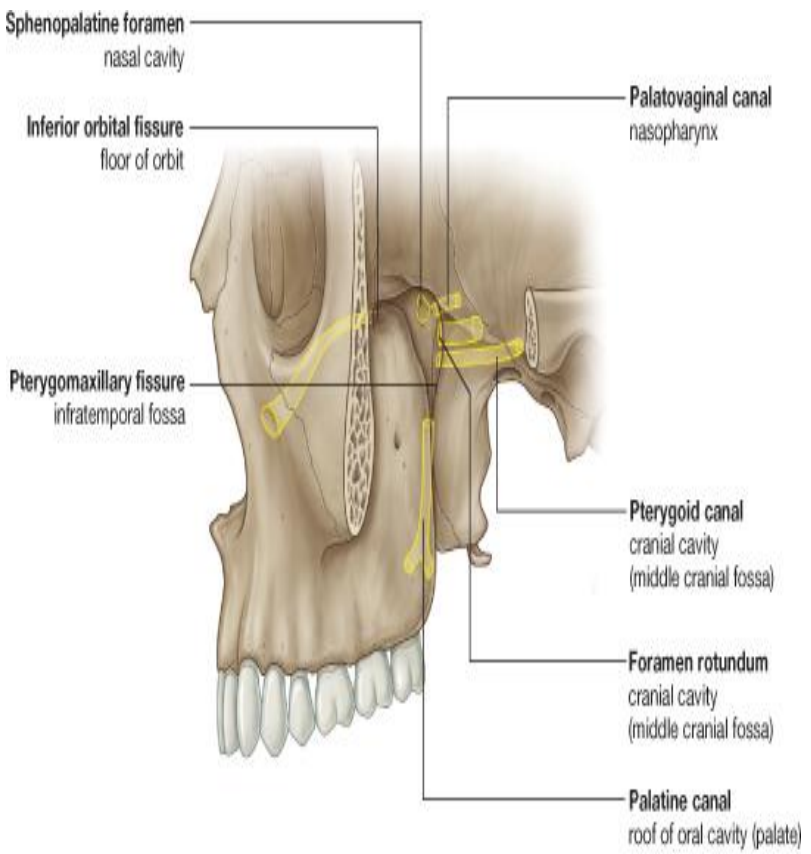
# Skull - Infratemporal Fossa Exposed

## Lateral View



# Gateways

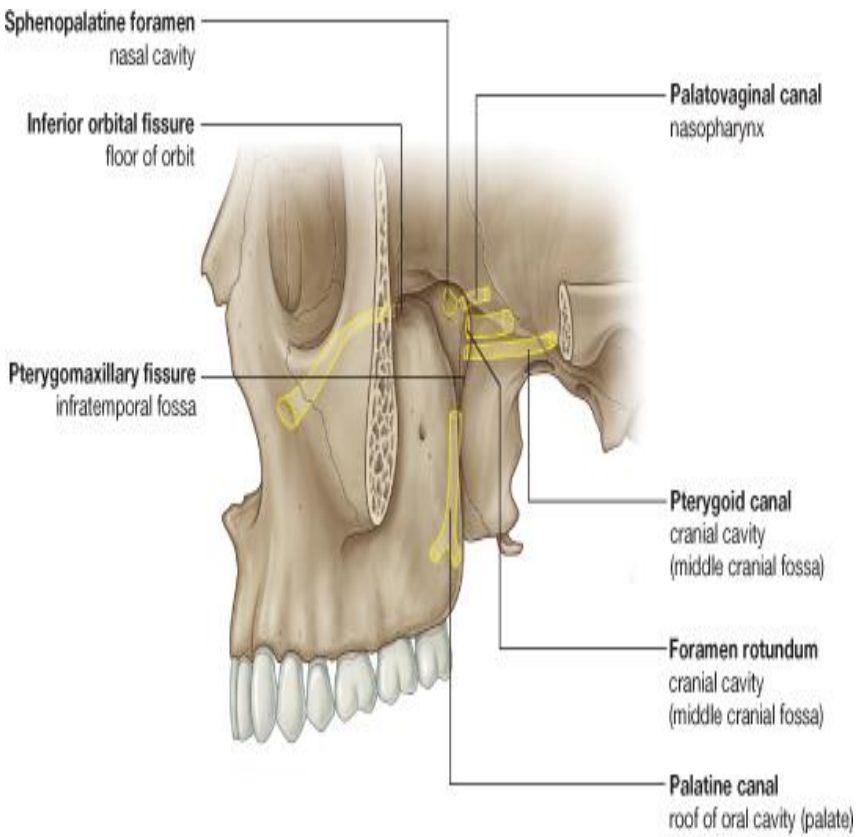
- Seven foramina and fissures provide apertures through which structures enter and leave the pterygopalatine fossa
- 1. **Foramen rotundum and pterygoid canal** communicate with the middle cranial fossa
- **2. Palatovaginal canal** opens onto the posterior wall and leads to the nasopharynx;
- 3. **Palatine canal** leads to the roof of the oral cavity (hard palate) and opens inferiorly;
- 4 **Sphenopalatine foramen** opens onto the lateral wall of the nasal cavity and is in the medial wall;

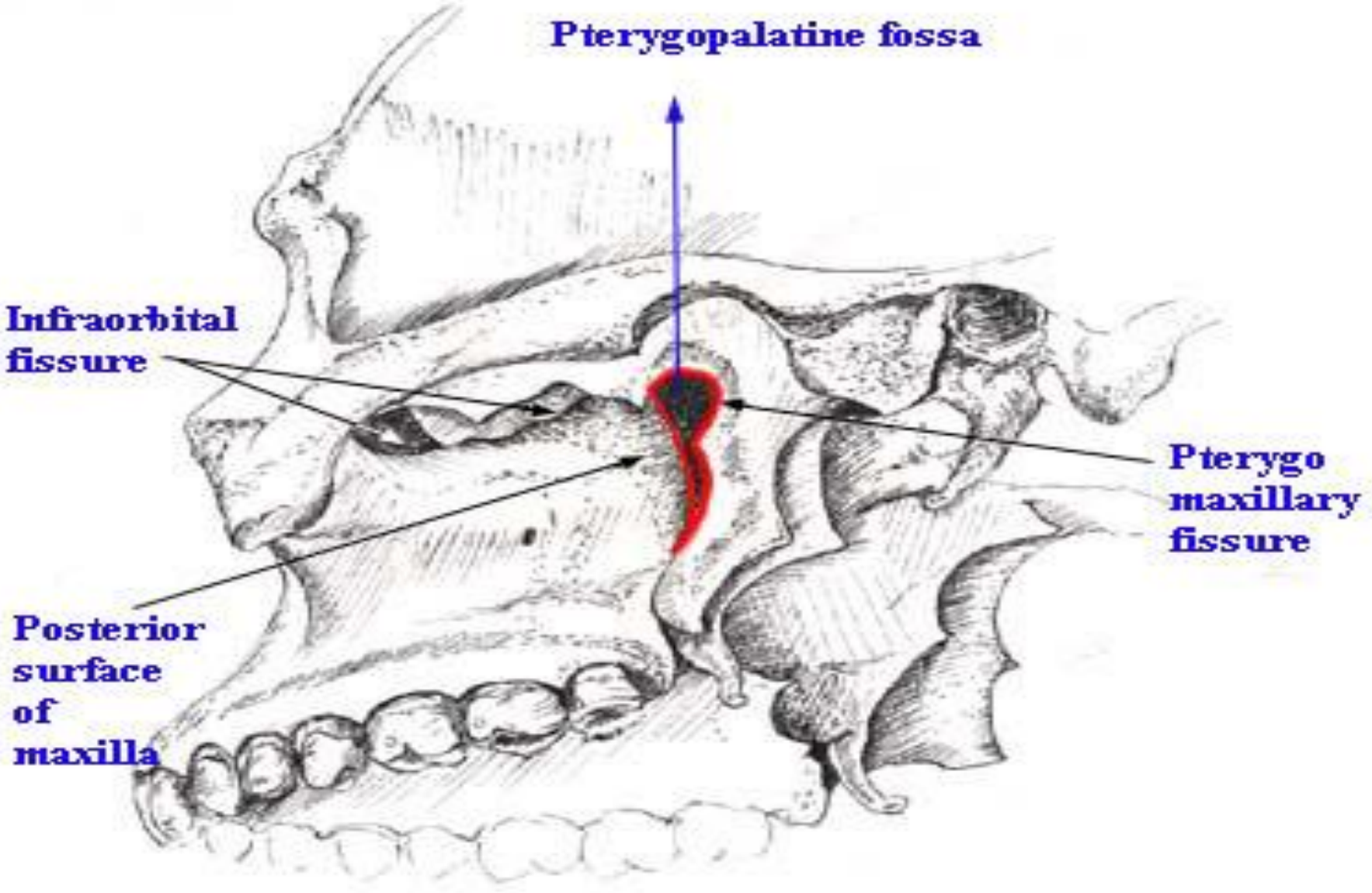


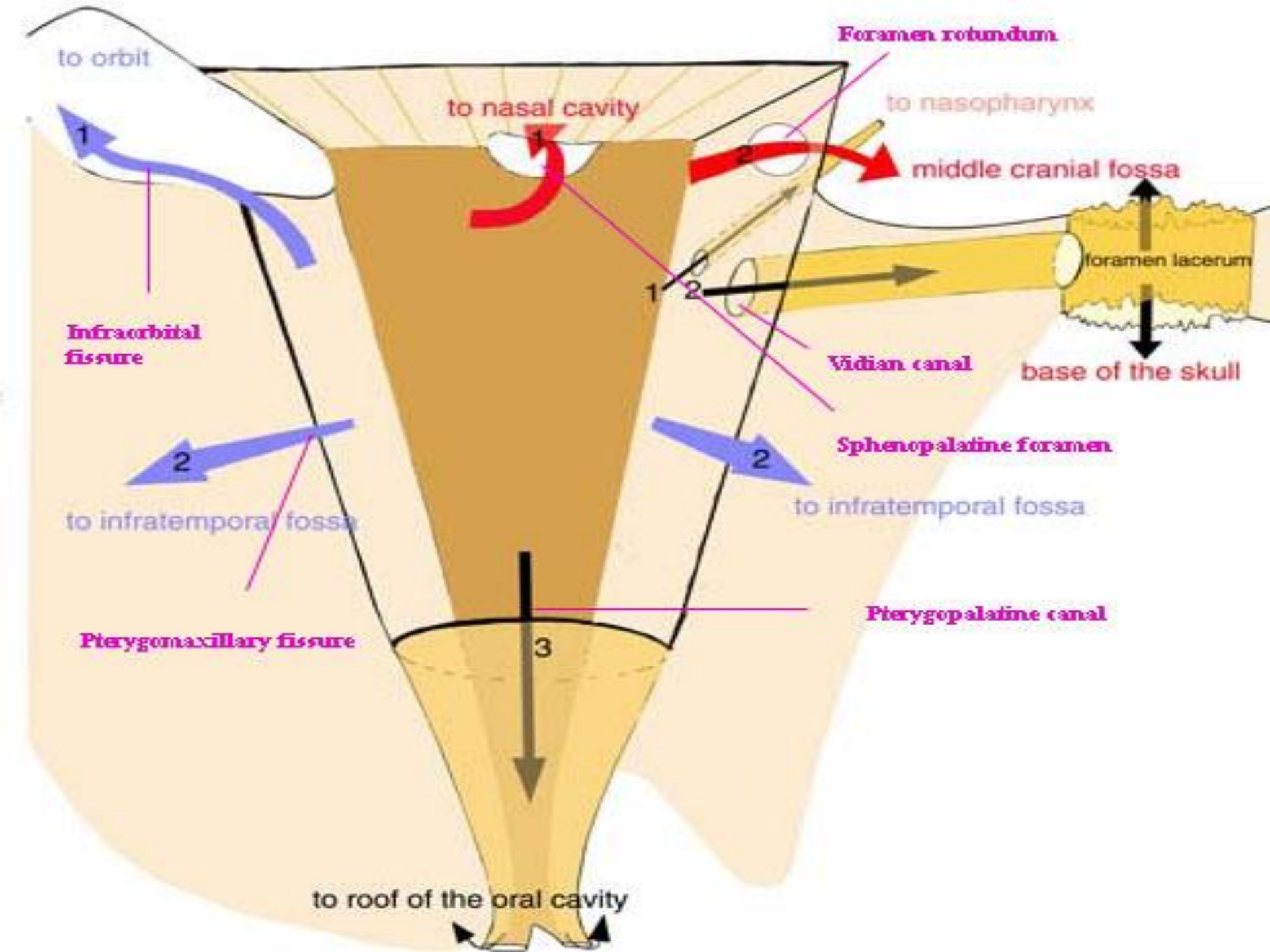
# Gateways

- 5. **Pterygomaxillary fissure** between lateral aspect of the pterygopalatine fossa and the infratemporal fossa;

- 6. **Inferior orbital fissure** between the superior aspect of the fossa into the floor of the orbit



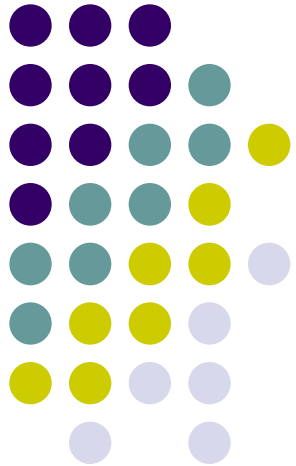

Pterygopalatine fossa
Infraorbital fissure
Pterygo maxillary fissure
Posterior surface of maxilla


to orbit
to nasal cavity
Foramen rotundum
to nasopharynx
middle cranial fossa
foramen lacerum
base of the skull
Infraorbital fissure
Vidian canal
Sphenopalatine foramen
to infratemporal fossa
to infratemporal fossa
Pterygopalatine canal
Pterygomaxillary fissure
to roof of the oral cavity
1
2
3

# Contents

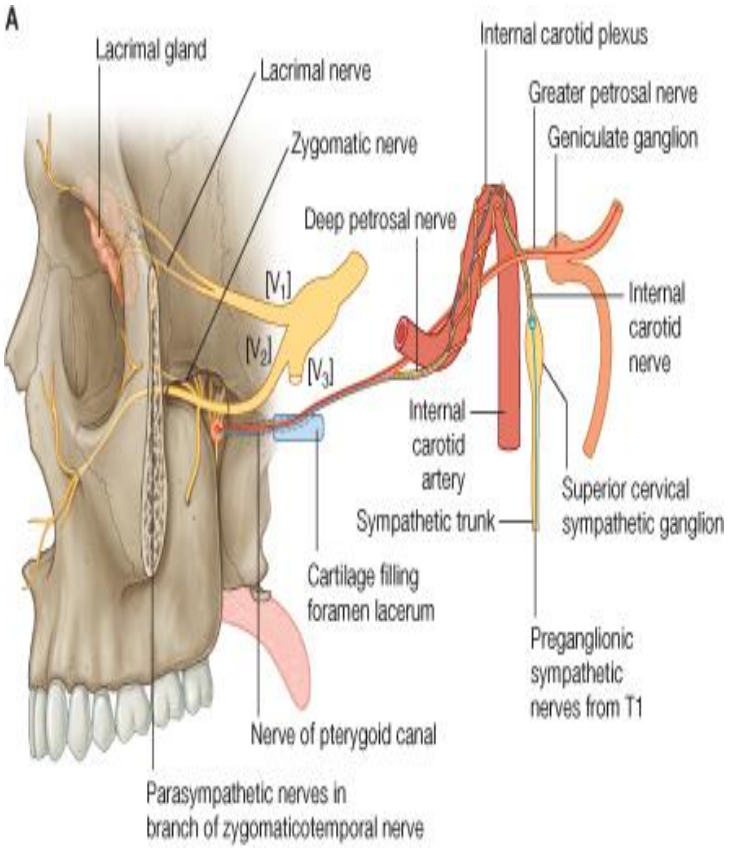
- 1. The maxillary nerve [V2]
- 2. Terminal part of the maxillary artery
- 3. Nerve of the pterygoid canal
- 4. The pterygopalatine ganglion
- 5. Veins and lymphatics also pass through the pterygopalatine fossa.

# Pterygopalatine ganglion



# Nerve of the pterygoid canal

- Formed in the middle cranial fossa by the union of:
- 1. The greater petrosal nerve (a branch of the facial nerve [VII]);
- 2. The deep petrosal nerve (a branch of the internal carotid plexus).
- Joins the pterygopalatine ganglion
- Carries mainly **preganglionic parasympathetic** (great petrosal) and **postganglionic sympathetic** (deep petrosal) fibers.

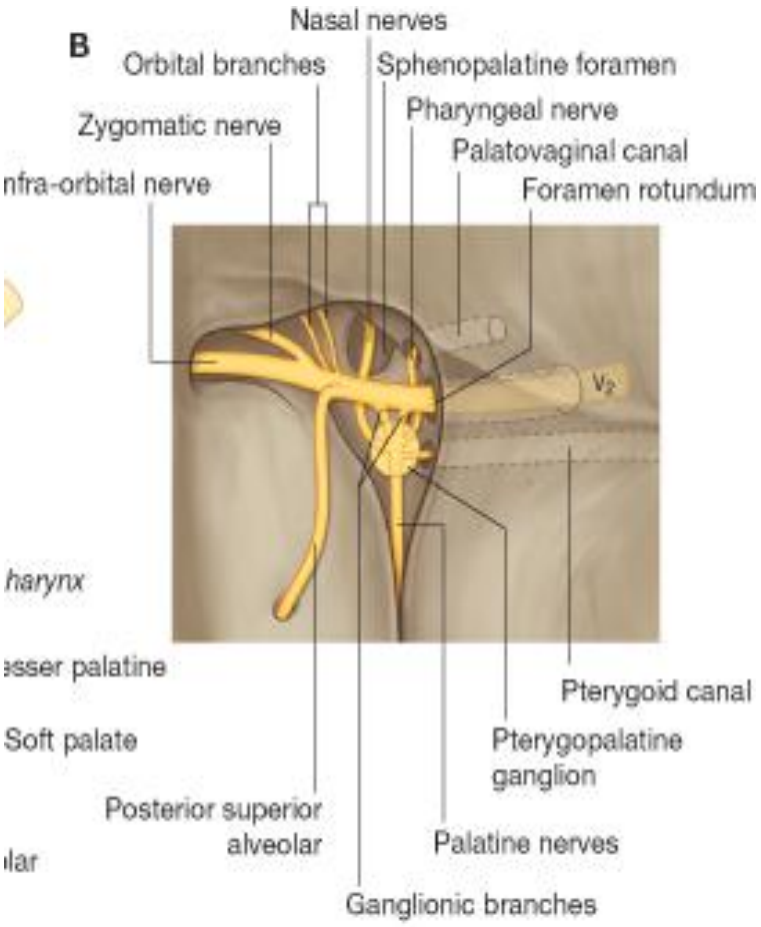


# Pterygopalatine ganglion

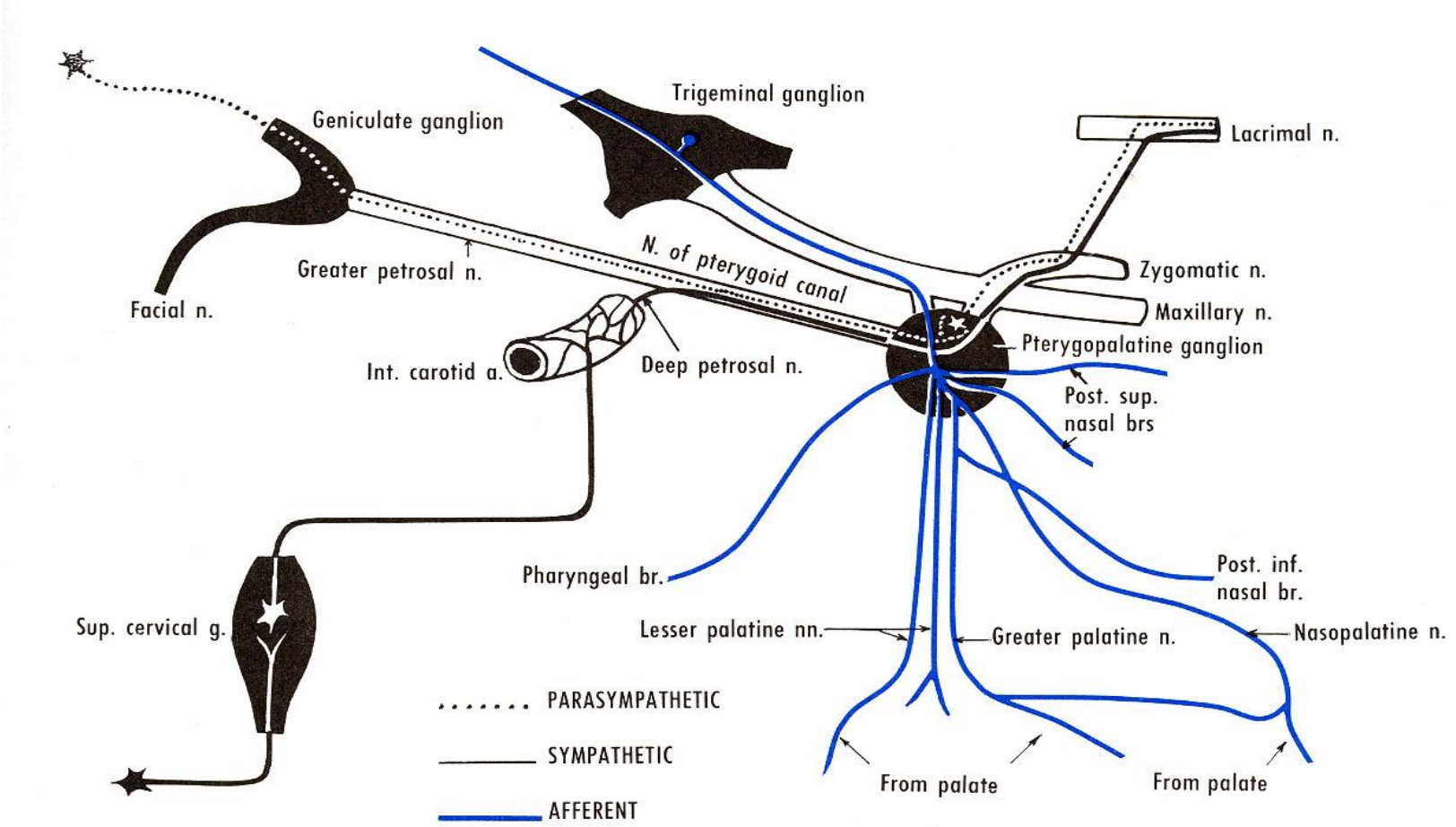
- Largest of the four parasympathetic ganglia in the head
- Formed by the cell bodies neurons associated with:
- 1. **Preganglionic parasympathetic** fibers of the facial nerve carried by the **greater petrosal nerve** and the **nerve of the pterygoid canal**.
- **2.Sensory and ganglionic** branches of the **maxillary nerve**
- **3.Postganglionic sympathetic** fibers **(deep petrosal)**

# Pterygopalatine ganglion

- These fibers form **orbital, palatine, nasal, and pharyngeal branches**, which leave the ganglion.
- Other fibers pass superiorly through the ganglionic branches of the maxillary nerve to enter the main trunk of the maxillary nerve
- And then **distributed with the zygomatic, posterior superior alveolar, and infra-orbital nerves**



# Pterygopalatine ganglion

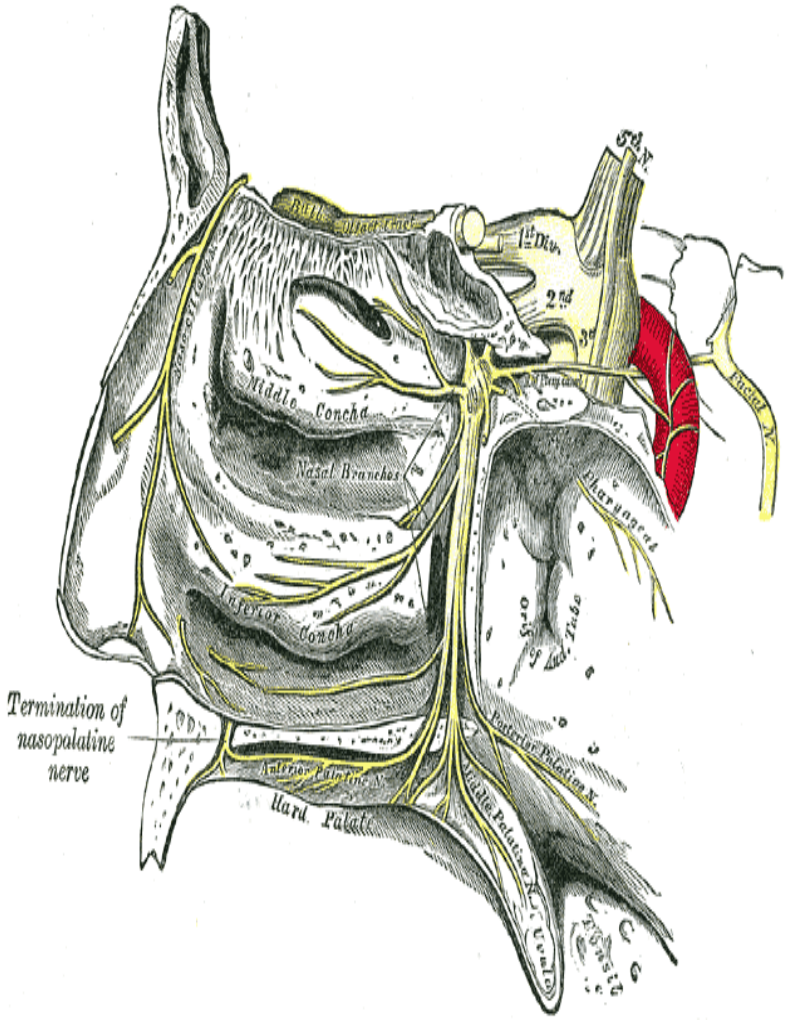


# Orbital branches

- Pass through the inferior orbital fissure
- Supply of the orbital wall (periosteum) and lacrimal gland
- Supply the sphenoidal and ethmoidal sinuses.

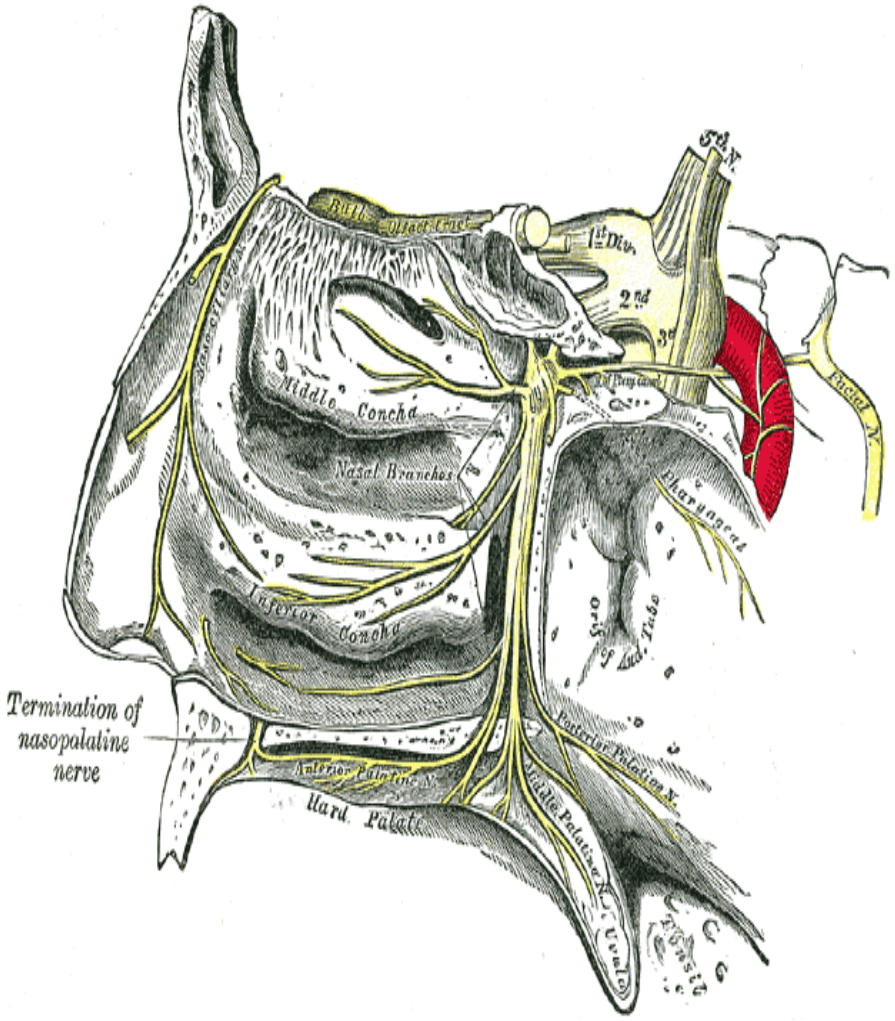
# Pharyngeal nerve

- Passes posteriorly from th pterygopalatine ganglion
- Leaves the fossa through the palatovaginal canal
- Supply the mucosa and glands of the nasopharyn›



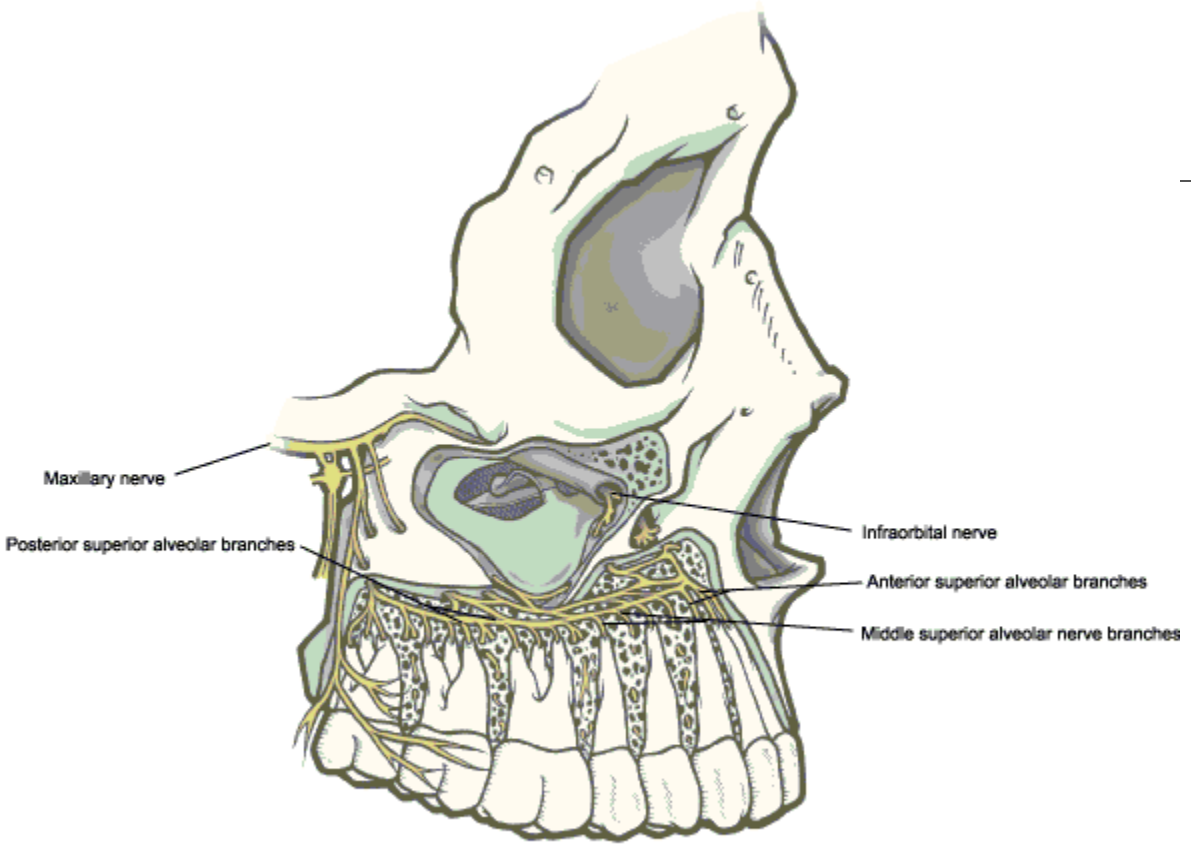
# Greater and lesser palatine nerves

- Pass through the palatine canal
- Enter the oral surface of the palate through the greater and lesser palatine foramina.
- **Lesser palatine (Middle, Post, palatine)** nerve passes posteriorly to supply the soft palate.



More anteriorly **posterior superior alveolar nerves** are given off.

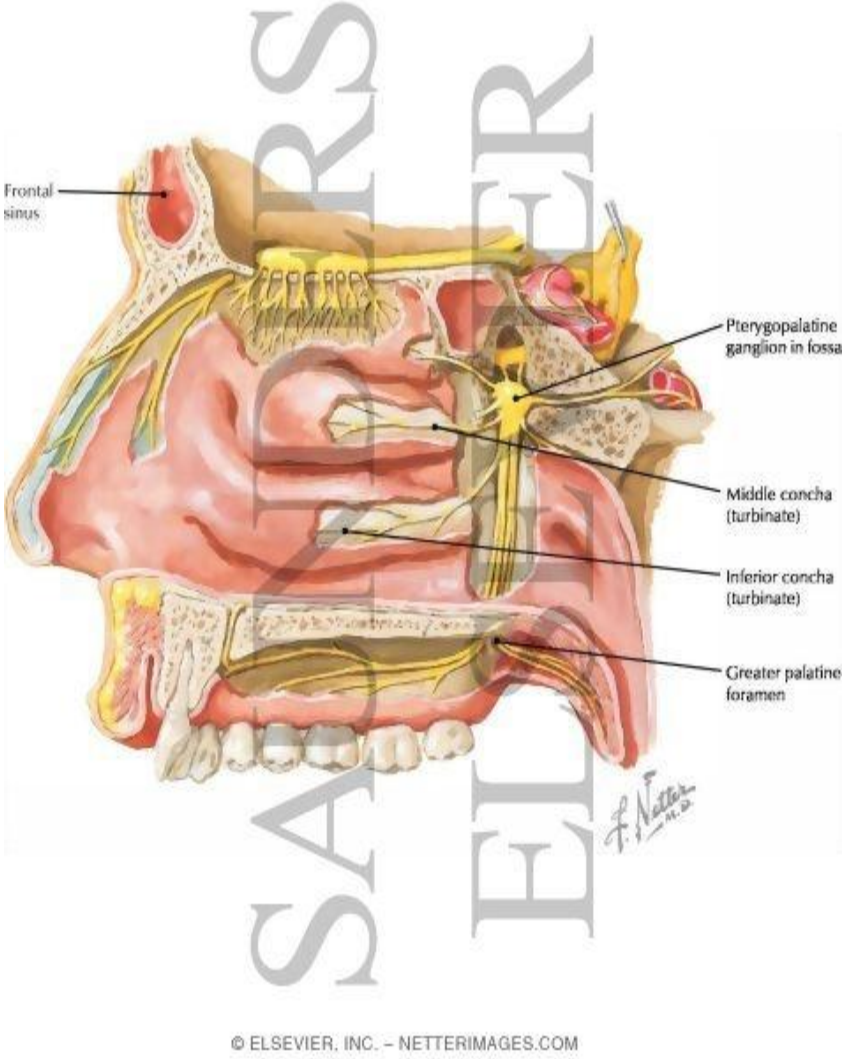
Pass through the pterygopalatine maxillary fissure into the infratemporal fossa.




The Maxillary Nerve and its Distribution

# Greater and lesser palatine nerves

- **The Greater palatine (Ant.palatine)** nerve passes forward on the roof of the oral cavity
- Innervate mucosa and glands of the hard palate and the adjacent gingiva, almost as far forward as the incisor teeth
- Also supply the mucosa over the middle and lower part of the lateral wall of the nasal cavity
- Joins the long sphenopalatine nerve



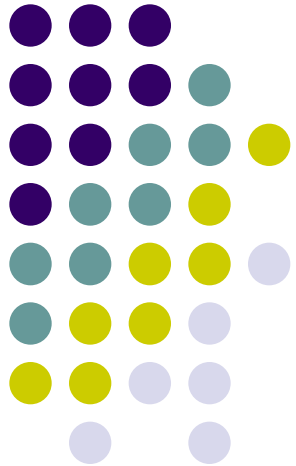
# Nasal nerves

- Seven in number
- Pass medially through the sphenopalatine foramen to enter the nasal cavity

- **Short spheno-palatine** (Post.Sup. Lateral nasal) supply the mucosa of the Post,Sup. quadrant of the nasal cavity.

- The **Nasopalatine nerve (long Spheno-palatine)** is the largest of the nasal nerves
- Passes anteriorly grooving down the nasal septum
- Through the incisive canal and fossa in the hard palate
- Supply mucosa, gingiva, and glands adjacent to the incisor teeth.
- Join the greater palatine nerve.

# Maxillary Nerve

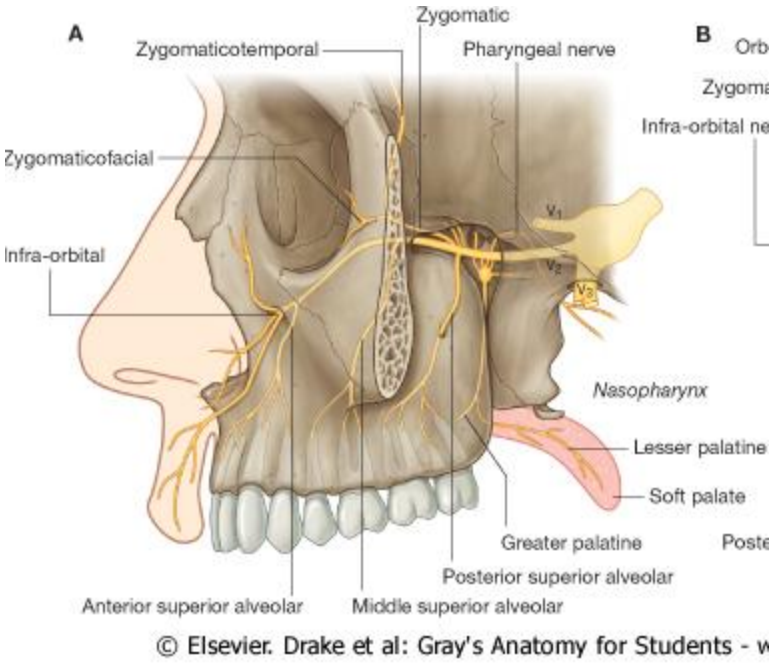


# Maxillary nerve [V2]

- Purely sensory
- Originates from the trigeminal ganglion in the cranial cavity
- Exits the middle cranial fossa, and enters the pterygopalatine fossa through the foramen rotundum
- It terminates as the infra-orbital nerve through the inferior orbital fissure.

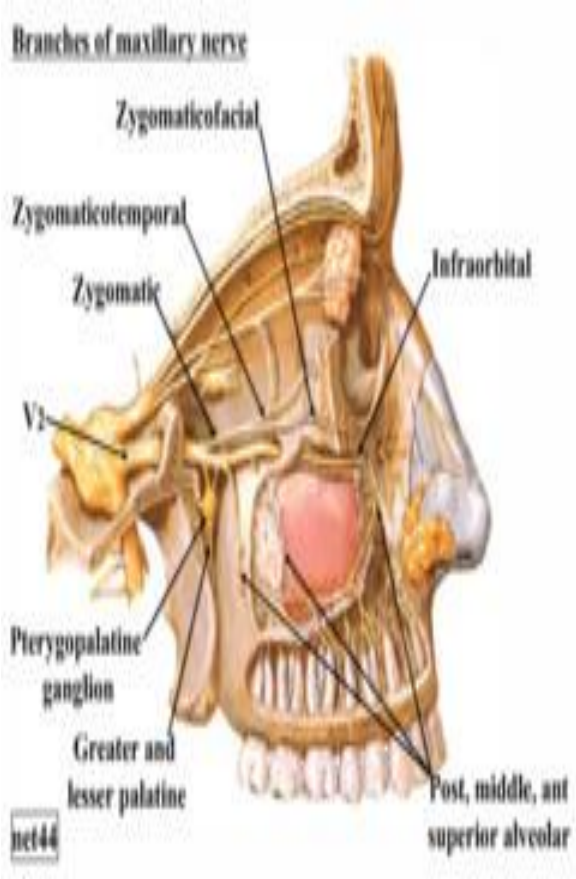
# Maxillary nerve

- Branches:
- Meningeal (before it enters the Fossa)
- Two ganglionic branches pass through the pterygopalatine ganglion (Postganglionic parasympathetic fibers and sensory).
- Zygomatic nerve
- Posterior superior alveolar nerve
- Infra-orbital



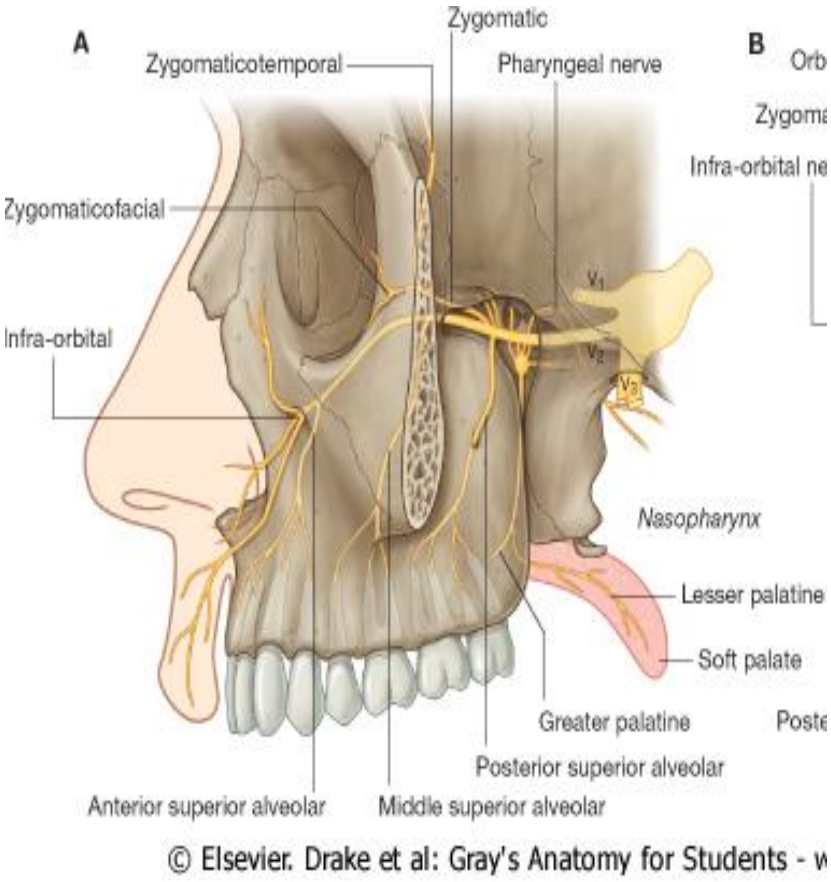
# Zygomatic nerve

- Originates directly from the maxillary nerve in the pterygopalatine fossa
- Enter the orbit through the inferior orbital fissure
- Divides into zygomaticotemporal and zygomaticofacial branches
- **Zygomaticotemporal branch** enter the temporal fossa and passes superficially to supply skin over the temple
- Carries postganglionic parasympathetic and sympathetic fibers and form a special autonomic nerve to join the lacrimal nerve
- The **Zygomaticofacial branch** opens on the anterolateral surface of the zygomatic bone, and supply the adjacent skin.



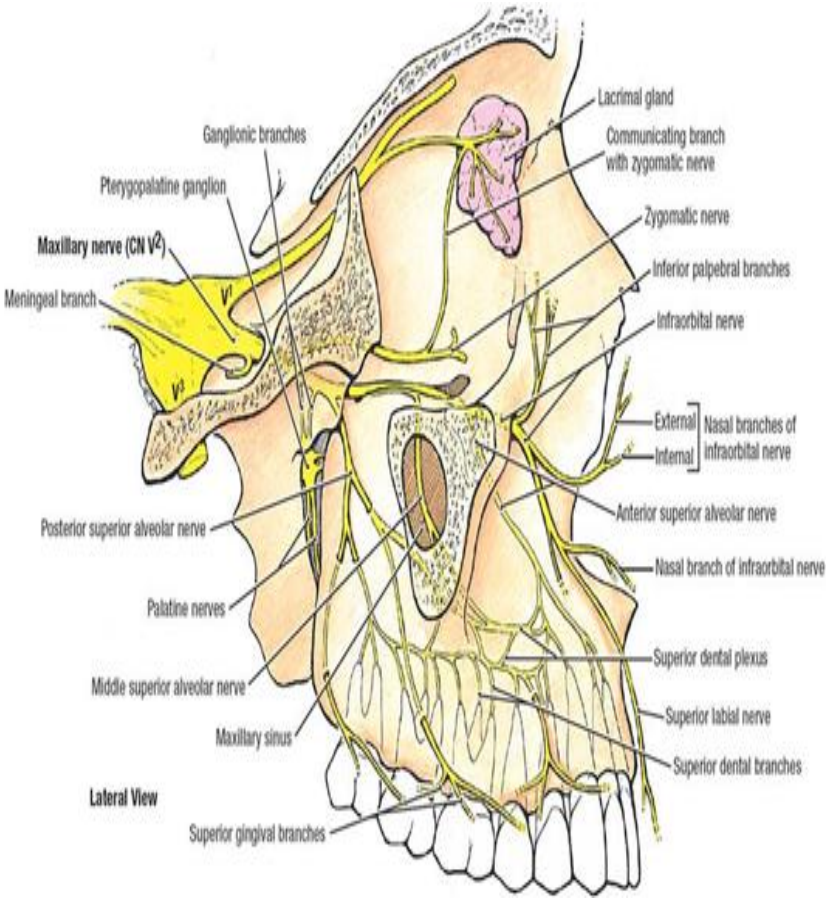
# Posterior superior alveolar nerve

- Passes laterally out of the fossa through the pterygomaxillary fissure
- Enter the posterior surface of the maxilla approximately midway between the last molar tooth and the inferior orbital fissure
- Supplies the molar teeth and adjacent buccal gingivae
- contributes to the supply of the maxillary sinus



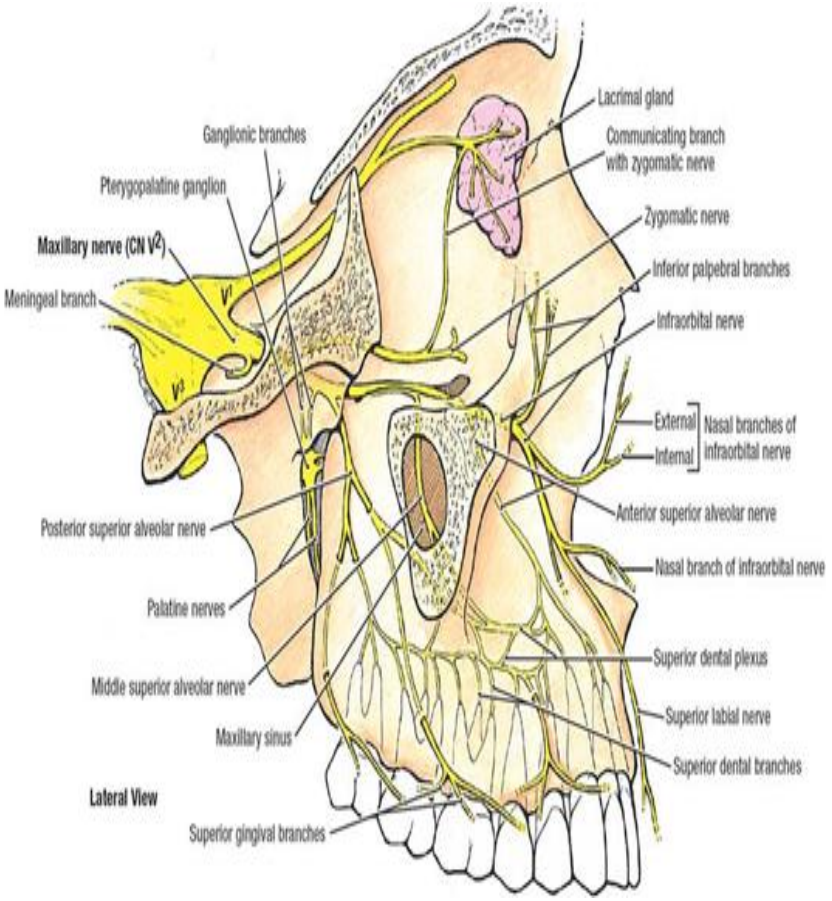
# Infra-orbital nerve

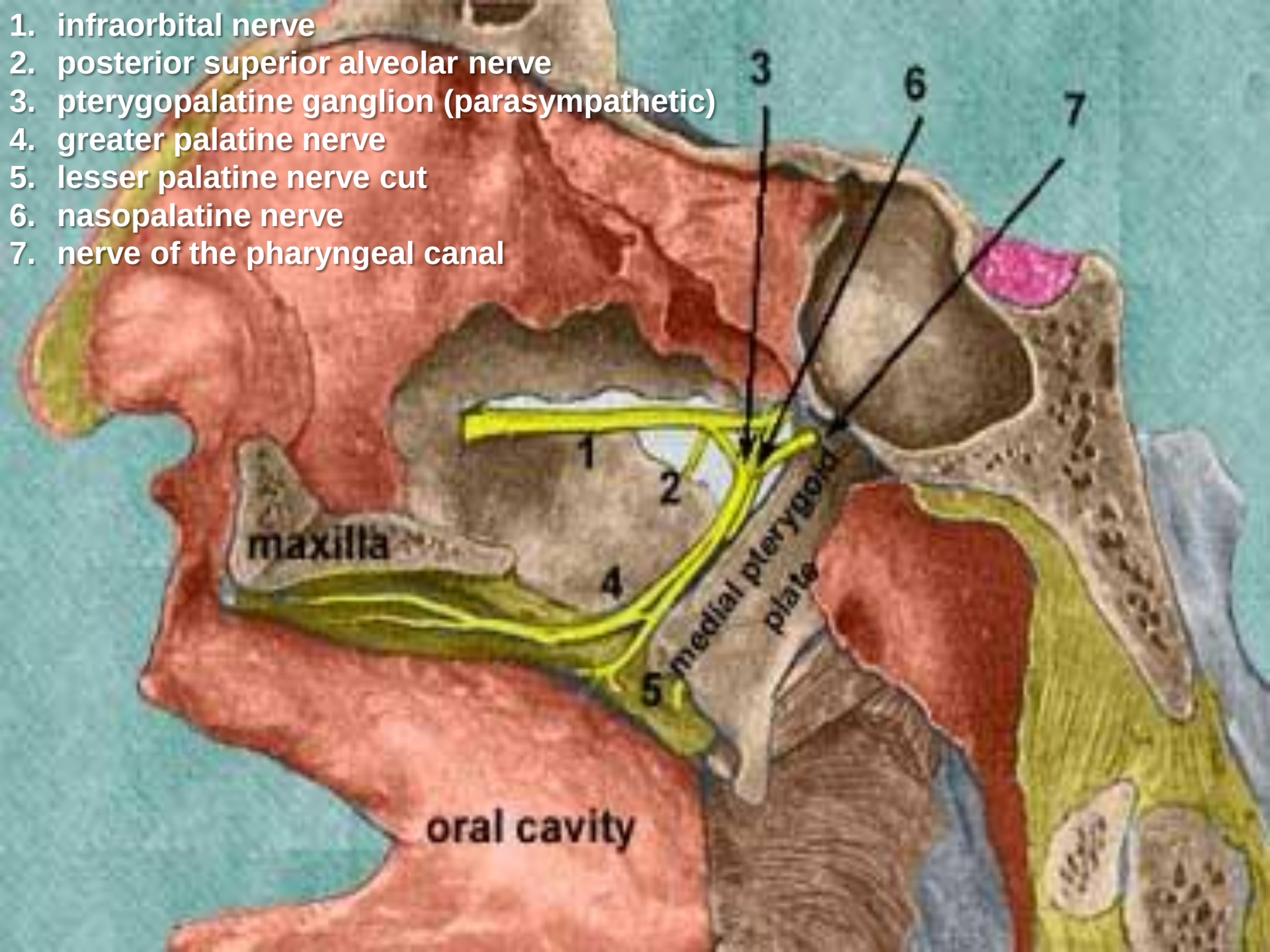
- Anterior continuation of the maxillary nerve
- Leaves the pterygopalatine fossa through the inferior orbital fissure
- First in the **infra-orbital groove** in the floor of the orbit and then continues forward in the **infra-orbital canal.**
- While in the infra-orbital groove and canal, the infra-orbital nerve gives origin to **middle** and **anterior superior alveolar nerves:**
- They Join the **superior alveolar plexus** to supply the upper teeth
- Middle superior alveolar nerve also supplies the maxillary sinus
- Anterior superior alveolar nerve also gives origin to a small nasal branch



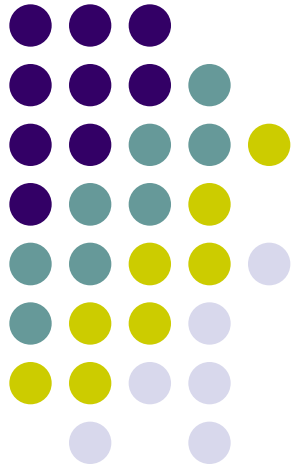
# Infra-orbital nerve

- The infra-orbital nerve exits the infra-orbital canal through the **infra-orbital foramen**
- Divides into nasal, palpebral, and superior labial branches
- Nasal branches supply skin over the lateral aspect of the external nose and part of the nasal septum;
- Palpebral branches supply skin of the lower eyelid;
- Superior labial branches supply skin over the cheek and upper lip, and the related oral mucosa.



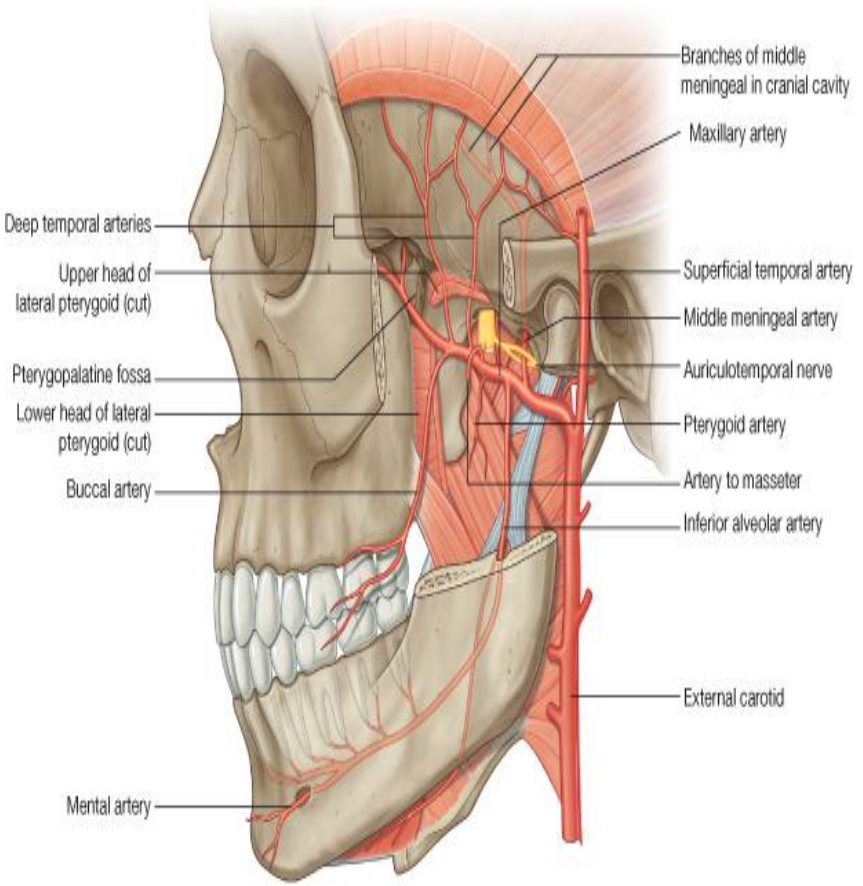

1. infraorbital nerve
2. posterior superior alveolar nerve
3. pterygopalatine ganglion (parasympathetic)
4. greater palatine nerve
5. lesser palatine nerve cut
6. nasopalatine nerve
7. nerve of the pharyngeal canal
3
6
7
1
2
maxilla
4
medial pterygoid plate
5
oral cavity

# Maxillary Artery



# Maxillary artery

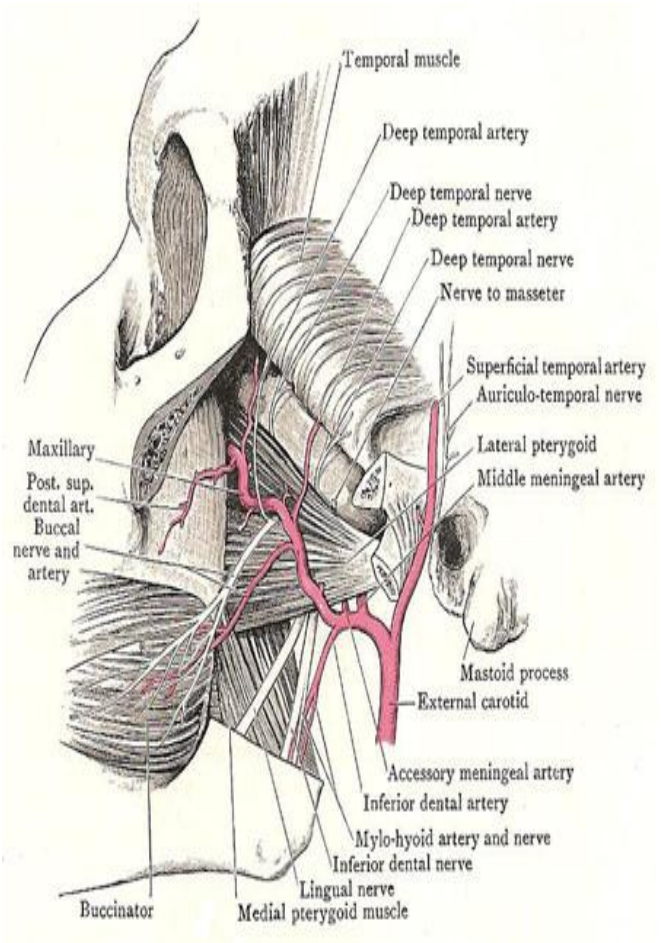
- Major branch of the external carotid artery in the neck
- Originates adjacent to the neck of mandible
- Originates within the substance of the parotid gland
- Passes forward through the infratemporal fossa
- Enters the pterygopalatine fossa through the pterygomaxillary fissure (the third part)



# First part

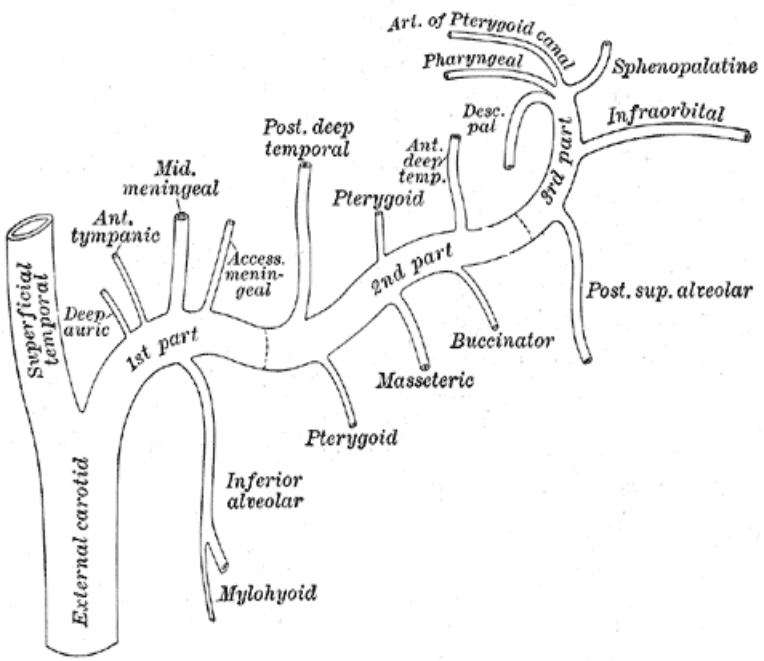
- The first part of the maxillary artery is the part between the neck of mandible (Lat.) and the sphenomandibular ligament (Med.)
- Also related to the auriculo.temporal nerve (above) and the maxillary vein (below).

- Gives origin to two major branches (the middle meningeal and inferior alveolar arteries)
- Smaller branches (deep auricular, anterior tympanic, and accessory meningeal);



# Second part

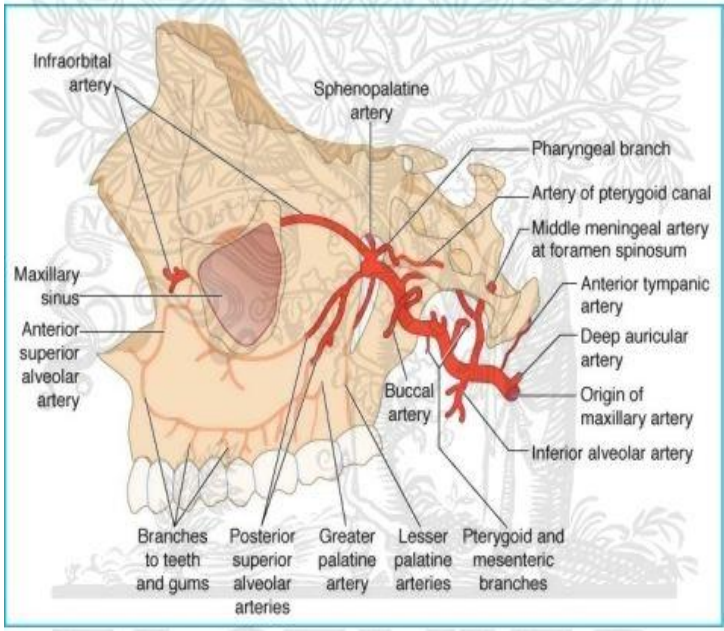
- The second part of the maxillary artery the part related to the lateral pterygoid muscle
- Gives origin to deep temporal, masseteric, buccal, and pterygoid branches (muscles of mastication)
- Course with branches of the mandibular nerve




Branches of the maxillary artery
Gray's Anatomy 1918

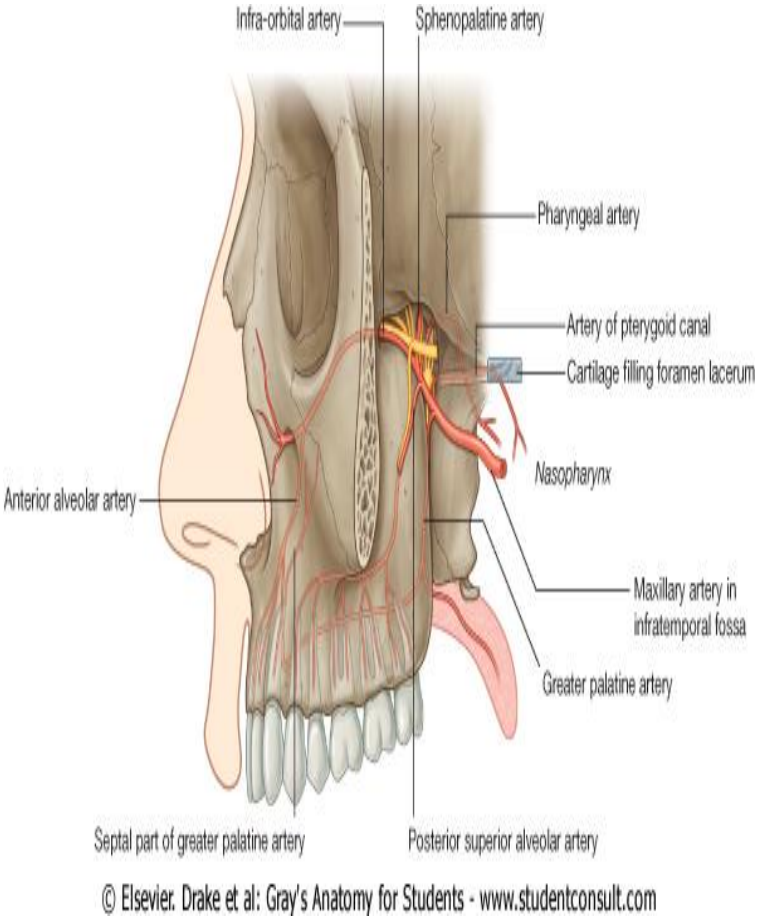
# Terminal (3rd) part

- In the pterygopalatine fossa
- Anterior to the pterygopalatine ganglion
- Gives origin to branches that accompany branches of the maxillary nerve [V2] and the pterygopalatine ganglion.
- These branches supply much of the nasal cavity, the roof of the oral cavity, and all upper teeth.
- In addition, they contribute to the blood supply of the sinuses, oropharynx, and floor of the orbit.



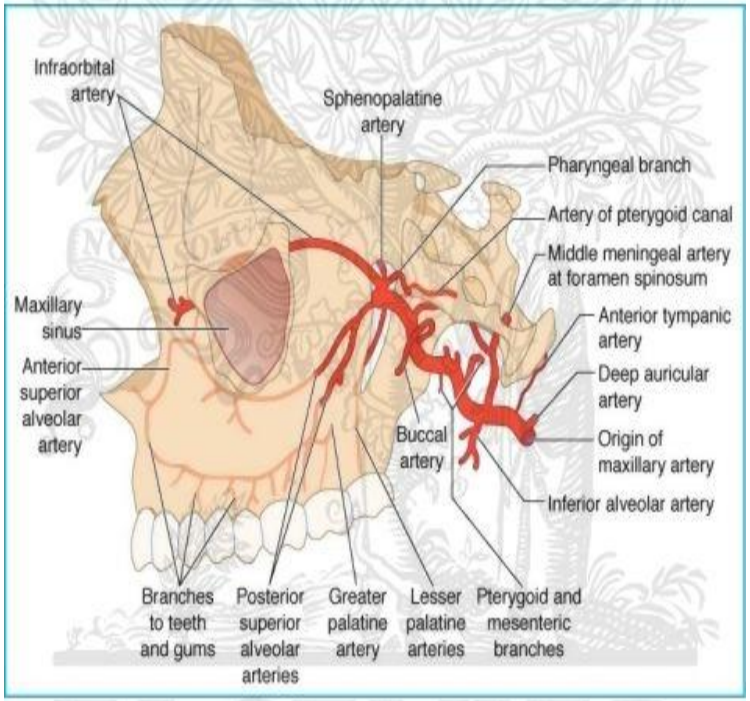
# Branches of the 3rd part maxillary artery

- 1. The posterior superior alveolar,
- 2. Infra-orbital,
- 3. Greater palatine,
- 4. Pharyngeal,
- 5. Sphenopalatine arteries,
- 6.The artery of the pterygoid canal



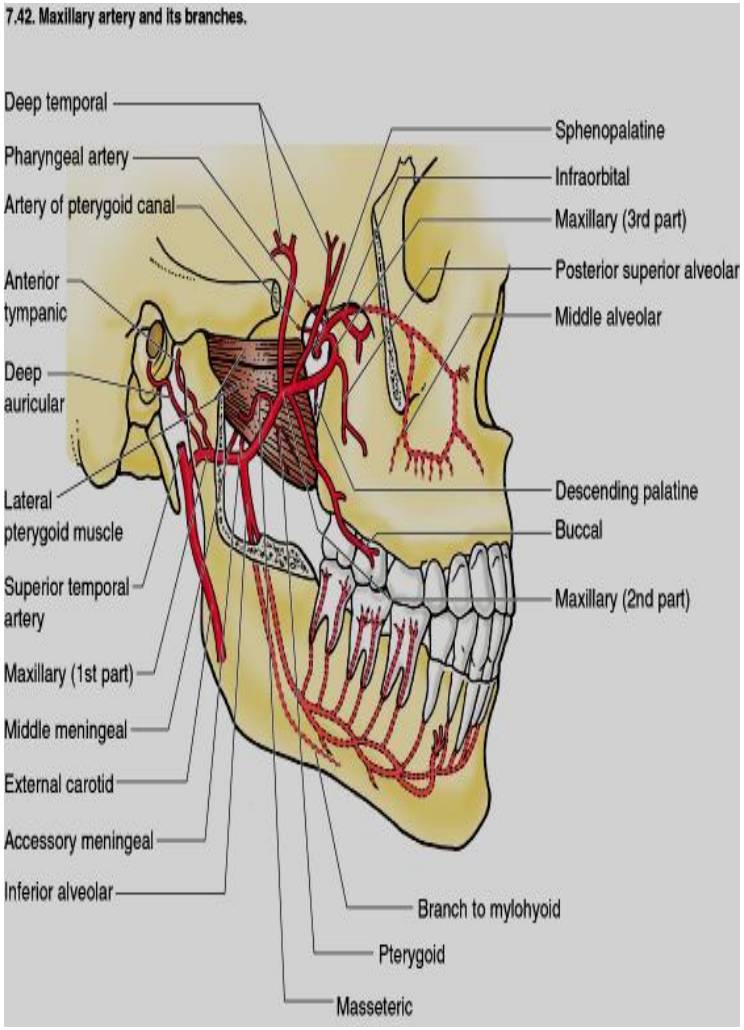
# Posterior superior alveolar artery

- Originates from the maxillary artery as it passes through the pterygomaxillary fissure
- Meets the posterior superior alveolar nerve,
- Accompanies it through the alveolar foramen on the infratemporal surface of the maxilla
- Supplies the molar and premolar teeth, adjacent gingiva, and the maxillary sinus.



# Infra-orbital artery

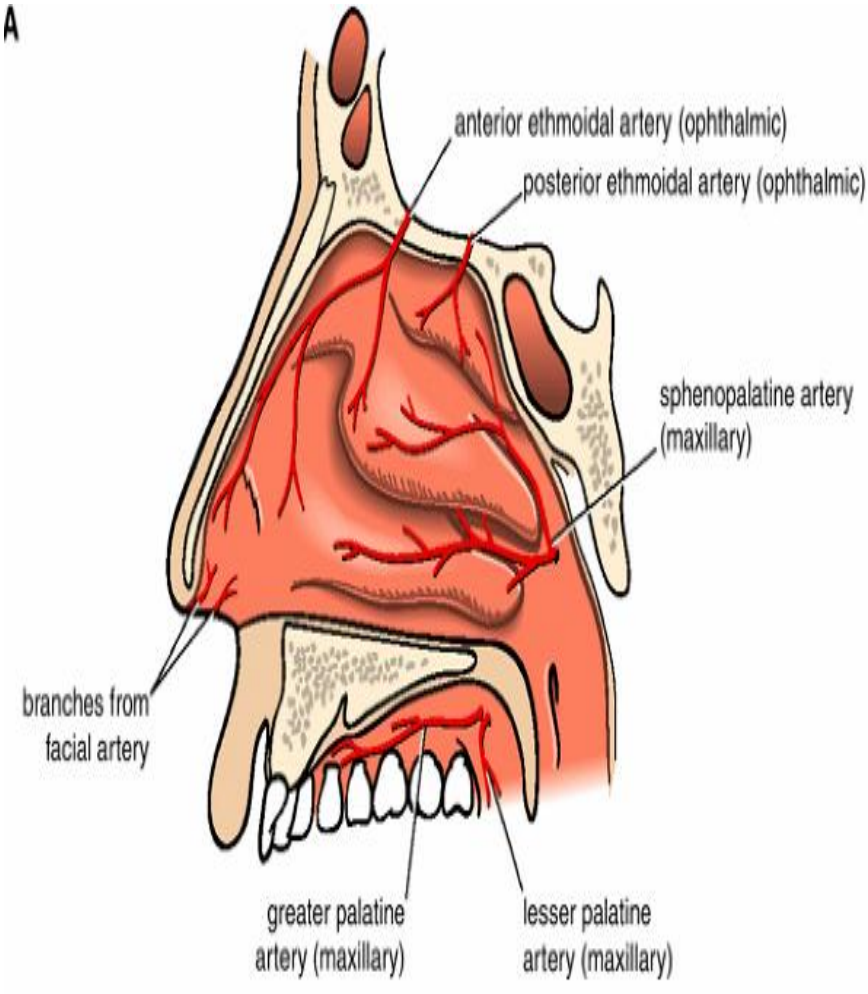
- Passes forward with the infra-orbital nerve and leaves the pterygopalatine fossa through the inferior orbital fissure
- With the infra-orbital nerve, it lies in the infra-orbital groove and infra-orbital canal
- Emerges through the infra-orbital foramen to supply parts of the face.
- In the orbital canal gives :
- 1. Branches that contribute to the blood supply of structures near the floor of the orbit-the inferior rectus and inferior oblique muscles, and the lacrimal sac;
- **2. Anterior superior alveolar arteries**, which supply the incisor and canine teeth and the maxillary sinus.



# Greater palatine artery

- Travels posteriorly and leaves the pterygopalatine fossa through the palatovaginal canal with the pharyngeal nerve

- Supplies the posterior aspect of the roof of the nasal cavity, the sphenoidal sinus, and the pharyngotympanic tube.

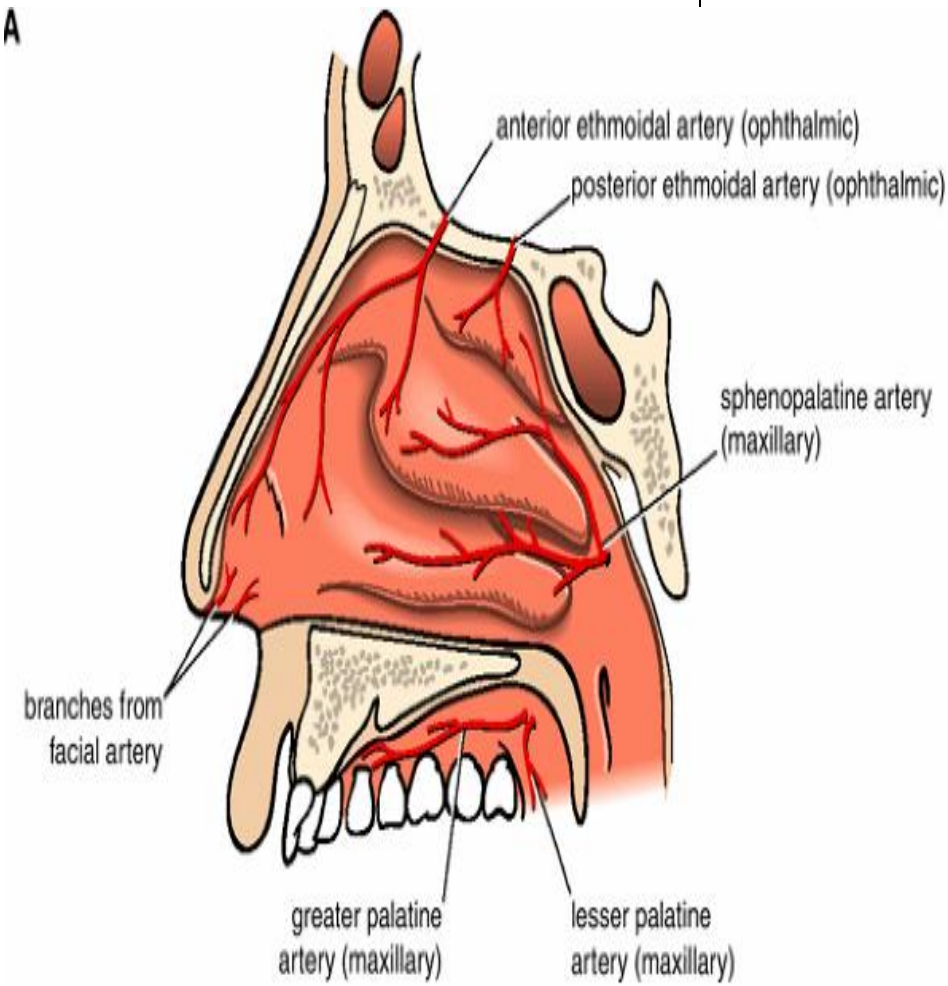


# Sphenopalatine artery

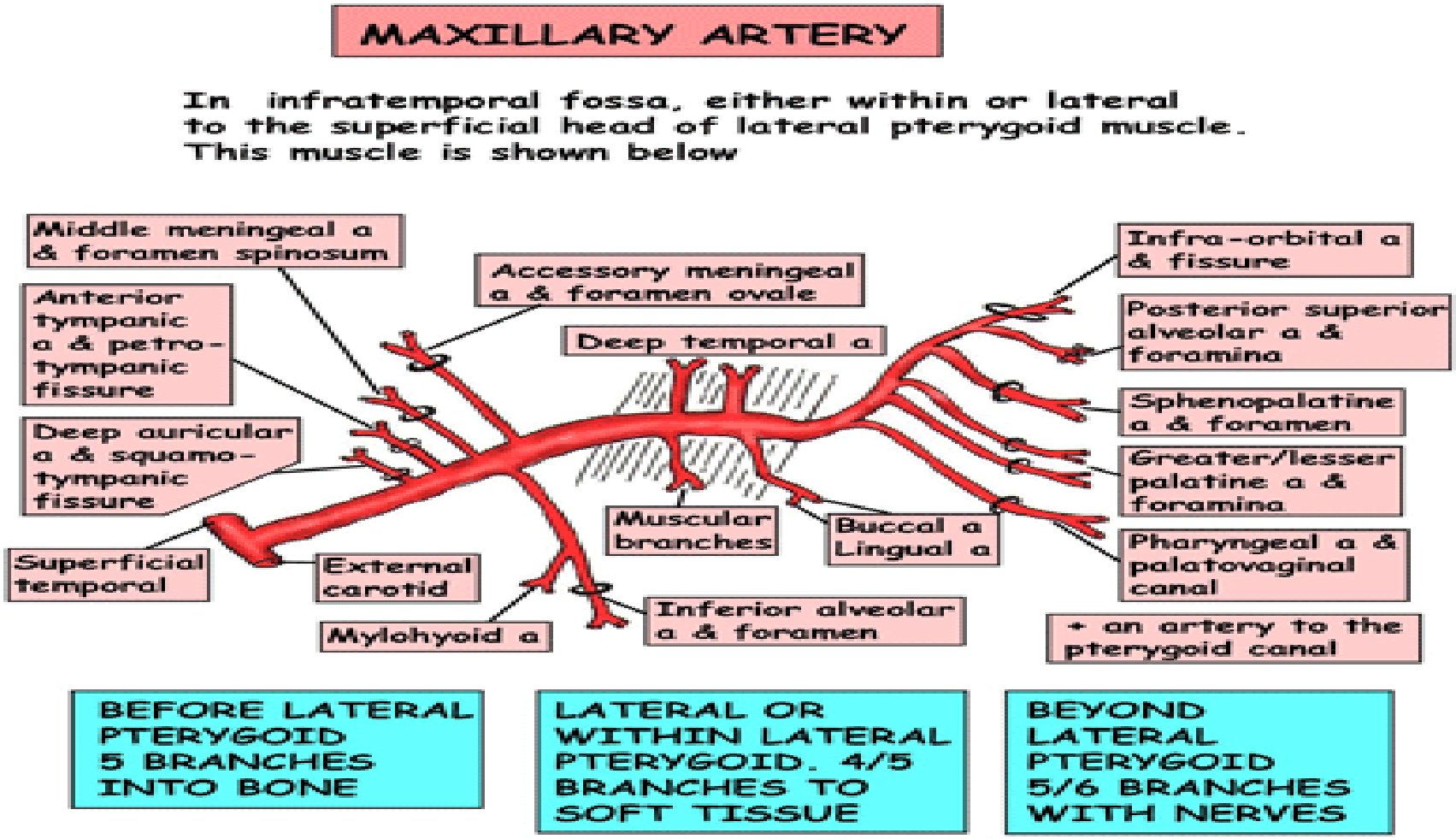
- The terminal branch of the maxillary artery
- Leaves the pterygopalatine fossa medially through the sphenopalatine foramen
- Accompanies the nasal nerves, giving off:

- 1. Posterior lateral nasal arteries, which supply the lateral wall of the nasal cavity and contribute to supply of the paranasal sinuses;

- 2. Posterior septal branches, which supply the nasal septum-the largest of these branches passes anteriorly down the septum to anastomose with the end of the greater palatine artery.

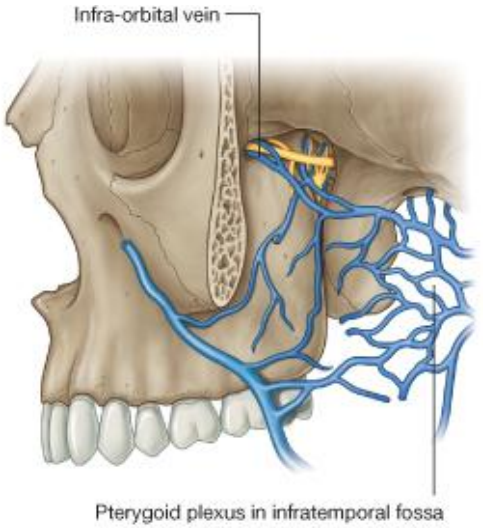


# Maxillary artery



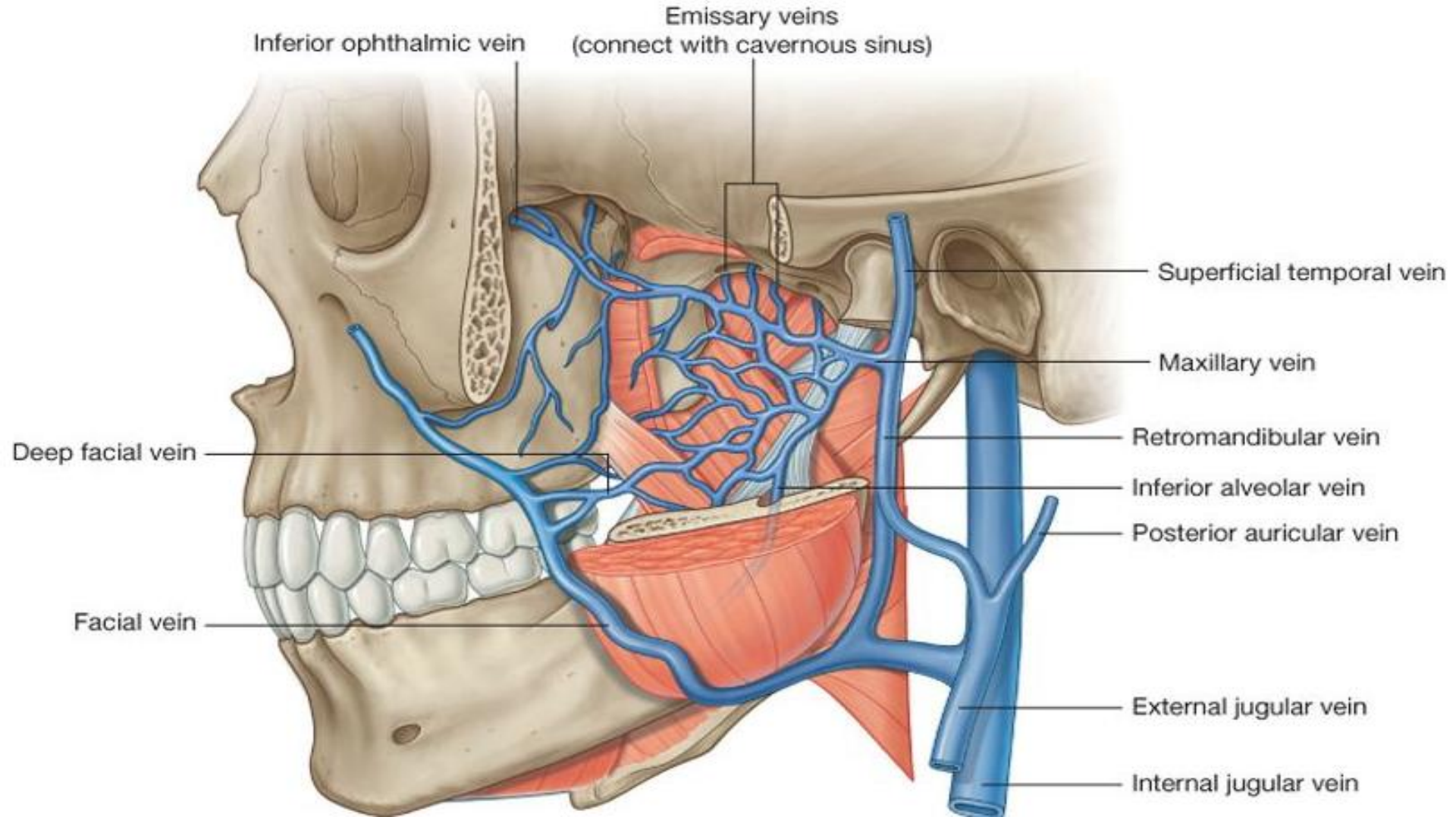
# Veins

- Drain areas supplied by branches of the terminal part of the maxillary artery
- Generally travel with these branches back into the pterygopalatine fossa.
- The veins coalesce in the fossa and then pass laterally through the pterygomaxillary fissure to join the pterygoid plexus of veins in the infratemporal fossa
- The infra-orbital vein, drains the inferior aspect of the orbit,
- May pass directly into the infratemporal fossa, so bypassing the pterygopalatine fossa



# Veins

The veins pass through the pterygomaxillary fissure to join the pterygoid plexus of veins in the infratemporal fossa.



# Thank you