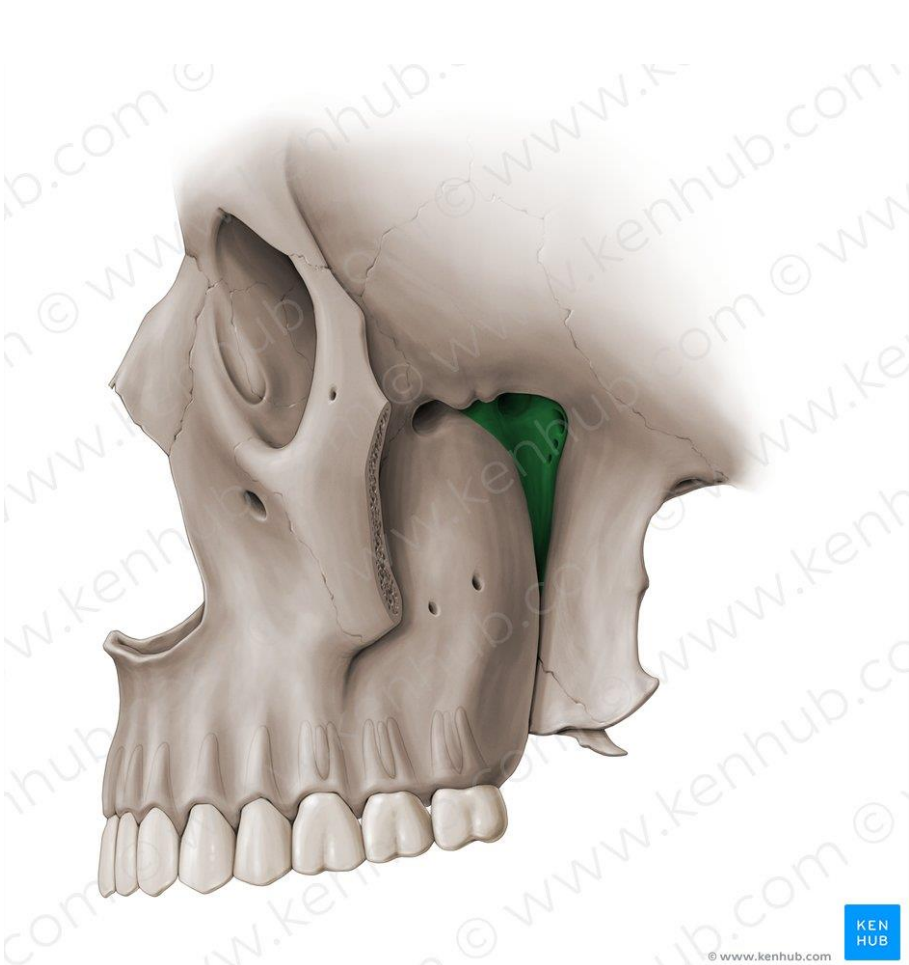
بِسْمِ اللَّهِ الرَّحْمَـٰنِ الرَّحِيم

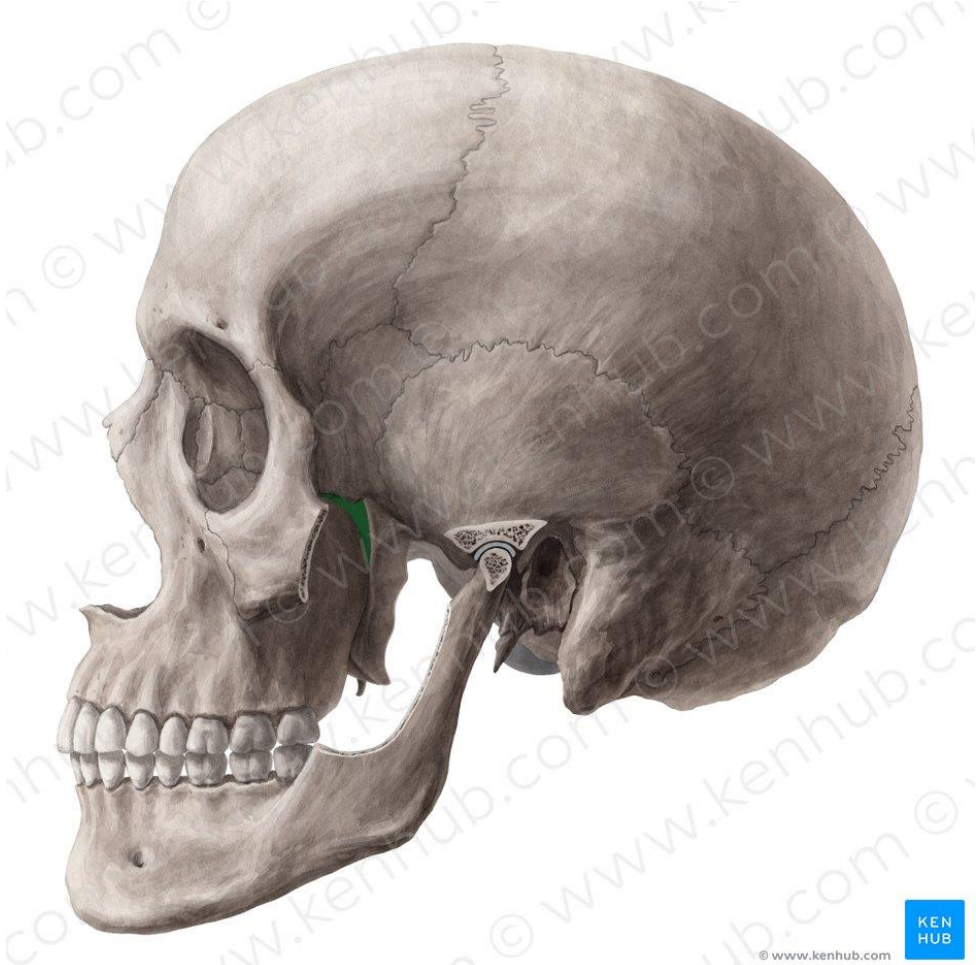
The Pterygopalatine Fossa

Done by: Ahmad Ayman

THE PTERYGOPALATINE FOSSA

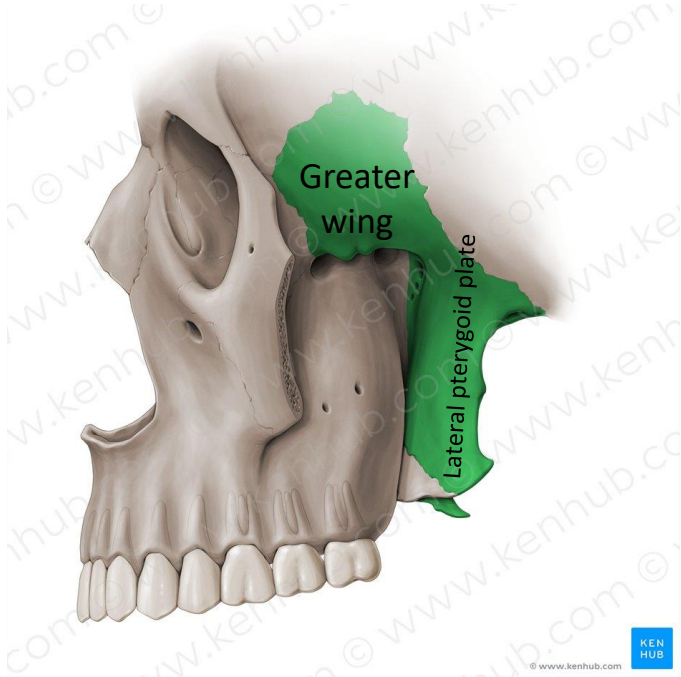
The pterygopalatine fossa is an inverted 'tear-drop' shaped space between bones on the lateral side of the skull, it is located immediately posterior to the maxilla and it is small in size, this fossa provides a passage for nerves and blood vessels to reach the nasal cavity and the nasopharynx.

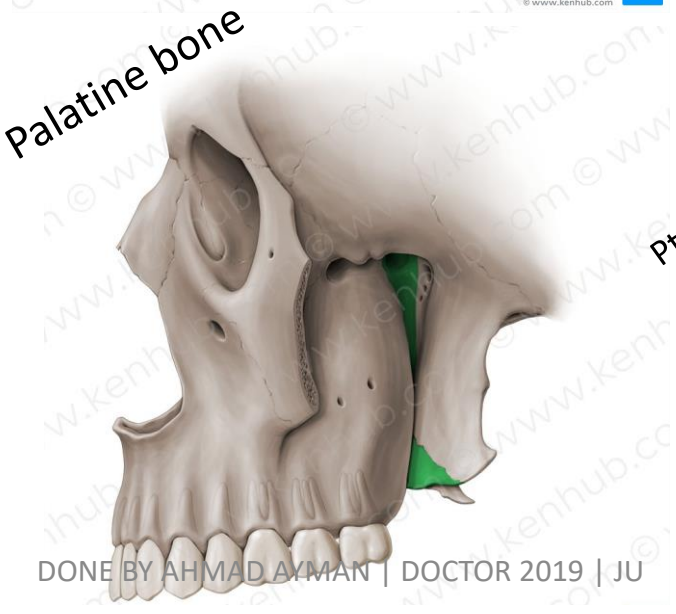


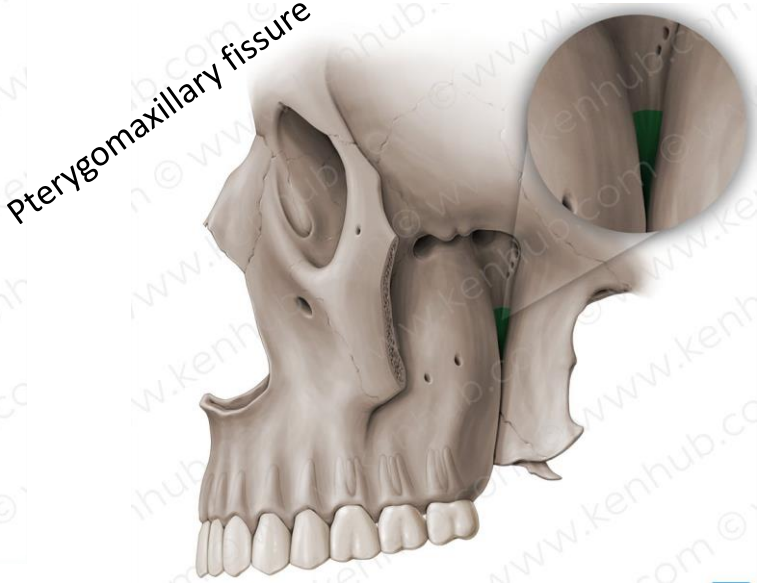


WALLS OF THE PTERYGOPALATINE FOSSA

- 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 is formed by the lateral plate of the pterygoid process.
- The roof is formed by the greater wing of the sphenoid bone.
- There is no lateral wall, rather, the pterygopalatine fossa is bordered laterally by the pterygomaxillary fissure which connects it to the infratemporal fossa.







CONTRIBUTION OF SPHENOID BONE

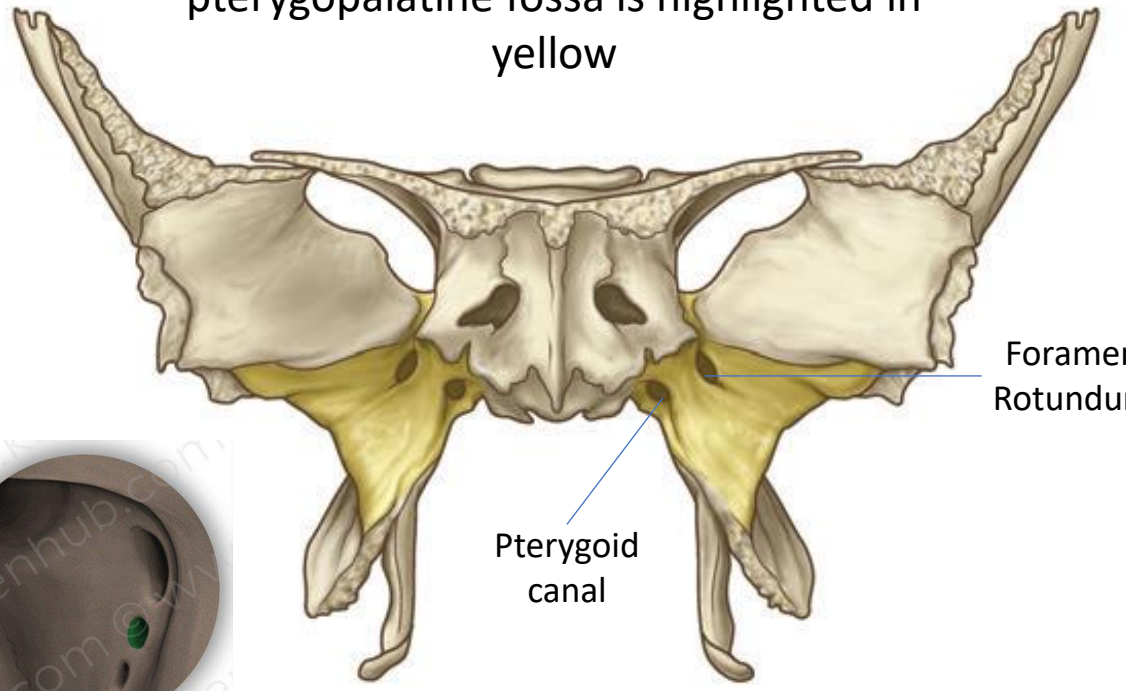
The part of bone that contributes to the formation of the pterygopalatine fossa is the anterosuperior surface of the pterygoid process

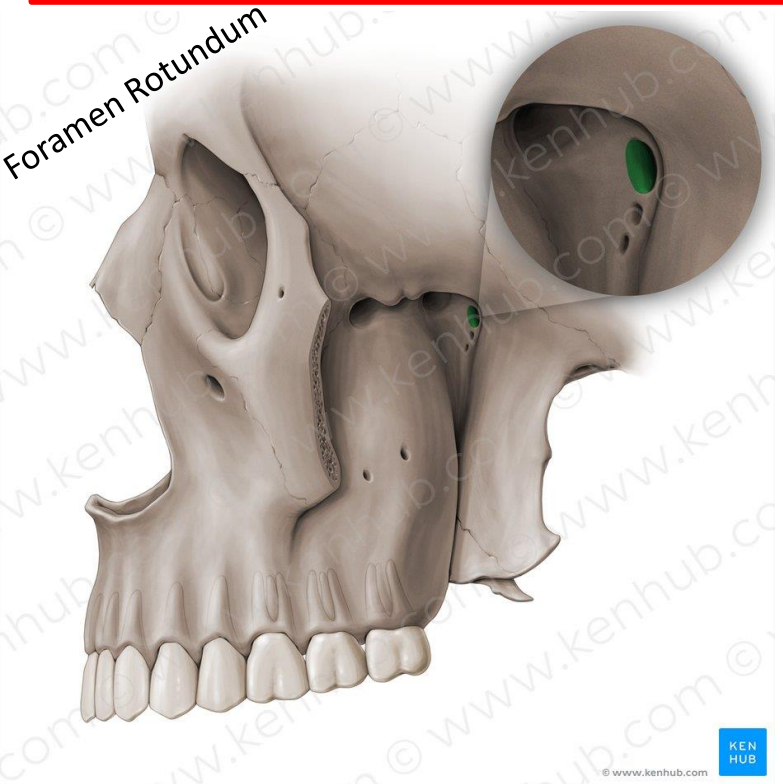
Opening onto this surface are two large foramina:

1. The Foramen rotundum, which transmits the maxillary nerve

2. Pterygoid canal which transmits the artery and the nerve of pterygoid canal.

The part that contributes to the pterygopalatine fossa is highlighted in yellow

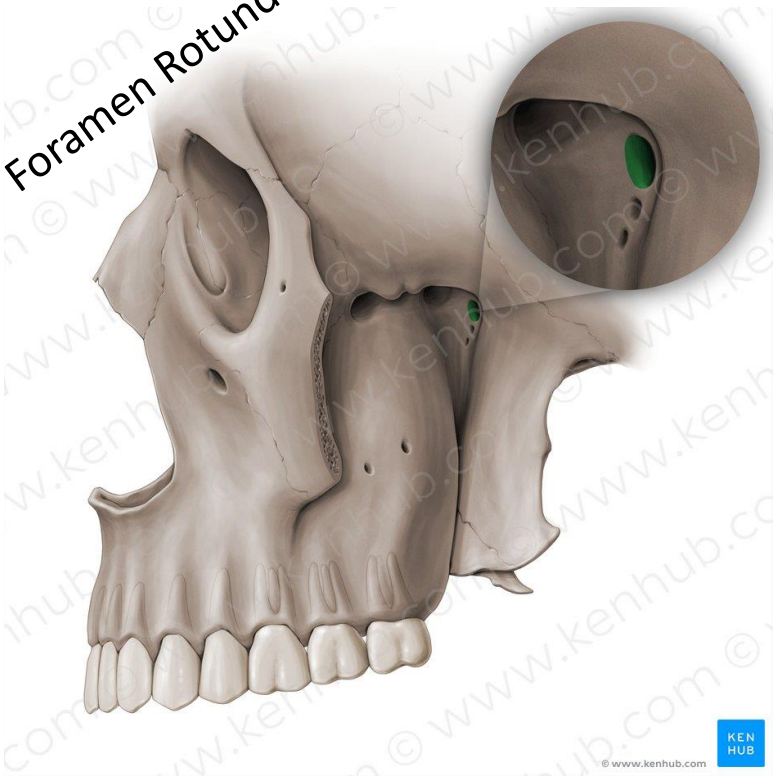




GATEWAYS IN AND OUT THE PTERYGOPALATINE FOSSA

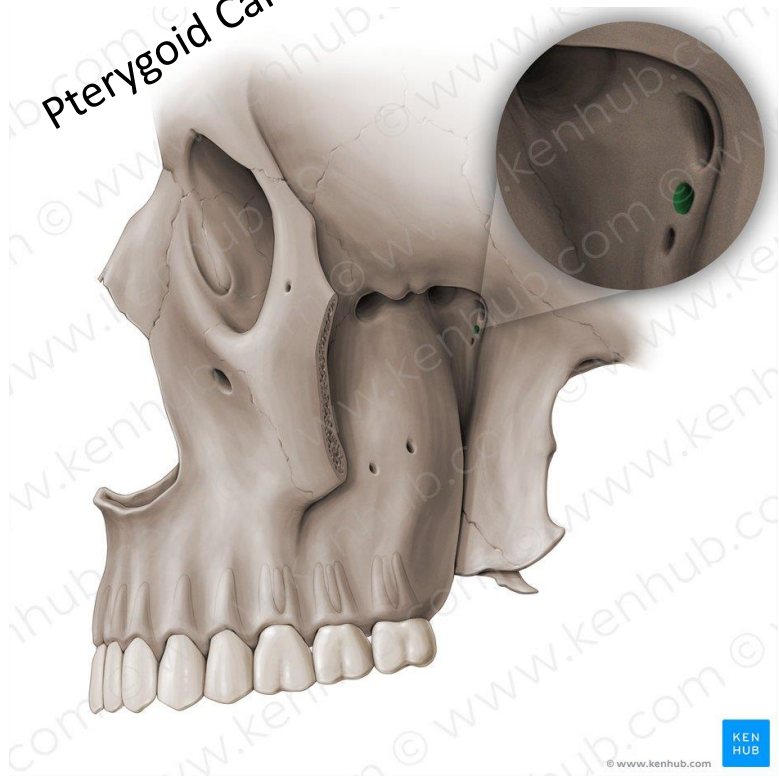
Seven foramina and fissures provide apertures through which structures enter and leave the pterygopalatine fossa

Foramen Rotundum



It is located laterally and superiorly, it connects the pterygopalatine fossa to the middle cranial fossa and transmits the maxillary division of the trigeminal nerve.

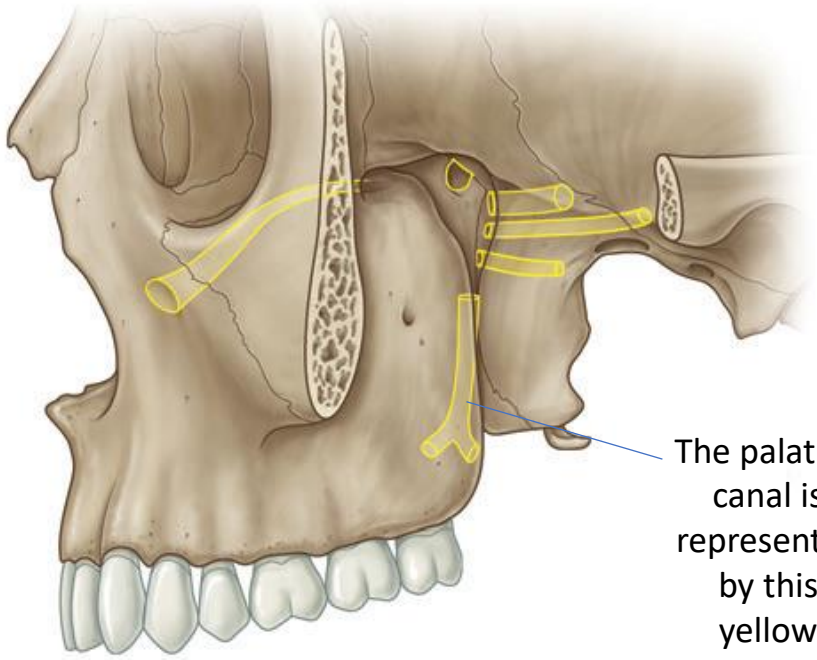
Pterygoid Canal

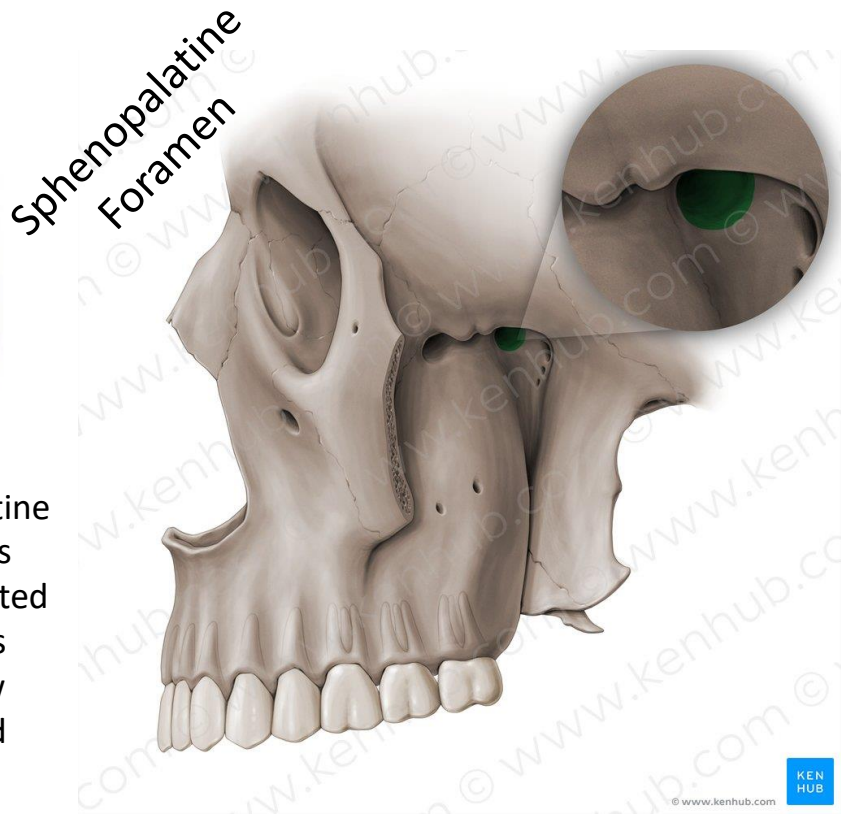


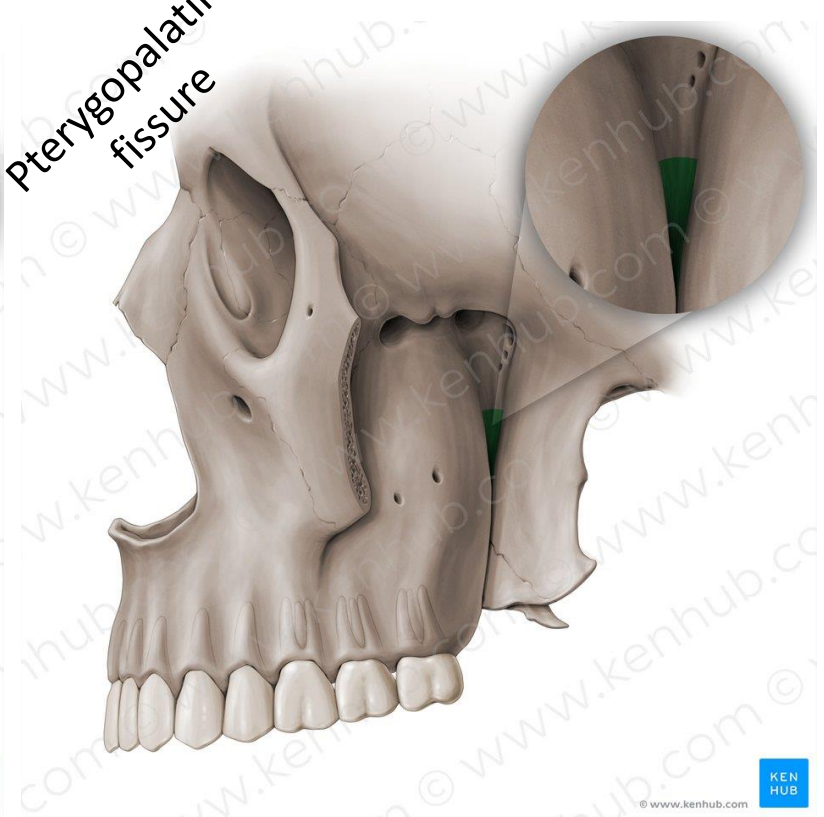
It is located medially and inferiorly it is a bony canal that opens onto the posterior surface of the pterygoid process and continues superomedially for a short distance in the cartilage that fills the foramen lacerum, it opens into the middle cranial fossa just anteroinferior to the internal carotid artery.

Palatovaginal Canal

Opens onto the posterior wall of the pterygopalatine fossa and leads to the nasopharynx, transmits the pharyngeal artery and nerve which supply the nasopharynx.





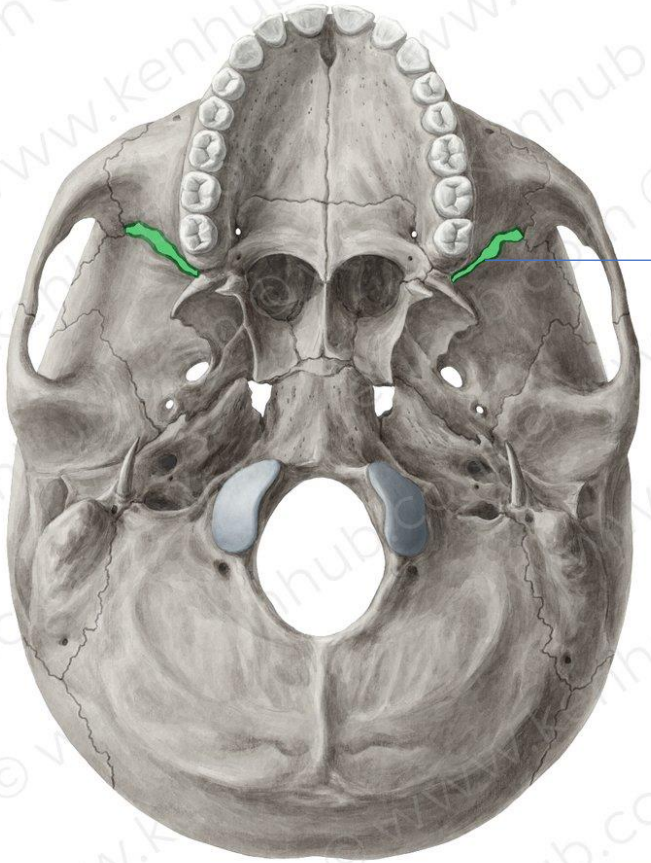


The palatine canal leads to the roof of the oral cavity (hard palate) and opens inferiorly through the greater and lesser palatine foramina, it transmits the greater and lesser palatine nerve and vessels.

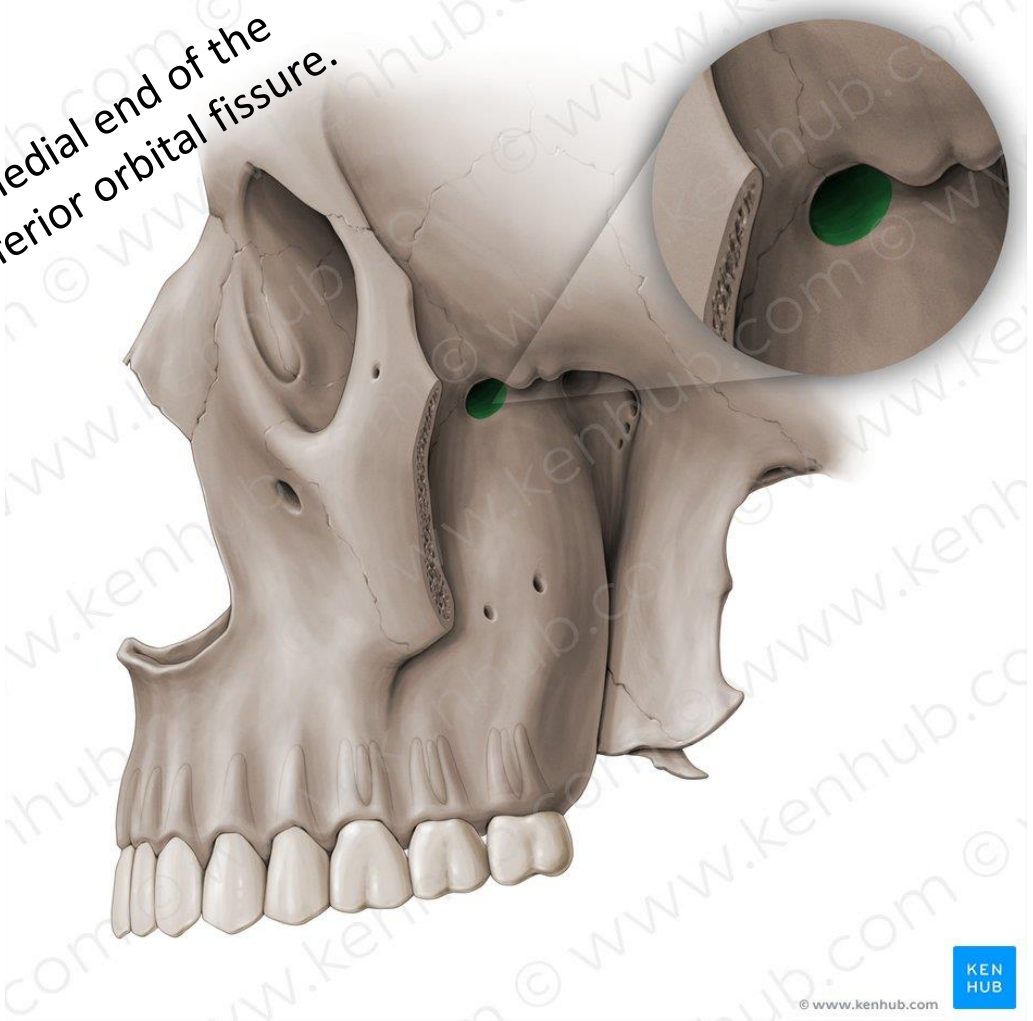
Sphenopalatine foramen opens onto the lateral wall of the nasal cavity and is in the medial wall of the pterygopalatine fossa, it transmits the sphenopalatine artery and the nasopalatine nerve.

Pterygomaxillary fissure between lateral aspect of the pterygopalatine fossa and the infratemporal fossa, it transmits the structures that passes between these two fossae, including the maxillary artery.

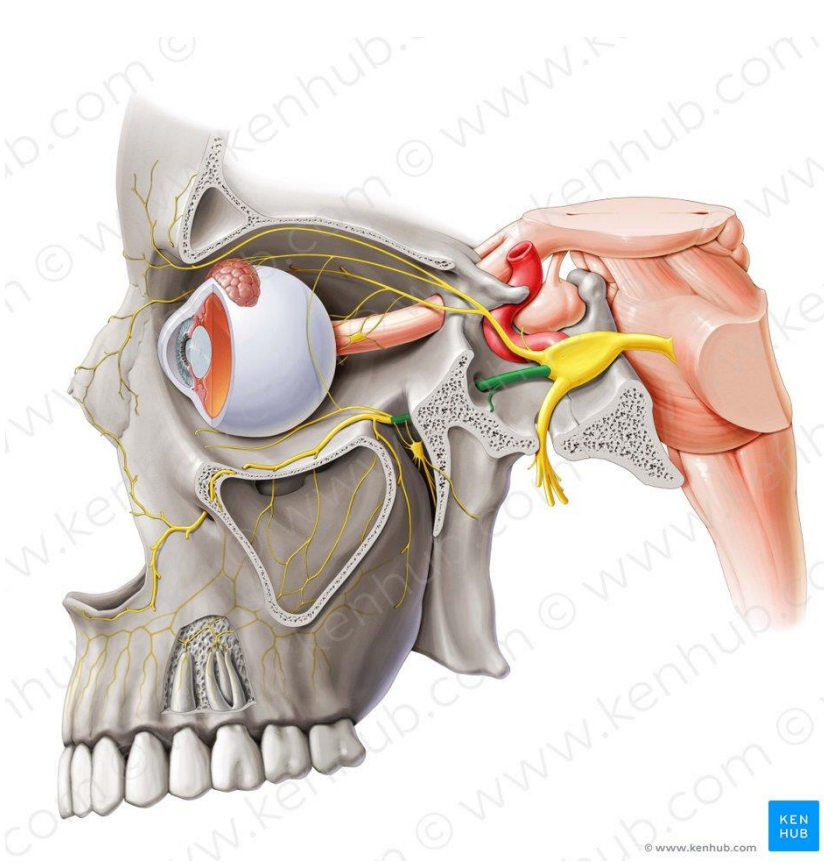
Last but not least, the medial end of the inferior orbital fissure opens into the pterygopalatine fossa, it connects the superior aspect of the fossa fossa to the floor of the orbit, it transmits the maxillary nerve and artery, which pass on the floor of the orbit then leave the orbit through the infraorbital foramen, so they become the infra orbital nerve and artery.



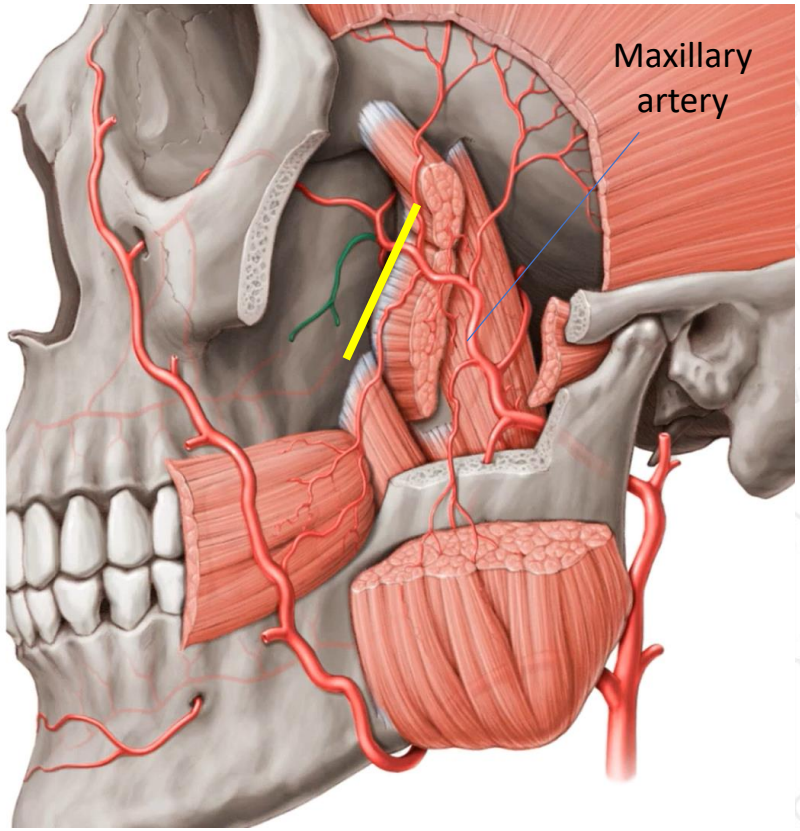
The inferior orbital fissure as viewed from the base of the skull.



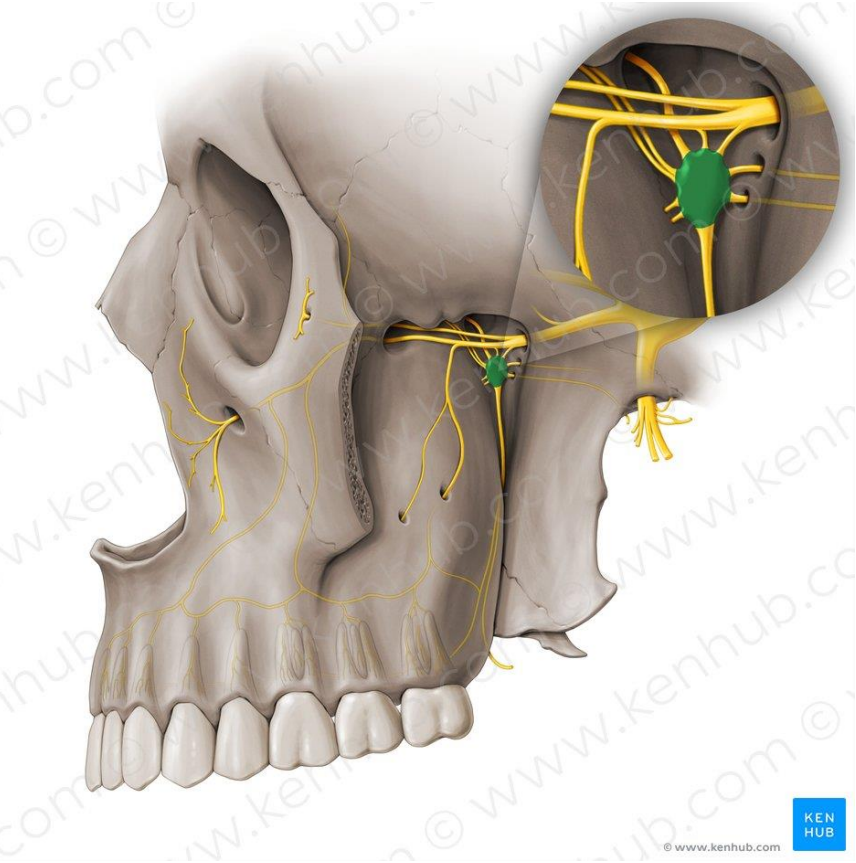
CONTENTS OF THE PTERYGOPALATINE FOSSA



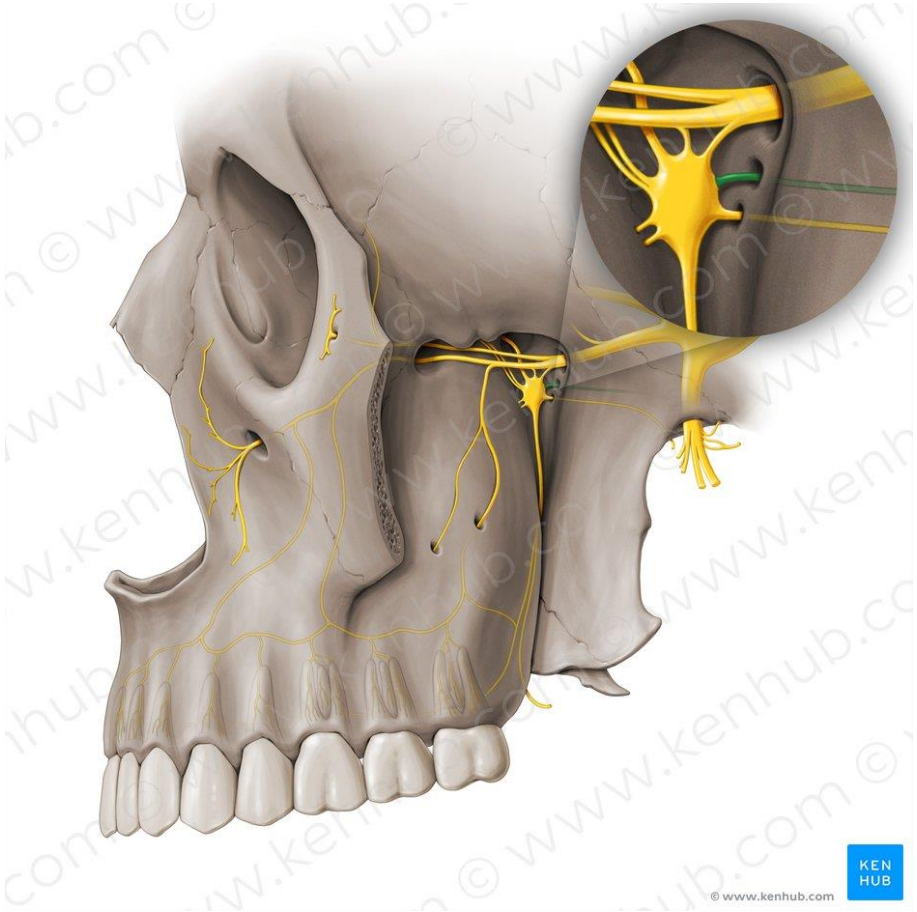
The Maxillary Nerve and its branches .



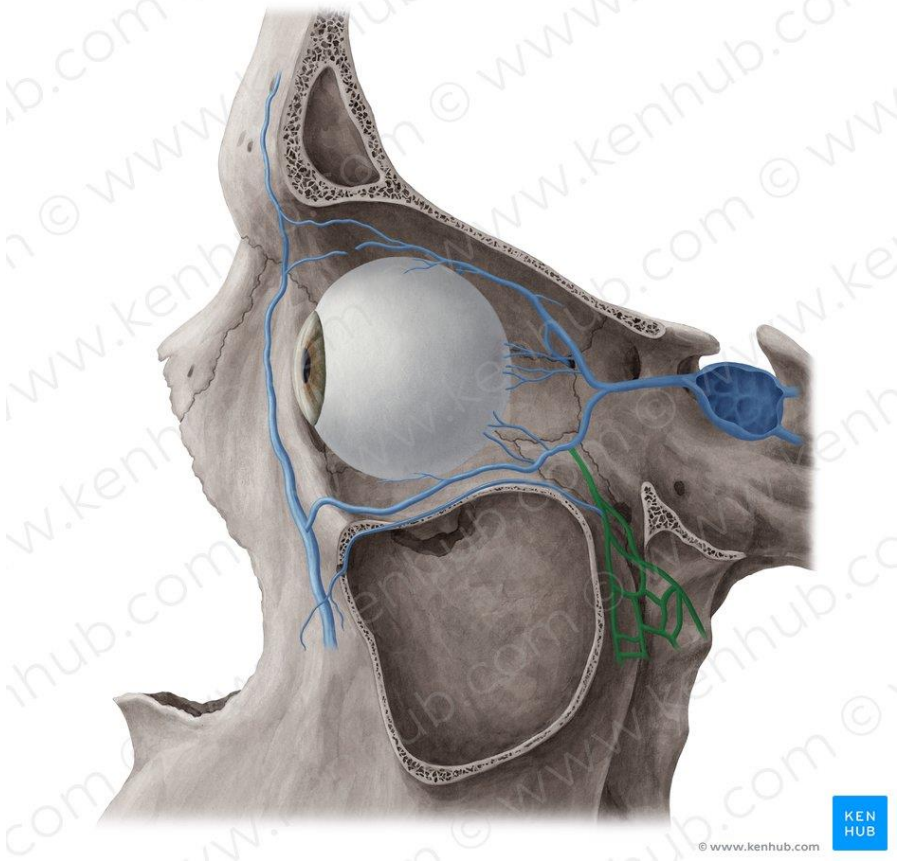
3rd Part of The Maxillary Artery and its branches.



Pterygopalatine Ganglion



Nerve to Pterygoid Canal



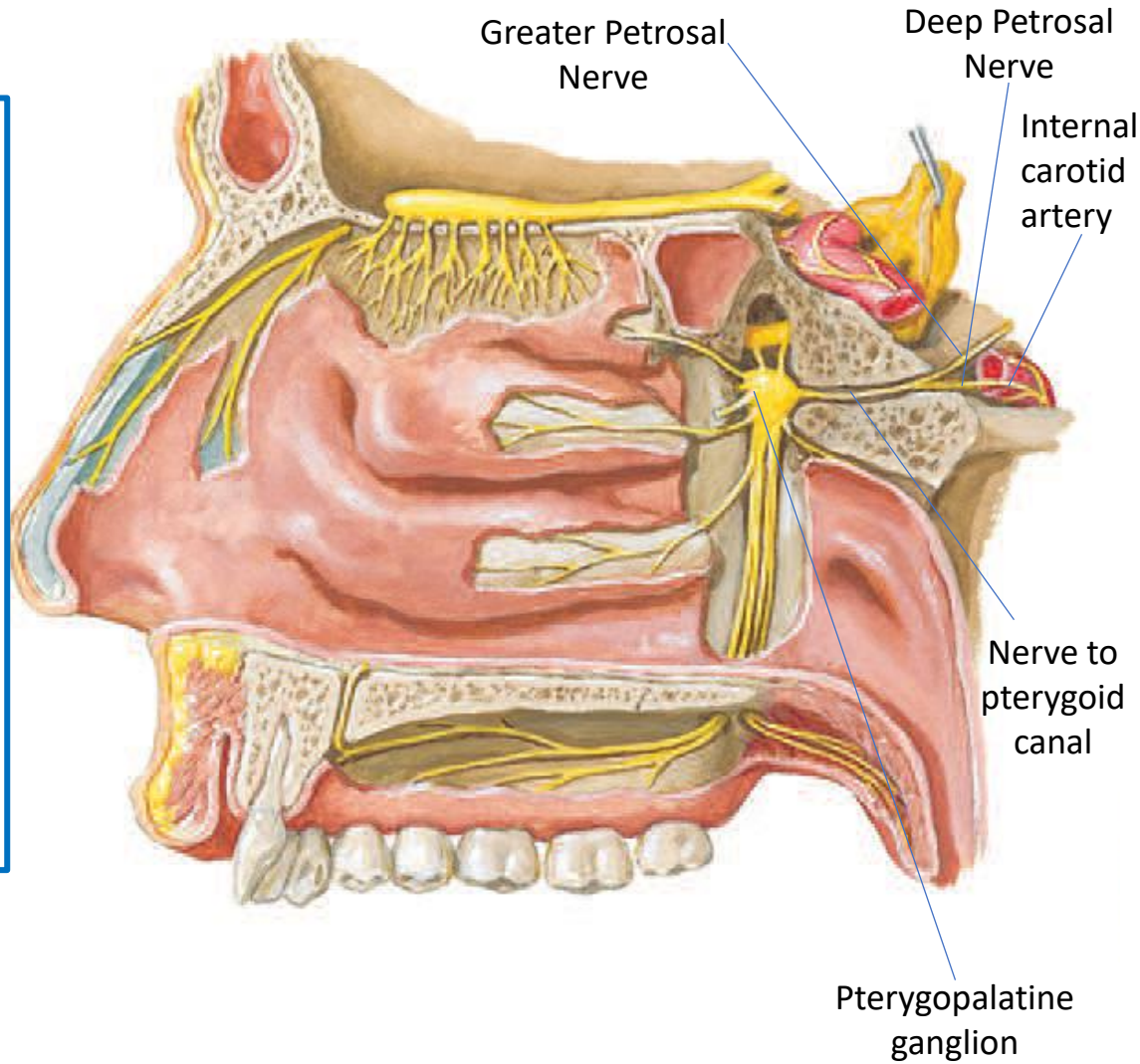
Veins and Lymphatics

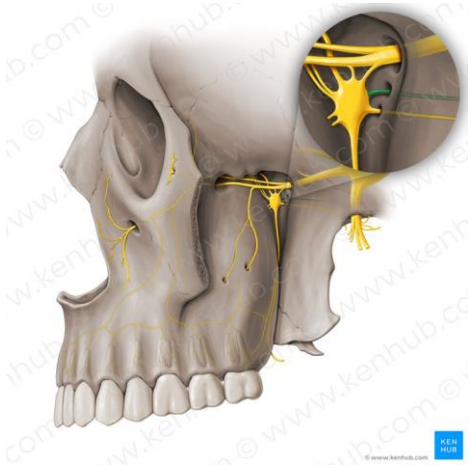
THE NERVE TO PTERYGOID CANAL

- The nerve of pterygoid canal is formed in the middle cranial fossa by the union of:

1. The greater petrosal nerve which is a branch of the (it arises form the geniculate ganglion) facial nerve (CN VII), it carries preganglionic parasympathetic fibers.
2. The deep petrosal nerve, which is a branch of the internal carotid plexus, it carries postganglionic sympathetic fibers (the perganglionic sympathetic fibers were in the sympathetic chain and have synapsed in the superior cervical ganglia)

- This nerve passes through the pterygoid canal to the pterygopalatine fossa to joins the pterygopalatine ganglion
- It Carries mainly preganglionic parasympathetic (great petrosal) and postganglionic sympathetic (deep petrosal) fibers.



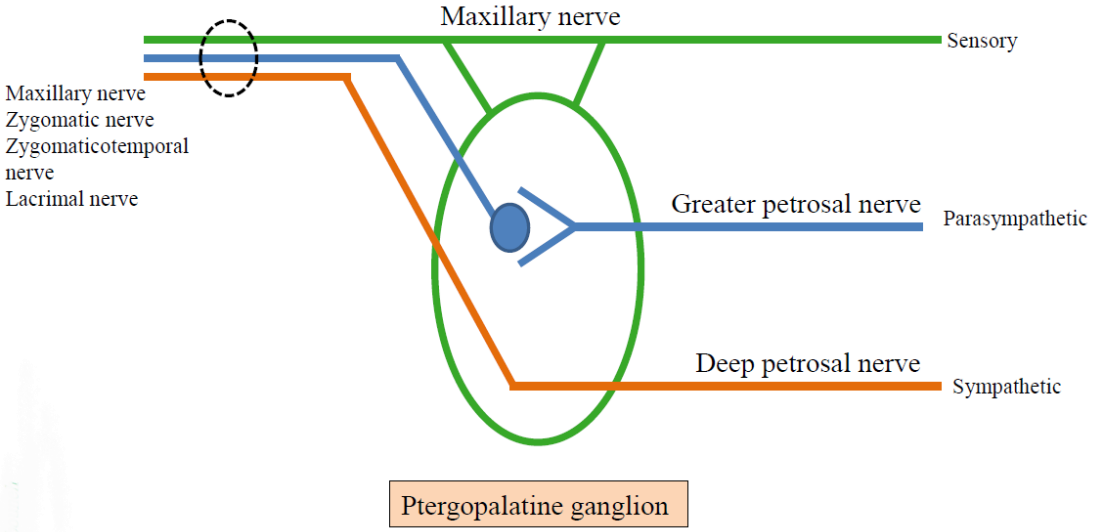


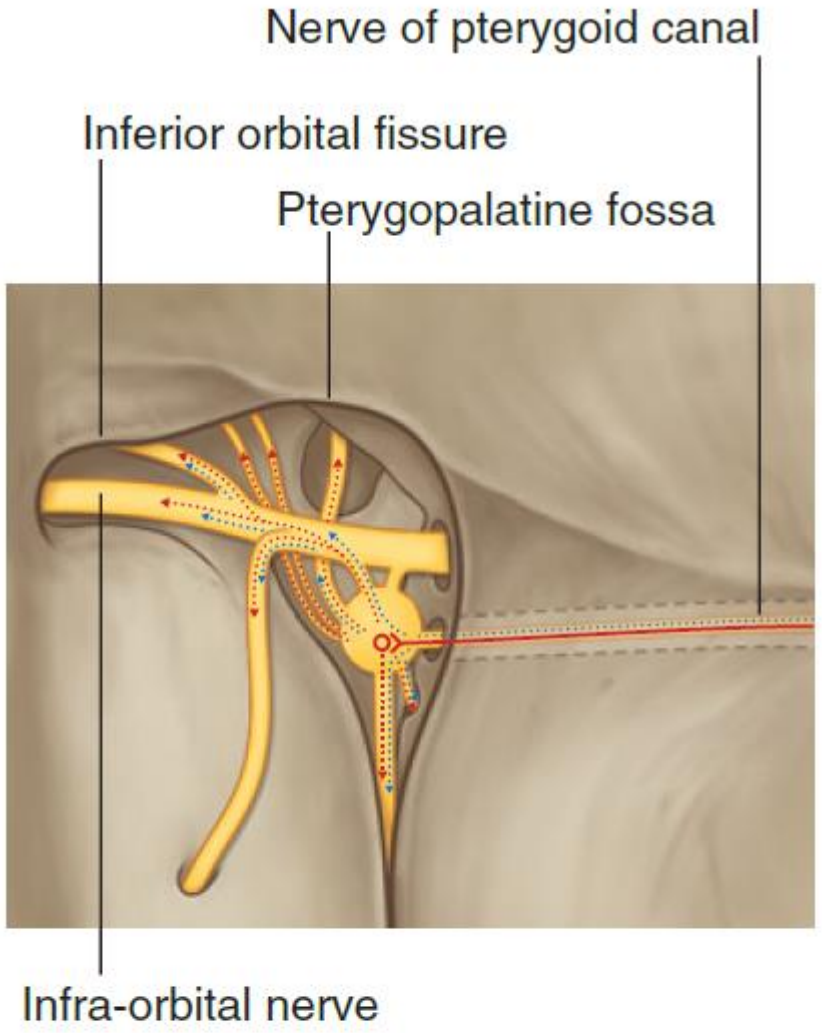
PTERYGOPALATINE GANGLION

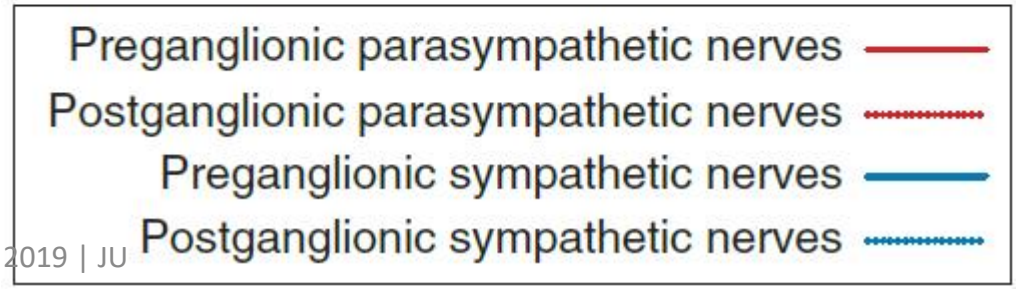
The pterygopalatine ganglion is the largest of the four parasympathetic ganglia in the head (the other three the ciliary, otic and submandibular ganglia).

It is formed by the cell bodies neurons associated with:

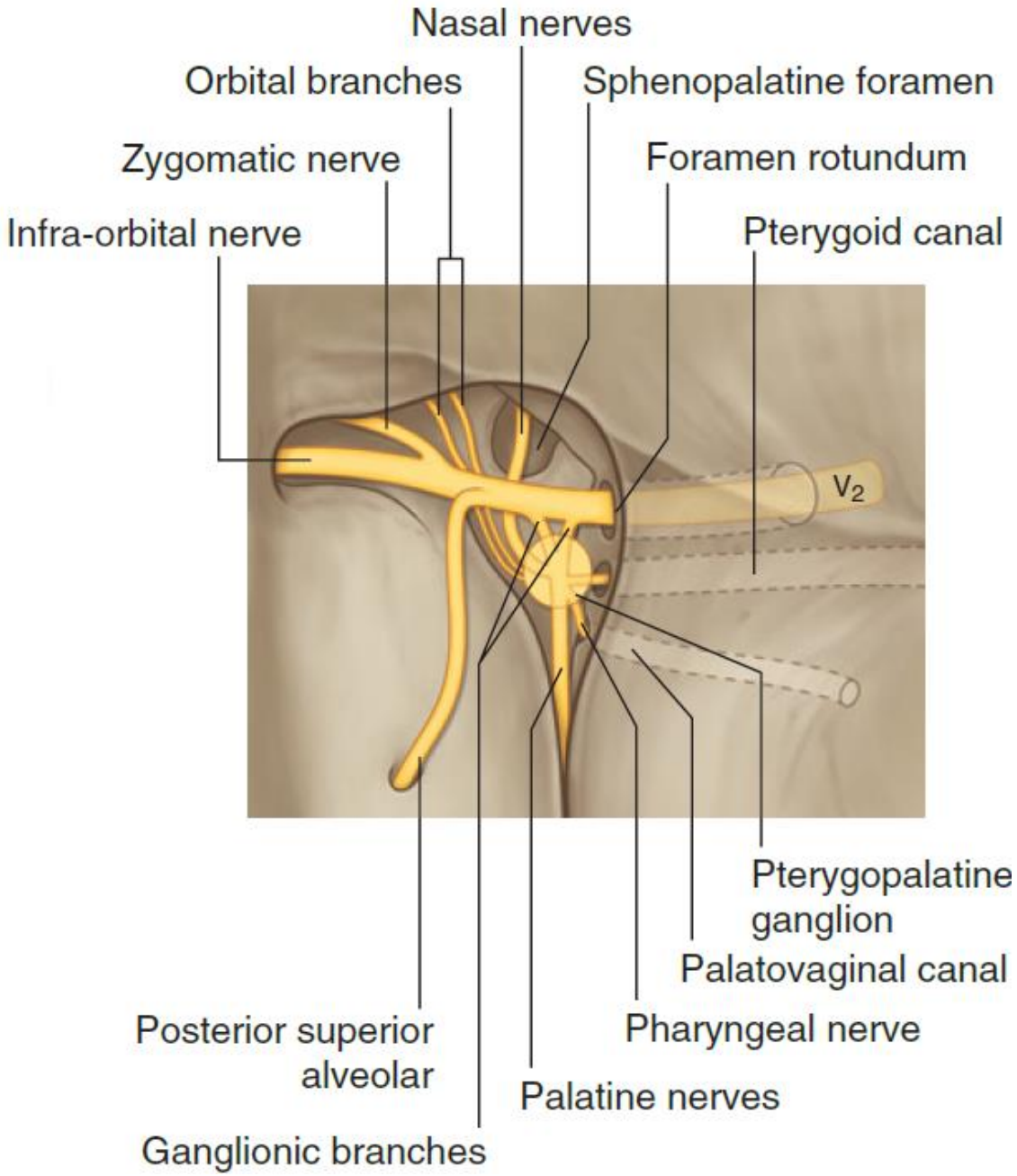
1. Preganglionic parasympathetic fibers of the facial nerve carried by the greater petrosal nerve and then the nerve of the pterygoid canal.
2. Sensory and ganglionic branches of the maxillary nerve
3. Postganglionic sympathetic fibers (deep petrosal)



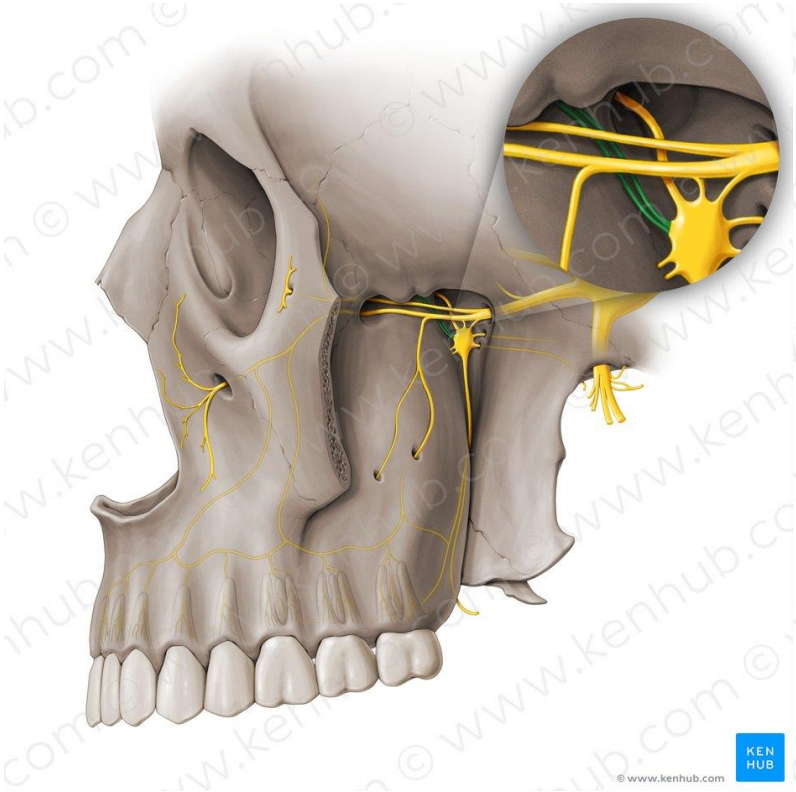


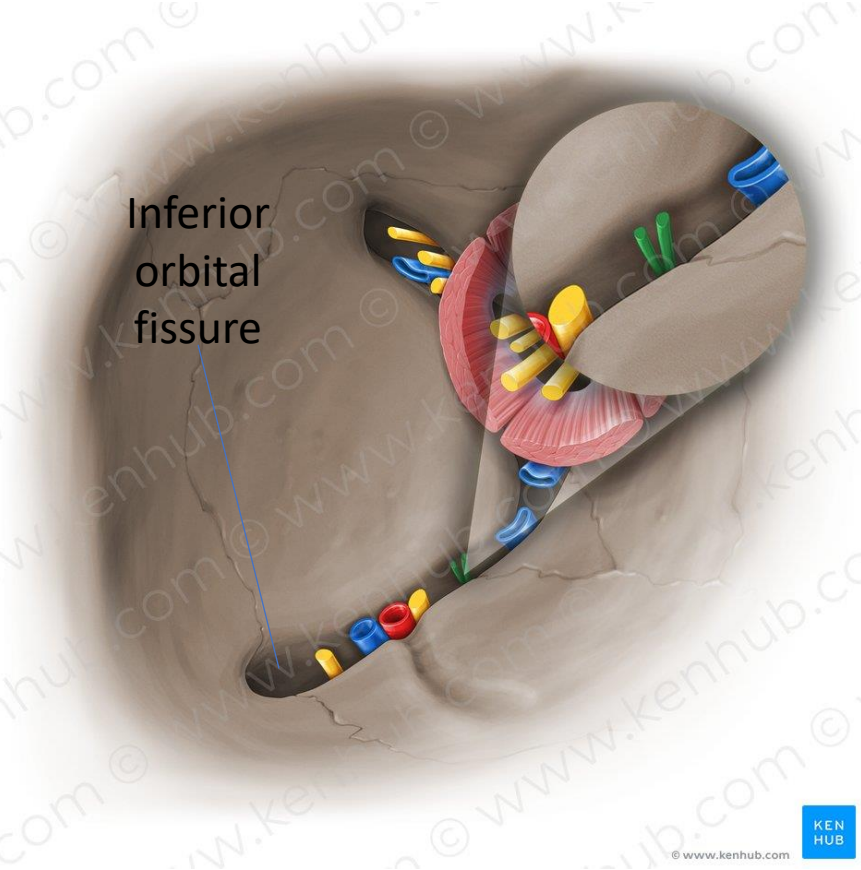


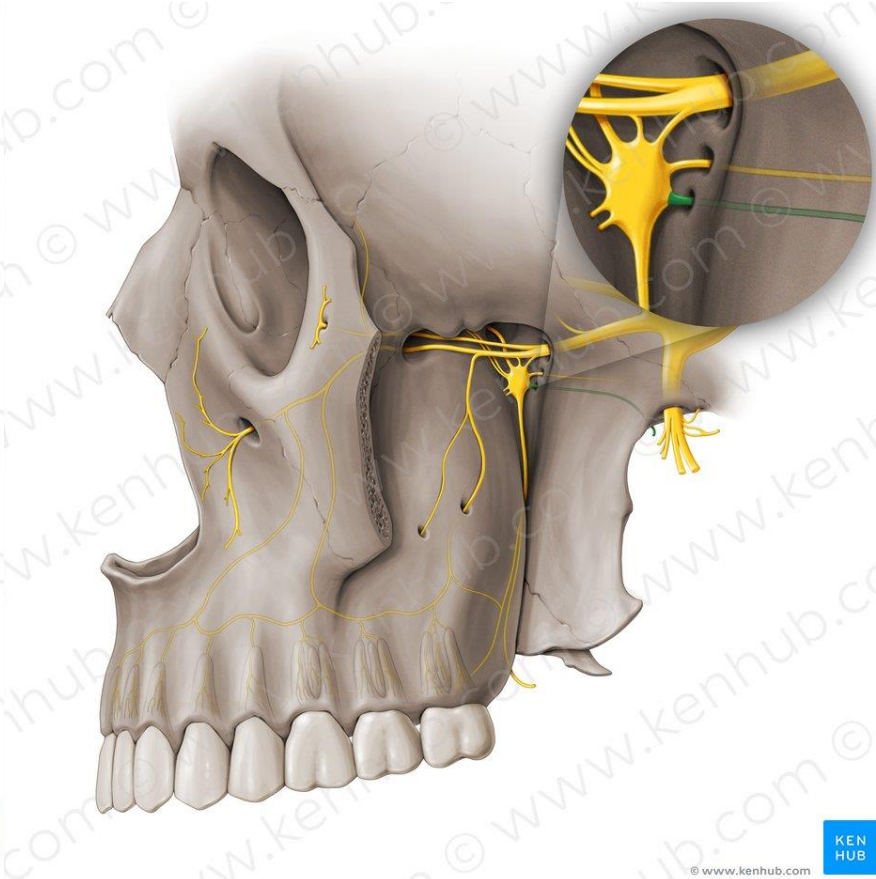
- The preganglionic parasympathetic fibers synapse within the pterygopalatine ganglion, then the postganglionic parasympathetic fibers among with the postganglionic sympathetic fibers and the sensory fibers form orbital, palatine, nasal, and pharyngeal branches, which leave the ganglion.
- Other fibers pass superiorly through the ganglionic branches of the maxillary nerve to enter the main trunk of the maxillary nerve and then distribute with the zygomatic, posterior superior alveolar, and infra-orbital nerves.
- So all these nerves (including the branches of the ganglion and the branches of the maxillary) contain these three types of fibers.
- So that, all the glands in the head above the level of the oral fissure (including the nasal, lacrimal and palatal, upper oral, are supplied by the pterygopalatine ganglion



BRANCHES OF THE PTERYGOPALATINE GANGLION: ORBITAL AND PHARYNGEAL BRANCHES.





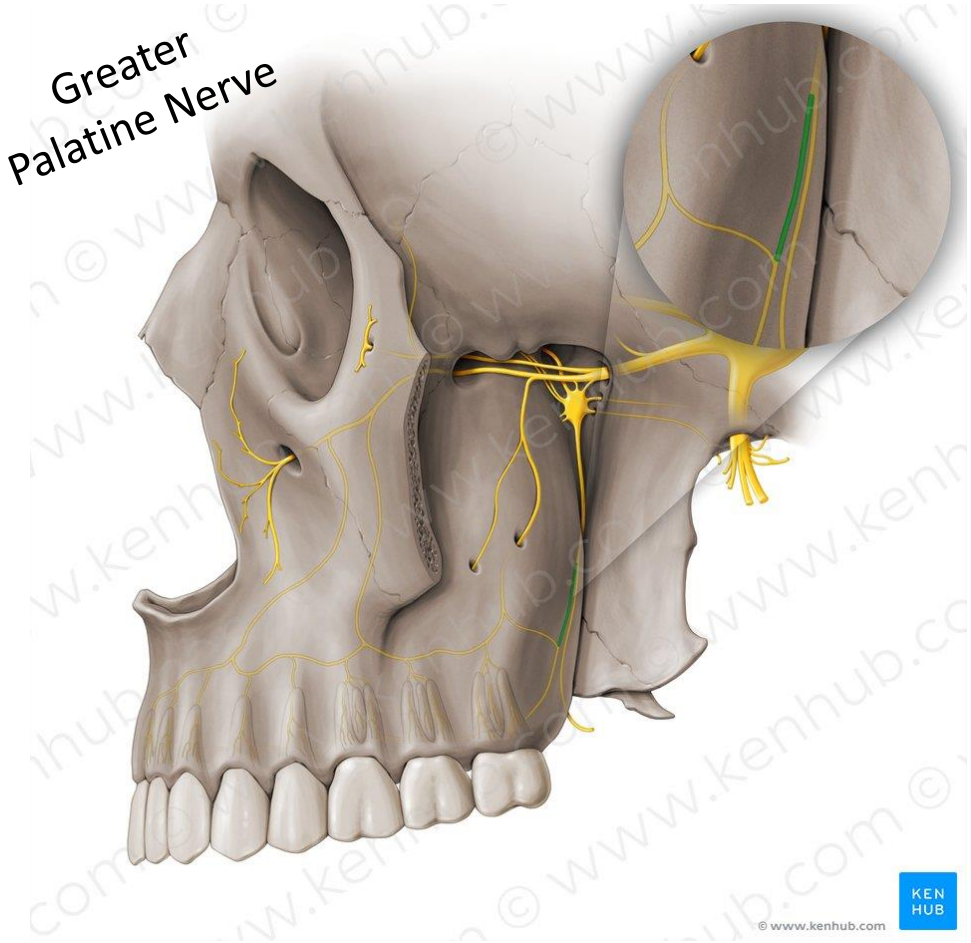


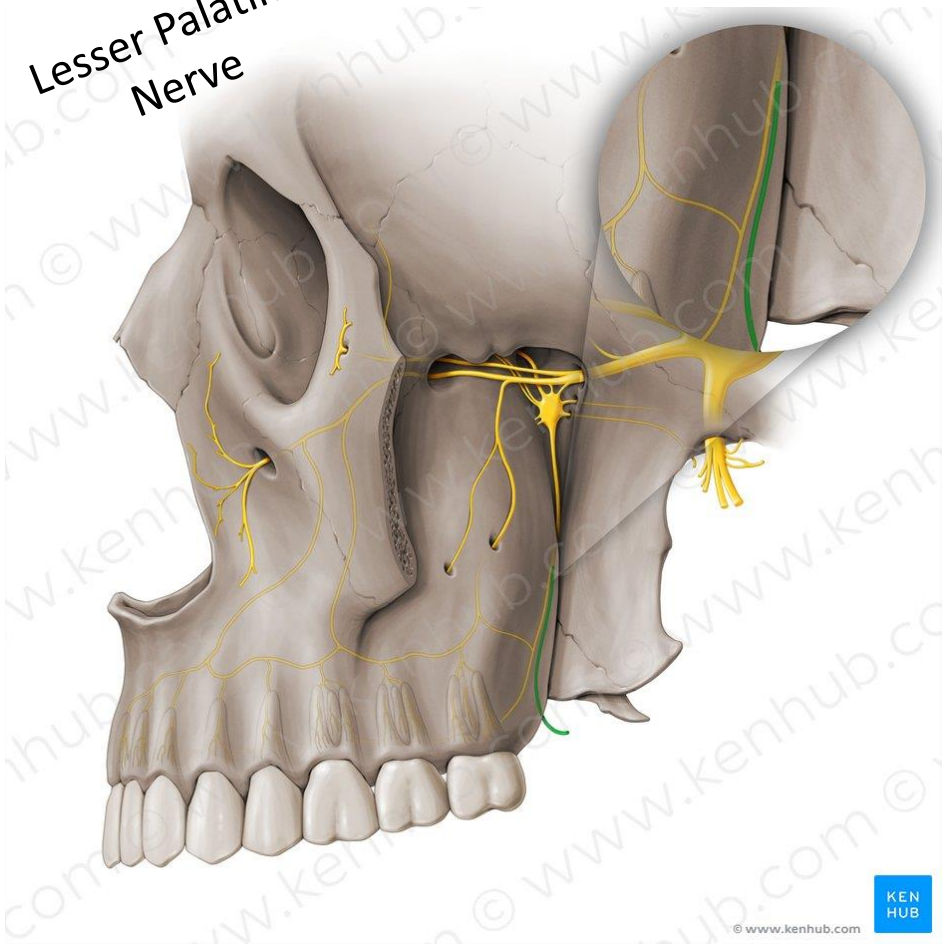
The orbital branches of the pterygopalatine ganglion pass through the inferior orbital fissure, they contribute to the nerve supply of the periosteum of orbital wall, the lacrimal gland, the sphenoidal and ethmoidal sinuses.

The pharyngeal nerve passes posteriorly from the pterygopalatine ganglion, it leaves the pterygopalatine fossa through the palatovaginal canal and Supplies the mucosa and glands of the nasopharynx.

GREATER AND LESSER PALATINE NERVES

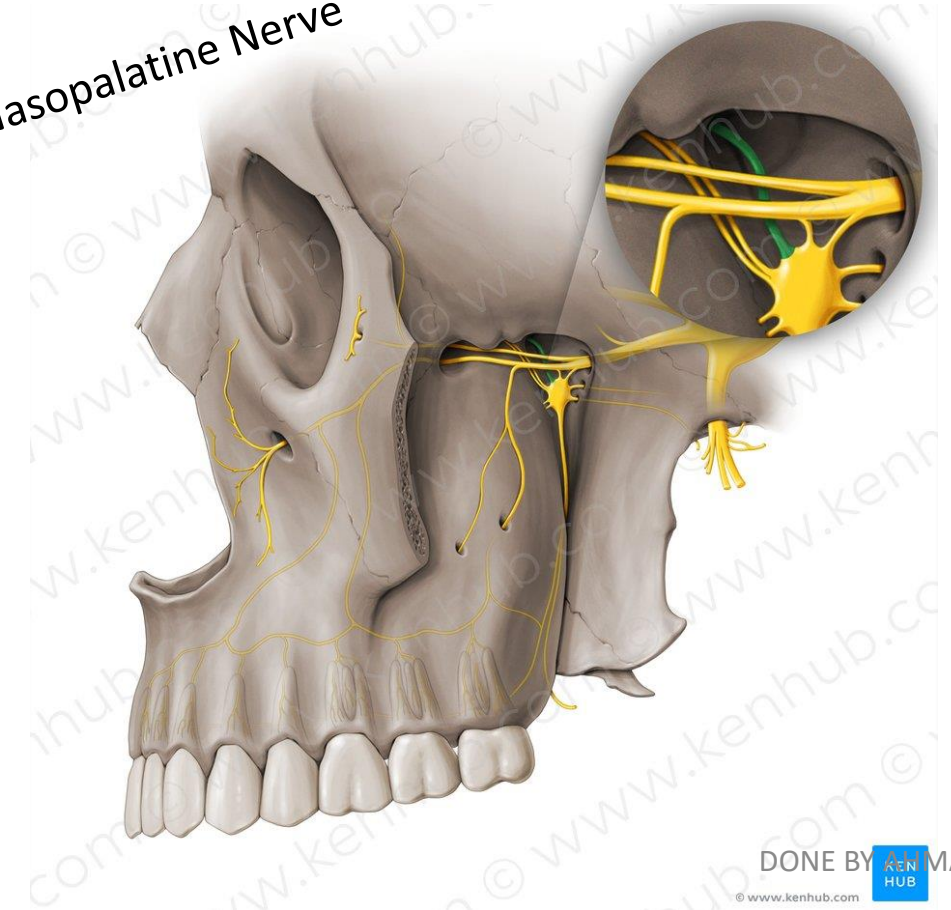
The greater and lesser palatine nerves pass through the palatine canal, then they enter the oral surface of the palate through the greater and lesser palatine foramina, the Lesser palatine nerve passes posteriorly to supply the soft palate.

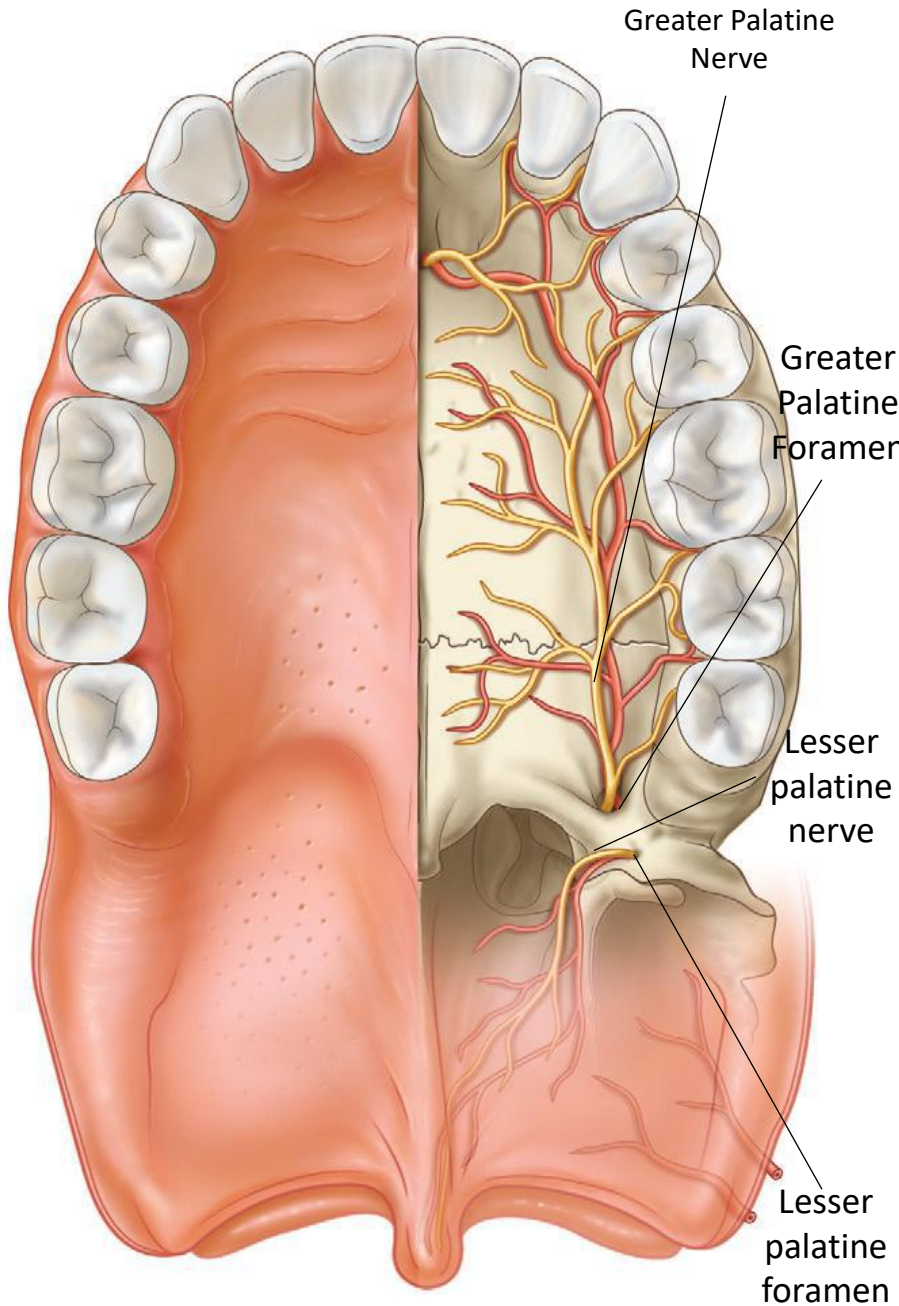




- The Greater palatine nerve passes forward on the roof of the oral cavity, it innervates the mucosa and the glands of the hard palate and the adjacent gingiva, almost as far forward as the incisor teeth.
- It Also supplies the mucosa over the middle and lower part of the lateral wall of the nasal cavity as it joins the long sphenopalatine nerve (the long sphenopalatine nerve is another name for the nasopalatine nerve which we discussed in the previous lecture).

The Nasopalatine Nerve



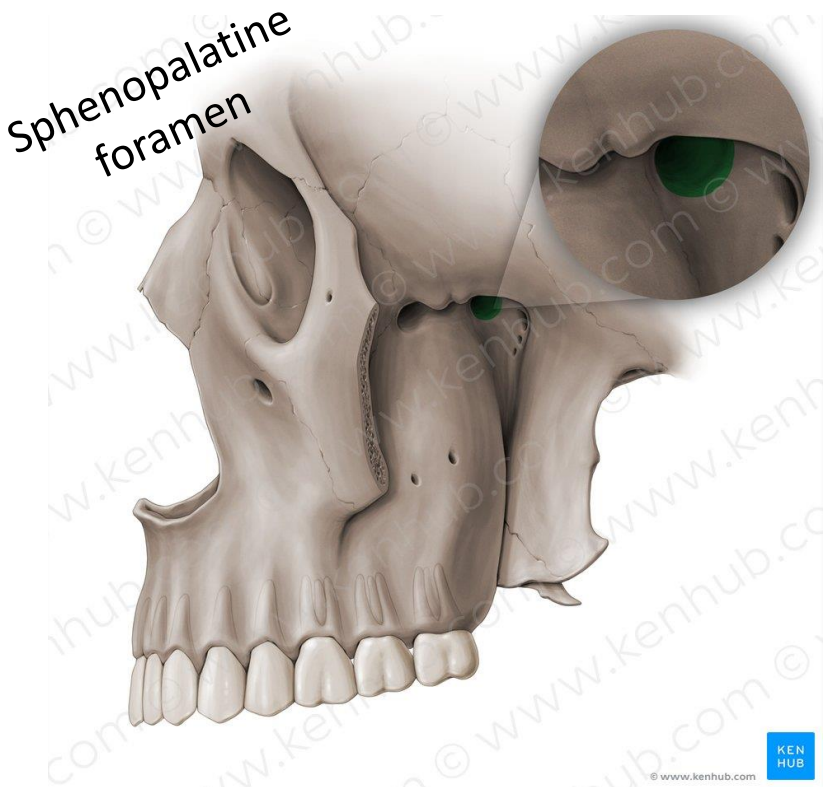


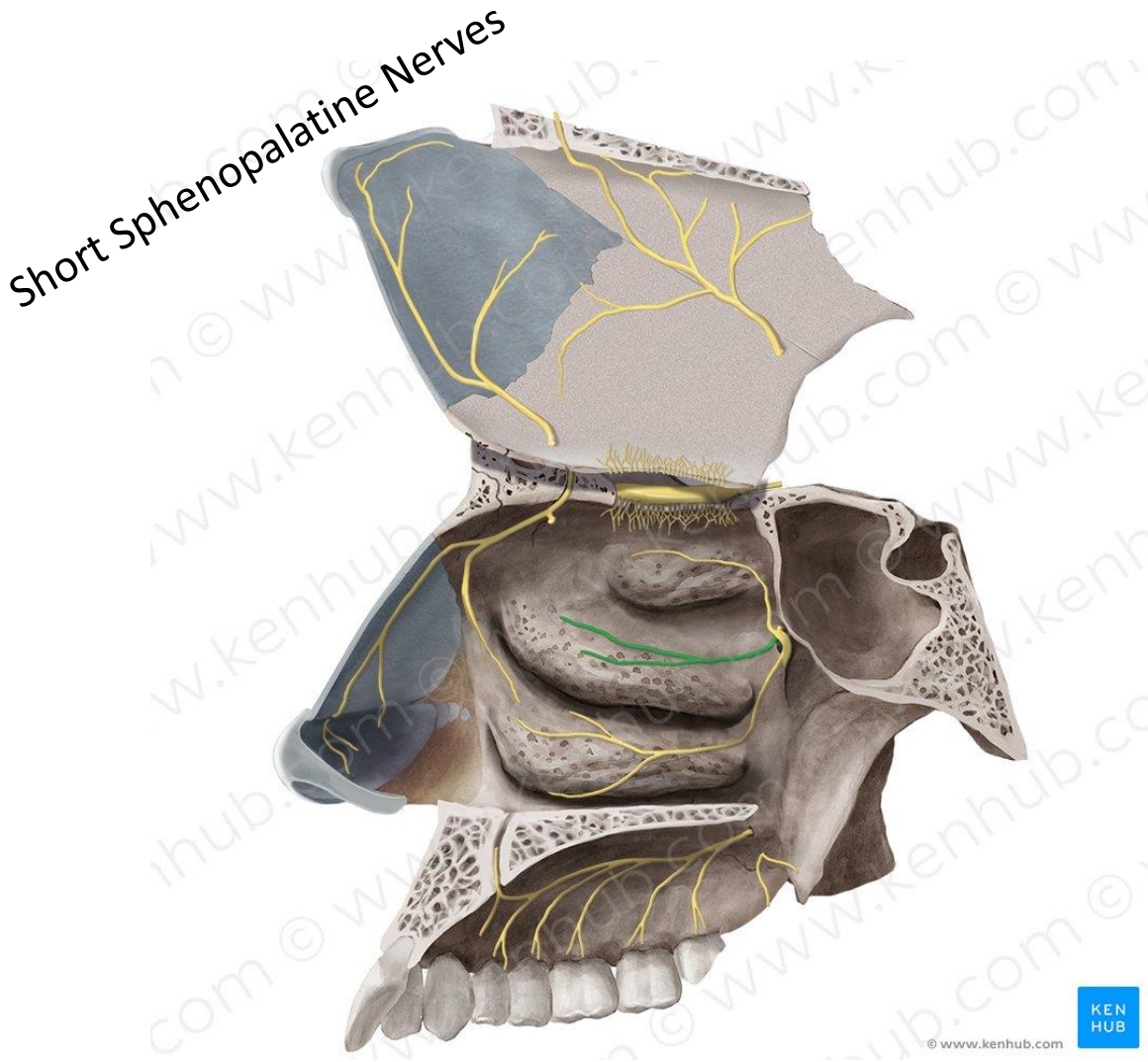
NASAL BRANCHES OF THE PTERYGOPALATINE GANGLION

- They are Seven in number, they Pass medially through the sphenopalatine foramen to enter the nasal cavity.

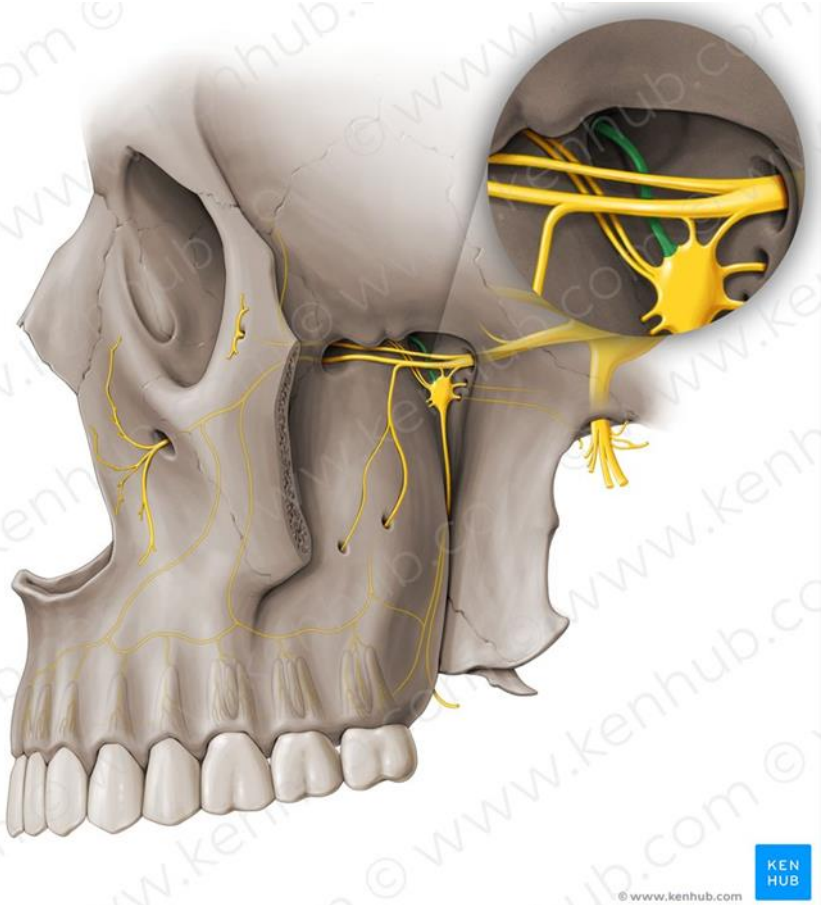
They include

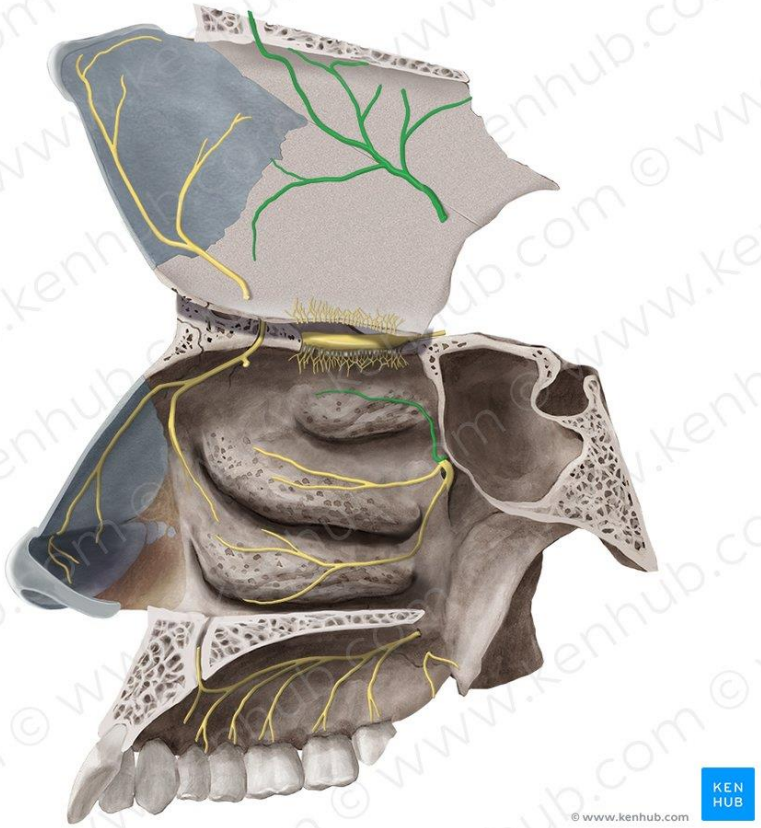
- Short sphenopalatine nerves (also called Posterior superior lateral nasal nerves) supply the mucosa of the posterior superior quadrant of the nasal cavity

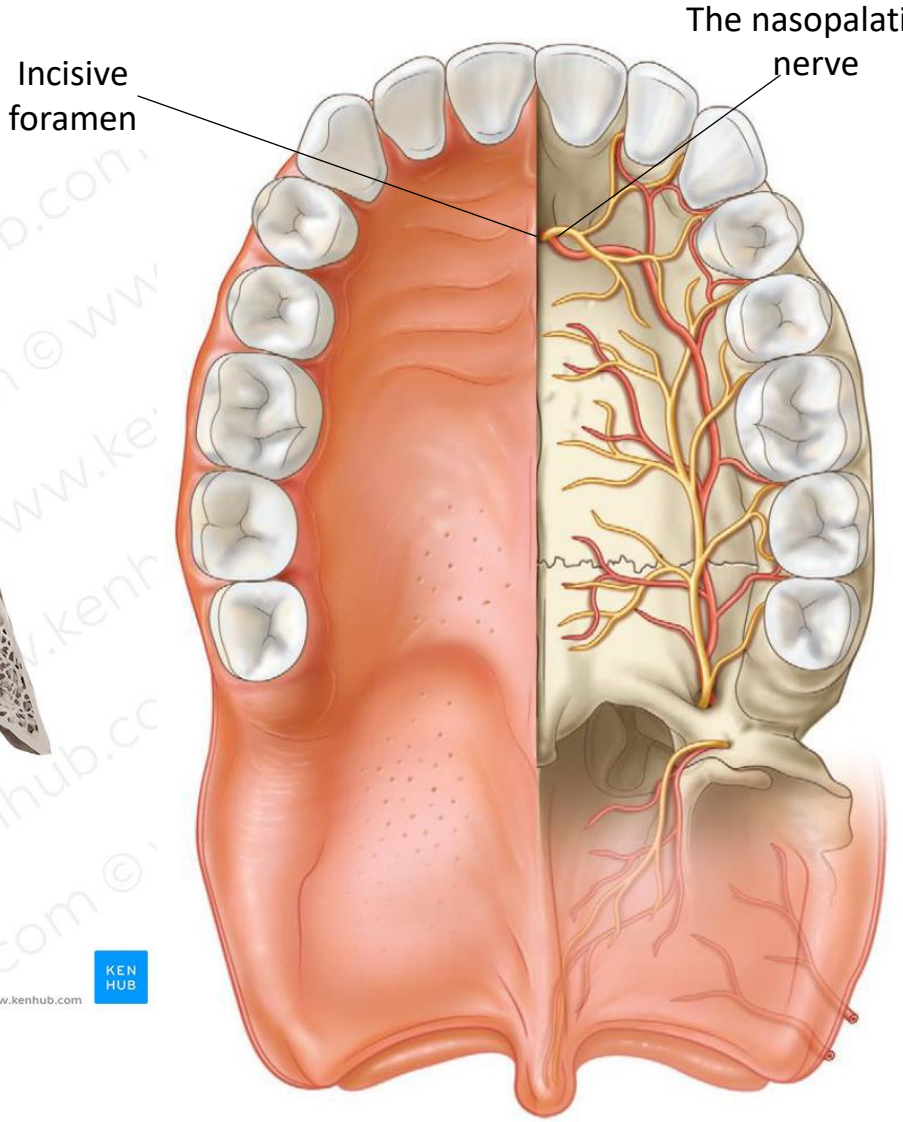




The Nasopalatine nerve (also called long Sphenopalatine nerve) is the largest of the nasal nerves, it passes anteriorly grooving down the nasal septum then it passes through the incisive canal hard palate, it supplies mucosa, gingiva, and glands adjacent to the incisor teeth by joining the greater palatine nerve.

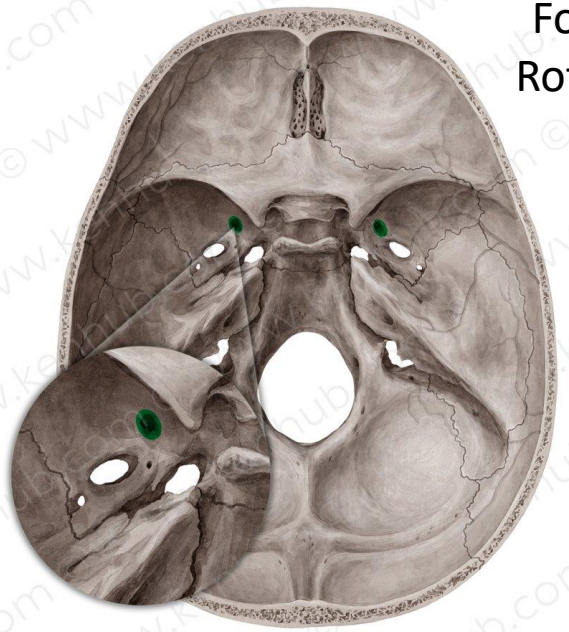




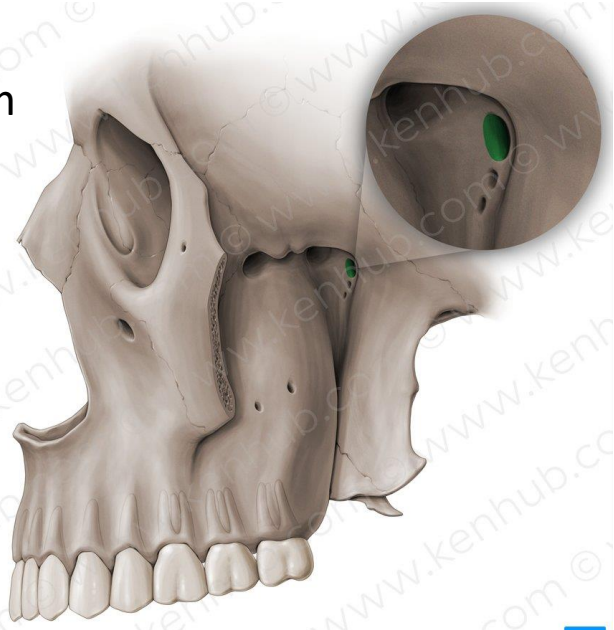


THE MAXILLARY NERVE

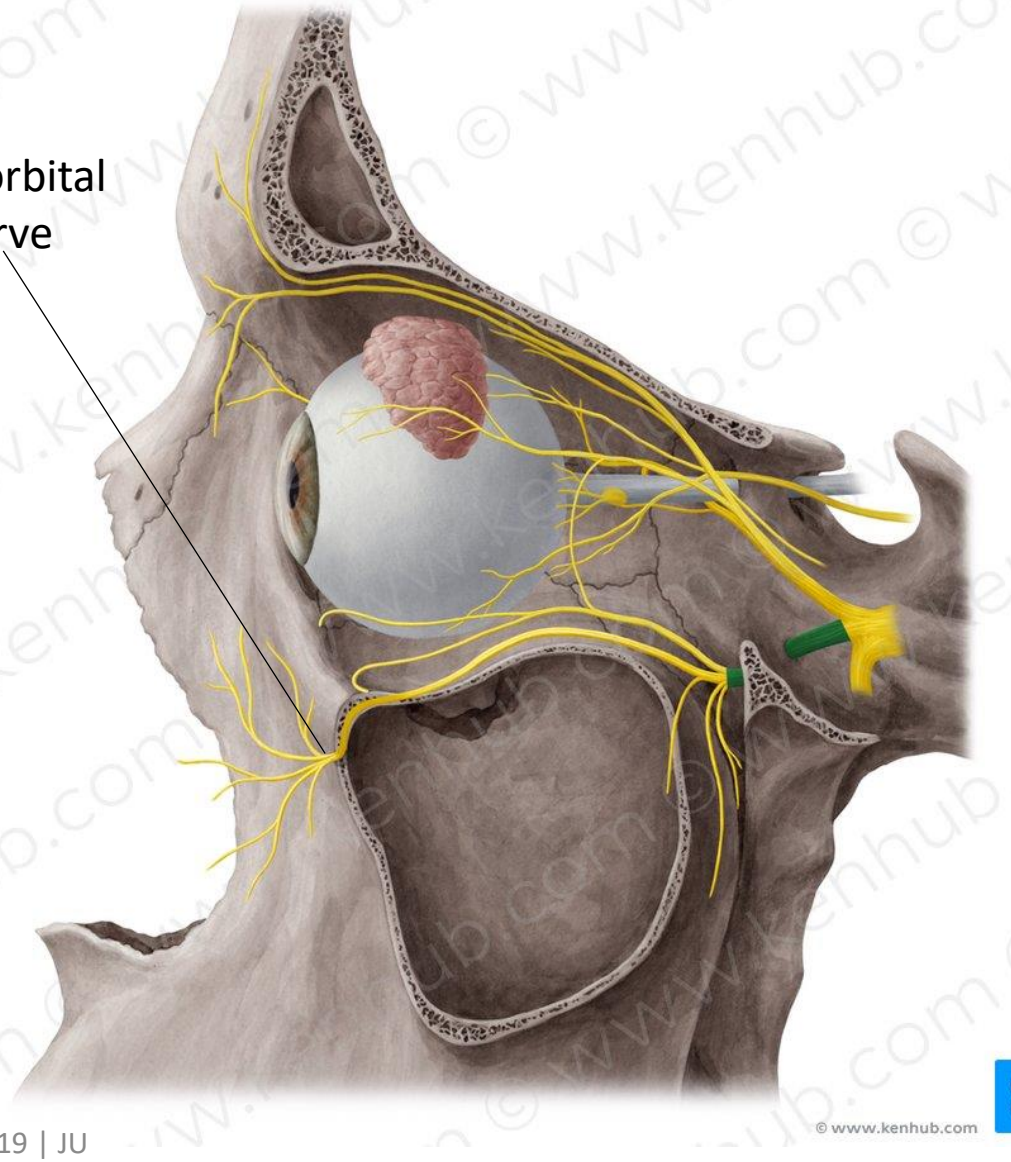
- The maxillary nerve, which is the second division of the trigeminal nerve is purely sensory, it originates from the trigeminal ganglion in the cranial cavity
- It exits the middle cranial fossa, and enters the pterygopalatine fossa through the foramen rotundum
- It terminates as the infra-orbital nerve through the inferior orbital fissure.



Foramen Rotundum

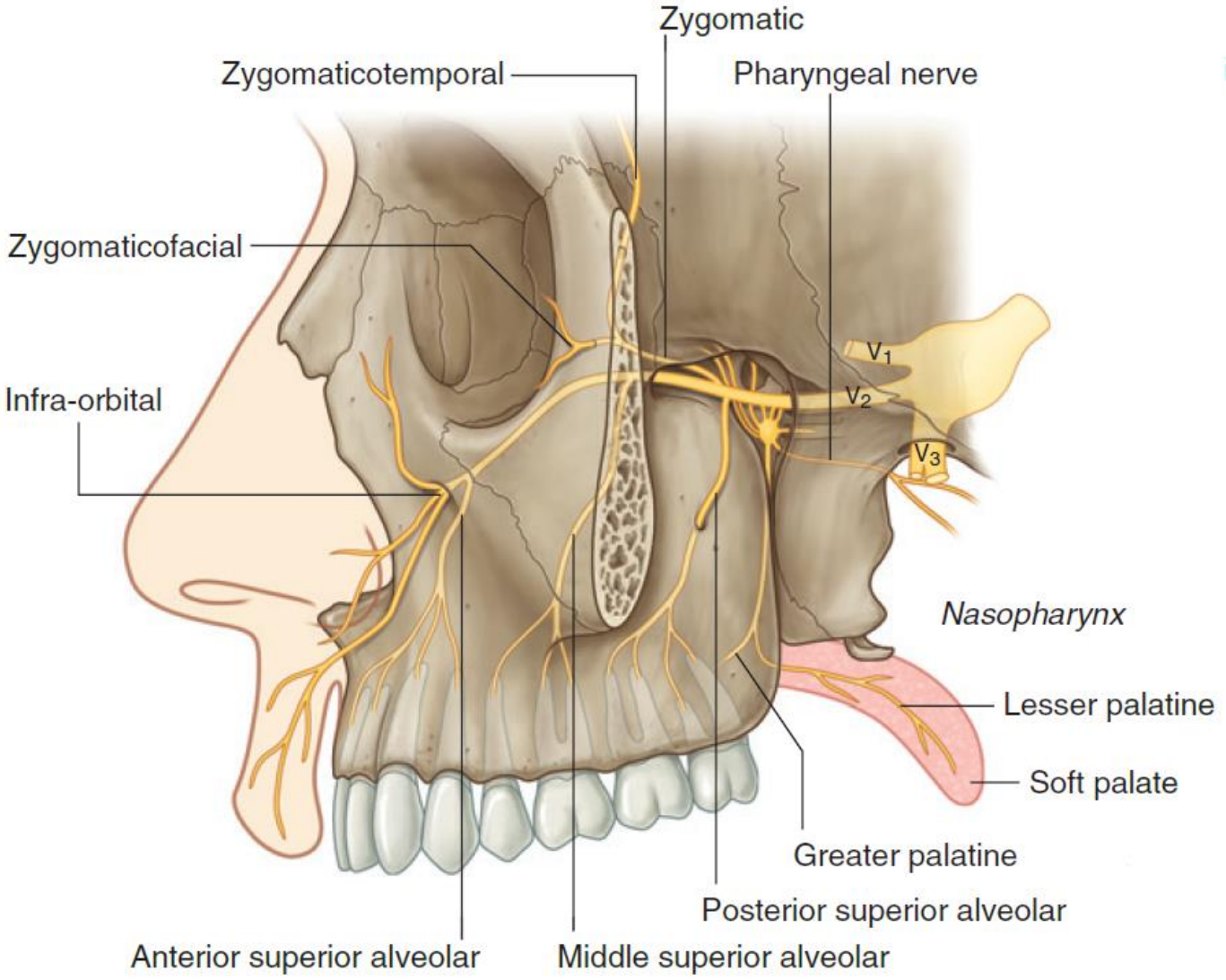


Infraorbital nerve



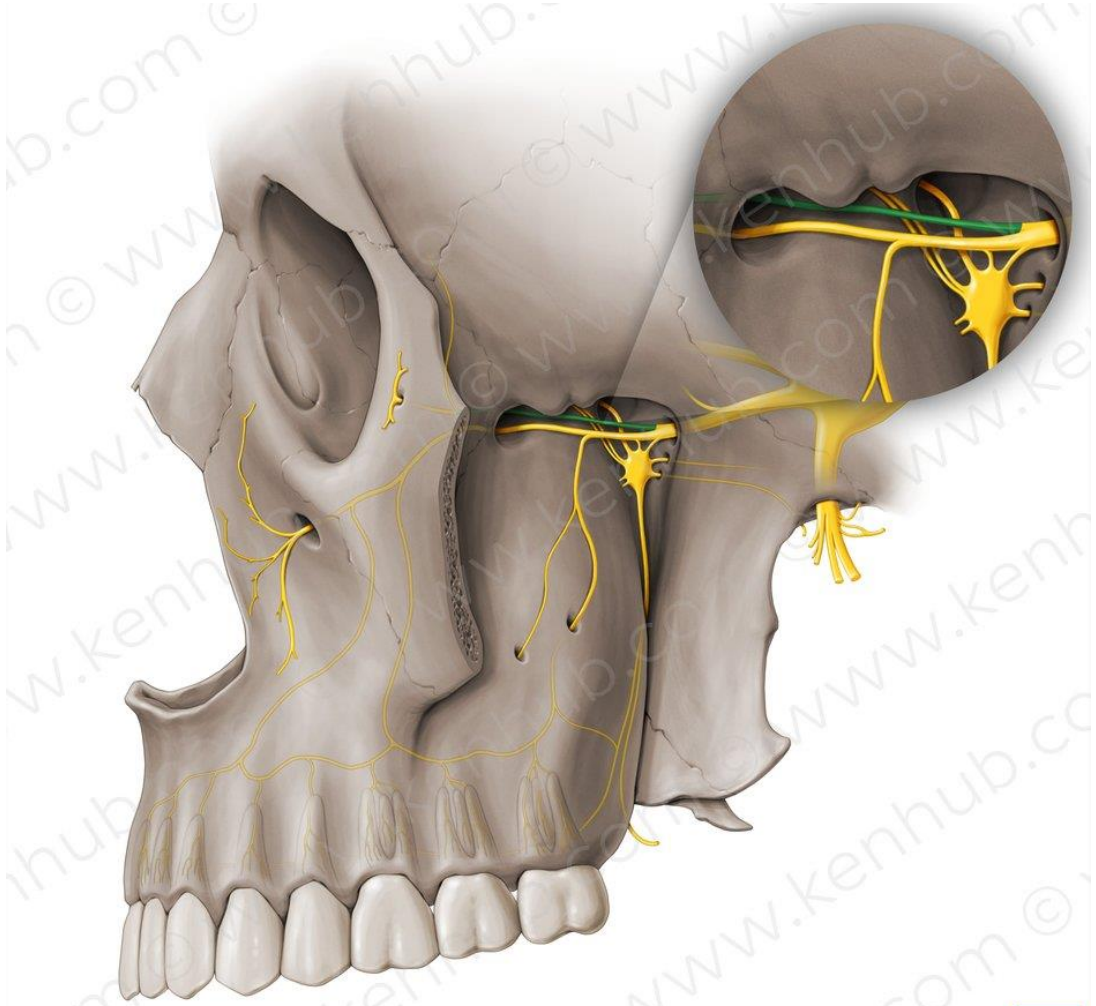
BRANCHES OF THE MAXILLARY NERVE

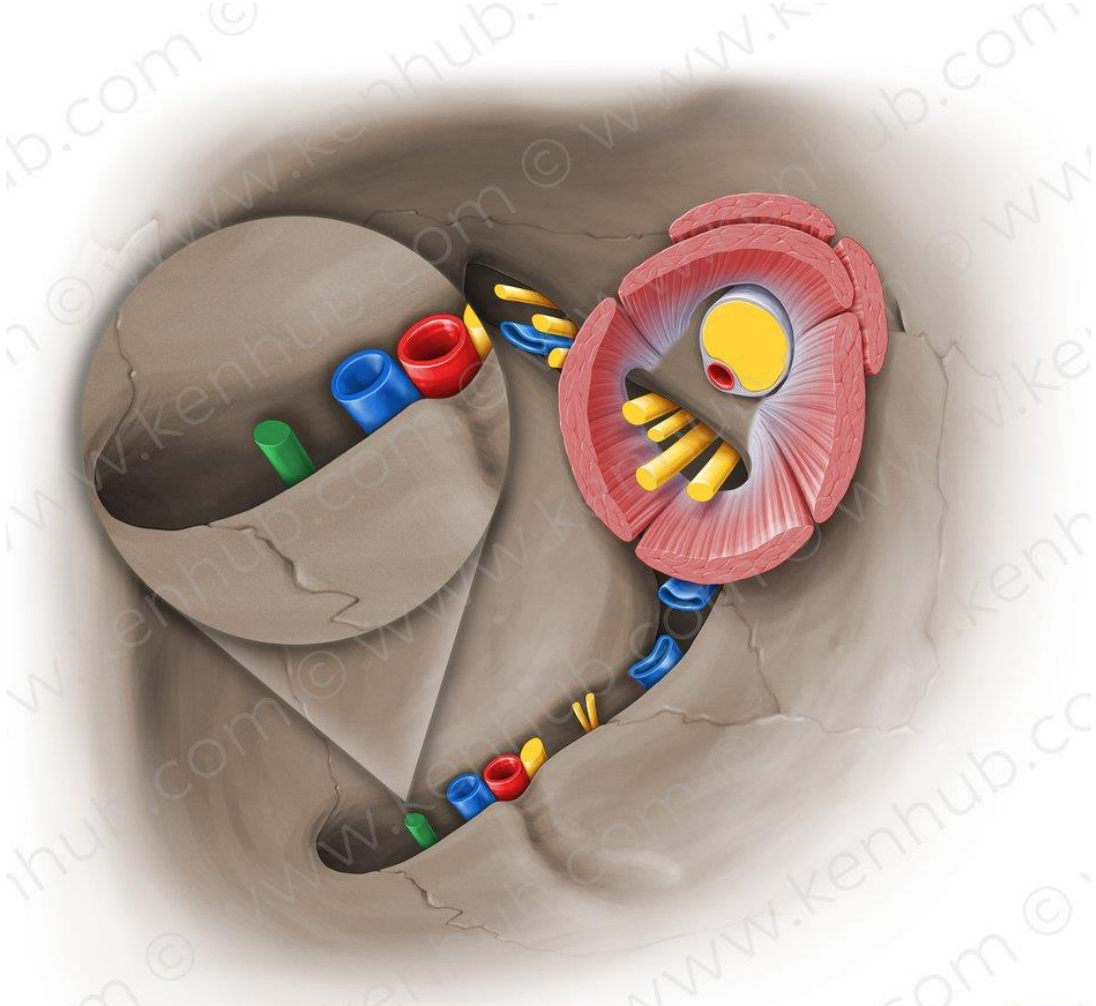
- Meningeal branches (before it enters the pterygopalatine fossa)
- Two ganglionic branches that pass through the pterygopalatine ganglion, these carry postganglionic parasympathetic and sensory fibers
- Zygomatic nerve
- Posterior superior alveolar nerve
- Infraorbital nerve

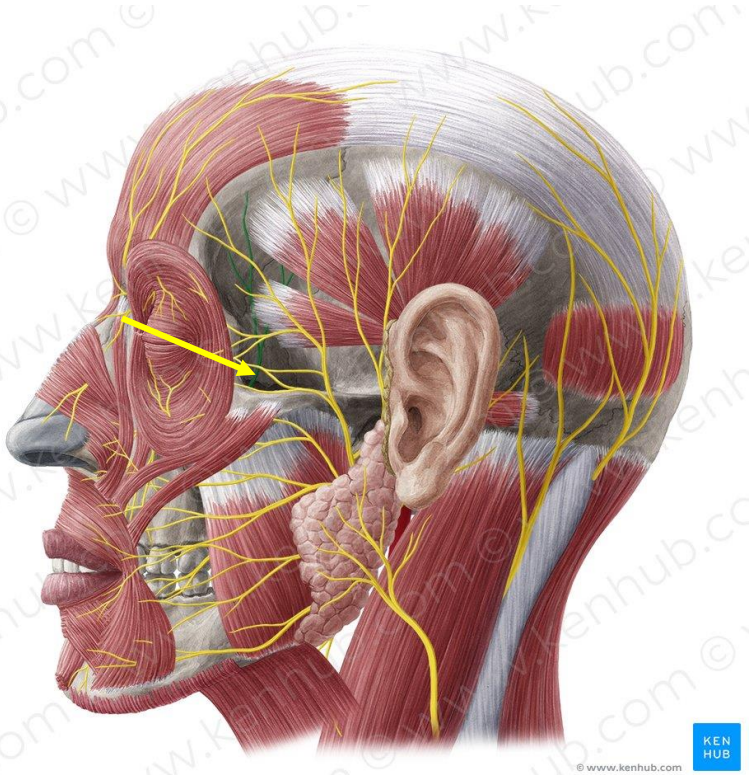


THE ZYGOMATIC NERVE

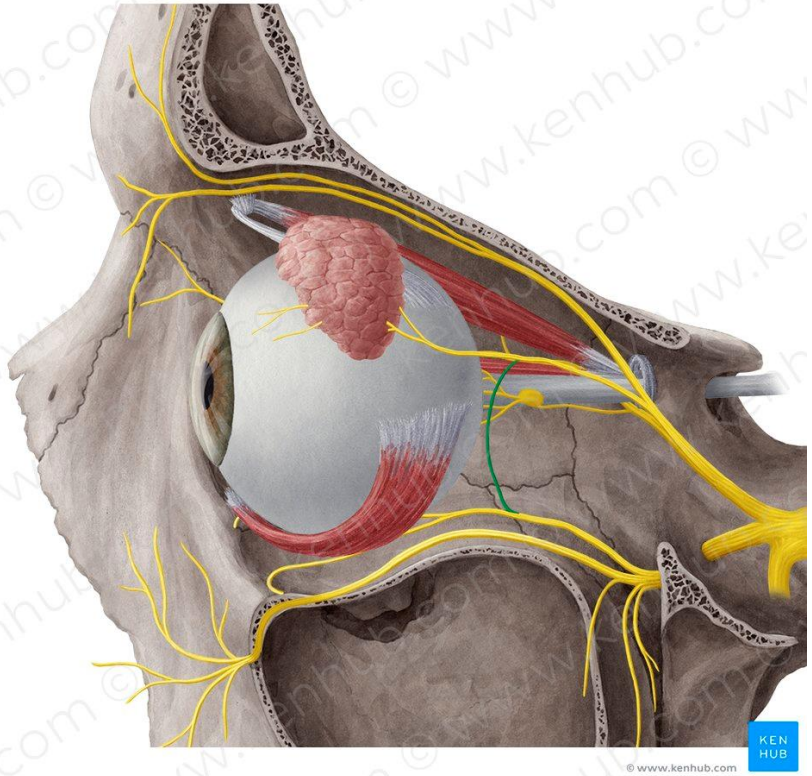
The zygomatic nerve originates directly from the maxillary nerve in the pterygopalatine fossa, it enters the orbit through the inferior orbital fissure, then it divides into zygomaticotemporal and zygomaticofacial branches.



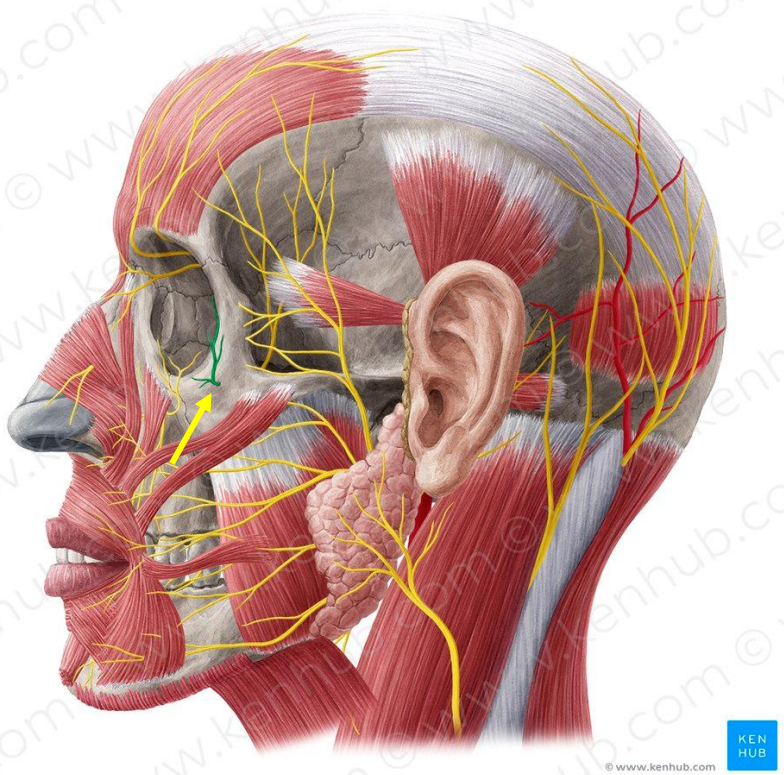




Zygomaticotemporal branch of the zygomatic nerve enters the temporal fossa and passes superficially to supply skin over the temple.



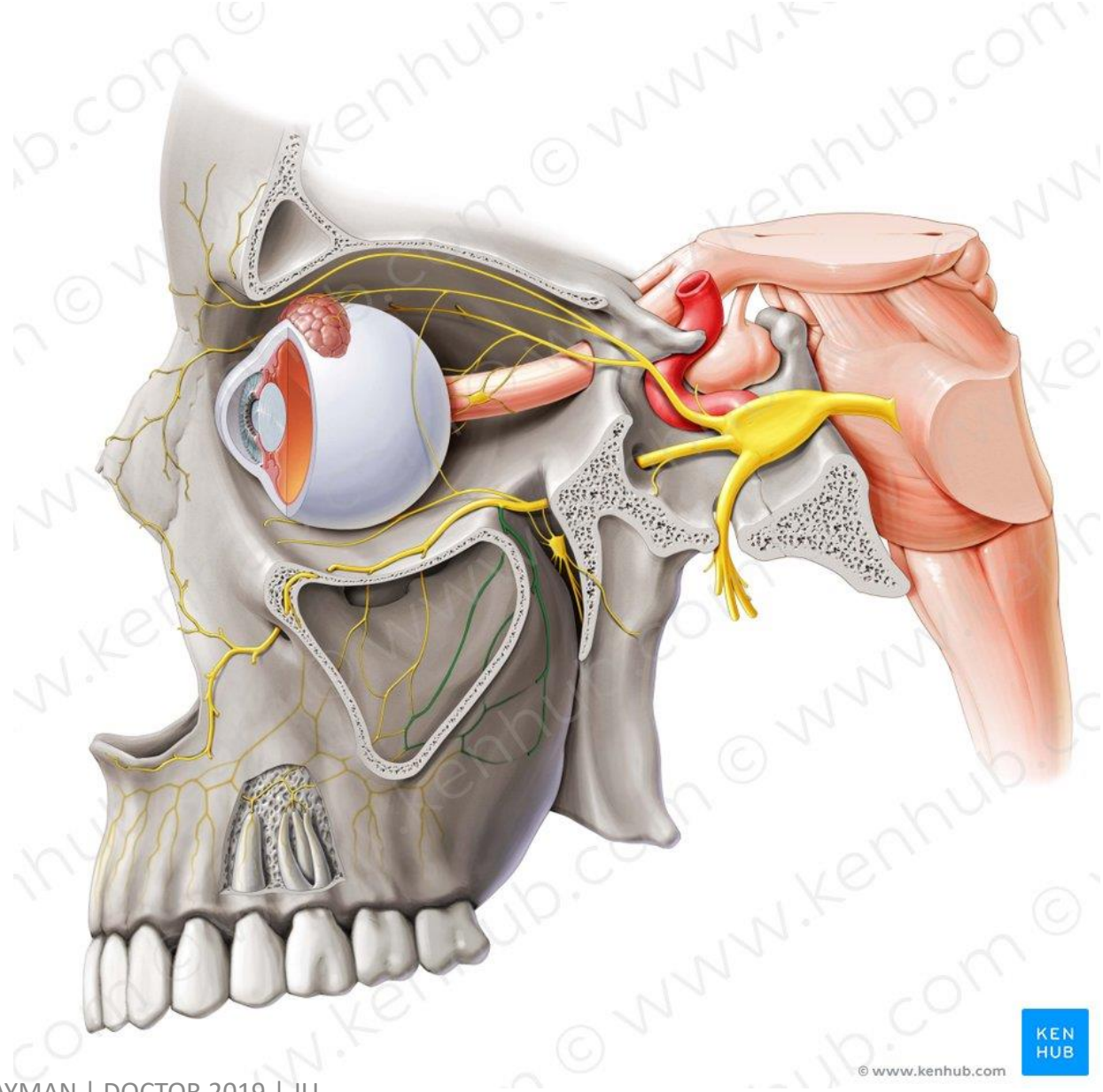
The zygomaticotemporal nerve carries postganglionic parasympathetic and sympathetic fibers, it forms a special autonomic nerve (communicating branch) to join the lacrimal nerve and supply the lacrimal gland.



The Zygomaticofacial branch of the zygomatic nerve opens on the anterolateral surface of the zygomatic bone, and supply the adjacent skin.

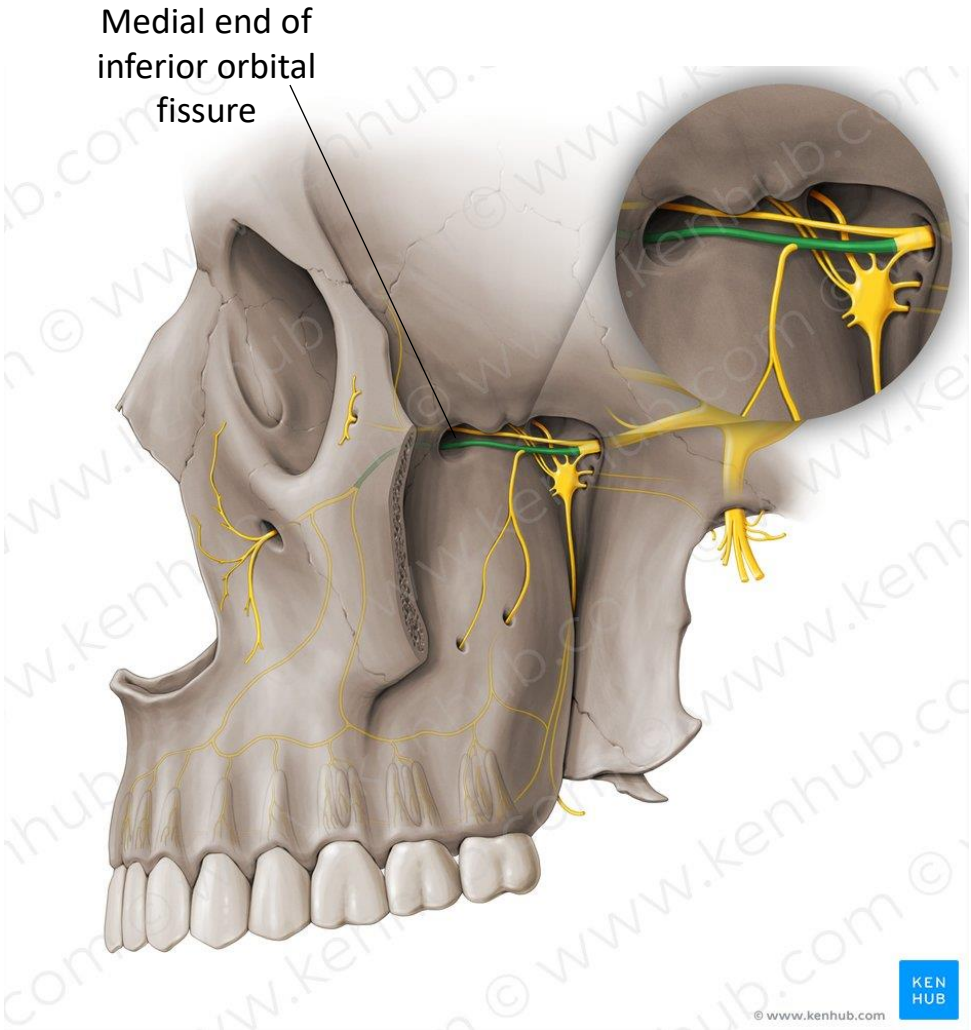
POSTERIOR SUPERIOR ALVEOLAR NERVE

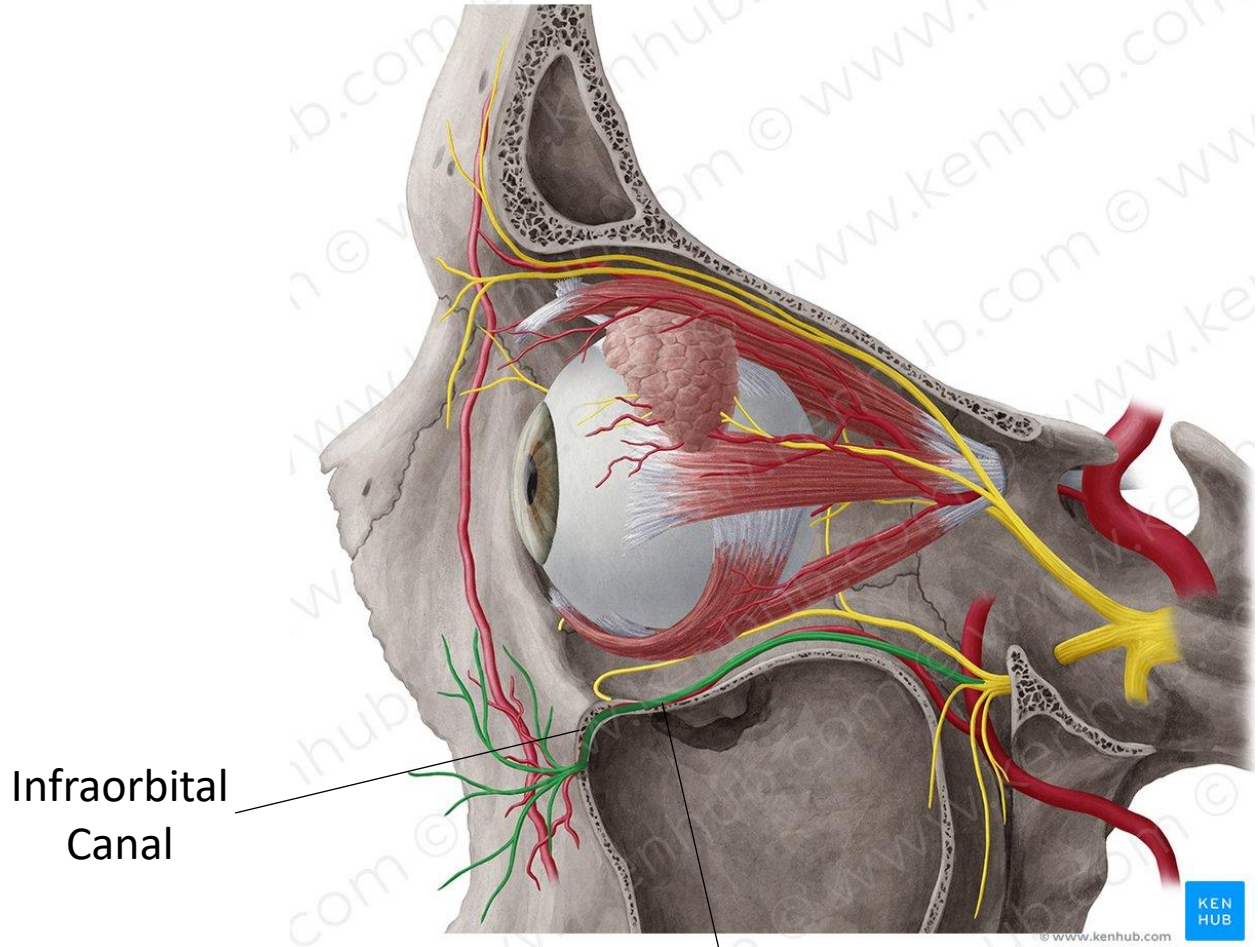
- The posterior superior alveolar nerve passes laterally out of the pterygopalatine fossa through the pterygomaxillary fissure.
- It then enters the posterior surface of the maxilla approximately midway between the last molar tooth and the inferior orbital fissure.
- it supplies the molar teeth and adjacent buccal gingivae and contributes to the innervation of the maxillary sinus.



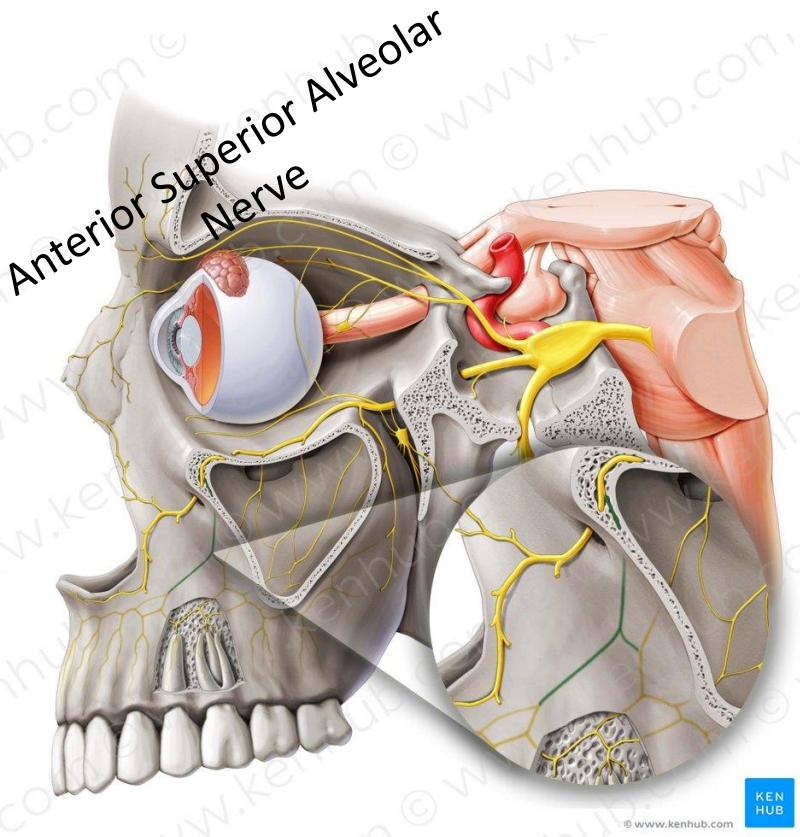
THE INFRAORBITAL NERVE

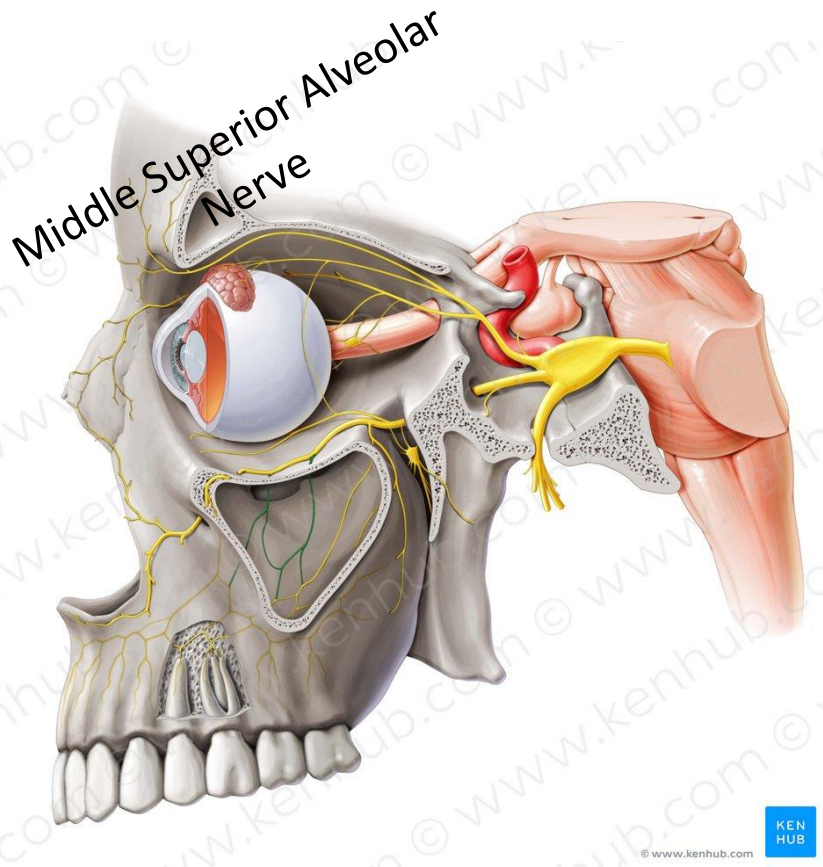
The infraorbital nerve is the anterior continuation of the maxillary nerve, it leaves the pterygopalatine fossa through the inferior orbital fissure, it passes in the infra-orbital groove in the floor of the orbit and then continues forward in the infraorbital canal.

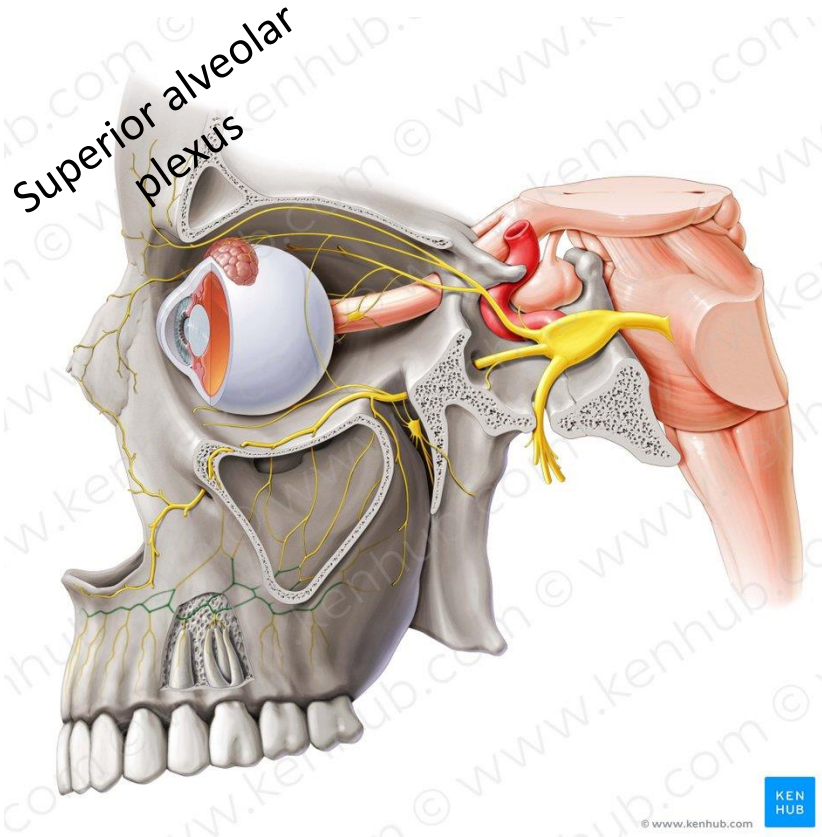




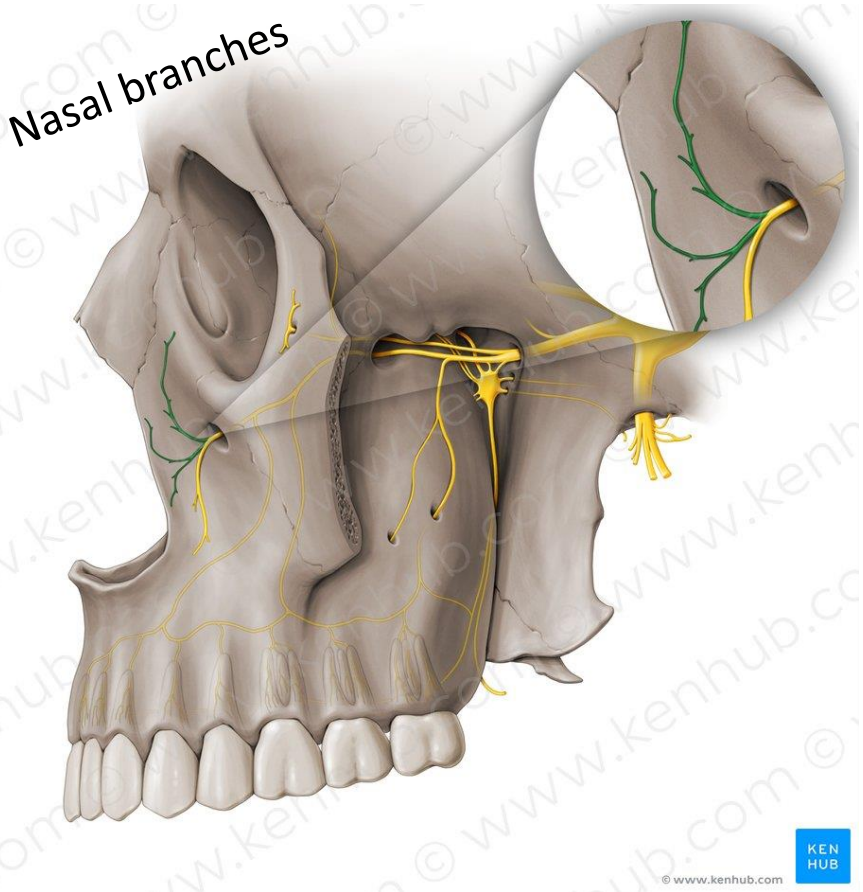
While in the infra-orbital groove and canal, the infra-orbital nerve gives origin to middle and anterior superior alveolar nerves, they Join the superior alveolar plexus to supply the upper teeth, the middle superior alveolar nerve also supplies the maxillary sinus, while the anterior superior alveolar nerve also gives origin to a small nasal branch.

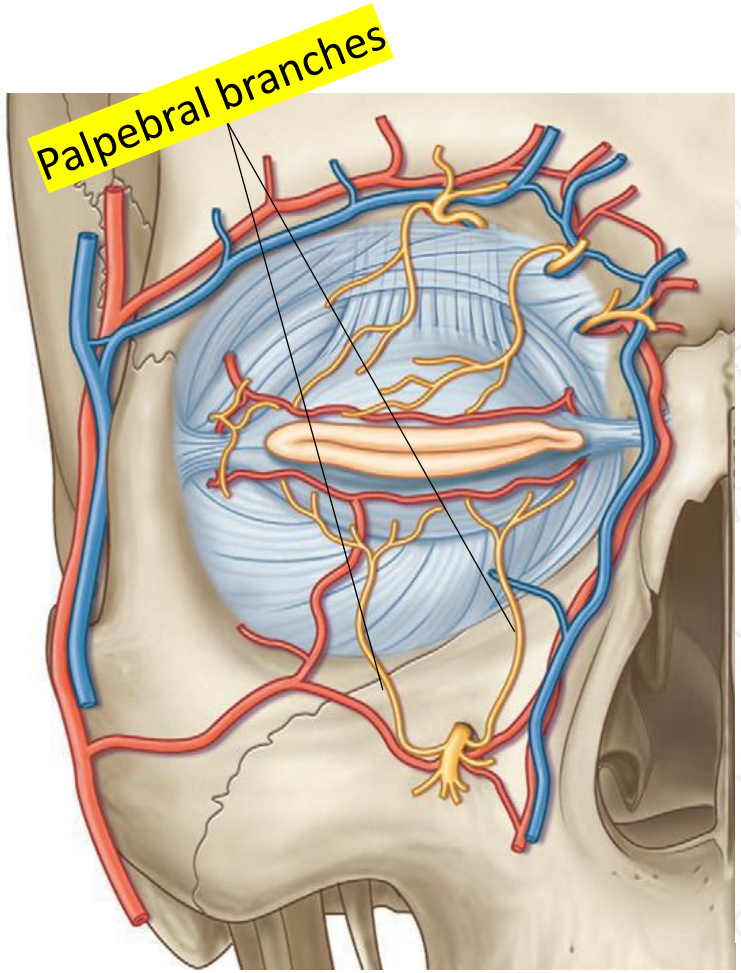


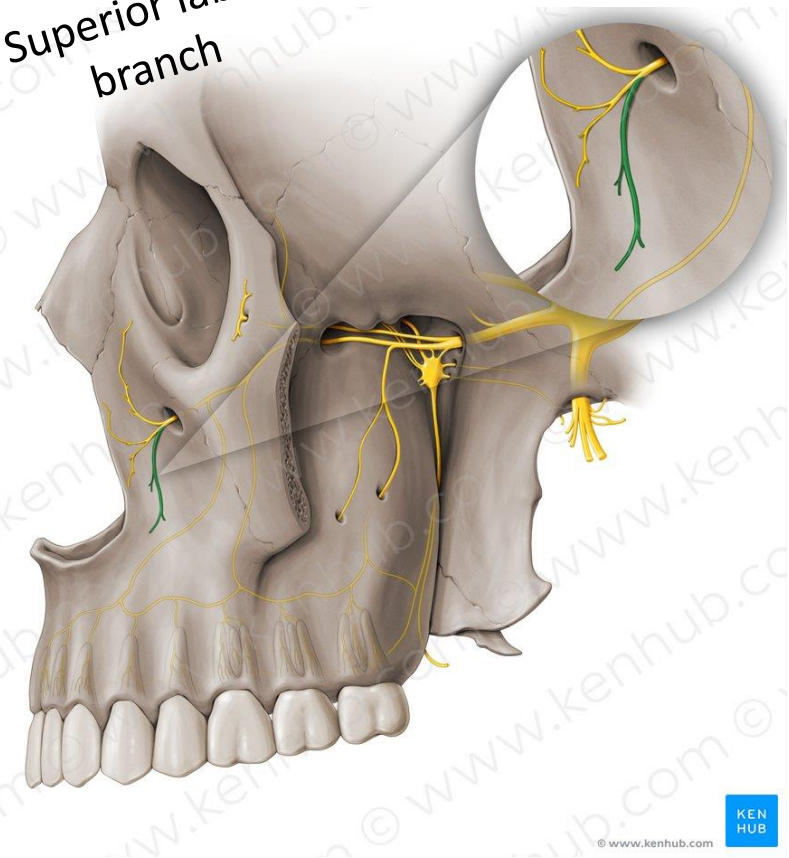




The infraorbital nerve exits the infraorbital canal through the infraorbital foramen, it divides into nasal branches which supply the lateral aspect of external nose and part of the septum, palpebral branches which supply the lower eyelid, and superior labial branches which supply supply skin over the cheek and upper lip, and the related oral mucosa.

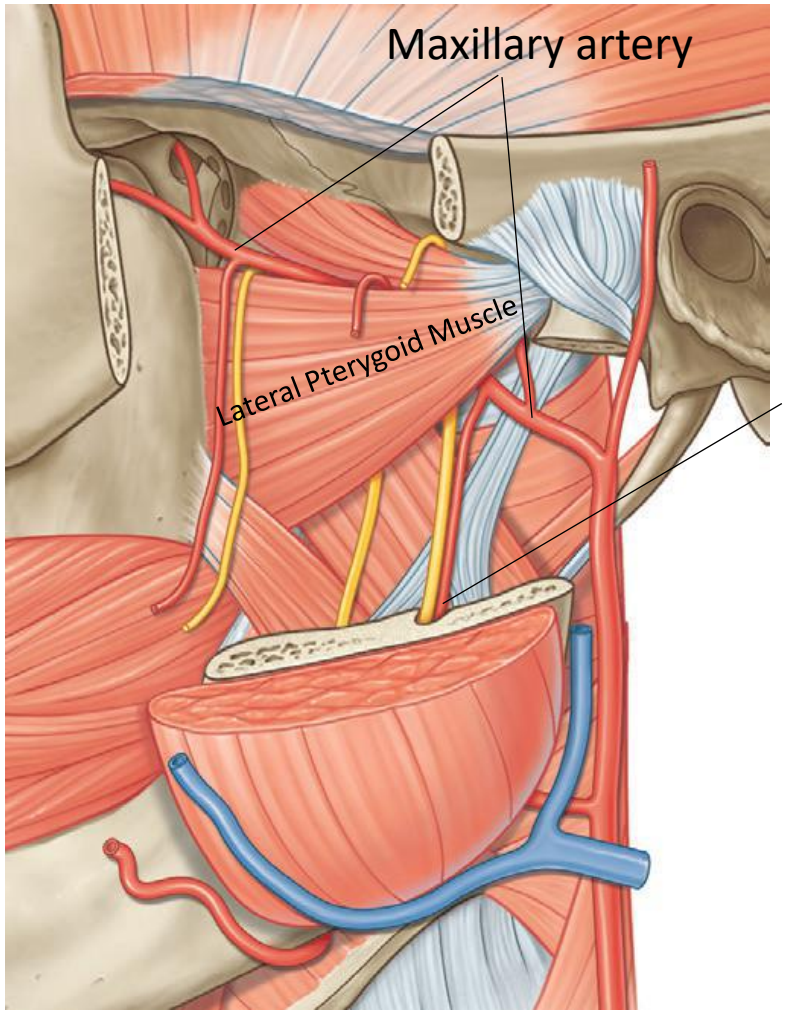


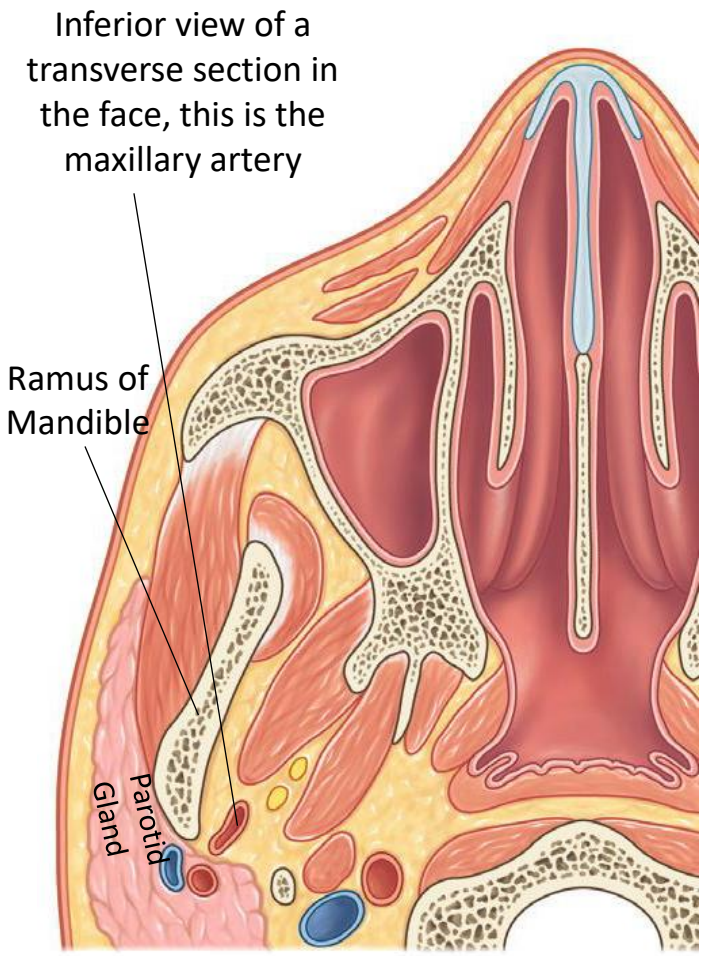


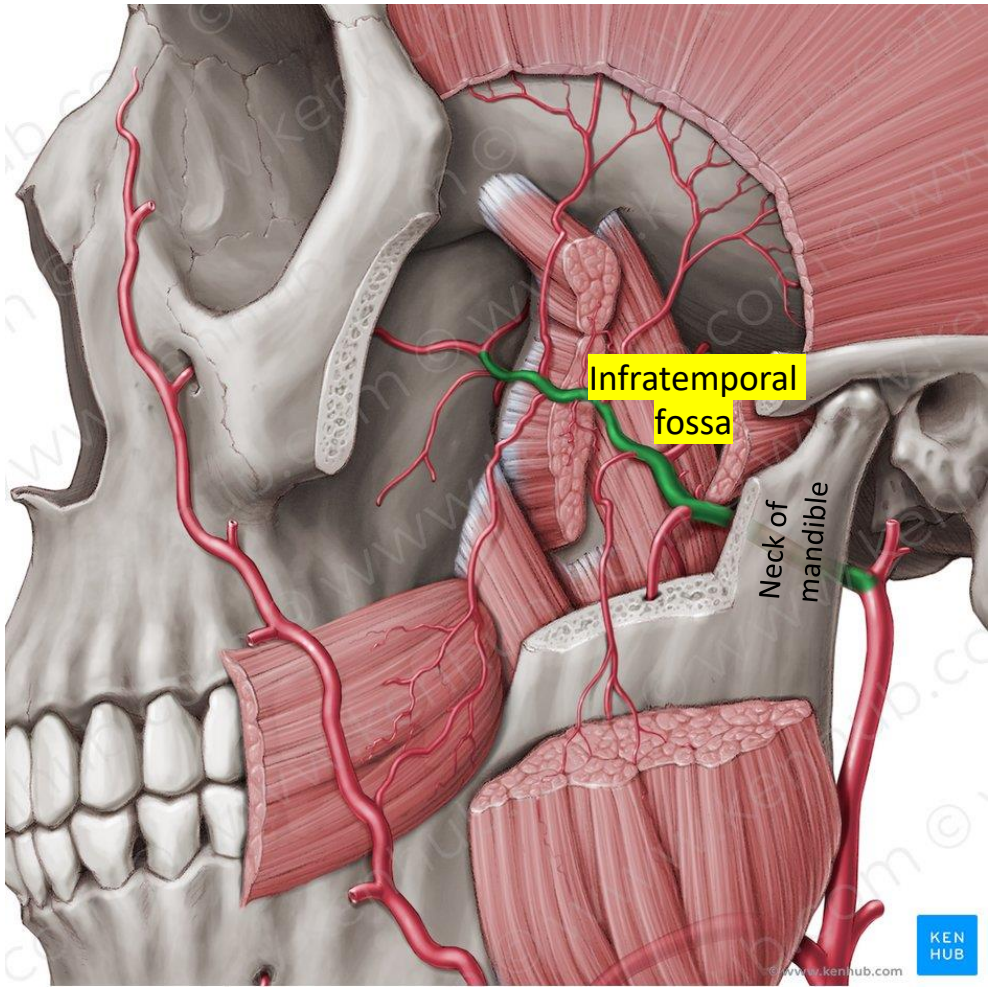


THE MAXILLARY ARTERY

The maxillary artery is the major branch of the external carotid artery in the neck, it originates adjacent to the neck of mandible within the substance of the parotid gland, then it passes forward through the infratemporal fossa, then it enters the pterygopalatine fossa through the pterygomaxillary fissure.

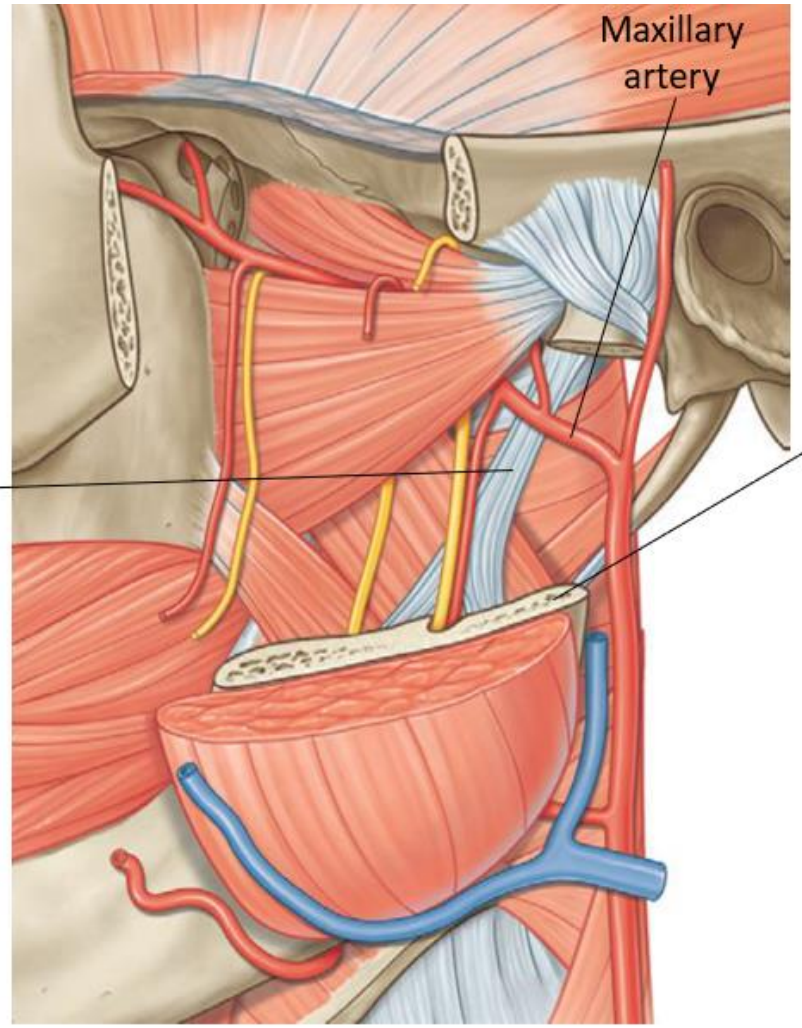


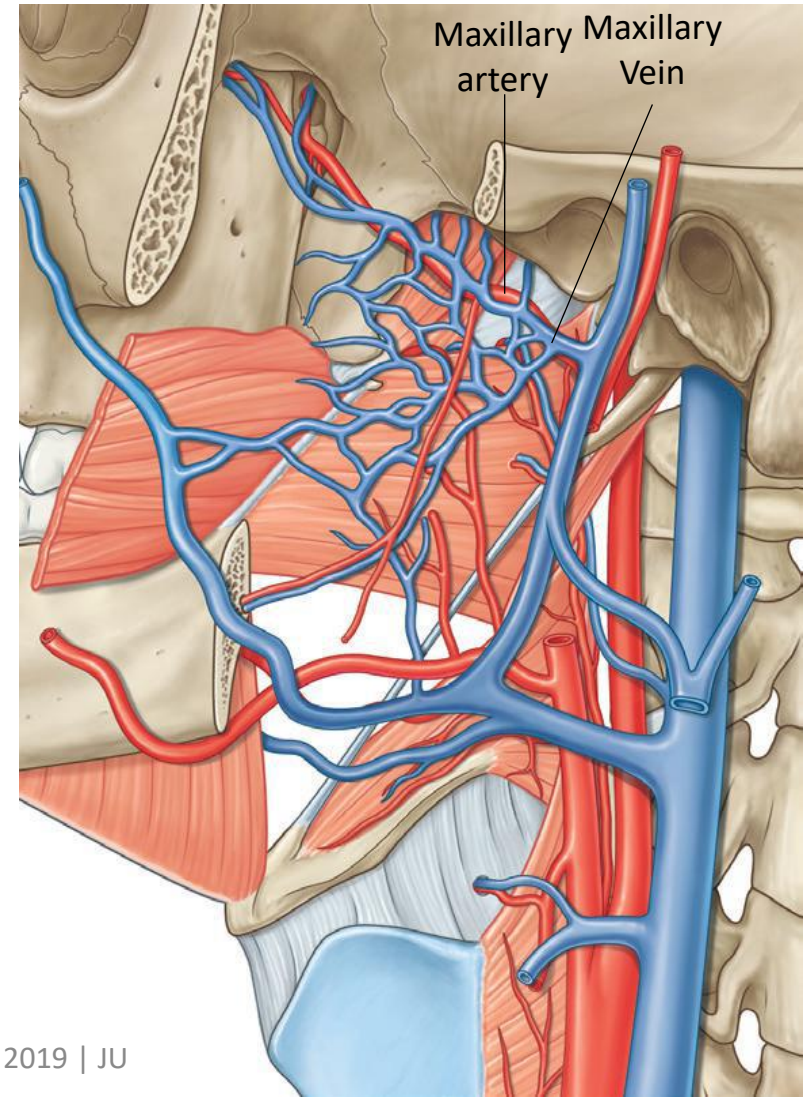


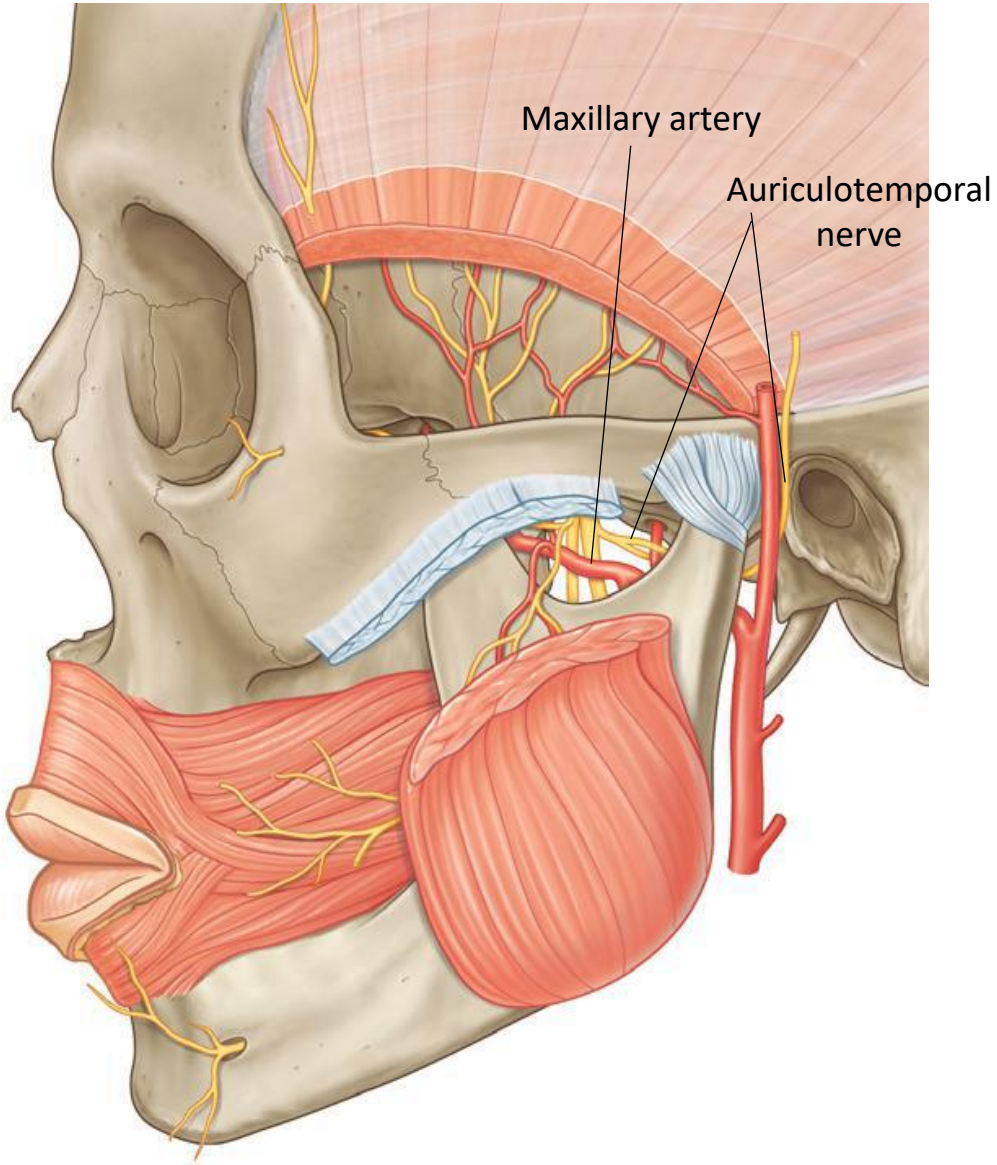


1ST PART OF THE MAXILLARY ARTERY

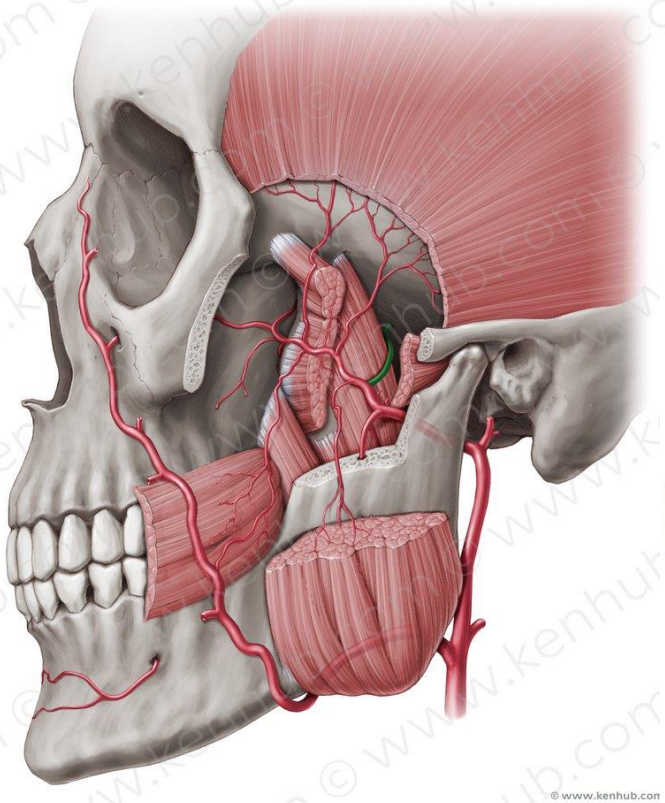
The first part of the maxillary artery is the part between the neck of mandible laterally and the sphenomandibular ligament medially, it is also related to the auriculotemporal nerve above and the maxillary vein below.

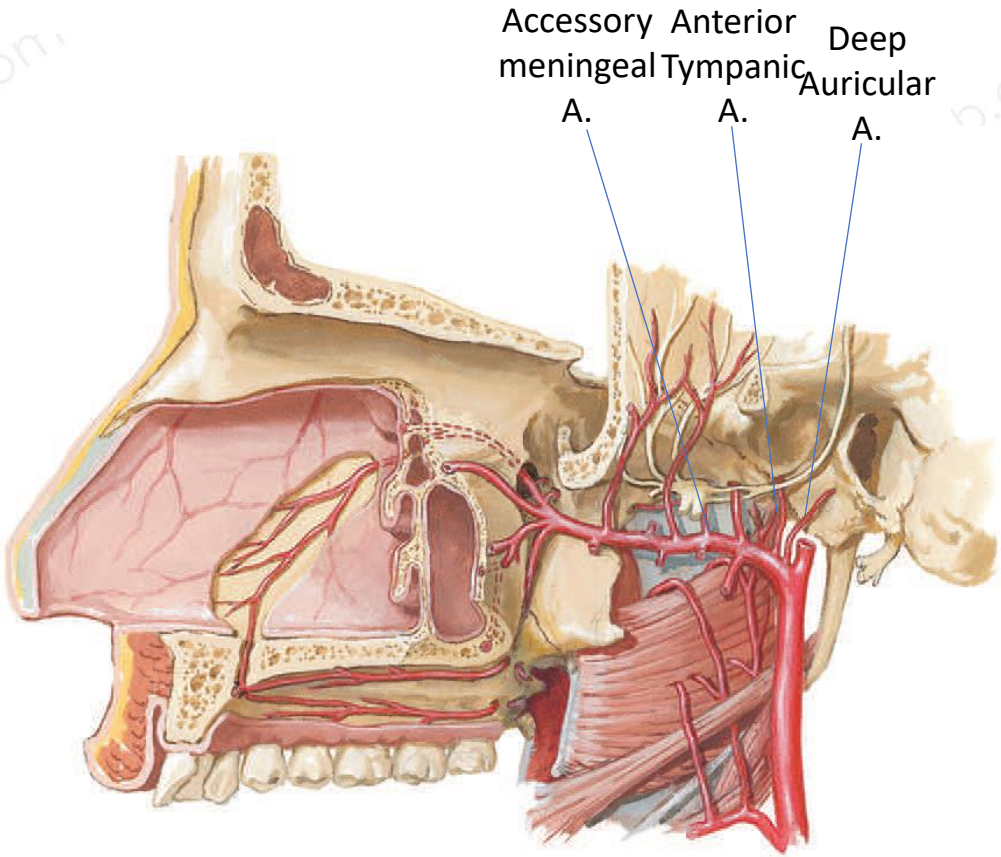


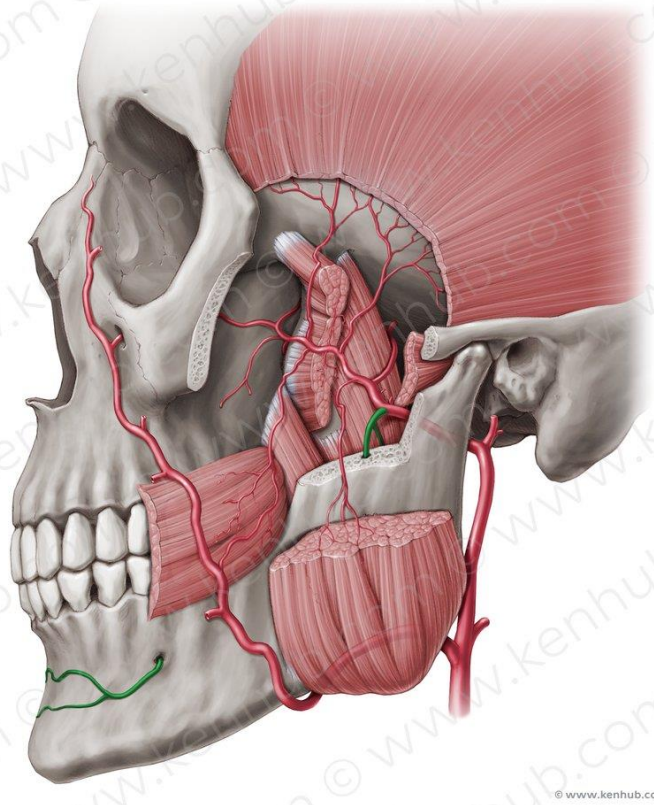



Maxillary artery
Auriculotemporal nerve

The 1st part of the maxillary artery gives origin to two major branches (the middle meningeal and inferior alveolar arteries) and smaller branches (deep auricular, anterior tympanic, and accessory meningeal arteries)





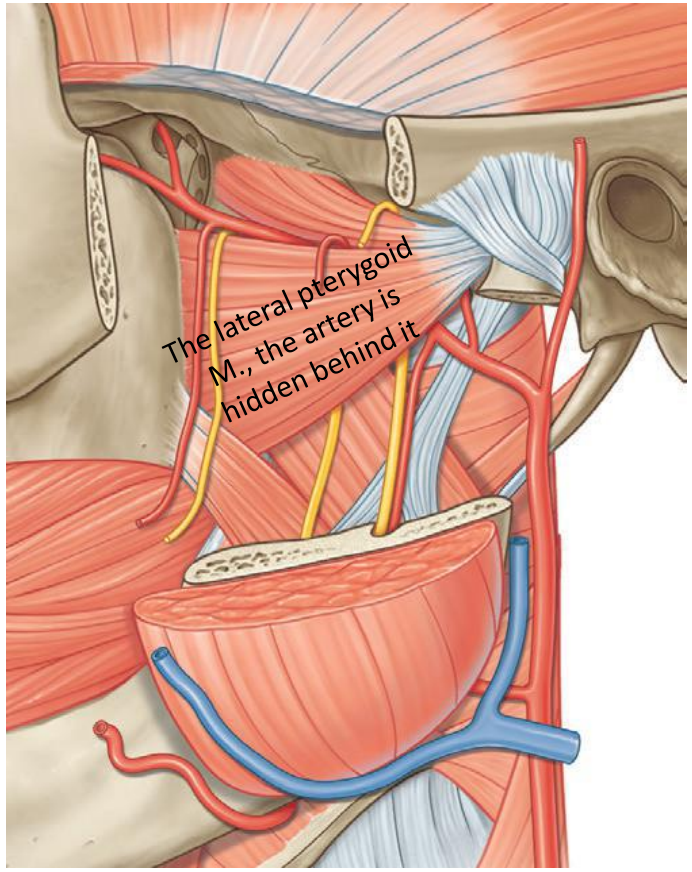


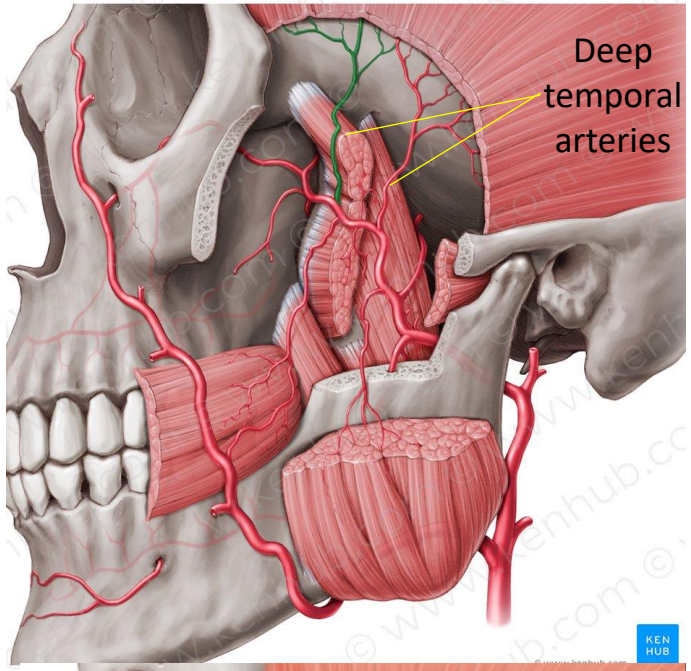
Middle Meningeal Artery

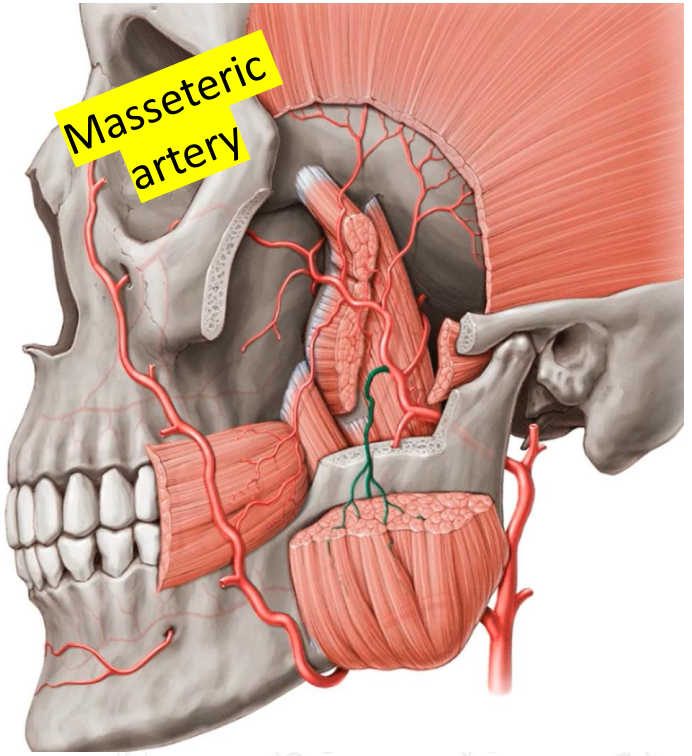
Inferior Alveolar Artery

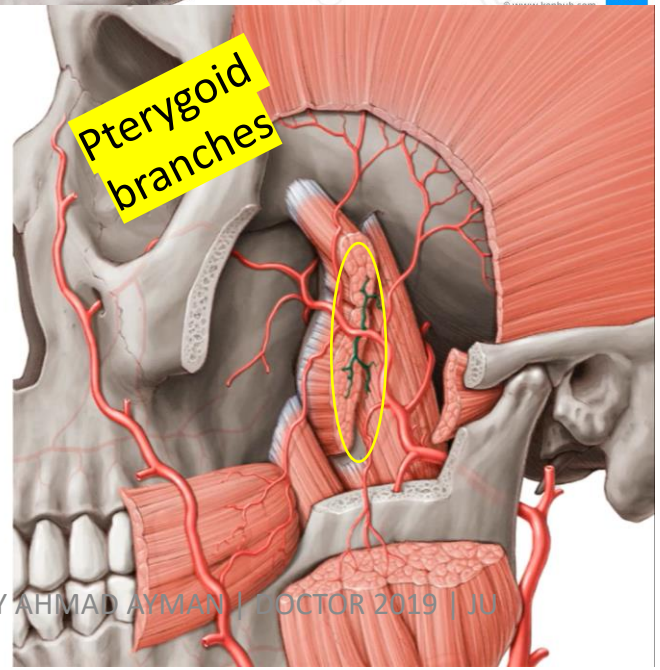
2ND PART OF THE MAXILLARY ARTERY

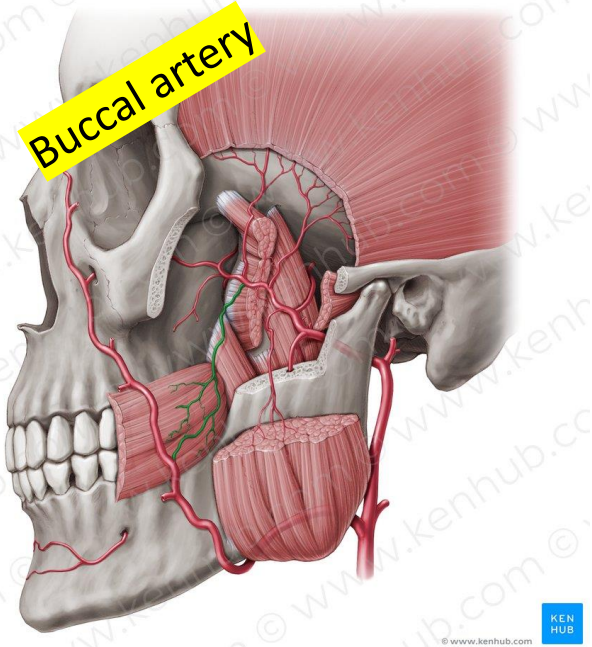
The second part of the maxillary artery is the part related to the lateral pterygoid muscle , it gives origin to deep temporal, masseteric, buccal, and pterygoid arteries, those arteries supply muscles of mastication and course with deep temporal, masseteric, buccal and pterygoid branches of the mandibular nerve.





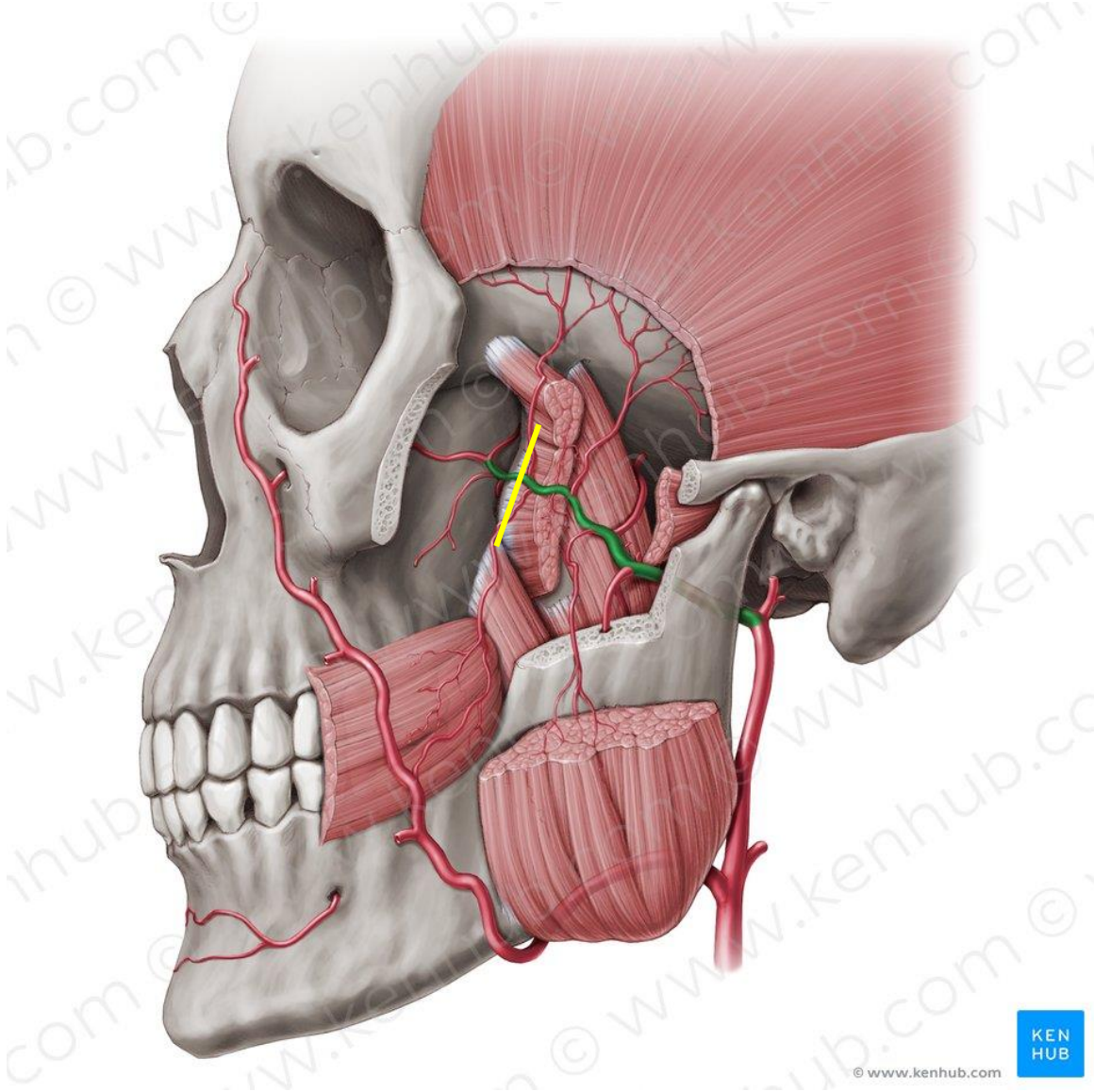






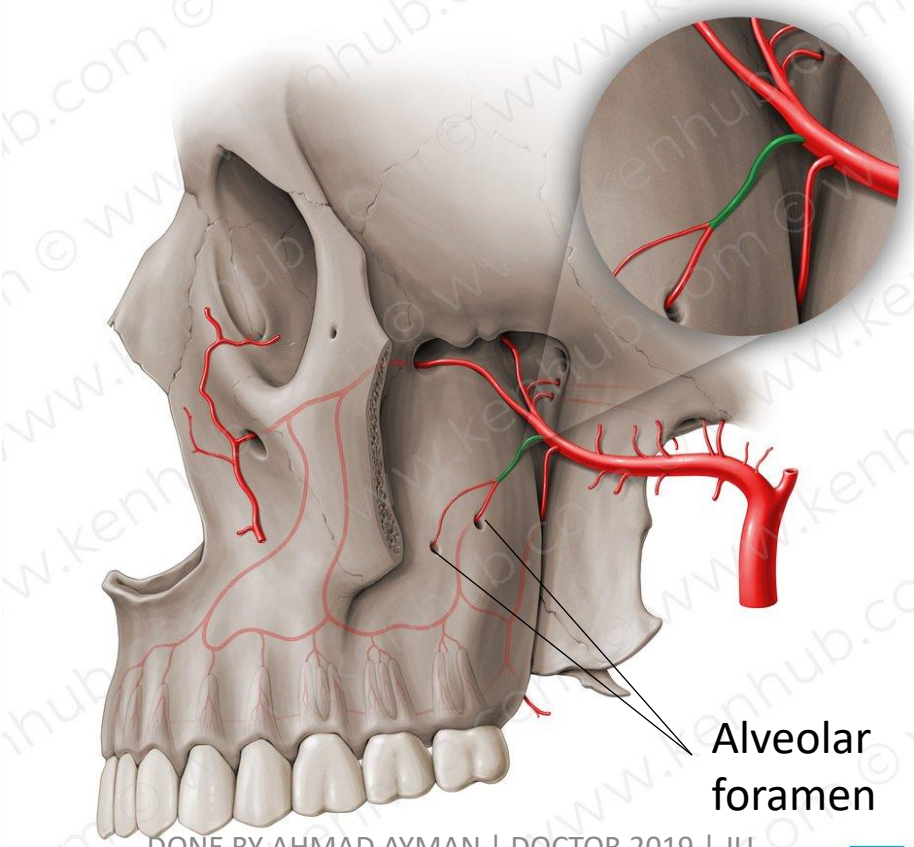
3RD PART OF THE MAXILLARY ARTERY

- the third part of the maxillary artery resides in the pterygopalatine fossa anterior to the pterygopalatine ganglion
- It Gives origin to branches that accompany branches of the maxillary nerve (CN V_2) and the pterygopalatine ganglion.
- These branches supply much of the nasal cavity, the roof of the oral cavity, and all upper teeth. l In addition, they contribute to the blood supply of the sinuses, oropharynx, and floor of the orbit.



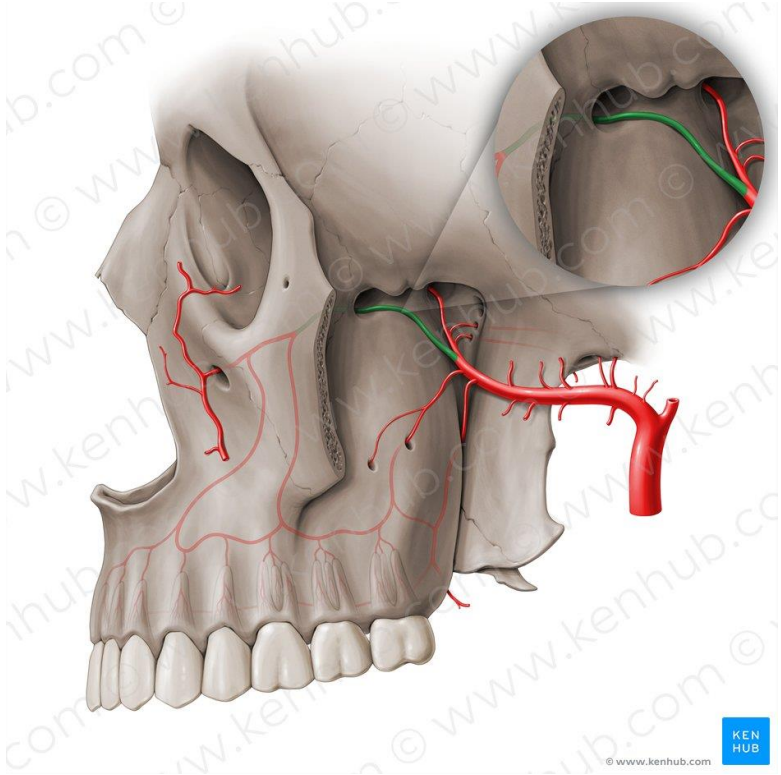
BRANCHES OF THE 3RD PART OF THE MAXILLARY ARTERY: THE POSTERIOR SUPERIOR ALVEOLAR ARTERY

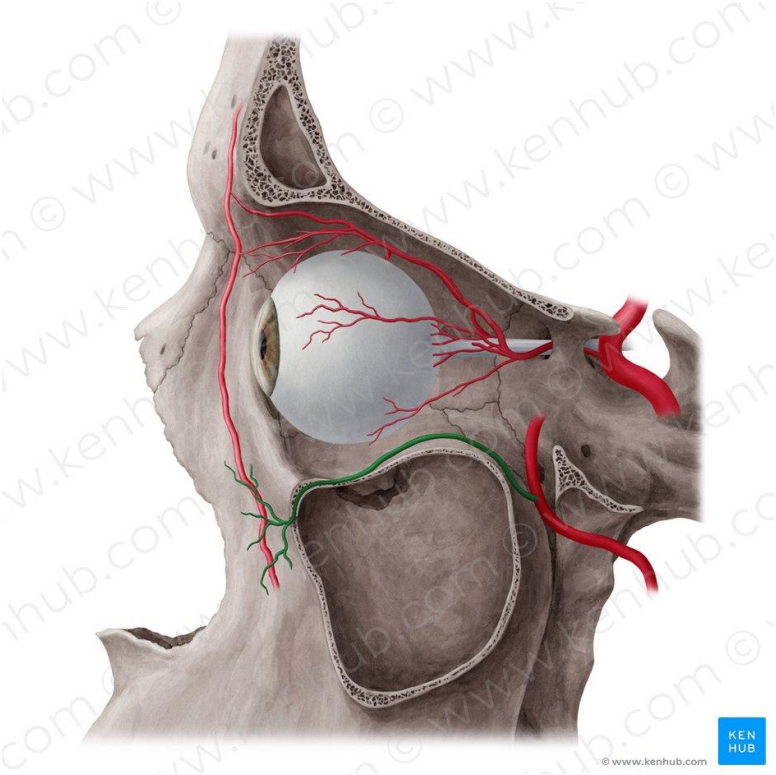
The posterior superior alveolar artery originates from the maxillary artery as it passes through the pterygomaxillary fissure, it meets the posterior superior alveolar nerve (which we've discussed previously), and accompanies it through the alveolar foramen on the infratemporal surface of the maxilla, it supplies the molar and premolar teeth, adjacent gingiva, and the maxillary sinus.

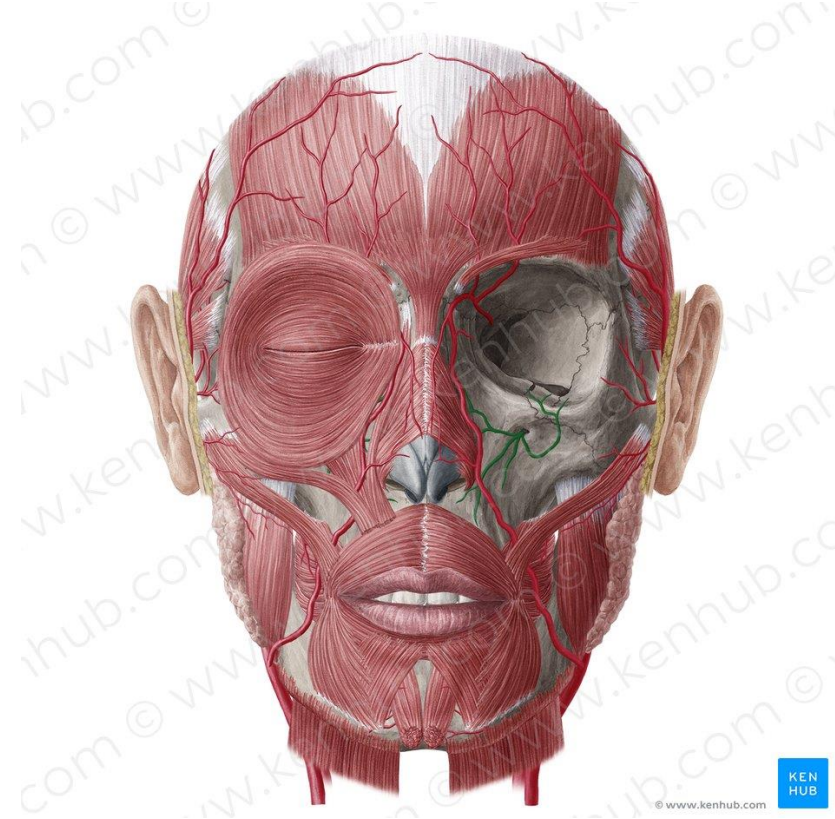


INFRAORBITAL ARTERY

The infraorbital artery passes forward with the infraorbital nerve and leaves the pterygopalatine fossa through the inferior orbital fissure, with the infraorbital nerve, it lies in the infraorbital groove and infraorbital canal, it then emerges through the infra-orbital foramen to supply parts of the face.

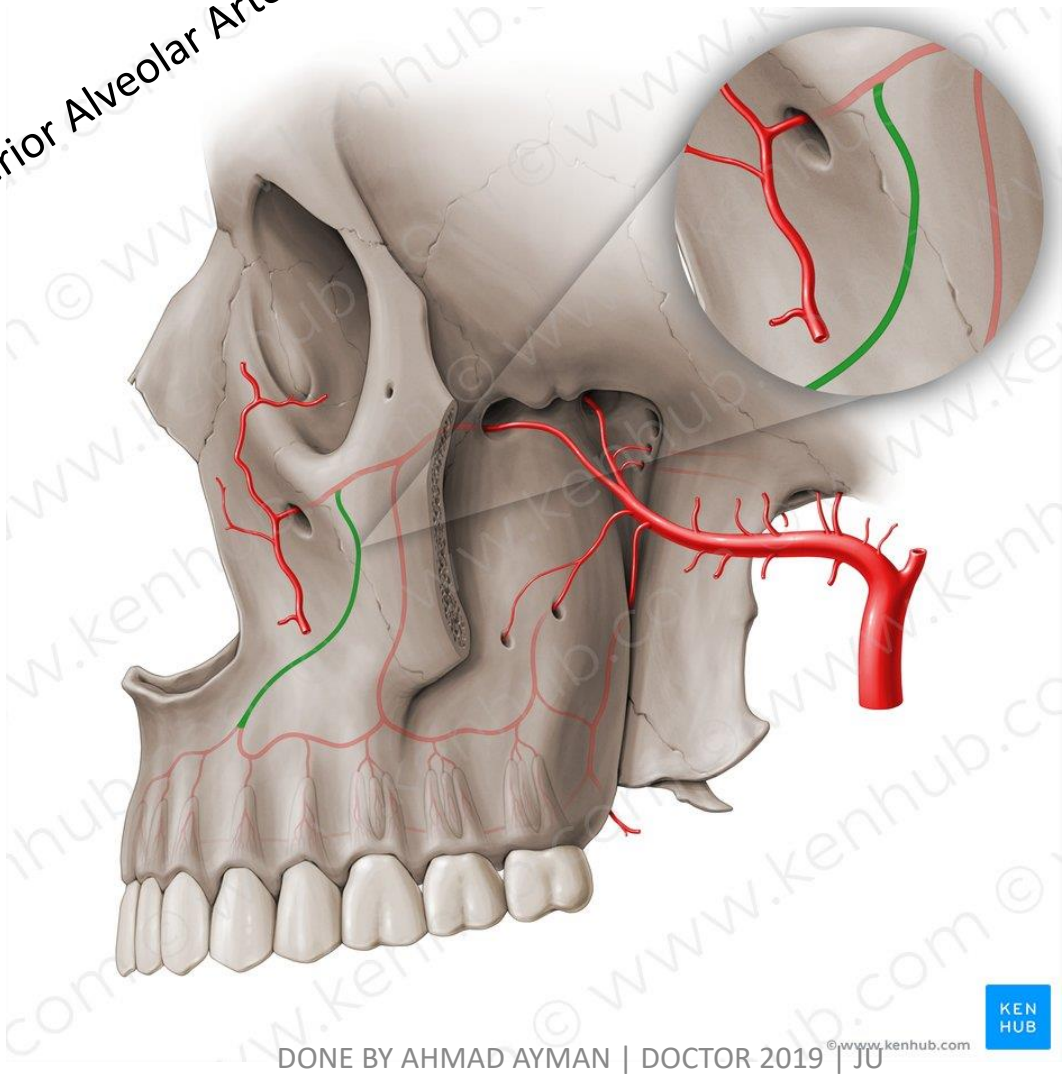






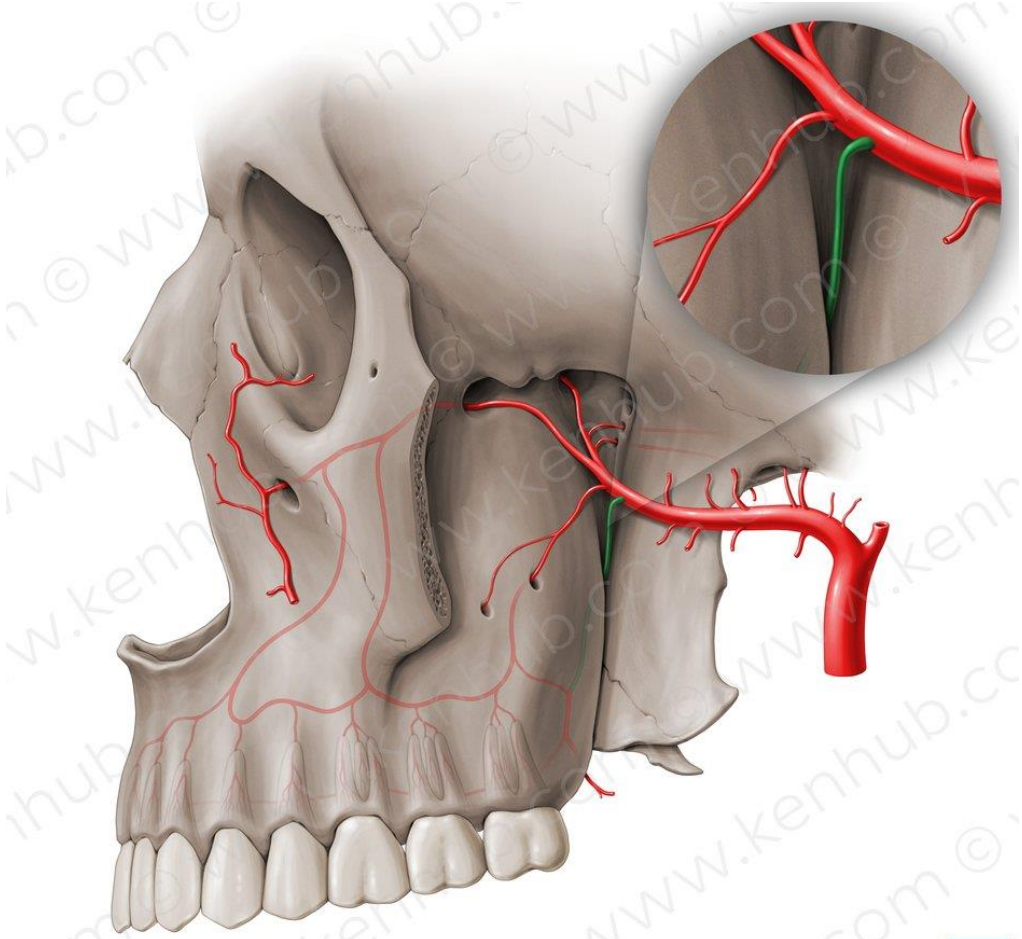
In the orbital canal, the infraorbital gives branches that contribute to the blood supply of structures near the floor of the orbit, including the inferior rectus and inferior oblique extraocular muscles, and the lacrimal sac, it also gives the anterior superior alveolar arteries, which supply the incisor and canine teeth and the maxillary sinus.

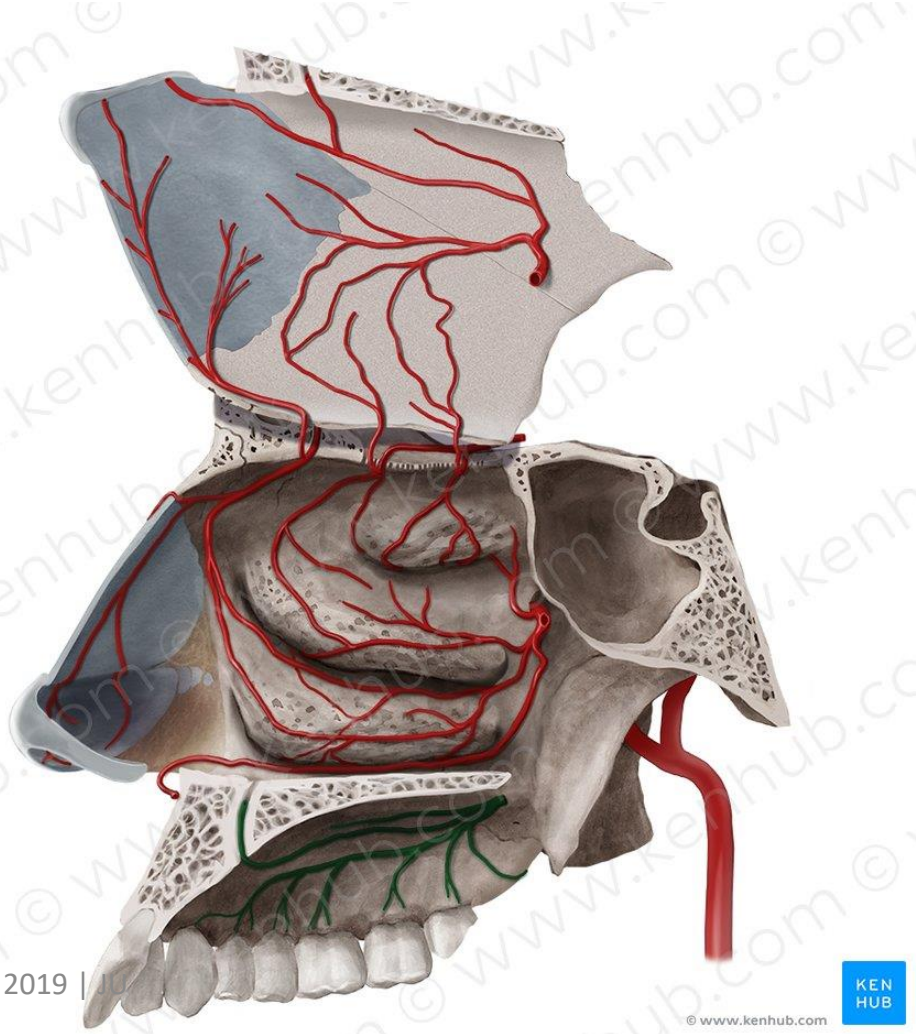
Anterior Superior Alveolar Artery



GREATER PALATINE ARTERY

The greater palatine artery travels posteriorly and leaves the pterygopalatine fossa through the palatovaginal canal with the pharyngeal nerve, it supplies the posterior aspect of the roof of the nasal cavity, the sphenoidal sinus, and the pharyngotympanic tube.

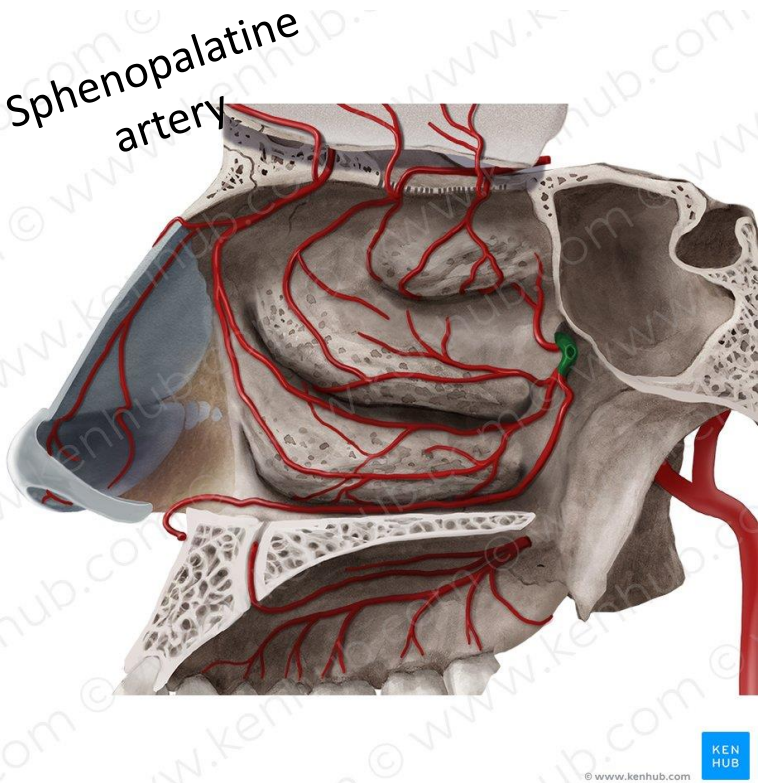


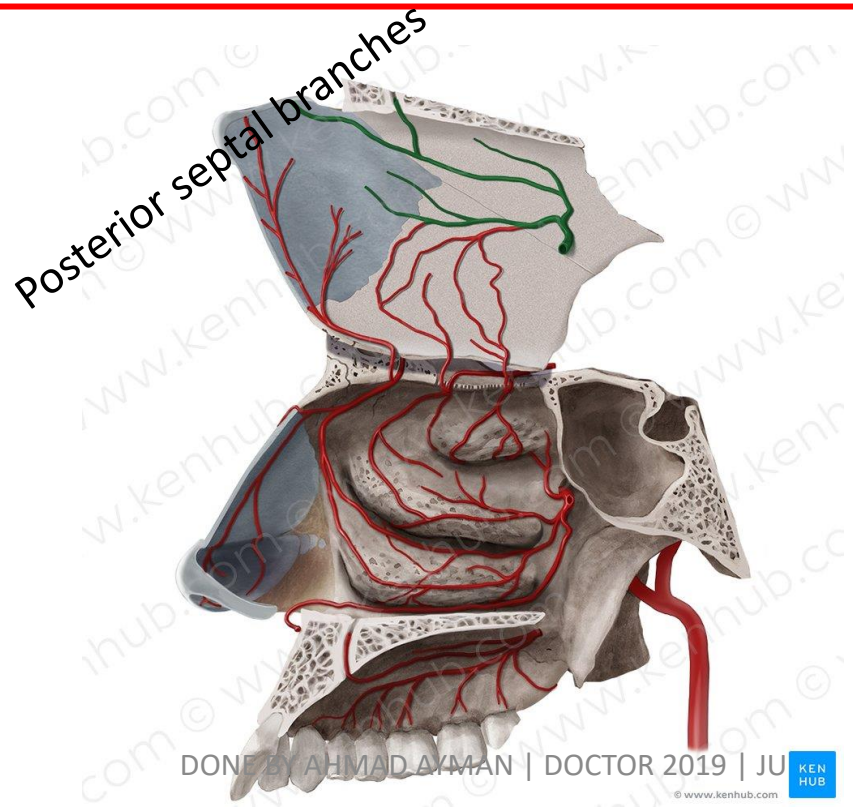


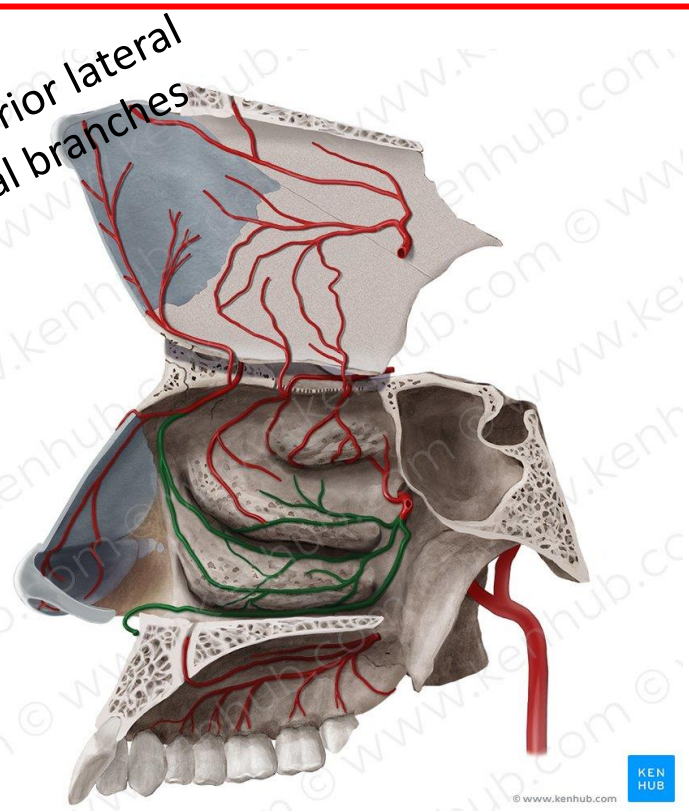
SPHENOPALATINE ARTERY

- It is the terminal branch of the maxillary artery, it leaves the pterygopalatine fossa medially through the sphenopalatine foramen
- It 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.

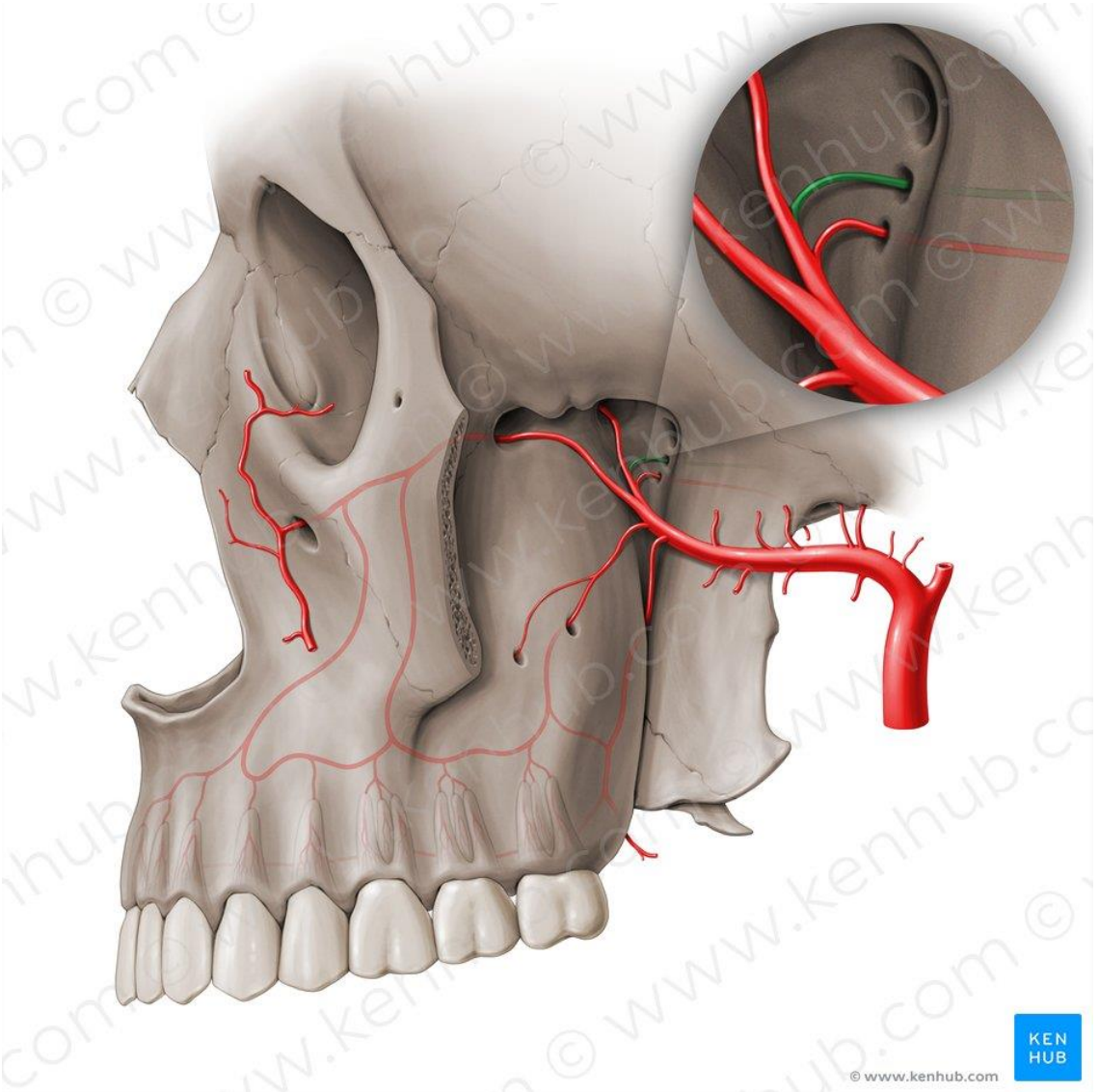






ATERY OF PTERYGOID CANAL

- The artery of pterygoid canal passes posteriorly into the pterygoid canal and supplies surrounding tissues by passing inferiorly through cartilage filling the foramen lacerum, it terminates in the mucosa of the nasopharynx.



NOTE: branches of the maxillary artery can be memorized through this mnemonic :

DAM I AM Piss Drunk But Stupid Drunk I Prefer, Must Phone Alcoholic Anonymous.

D: Deep auricular artery

A: Anterior tympanic artery

M: Middle meningeal artery

I: Inferior alveolar artery

A: Accessory Meningeal Artery

M: Masseteric artery

P: pterygoid branches

D: Deep temporal branches

B: Buccal artery

S: Sphenopalatine artery

D: Descending palatine artery

I: Infraorbital artery

P: Posterior superior alveolar artery

M: middle superior alveolar artery

P: Pharyngeal artery

A: Anterior superior alveolar artery

A: artery of pterygoid canal

VEINS

- Veins that drain areas supplied by branches of the terminal part of the maxillary artery generally travel with these branches back into the pterygopalatine fossa, these 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, it may pass directly into the infratemporal fossa, so bypassing the pterygopalatine fossa