بسم الله الرحمن الرحيم

DOPAMINE SCIENTIFIC TEAM

ANATOMY

MID | Lecture 2

Pterygopalatine fossa

Written by: Layan Fawarseh
Maria Alrawi
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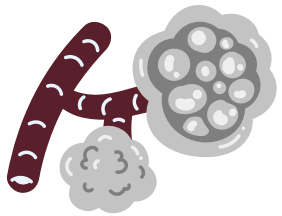
Reviewed by: Mas Nafoukh

﴿ وَلَقَدْ نَعْلَمُ أَنَّكَ يَضِيقُ صَدْرُكَ بِمَا يَقُولُونَ ﴿٩٧﴾ فَسَبِّحْ بِحَمْدِ رَبِّكَ وَكُن مِّنَ السَّاجِدِينَ ﴾

سبحان الله وبحمده، سبحان الله العظيم



وَلِلَّهِ الْأَسْمَاءُ الْحُسْنَى فَادْعُوهُ بِهَا

المعنى: الذي له الحكمة العليا في قدره وشرعه وجزائه يوم القيامة، الذي أحسن كل شيء خلَقه، فلا يخلق شيئًا عبثًا، ولا يشرع ولا يقضي إلا بما فيه حكمة.

الورود: ورد في القرآن (٩١) مرة.

الشاهد: ﴿وَهُوَ ٱلْعَزِيزُ ٱلْحَكِيمُ﴾ [الجمعة:٣].

٤٣

اضغط هنا لشرحٍ أكثر تفصيلًا

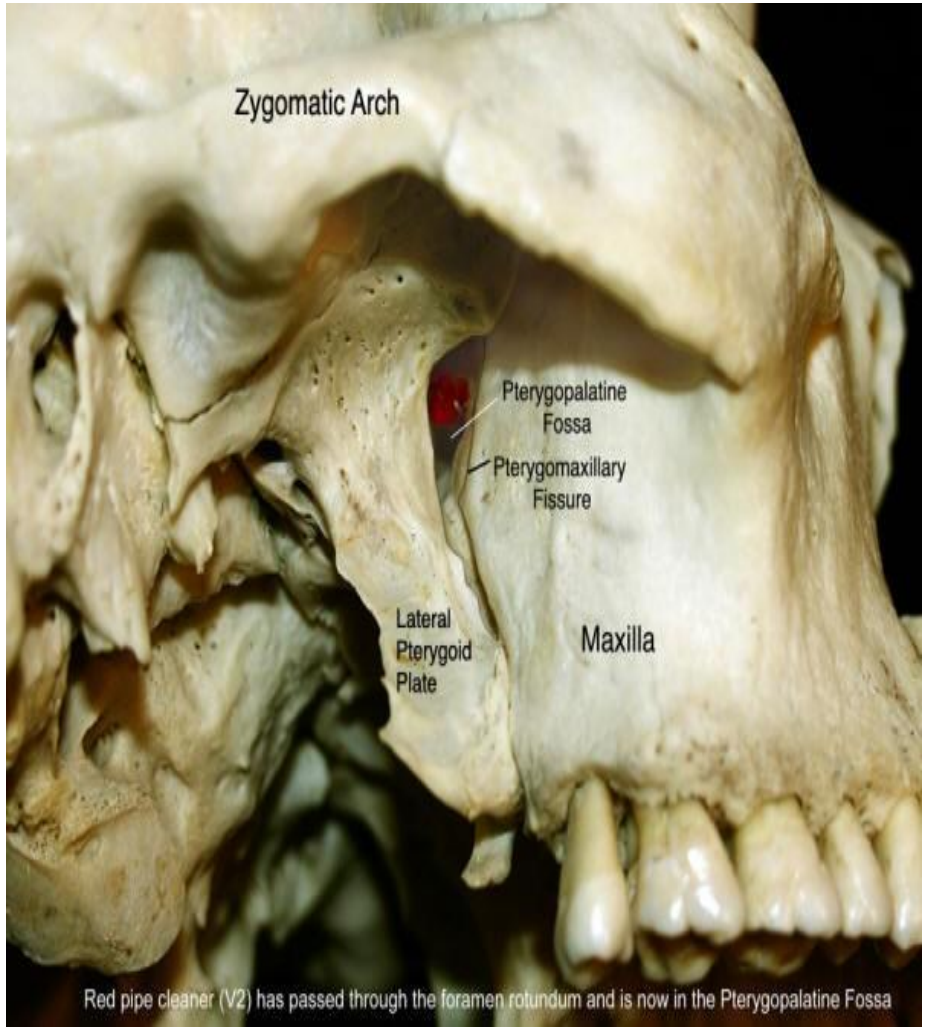
Prof. Dr.Mohammed Hisham Al-Muhtaseb

Pterygopalatine Fossa

1- The Pterygopalatine fossa

- Inverted **'tear-drop'** shaped space
- Between bones on the lateral side of the skull (mainly **maxilla** and **sphenoid** and palatine bones)
- Immediately **posterior** to the maxilla
- Small in size
- It has communications with **orbit**, **nasopharynx**, **oral cavity**, the **nose** (through spheno-palatine foramen), **middle cranial fossa**, and **infra temporal fossa**.
- All these communications have structures that deliver -or drain- either blood or nerve supply to certain areas.

Dr.'s figure:



2- Skeletal framework

- The **walls** of the pterygopalatine fossa are formed by:

1. The **anterior** wall is formed by the **posterior** surface of the **maxilla.**

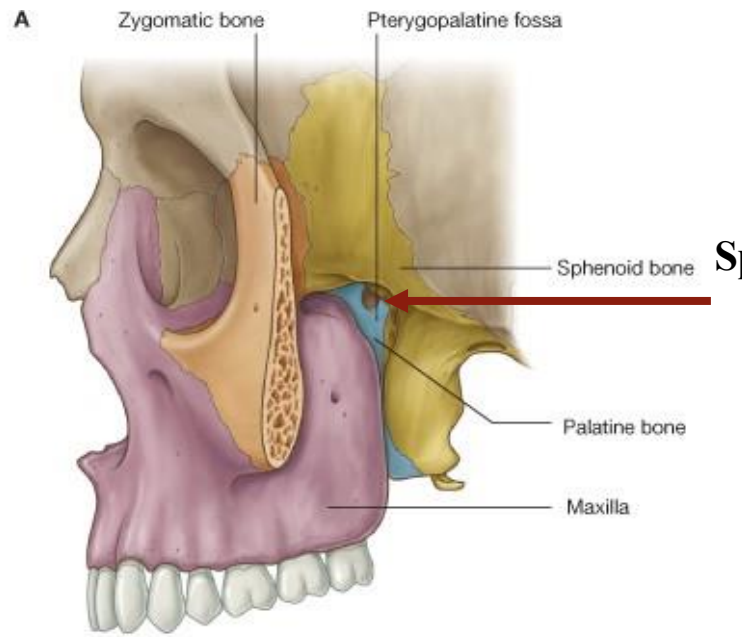
2. The **medial** wall is formed by the **lateral** surface of the **palatine bone.**

   (**Spheno-palatine artery** and **nerve** pass through **spheno-palatine foramen** which is located in the palatine bone. Spheno-palatine artery and nerve are divided into long and short that supply the nasal cavity).

3. The **posterior** wall and **roof** are formed by parts of the **sphenoid bone:**

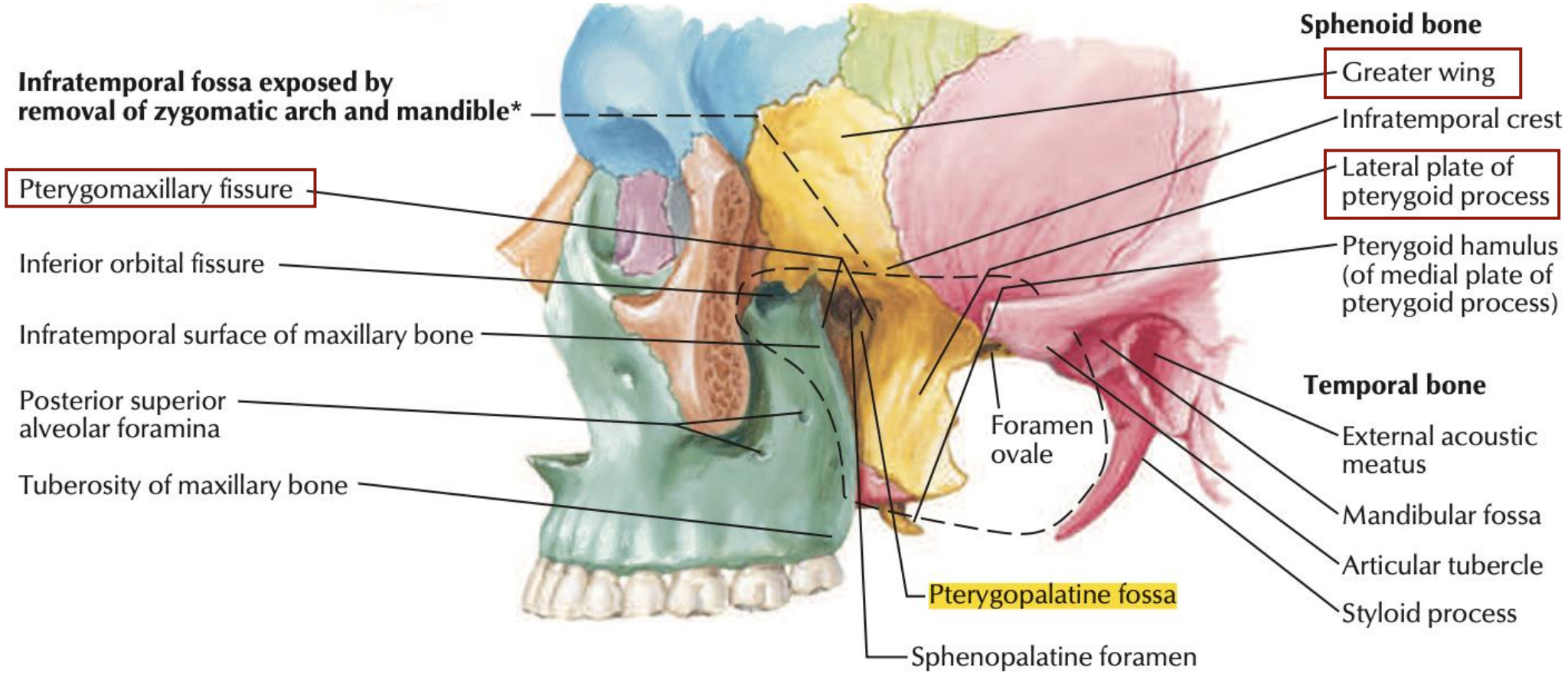
Posterior wall : **lateral pterygoid plate**
Roof : **greater wing of sphenoid**

Dr.'s figure:



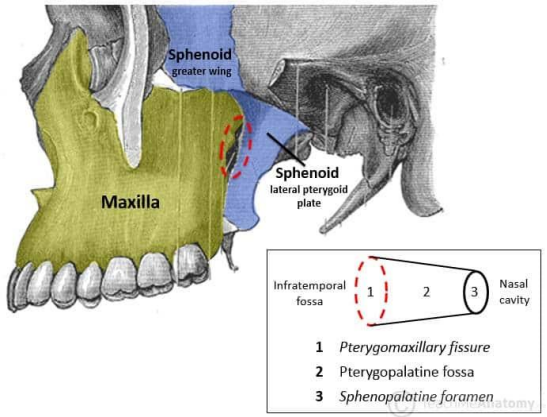
Spheno-palatine foramen

Skeletal framework – con.



*Superficially, mastoid process forms posterior boundary.

Skeletal framework – con.



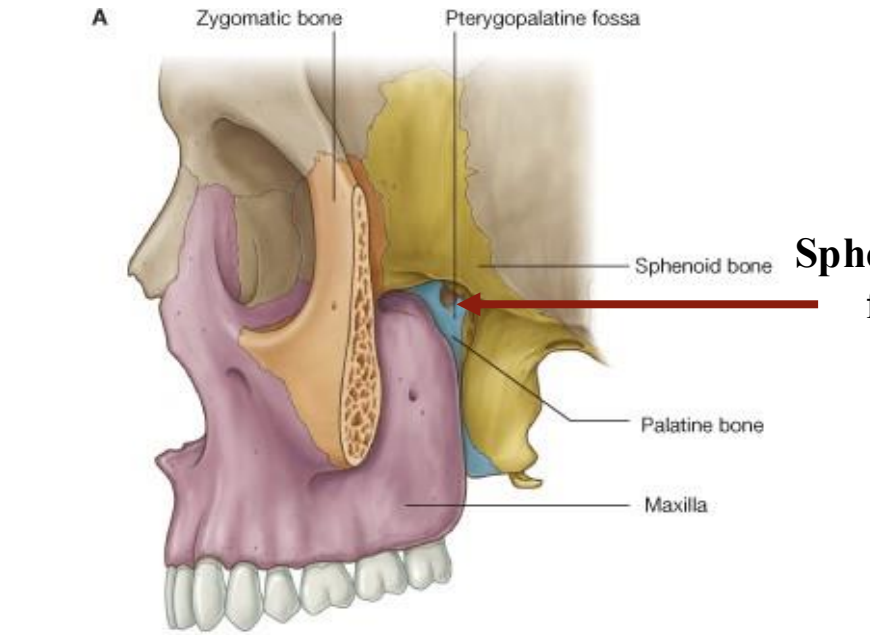
- Pterygomaxillary fissure :

The **lateral** side of the pterygopalatine fossa is occupied by a space (**pterygomaxillary fissure** - PMF) that communicates with the **infratemporal fossa**.

The **importance** of this communication:

1. The **Maxillary artery** - which is a branch of the external carotid artery- passes through **infratemporal** fossa then **PMF** reaching the **pterygopalatine** fossa.
2. **Maxillary nerve** - passes from **PPF** then **PMF** reaching **infratemporal fossa** (opposite pathway) (slide 37)

Dr.'s figure:



Spheno-palatine foramen

PMF : Pterygomaxillary fossa
PPF: Pterygopalatine fossa

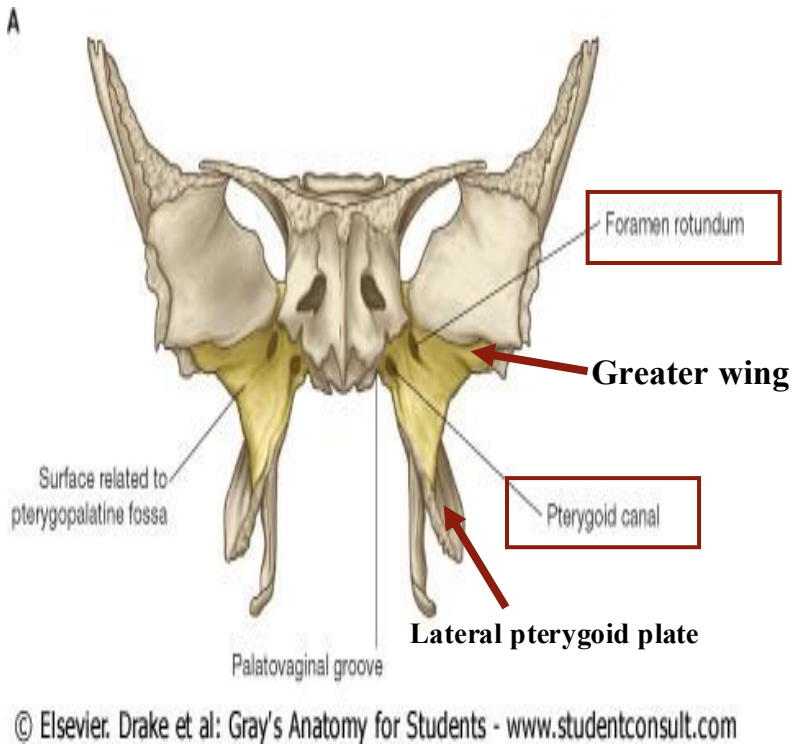
3- Sphenoid bone

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

Opening onto this surface are two large foramina which form a communication between **middle** cranial fossa and **PPF** :

1.The **Foramen rotundum.**
2. **Pterygoid canal.**

Dr.'s figure:



PPF: Pterygopalatine fossa
See next slide for further details (:

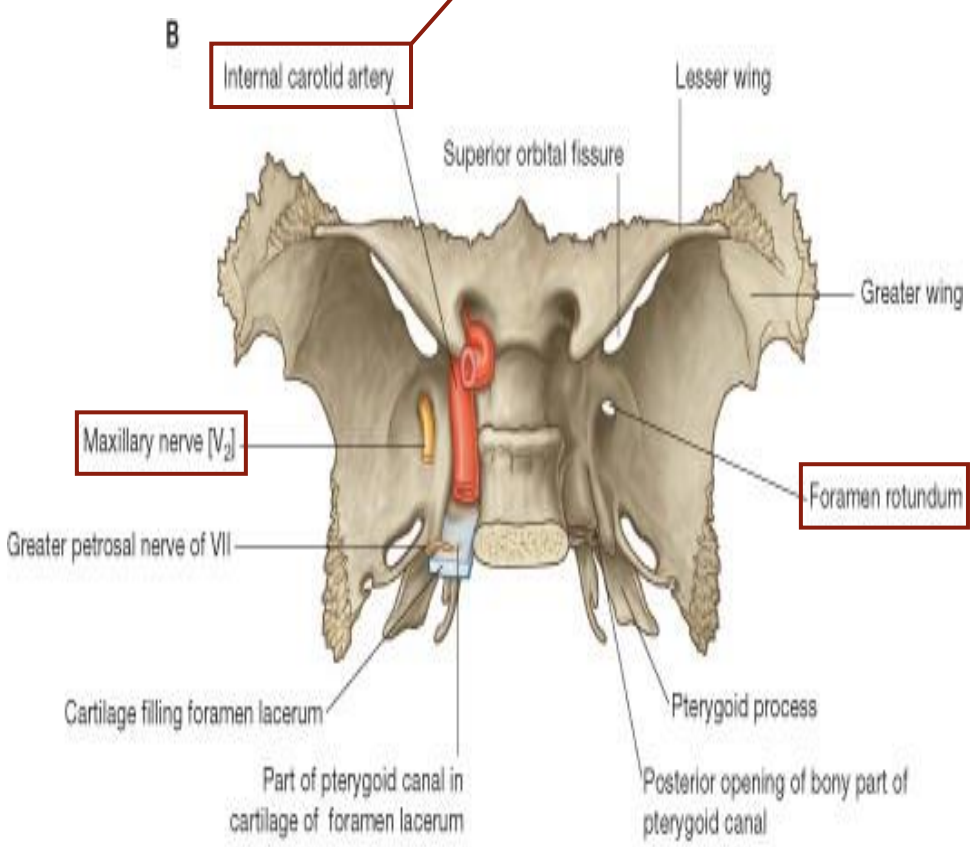
4- Foramen rotundum

- Communicates **posteriorly** with the middle cranial fossa
- **Structures that pass through it:**

Maxillary nerve V2 - which is a branch of the trigeminal nerve - present in the middle cranial fossa passes through foramen rotundum reaching the pterygopalatine fossa.

lays in the roof of foramen lacerum

Dr.'s figure:



5- Pterygoid canal

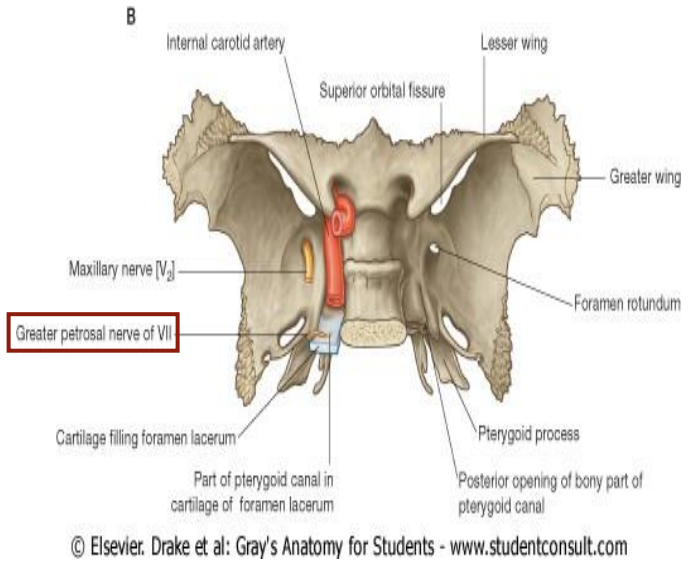
- It is located on the roof of foramen lacerum
- **Structure that pass through it :**

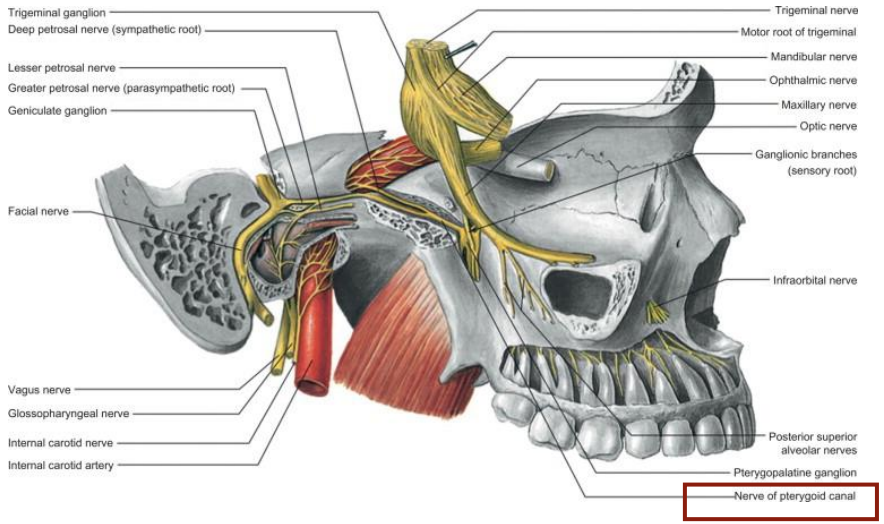
Nerve of Pterygoid canal which formed in the middle cranial fossa and carries sympathetic and parasympathetic fibers:

1.The **parasympathetic fibers** (**Greater petrosal nerve** - which is a branch of the facial nerve) are **pre**ganglionic fibers that synapse in the pterygopalatine ganglia that is located in the PPF.

2. The **sympathetic fibers** (**deep petrosal nerve**) are **post**ganglionic fibers which means that they pass through PPF without synapsing.

Dr.'s figure:





الحمد لله رب العالمين

6- Gateways

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

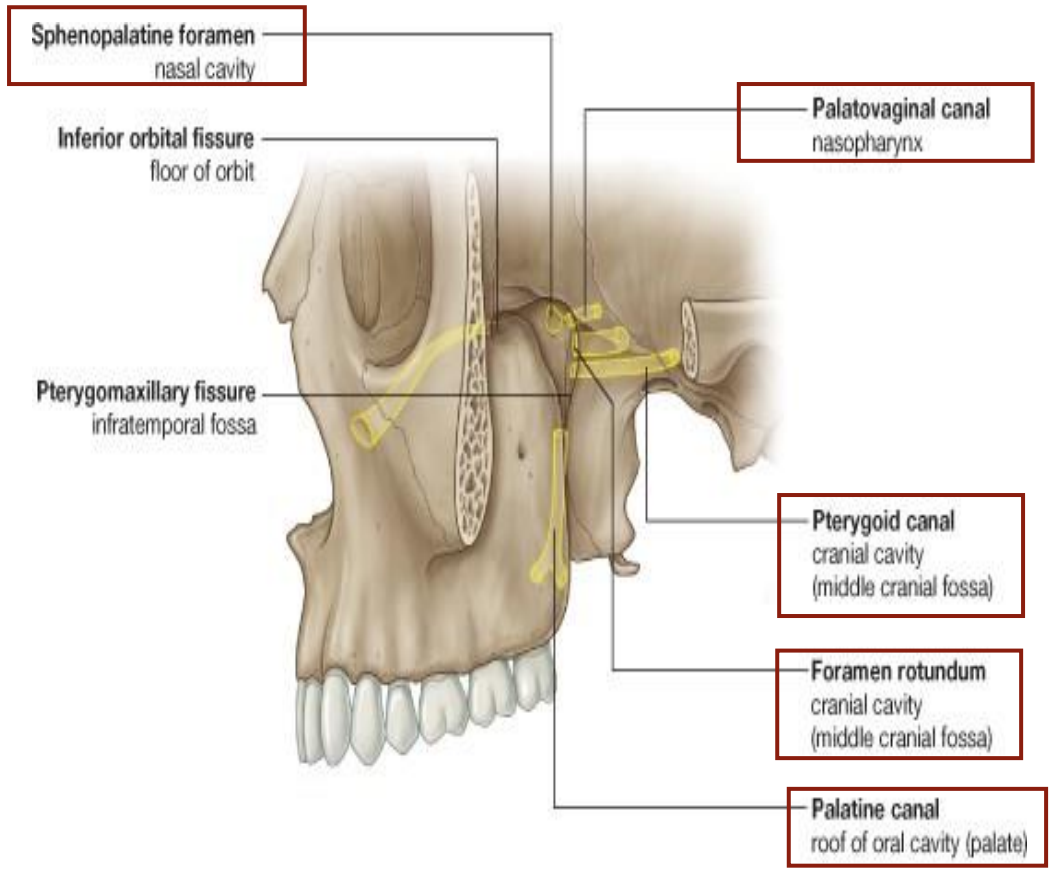
1. **Foramen rotundum and pterygoid canal** communicate with the middle cranial fossa

2. Palatovaginal canal opens into the posterior wall and leads to the **nasopharynx** (deliver blood and nerve supply to the nasopharynx);

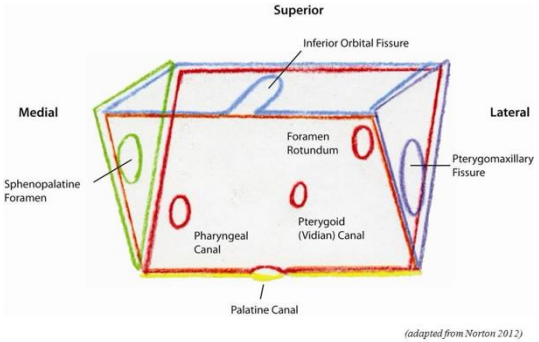
3. **Palatine canal** leads to the roof of the **oral cavity** (hard palate) and opens inferiorly; passes through it the palatine artery which is divided into Greater Palatine artery -which supplies the hard palate then passes to the nasal cavity, and the Lesser Palatine artery -which supplies the soft palate-

4. **Sphenopalatine foramen** opens onto the lateral wall of the **nasal cavity** and is in the medial wall of PPF; Sphenopalatine artery (which is divided into long and short) and vein pass through it.

Dr.'s figure:



Gateways – con.



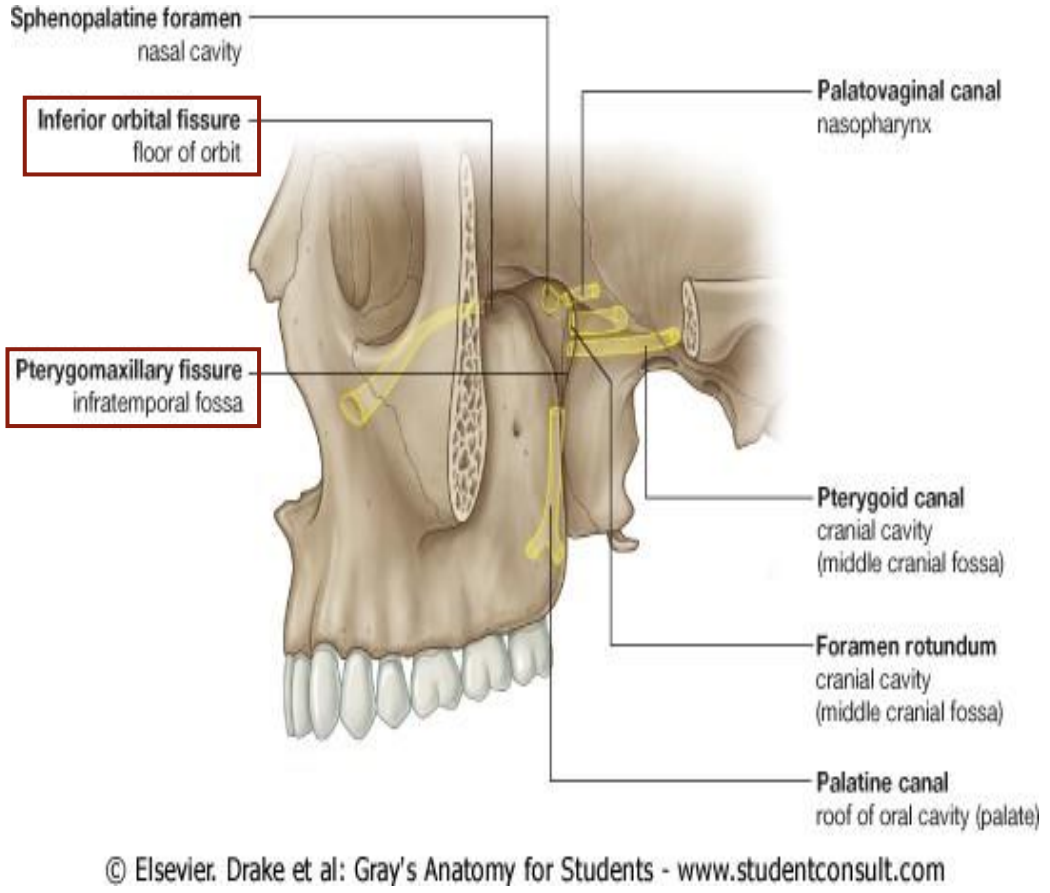
5. Pterygomaxillary fissure between lateral aspect of the pterygopalatine fossa and the infratemporal fossa.

- contents: Maxillary artery **to** PPF, and Maxillary nerve **coming** from PPF. (Opposite pathways)

6. Inferior orbital fissure between the superior aspect of the fossa and the **orbital cavity** (the floor of the orbit).

- **contents**: the **terminal** segments of Maxillary artery and Maxillary nerve extend through it, then they pass through the **infraorbital foramen**.

Dr.'s figure:



لا إله إلّا أنت سبحانك
إنّي كنت من الظالمين

Gateways – additional illustrations

Foramen Rotundum

Pterygoid Canal

Pterygomaxillary fissure

Inferior orbital fissure

Sphenopalatine foramen

7- Contents of Pterygopalatine Fossa

1. The maxillary nerve [V2]

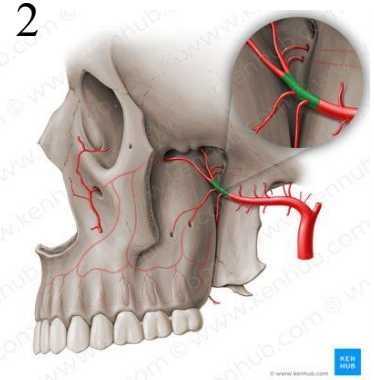
2. Terminal part of the maxillary artery

3. Nerve of the pterygoid canal

4. The pterygopalatine ganglion (parasympathetic)

5. Veins and lymphatics also pass through the pterygopalatine fossa.

2



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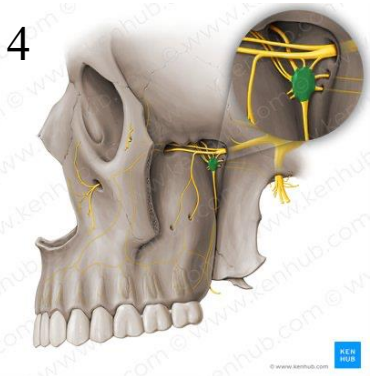
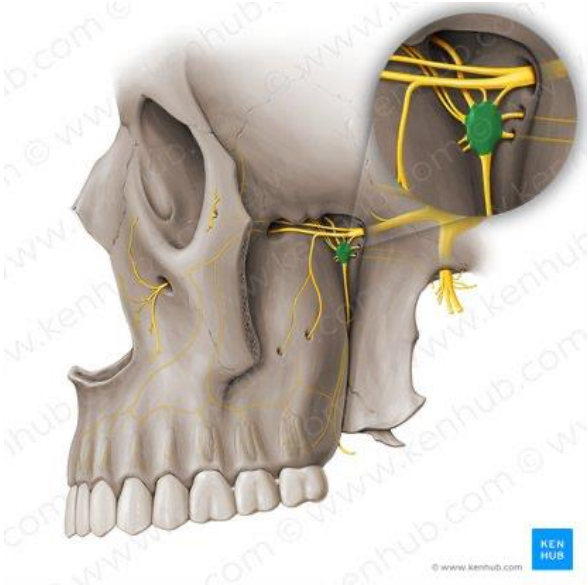


Pterygopalatine ganglion



8- Nerve of the pterygoid canal

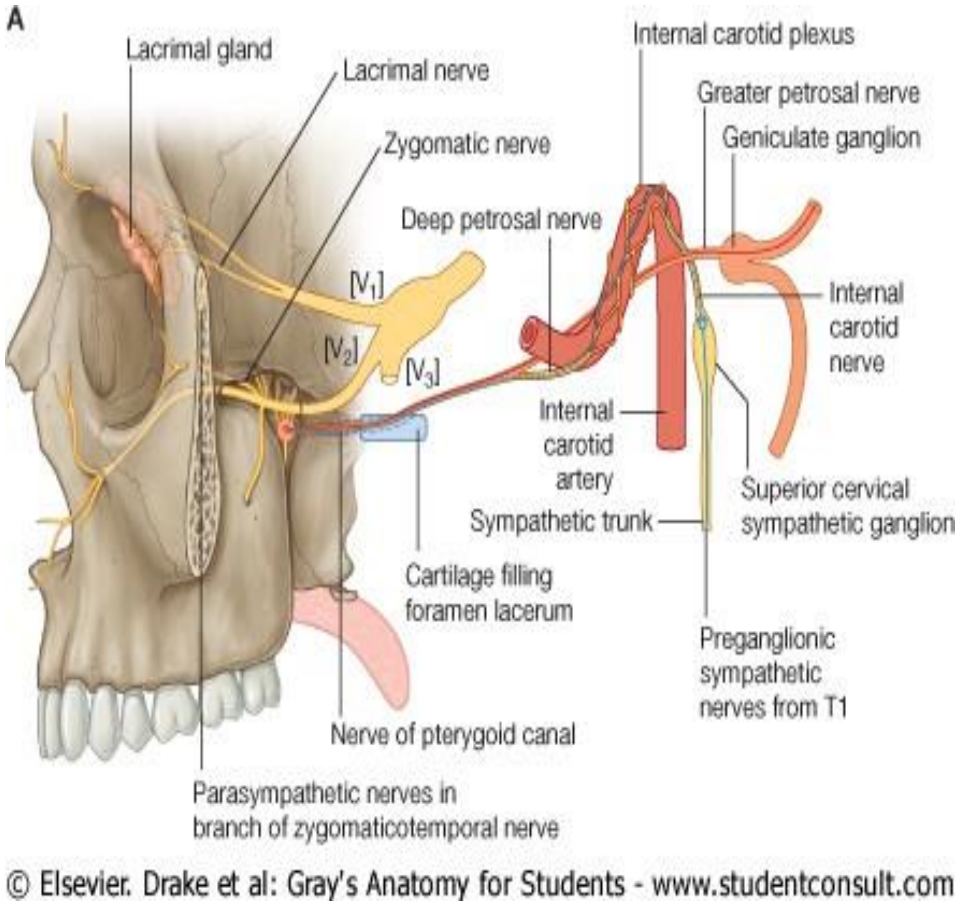
- Formed in the **middle cranial fossa** by the union of:

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.

Dr.'s figure:



Nerve of the pterygoid canal – con.

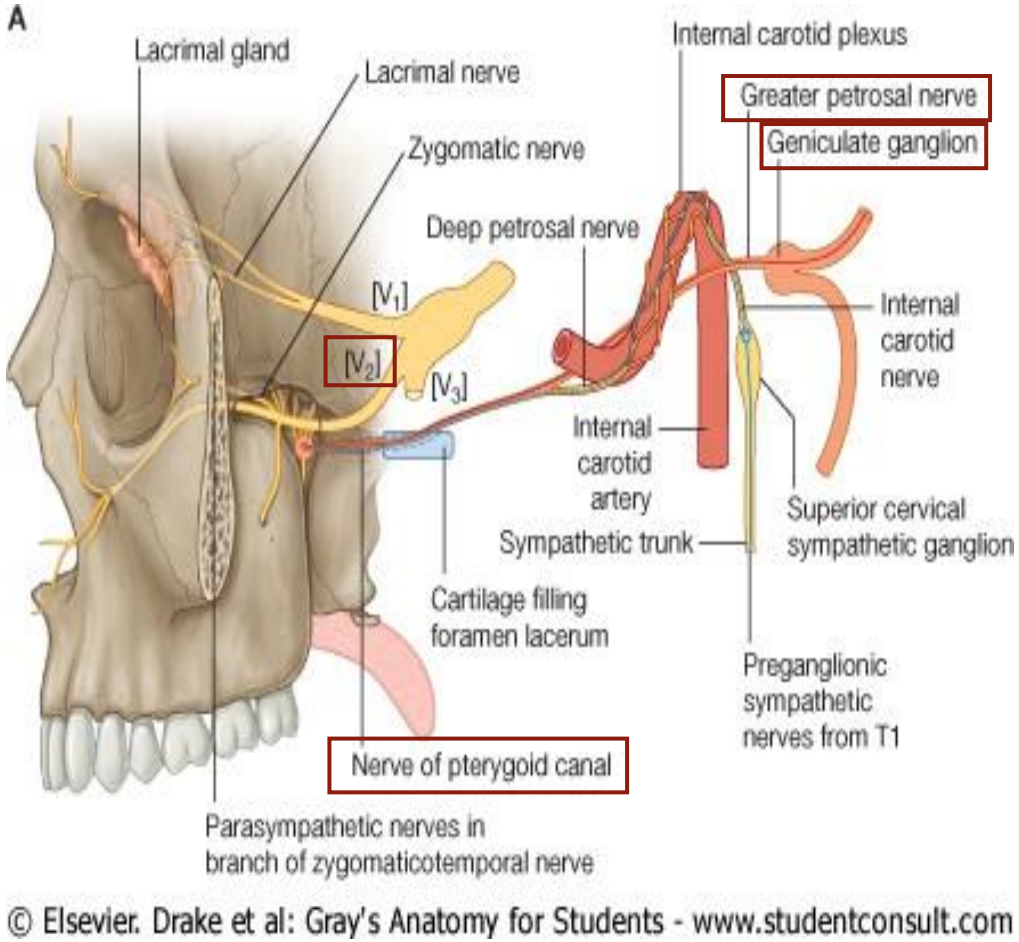
- **Parasympathetic fibers:**

Greater petrosal nerve (preganglionic parasympathetic) passes through guniculate ganglia* **-without** synapsing- until it reaches **pterygopalatine ganglia** where it **synapses**.

Postganglionic parasympathetic fibers distribute with the branches of the **maxillary nerve** and **maxillary artery**.

*Geniculate Ganglion is related to the facial nerve.

Dr.'s figure:



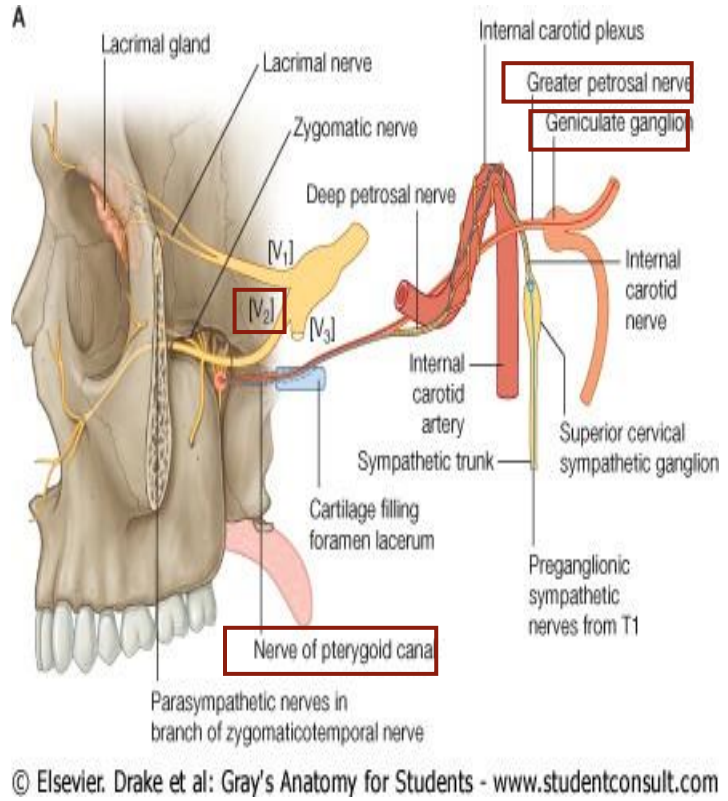
Nerve of the pterygoid canal – con.

- **Sympathetic fibers:**
- The **origin** of **preganglionic** sympathetic fibers: is the sympathetic nuclei in the **lateral horn** of **thoraco-lumber** segments in the spinal cord, then they synapse in the **superior** sympathetic ganglion.
- Then **postsynaptic** neurons (**Deep petrosal Nerve**) passes through the Pterygopalatine ganglia in PPF **without** synapsing and then gets distributed with the branches of maxillary artery and nerve.

So The sympathetic fibers that are present in the PPF (known as: **deep petrosal nerve**) are **postsynaptic** neurons, and they synapse in the superior sympathetic ganglia -before reaching PPF-

- Preganglionic fibers Lateral horn —> **superior** sympathetic ganglia (synapse) —> **postganglionic** fibers (pass through PPF)

Dr.'s figure:



Remember that In the neck there are **three** sympathetic ganglion: **superior**, middle, and inferior, each sends postsynaptic neurons.

9- Pterygopalatine ganglion

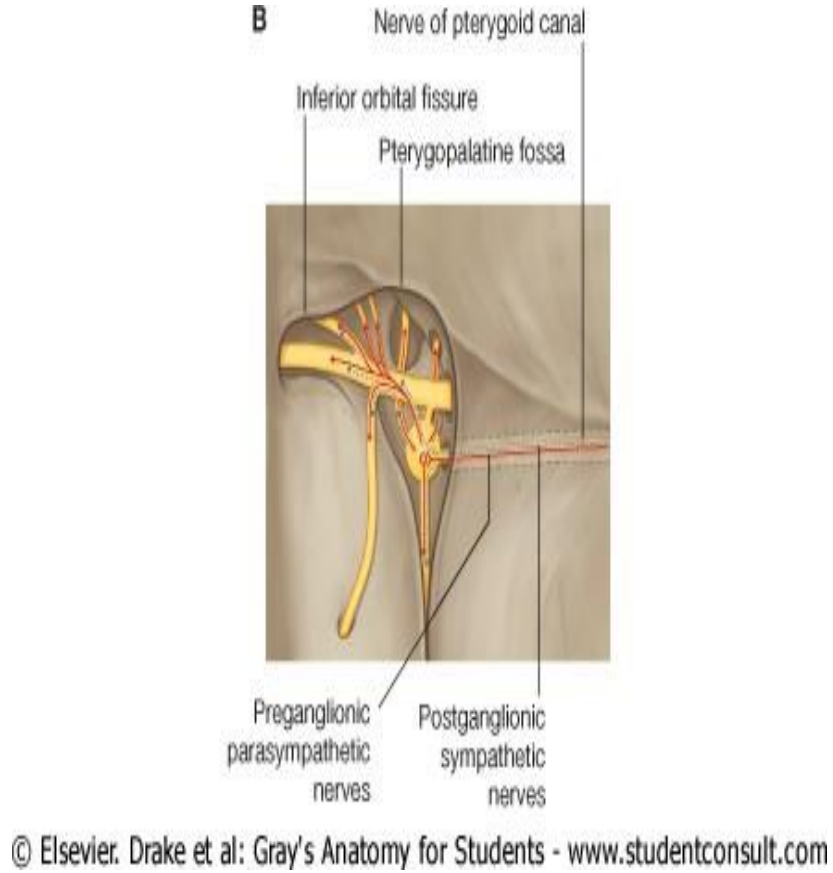
- It's a **Parasympathetic** ganglia :

Preganglionic: great petrosal nerve and nerve of pterygoid canal.

Postganglionic: branches distributed with maxillary artery and nerve reaching the glands as secretomotor.

- It receives **sensation** from two branches (**twigs**) of **maxillary** nerve. (Sensory)
- Postganglionic **sympathetic** fibers : Deep petrosal nerve passes through it as postganglionic fibers -without synapse-, then it will be distributed -mainly to BVs for vasoconstriction / vasodilation- with maxillary artery and nerve.

Dr.'s figure:



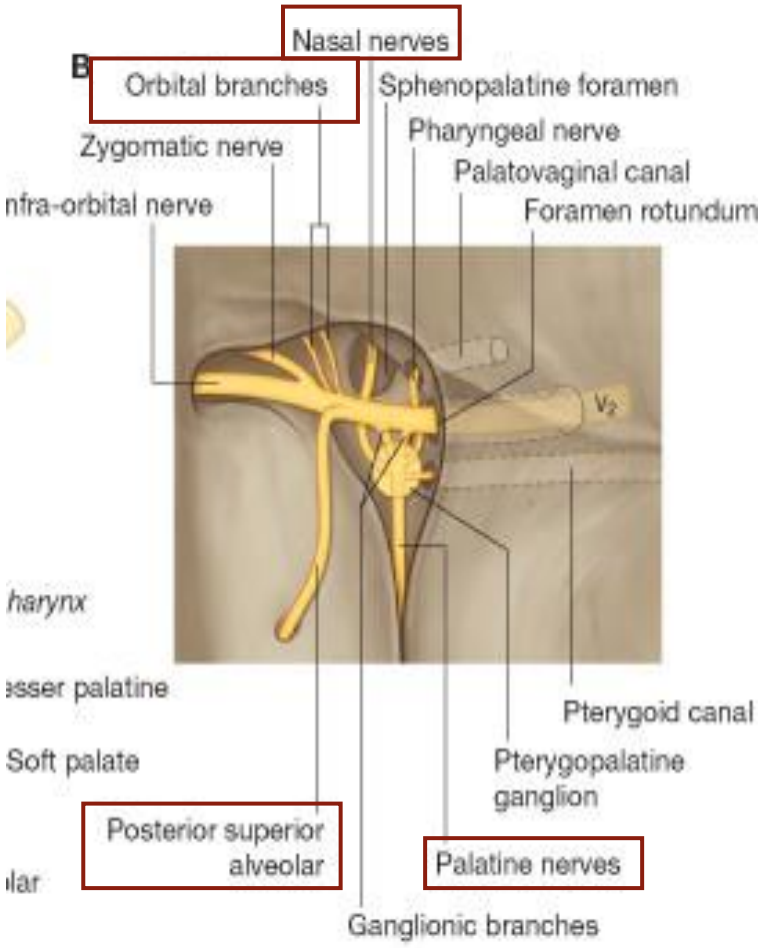
Pterygopalatine ganglion – Branches

- These fibers form **orbital**, **palatine**, **nasal**, and **pharyngeal** branches (mainly nasopharynx), which leave the ganglion.

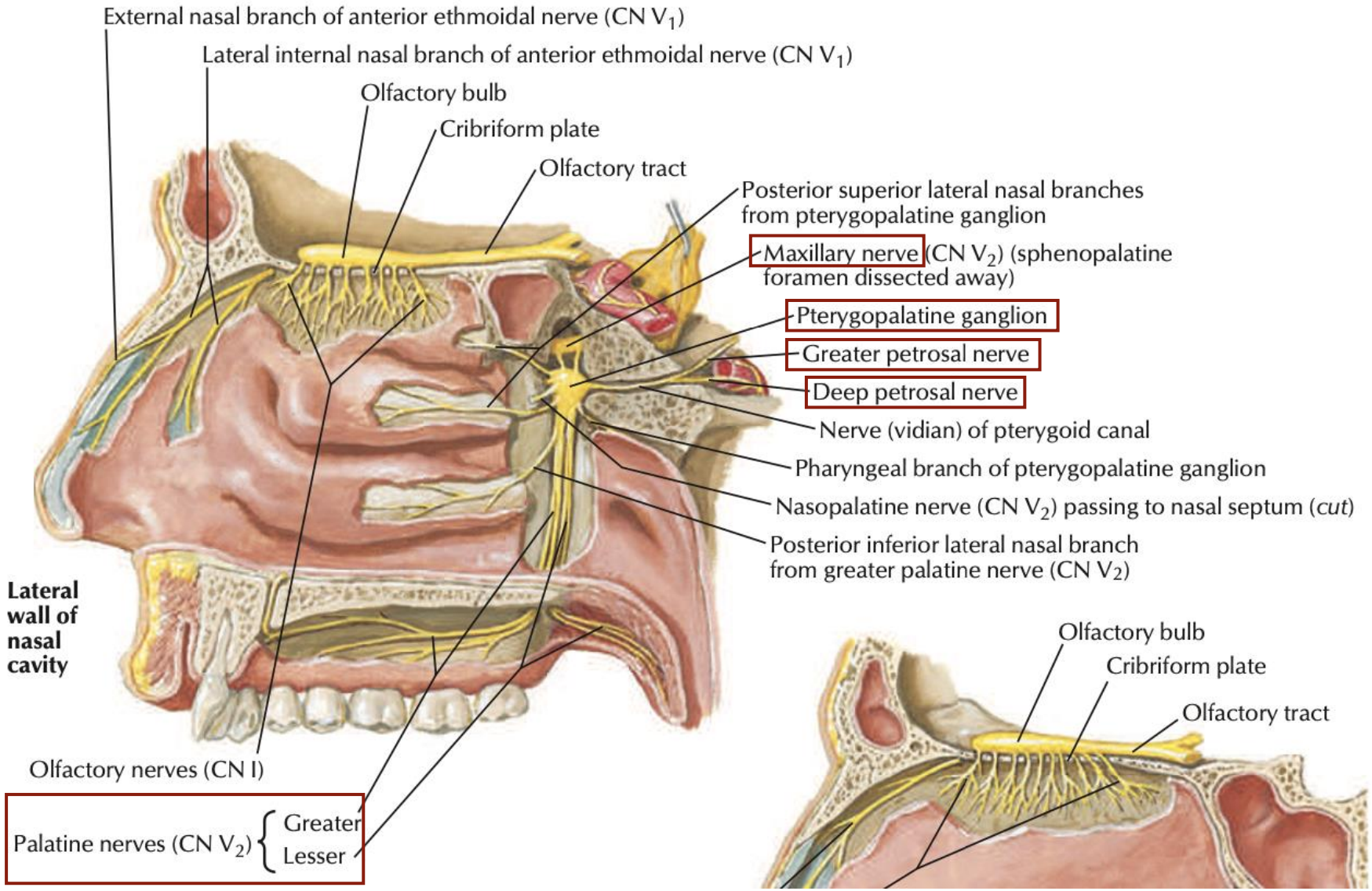
- Other fibers pass superiorly through the ganglionic branches of the maxillary nerve (to enter the main trunk of the maxillary nerve), and maxillary artery.

- And then distributed with maxillary nerve branches: the **zygomatic** (Zygomatico-temporal and Zygomatico-facial), **posterior superior alveolar** (sensory of molar teeth) ,and terminate as **infra-orbital** nerves. (Go to Slide 28)

Dr.'s figure:



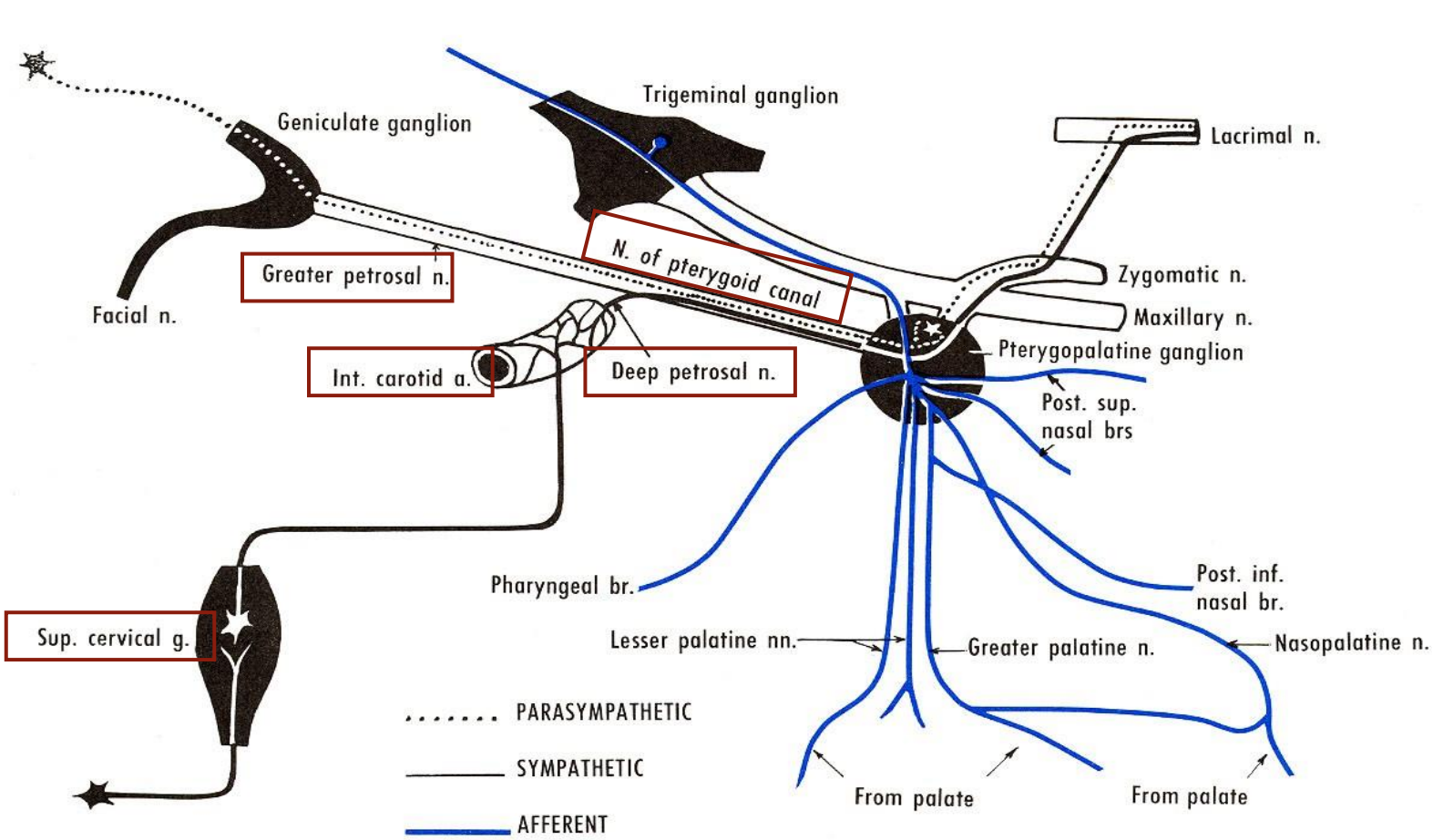
اللهم صلِّ على محمد وعلى آل محمد كما صلّيت
على إبراهيم وعلى آل إبراهيم إنّك حميد مجيد



important figure*

Pterygopalatine ganglion – Summery

Dr.'s figure:

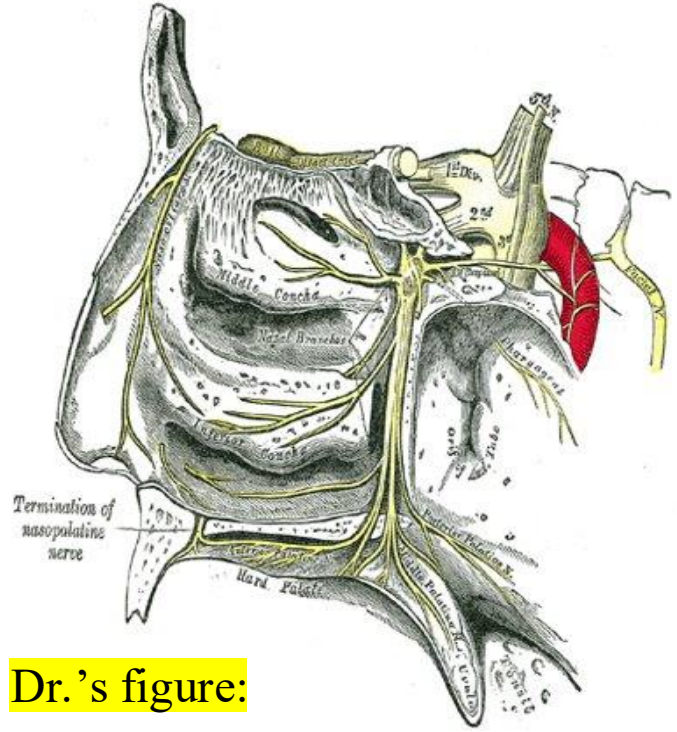


A.Orbital branches:

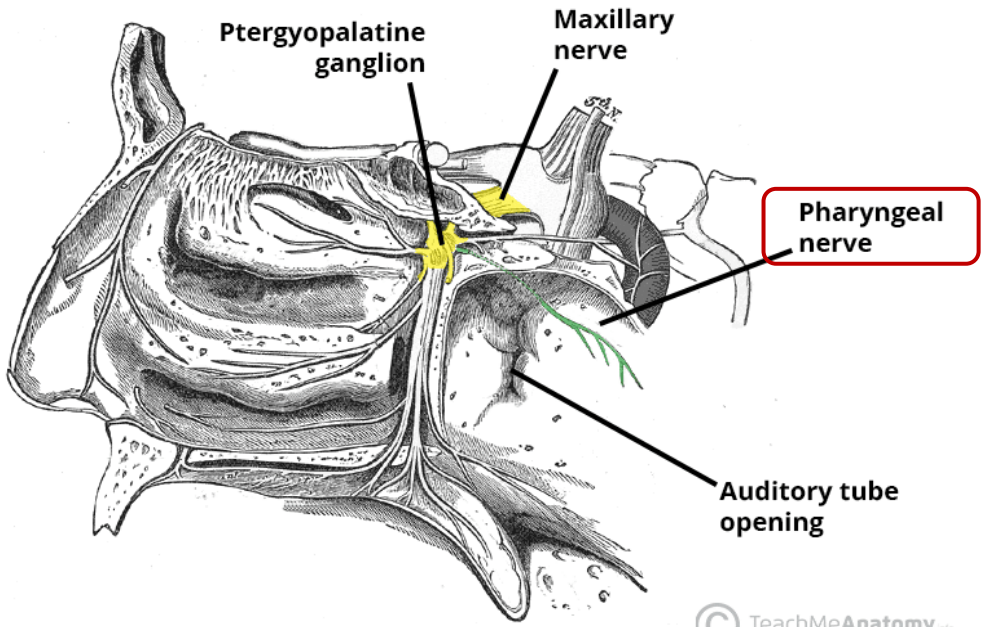
- Pass through the **inferior orbital fissure**
- Supply of the orbital wall (**periosteum**) and **lacrimal gland.**
- Supply the **sphenoidal** and **ethmoidal** sinuses.

B. Pharyngeal nerve

- Passes through the **pterygopalatine ganglion**
- Leaves the fossa through the **palatovaginal canal**
- Supply the **mucosa** of the **nasopharynx posteriorly.**

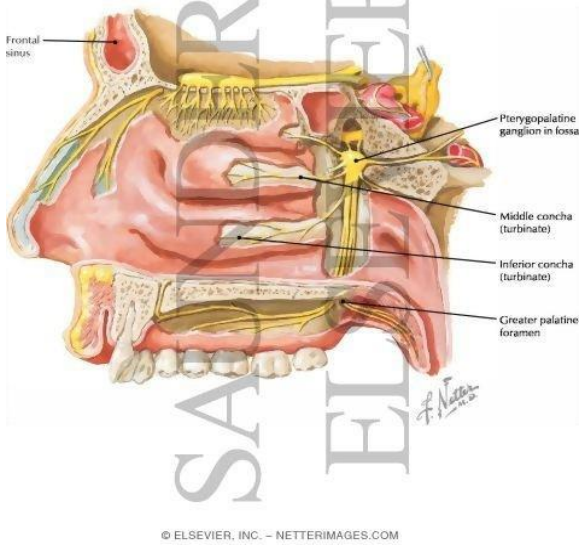


Dr.'s figure:

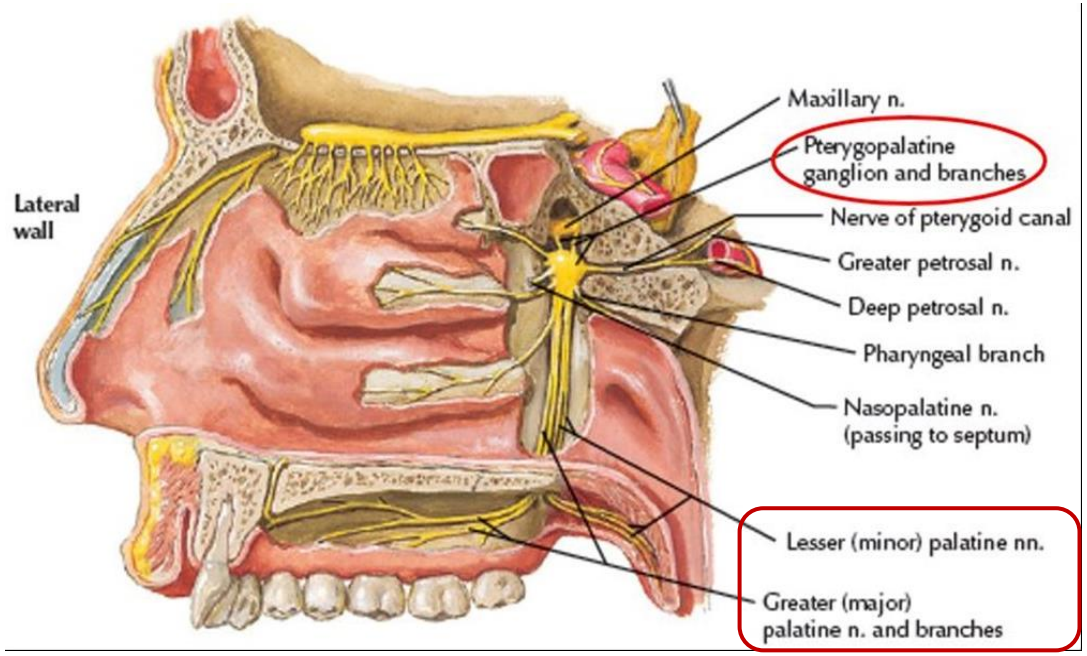


C. Greater and lesser palatine nerves

Dr.'s figure:



- **Lesser palatine** nerve passes posteriorly to supply the **soft palate**.
- **The Greater palatine** (Ant. palatine) nerve
- Innervates mucosa and glands of the **hard palate**
- Also supplies the **nose** (it passes through the **incisive foramen** into the nasal cavity)

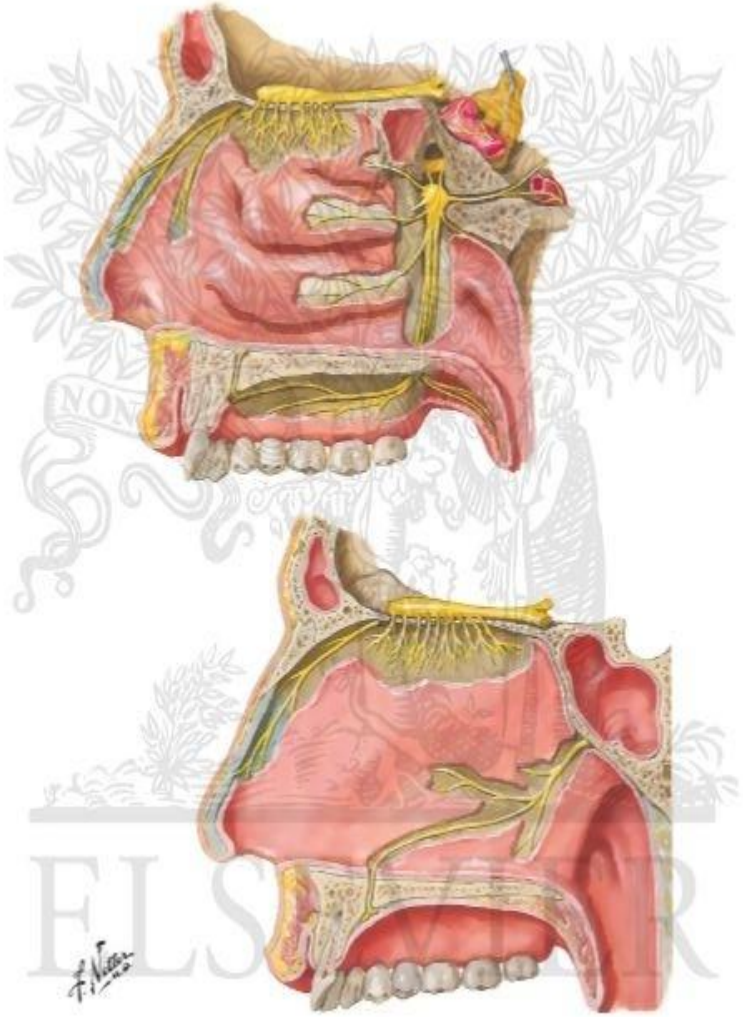


D. Nasal nerves

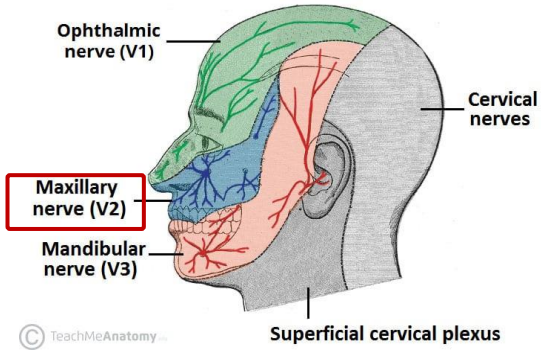
- **Short spheno-palatine** supplies the mucosa of the **upper posterior** quadrant of the **nasal cavity**.

- The **Nasopalatine nerve (long Spheno- palatine)** supplies the nasal **septum**.

Dr.'s figure:



10- Maxillary nerve [V2]



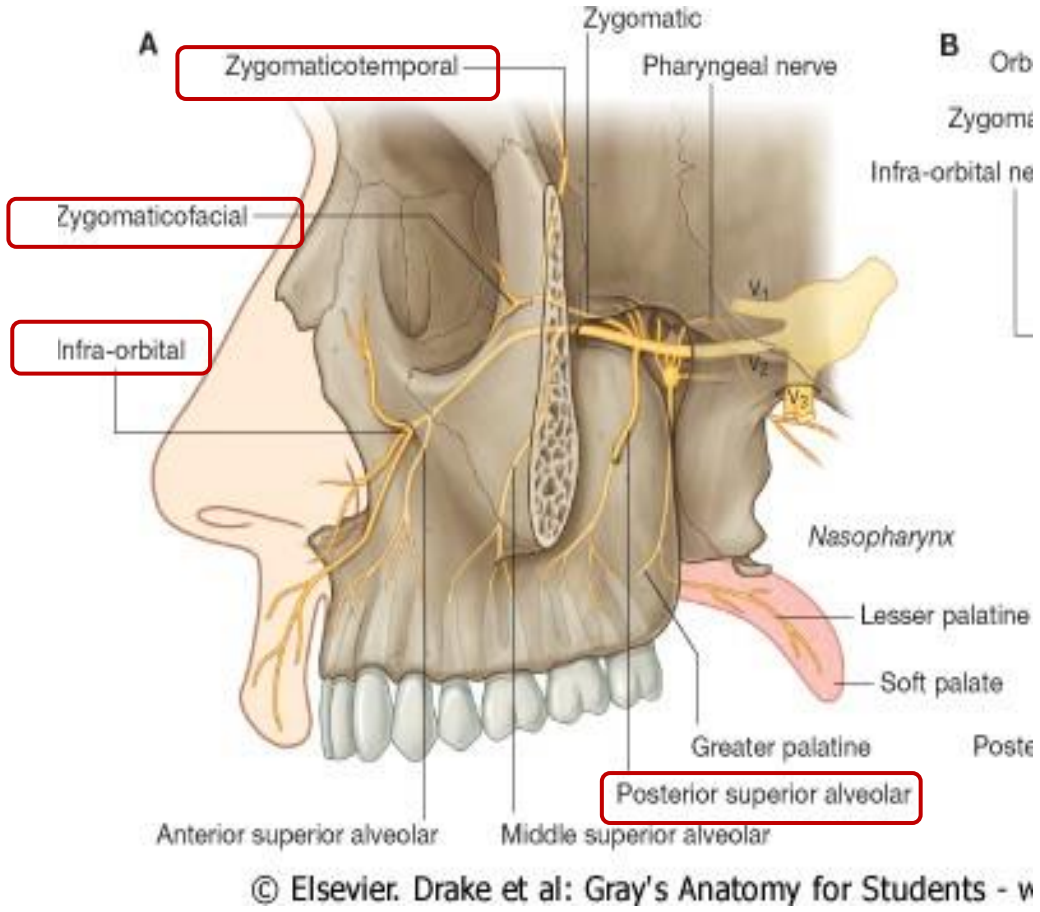
- Purely **sensory**, no motor

(same as ophthalmic, unlike mandibular which is mixed (sensory and motor).

- **Originates** from the **trigeminal ganglion** in the middle cranial cavity.
- Exits the middle cranial fossa & enters the pterygopalatine fossa through foramen rotundum.
- Gives its branches in the pterygopalatine fossa.
- It **terminates** as the **infra-orbital nerve** (the maxillary artery also terminates as infra-orbital) through the infra-orbital foramen, with its 3 terminal branches:
  - ✓ Palpebral (supplies the lower eyelid)
  - ✓ Nasal (supplies the external nose)
  - ✓ Labial (supplies the upper lip)

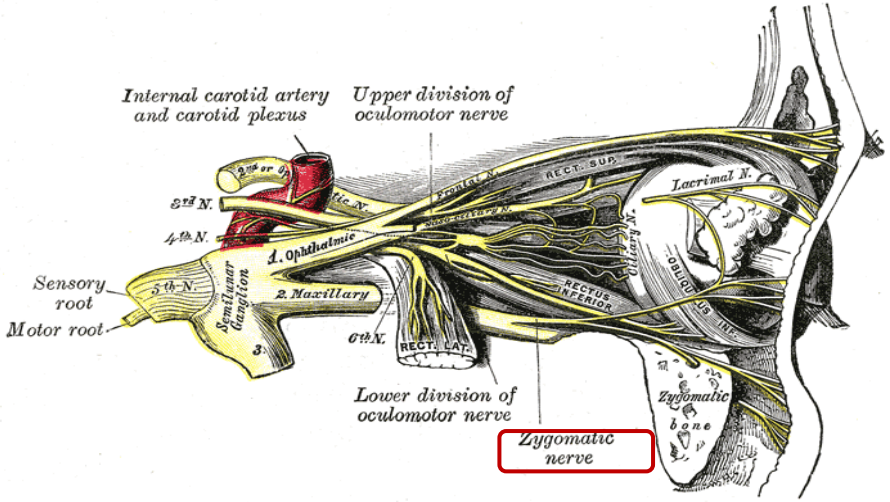
Maxillary nerve – Branches

- **Meningeal** to the meninges.
- **Twigs** (small branches) that supply the ganglia- pterygopalatine ganglion.
- **Zygomatic nerve**: which devices into
1. Zygomatico-temporal
2. Zygomatico-facial
- **Posterior superior alveolar nerve** (to the upper three molars)
- Terminates as **Infra-orbital**



Dr.'s figure:

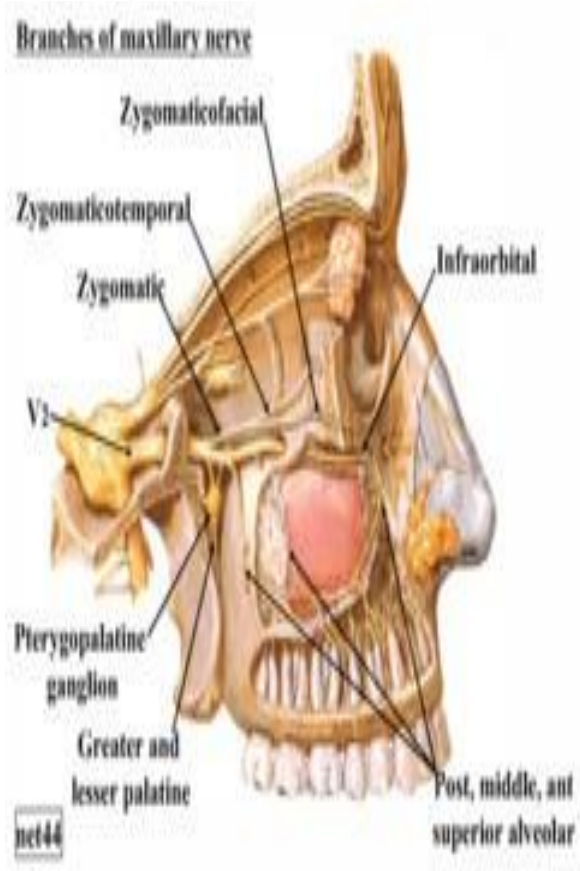
A. Zygomatic nerve



- Divides into *zygomaticotemporal* and *zygomaticofacial* branches.

- **Zygomaticotemporal branch** passes superficially to supply skin over the temple
- **sensory** & carries post ganglionic **parasympathetic** fibers to the **lacrimal** nerve

- The **Zygomaticofacial branch** opens on the anterolateral surface of the zygomatic bone, and supplies the adjacent skin.

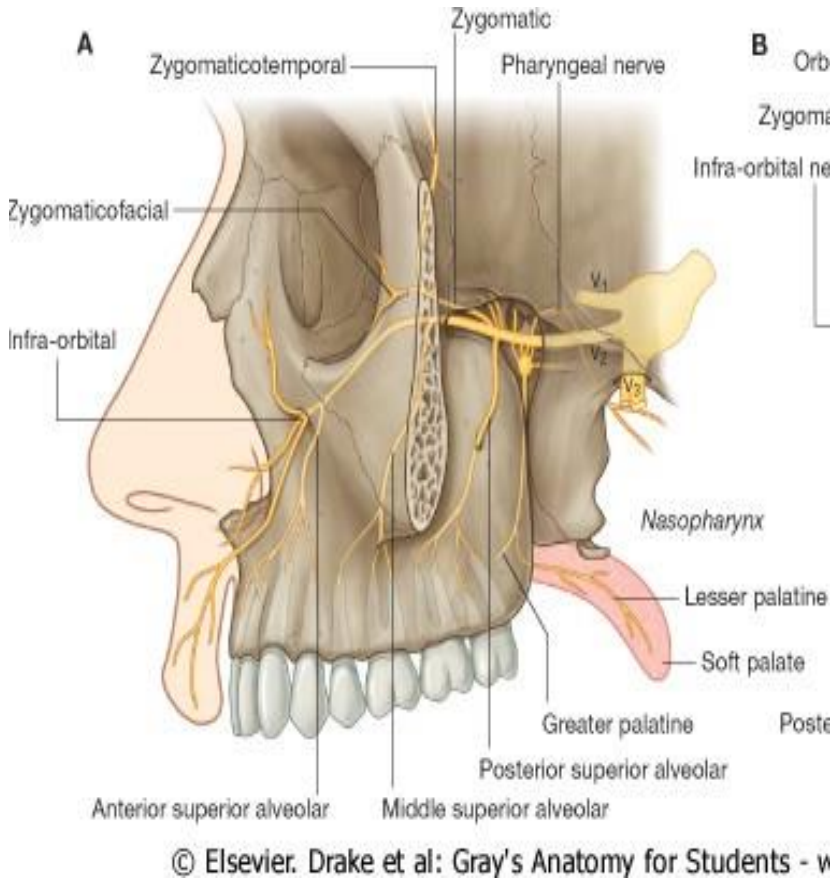


Dr.'s figure:

The doctor did not have enough time, so he skipped this slide. Make sure to take a look

B. 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



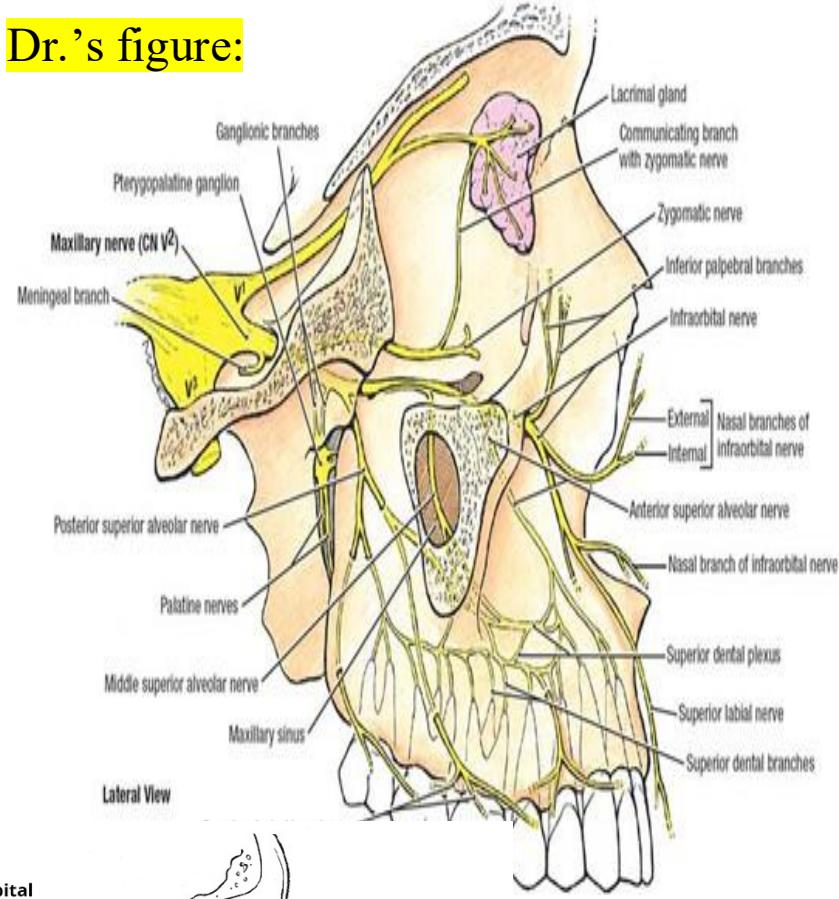
Dr.'s figure:

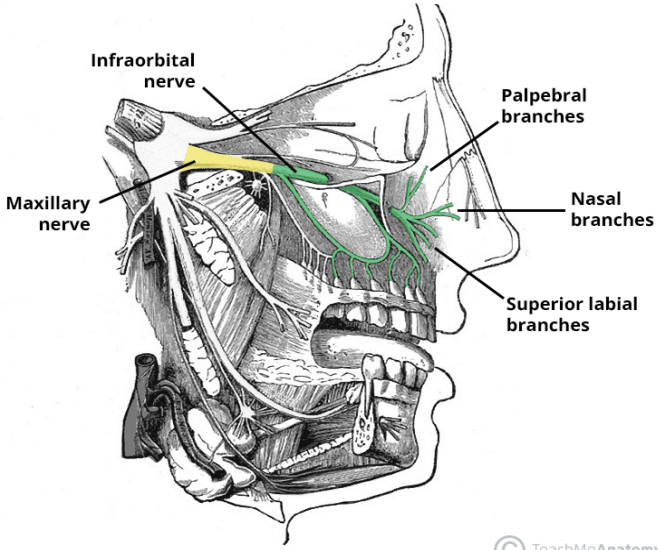
C. Infra-orbital nerve

- **Termination** of the maxillary nerve
- Leaves the pterygopalatine fossa through the inferior orbital fissure
- Divides into:

1. Nasal branches (external nose)
2. Palpebral branches supply skin of the lower eyelid
3. Superior labial branches (upper lip)

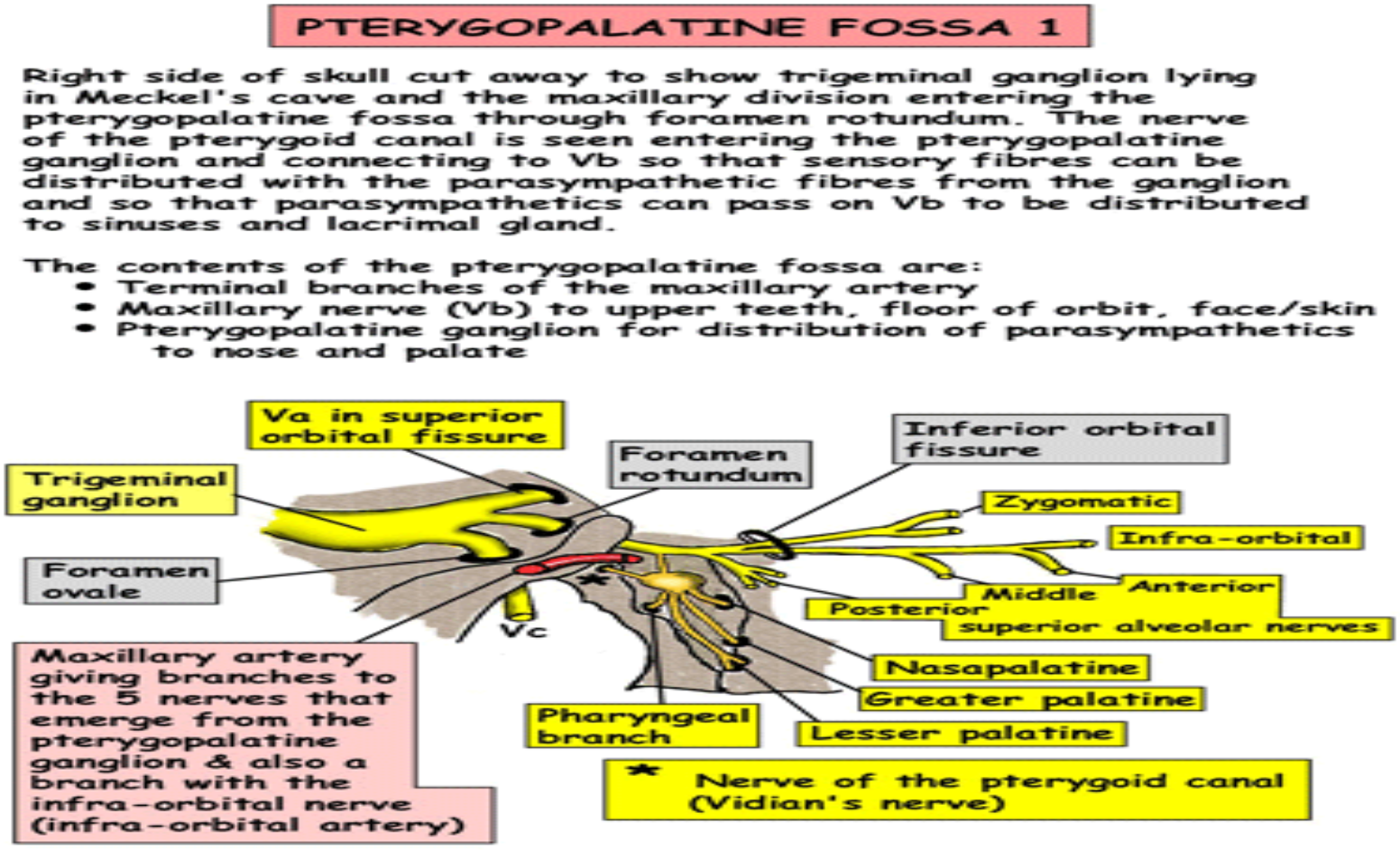
Dr.'s figure:

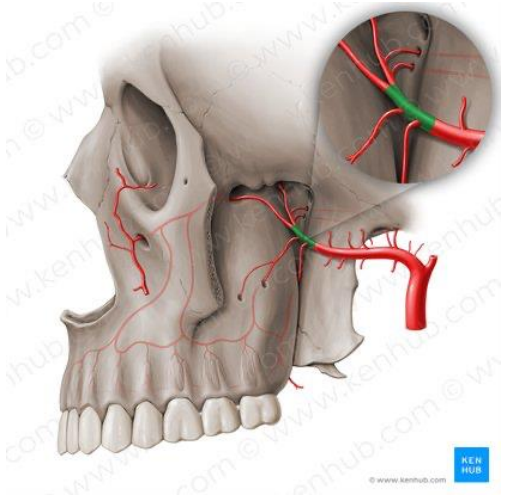




Maxillary Nerve and Pterygopalatine ganglion

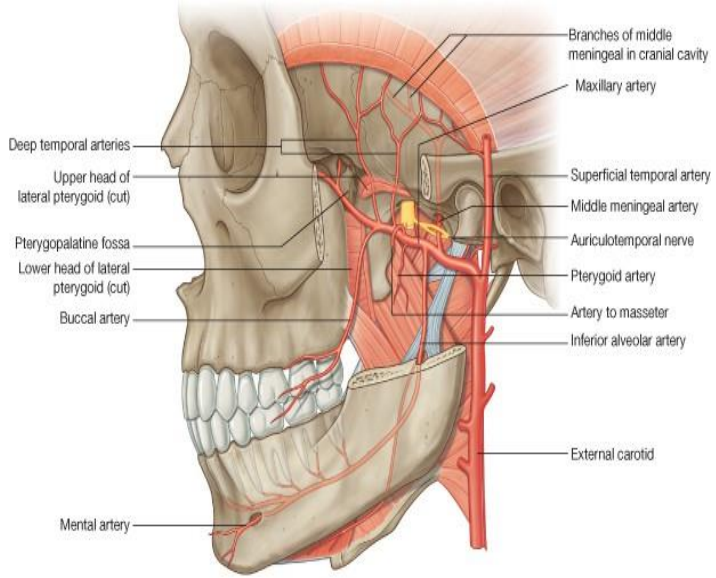
Dr.'s figure:





Maxillary Artery

Dr.’s figure:



11- Maxillary artery

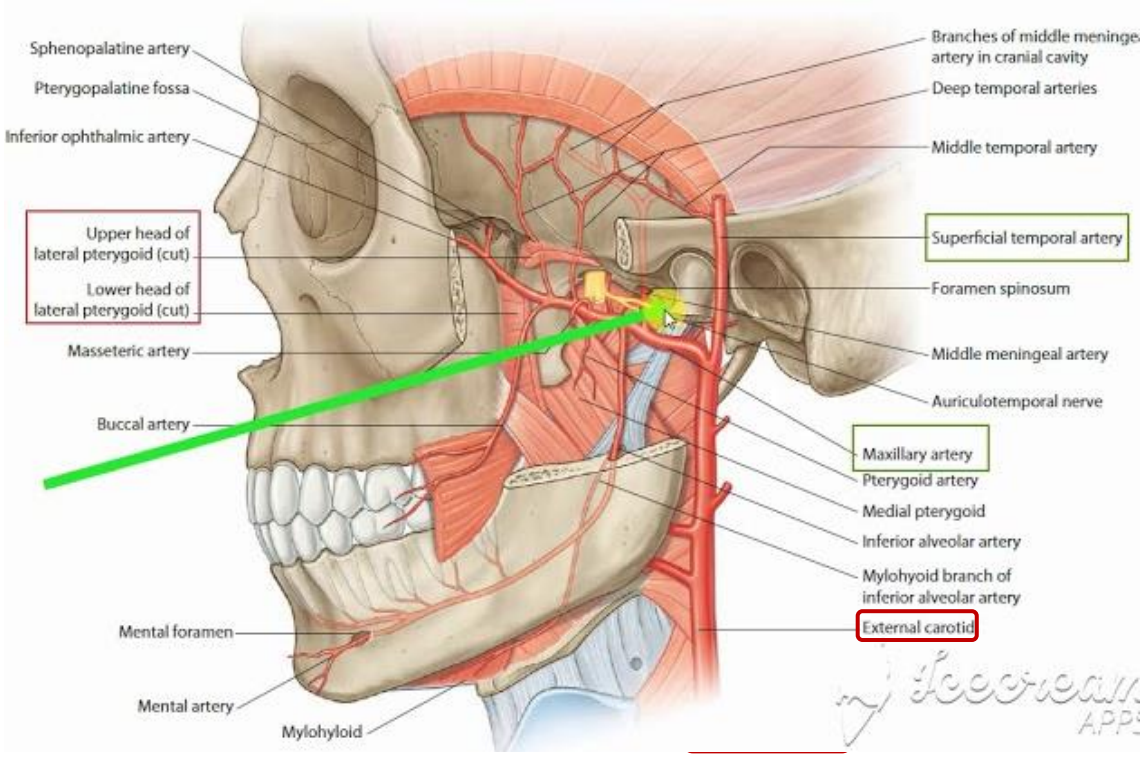
- Major branch of the **external carotid artery** in the neck which divides into **superficial temporal** & **maxillary** at the level of the **parotid gland.**
- Originates adjacent to the neck of mandible

- **Pathway**: Passes forward through the **infratemporal fossa** then enters to the **pterygopalatine fossa** through the **pterygomaxillary fissure** (3rd part)

- It is divided into **three parts** by the **lateral pterygoid muscle** which is usually **posterior** to the artery, but sometimes it might be anterior.

- The three parts:

1. **First**, **before** the muscle
2. **Second**, related to the muscle (**anterior**/**posterior** to the muscle)
3. **Third, After** the muscle

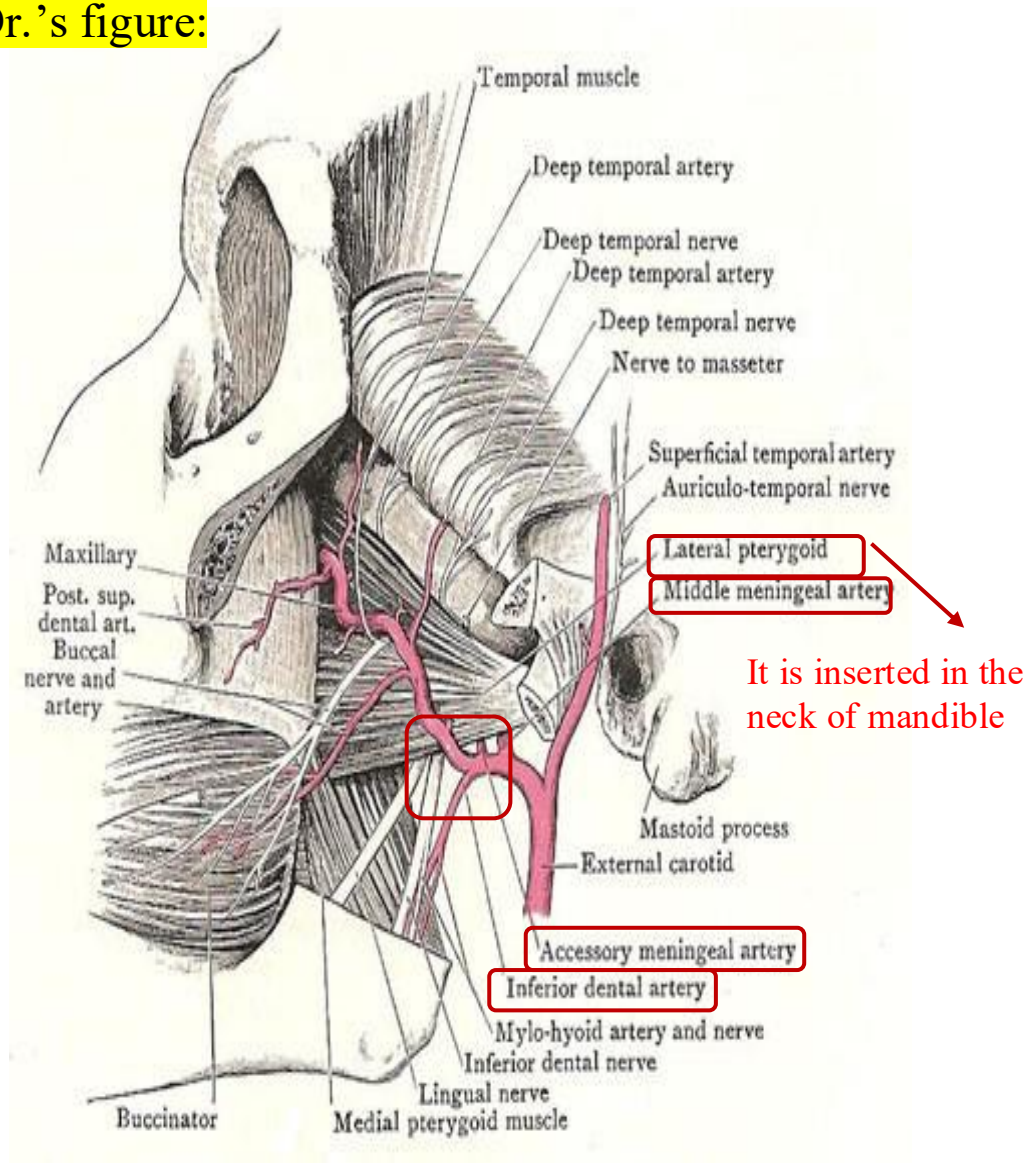


First part – Maxillary art.

- **Before** the lateral pterygoid muscle
- Gives rise to **five** branches (they all pass through foramina) :

Branch category	Branch name	Course	Foramen
Two Major branches	**Middle meningeal**	goes **intracranially (Cranial fossa)**	Through **foramen spinosum**
	Inferior Alveolar	supply the **lower jaw** along with the inf. Alveolar nerve (branch of mandibular nerve)	through **mandibular foramen**
Smaller branches	**Accessory meningeal**	goes **intracranially**	through **foramen ovale**
	Deep auricular	Both Go to the **ear**	Both enter the **auricle**
	Anterior tympanic		

Dr.'s figure:



Second part -Maxillary art.

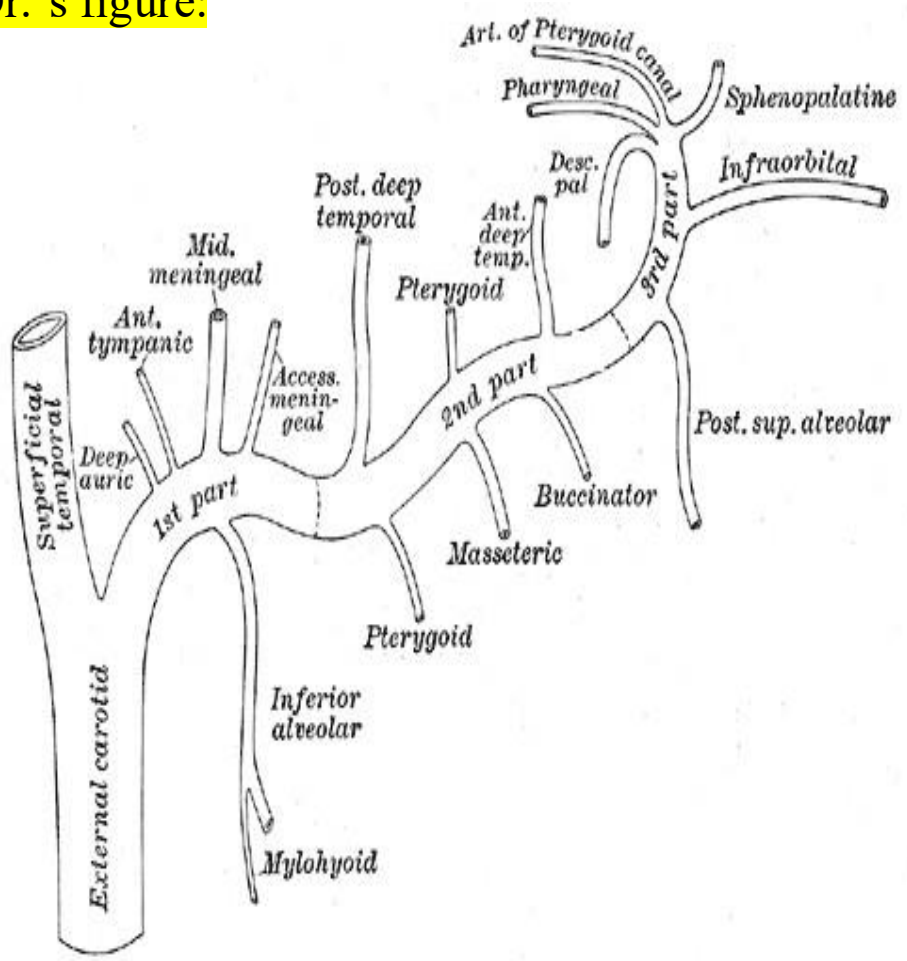
- The second part of the maxillary artery the part related to the **lateral pterygoid muscle**

- Gives origin to **5 muscular** branches supplying **muscles of mastication**:

1. Deep temporal (temporalis).
2. Masseteric.
3. Buccal.
4. Medial Pterygoid branch
5. Lateral Pterygoid branch

- Course with branches of the mandibular nerve

Dr.'s figure:



Branches of the maxillary artery
Gray's Anatomy 1918

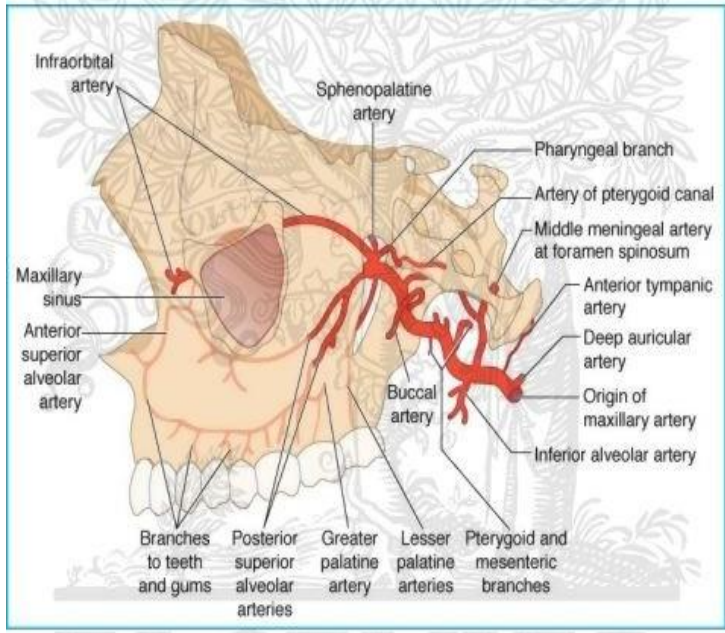
Terminal (3rd) part most imp.

- Enters the **pterygopalatine fossa**
- Gives origin to branches that accompany branches of the **maxillary nerve [V2]** and the **pterygopalatine ganglion.** (Slide 22-30)

(Dr. Muhtaseb mentioned the branches again).

- 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**.

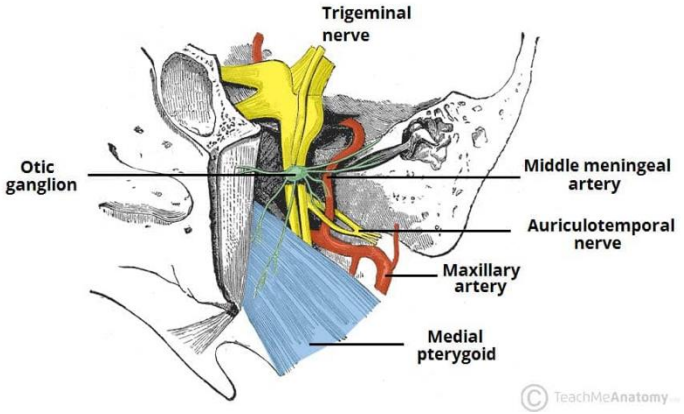
Dr.'s figure:



Courses of Maxillary Artery & Nerve

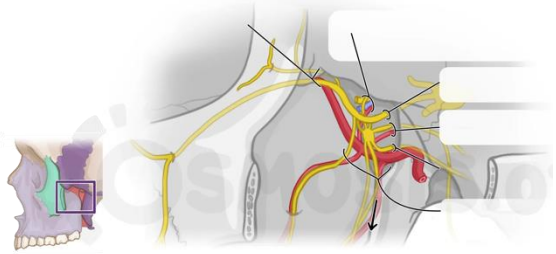
➢Maxillary Artery

It travels from the **infratemporal fossa** through the **pterygomaxillary fissure** to reach the **pterygopalatine fossa.**

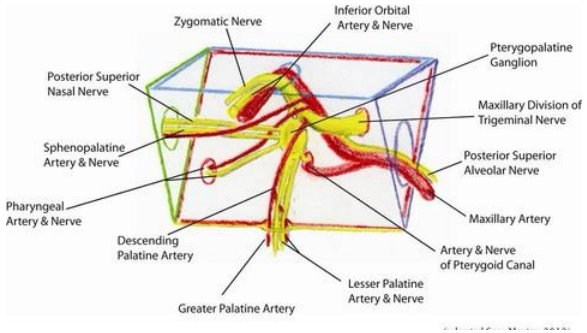


➢Opposite to **Maxillary nerve**

Middle cranial fossa → foramen rotundum → pterygopalatine fossa, where it gives 5 branches → **pterygomaxillary fissure → infratemporal fossa** where it gives post. Sup. Alveolar nerve to supply the last 3 molars.

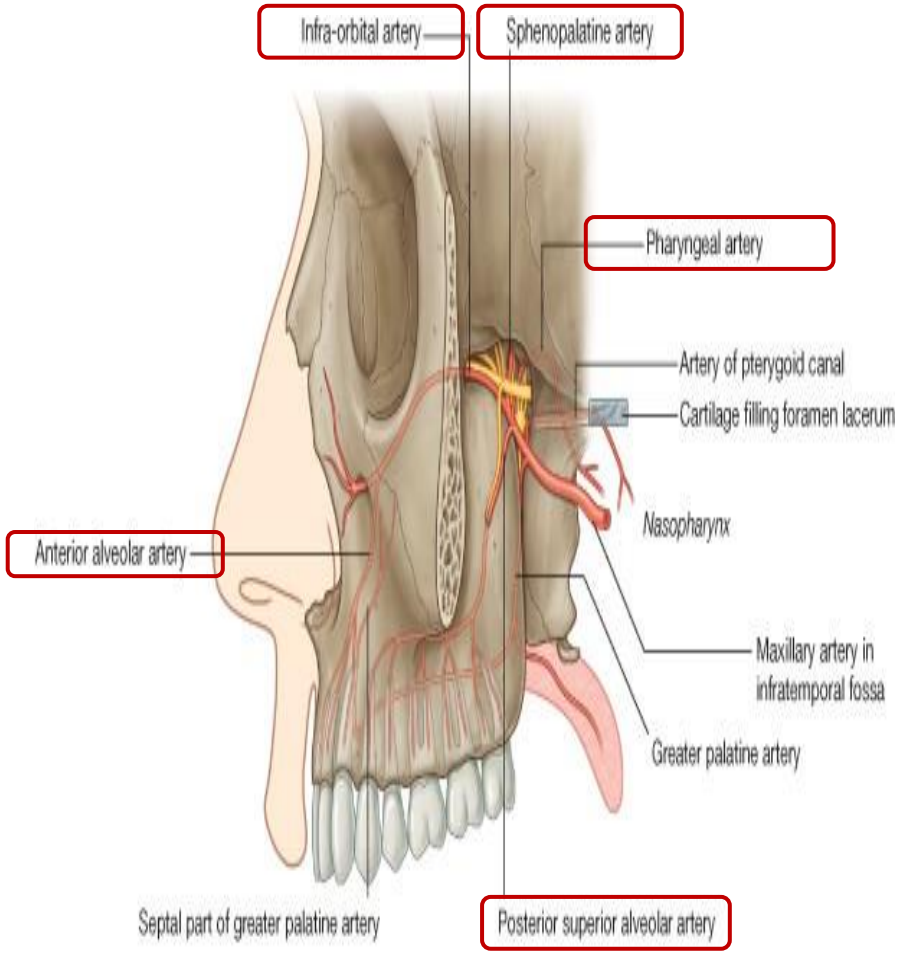


➢They **both** meet in the **pterygomaxillary fissure.**



Branches of the 3rd part maxillary artery

1. **Sphenopalatine** arteries (long & short) (slide 42)
2. **Palatine** artery (Greater palatine, lesser palatine) (slide 41)
3. In the orbit; **Middle** & **Anterior superior** alveolar (teeth of the upper jaw) (slide 40)
4. Terminates as **Infra-orbital** (palpebral, nasal, labial).
5. **Pharyngeal**, reaches the nasopharynx through the palatovaginal foramen.
6. The **Posterior superior alveolar** (to the last molar teeth), which is originated in the **infratemporal fossa.**
7. The artery of the **pterygoid** canal (slide 39)

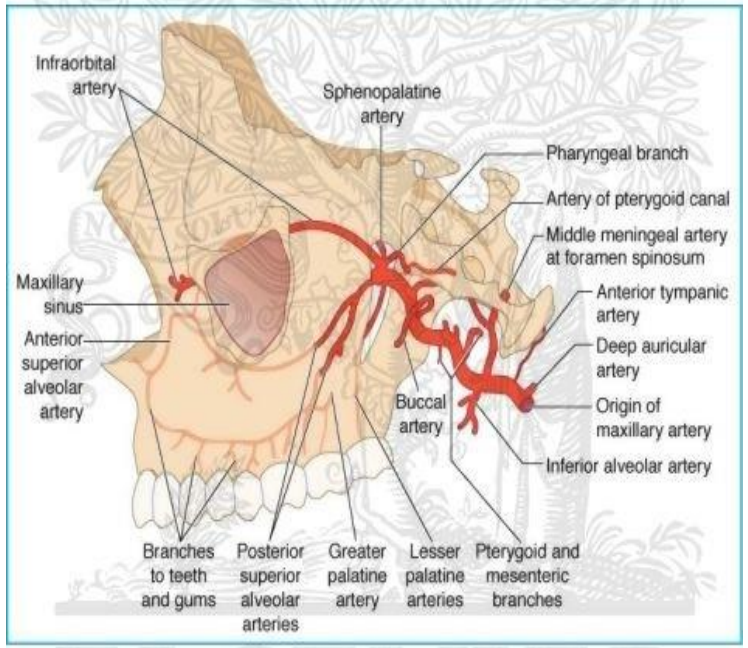


Dr.'s figure:

A. 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**.

Dr.'s figure:



B. Infra-orbital artery

- Terminal branch of 3rd part of maxillary
- Gives rise to 3 terminal Branches : Palpebral, nasal, and labial.

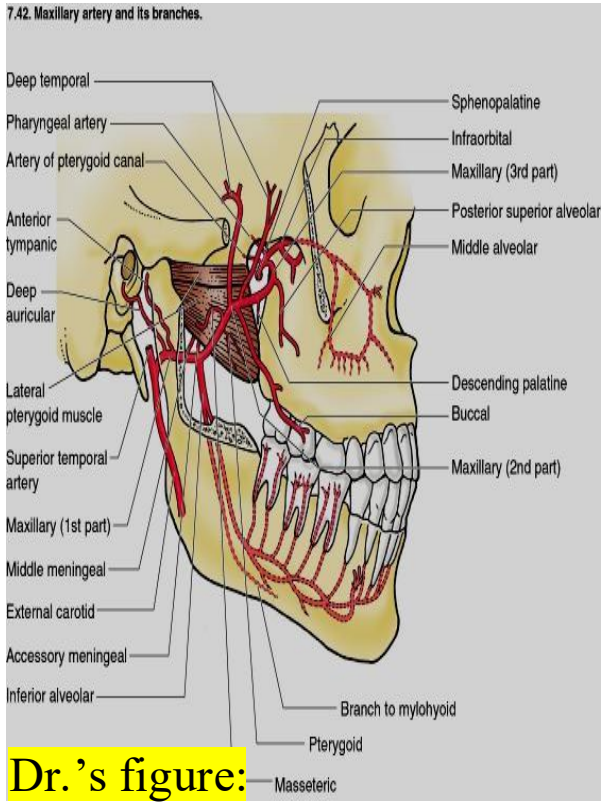
- It passes through the **infra-orbital canal** into the **orbital groove** and emerges through **infra-orbital foramen**
- **(More precisely:Groove > canal > foramen)**

- In the orbital canal it gives rise to 2 branches

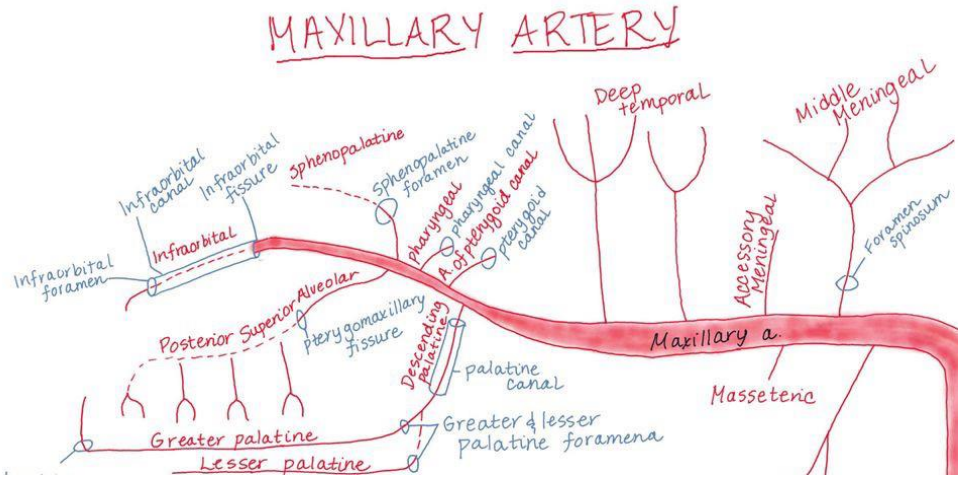
1- Middle superior alveolar

2- Anterior superior alveolar

Which supplies the **premolars**, **Anterior canine** and **incisors**.

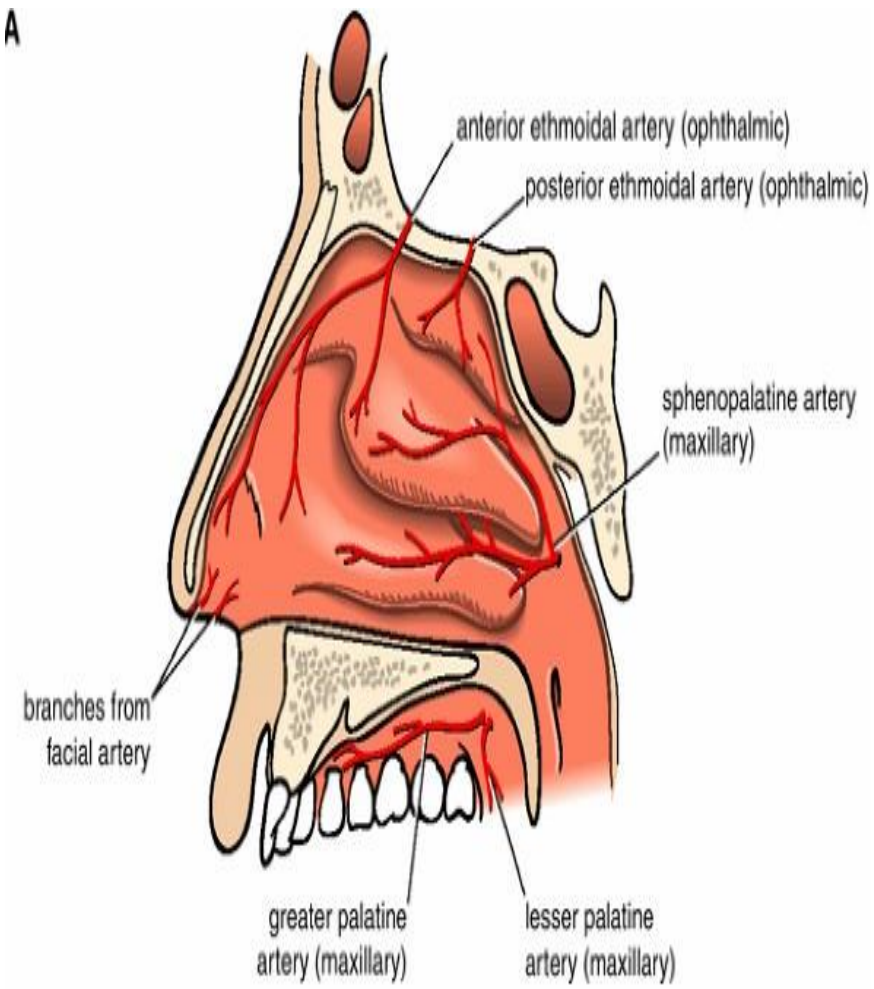


Dr.'s figure:



C. Greater palatine artery

- Branch of the **palatine artery.**
- Passes to the **oral cavity** through the **palatine canal** to supply the **hard palate .**
- Then continues to **the nose** through the **incisive foramen** to supply **posterior and anterior inferior** quadrant of the lateral wall of the nose .



Dr.'s figure:

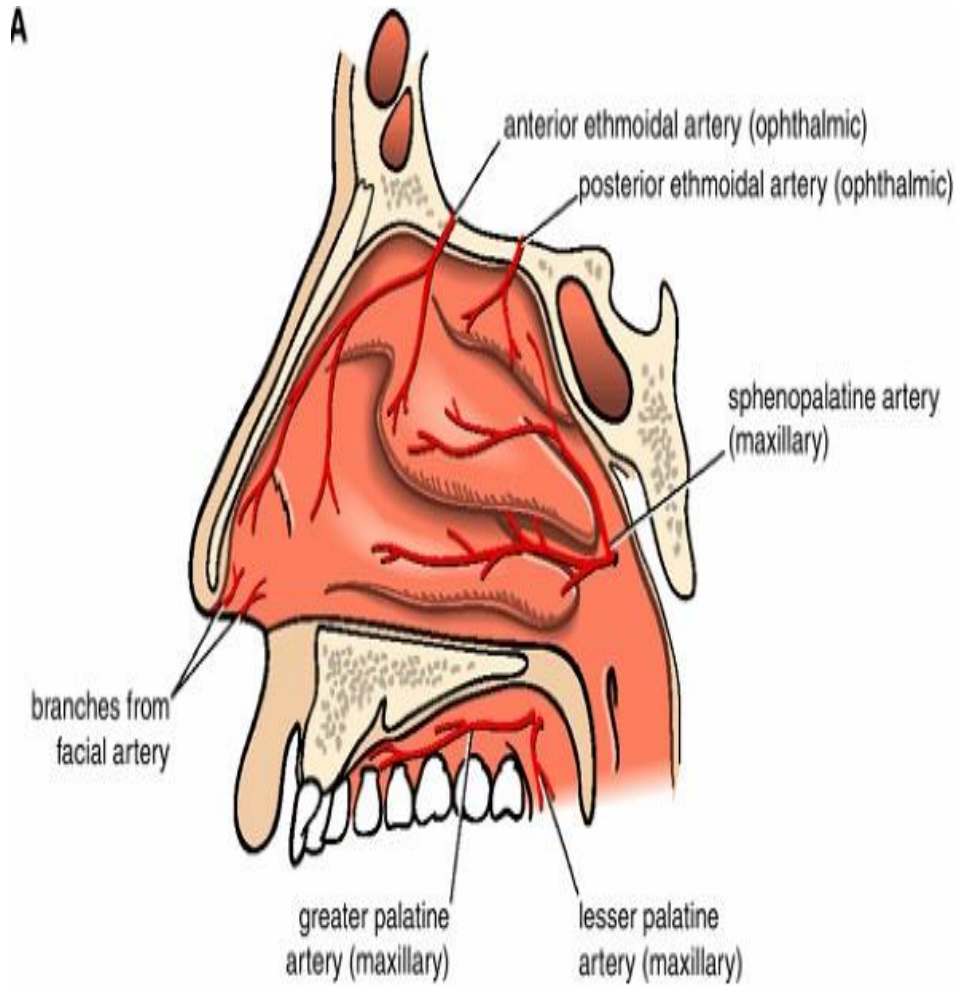
The doctor accidentally skipped this slide.
Make sure to take a look at it
All info. are relevant.

D. 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 (**short** sphenoid artery).

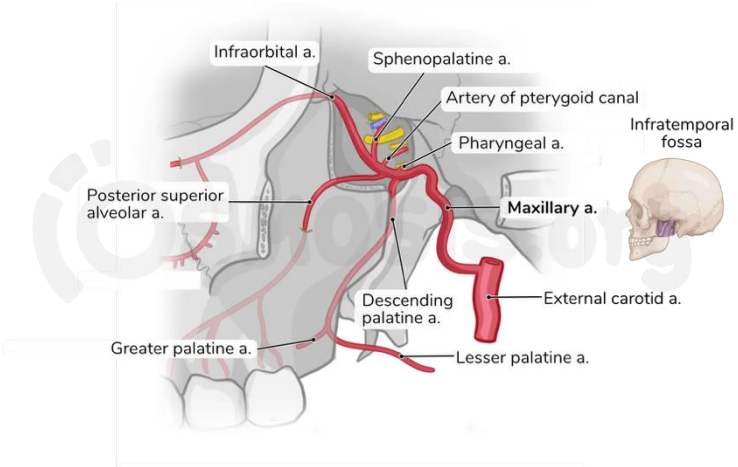
- 2. **Posterior septal branches**, which supply the nasal **septum**-the largest of these branches passes anteriorly down the septum to anastomose with the end of the nasal greater palatine artery.(**long** sphenoid artery)

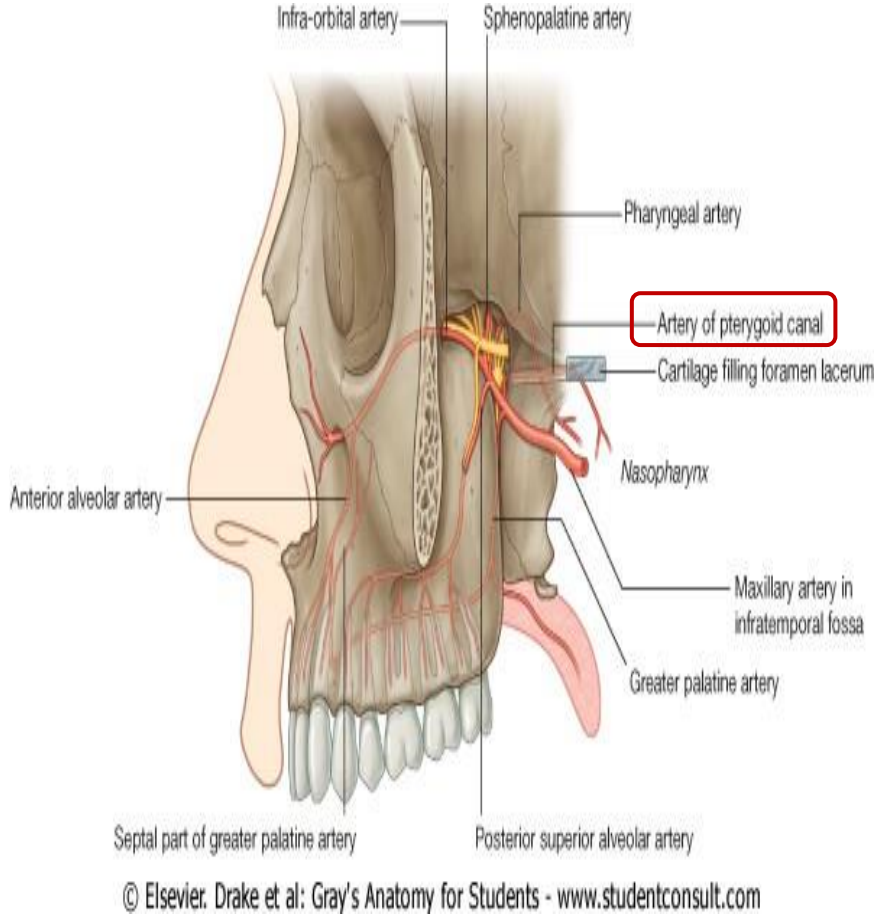


Dr.'s figure:

E. Artery of pterygoid canal

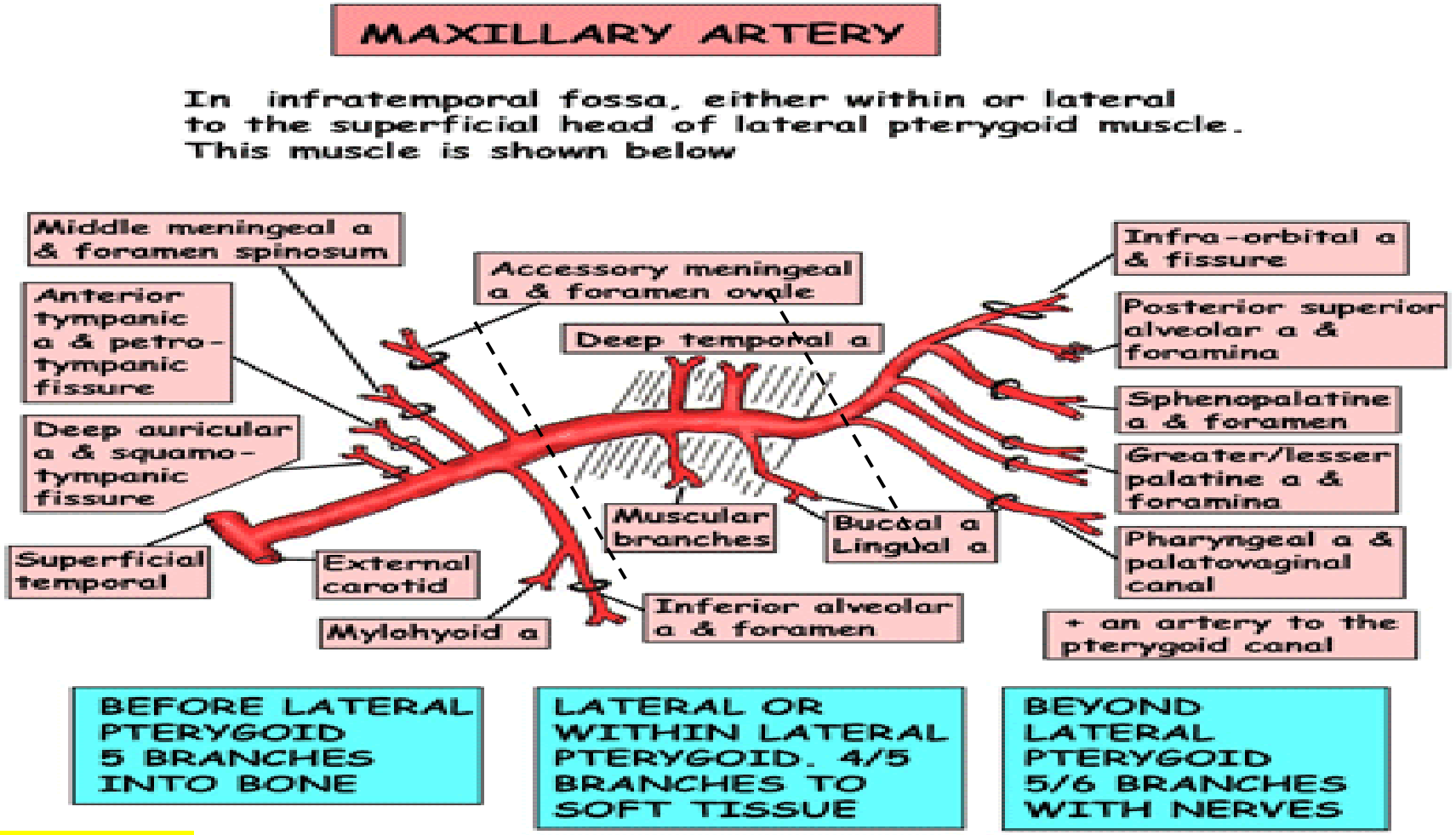
- Passes posteriorly into the **pterygoid canal** and supplies the **canal** and its structures.
- Terminates in the **mucosa of the nasopharynx**.





Dr.'s figure:

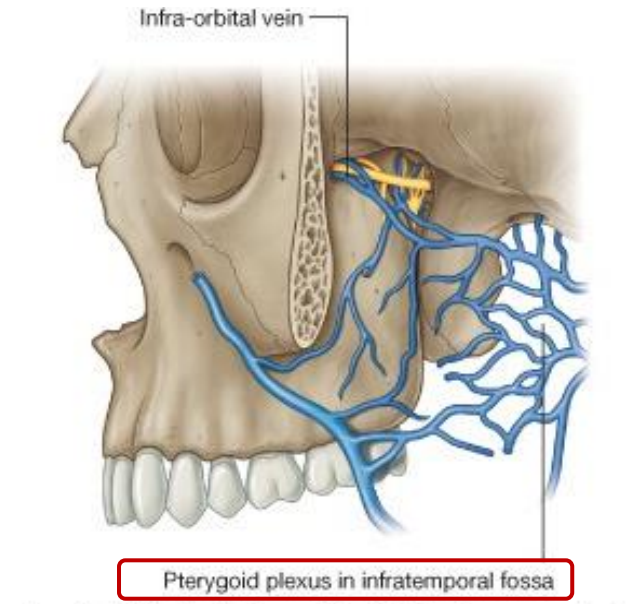
Maxillary artery – illustration



Dr.'s figure:

12- Veins of Pterygopalatine fossa

- Drain areas supplied by the arteries (opposite to arteries).
- Generally travel with these branches back into the pterygopalatine fossa.
- The veins coalesce in the fossa and then pass **posteriorly** to join the **pterygoid plexus of veins** in the **infratemporal fossa** near the lateral Pterygoid muscle.
- **Pterygoid plexus of veins** forms **maxillary** vein which terminates in the parotid gland joining the **superficial temporal vein** to form the **Retromandibular vein** .
- Some veins drain into The **infra-orbital vein** which indirectly drains into the **cavernous** sinus*.
- Additionally, **Pterygoid plexus** communicates with the **cavernous sinus** through **emissary veins** through foramen **spinosum** and foramen **oval**.

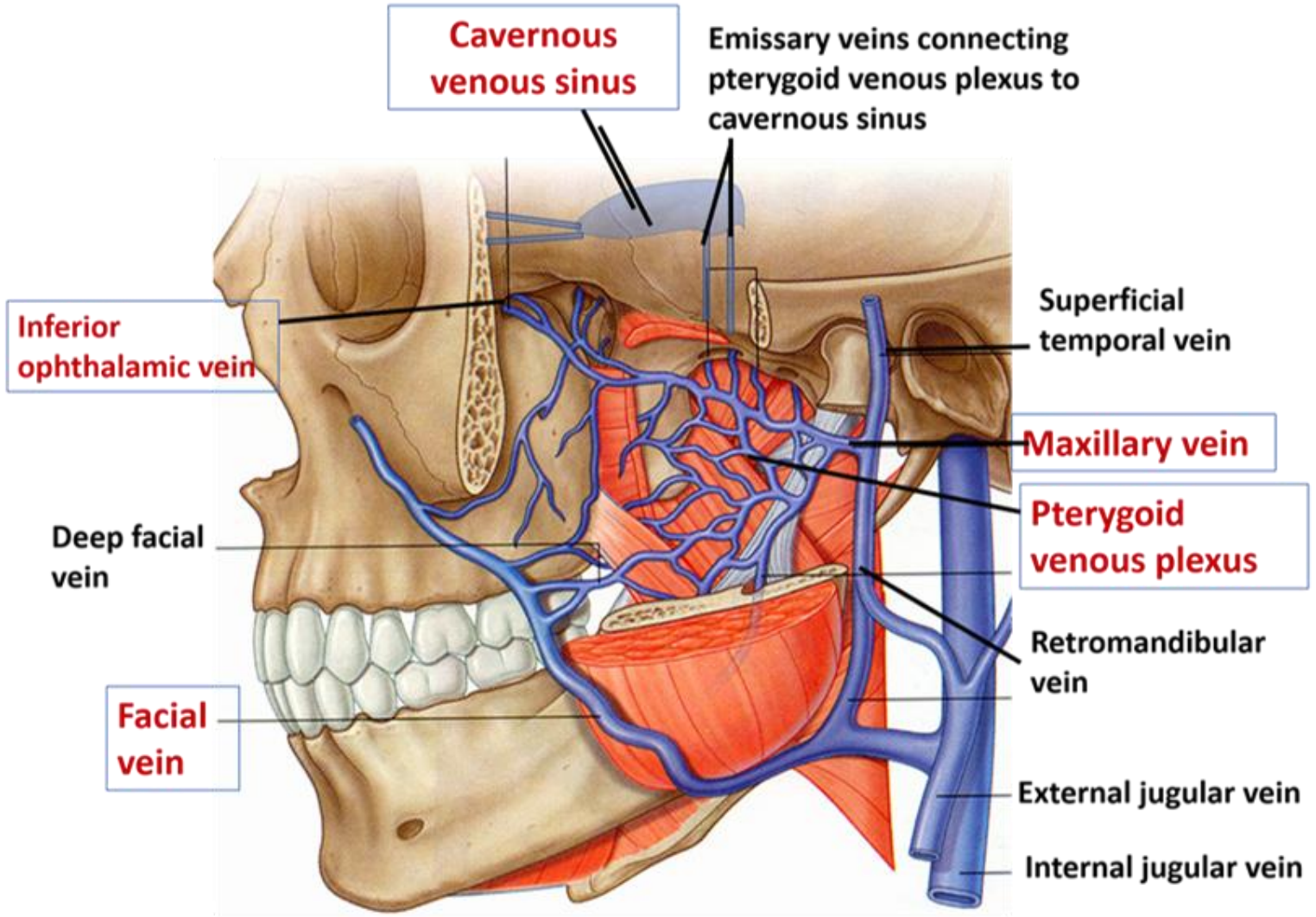


rake et al: Gray's Anatomy for Students - www.stude

Dr.'s figure:

*Infra-orbital vein → inferior ophthalmic vein → cavernous sinus

Veins of Pterygopalatine fossa – additional illustration



ANATOMY QUIZ LECTURE 2

External Resources

رسالة من الفريق العلمي

Additional sources:

1. Short Recommended video

اللهم اني استودعتك كل ما حفظت و ما قرأت و ما فهمت فردّه إليّ وقت حاجتي إليه.

اللهم هون برد الشتاء على من لا ملجأ ولا مأوى له، اللهم أنزل الدفء والطمأنينة عليهم، وارحم ضعفهم وقلة حيلتهم، وأغنهم من فضلك

Best of Luck ☺

Take a break🤍

For any feedback, scan the code or click on

Corrections from previous versions:

Versions	Slide # and Place of Error	Before Correction	After Correction
V0 → V1	Slide #5	**Spheno-palatine artery** and **vein** Spheno-palatine **artery is** divided into long and short…	**Spheno-palatine artery** and **nerve** Spheno-palatine **artery and nerve** are divided into long and short…
	Slide #35	Before the **pterygopalatine** muscle	Before the **lateral Pterygoid muscle**
	Slide #42	supply **posterior** **inferior** quadrant	supply **posterior and anterior** **inferior** quadrant
V1 → V2	Slide#7	**pterygomaxillary fossa**	**pterygomaxillary fissure**
	Slide #10	"from the internal carotid plexus "	Deleted
	Slide #41	Note added in gray	"(More precisely:Groove > canal > foramen)"