



TRIGEMINAL SYSTEM

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By

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Intended Learning Outcomes (ILOs)

1. Outline the components of trigeminal system.
2. Describe trigeminal ganglion.
3. Explain trigeminal nerve anatomy, including beginning, terminal branches and distribution of each one.





Agenda

1. Components of trigeminal system.
2. Anatomy of trigeminal ganglion.
3. Beginning & terminal branches of trigeminal nerve & distribution of each one.



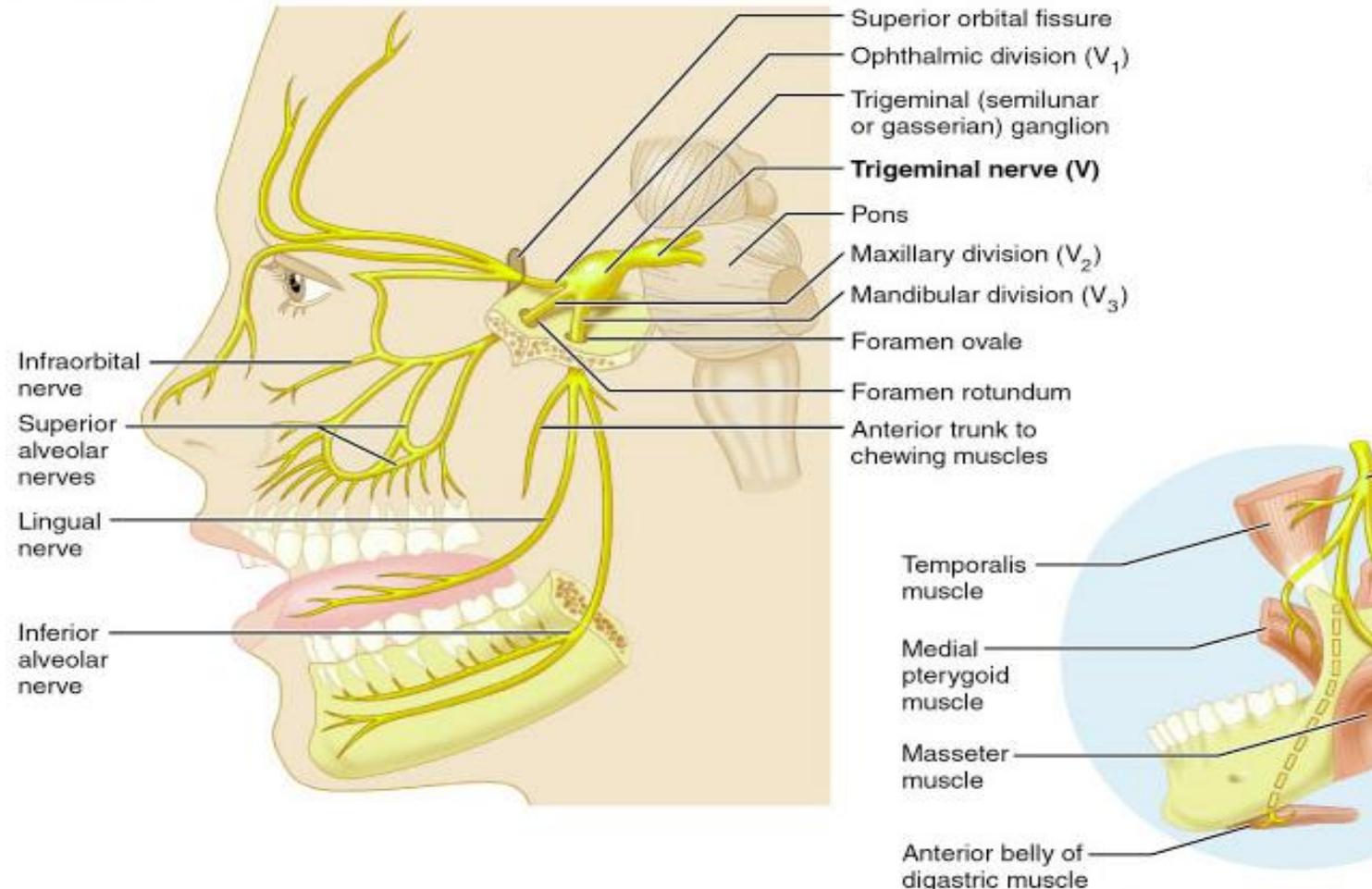


Trigeminal System



Trigeminal nerve (CN V)

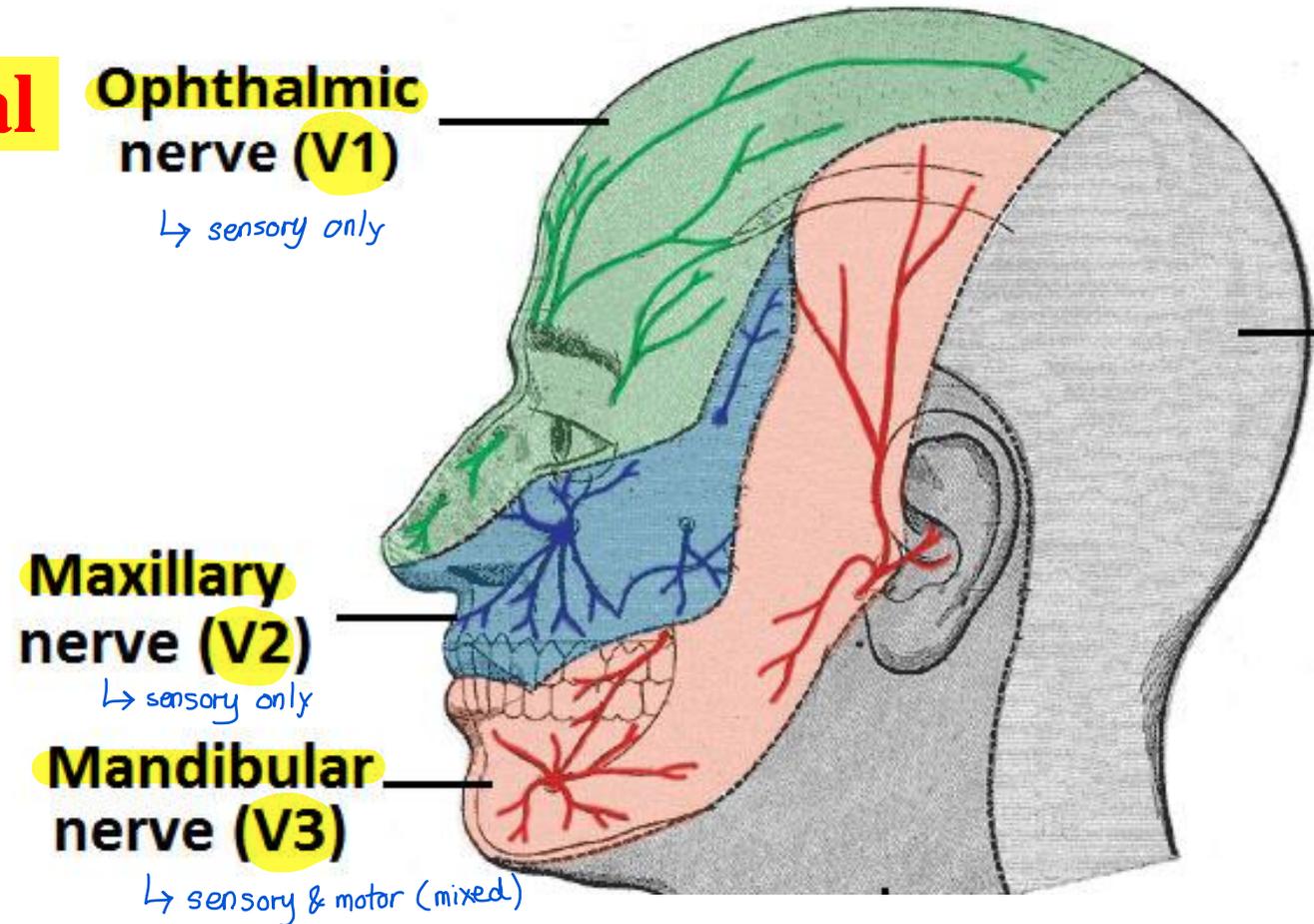
- Is the **fifth** cranial nerve.
- Is the **largest cranial nerve**.
- **Type: mixed** (sensory, motor & parasympathetic).



Trigeminal nerve (CN V)

- The trigeminal nerve **supply the derivatives of the 1st pharyngeal arch** (4 muscles of mastication, anterior belly of the digastric and mylohyoid, tensor palatae and tensor tympani)..

1. Sensory: The **three** terminal branches of CN V innervate the skin, mucous membranes and sinuses of the face.



The trigeminal nerve (CN V)

2. Motor: Only the **mandibular** branch of CN V has **motor** fibers.

❑ It innervates the **muscles of mastication**: medial pterygoid, lateral pterygoid, masseter and temporalis. **MCQ**

❑ It also supplies **1st pharyngeal arch muscles**: anterior belly of digastric, mylohyoid, tensor palati and tensor tympani.

مش **parasympathetic** بنفسه إنما الـ 3rd
التي بيتطفوا عليه 7th, 9th cranial nerve
ويدخلوا فيه خلوه **parasympathetic**

3. Parasympathetic Supply: The **post-ganglionic neurons** of **parasympathetic ganglia** travel with branches of the trigeminal nerve.

(Note that **CN V is NOT** part of the cranial outflow of PNS supply)



SAQ: Describe the nuclei of trigeminal nerve (Site - Function) ?

Nuclei of Trigeminal Nerve

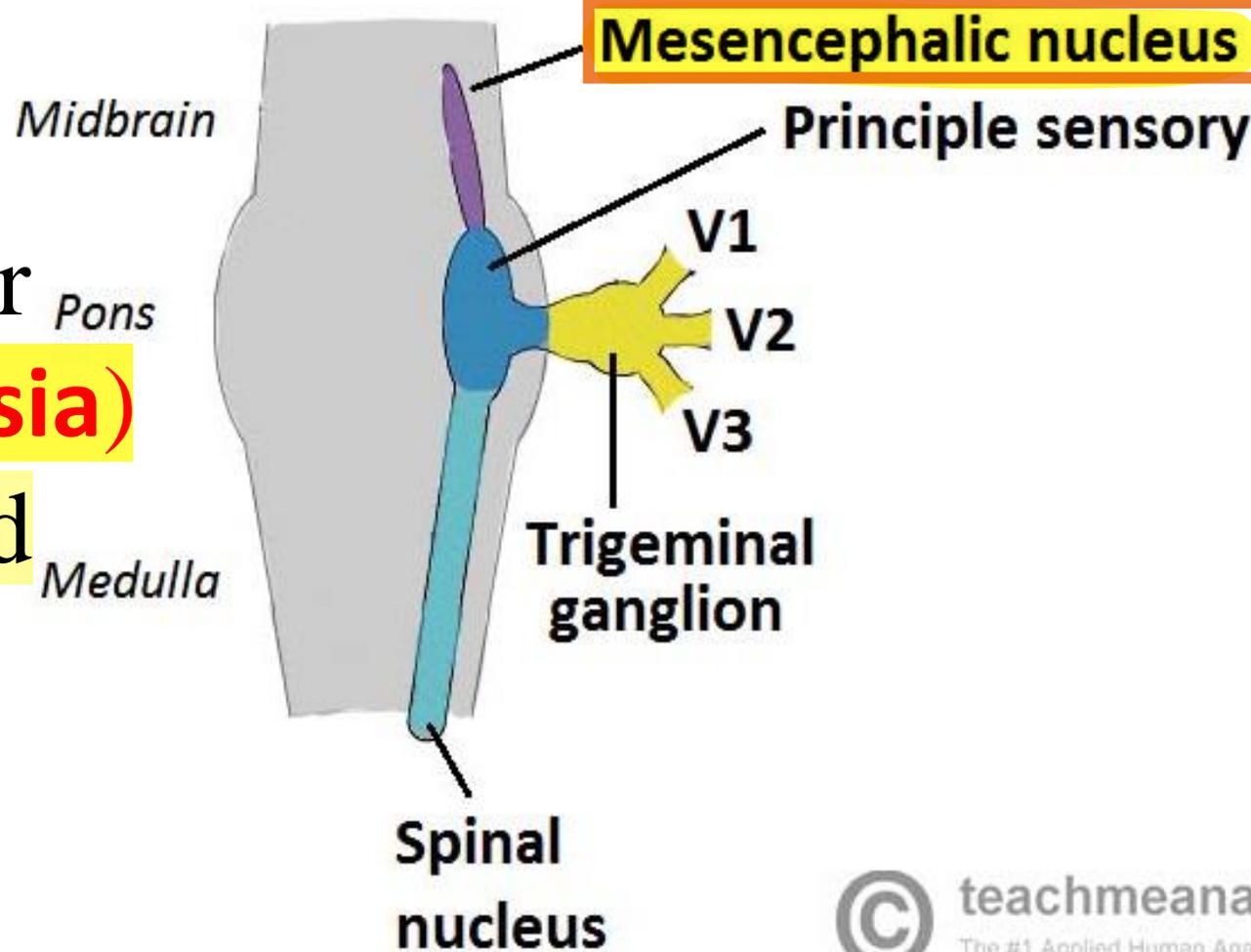
وكمكان ال common nuclei of facial ,vagus , glossopharyngeal أسئلة

في الامتحان



1. Mesencephalic nucleus

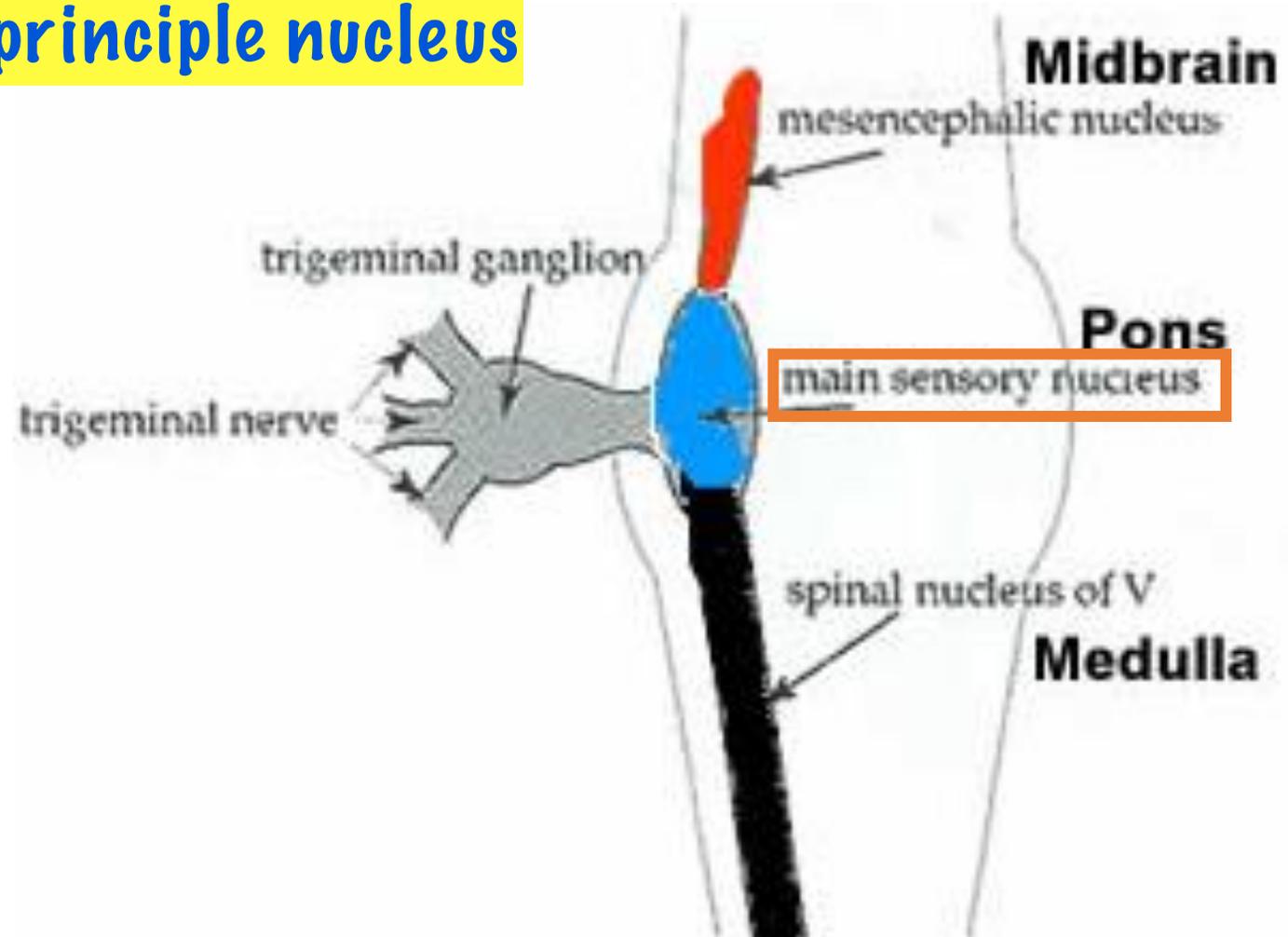
- In **midbrain**.
- Is the first-order neuron for **proprioception or (kinesthesia)** from the **muscles of the head** and from the **temporomandibular joint**



2. Main sensory nucleus

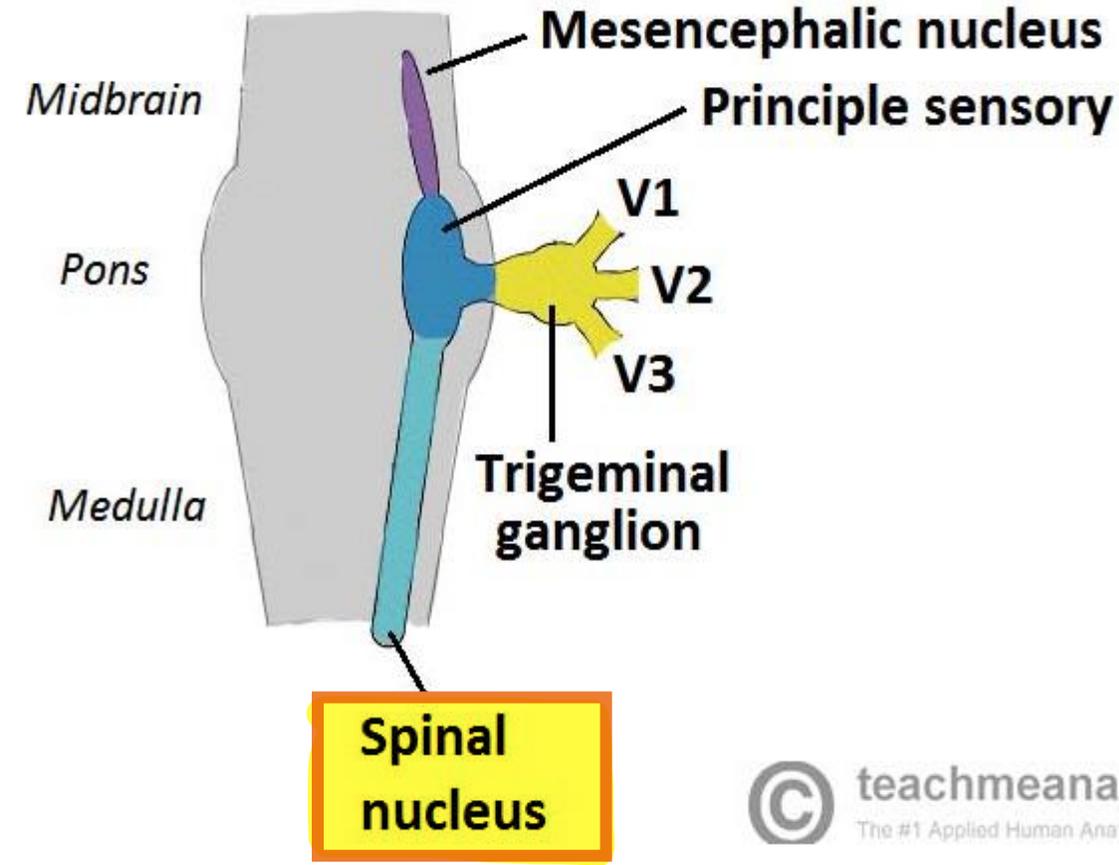
= principle nucleus

- In upper **pons**.
- It mediates **discriminative touch and pressure** sensations from the same side of the face



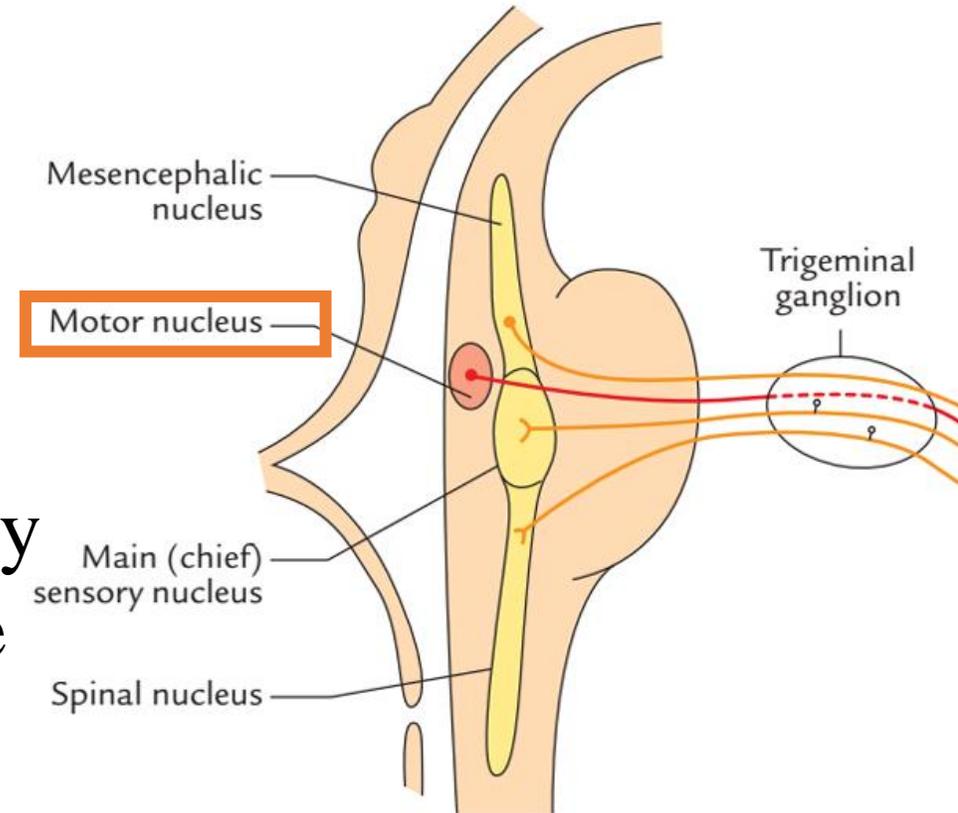
3. Spinal nucleus

- In upper **pons, medulla** down to C2 segment of **spinal cord**. (**pain and temperature**).
- It mediates pain and temperature sensations from the same side of the face



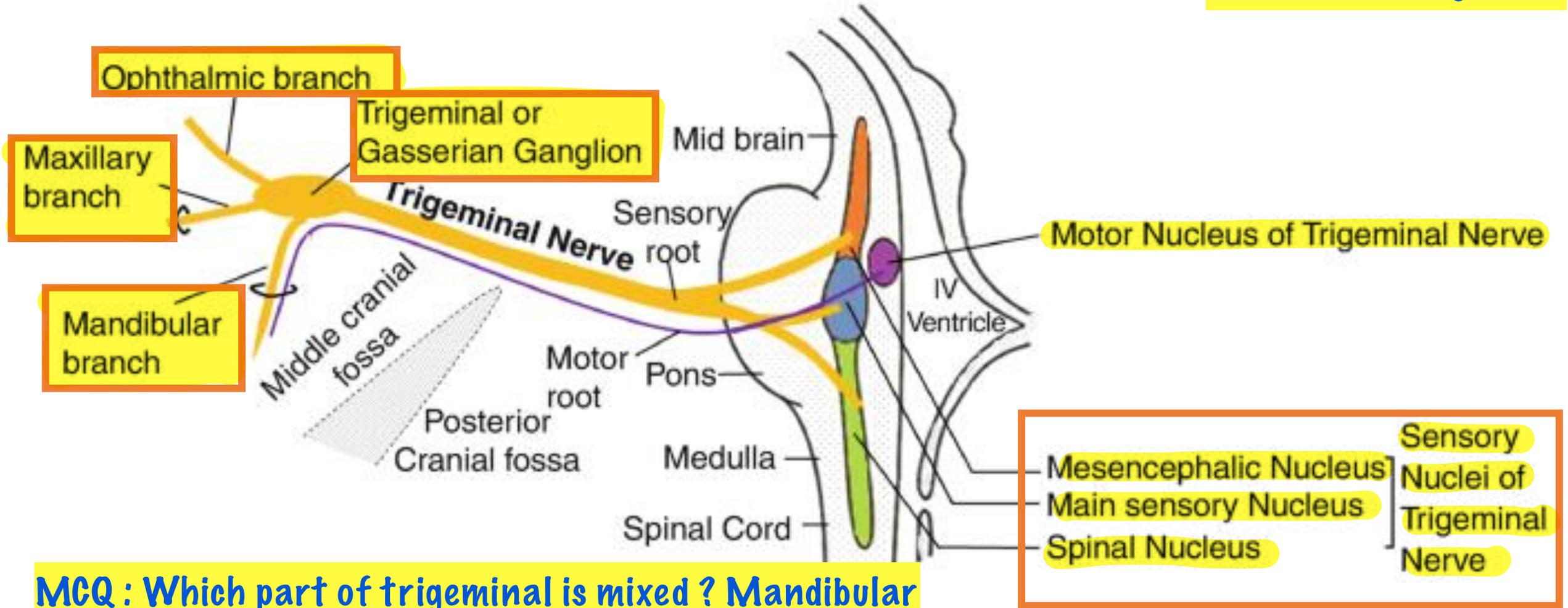
4. Motor nucleus

- In upper **pons**.
- Forms the **motor root** of the trigeminal nerve.
- It supplies **muscles of the 1st pharyngeal arch** (4 muscles of mastication, anterior belly of the digastric and mylohyoid, tensor palatae and tensor tympani).



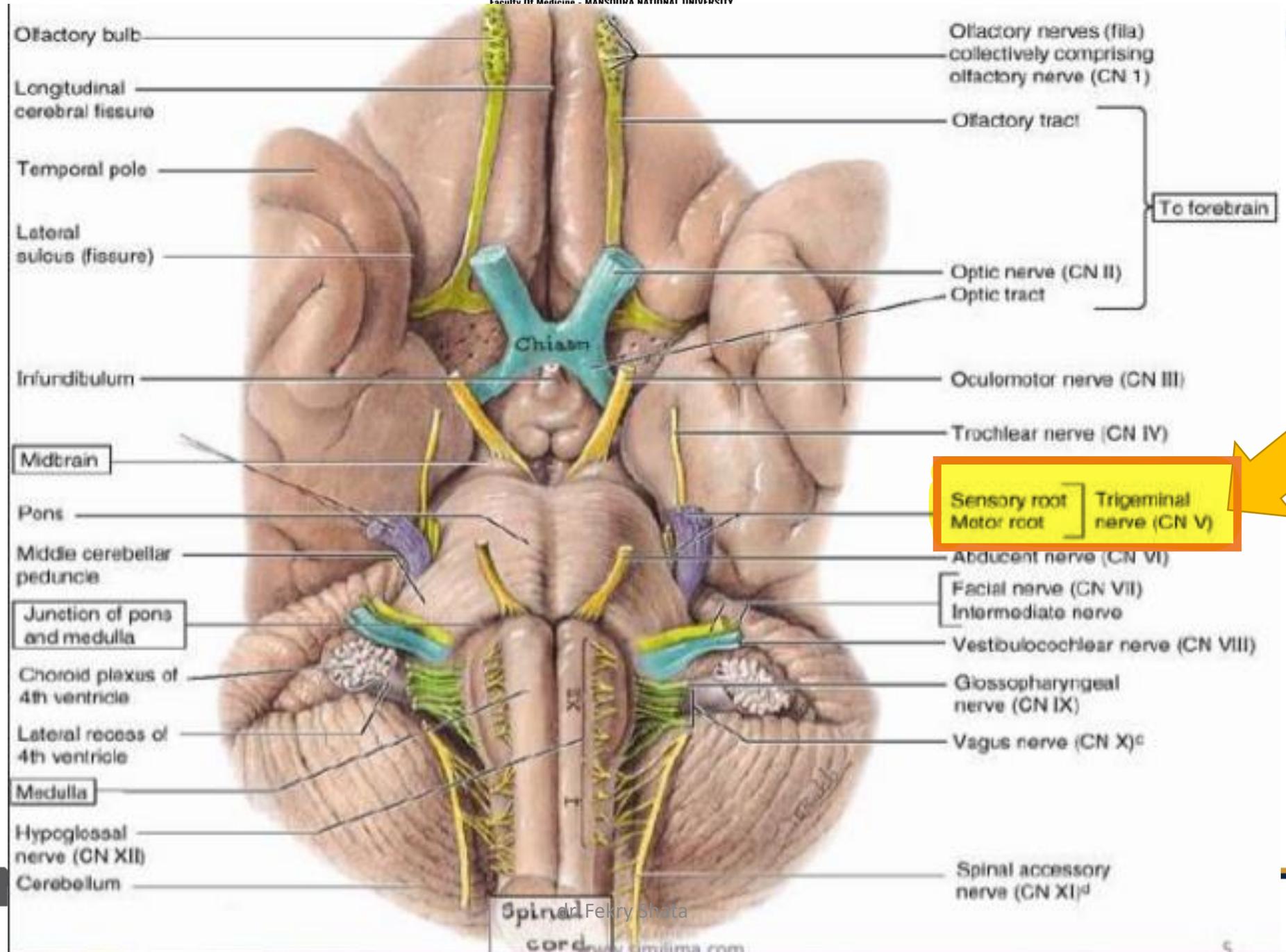
Trigeminal Ganglion

الصورة دي مهمة جدااا
وممكن يجي منها كل أسئلة
المحاضرة



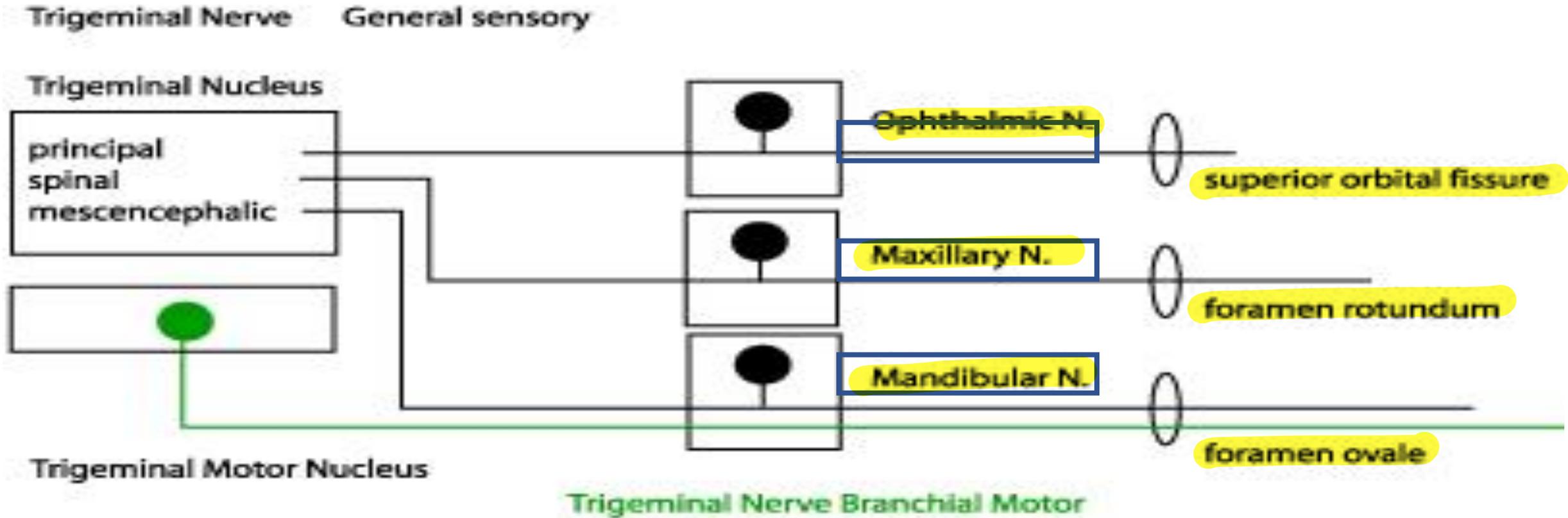
MCQ : Which part of trigeminal is mixed ? Mandibular
MCQ : The largest cranial nerve is ? Trigeminal





سؤال تجميعية ومهم بيجي OSPE كمان

Foramen of the skull in relation to trigeminal



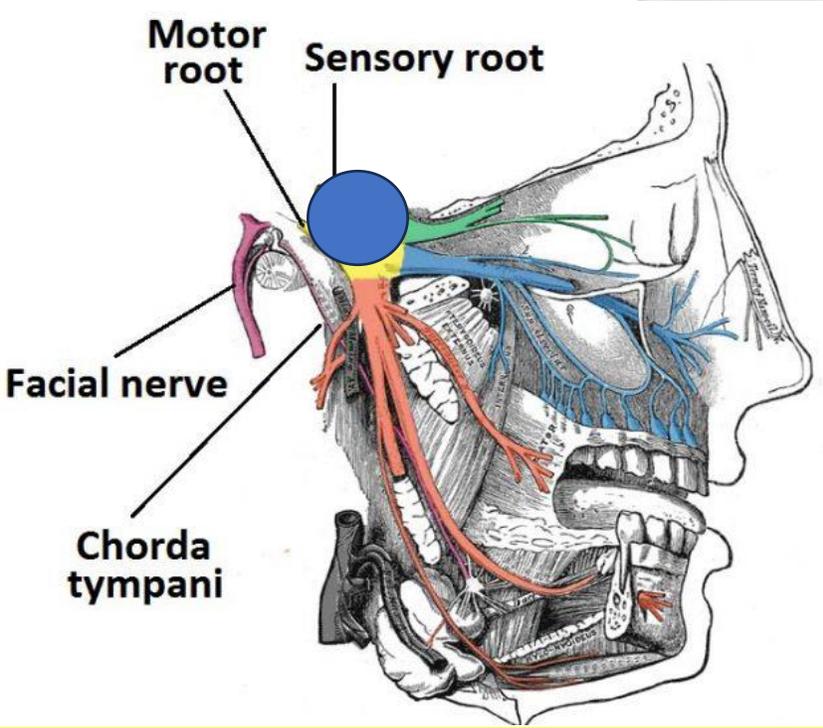
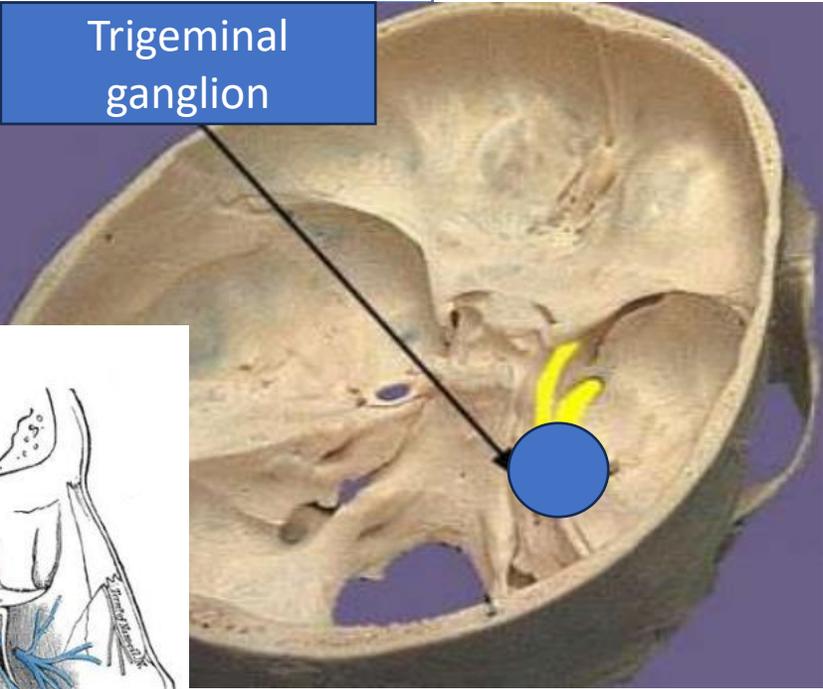


Course of Trigeminal Nerve



Intracranial Course

- In the **middle cranial fossa**, the sensory root expands into the **trigeminal ganglion**
- The trigeminal ganglion lies within a **pouch of dura mater** called **Cavum trigeminale**).
- Divided into **3 branches** which travel through the **cavernous sinus**
- The motor root of the trigeminal nerve is situated below the sensory ganglion



MCQ : Which dural fold cover trigeminal : Cavum trigeminale

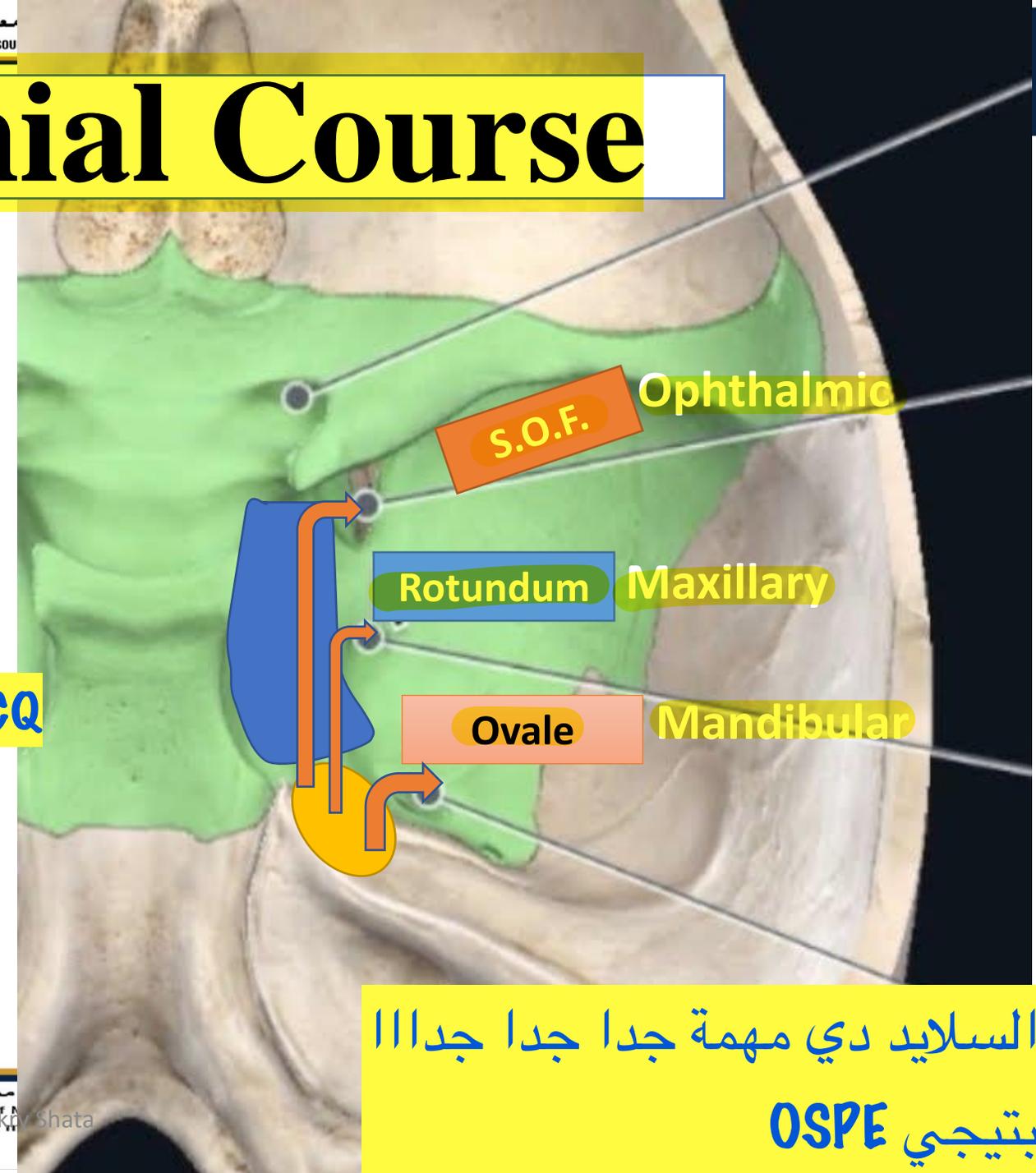
Extracranial Course

1. Ophthalmic nerve: exiting the cranium via the **superior orbital fissure**. **MCQ**

2. Maxillary nerve: exiting the cranium via the **foramen rotundum**. **MCQ**

3. The mandibular nerve: exits via the **foramen ovale** entering the infra-temporal fossa. **MCQ**

Note: the **motor root** passes **inferiorly** to the **sensory root**. Its fibers are only **distributed** to the **mandibular division**.



الاسلايد دي مهمة جدا جدا

OSPE بتيجي

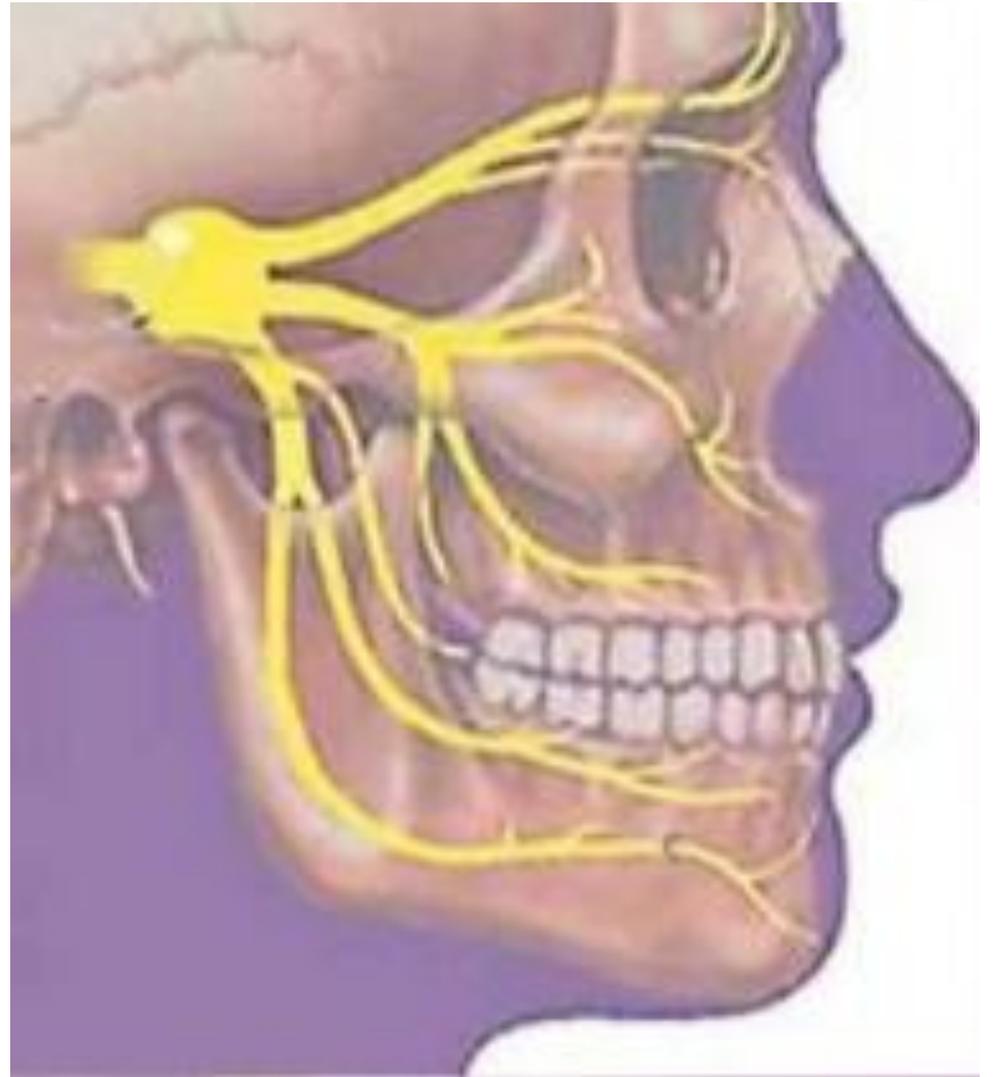


Divisions of Trigeminal Nerve

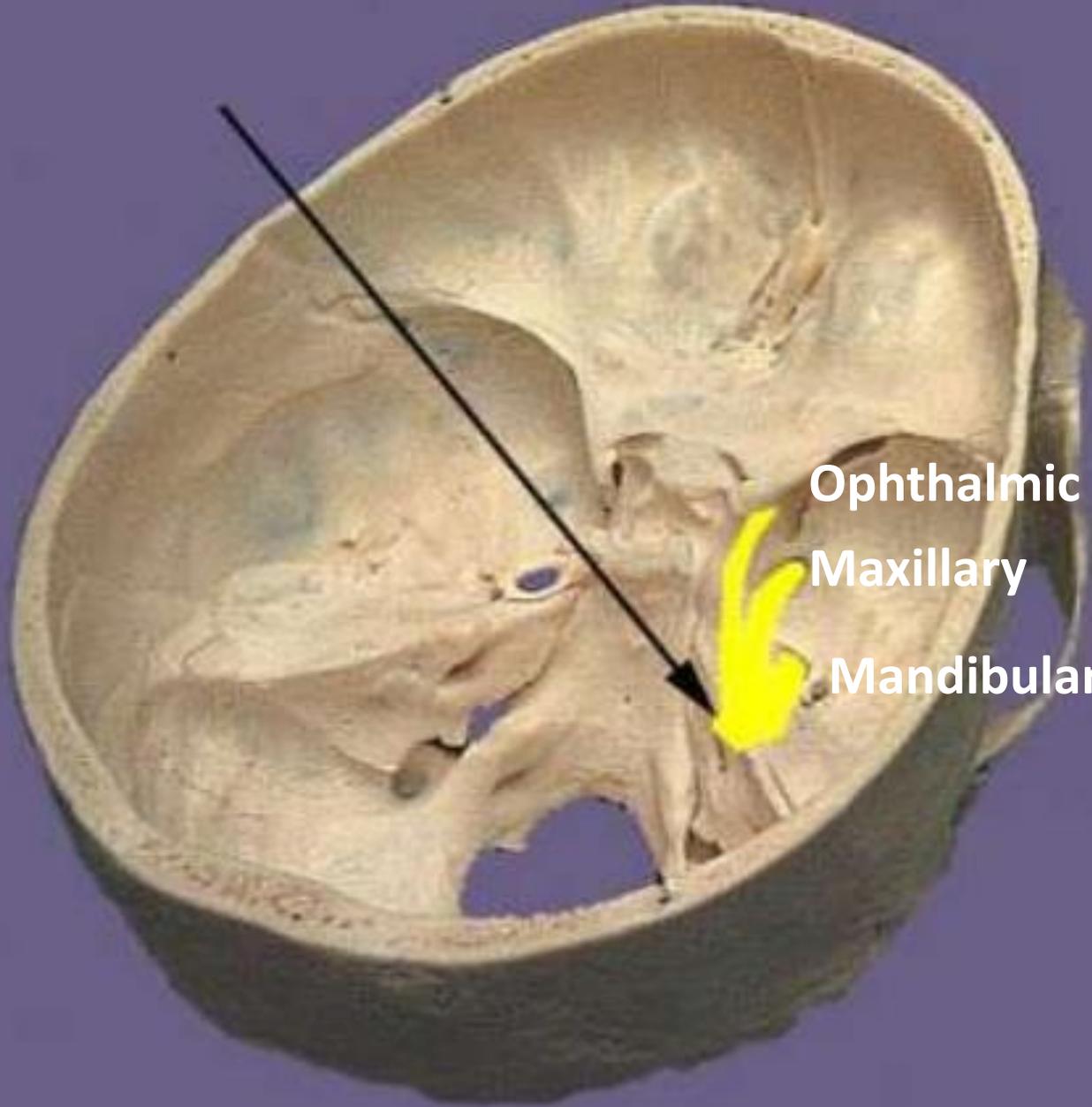
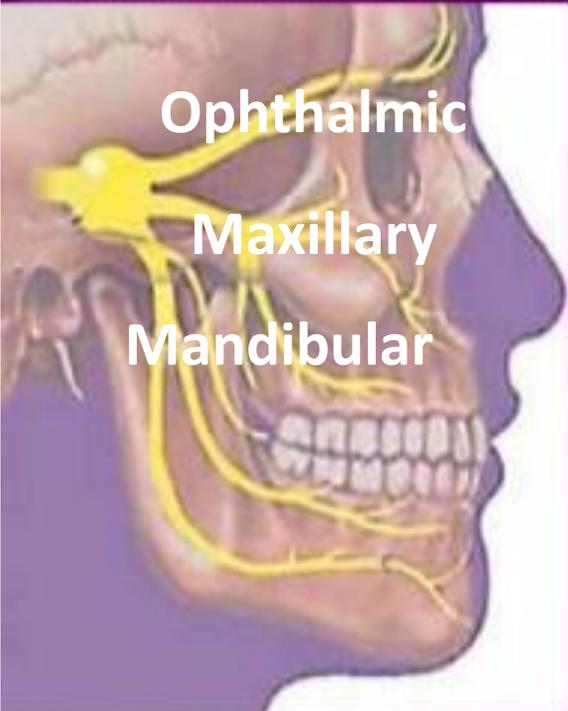


The trigeminal ganglion gives rise to 3 divisions:

1. **Ophthalmic (V1)**
2. **Maxillary (V2)**
3. **Mandibular (V3)**



EXIT FROM SKULL





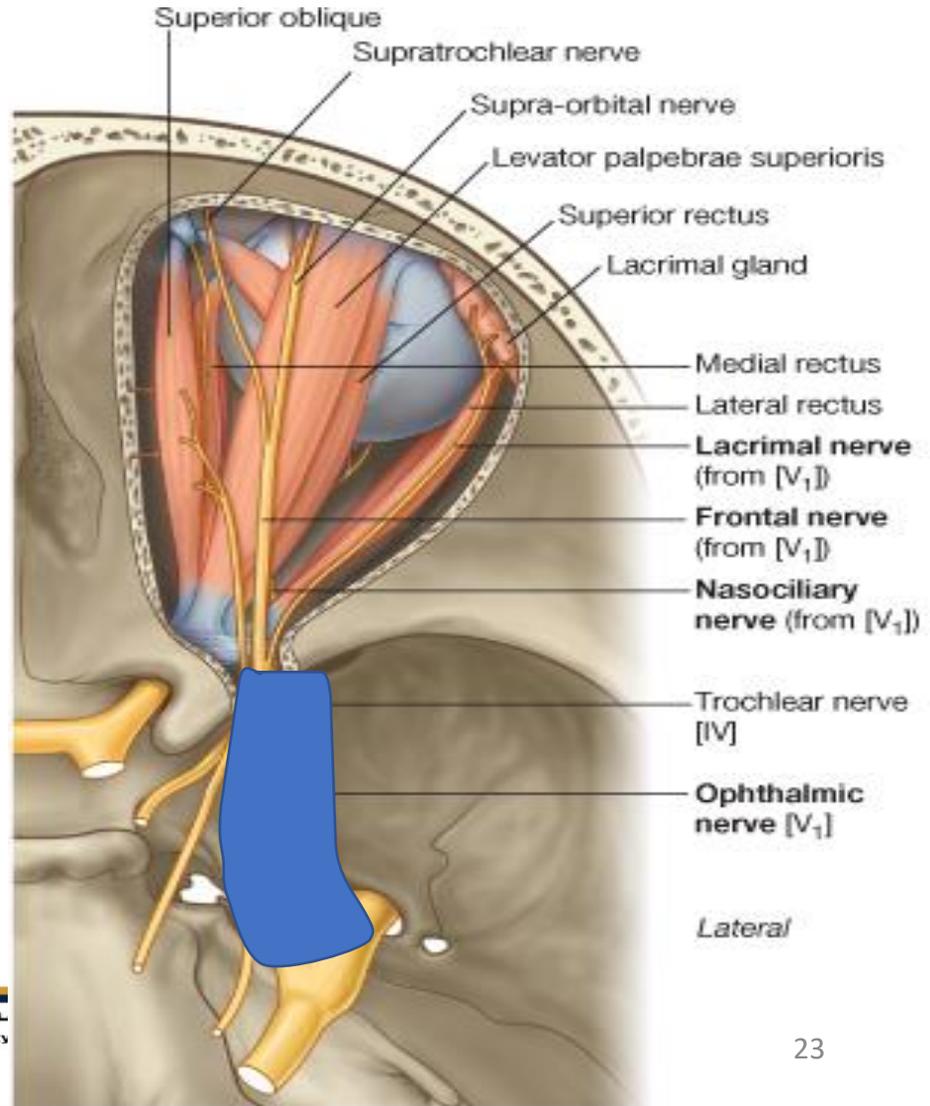
Ophthalmic Nerve

V1



Ophthalmic nerve - V1

- Superior and **smallest** division.
- **Type: Sensory** Nerve
- Passes forward in the lateral wall of the **cavernous sinus**, below the **oculomotor and trochlear nerves**.



Ophthalmic nerve (V1)

SAQ : Enumerate branches of ophthalmic nerve ?

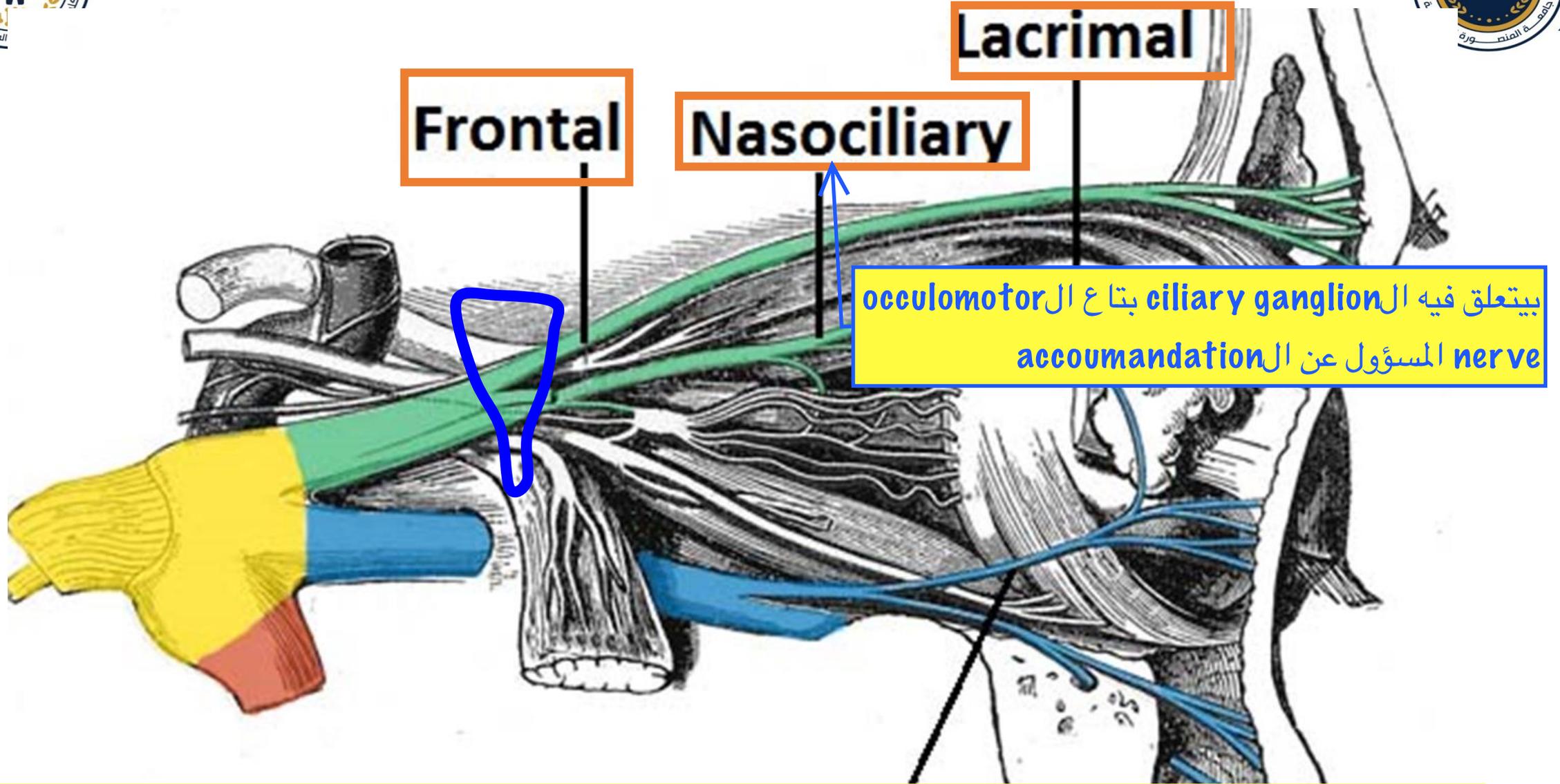
Cavernous sinus → **sup. orbital fissure** → **orbit**

Branches:

1. Frontal n: skin of forehead.

2. Lacrimal n.: lacrimal gland (sensory fibers) + upper eyelid

3. Nasociliary n.: eye, nasal cavity, dorsal part of the nose



بيتعلق فيه ال ciliary ganglion بتاع ال oculomotor nerve المسئول عن ال accommodation

MCQ : Which cranial nerve is related to ciliary ganglion ? Oculomotor nerve



Before entering the orbit by the **superior orbital fissure**, it divides into

البرانشات الكبار بس اللي حفظ
(متعلم عليهم بالهايلايت)

Lacrimal

(smallest)



Glandular palpebral

Nasocilliary

(intermediate)



Internal nasal

External nasal

Anterior ethmoidal

1. communicating branch to ciliary ganglion

2. Long ciliary

3. Infra Trochlear

4. Posterior Ethmoidal

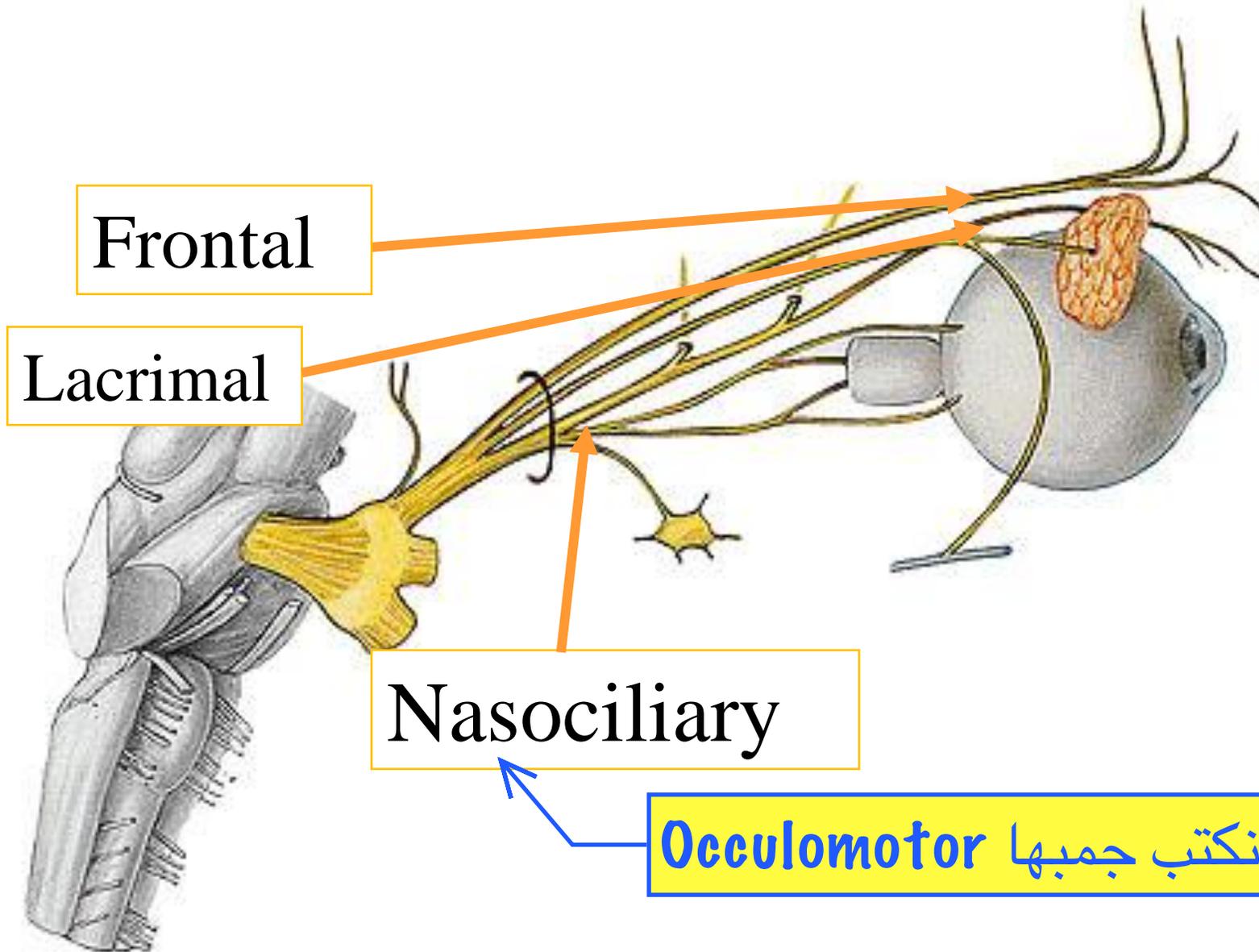
Frontal

(largest)



Supra Trochlear

Supra Orbital



Frontal

Lacrimal

Nasociliary

الدكتور قال نكتب جنبها Oculomotor



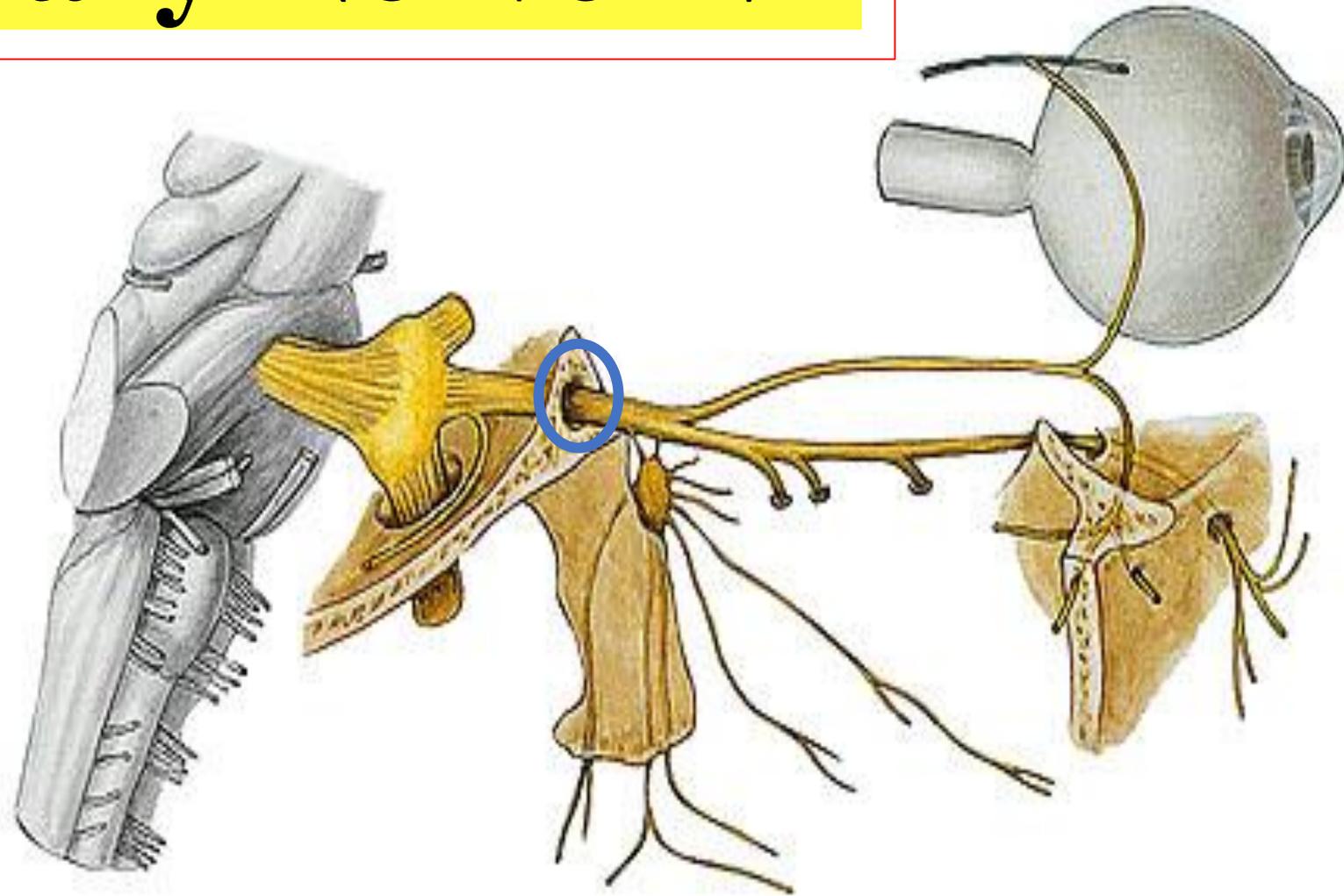
Maxillary Nerve

V2

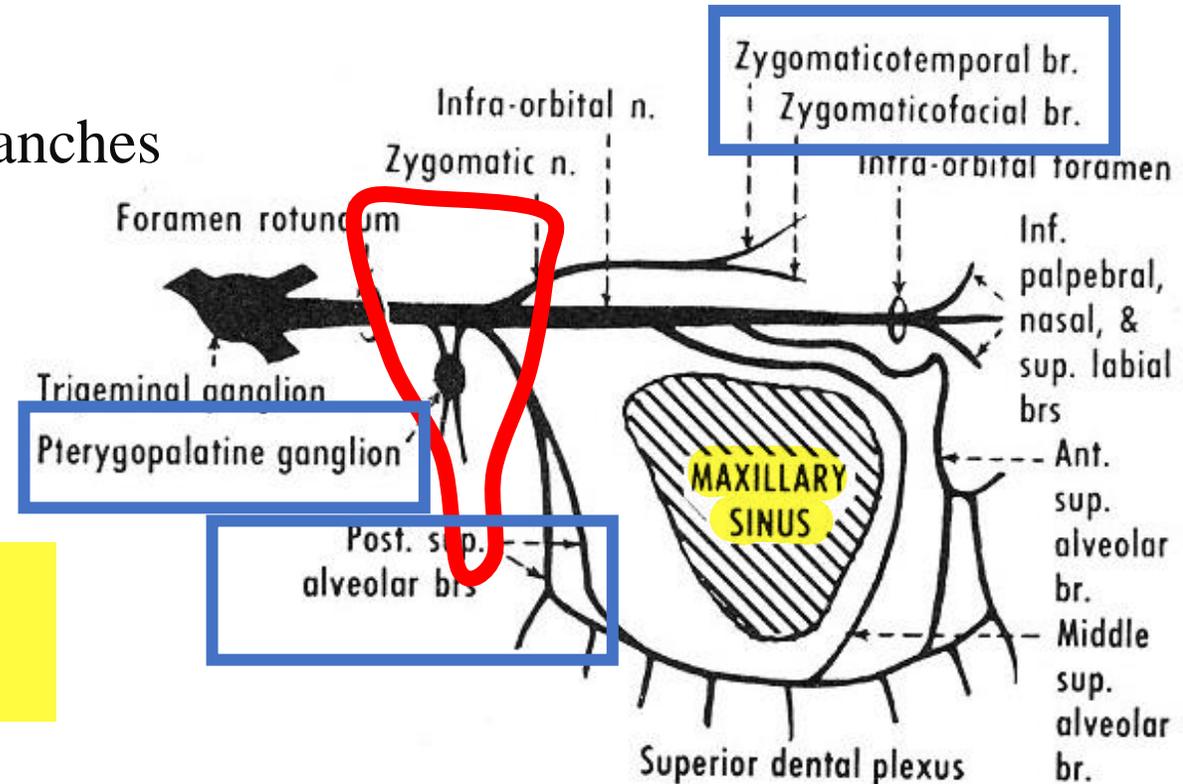
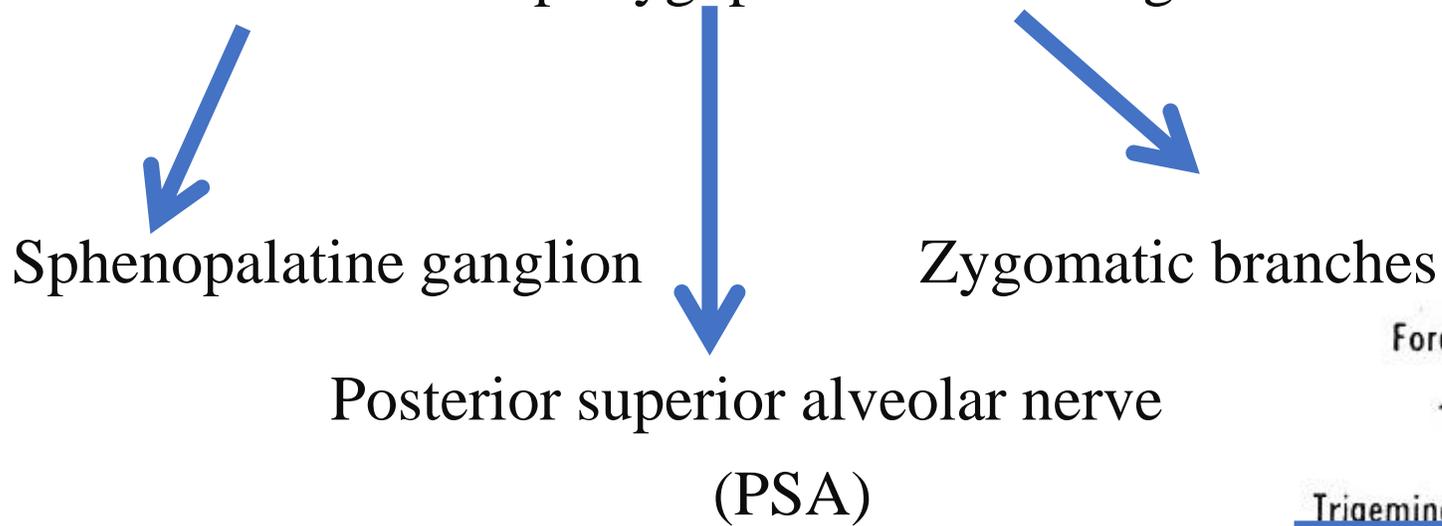


Maxillary Nerve - V2

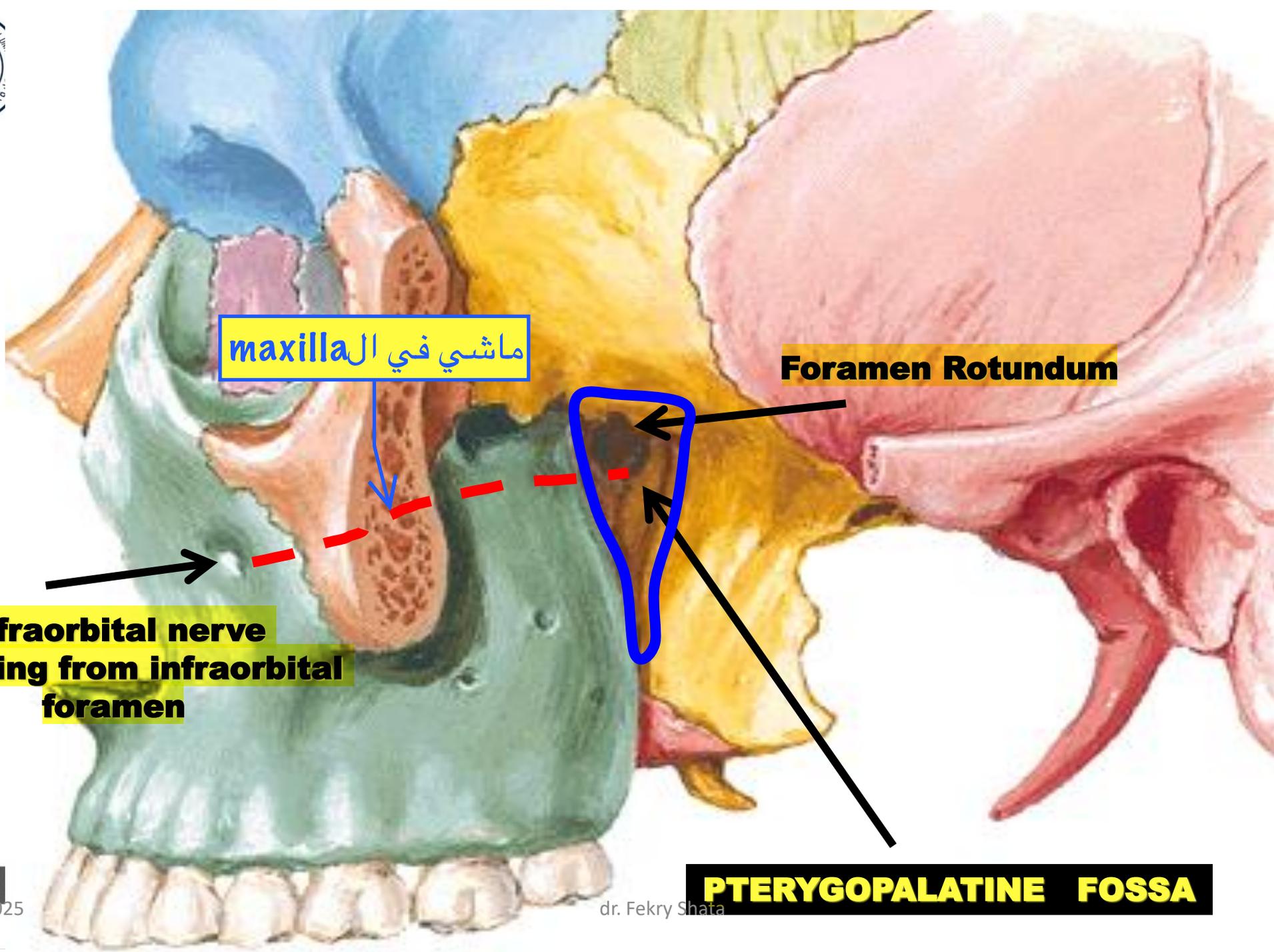
- It is **intermediate division** of trigeminal nerve. **Longest branch**
- **Type:** Whole **sensory**.
- Leaves the cranium through **foramen rotundum**, which is located in the greater wing of sphenoid bone.



Once outside the cranium, it crosses the uppermost part of the **pterygopalatine fossa**,
(between the pterygoid plates and the palatine bone)
As it crosses the pterygopalatine fossa it gives of branches



Type R MCQ : Which cranial nerve is related to maxillary sinus ? Maxillary nerve

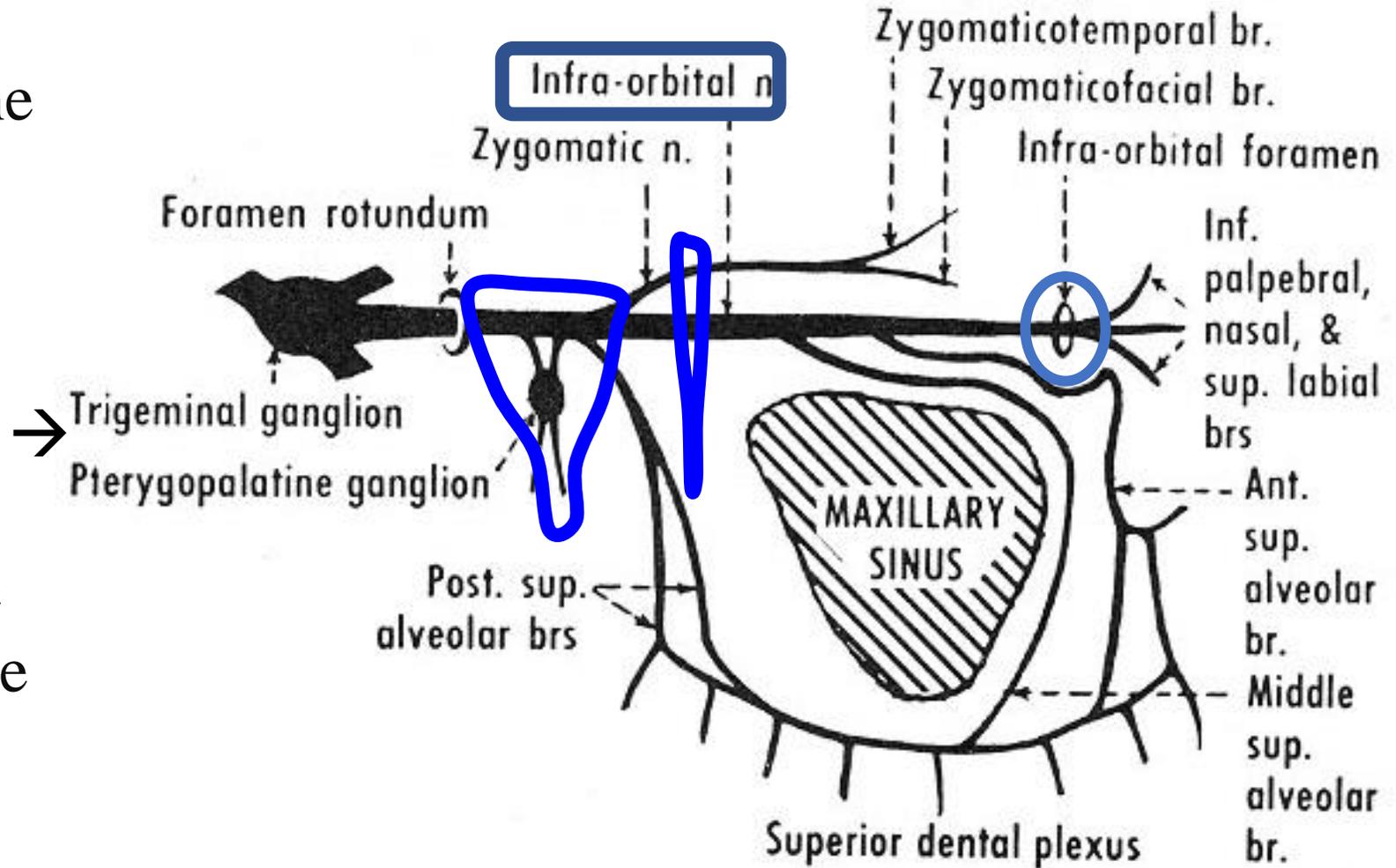


**Infraorbital nerve
emerging from infraorbital
foramen**

Foramen Rotundum

PTERYGOPALATINE FOSSA

- It enters the orbit through the **inferior orbital fissure**.
- The infraorbital nerve runs forwards on the floor of the orbit in **infraorbital groove** → **infraorbital canal** → **infraorbital foramen** → the **face** supplying the skin of the face, nose, lower eyelid and upper lip.

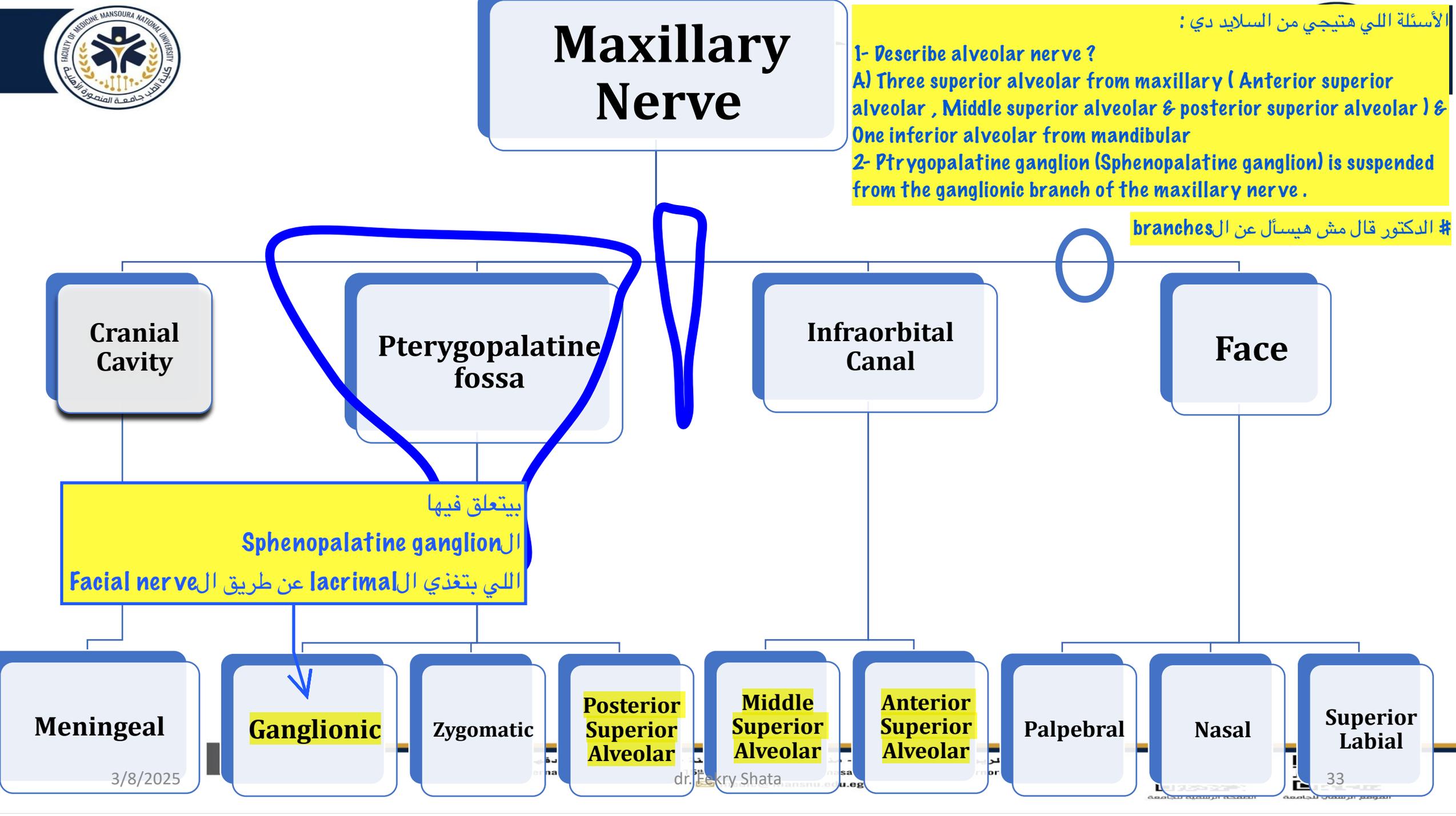


Maxillary Nerve

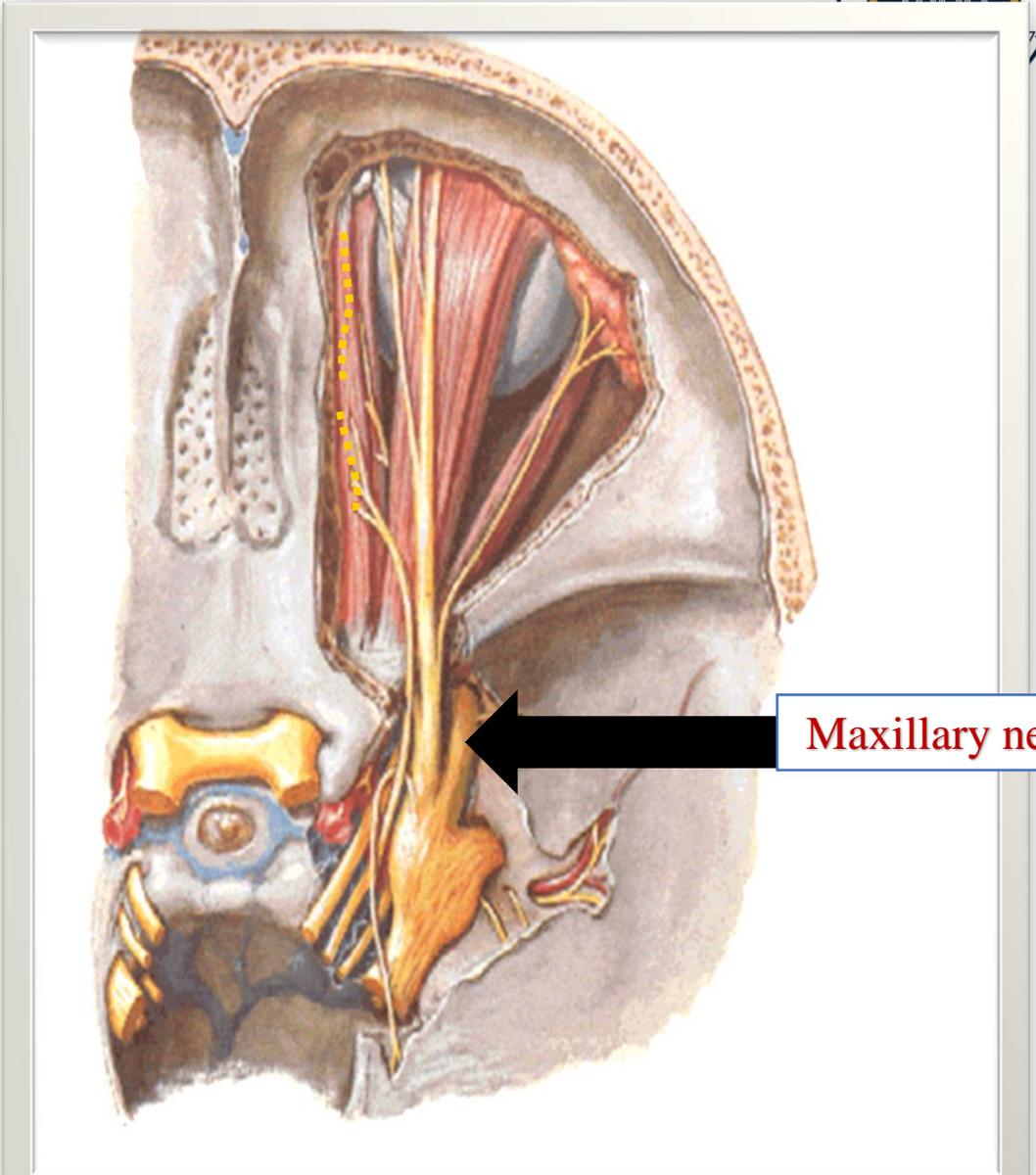
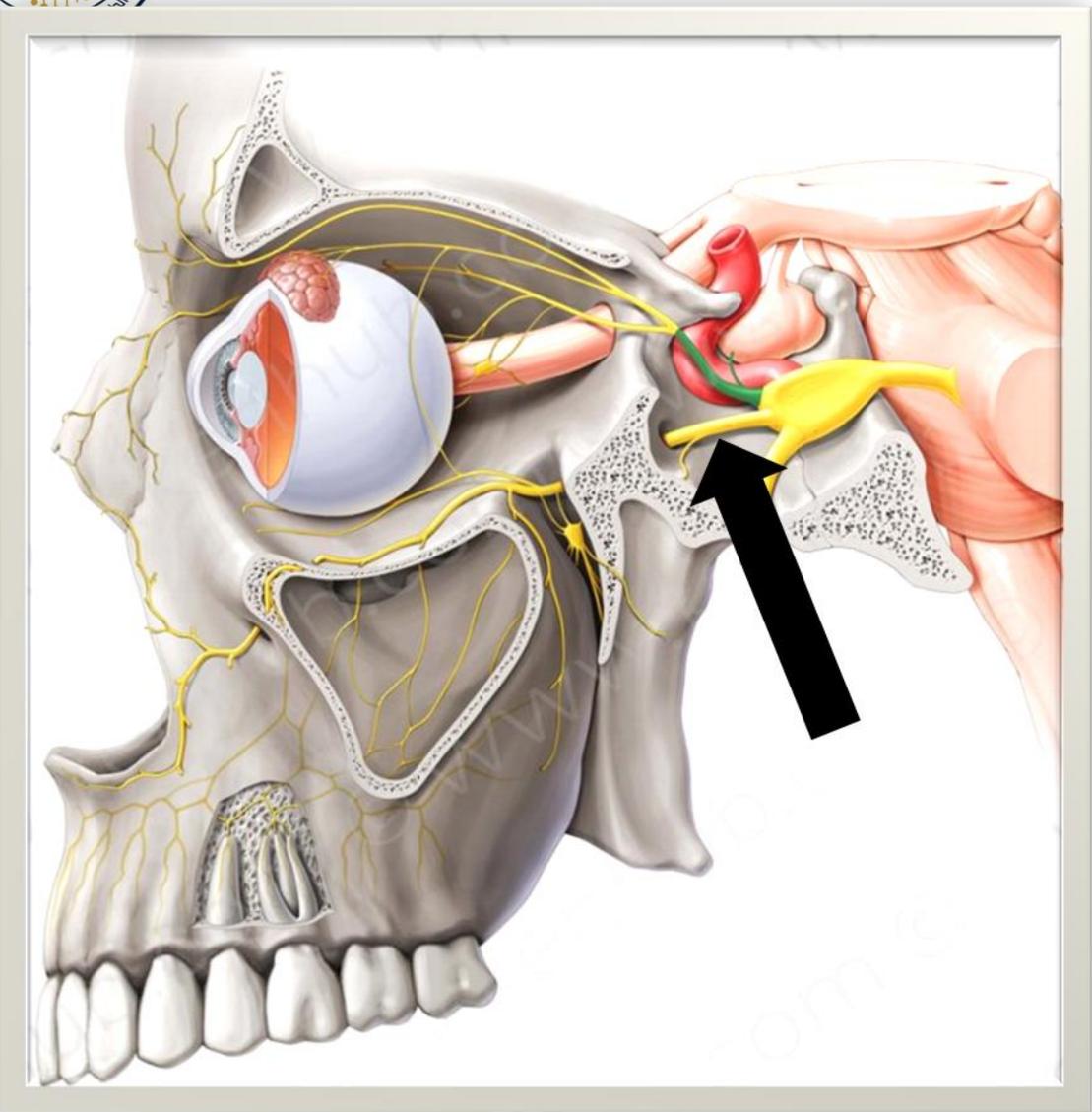
الأسئلة اللي هتيجي من السلايد دي :

- 1- Describe alveolar nerve ?
- A) Three superior alveolar from maxillary (Anterior superior alveolar , Middle superior alveolar & posterior superior alveolar) & One inferior alveolar from mandibular
- 2- Pterygopalatine ganglion (Sphenopalatine ganglion) is suspended from the ganglionic branch of the maxillary nerve .

الدكتور قال مش هيسأل عن الbranches



بيتعلق فيها
الSphenopalatine ganglion
اللي بتغذي الlacrimal عن طريق الFacial nerve



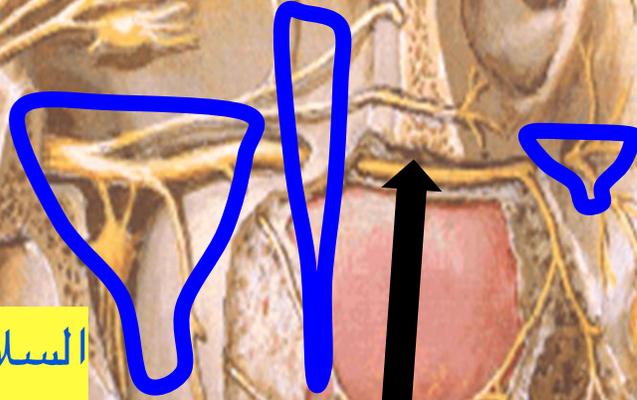
Maxillary nerve

EXIT FROM SKULL

Maxillary nerve



الاسلايد دي مهمة وحفظ



Infraorbital nerve



r. Fekry Shata



الصفحة الرسمية

الموقع الرسمي للجامعة

SAQ : Describe exit of maxillary?

A) foraman rotandum → Pterygopalatine fossa

→ infraorbital canal → infraorbital foramen



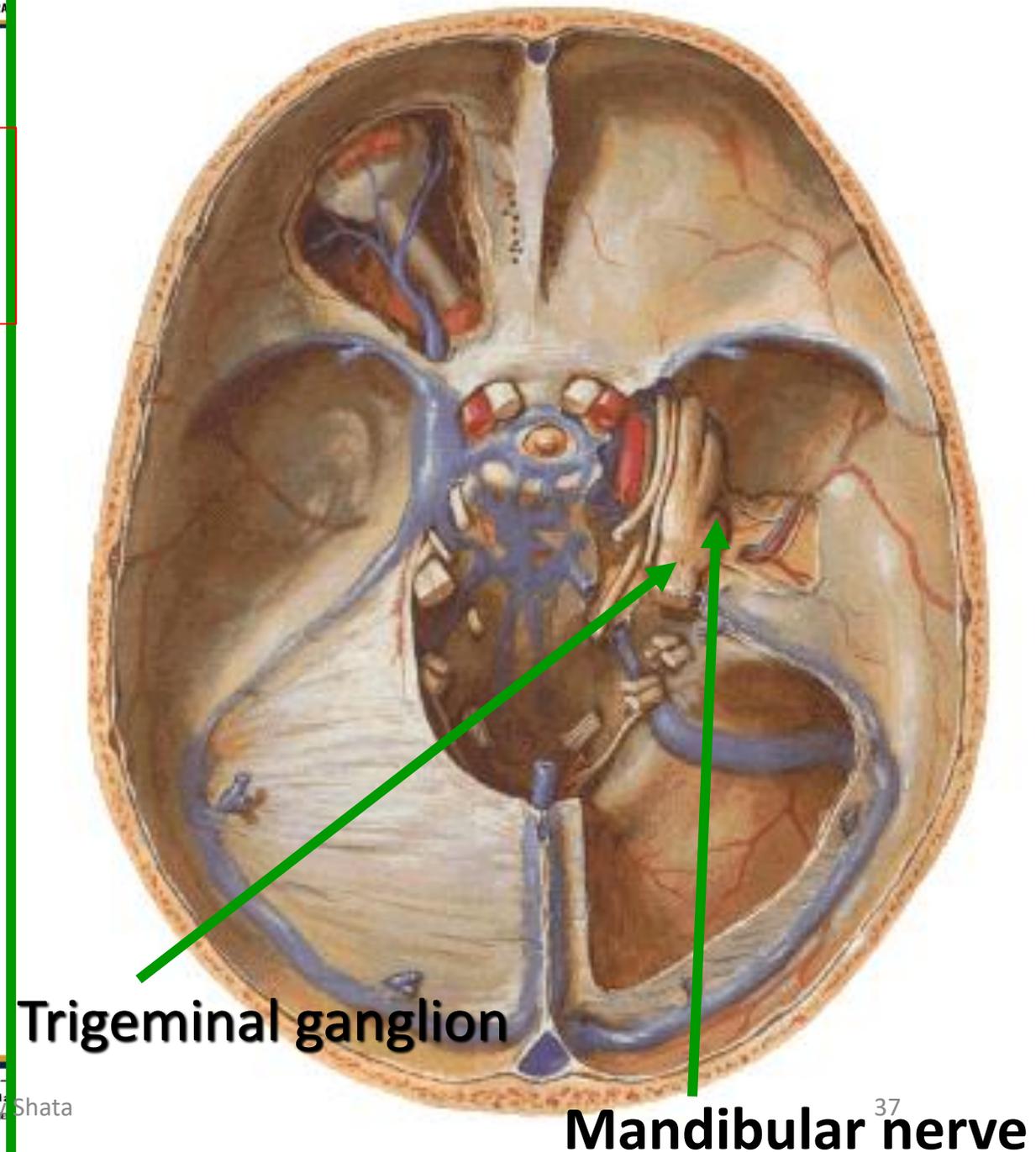
Mandibular Nerve

V3

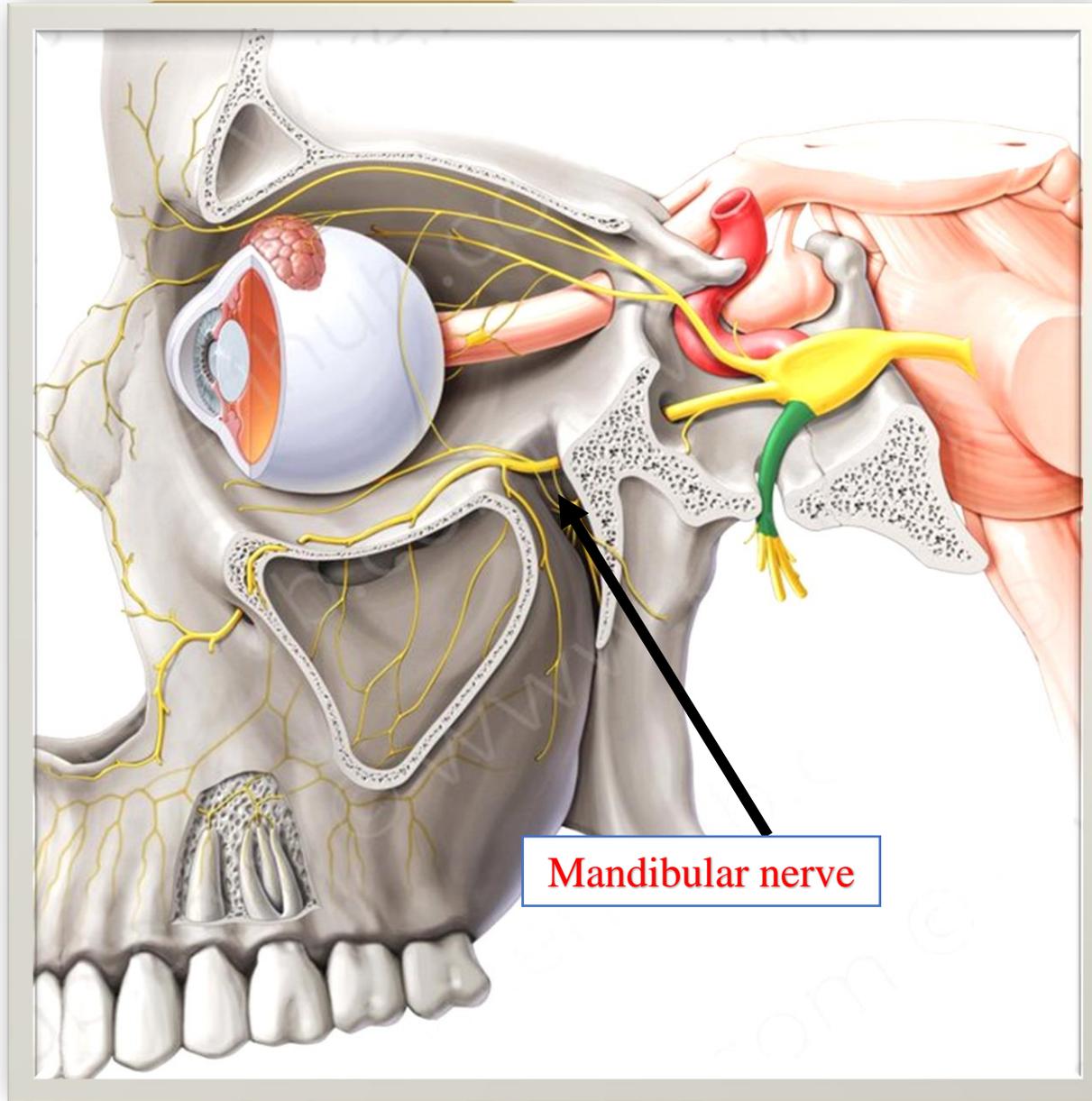


Mandibular Nerve - V3

- ❖ A **small motor root** passes under the ganglion to unite with the sensory root just outside the skull.
- ❖ A **Large Sensory root:** Arises from trigeminal ganglia in middle cranial fossa.

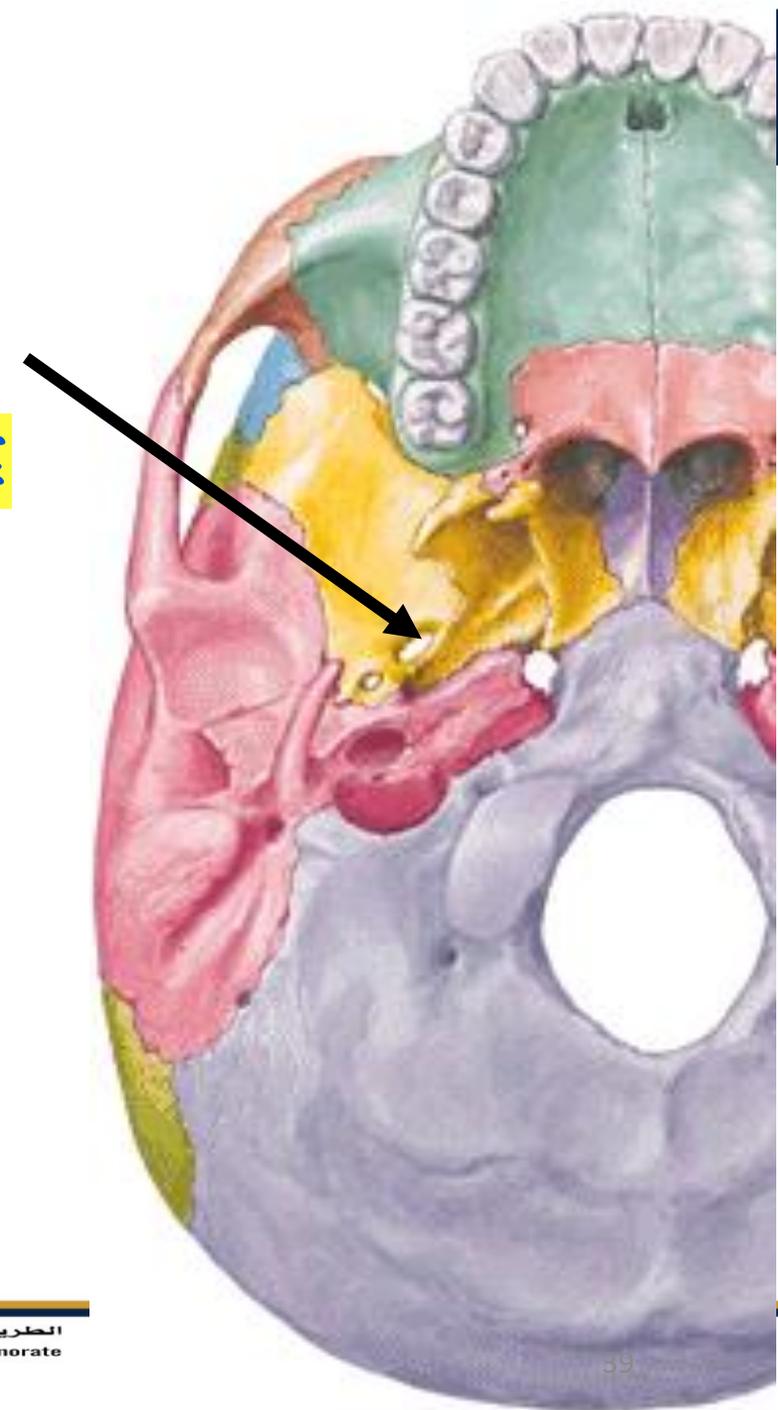


EXIT FROM SKULL



Mandibular nerve

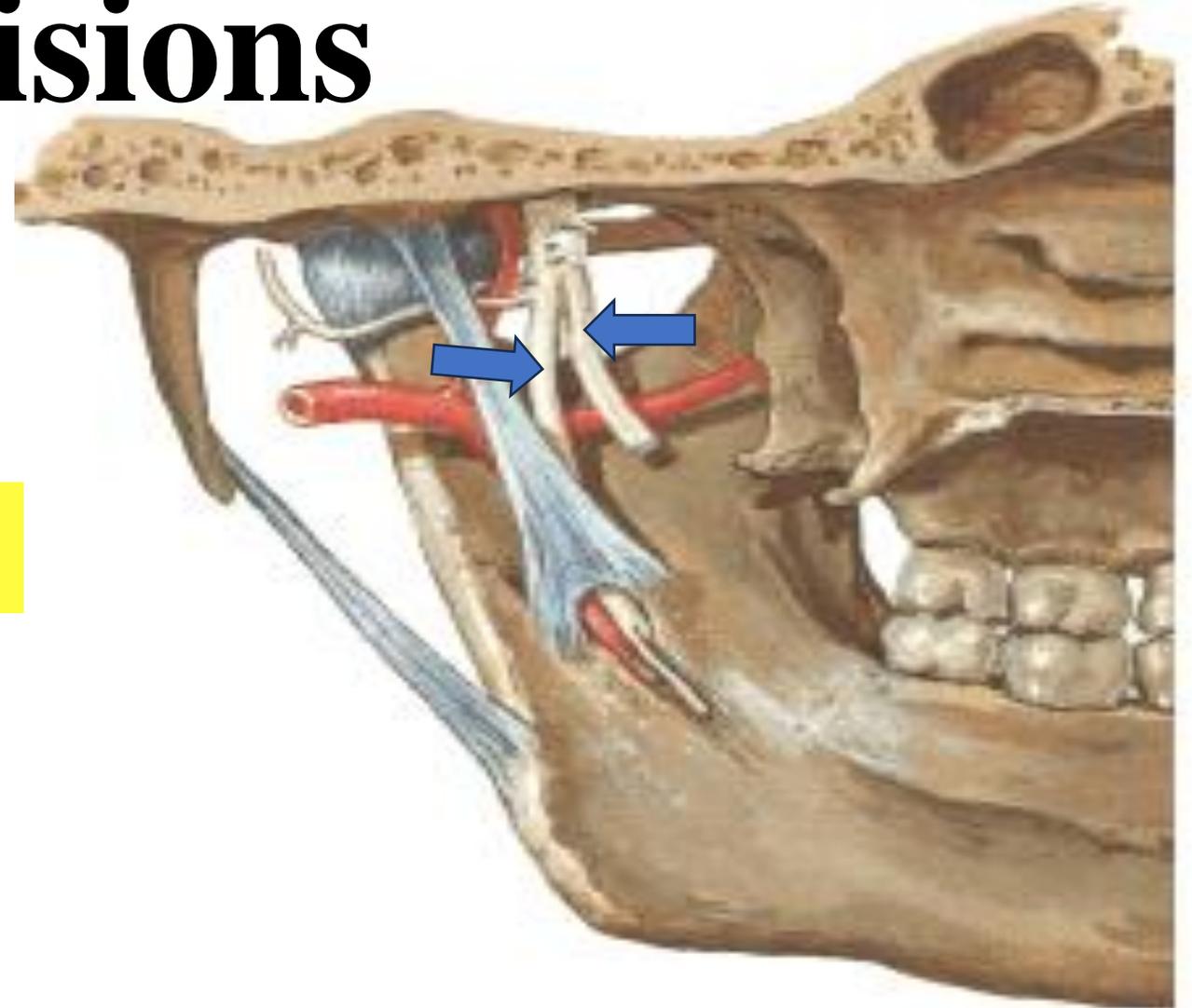
Passes through **foramen ovale** to infratemporal fossa. **MCQ + OSPE**



EXIT FROM SKULL

Divisions

- The mandibular nerve then divides into a **small anterior** and **large posterior** trunk.



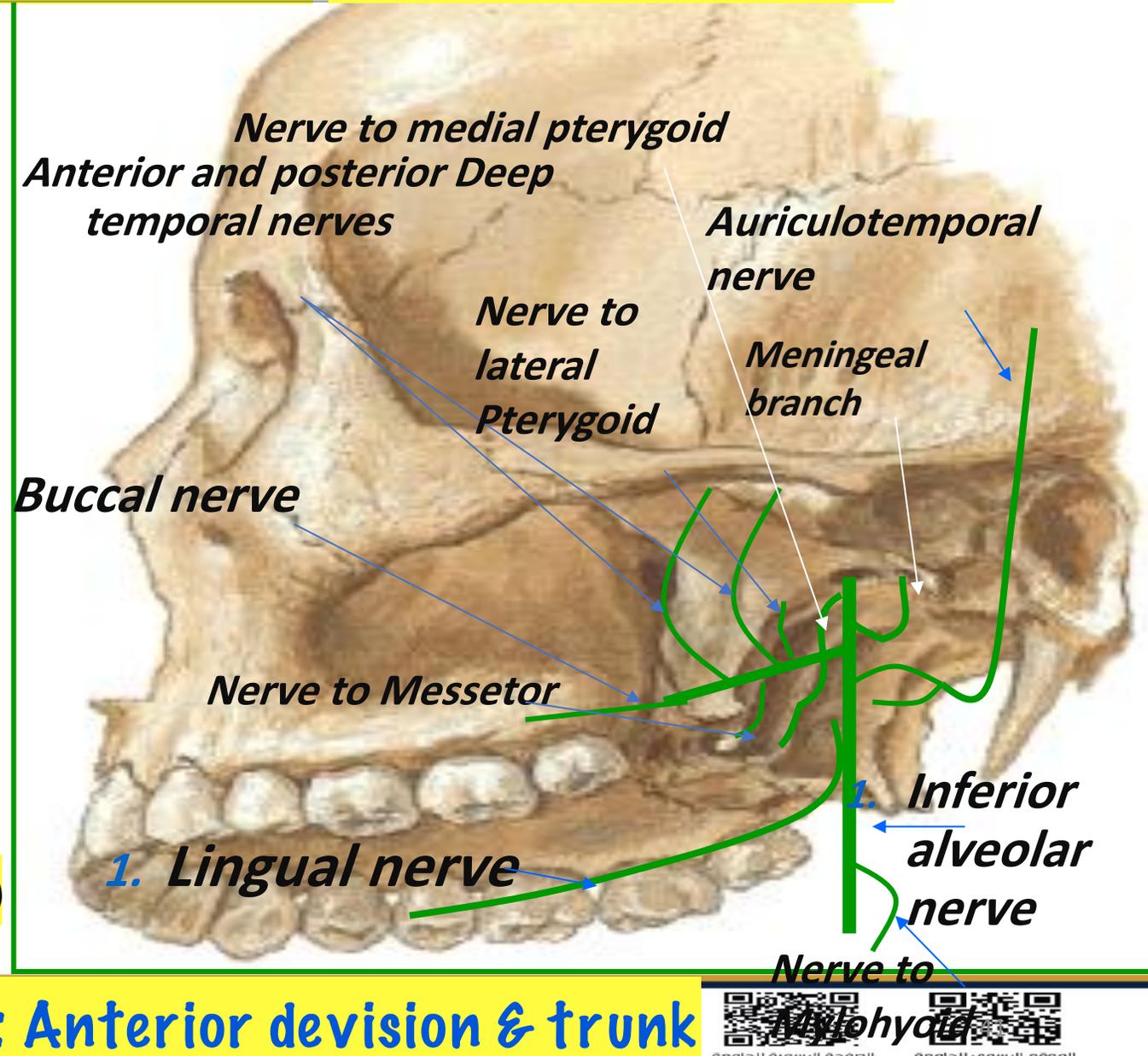
Branches مهمة وبتيجي كثير

Trunk:

1. Meningeal branch
2. Nerve to medial pterygoid muscle

Anterior Division:

1. Temporal nerves
2. Nerve to lateral Pterygoid muscle
3. Nerve to Messeter muscle
4. Buccal nerve (only sensory nerve)



MCQ : ms of mastication supplied by : Anterior division & trunk

Posterior Division:

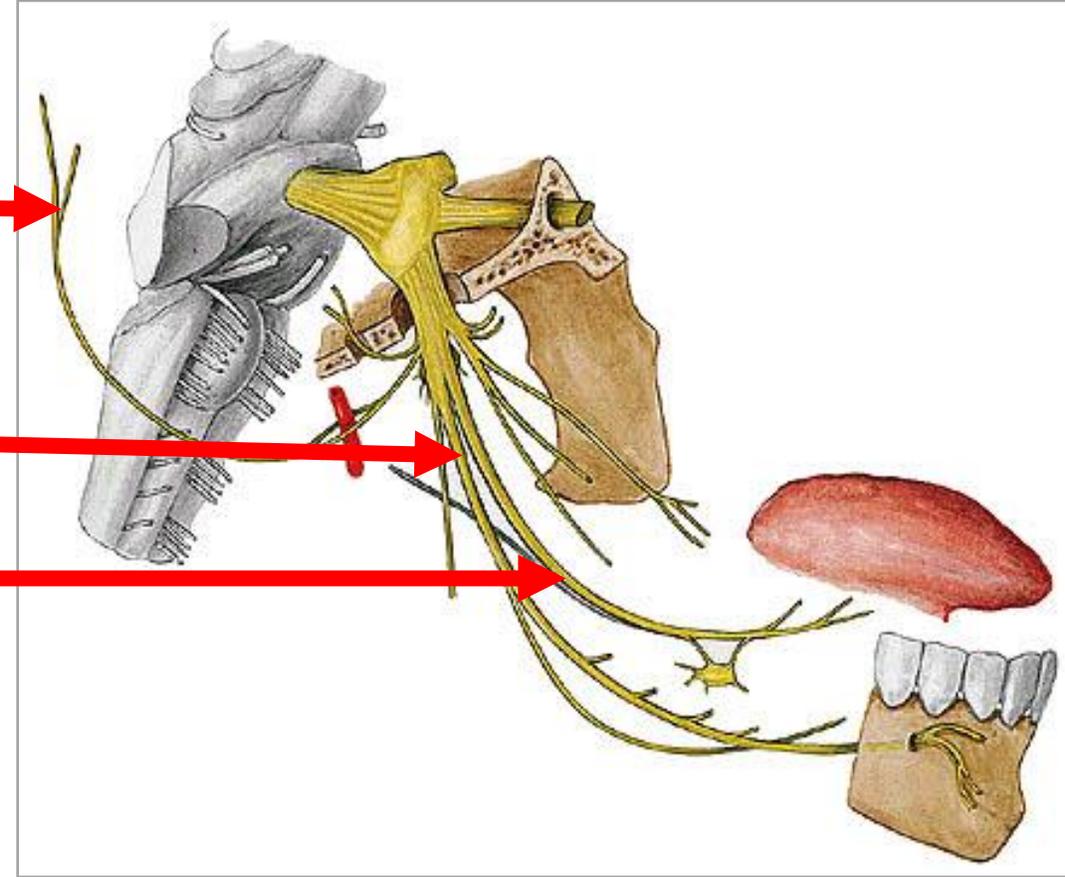
1. Auriculotemporal nerve
2. Inferior alveolar nerve
3. Lingual nerve

MCQ : lingual nerve arises from :
posterior division
أو أي برانش ويسألك طالع منين

auriculotemp. n.

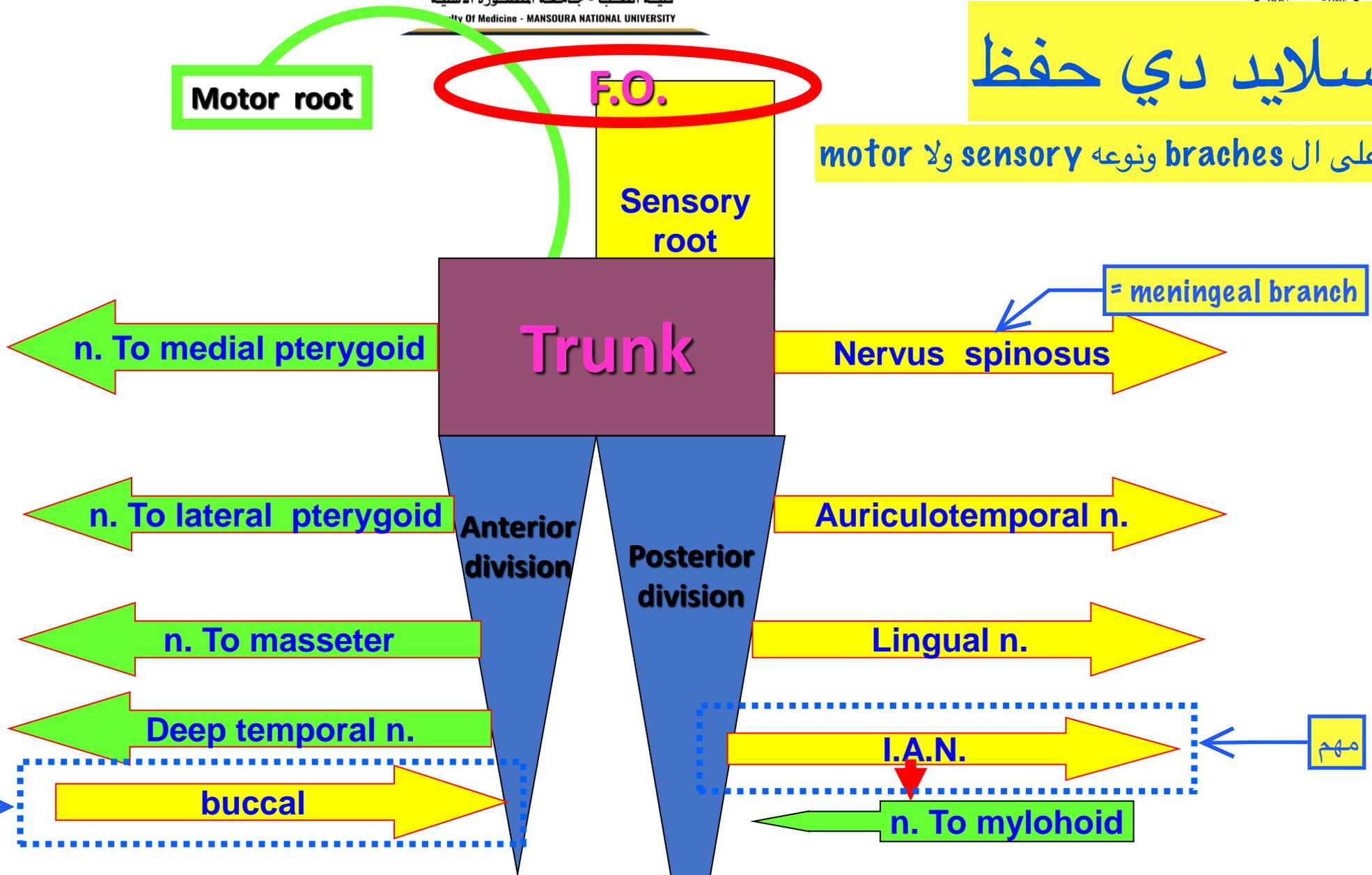
inf. alveolar n.

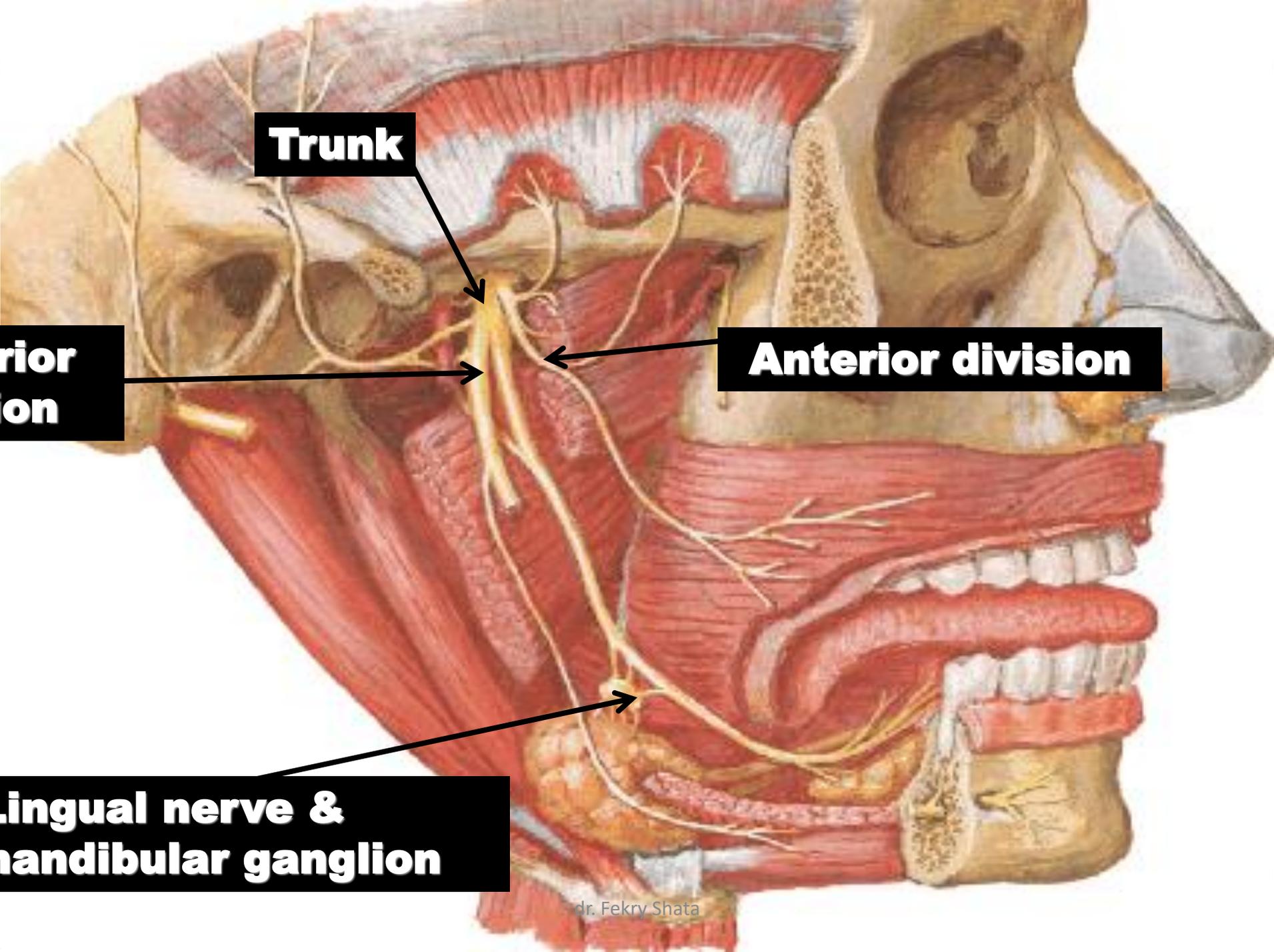
lingual n.



السلاليد دي حفظ

ركز على ال braches ونوعه sensory ولا motor



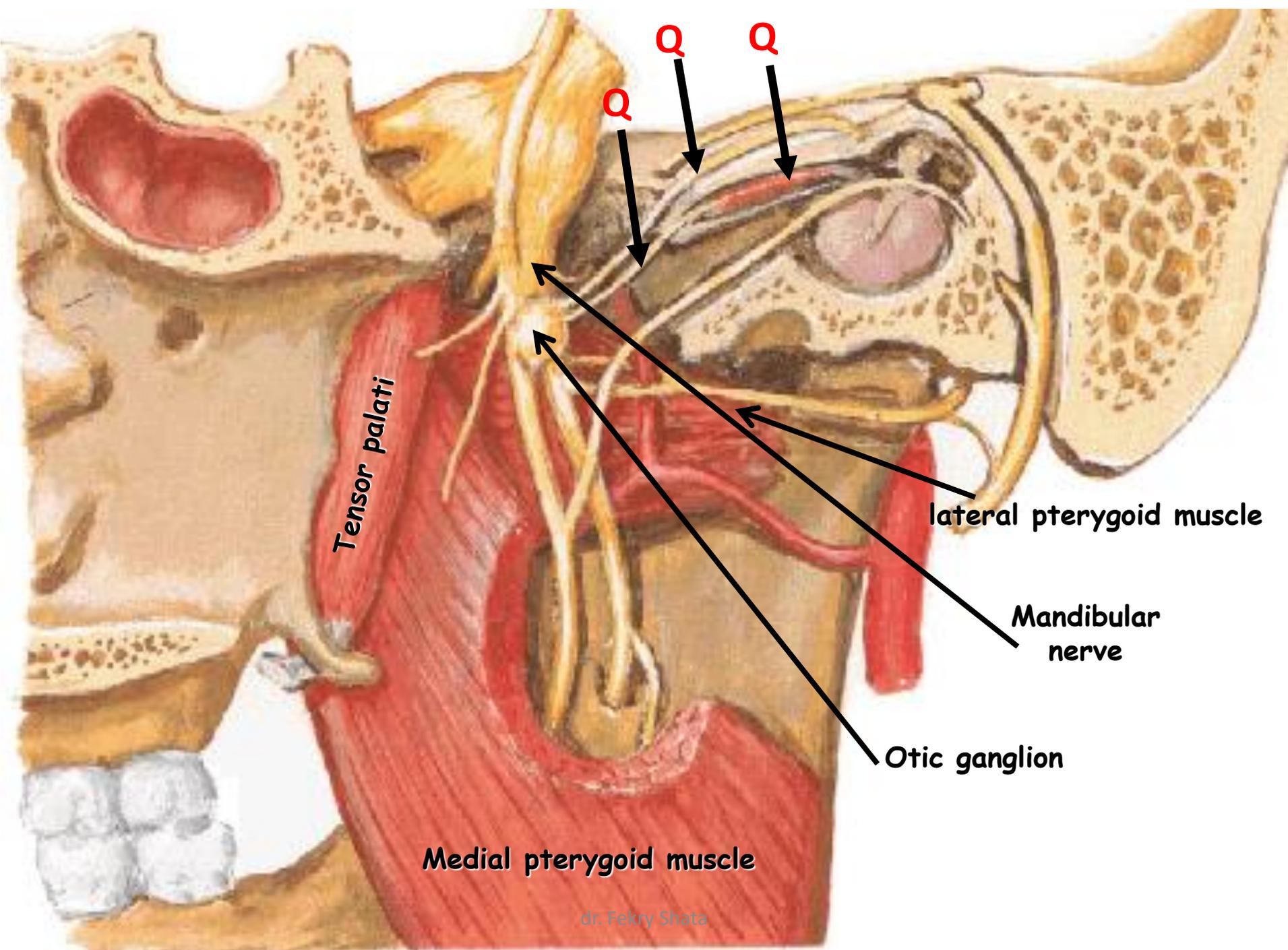


Trunk

Posterior division

Anterior division

Lingual nerve & Submandibular ganglion



Tensor palati

lateral pterygoid muscle

Mandibular nerve

Otic ganglion

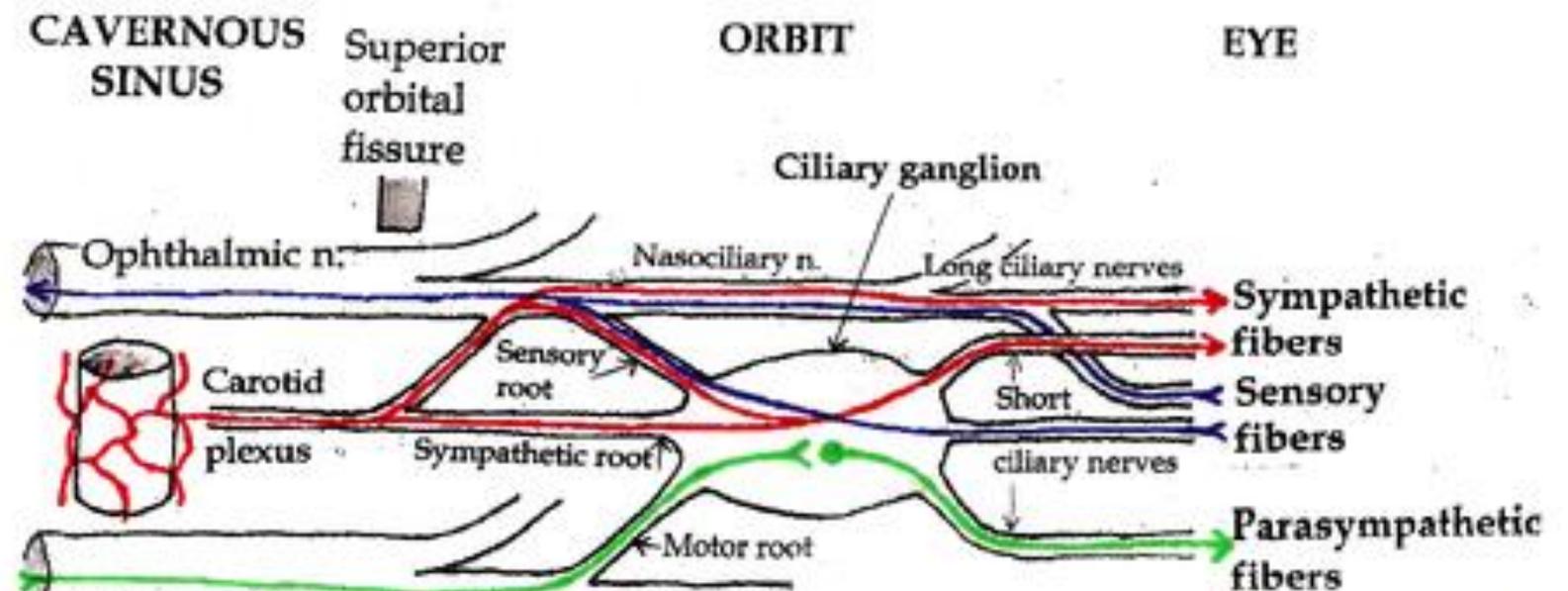
Medial pterygoid muscle

تاني أهم سؤال بعد ال Nuclei

GANGLIA ASSOCIATED WITH TRIGEMINAL NERVE

1. CILLIARY GANGLION

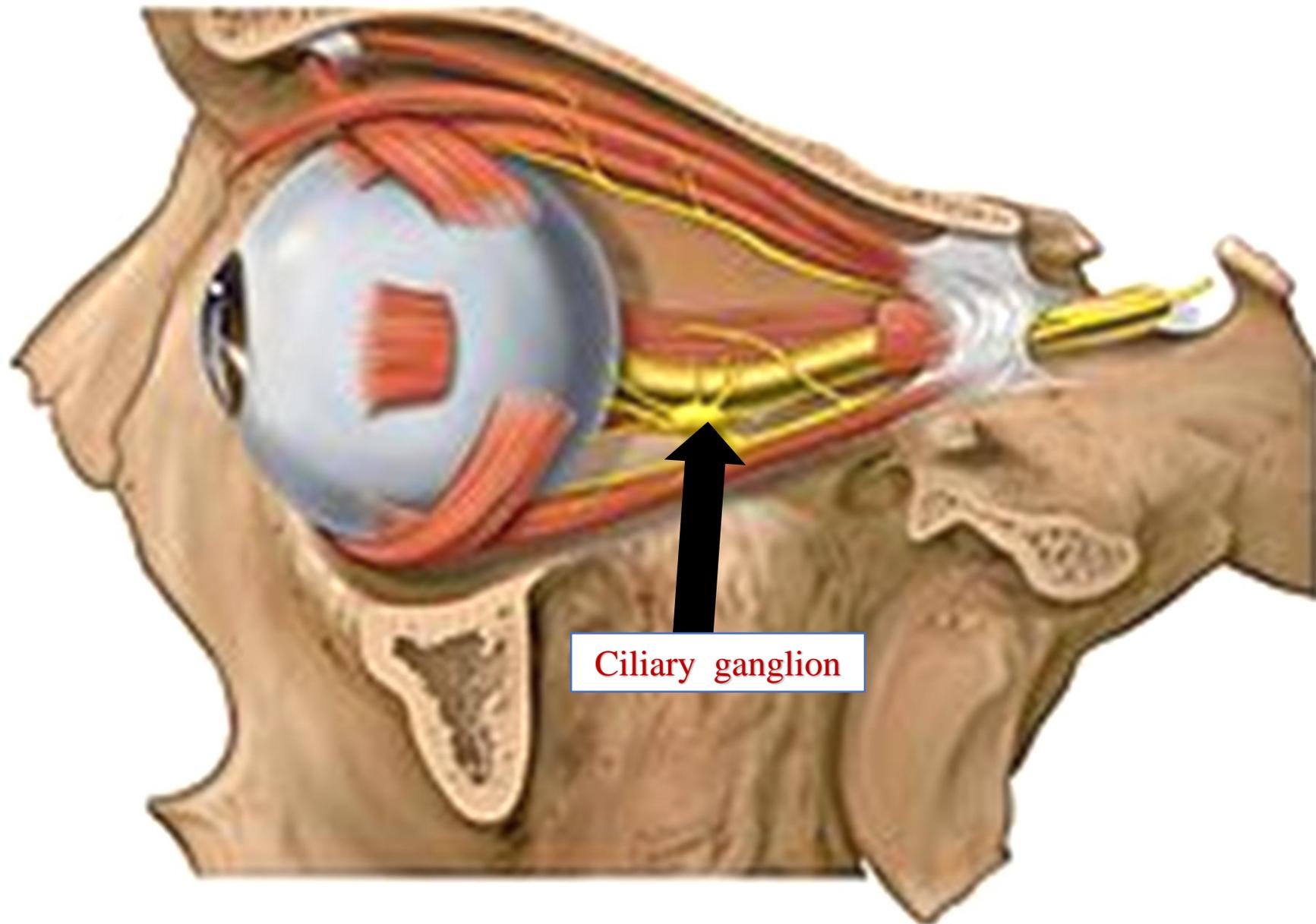
- Connected with **nasocilliary nerve**
- **Responsible for accommodation through oculomotor nerve** **MCQ**



MCQ : Ciliary ganglion related to which cranial nerve ? Oculomotor

MCQ : Ciliary ganglion suspended to ? Ophthalmic nerve





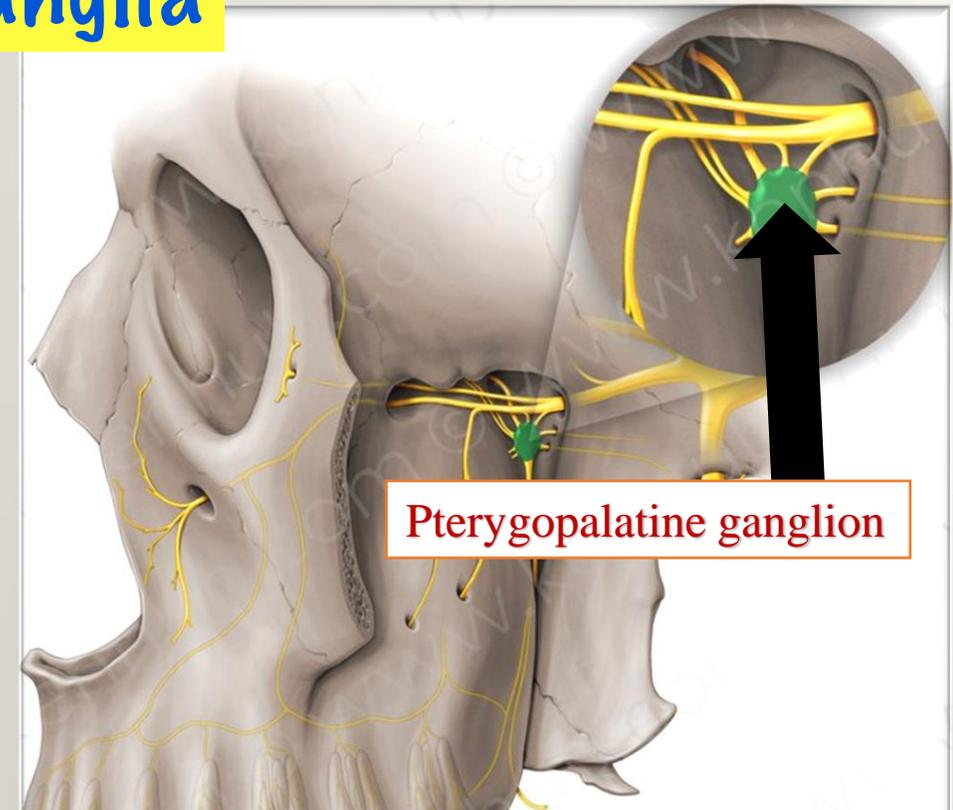
Ciliary ganglion



2. PTERYGOPALATINE

= Sphenopalatine ganglia

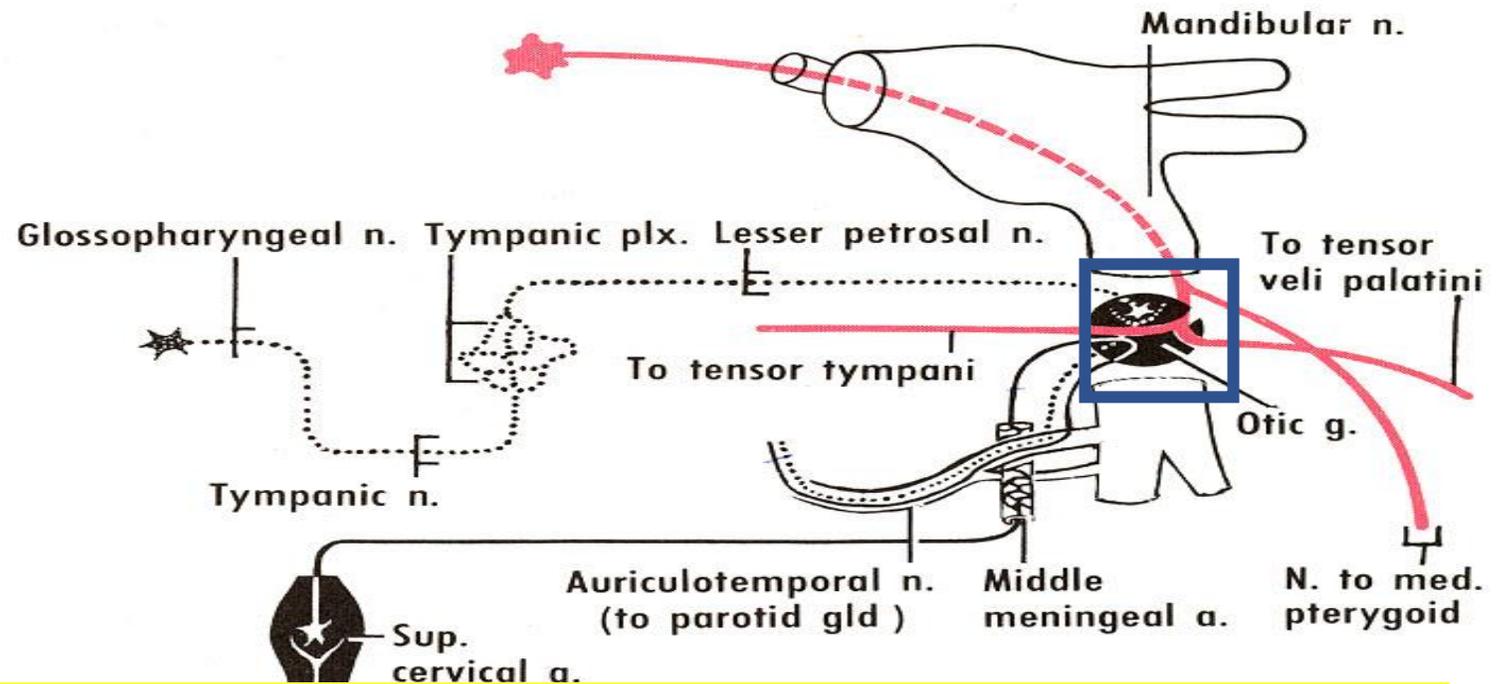
- Connected to **maxillary MCQ nerve** in infratemporal fossa
- **Secretomotor fibers to lacrimal gland through Facial nerve**



MCQ : Which ganglia related to (maxillary - Facial) ? Sphenopalatine
MCQ : Which of the following ganglia is related to maxillary nerve? Pterigopalatine

3. OTIC GANGLION

- Lies deep to the **trunk of mandibular nerve**.
- **Secretomotor fibers to parotid gland through glossopharyngeal nerve** **MCQ**



MCQ : Which of the following ganglia is related to mandibular nerve? Otic

4. Submandibular

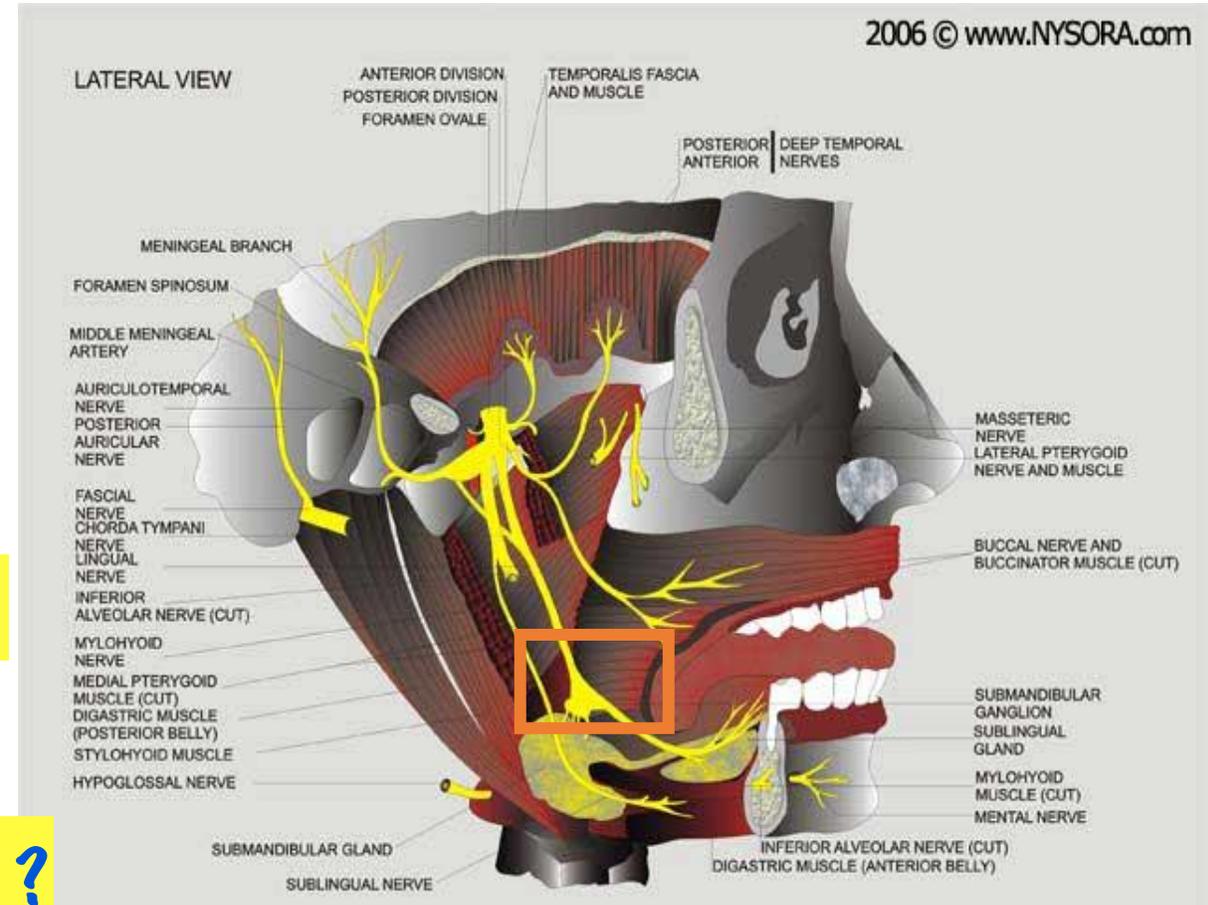
Branch of mandibular

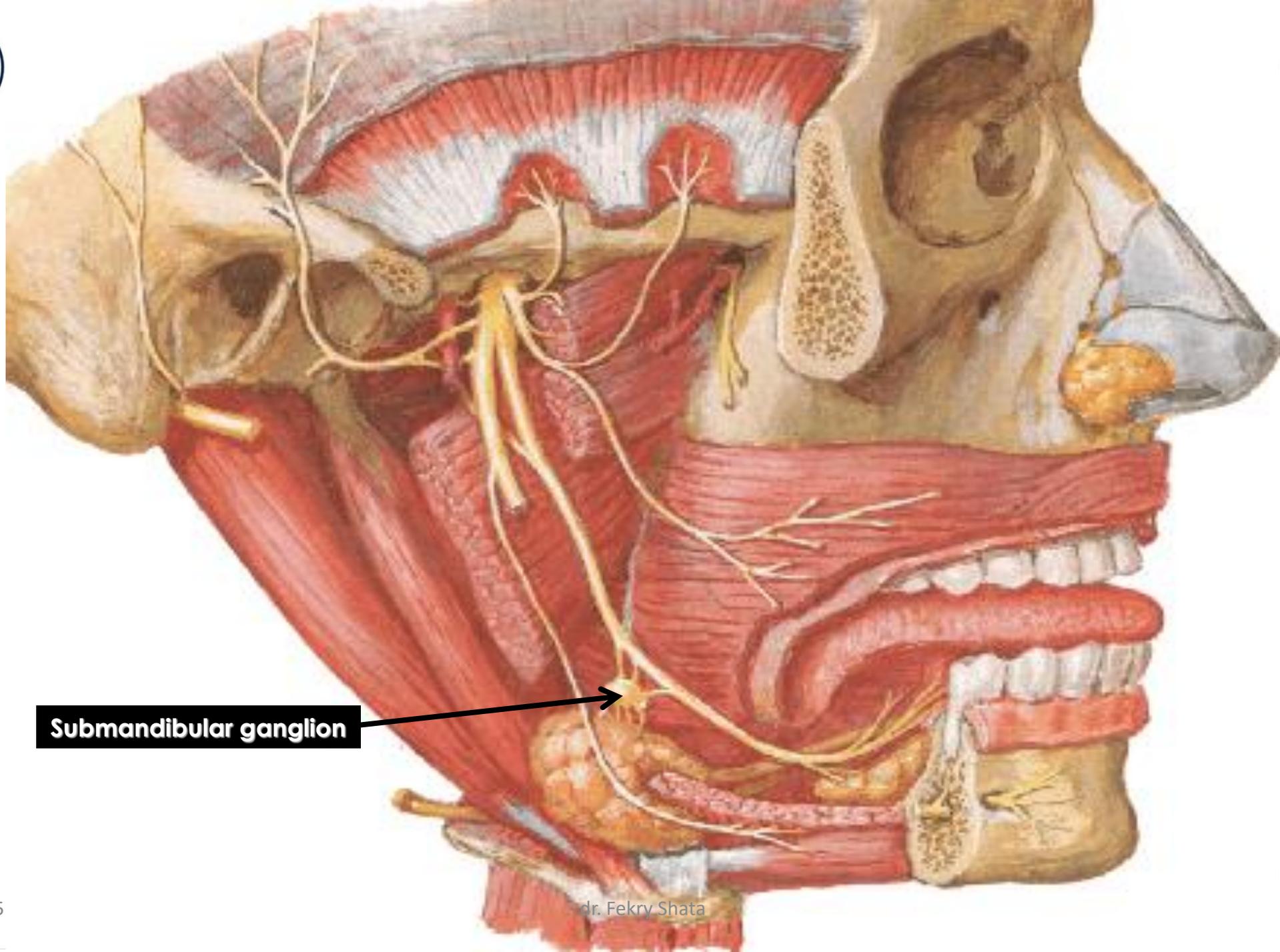
- Related to **lingual nerve**, rest on hyoglossus.

Supplies posterior ganglionic

- **Secretomotor fibres to submandibular and sublingual gland through Facial.**

**MCQ : Which ganglia related to facial ?
Submandibular & Sphenopalatine**

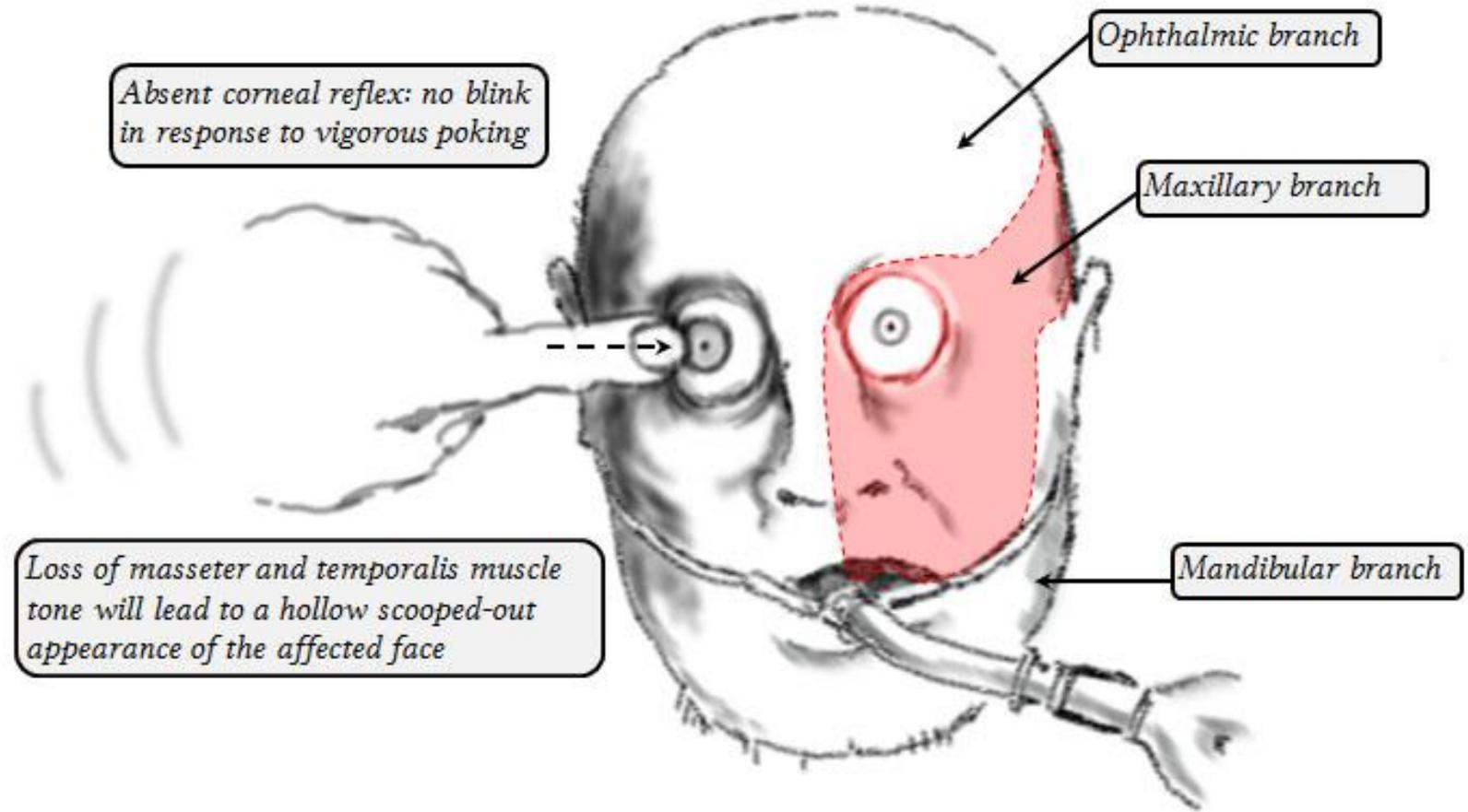




Submandibular ganglion

Trigeminal nerve lesion

- Paralysis of muscles of mastication on the **same side** of the head.
- Loss of all **sensations** on the **same side** of the face





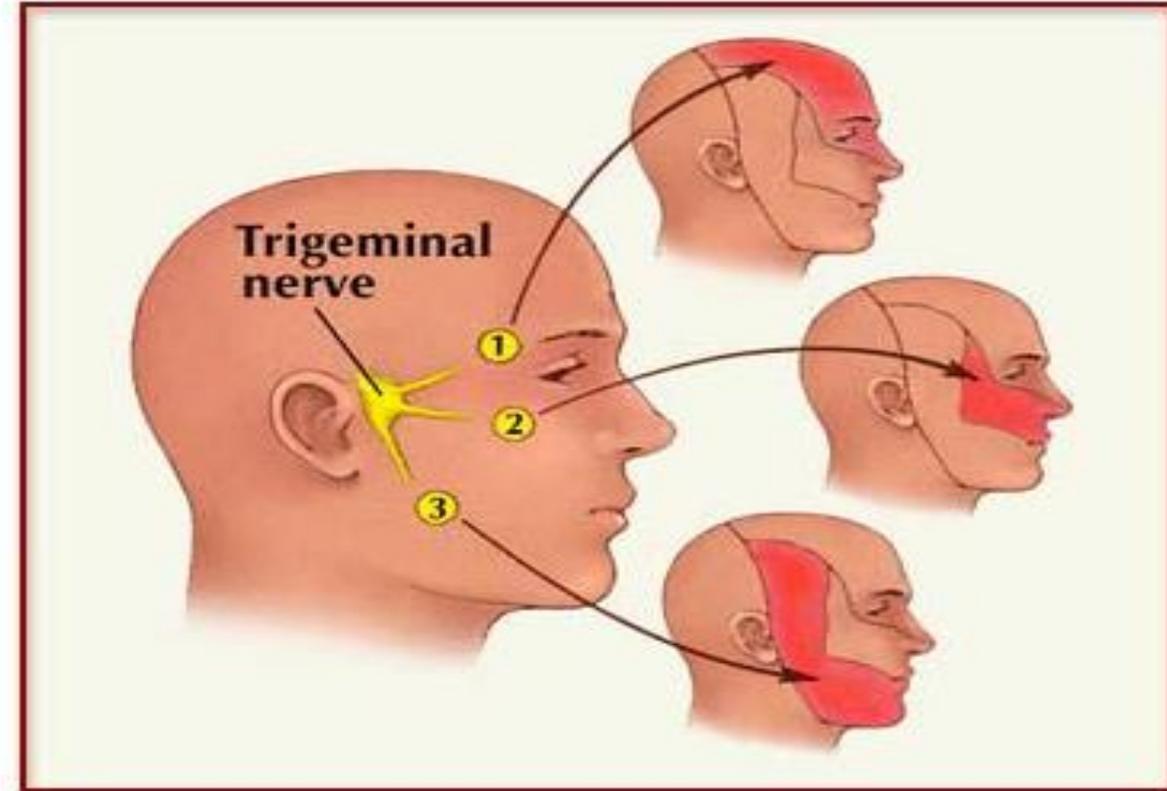
TRIGEMINAL NEURALGIA



Trigeminal Neuralgia

Fothergill's disease

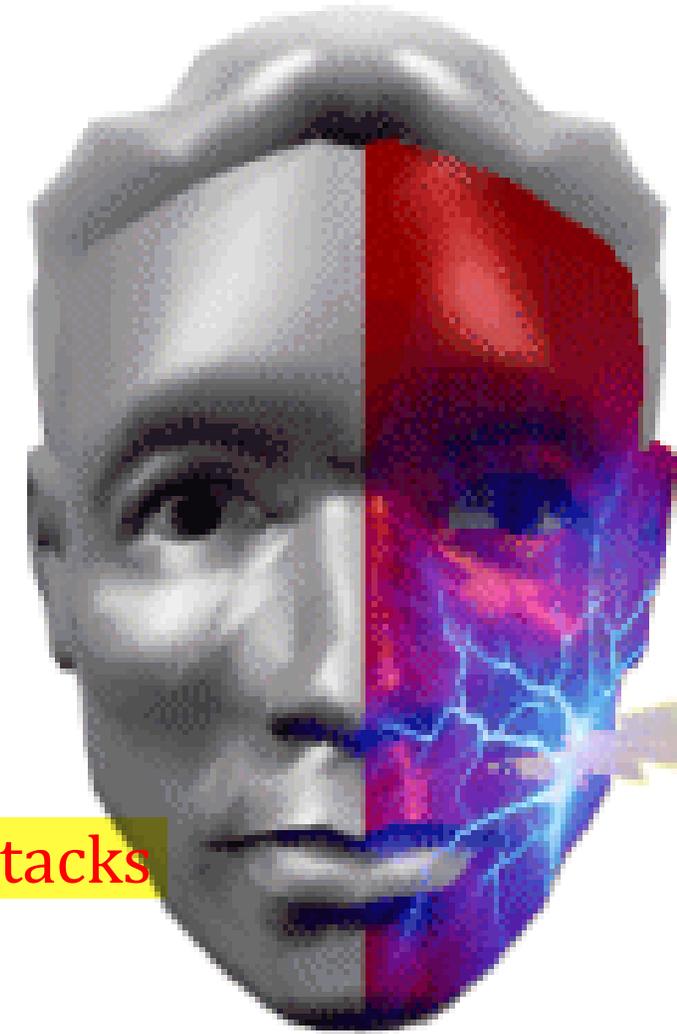
- **Tic douloureux** (painful **jerking-uncontrollable facial twitching caused by the pain**)
- Sudden, usually unilateral, severe, brief, stabbing, recurring pain in the distribution of one or more branches of trigeminal nerve.
- Mean age: **50 y** onwards
- **Female** predominance



Provocated by **stimuli** like:

1. **Touching to face** at particular site
2. **Chewing**
3. **Speaking**
4. **Brushing**
5. **Shaving**
6. **Washing the face**

The characteristic of the disorder being that the **attacks** do not occur during sleep.



Quiz

1. Paralysis of muscles of mastication on the same side of the head is caused by lesion of which cranial nerve?

- A. 3rd
- B. 5th
- C. 7th
- D. 9th
- E. 11th

Answer: B



Quiz

2. Which of the following ganglia is related to lingual nerve?

A. Ciliary

B. Submandibular

C. Pterygopalatine

D. Otic

E. Geniculate

Answer: B

References for further readings

- Oxford Handbook of Clinical Medicine (3rd edition).
- Gray's anatomy for students
- The Clinical Practice Of Neurological and Neurosurgical Nursing Fourth Edition.

