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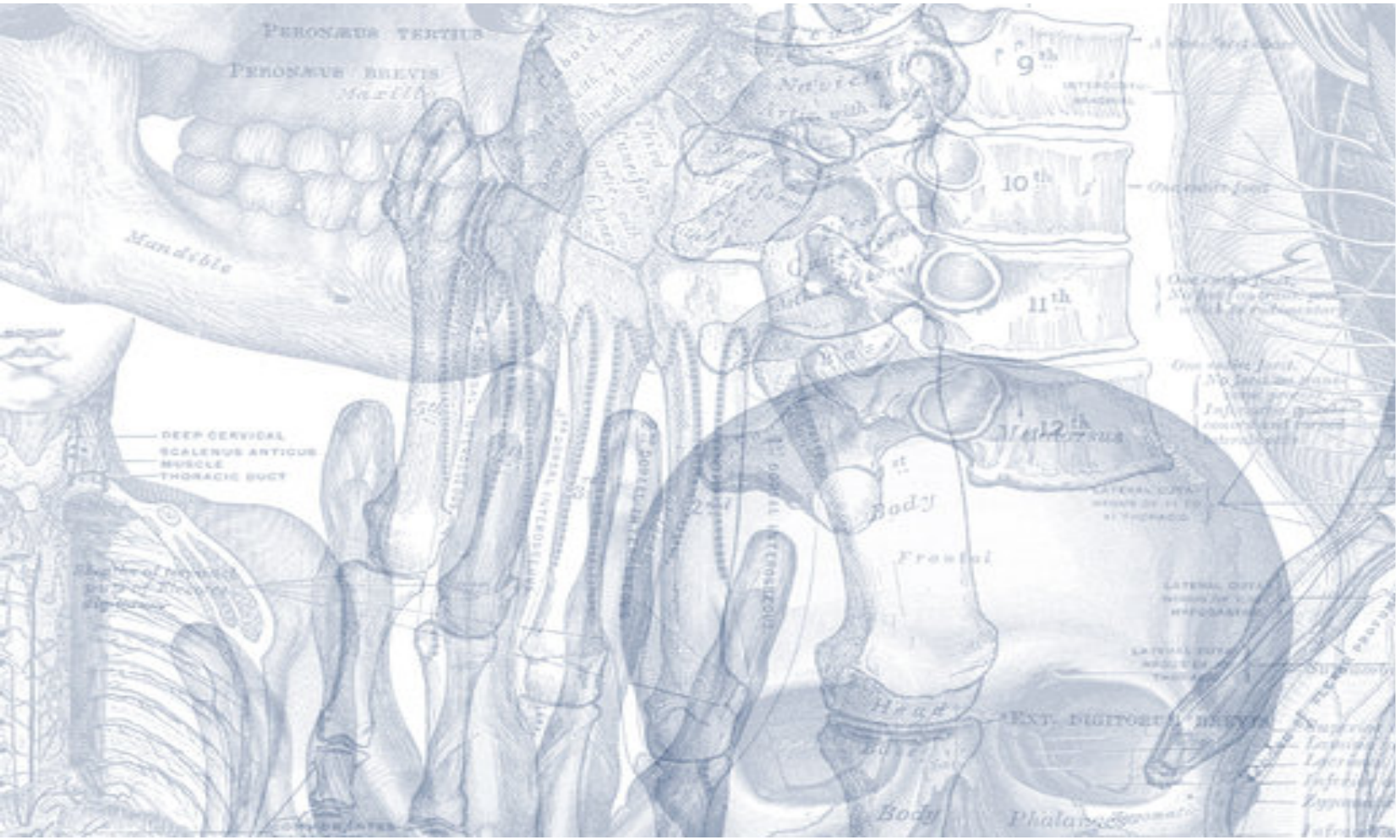


ANATOMY
TEAM 436

436
MEDICINE
KING SAUD UNIVERSITY

تمت المراجعة
شوق الأحمري & عبدالعزيز العنقري

Nerve Supply of Face: Cranial Nerves V-VII (Trigeminal & Facial Nerves)

Please view our Editing File before studying this lecture to check for any changes.

Color Code

- **Important**
- **Doctors Notes**
- **Notes/Extra explanation**

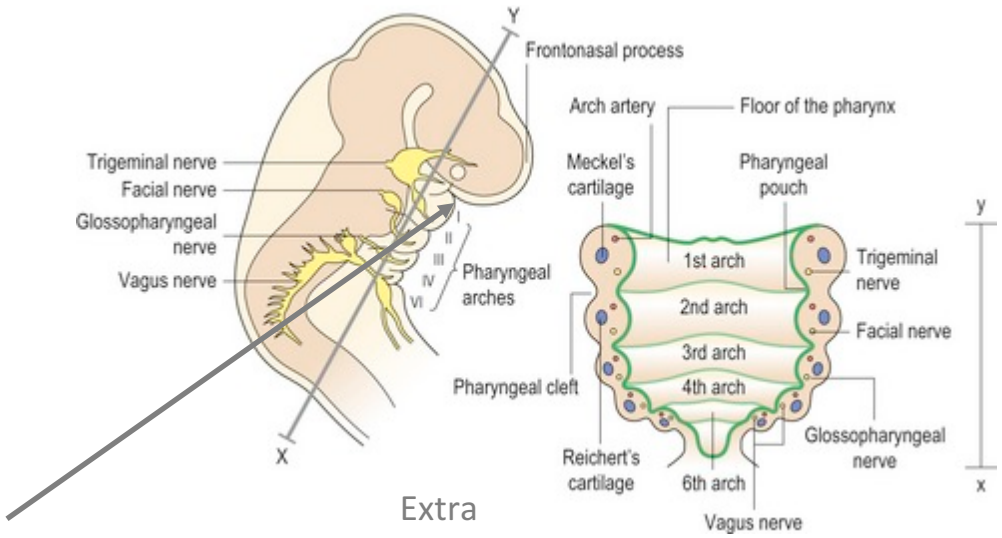
Objectives

By the end of the lecture, students should be able to:

- ✓ List the nuclei of the deep origin of the trigeminal and facial nerves in the brain stem.
- ✓ Describe the type and site of each nucleus.
- ✓ Describe the superficial attachment of trigeminal and facial nerves to the brain stem.
- ✓ Describe the main course and distribution of trigeminal and facial nerves in the face.
- ✓ Describe the main motor & sensory manifestation in case of lesion of the trigeminal & facial nerves.

Trigeminal (V) 5th Cranial Nerve

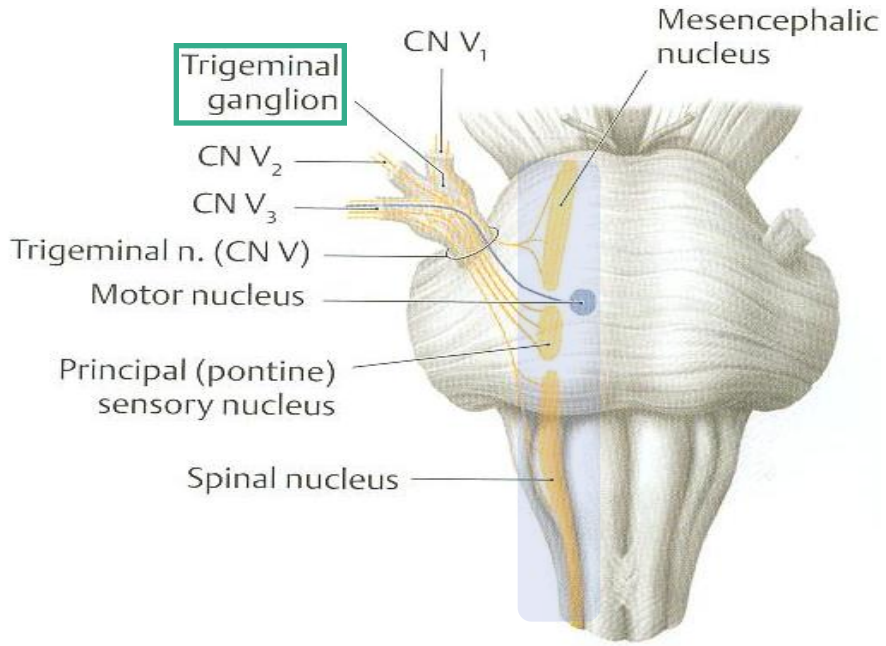
- Type: **Mixed** (sensory & motor).
- Fibers:
  1. *General somatic afferent*: afferent → sensory
     Carrying general sensations from **face,** and anterior part of **scalp**.
  2. *Special visceral efferent*: efferent → motor
     Supplying **muscles developed from the 1st pharyngeal arch**, (8 muscles will be mentioned in slide 5).



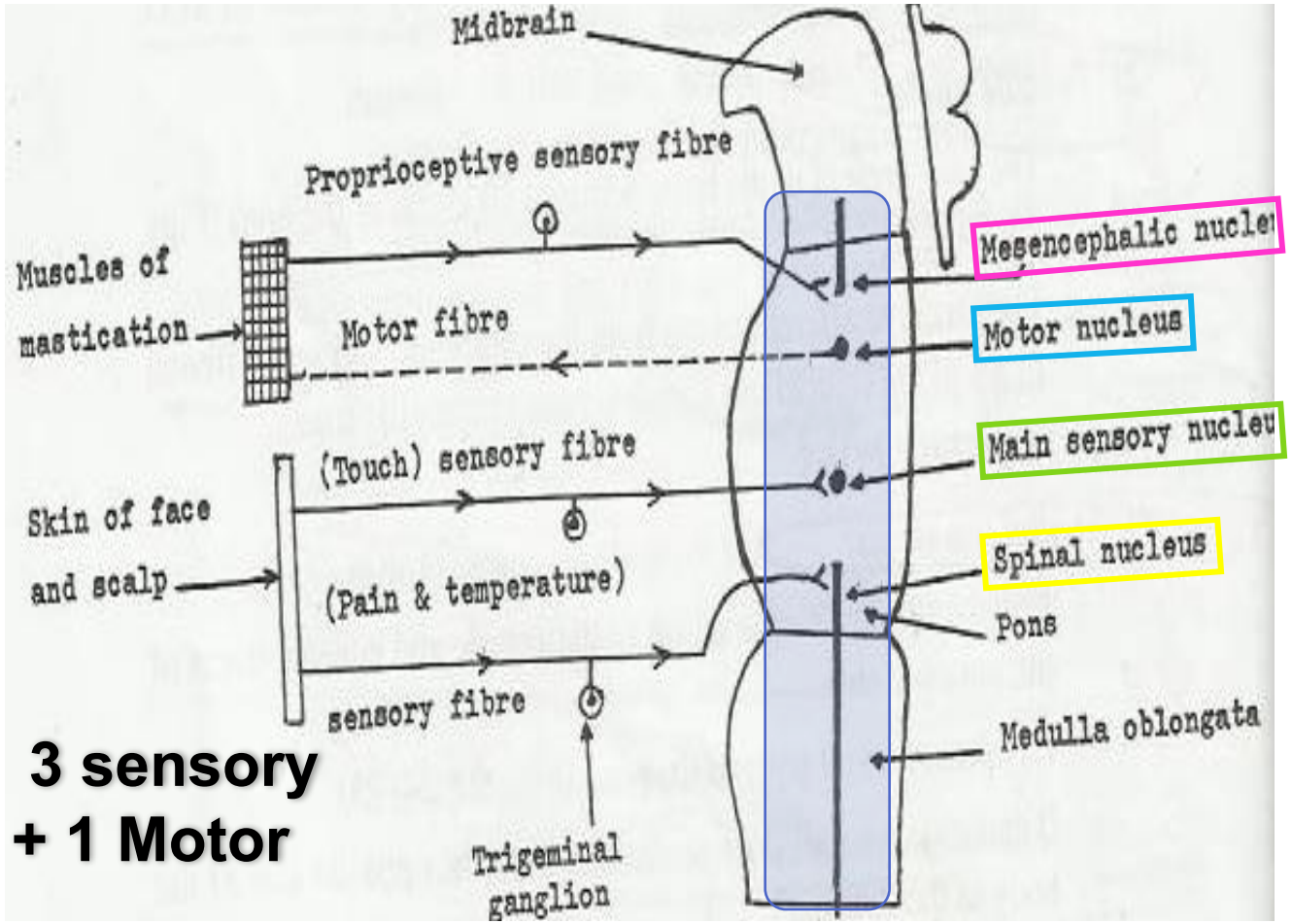
Extra

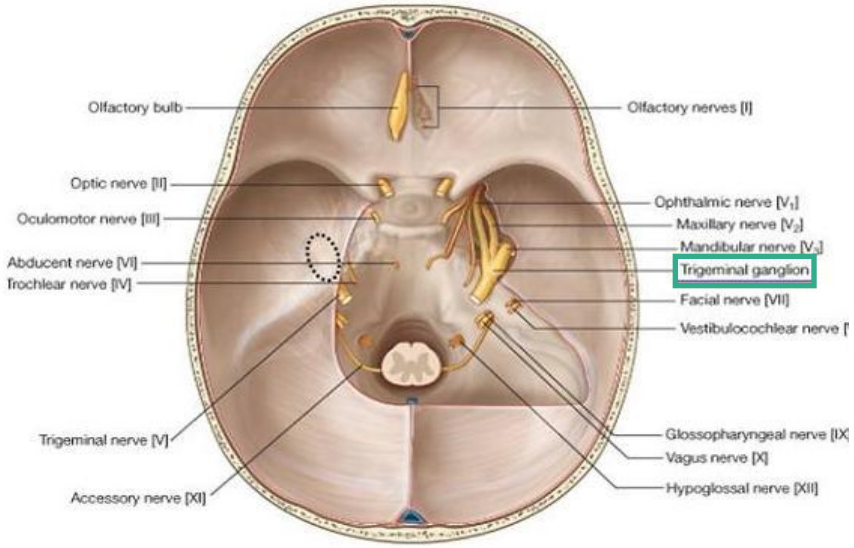
Trigeminal Ganglion

- *Site*: Occupies a depression in the middle cranial fossa. see next slide
- *Importance*: Contains cell bodies:
  1. Whose dendrites carry sensations from the face.
  2. Whose axons form the sensory root of trigeminal nerve.



Trigeminal (V) 5th Cranial Nerve
Nuclei (deep origin)





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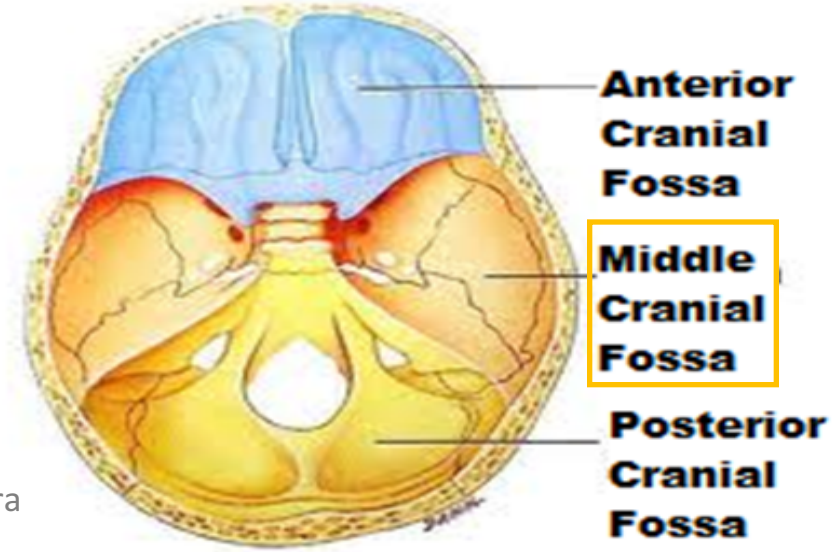


Trigeminal (V) 5th Cranial Nerve
Nuclei

Four nuclei: (3 sensory + 1 Motor).

*chewing

General somatic afferent:

1. **Mesencephalic nucleus** (midbrain &pons): receives *proprioceptive* fibers from muscles of mastication*.

2. **Principal (main) sensory nucleus** (pons): receives *touch* fibers from face & scalp

3. **Spinal nucleus** (pons, medulla & upper 2-3 cervical segments of spinal cord): receives *pain & temperature* sensations from face & scalp.

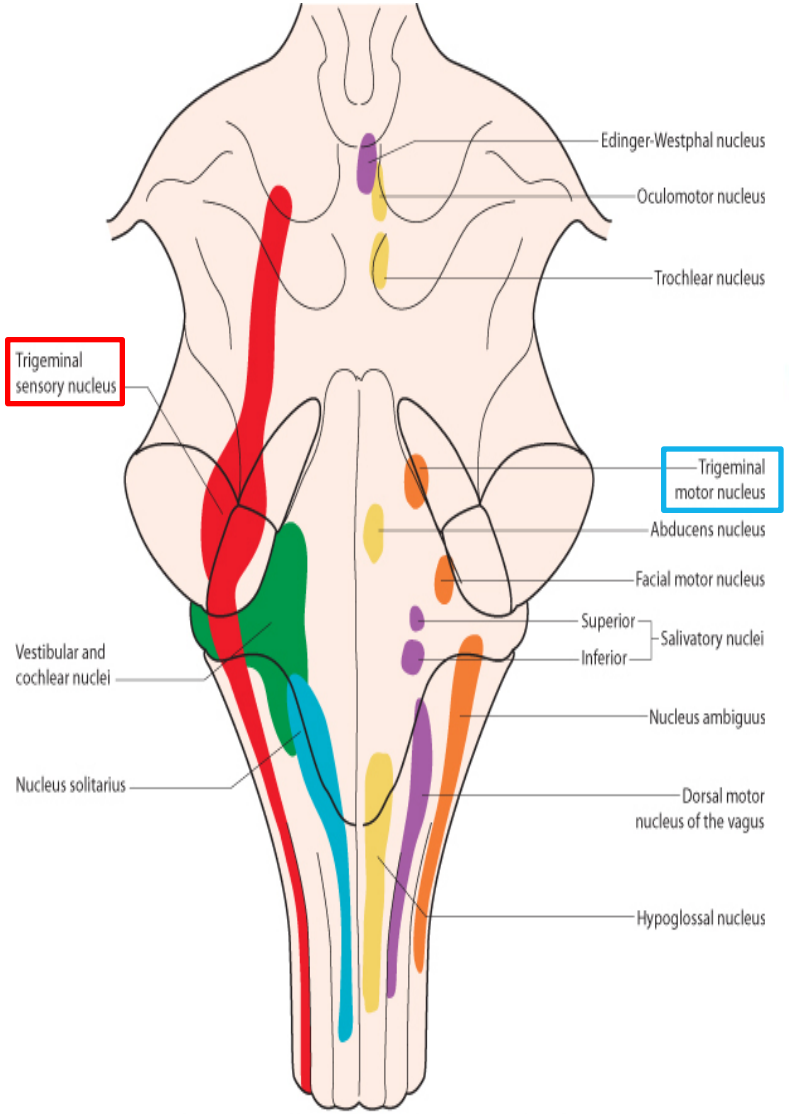
the other name of it is tractus nucleus
لانها زي التراكت نازلة لتحت.

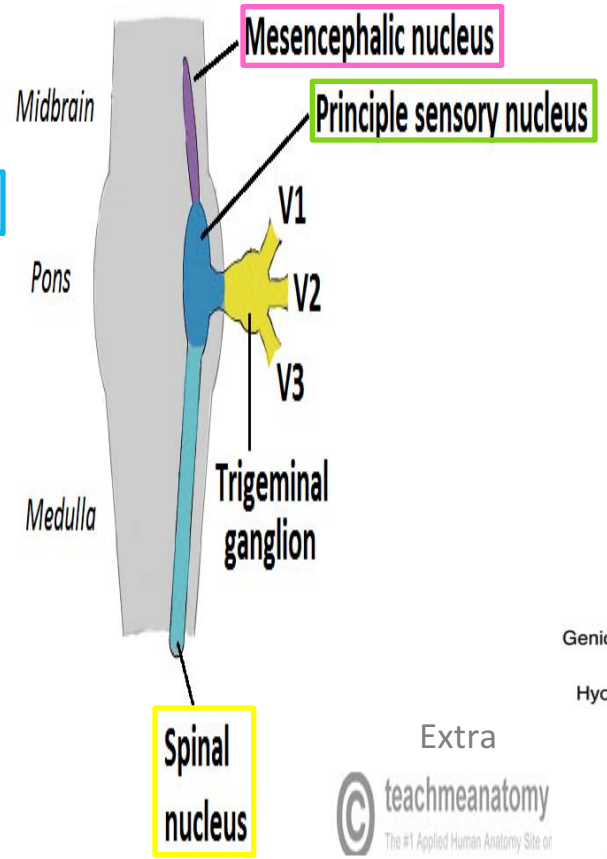
Special visceral efferent:

Motor nucleus (pons): supplies:

- Four Muscles of mastication* (temporalis, masseter, medial & lateral pterygoid).
- **Other four muscles** (Anterior belly of digastric, mylohyoid, tensor palati & tensor tympani).

For the diagrams see next slide





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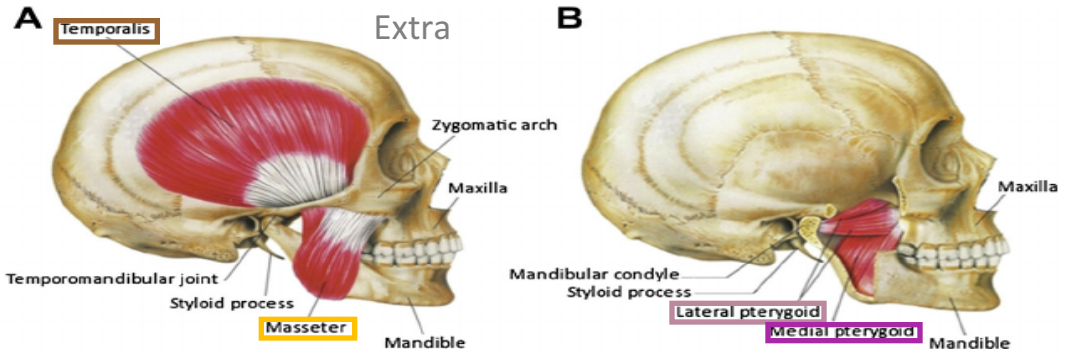

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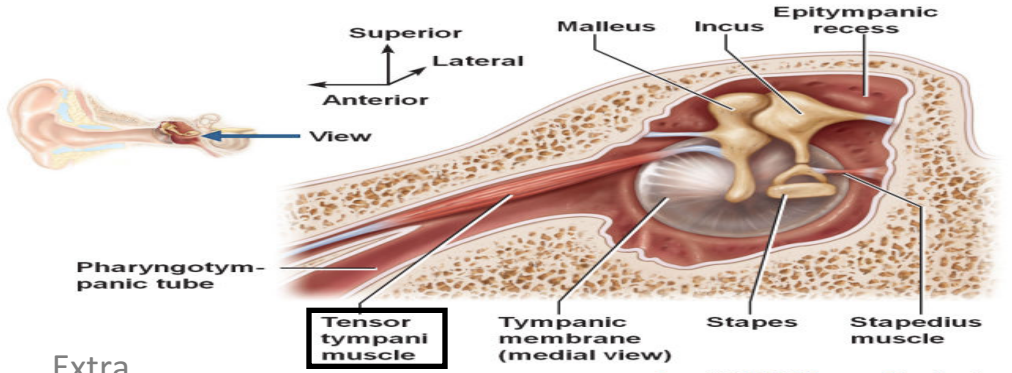

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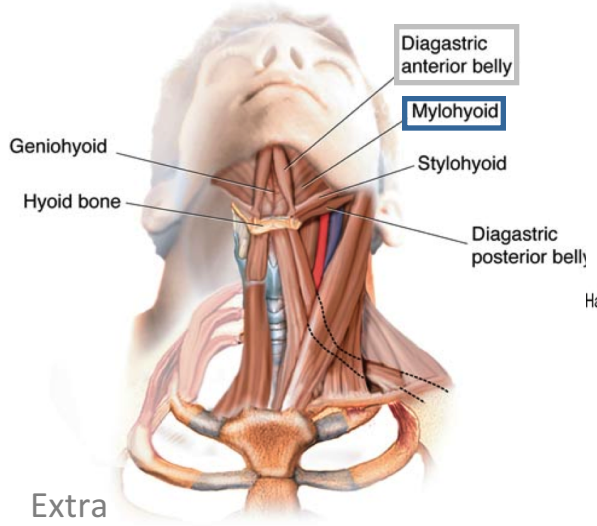

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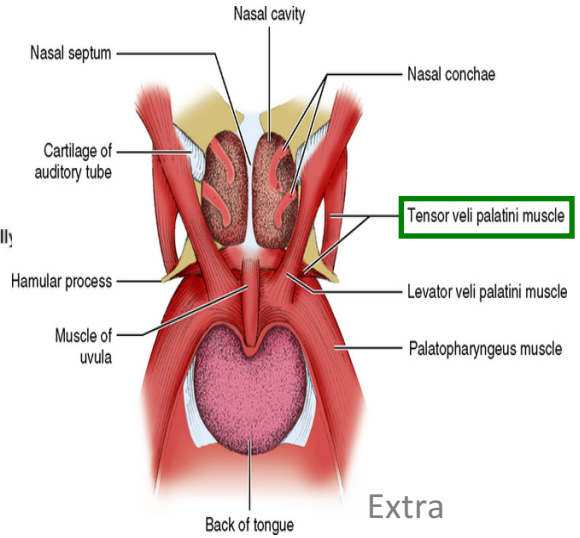
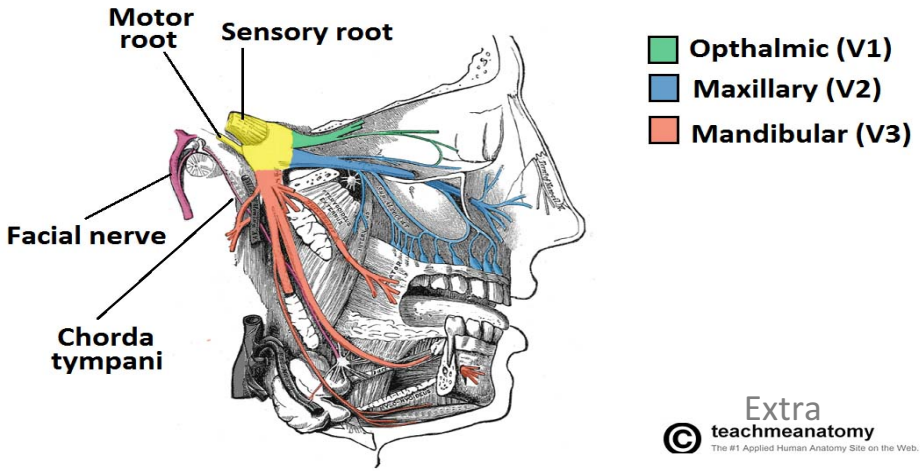


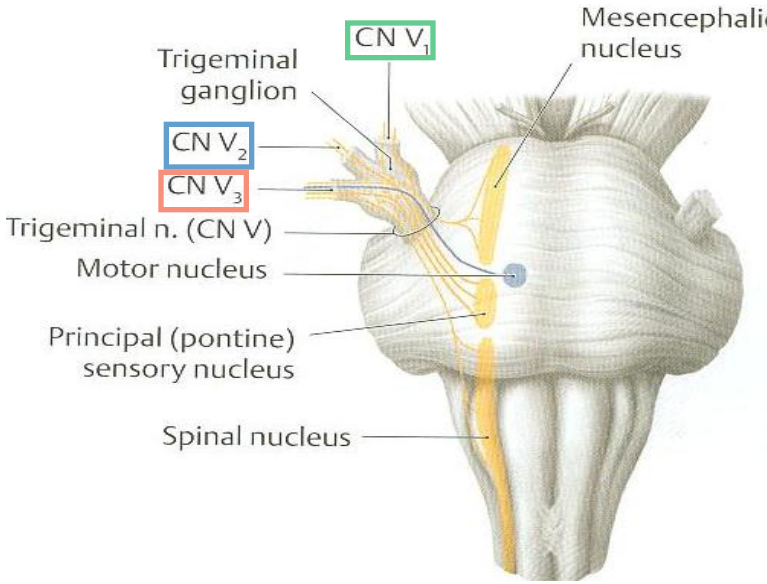
Extra

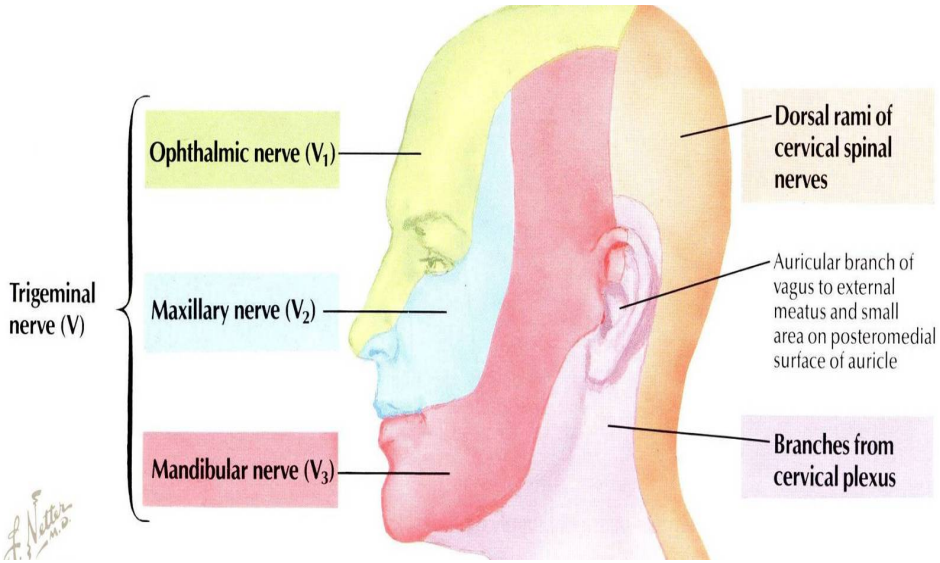
Trigeminal (V) 5th Cranial Nerve

* To remember:
Motor → medial
Large → Lateral

- Emerges from the **middle** of the **ventral surface of the pons** by 2 roots (Large Lateral sensory root & small medial motor root)*.
- Divides into 3 divisions (dendrites of trigeminal ganglion):
  1. **Ophthalmic, CV1** → Pure Sensory
  2. **Maxillary, CV2** → Pure Sensory
  3. **Mandibular, CV3** → Motor & Sensory
- Axons of cells of motor nucleus *join **only** the mandibular division.*





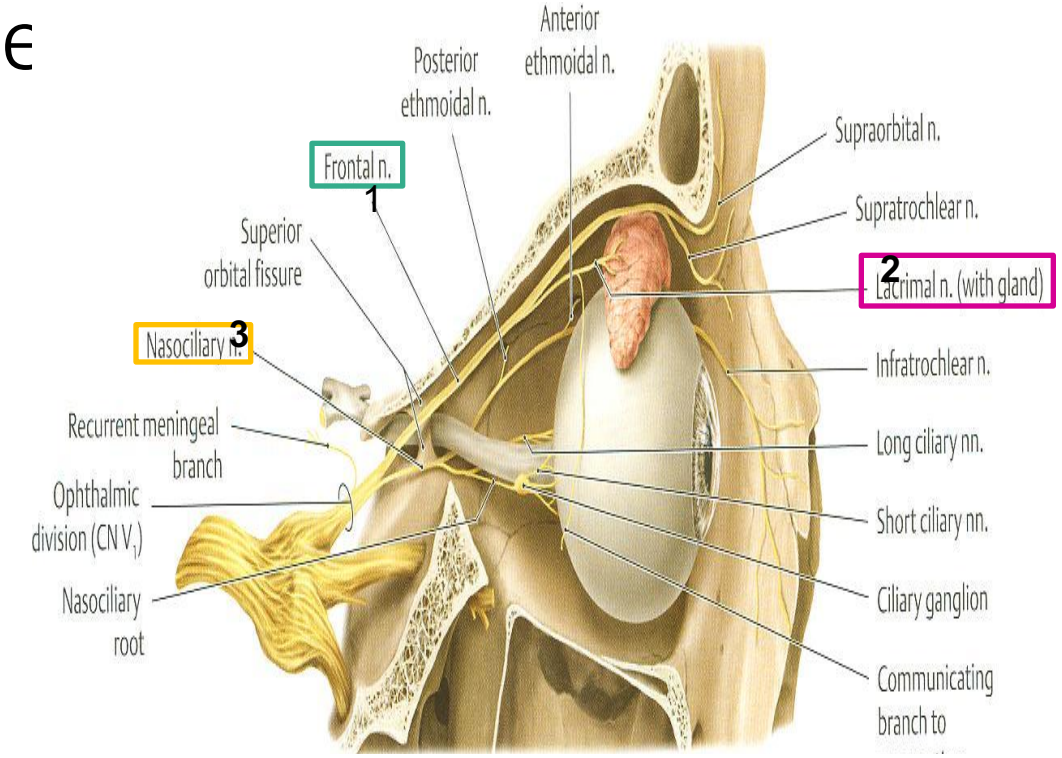


Trigeminal (V) 5th Cranial Nerve

1. Ophthalmic nerve

- PURE SENSORY
- Divides into *3 branches* which pass through superior orbital fissure to the orbit:
  1. **Frontal:** supplies skin of face & scalp.
  2. **Lacrimal**: supplies skin of face & lacrimal gland.
  3. **Nasociliary**: supplies skin of face, nasal cavity & eyeball.

اعرفها من اسمها + supply skin of the face



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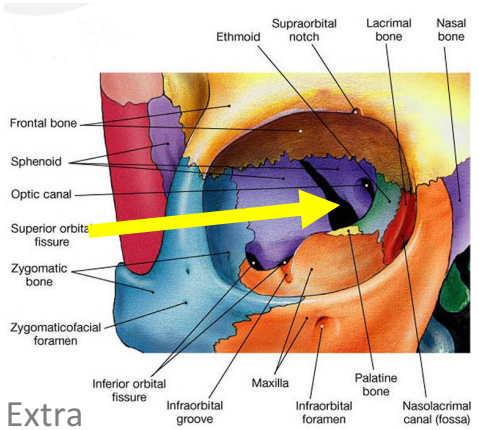
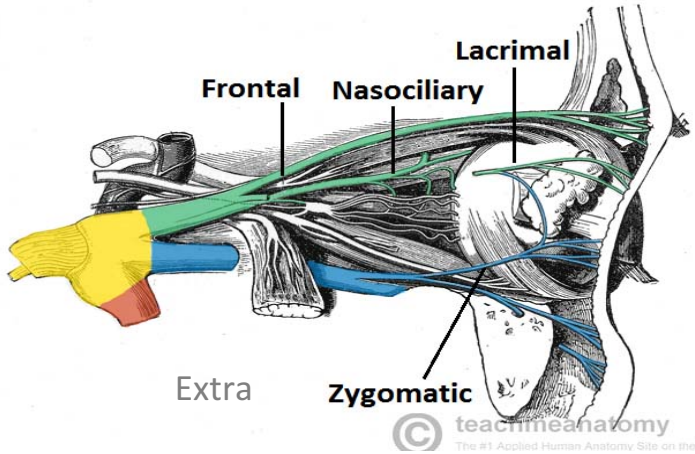
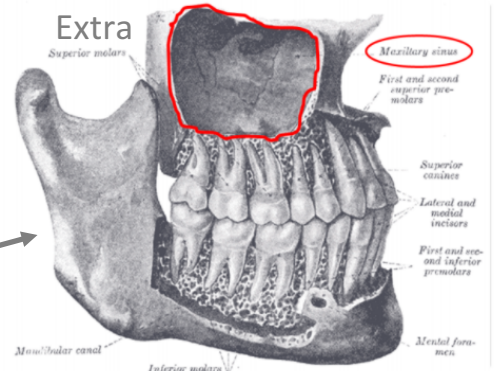


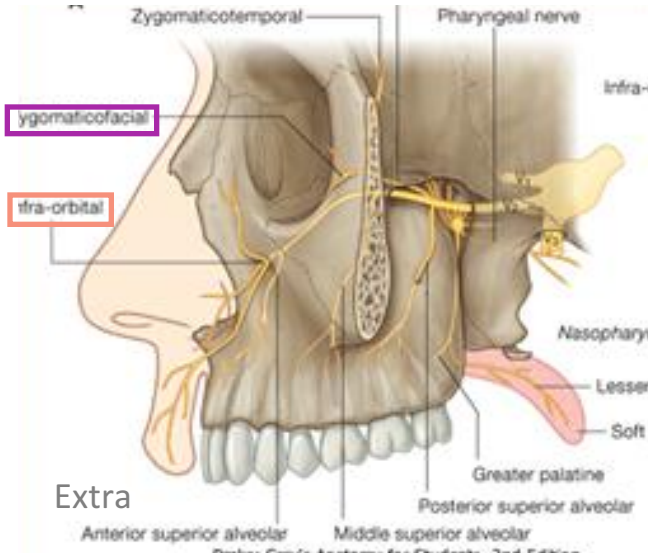


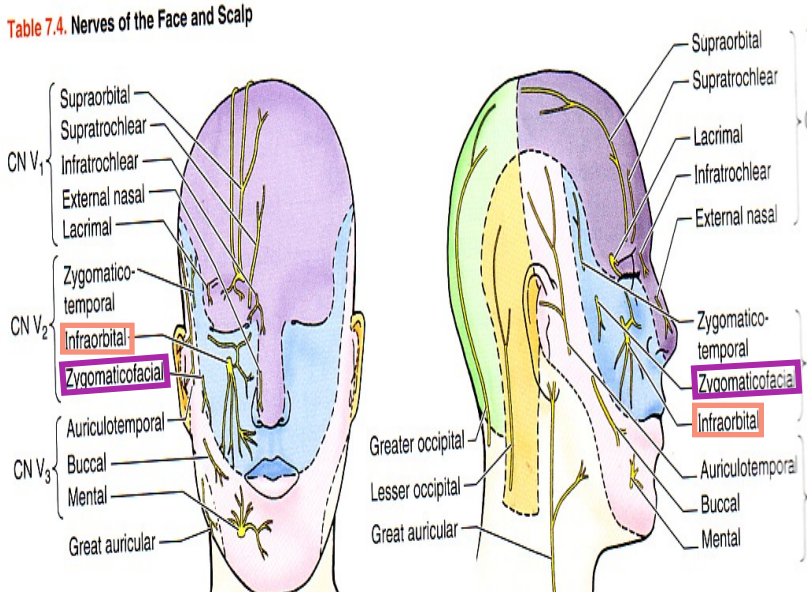
Trigeminal (V) 5th Cranial Nerve

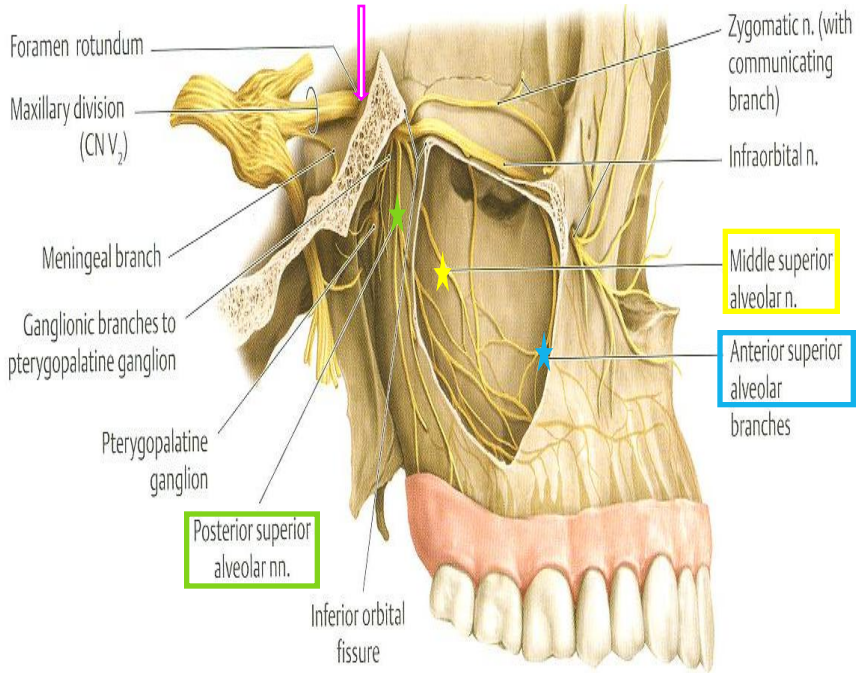
2. Maxillary nerve



- PURE SENSORY
- *Supplies*:
  - Upper teeth, gums & maxillary air sinus (posterior, middle & anterior superior alveolar nerves).
  - Face: (zygomaticofacial & infraorbital nerves).





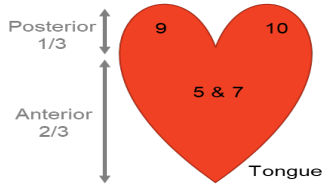


Trigeminal (V) 5th Cranial Nerve

3. Mandibular

MIXED (sensory and motor) → *Motor Branches*

to 8 muscles (4 muscles of mastication & other 4 muscles).



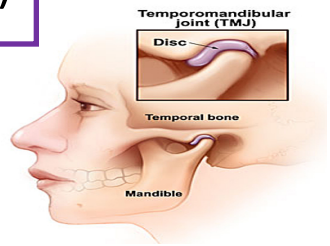
Sensory Branches حار وبارد وليس التذوق

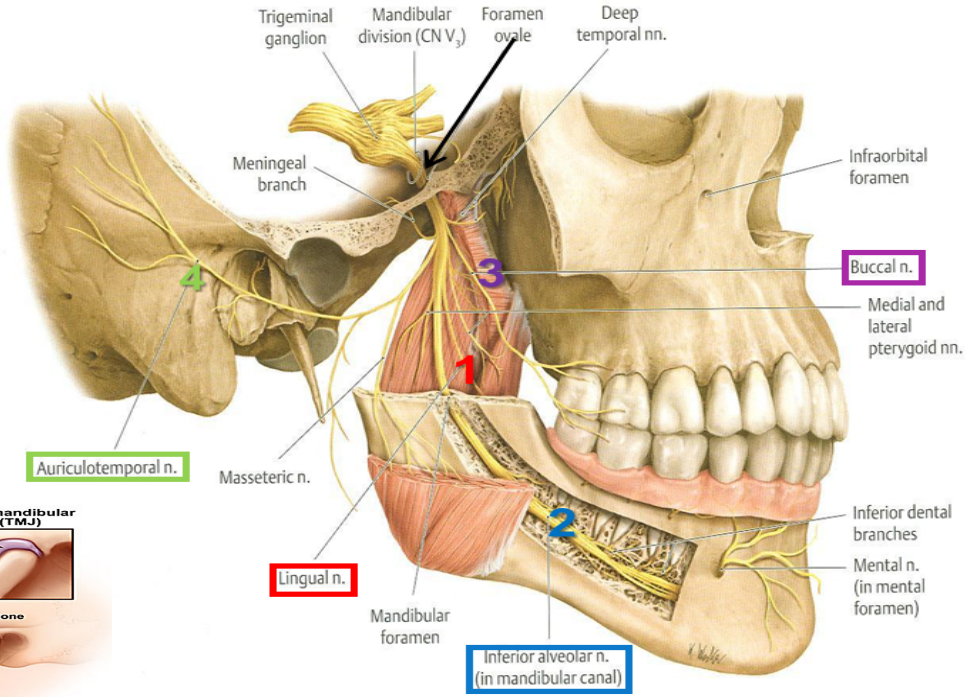
1. Lingual:
receives General sensations from anterior 2/3 the of tongue.

2. Inferior alveolar:
supplies Lower teeth, gums & face.
Through mandible bone through mandibular canal

3. Buccal:
supplies Face (cheek on upper jaw)

4. Auriculotemporal:
supplies auricle, temple, parotid gland & TMJ tempromendibular joint.



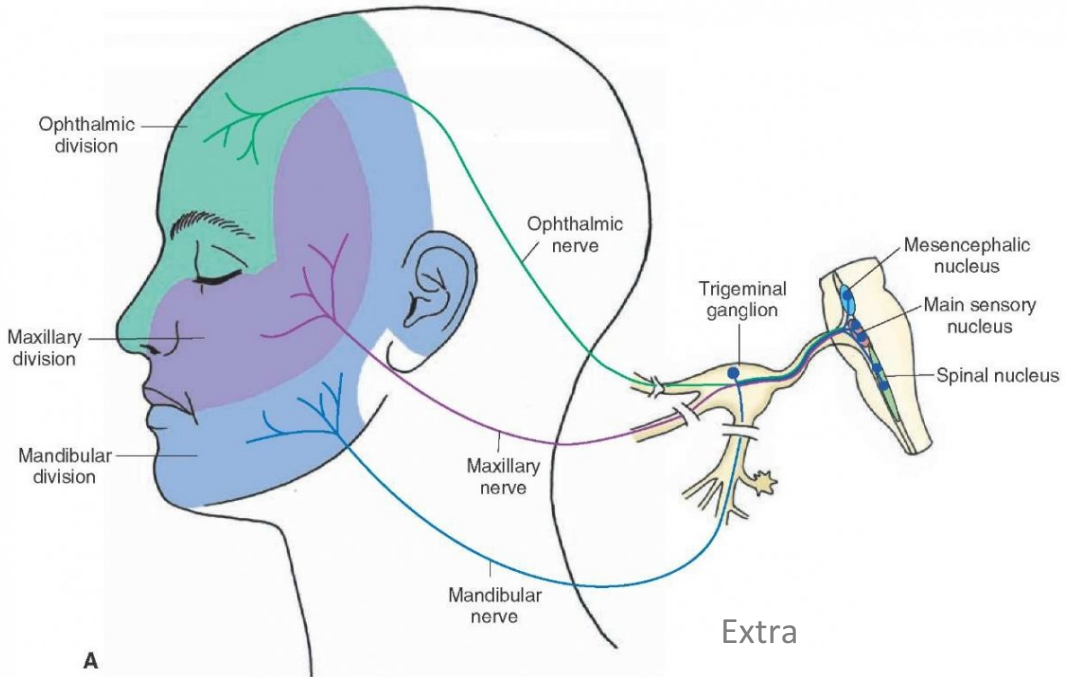


Trigeminal (V) 5th Cranial Nerve

Trigeminal Neuralgia

المريض يجي يشتكي من الم رهيب عند وضع المشط زي الدبابيس في الوجه

- *Compression, degeneration* or *inflammation* of the **5th cranial nerve** may result in a condition called **trigeminal neuralgia** or **tic douloureux** (spasmodic contraction of the muscles, most often in the face)
- This condition is characterized by *recurring episodes of intense stabbing excruciating pain* radiating from the angle of the jaw along a branches of the trigeminal nerve.
- Usually involves **maxillary** & **mandibular** branches**,** rarely in the ophthalmic division.



Extra

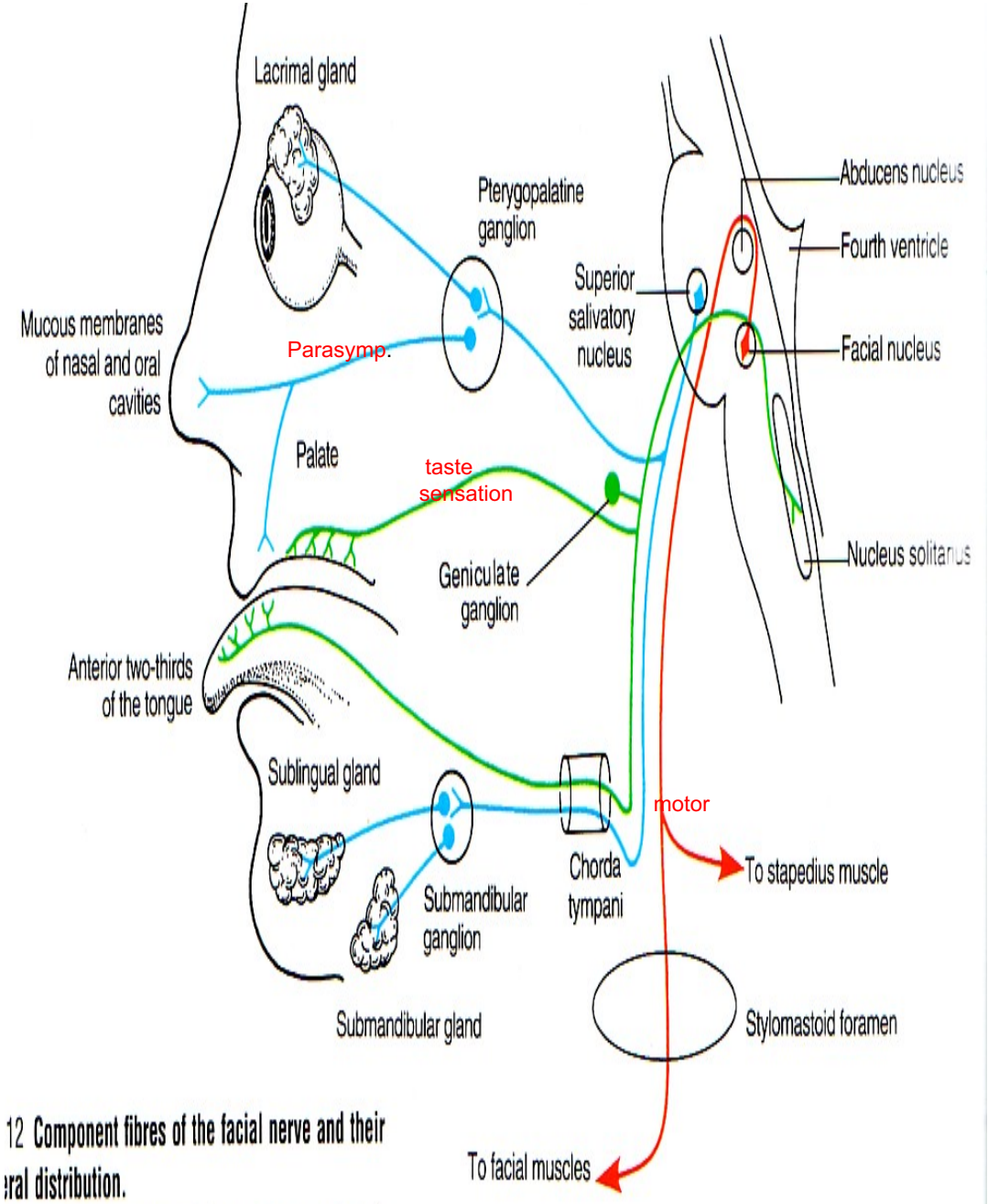
Facial (VII) 7th Cranial Nerve

- Type: **Mixed** (Motor, special sensory, parasympathetic).
- Fibers:

1. **Special visceral afferent:** carrying *taste sensation from anterior 2/3 of the tongue*.

2. **Special visceral efferent:** supplying *muscles developed from the 2nd pharyngeal arch*. (muscles of facial expression)

3. **General visceral efferent:** supplying parasympathetic secretory fibers (secretomotor) to *submandibular, sublingual, lacrimal, nasal & palatine glands*.



12 Component fibres of the facial nerve and their ıral distribution.

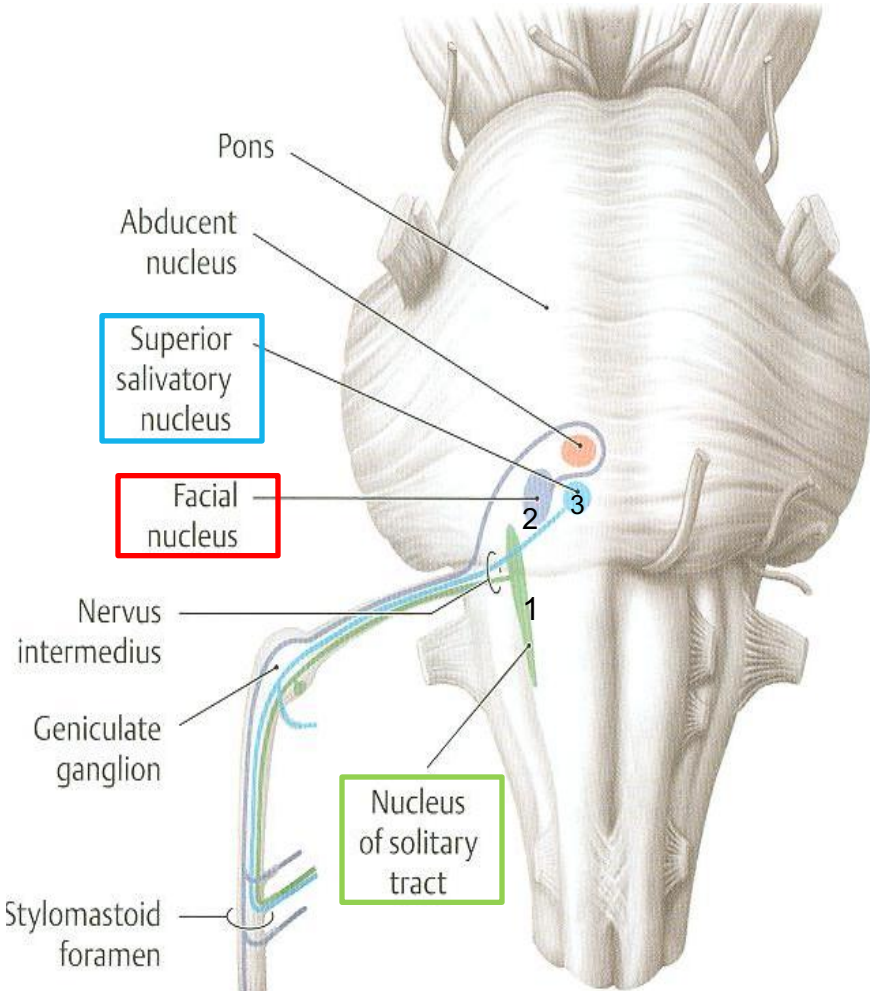
Facial (VII) 7th Cranial Nerve
Nuclei

3 Nuclei :

- **Special visceral afferent**: **(nucleus solitarius):** هي اللي تتذوق
  receives *taste from the anterior 2/3 of tongue*.

- **Special visceral efferent**: **(motor nucleus of facial nerve)**:
  supplies: **M**uscles of the face,
  Muscles of scalp, (Occipitofrontalis).
  Muscles of the auricle.
  Posterior belly of digastric,
  Platysma,
  Stylohyoid,
  Stapedius,

- **General visceral efferent**: (**superior salivatory nucleus):**
  sends preganglionic parasympathetic secretory fibers to *sublingual, submandibular, lacrimal, nasal & palatine glands*.

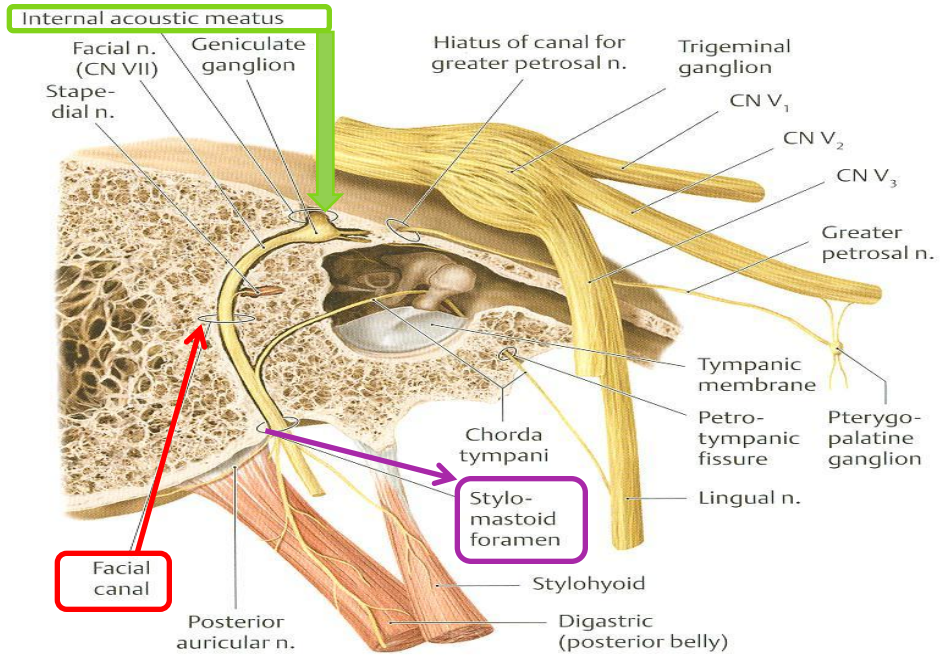


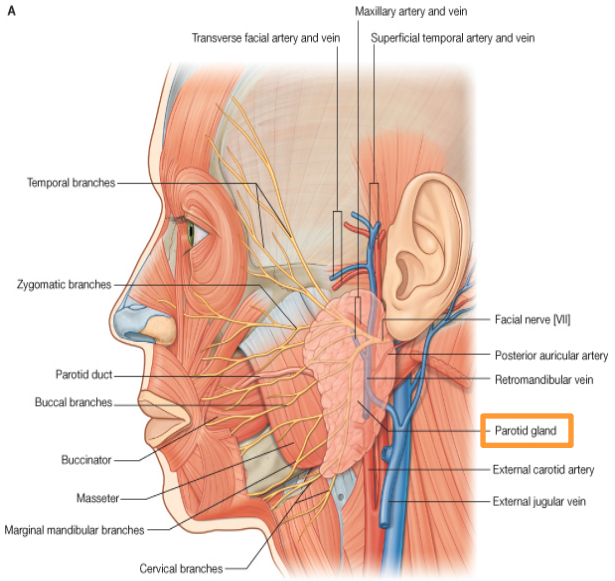
Facial (VII) 7th Cranial Nerve
Course

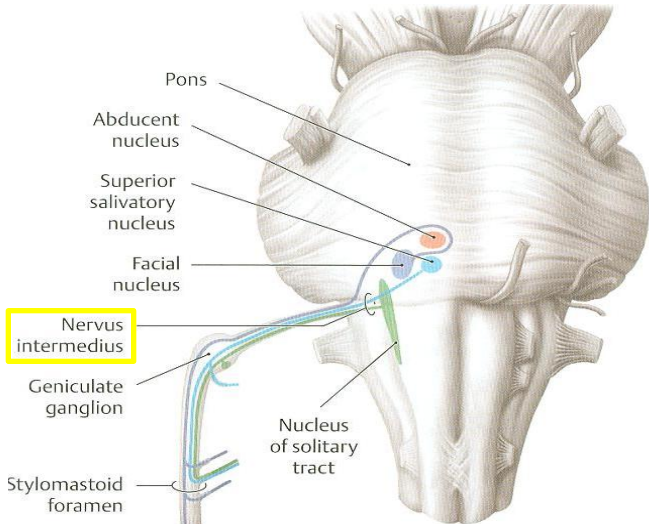
- Emerges from the <u>cerebellopontine angle</u> by 2 roots:
  1. *Medial motor root*: contains motor fibers.
  2. *Lateral root* **(nervous intermedius):** contains parasympathetic & taste fibers.

- Course:
  - Passes through **internal auditory meatus** to inner ear where it runs in **facial canal**.
  - Emerges from the **stylomastoid foramen** & enters the **parotid gland** where it ends.

To remember:
Motor → **m**edial







Facial (VII) 7th Cranial Nerve

Branches

In **facial Canal**

As it emerges from the **stylomastoid foramen**

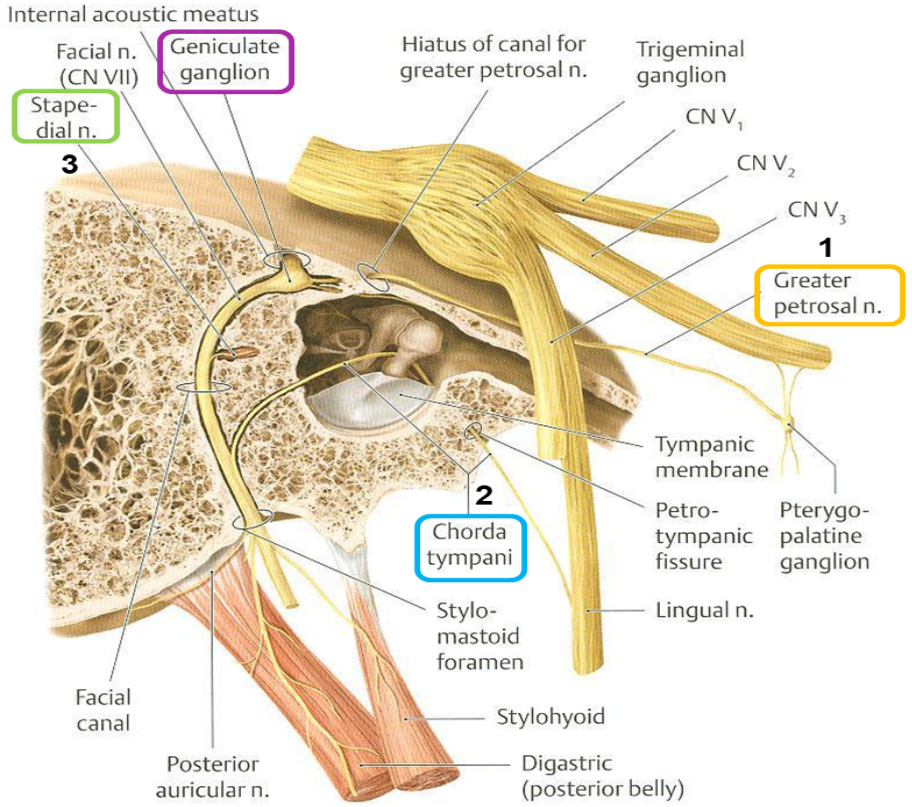
Inside **parotid gland**

1. Greater petrosal nerve: *carries* preganglionic parasympathetic fibers to **pterygopalatine** ganglion then postganglionic to lacrimal, nasal & palatine glands تخليك تعيط.

3. Nerve to stapedius : control the amplitude of sound waves from the external environment to the inner ear.

2. Chorda tympani: carries
a) preganglionic parasympathetic fibers to submandibular & sublingual glands.
b) taste fibers from anterior 2/3 of tongue.

N.B.: **Geniculate ganglion**: *contains* cell bodies of neurones ; its fibres carrying taste sensations from anterior 2/3 of tongue; ending in solitary nucleus in M.O. Lies in internal acoustic meatus.



Facial (VII) 7th Cranial Nerve

Branches

In **facial Canal**

As it emerges from the **stylomastoid foramen**

Inside **parotid gland**

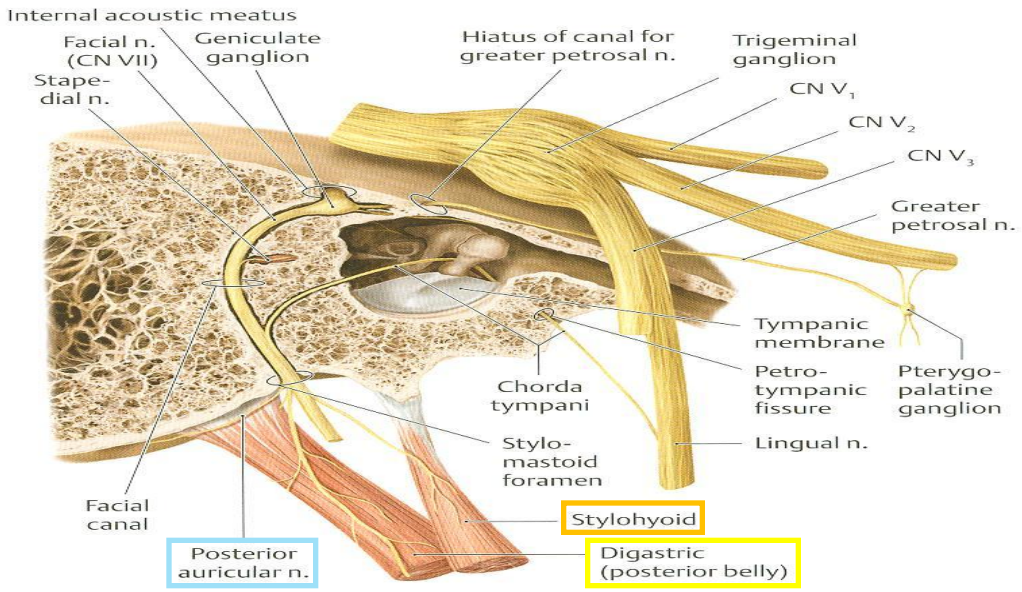
gives *5 terminal <u>motor</u> branches* to the muscles of the face:

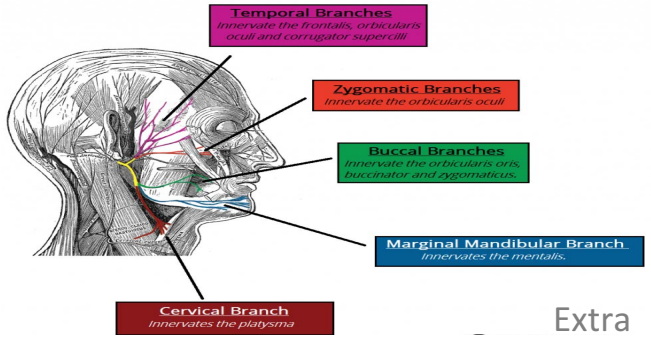
Temporal | **Zygomatic** | **Buccal** | **Mandibular** | **Cervical**

1. **Posterior auricular**: to occipitofrontalis muscle.

*2. **Muscular** branches to:*

- **stylohyoid**
- **posterior belly of digastric**





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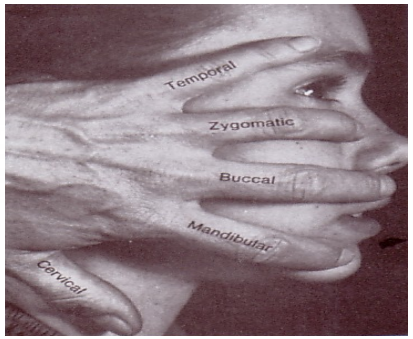
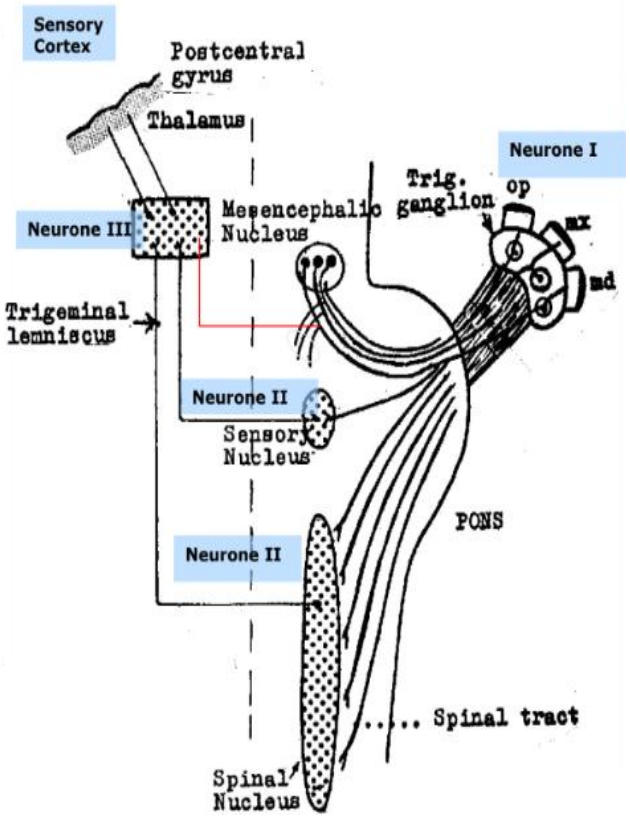


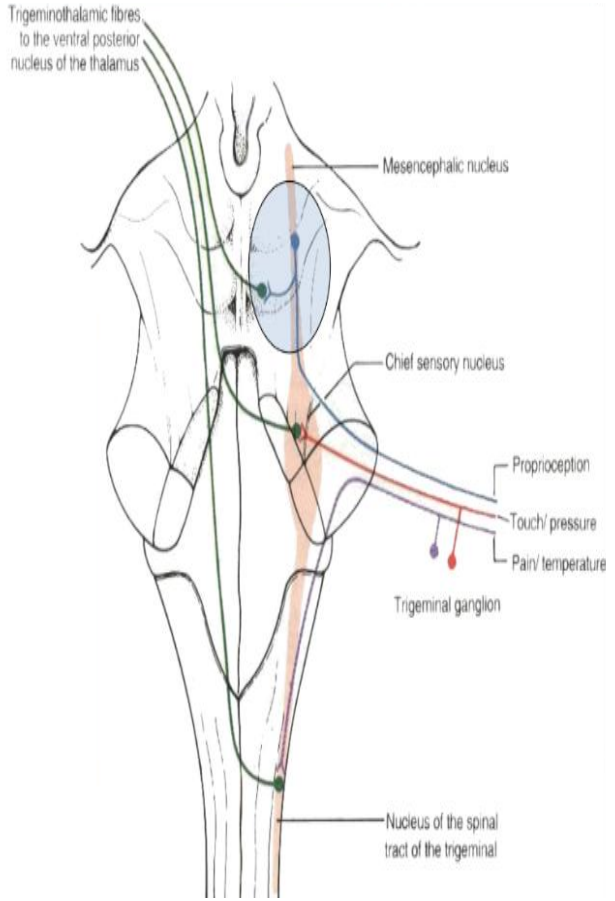
Only on the boys' slides

Pathway of Sensation from the Face and Scalp



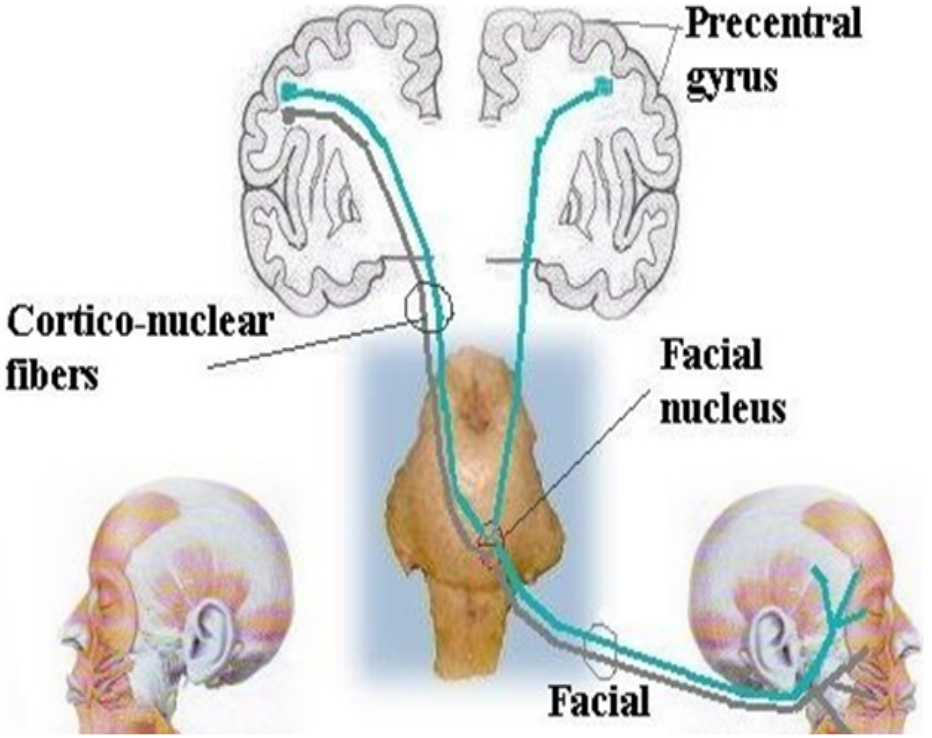
Pain, Temperature, and Touch Sensations	*Proprioceptive Sensations*
Neuron 1: Cells of trigeminal ganglion **Neuron 2:** For <u>pain</u> and <u>temperature</u>: the cells of spinal nucleus of the trigeminal in the medulla. For <u>touch</u> cells of main sensory nucleus. **Neuron 3:** Cells of PMVNT **Sensory Cortex**	**Neuron 1:** Mesencephalic nucleus in midbrain **Neuron 2:** Cells of PMVNT **Sensory Cortex**

PMVNT: nucleus in thalamus



Facial (VII) 7th Cranial Nerve
Bell's Palsy

- Damage of the facial nerve results in paralysis of muscles of facial expressions : **Facial (Bell's) palsy**; also called lower motor neuron lesion *(whole face affected)* يا انو اكل خبطة على وشو او يكون من جو حار وبارد ويلتهب
- NB. In upper motor neuron lesion (upper face is intact) .زي اللي تصير في الجلطات يكون الجزء العلوي شغال لانو ياخذ سبلاي من الجهتين
- Face is distorted: (effect is on the same side of injury)
  - Drooping of lower eyelid,
  - Sagging of mouth angle,
  - Dribbling of saliva,
  - Loss of facial expressions,
  - Loss of chewing,
  - Loss of blowing,
  - Loss of sucking,
  - Unable to show teeth or close the eye **on that side**.

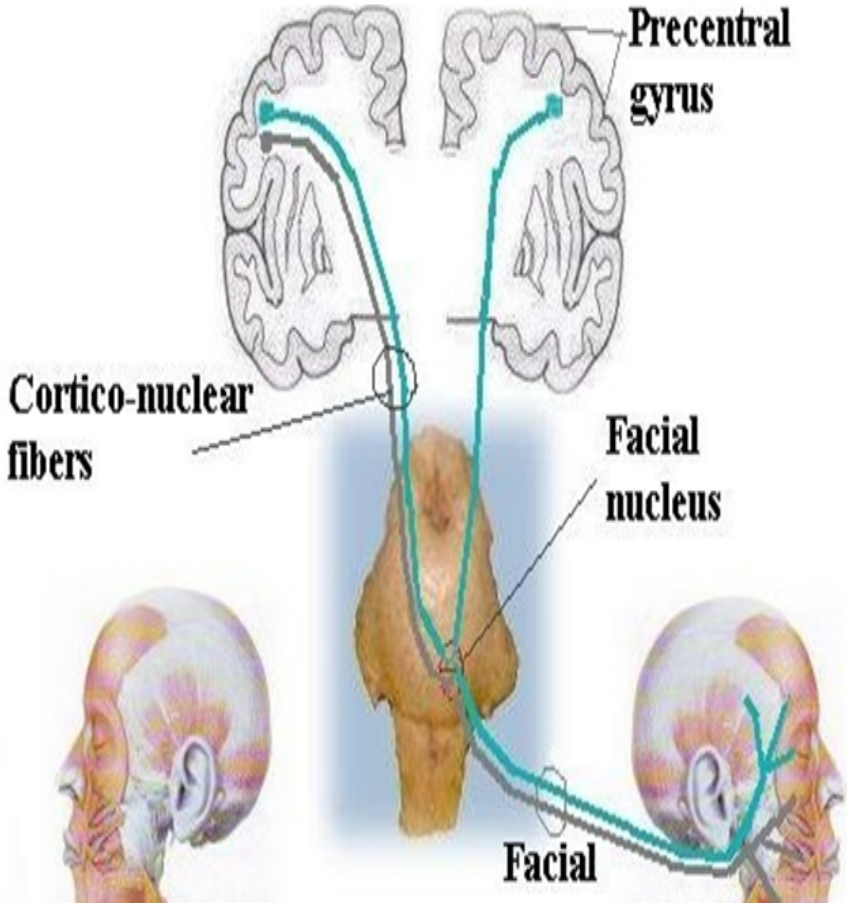


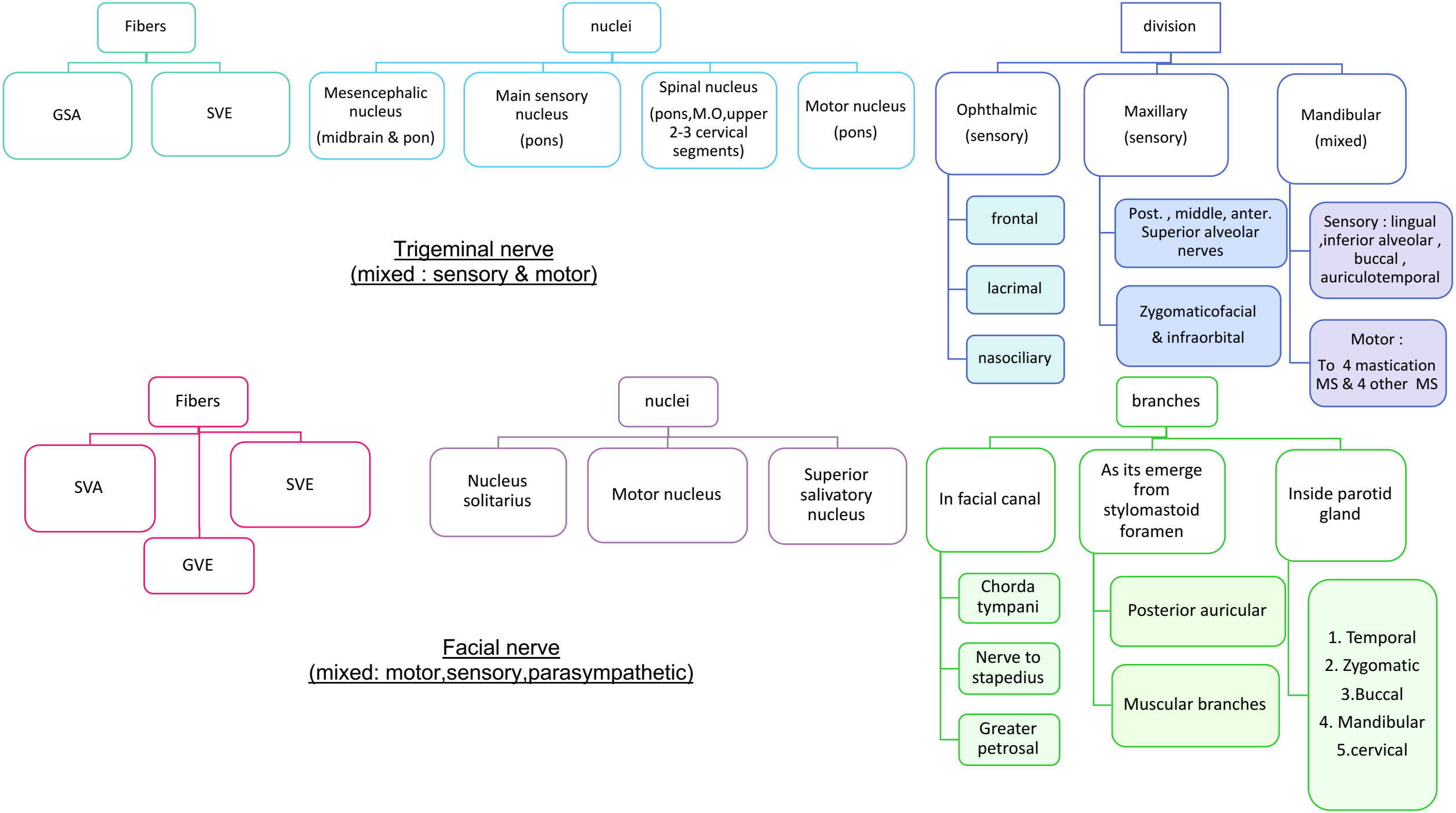
For Your Information

Only on the girls' slides

This slide is extra from Dr. Sanaa to differentiate between upper and lower motor lesions.

Lower Motor Neuron Lesion	Upper Motor Neuron Lesion
Results from **injury of facial nerve** fibres: in internal acoustic meatus; in the middle ear; in the facial canal, or in parotid gland.	This occurs after injury to the pyramidal tract (corticonuclear) above facial nucleus...
Manifested by **complete paralysis of facial muscles** on the **same side** of lesion.	Leads to **paralysis of facial muscles of lower ½ of face of opposite side** but the upper ½ of the face not affected because the lower part of facial nucleus & Ms.of lower ½ of face receive pyramidal fibres from opposite cerebral cortex only, while Ms..of upper ½ of face are normal because they receive pyramidal fibres from both cerebral hemispheres.
If lesion of facial nerve **above the origin of chorda tympani and nerve to stapedius,** the paralysis of facial muscles will be associated with : 1- Hyperacusis : sounds are heard more acute due to paralysis of stapedius ms. 2- Loss of taste sensation from anterior 2/3 of tongue.	




Fibers
GSA
SVE
nuclei
Mesencephalic nucleus (midbrain & pon)
Main sensory nucleus (pons)
Spinal nucleus (pons,M.O,upper 2-3 cervical segments)
Motor nucleus (pons)
division
Ophthalmic (sensory)
Maxillary (sensory)
Mandibular (mixed)
frontal
lacrimal
nasociliary
Post. , middle, anter. Superior alveolar nerves
Zygomaticofacial & infraorbital
Sensory : lingual ,inferior alveolar , buccal , auriculotemporal
Motor : To 4 mastication MS & 4 other MS
Trigeminal nerve
(mixed : sensory & motor)
Fibers
SVA
SVE
GVE
nuclei
Nucleus solitarius
Motor nucleus
Superior salivatory nucleus
branches
In facial canal
As its emerge from stylomastoid foramen
Inside parotid gland
Chorda tympani
Nerve to stapedius
Greater petrosal
Posterior auricular
Muscular branches
1. Temporal
2. Zygomatic
3.Buccal
4. Mandibular
5.cervical
Facial nerve
(mixed: motor,sensory,parasympathetic)

Summary

- Both trigeminal & facial nerves are mixed.
- **Nuclei of trigeminal** nerve are found in **midbrain, pons & medulla.** They are of the general somatic afferent & special visceral efferent types.
- **The trigeminal nerve** emerges from the **pons** and divides into: ophthalmic, maxillary *&* *mandibular divisions* that receive sensory supply from the face (with an exception of a small area over ramus of mandible).
- All motor fibers are included in the mandibular division & supply muscles of mastication.
- **Nuclei of facial nerve** are found in **pons.** They are of the special visceral afferent & efferent, as well as general visceral efferent type.
- **The facial nerve** emerges from the **cerebellopontine angle**, gives **motor fibers** to muscles of facial expression, **secretory fibers** to submandibular, sublingual, lacrimal, nasal & palatine glands & receives **taste fibers** from anterior 2/3 of tongue.

Questions

1-The special visceral efferent fibers of the trigeminal nerve supplies:
A- temporalis muscle
B- posterior belly of digastric
C- omohyoid
D- ventral pterygoid
Answer: A

2- which of the following true about the TRIGEMINAL nerve is true :
A- the axons of the cells of motor nucleus join only maxillary division
B- it emerges the middle of the dorsal surface of the pons
C- the TRIGEMINAL GANGLION occupies the middle cranial fossa
D- all the above
Answer :C

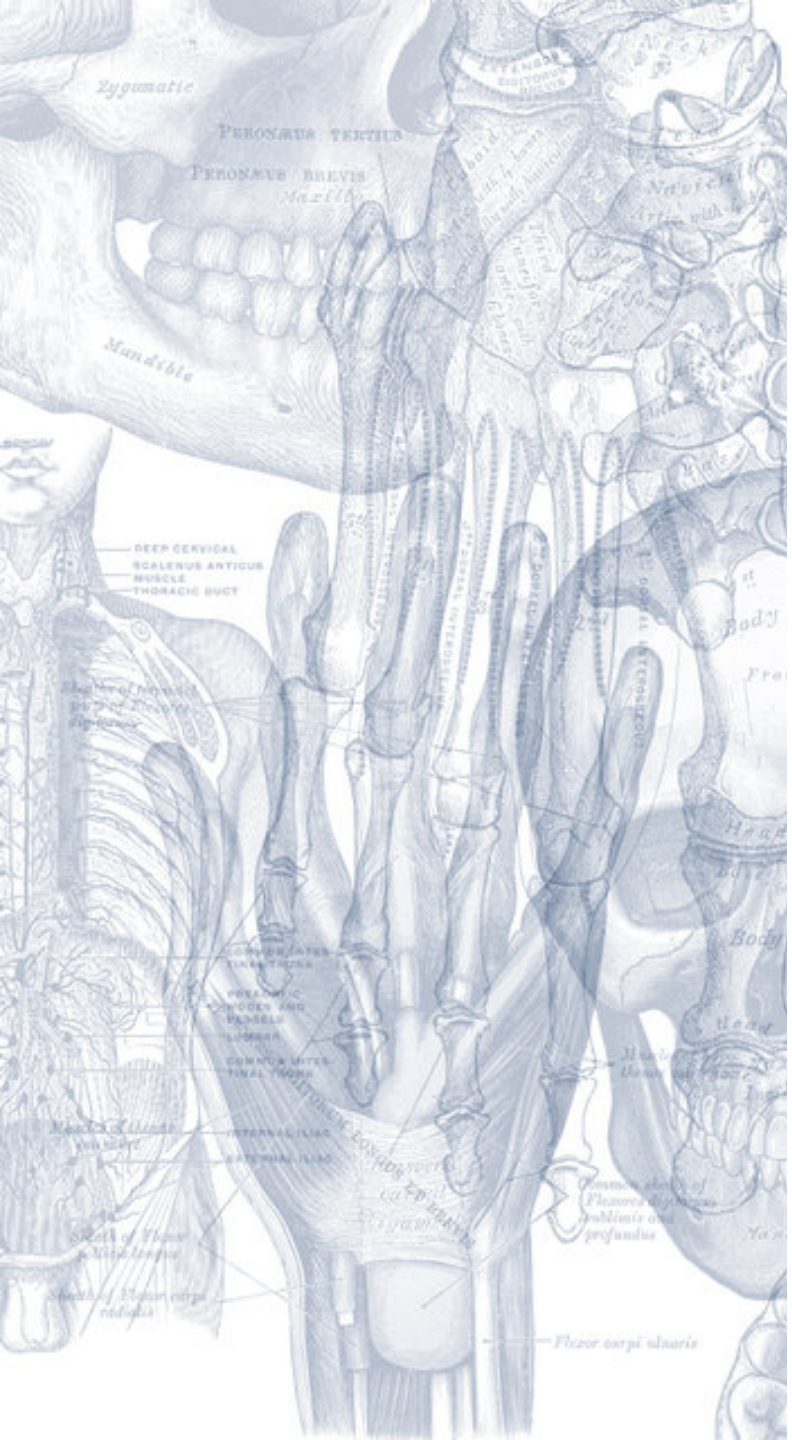
3-TRIGEMINAL NEURALGIA rarely involves :
A-maxillary branch
B-mandibular branch branch
C- ophthalmic
D-all the above
Answer: C

4- the posterior aulicular branch of the FACIAL nerve supply :
A- posterior belly of digastric
B-stylohyoid
C-occipitofrontalis muscle
D-A&B
Answer:C

5-Damage of the FACIAL nerve will lead to which of the following deformities :
A-Erb-Duchenne palsy
B-Klumpke palsy
C-Bell's palsy
D-Cerebral palsy
Answer: C

6-List the branches of the ophthalmic division of the trigeminal nerve.
FRONTAL ,LACRIMAL ,NASOCILIARY

7- list the branches of the facial nerve inside parotid gland and what do they supply .
TEMPORAL ,ZYGOMTIC ,BUCCAL, MANDIBULAR ,CERVICAL → muscles of the face



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