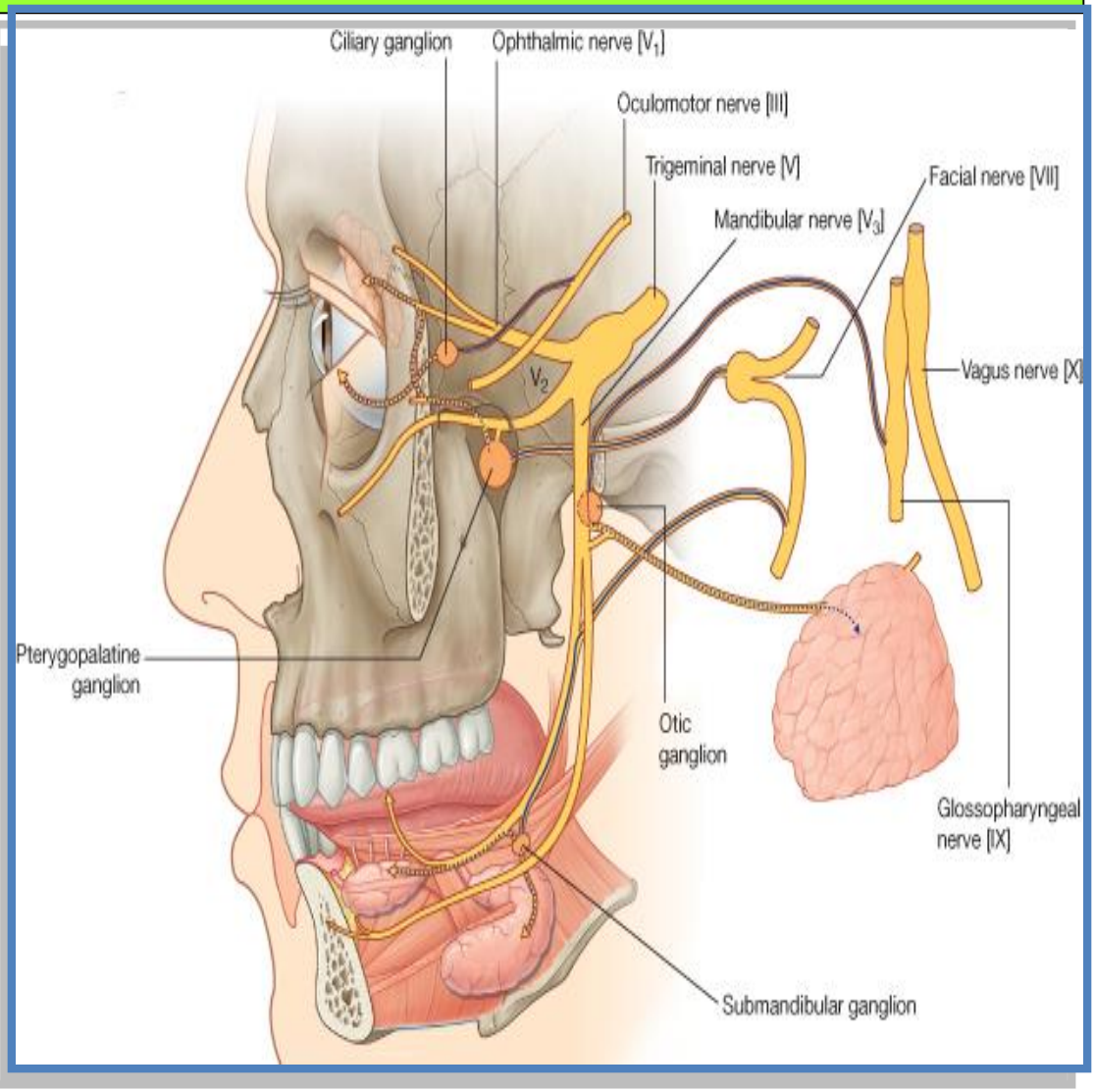
NERVE SUPPLY OF THE FACE
5TH & 7TH CRANIAL NERVES



Prof. Saeed Abuel Makarem

OBJECTIVES

***By the end of the lecture, you should be able to*:**

- List the nuclei of deep origin of the trigeminal and facial nerves in the brain stem.
- Describe the site and type of each nucleus.
- Describe the superficial attachment of these 2 nerves to the brain stem.
- Describe the main points in the course and distribution of these 2 nerves to the face.
- Describe the main motor & sensory manifestation in case of lesion of these 2 nerves.

TRIGEMINAL NERVE

- **Type:**

Mixed: (sensory & motor).

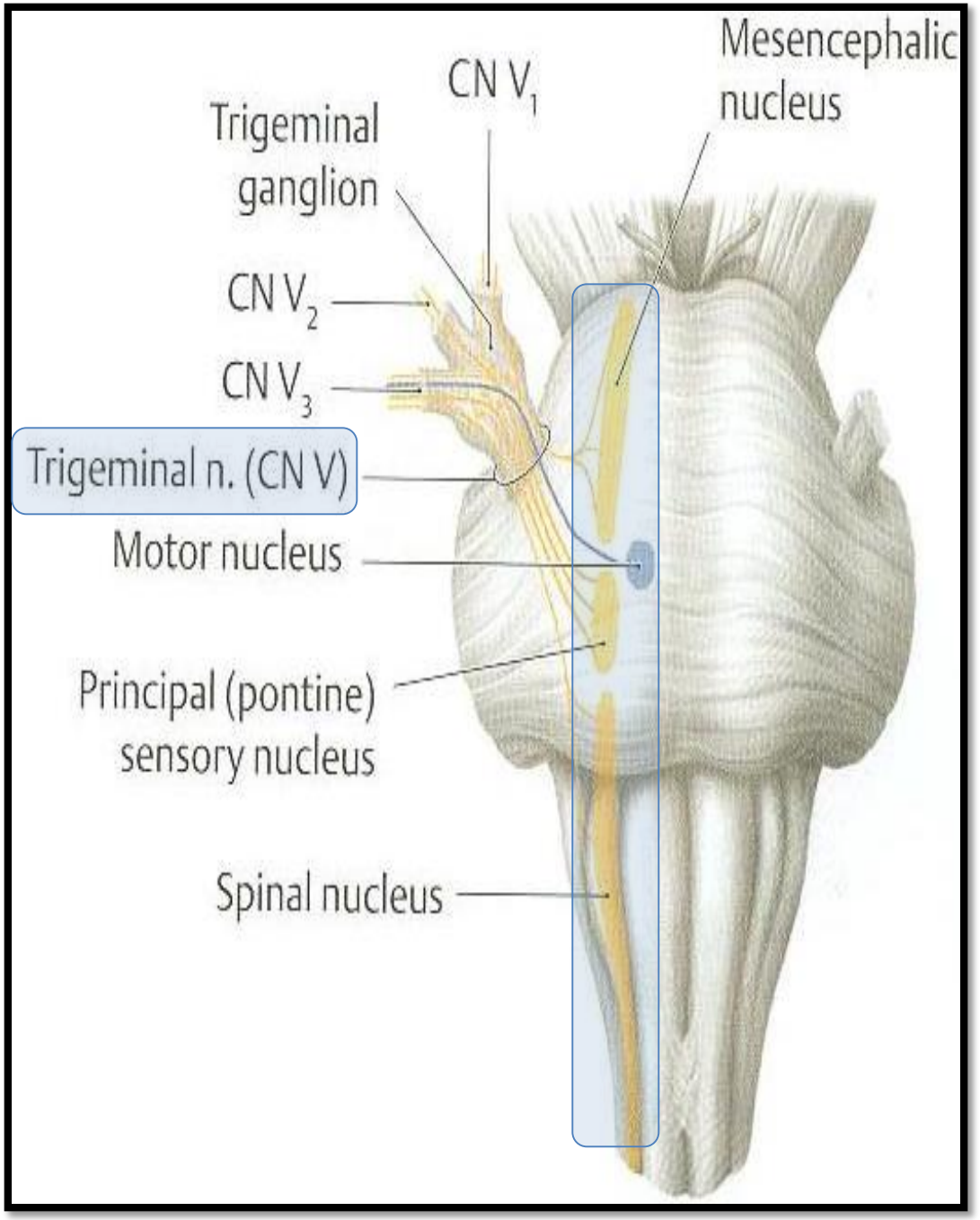
- **Fibers:**

1. **General somatic afferent:**

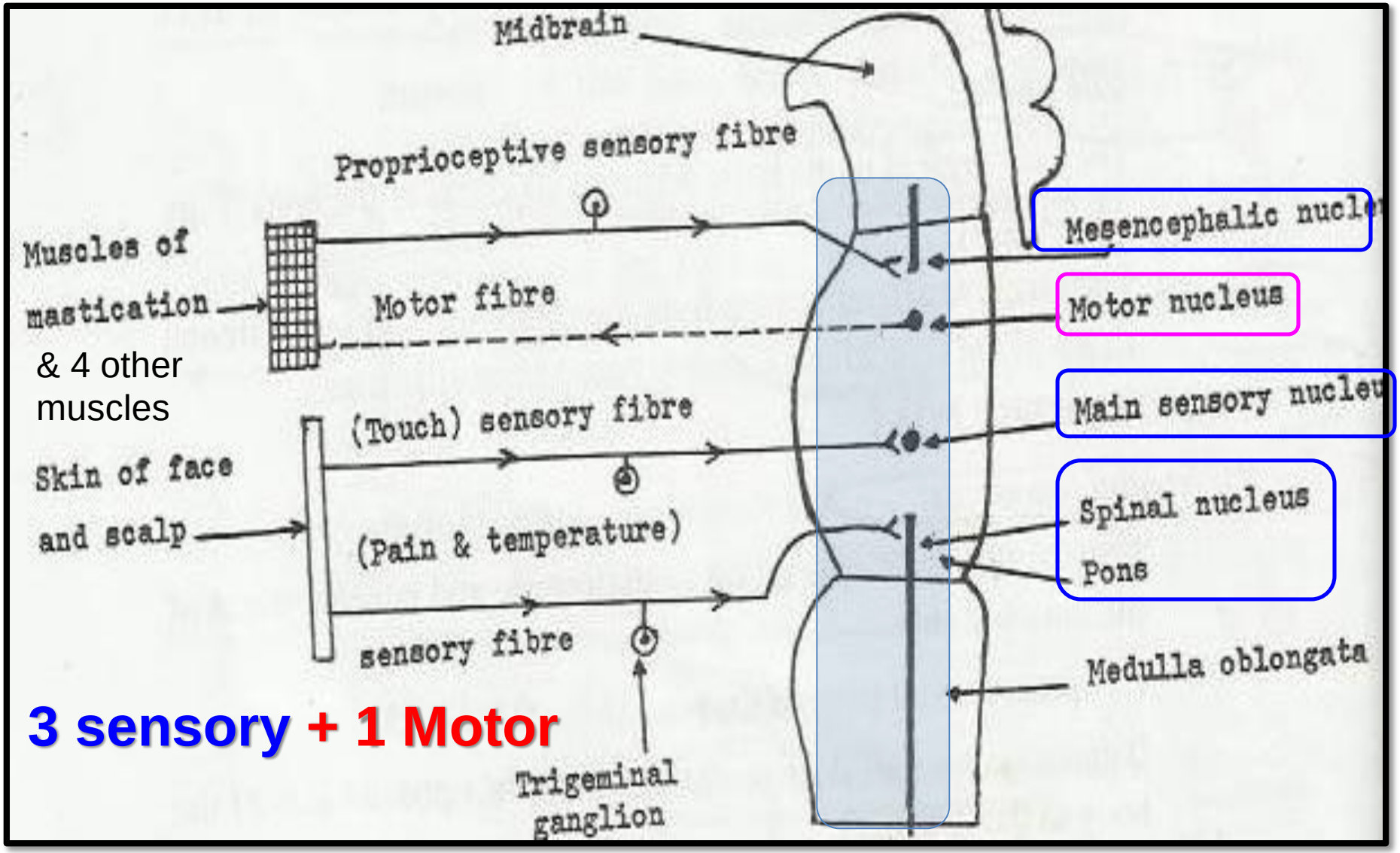
Carrying general sensations from the face and anterior part of the scalp.

2. **Special visceral efferent:**

Supplying muscles developed from the **1st pharyngeal** arch, (8 muscles).



TRIGEMINAL NERVE NUCLEI (Deep origin)



TRIGEMINAL NERVE NUCLEI

- **Four nuclei: (3 sensory + 1 Motor).**
- **General somatic afferent:**

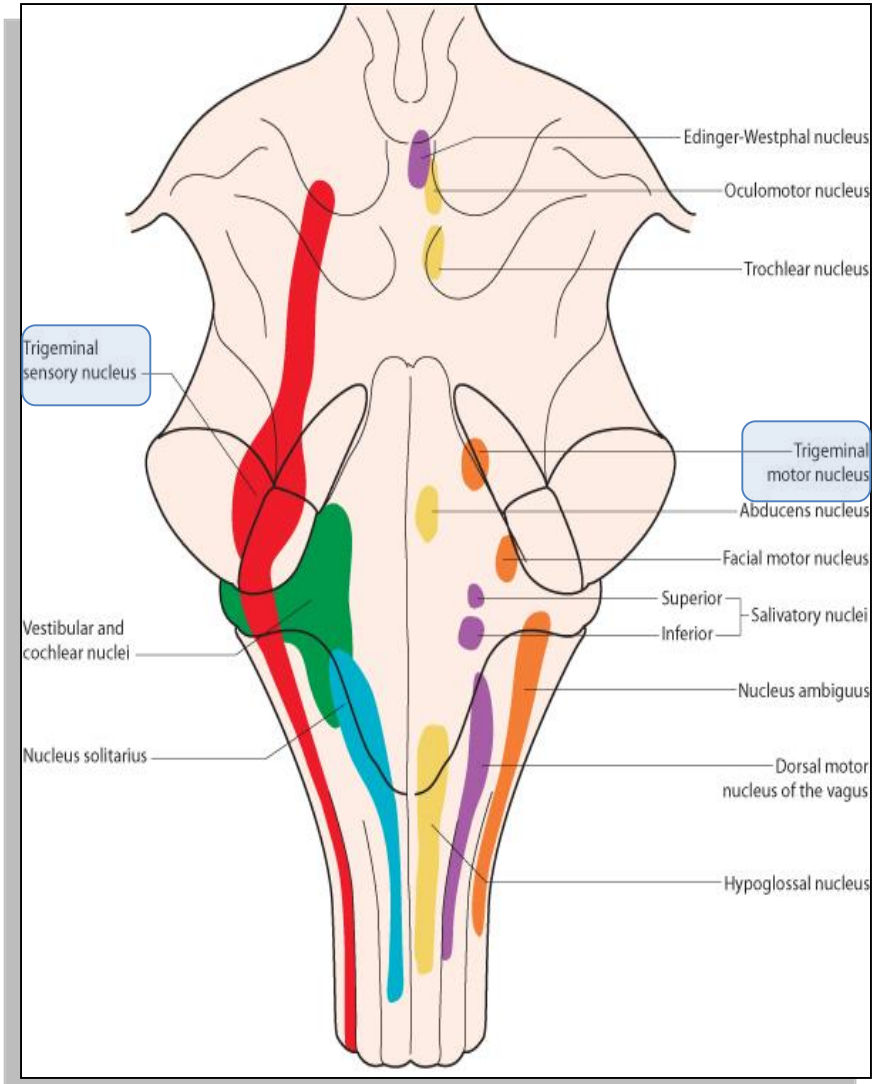
1. ***Principal (main) sensory nucleus,*** (pons): receives touch fibers from face and anterior part of the scalp.
2. ***Mesencephalic nucleus*** (Pons & midbrain): receives proprioceptive fibers from muscles of mastication.
3. ***Spinal nucleus,*** (Pons, medulla & upper 2 or 3 cervical segments of the spinal cord): receives pain & temperature sensations from face & scalp.

- **Special visceral efferent:**

4. *Motor nucleus* (**Pons**), supplies: **8 Ms.:**

✓ Four Muscles of mastication: (temporalis, masseter, medial pterygoid & lateral pterygoid).

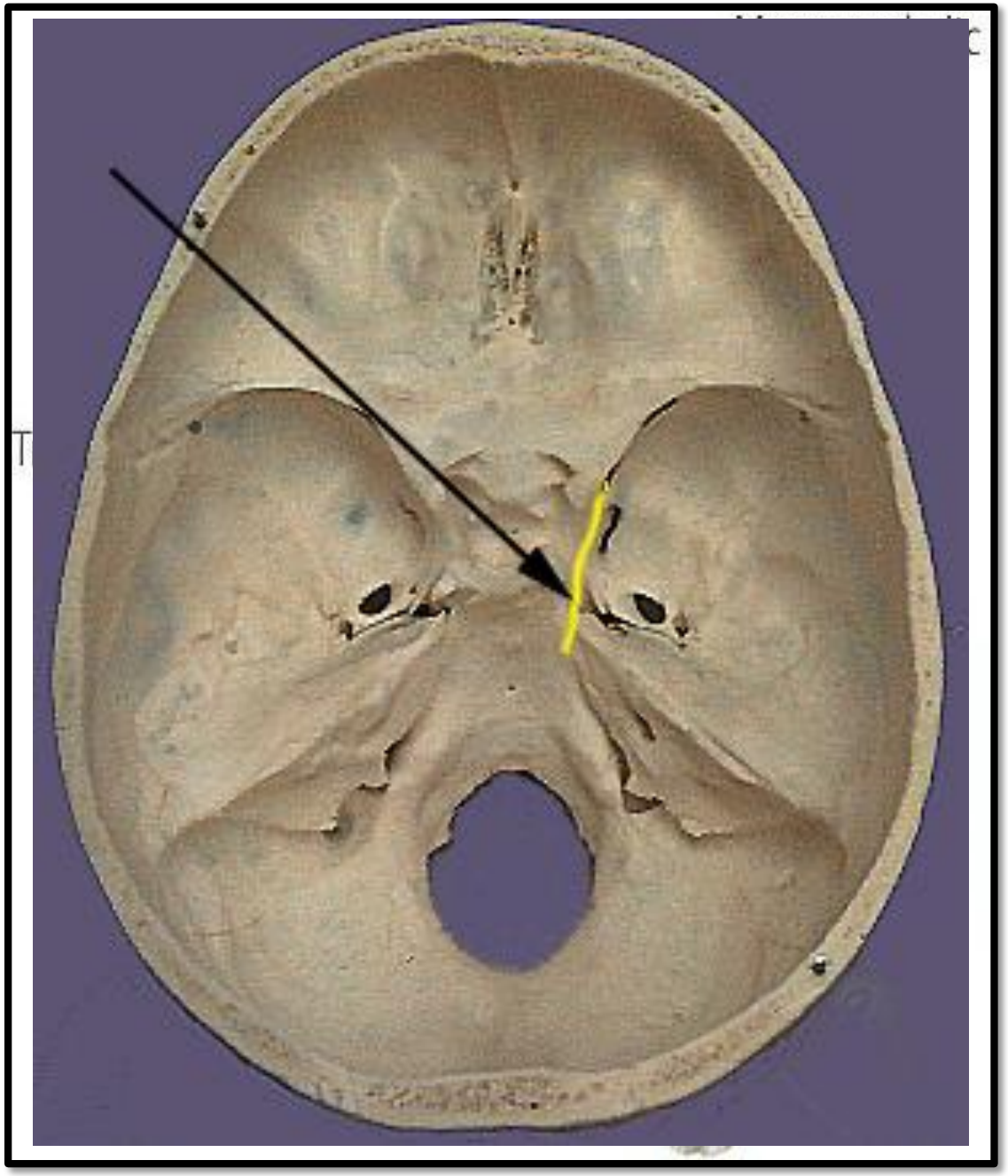
✓ **Other 4 muscles:** (Anterior belly of digastric, mylohyoid, tensor palati & tensor tympani).



TRIGEMINAL GANGLION

- **Site:**
- Occupies a depression in the middle cranial fossa called trigeminal impression, (apex of petrous temporal bone).
- **Importance: Contains cell bodies:**

1. **Whose dendrites carry sensations from the face & scalp.**
2. **Whose axons form the sensory root of trigeminal nerve.**

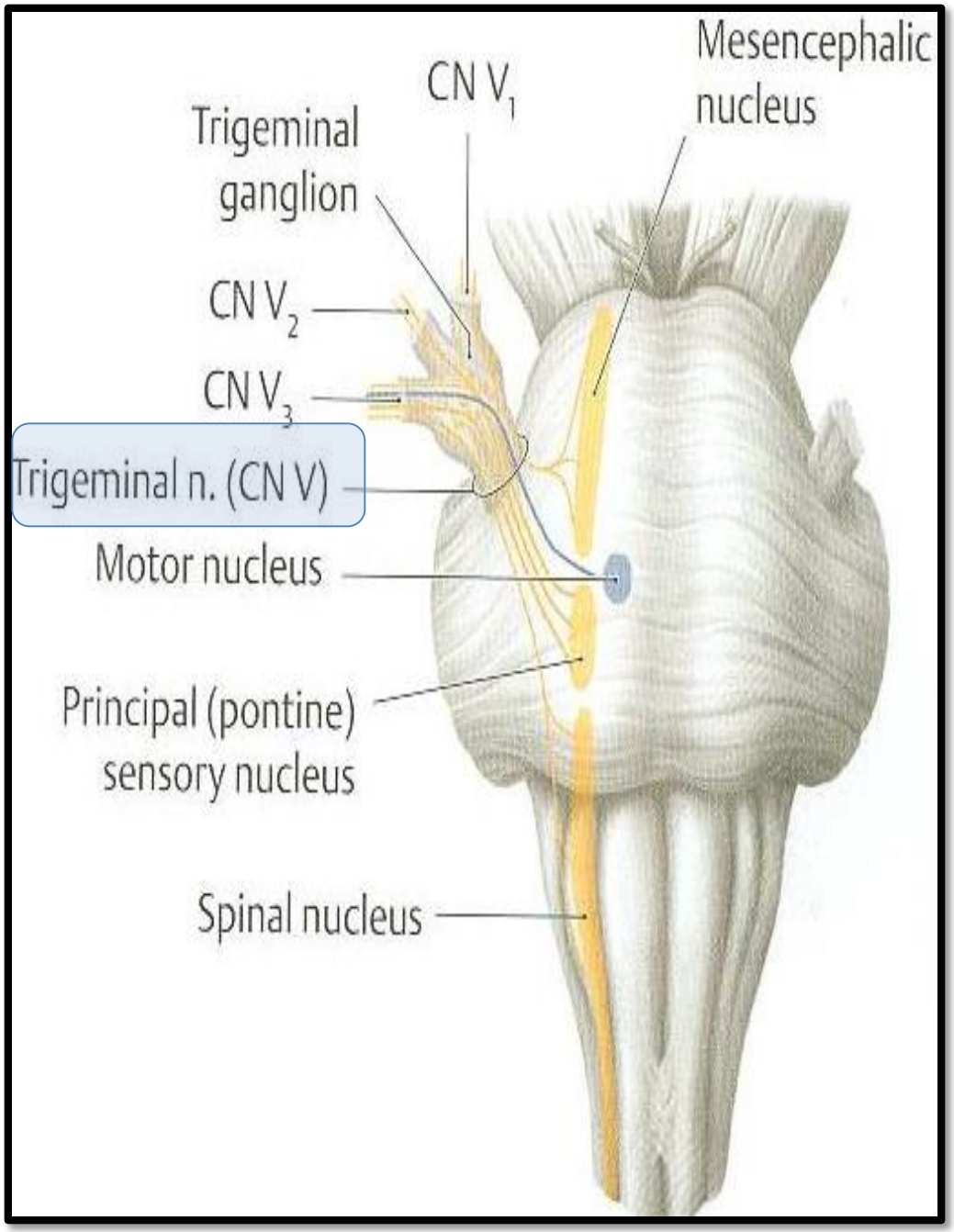


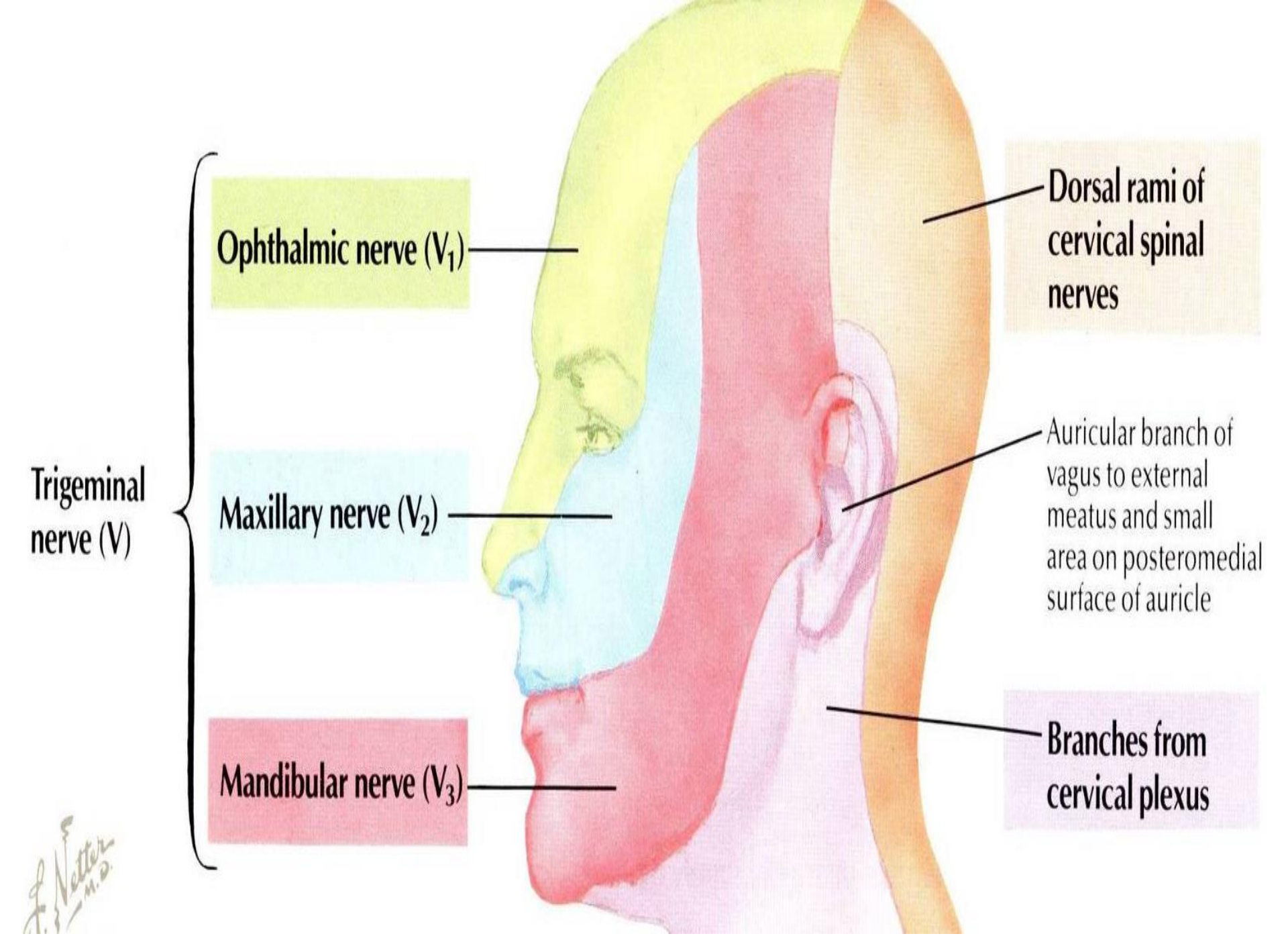
TRIGEMINAL NERVE

- ***Emerges*** from the **middle** of the **ventrolateral 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.***
2. ***Maxillary.***
3. ***Mandibular.***

- Axons of cells of motor nucleus *join **only** the mandibular division.*




Trigeminal nerve (V)
Ophthalmic nerve (V_1)
Maxillary nerve (V_2)
Mandibular nerve (V_3)
Dorsal rami of cervical spinal nerves
Auricular branch of vagus to external meatus and small area on posteromedial surface of auricle
Branches from cervical plexus

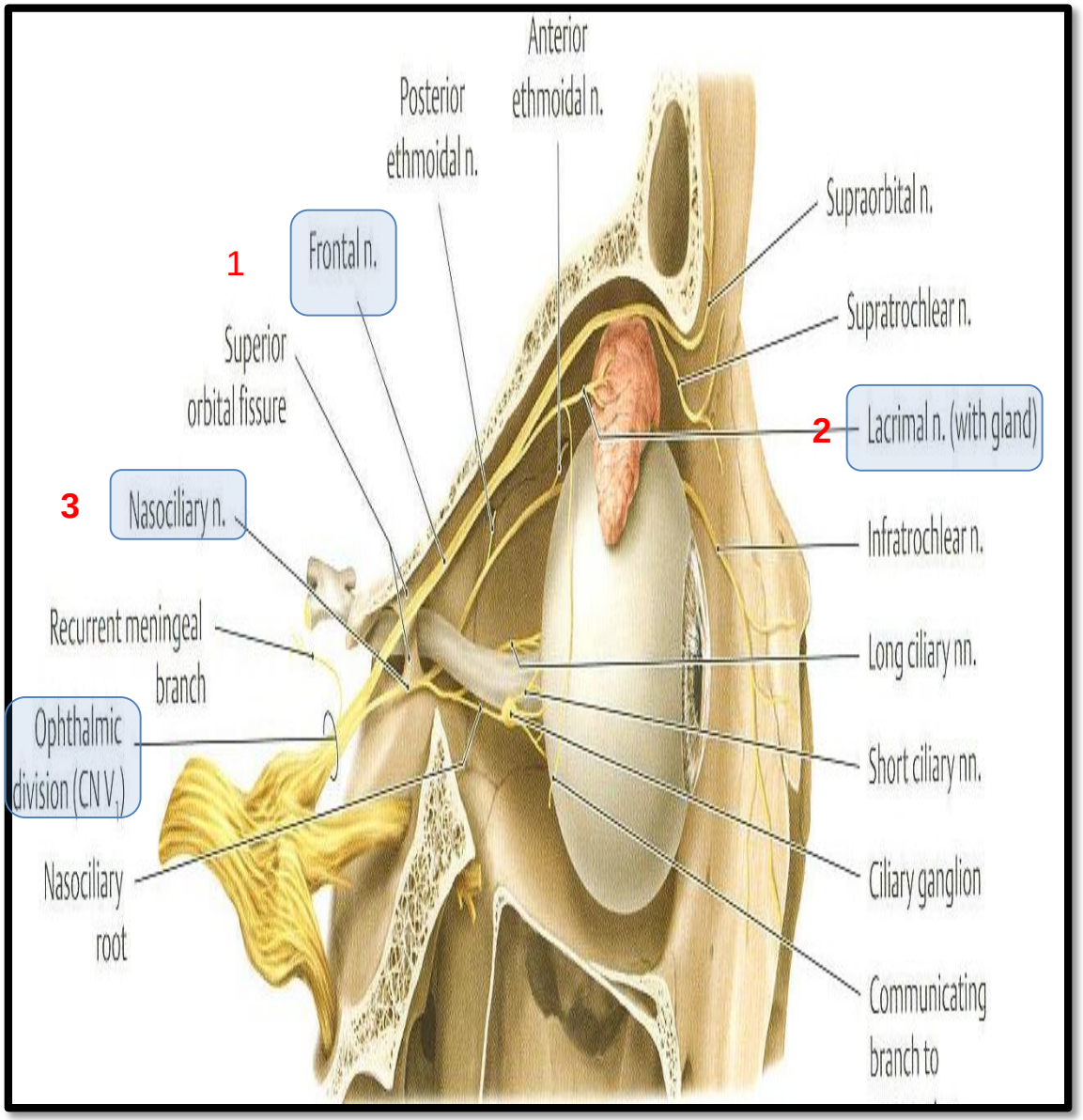
OPHTHALMIC (PURE SENSORY)

- **Divides into 3 branches:**

1. *Frontal, (in the middle).*
2. *Lacrimal, (most lateral).*
3. *Nasociliary, (most medial).*

- *All* pass through superior orbital fissure to reach the orbit.

1. Frontal: supplies skin of face & scalp.
2. Lacrimal: supplies skin of face & lacrimal gland (sensory)!!!!!!.
3. Nasociliary: supplies skin of face, nasal cavity & eyeball.



MAXILLARY (PURE SENSORY)

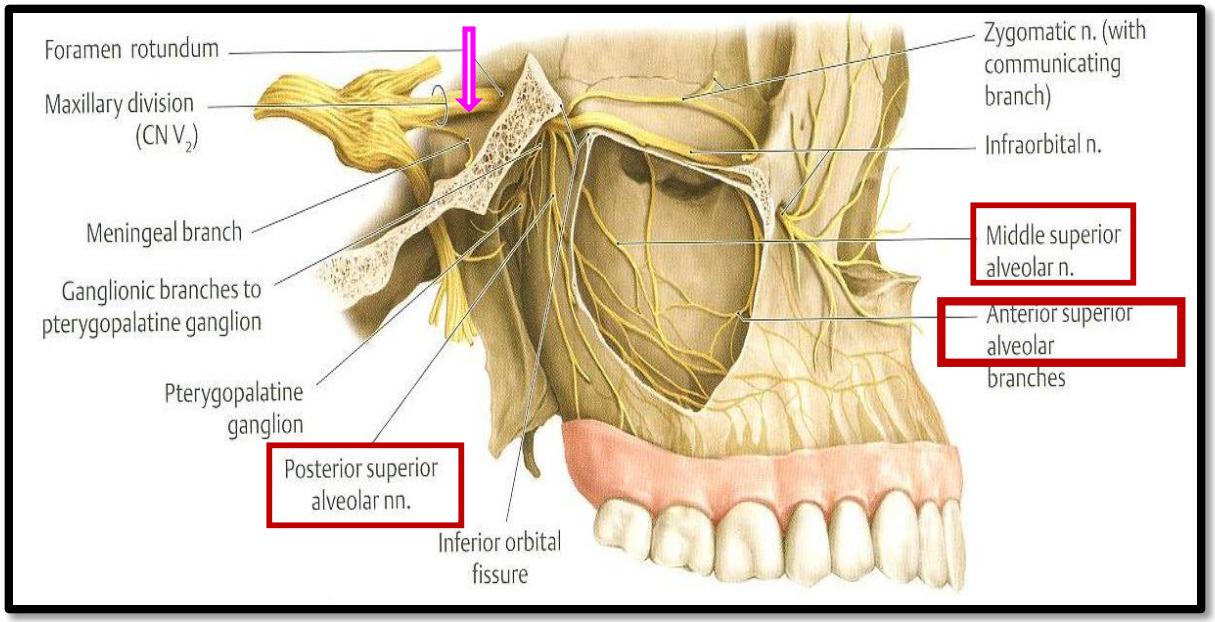
- **Supplies:**

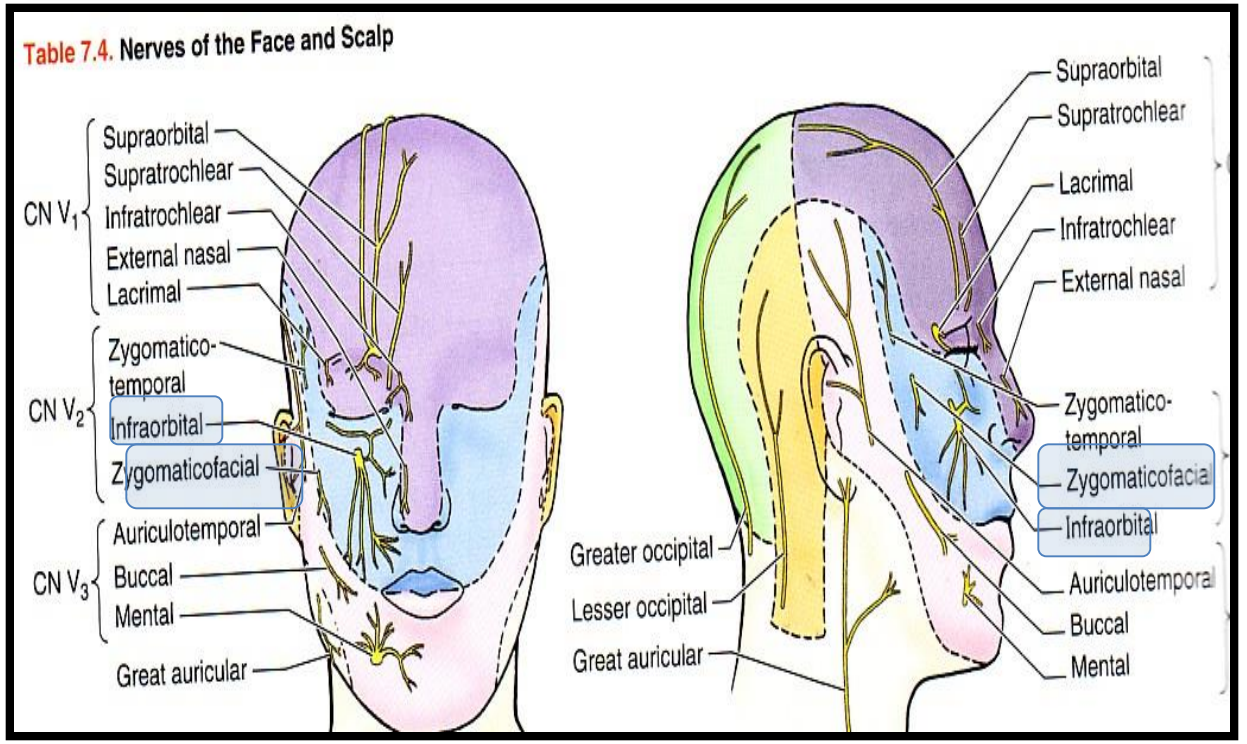
1. Upper teeth, gums & maxillary air sinus:

(posterior superior middle superior, anterior superior alveolar nerves).

2. Face:

(zygomaticofacial & infraorbital nerves).





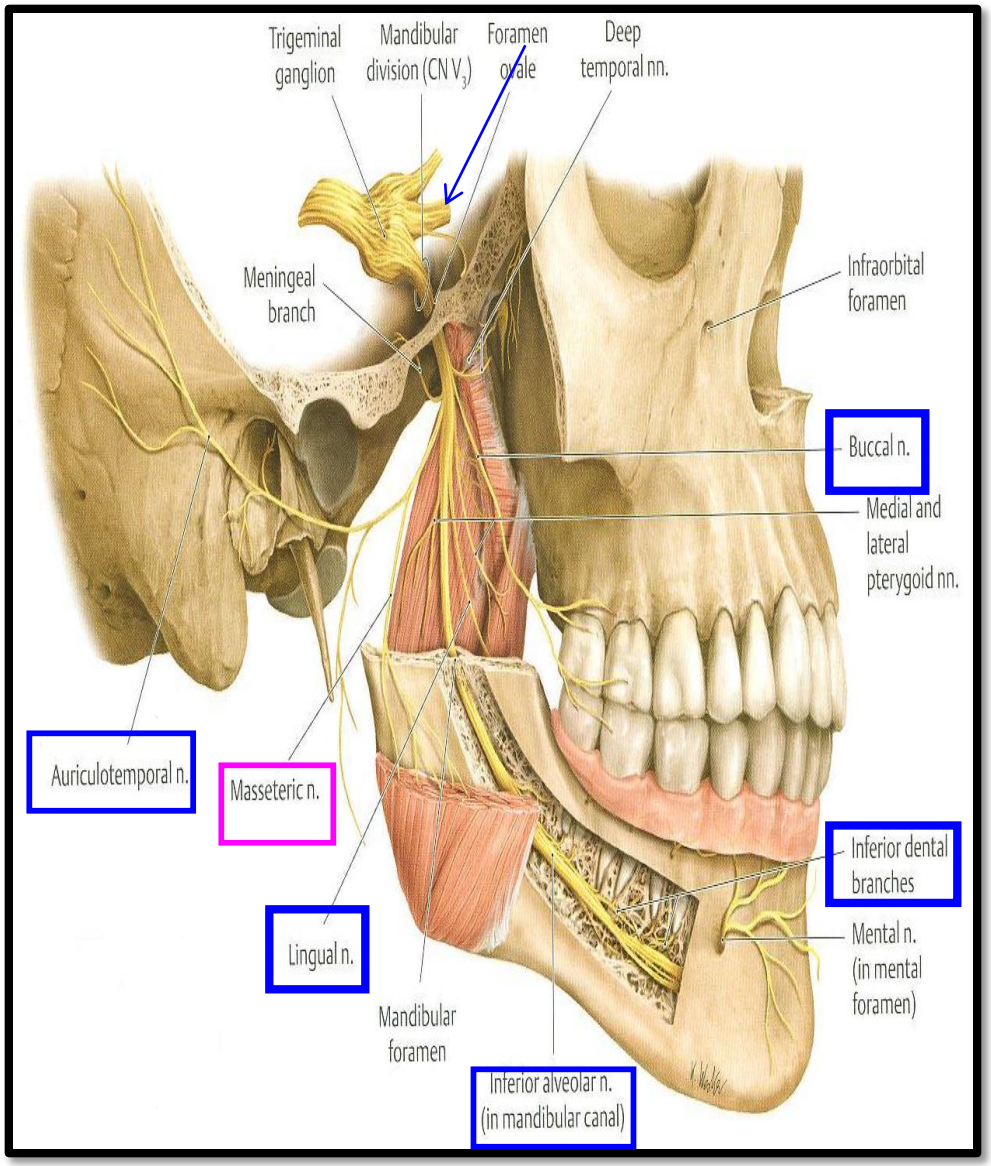
MANDIBULAR (MIXED)

- **SENSORY BRANCHES:**

1. **Lingual:** receives
   General sensations from anterior 2/3 the of tongue.
2. **Inferior alveolar:** supplies
   Lower teeth, gums & face.
3. **Buccal:** supplies the skin and mucous membrane of a small area of the cheek of upper jaw.
4. **Auriculotemporal:** supplies
   auricle, temple, parotid gland & Temporomandibular joint (TMJ).

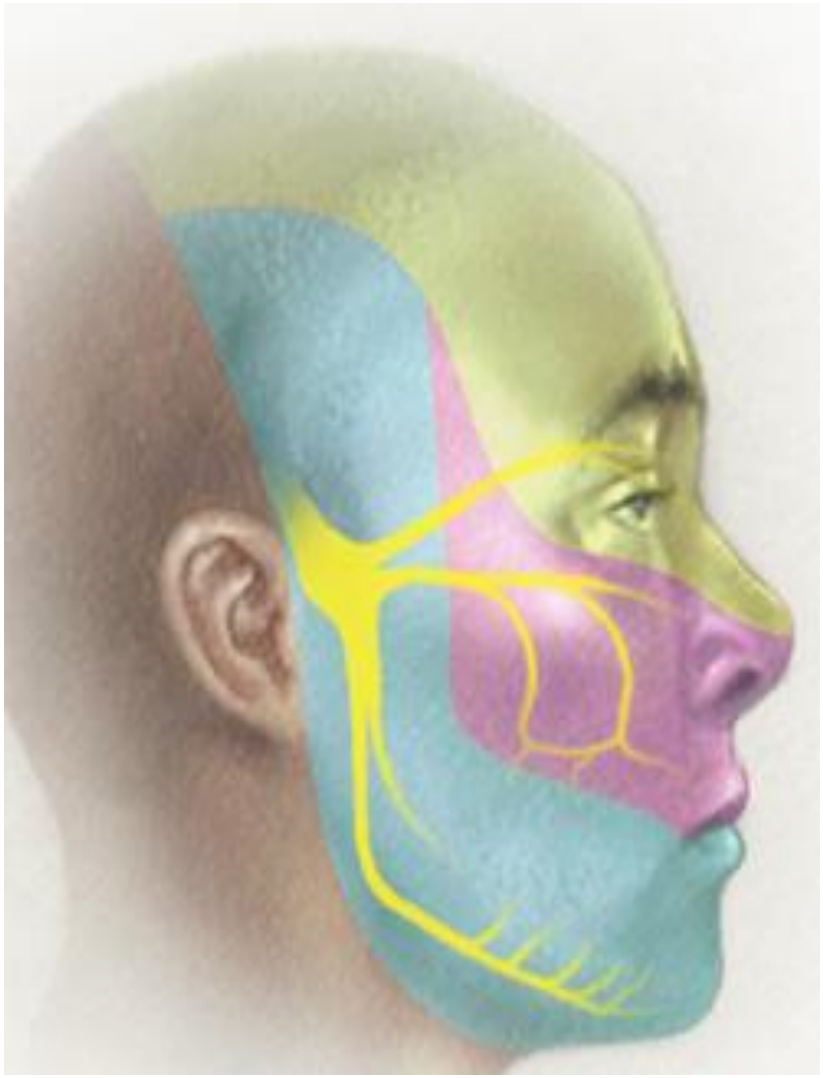
- **MOTOR BRANCHES:**

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



Trigeminal Neuralgia

- 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 in the face)
- This condition is characterized by recurring episodes of intense severe 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.



FACIAL NERVE

- Type: Mixed:

1. **Motor,**
2. Special sensory,
3. Parasympathetic.

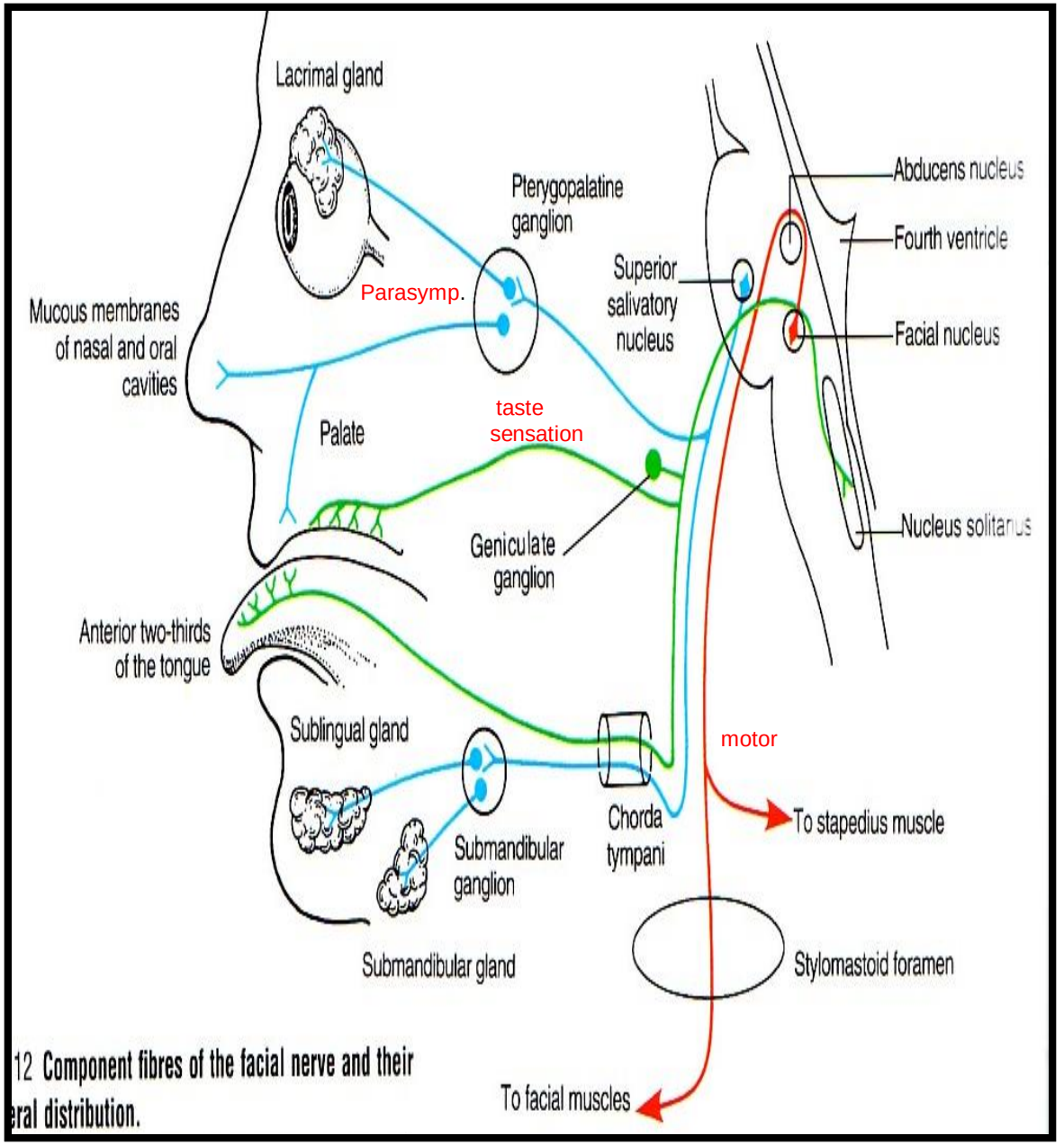
➢ **Fibers:**

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

To muscles developed from **the 2nd pharyngeal arch.**

3. **General visceral efferent:** supplying parasympathetic secretomotor fibers to the:

1. Submandibular,
2. Sublingual,
3. Lacrimal,
4. Nasal &
5. Palatine glands.



FACIAL NERVE NUCLEI

- **3 Nuclei:**

1. Special visceral afferent: (nucleus solitarius): receives taste from the anterior 2/3 of the tongue.

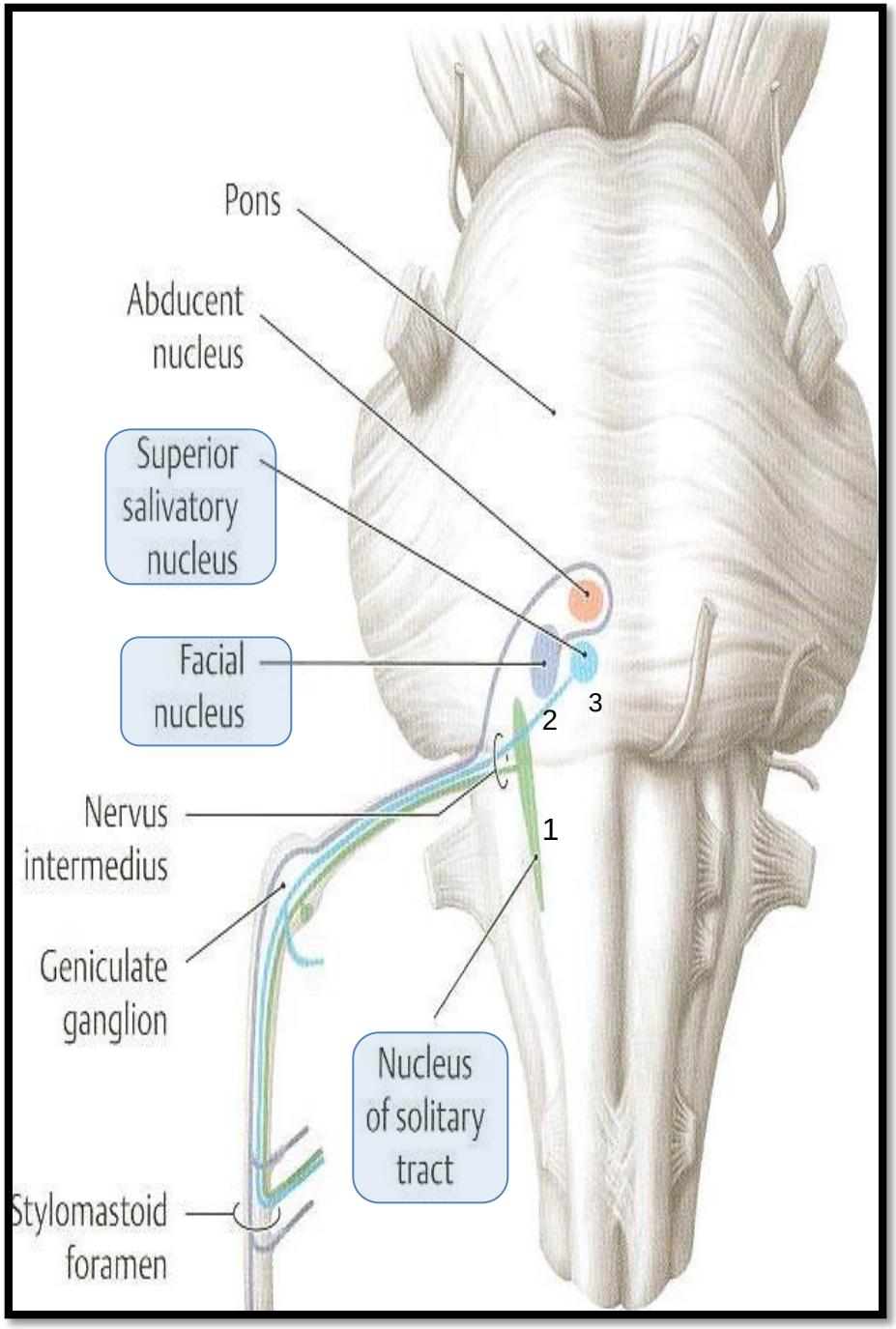
2. Special visceral efferent:

(motor nucleus of facial nerve): supplies muscles of 2nd pharyngeal arch: muscles of face, posterior belly of digastric, stylohyoid, platysma, stapedius, and occipitofrontalis.

3. General visceral efferent: superior salivatory nucleus: sends preganglionic **parasympathetic secretory fibers** to:

- **Pterygopalatine ganglion** and
- **Submandibular ganglion**.

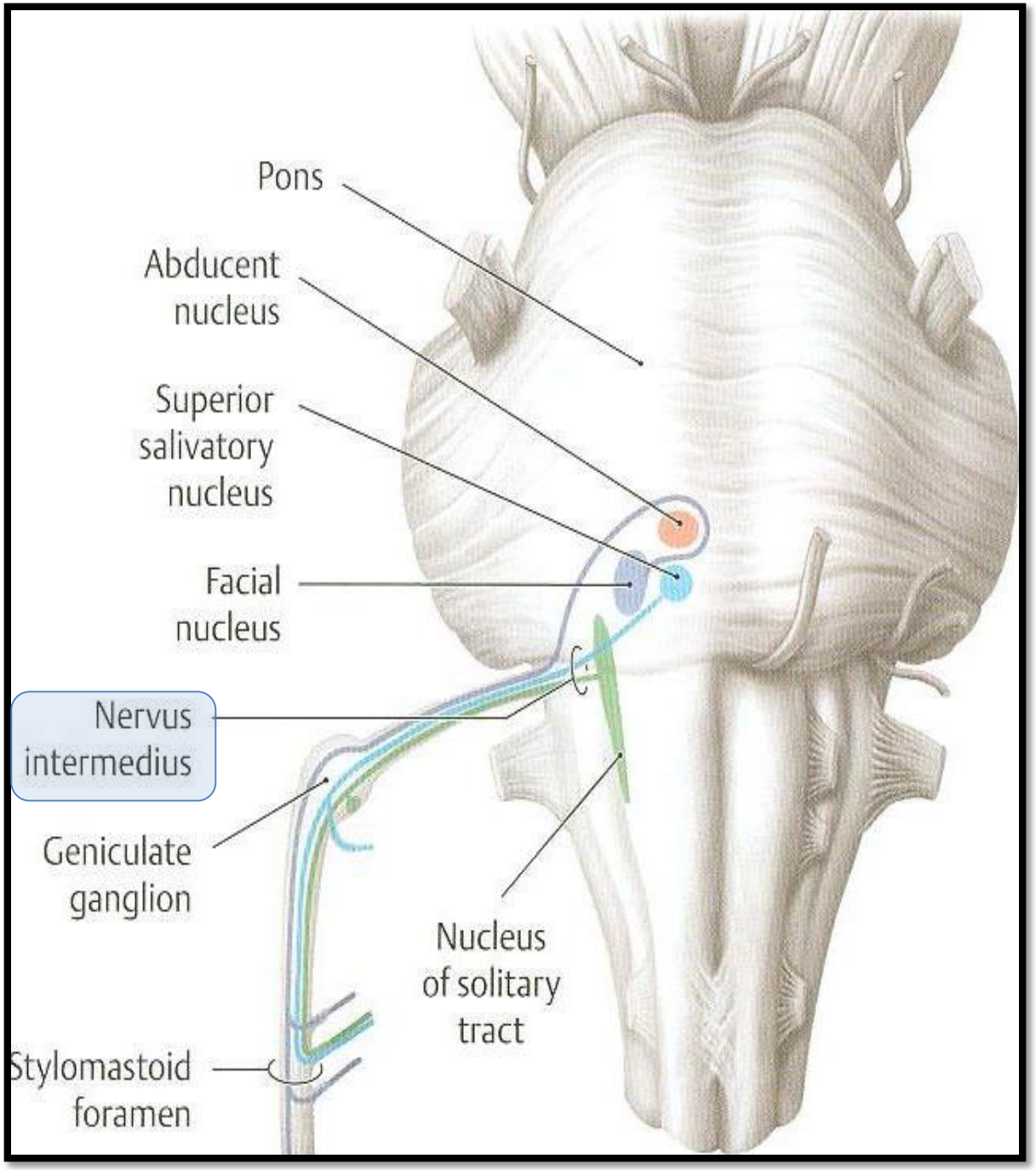
Then the Postganglionic fibers pass to the lacrimal, nasal, palatine sublingual, submandibular glands.



COURSE OF FACIAL NERVE

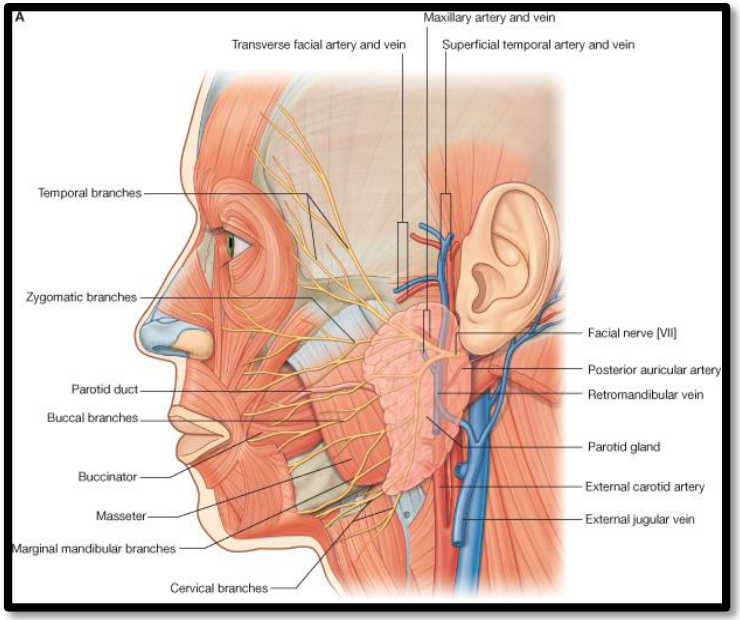
- Emerges from the **cerebellopontine angle, (very important)!!!**
- by 2 roots:

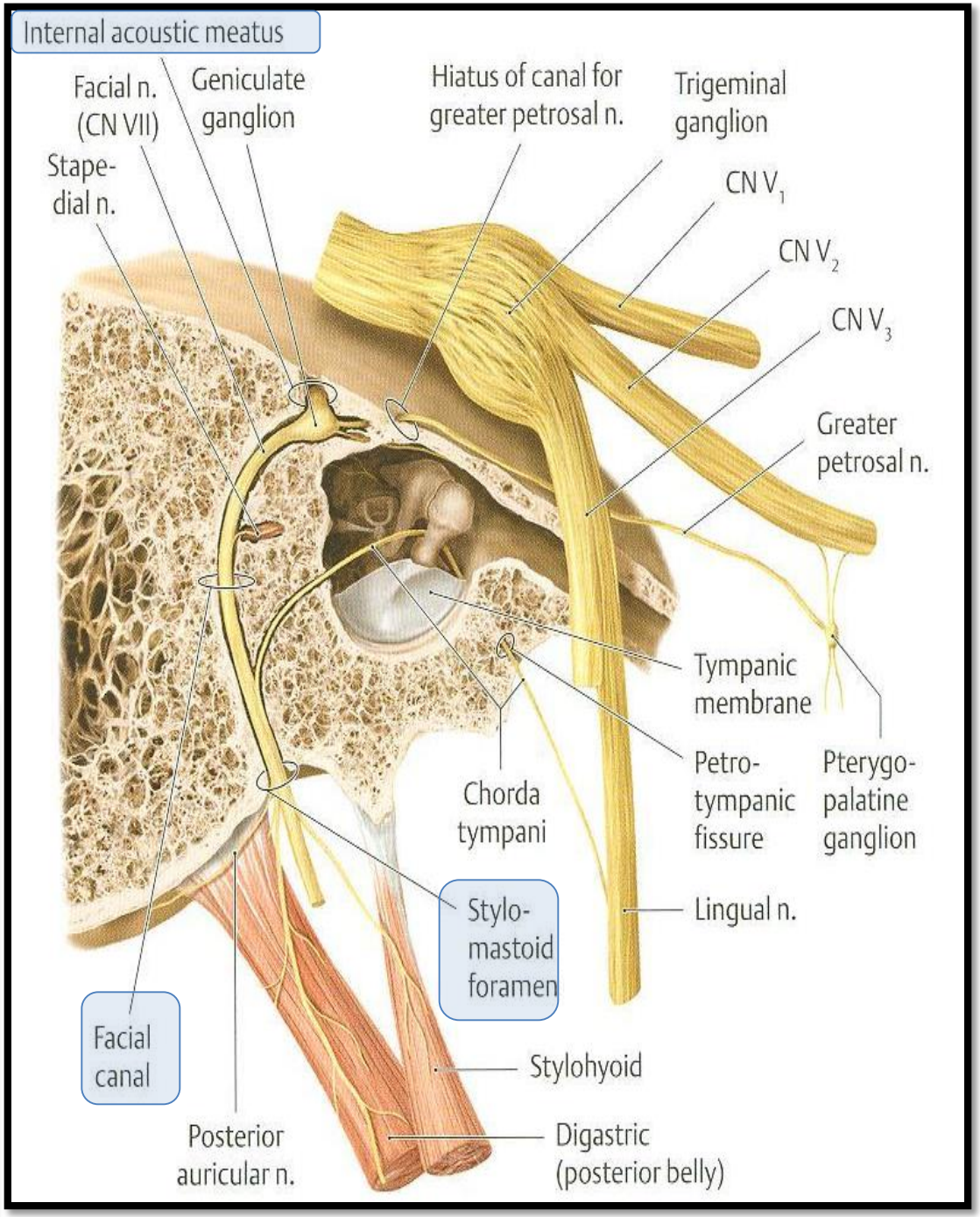
1. **Medial motor root**: contains **m**otor fibers.
2. **Lateral root (nervous intermedius):** contains **parasympathetic** & **taste fibers.**



COURSE OF FACIAL NERVE

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





BRANCHES

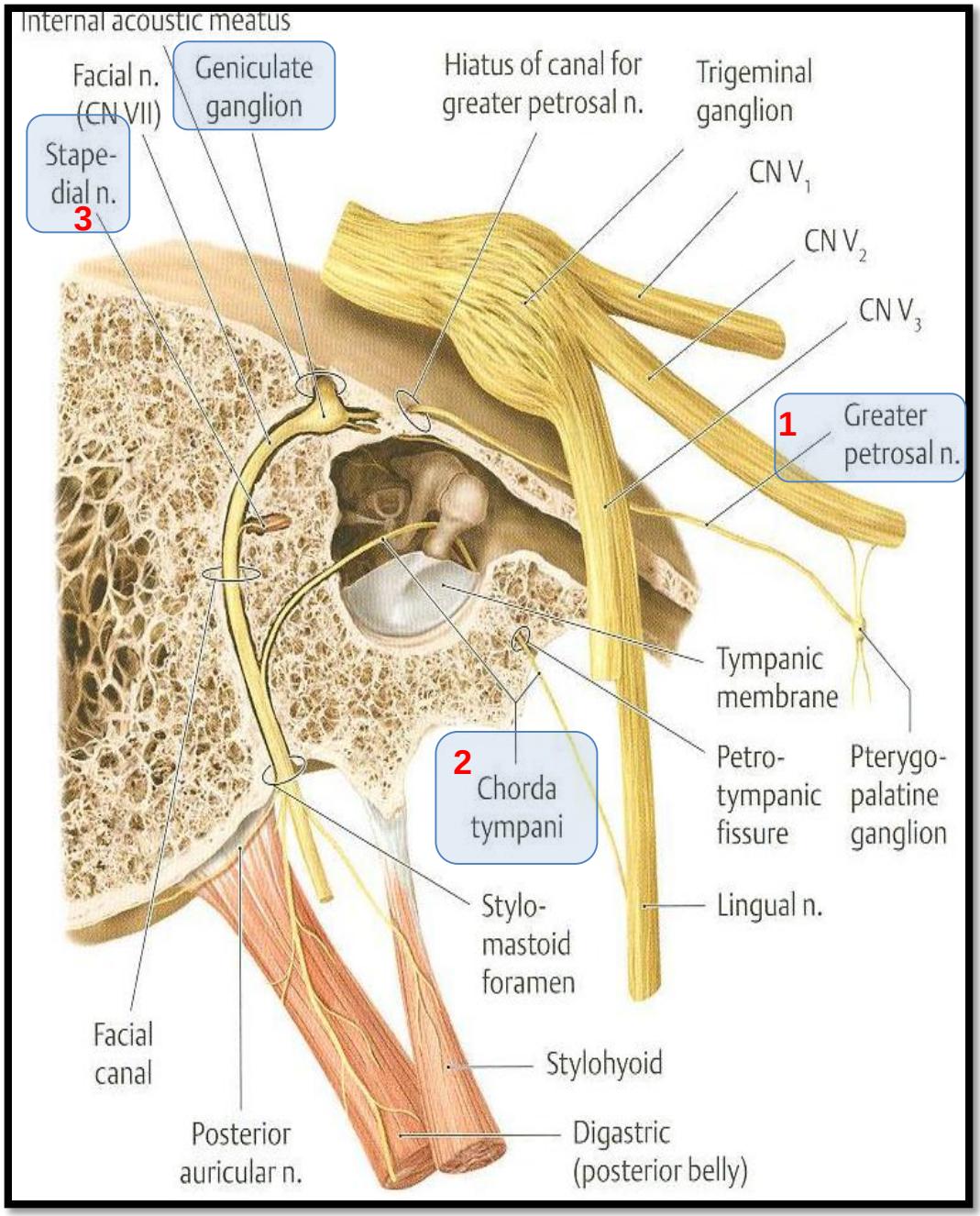
➢ **In facial canal:**

1. **Greater petrosal nerve:** carries preganglionic parasympathetic fibers to pterygopalatine ganglion then to the lacrimal, nasal & palatine glands.
2. **Chorda tympani:** carries:
   a) preganglionic parasympathetic fibers to submandibular ganglion then to submandibular & sublingual salivary glands.
   b) taste fibers from anterior 2/3 of the tongue.
3. **Nerve to stapedius.** control the amplitude of sound waves from external environment to inner ear.

N.B: Geniculate ganglion:

Lies in internal acoustic meatus.

contains cell bodies of **neurones** ; its Fibers carrying taste sensations from anterior 2/3 of tongue; ending in the solitary nucleus in medulla oblongata.



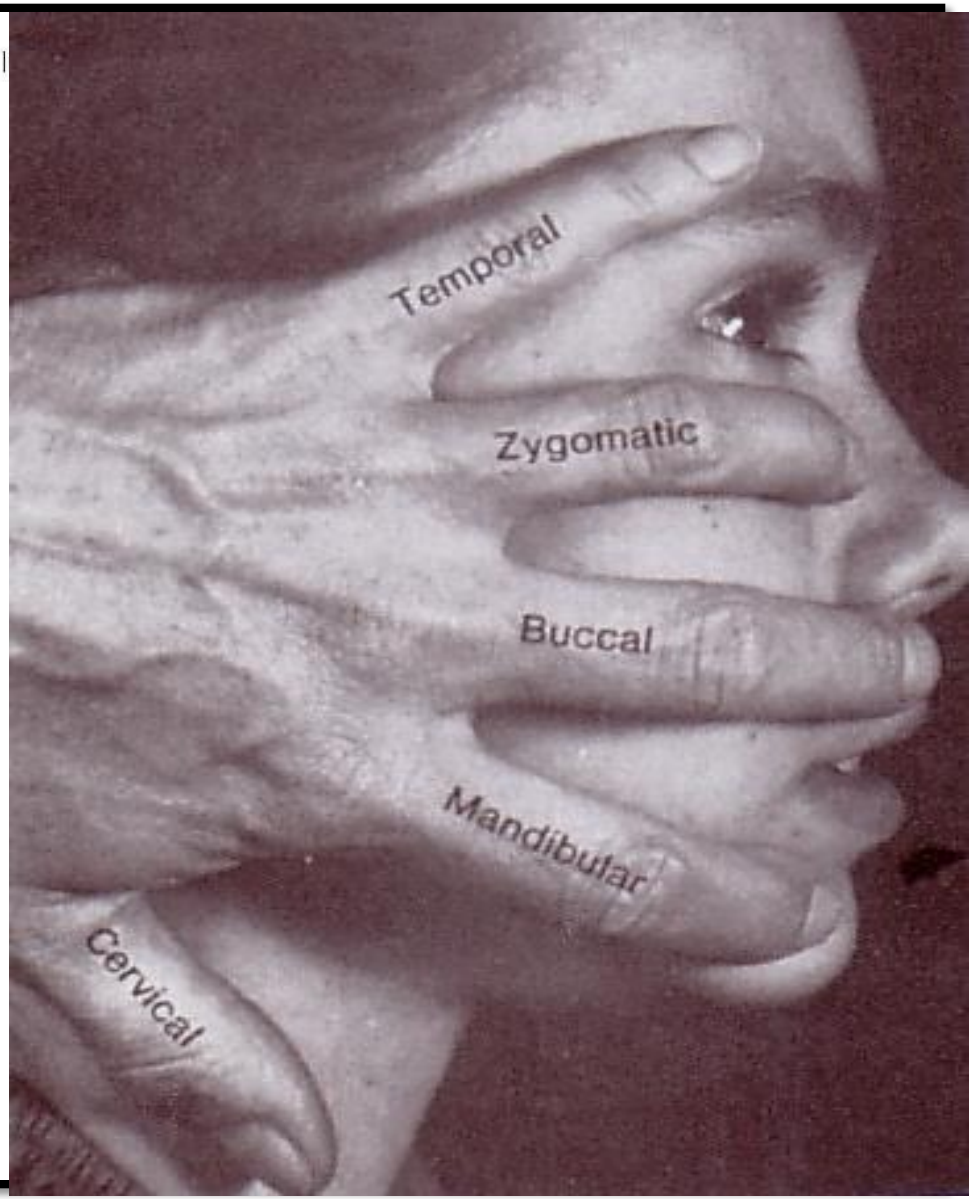
BRANCHES OF FACIAL NERVE

- Just as it **emerges** from the **stylomastoid foramen** it gives 2 branches:

1. **Posterior auricular:** to occipitofrontalis muscle.
2. **Muscular** branches to posterior belly of digastric & stylohyoid.

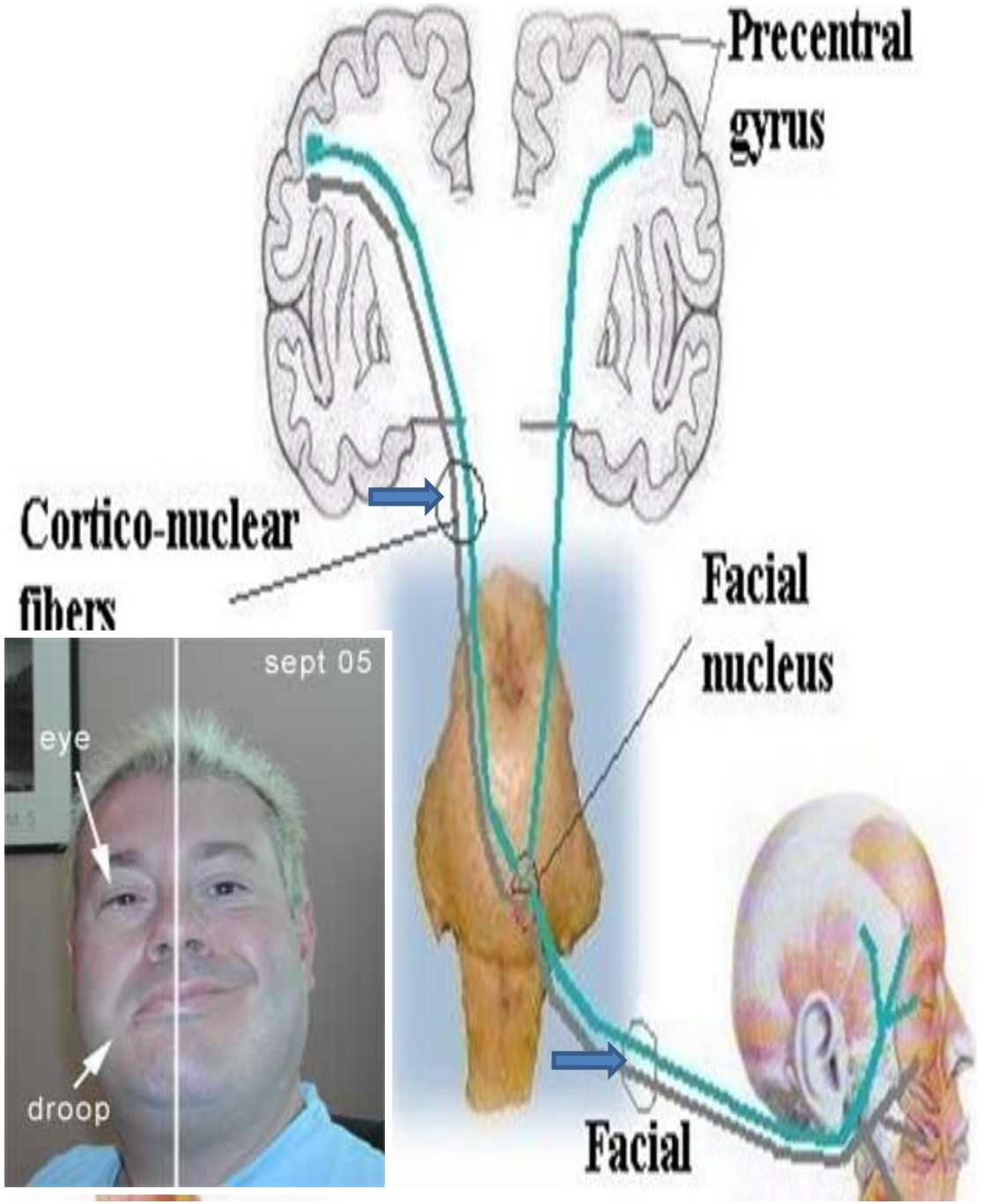
- **Inside parotid gland: it** gives **5 terminal motor branches:**
- *Temporal,*
- *Zygomatic,*
- *Buccal,*
- *Mandibular &*
- *Cervical….*

To the muscles of the face.



Bell's Palsy

- **Damage of the facial nerve results in paralysis of muscles of facial expressions: Facial (Bell's) palsy; lower motor neuron lesion *(whole face affected)***
- **NB. In upper motor neuron lesion (upper face is intact).**
- The face is distorted:
- Drooping of lower eyelid,
- Sagging of mouth angle,
- Dribbling of saliva,
- Loss of facial expressions,
- Loss of chewing, !!!!!!
- Loss of blowing,
- Loss of suckling,
- Unable to show teeth or close the eye on that side.
- Hyperacusis.



THANK YOU & BEST LUCK

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 by great auricular nerve C2,3).
- **All motor fibers** are only included in the mandibular division of the trigeminal nerve supply muscles of the 1st pharyngeal arch.

SUMMARY

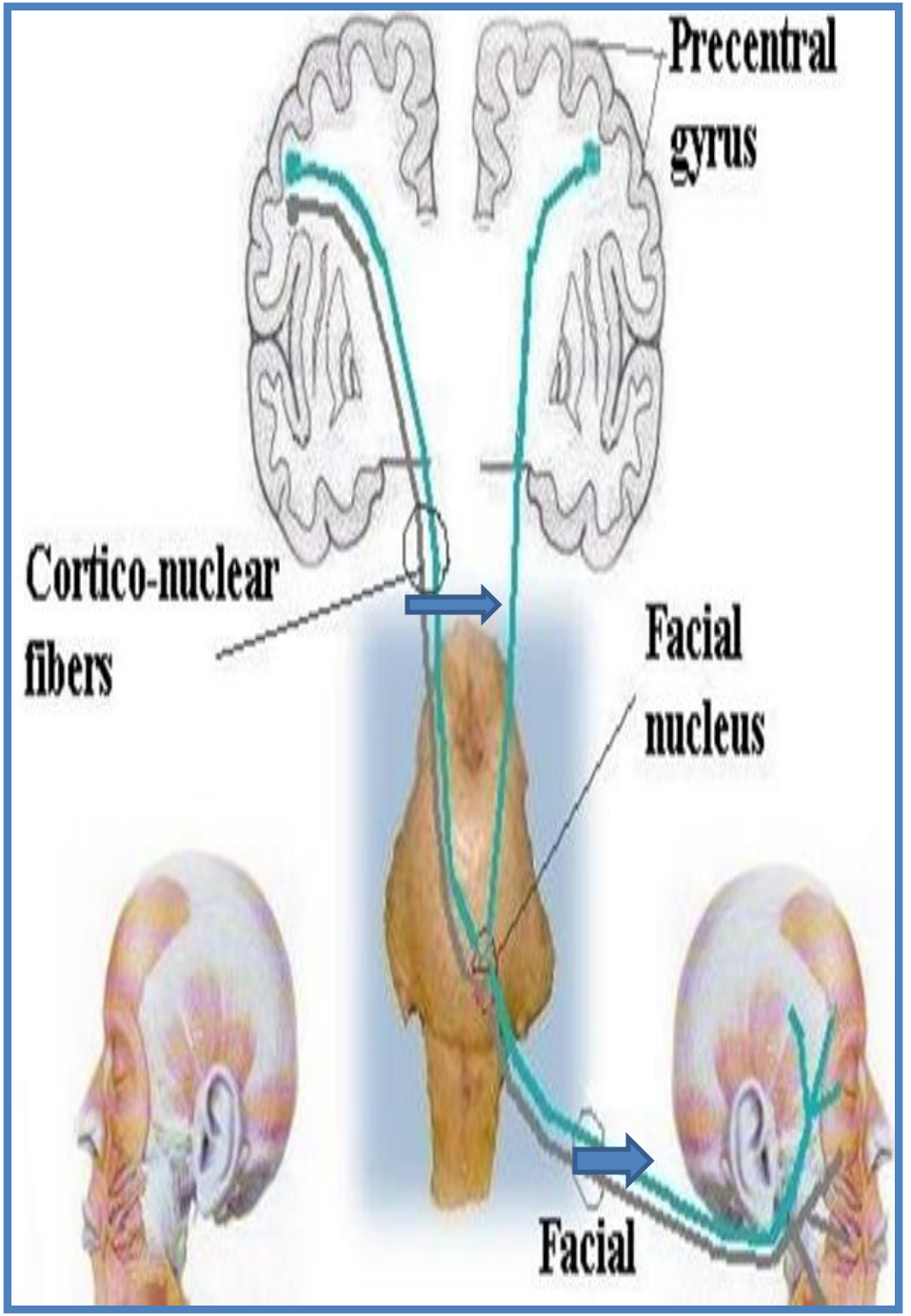
- **Nuclei of facial nerve** are found in **pons.** They are of the special visceral afferent & efferent types, as well as general visceral efferent type.
- **The facial nerve** emerges from the **cerebellopontine angle**, gives **motor fibers** to **muscles of 2nd pharyngeal arch**, and **secretory fibers** to submandibular, sublingual, lacrimal, nasal & palatine glands & receives **taste fibers** from anterior 2/3 of tongue.

Lower Motor Neuron Lesion

- Results from injury of the facial nerve fibers:
  - In Internal acoustic meatus;
  - In the middle ear;
  - In the facial canal or
  - In parotid gland.
- Manifested by complete paralysis of facial muscles on the same side of lesion, (Whole face affection.

Upper Motor Neuron Lesion

- This occurs after injury to the pyramidal tract (corticonuclear) above facial nucleus.
- Leads to paralysis of facial muscles of the lower ½ of face in the opposite side but the upper ½ of the face intact because:
- Ms. of lower ½ of face receive pyramidal fibers from opposite cerebral cortex only,
- While Ms. of upper ½ of face receive pyramidal fibers from both cerebral hemispheres (Bilateral representation).



TEST YOUR SELF !

- **Stimulation of which of the following nerves could lead to salivation and lacrimation?**

a) Glossopharyngeal.
b) Trigeminal.
c) Facial.
d) Vagus.

- **Lesion of the mandibular nerve may result in:**

a) Loss of sensation of skin over the nose.
b) Loss of lacrimation.
c) Loss of sensory supply of upper teeth.
d) Loss of general sensations of anterior 2/3 of tongue.

TEST YOUR SELF !

- **In bell palsy Hyperacusis is due to paralysis of which one of the following muscles?**
- Tensor tympani.
- Tensor palati
- Stapedius.
- Auricularis superior.

THANK YOU AND GOOD LUCK