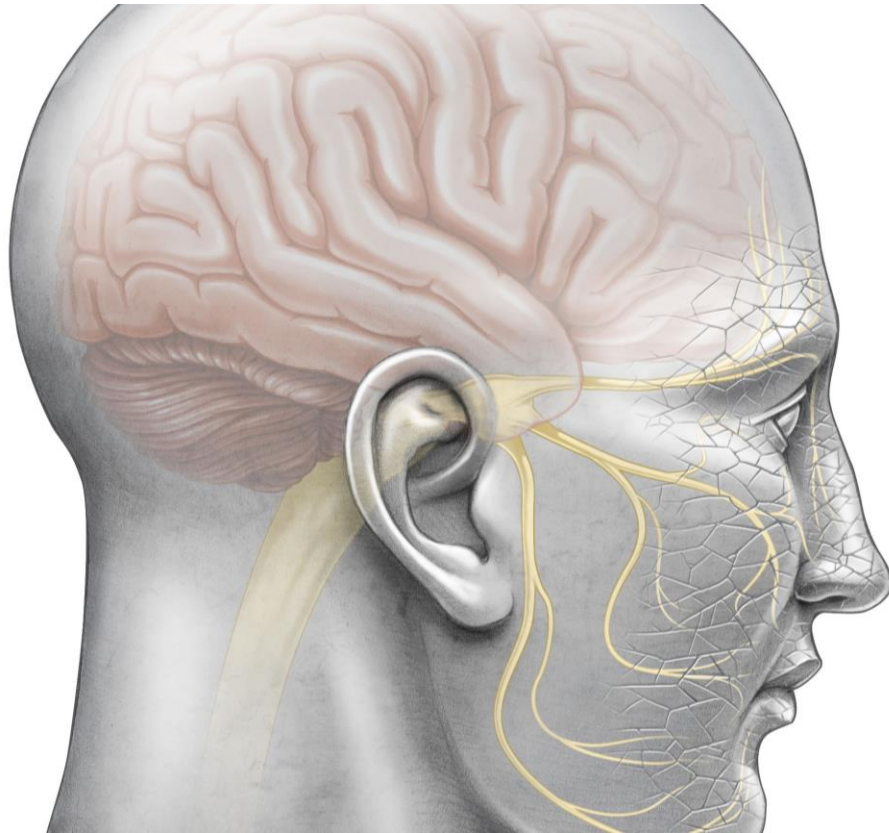


*www.khaleelalyahya.net*

# Nerve Supply of Face

Khaleel Alyahya, PhD, MEd



## Objectives

- 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.

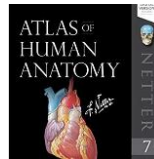
# Resources

## *Recommended textbooks*



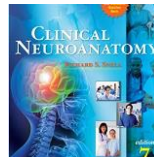
### **Essential of Human Anatomy & Physiology**

*By Elaine Marieb and Suzanne Keller*



### **Atlas of Human Anatomy**

*By Frank Netter*



### **Clinical Neuroanatomy**

*By Richard Drake, Wayne Vogl & Adam Mitchell*



### **KENHUB**

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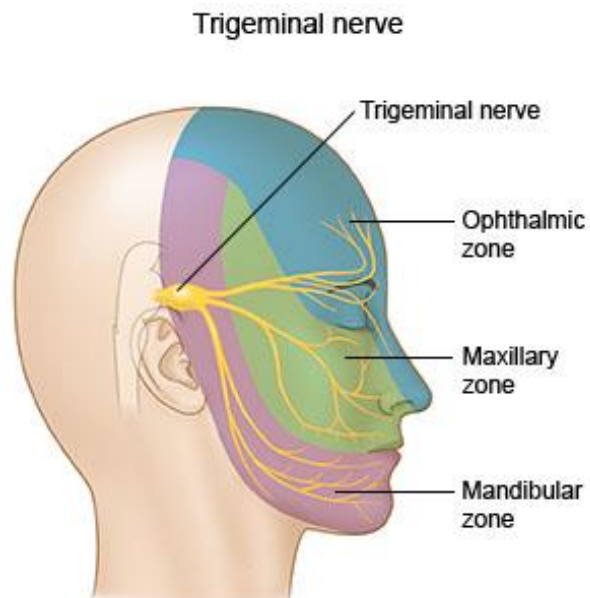
# TRIGEMINAL NERVE

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CR. V

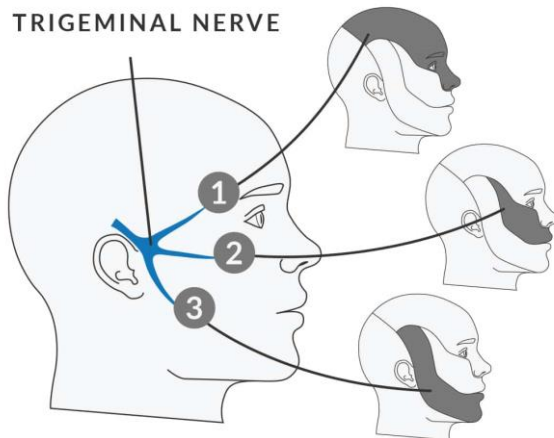


# Introduction



- It is the 5<sup>th</sup> paired cranial nerve, and the largest cranial nerve.
- Type: Mixed (sensory & motor).
- Fibers:
  1. General somatic afferent: Carrying general sensations from face and innervates the skin, mucous membranes and sinuses of the face.
  2. Special visceral efferent: Supplying muscles developed from the 1<sup>st</sup> pharyngeal arch.
    - The four muscles of mastication.
    - The anterior belly of the digastric.
    - The mylohyoid.
    - The tensor tympani.
    - The tensor veli palatini.

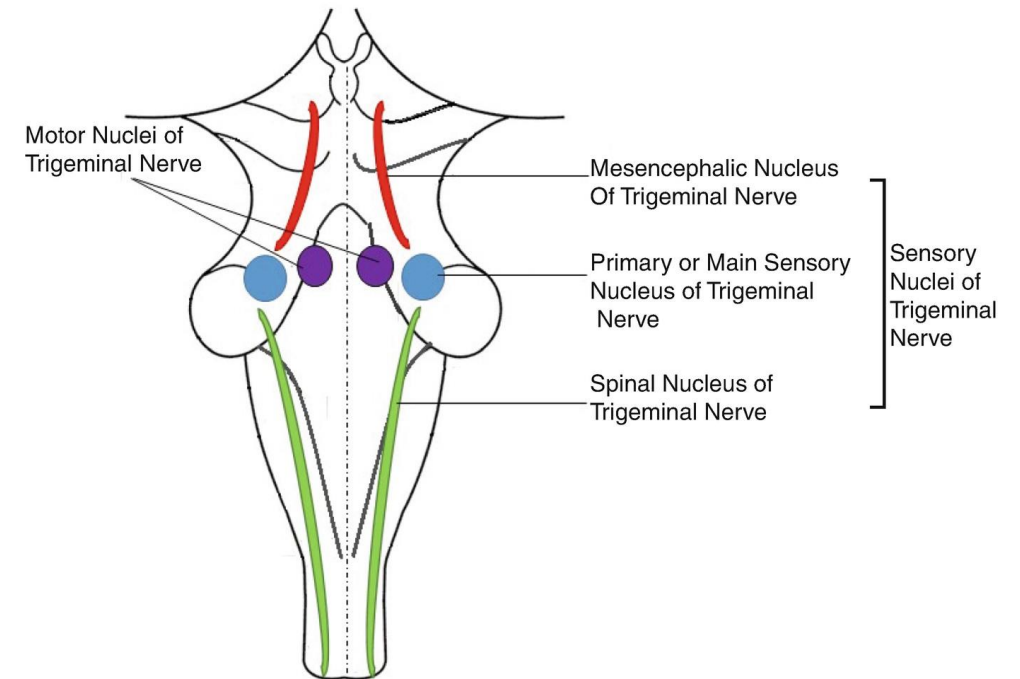
# Importance



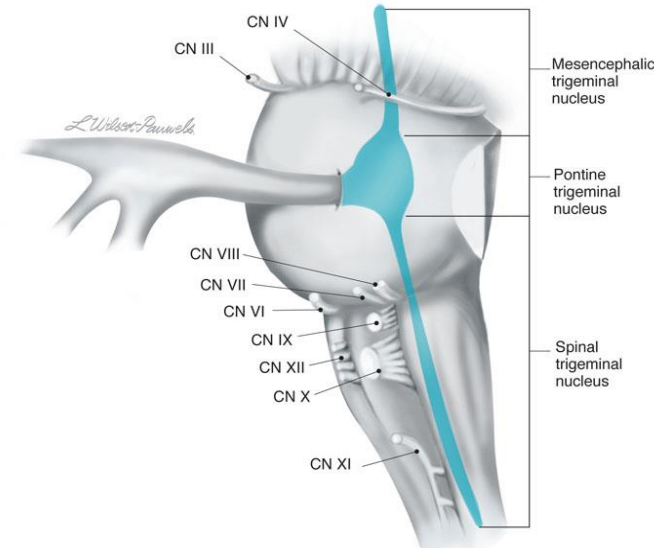
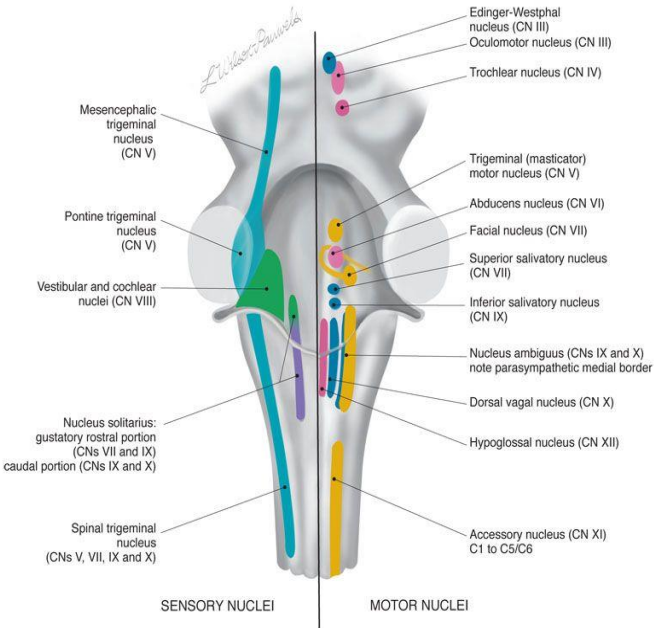
- Every time you eat something, you should thank mandibular nerve.
- It is one of the most important nerves for the functions of your mouth, and without it, you wouldn't be able to chew.
- It helps you feel sensations, including temperature and pain.
- Your mandibular nerve also helps you with other important functions besides eating that include the ability to speak and breathe.
- Knowing how does this nerve work will explain the importance of it.
- Understanding this nerve can help you understand any pain or discomfort you experience around your mouth.

# Trigeminal Nerve Nuclei

- Four nuclei: (3 **sensory** + 1 **motor**).
- 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.
- Special visceral efferent
  1. 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).



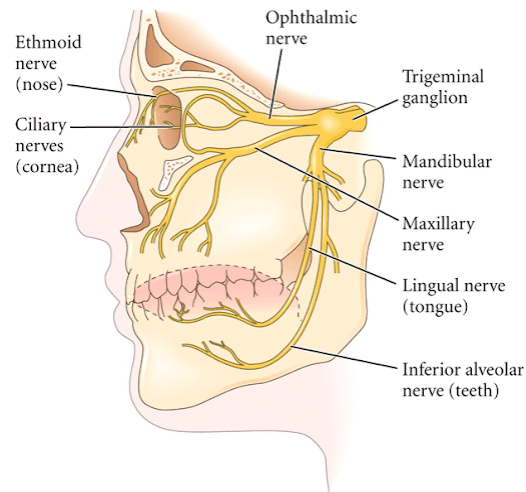
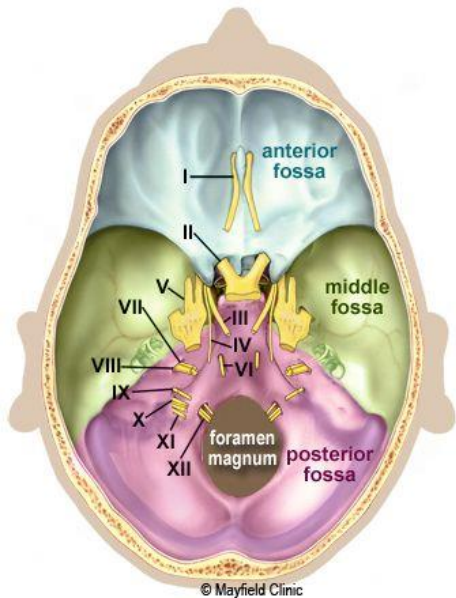
# Nuclei of Trigeminal nerve



**Figure V-9** Trigeminal sensory nucleus (lateral view of the brain stem).

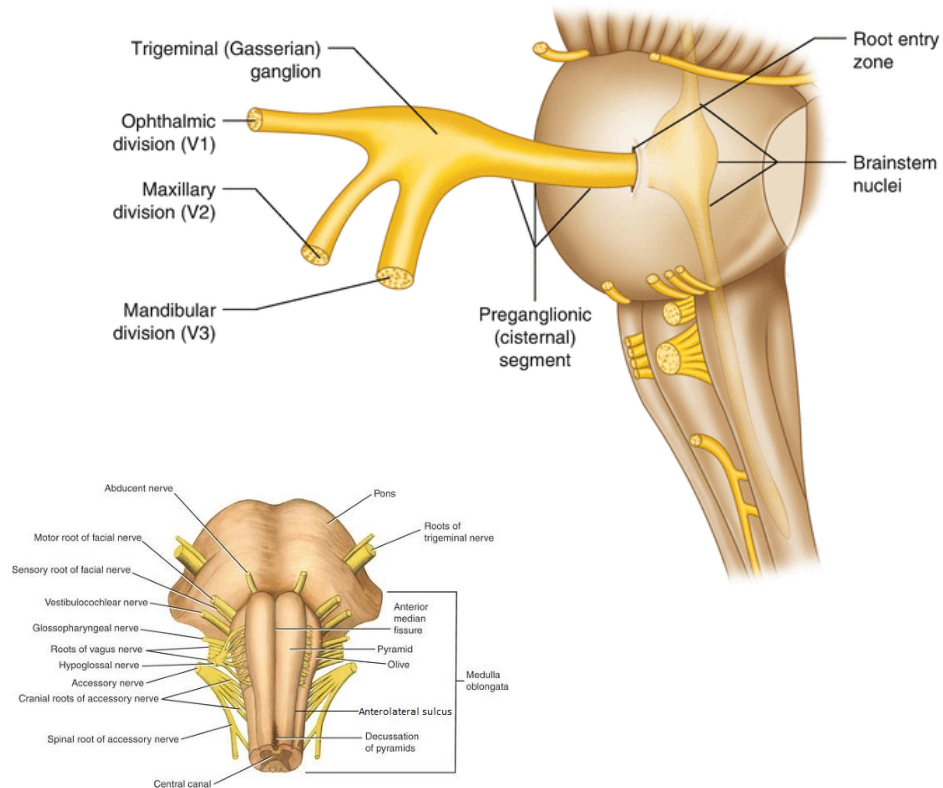


# Trigeminal Ganglion



- It occupies a depression in the middle cranial fossa (temporal bone) known as **trigeminal cave**.
- It contains cell bodies:
  - Whose dendrites carry sensations from the face.
  - Whose axons form the sensory root of trigeminal nerve.

# Trigeminal Nerve



- Emerges from the middle of the ventral surface of the pons by two roots
  - Large lateral sensory root & small medial motor root.
- Divides into 3 divisions (dendrites of trigeminal ganglion):
  - Ophthalmic.
  - Maxillary.
  - Mandibular.
- Axons of cells of motor nucleus join only the mandibular division.

# Opening

## Ophthalmic Nerve

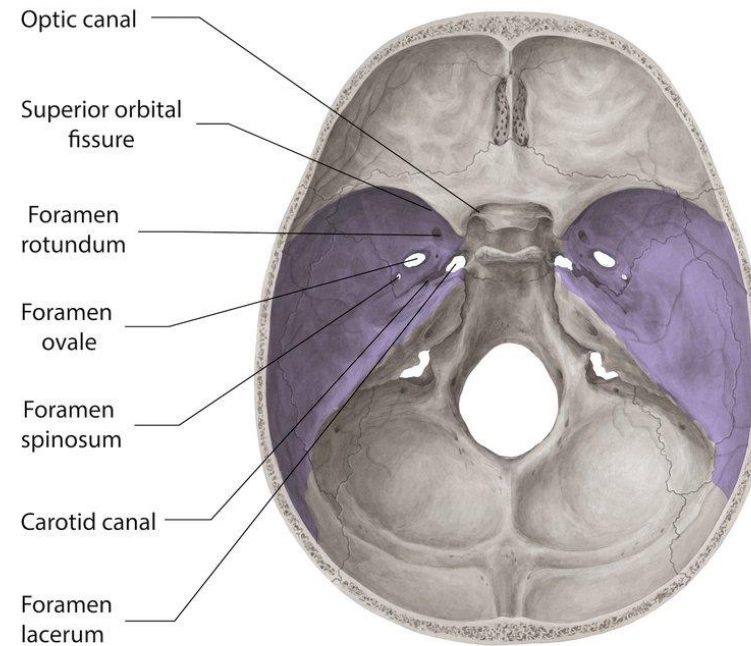
Passes through **superior orbital fissure**.

## Maxillary Nerve

Passes through **foramen rotundum**.

## Mandibular Nerve

Passes through **foramen ovale**.



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# Trigeminal Branches

## Mandibular Nerve

### *Mixed*

#### *Sensory branches supplies several regions:*

- Lingual: receives general sensations from anterior 2/3 the of tongue.
- Inferior alveolar: supplies lower teeth, gums & face (over mandible).
- Buccal: supplies face (cheek on upper jaw
- Auriculotemporal: supplies auricle, temple, parotid gland & TMJ.

#### *Motor branches supplies the followings:*

- Eight Muscles (four of muscles of mastication and other four muscles).

## Maxillary Nerve

### *Pure Sensory*

#### *Supplies the followings:*

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

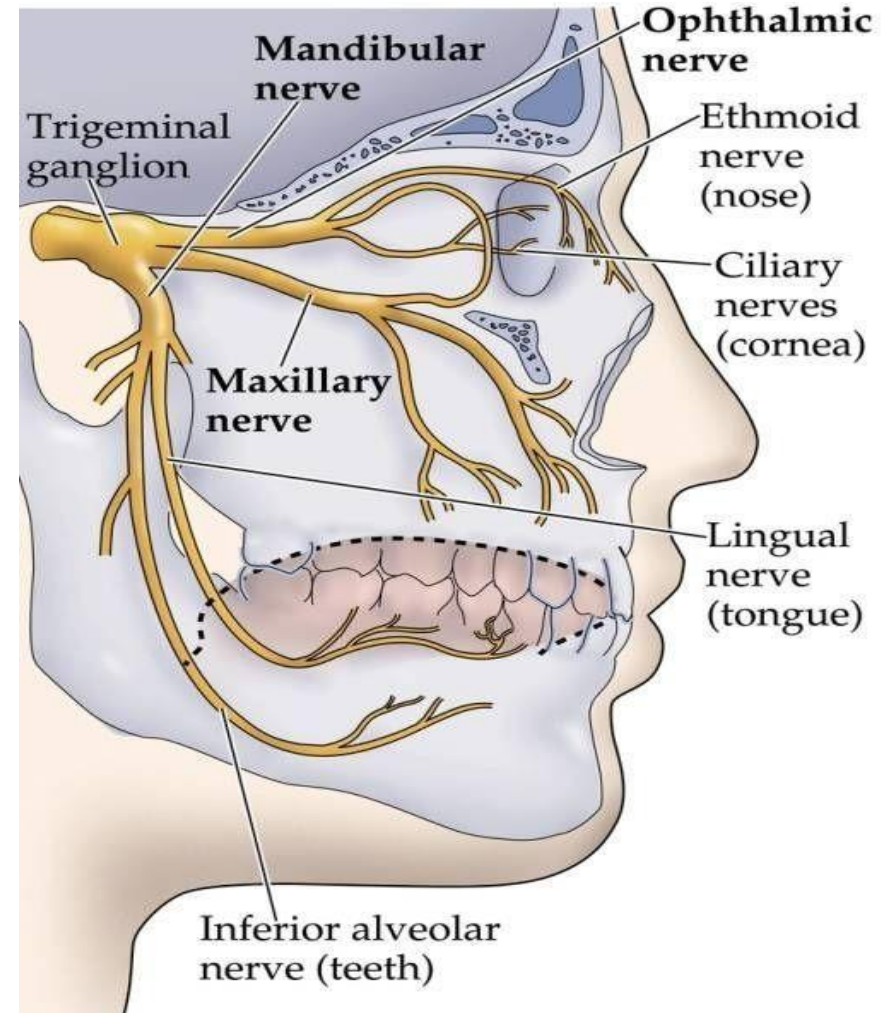
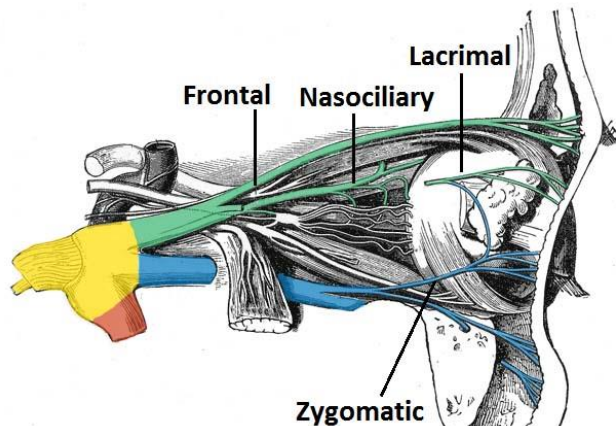
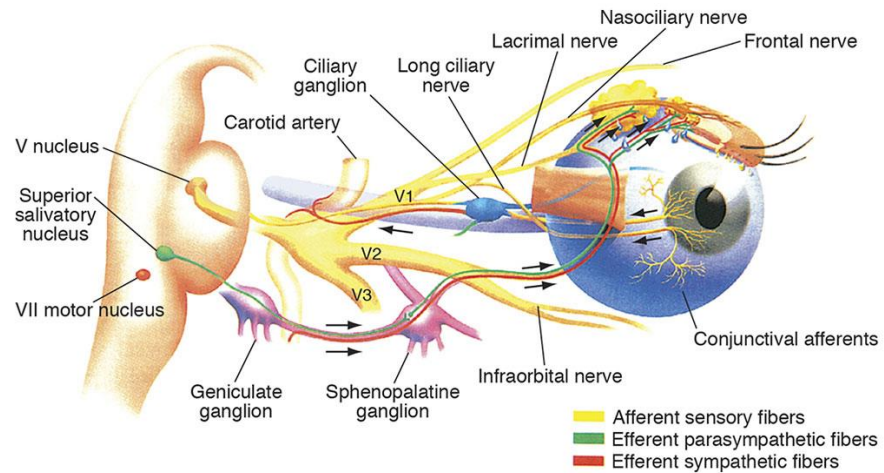
## Ophthalmic Nerve

### *Pure Sensory*

#### *Divided into 3 branches:*

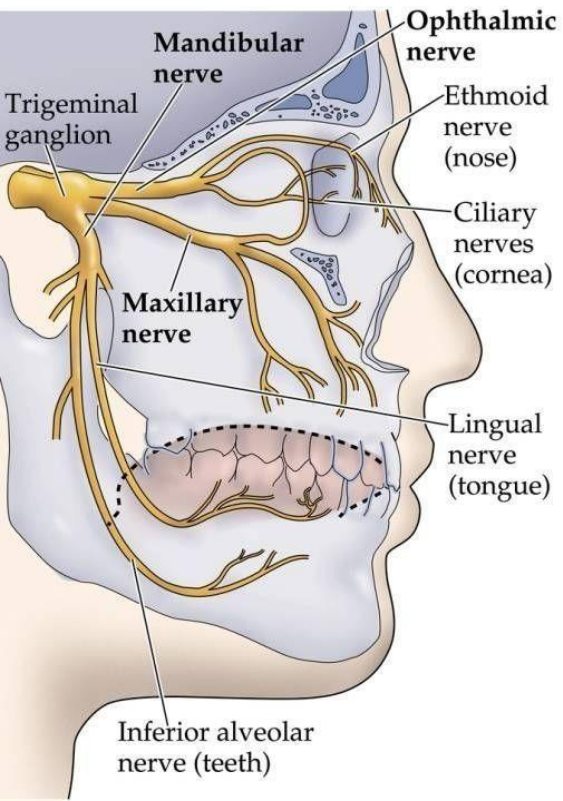
- Frontal, Lacrimal & Nasociliary which pass through superior orbital fissure to the orbit.
  - Frontal: supplies skin of face & scalp.
  - Lacrimal: supplies skin of face & lacrimal gland.
  - Nasociliary: supplies skin of face, nasal cavity & eyeball.

# Branches



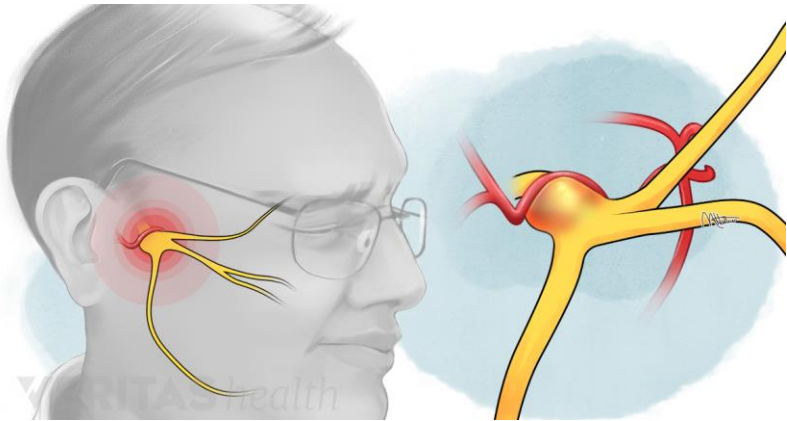


# Trigeminal Nerve & Dental Work



- The mandibular nerve plays a role just about every time you get dental work done, especially in the lower part of your mouth.
- Anytime you have dental work done, you'll face a small risk of permanent nerve damage.
- Wisdom tooth extraction is a common case in which patients face this risk.
- And in any dental surgery, you'll need local anaesthesia, so your mandibular nerve won't transmit pain messages during the surgery.
- Local anaesthetics block the part of the nerve that is affected.
- However, nerve damage also makes a rare complication for procedures like dental implants and other dental surgeries.
- That's why you should always work with an experienced, responsible dentist who can minimize your risk.

# Trigeminal Neuralgia



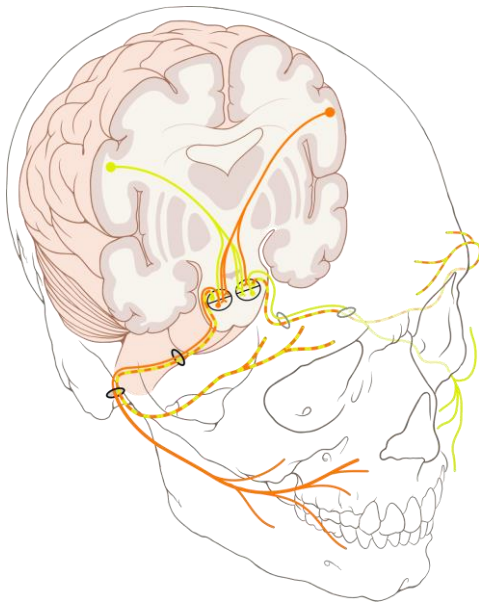
- Compression, degeneration or inflammation of the 5<sup>th</sup> cranial nerve may result in a condition called **trigeminal neuralgia** or tic douloureux (spasmodic contraction of the muscles in the face)
- This condition is characterized by recurring episodes (recurrent attacks) of intense stabbing 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.
- Usually the problem comes from the contact between a normal blood vessel and the trigeminal nerve at the base of the brain. This contact puts pressure on the nerve and causes it to malfunction.
- Trigeminal neuralgia can occur as a result of aging, or it can be related to multiple sclerosis or a similar disorder that damages the myelin sheath protecting certain nerves.
- Trigeminal neuralgia can also be caused by a tumour compressing the trigeminal nerve.

# FACIAL NERVE

## CR. VII



# Introduction



- It is the 7<sup>th</sup> paired cranial nerve, and it is involved in our facial expression.
- Type: Mixed nerve (motor, special sensory, parasympathetic).
- Fibers:
  - **Special visceral afferent:** carrying taste sensation from anterior 2/3 of the tongue.
  - **Special visceral efferent:** supplying muscles developed from the 2<sup>nd</sup> pharyngeal arch.
    - The muscles of facial expression.
    - The posterior belly of the digastric.
    - The stylohyoid muscle.
    - The auricular muscle.
    - The stapedius muscle of the middle ear.
  - **General visceral efferent:** supplying parasympathetic secretory fibers to submandibular, sublingual, lacrimal, nasal & palatine glands.

# Importance



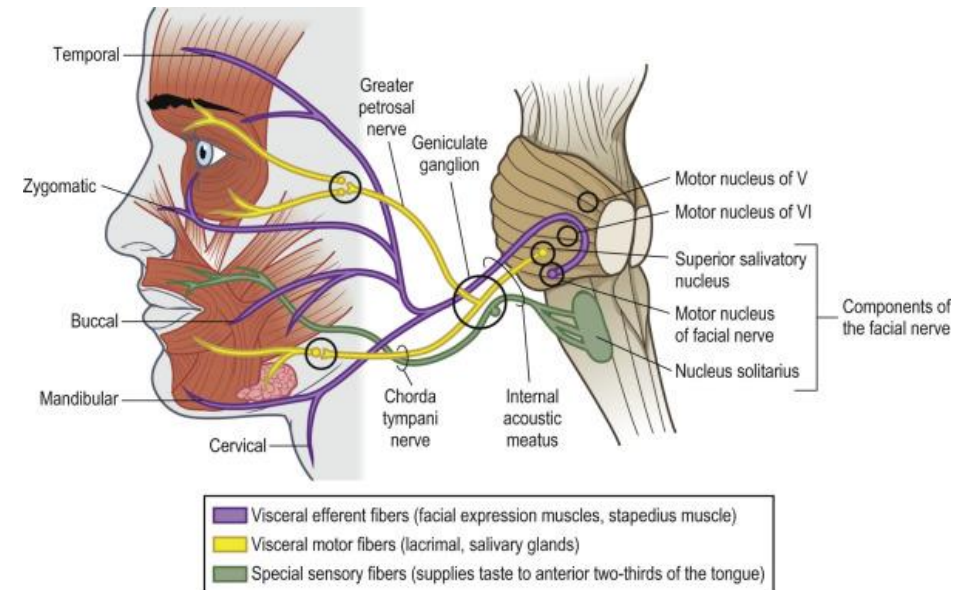
- One of the most important ways we non-verbally communicate with each other is by facial expression.
- A lift of an eyebrow, the wrinkling of a nose, or the slight twinge of the corner of the mouth can tell us quite a bit if we are paying attention.
- We notice these small changes and interpret not only what they indicate about the people we are interacting with, but also what they indicate regarding their behaviour towards us, and the relationships forming between us.



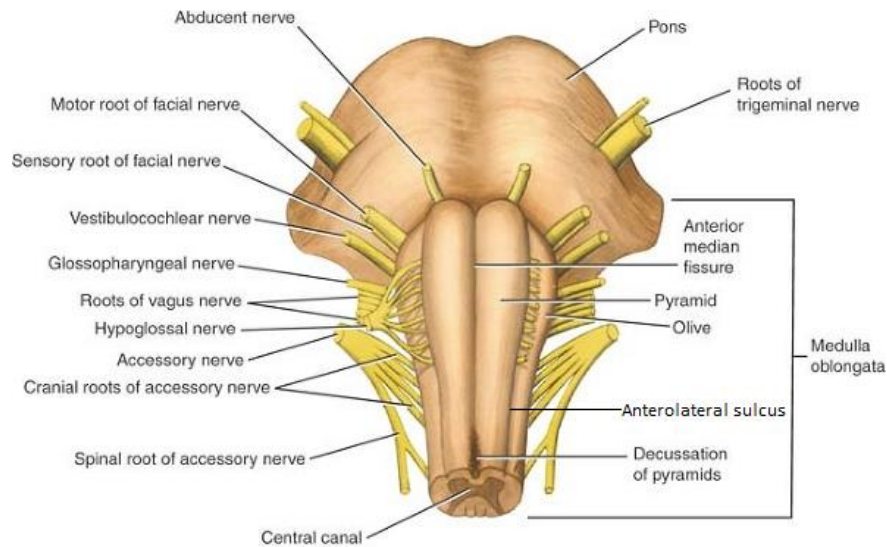
# Nuclei

## ■ Three Nuclei:

- **Special visceral afferent: nucleus solitarius:** receives taste from the anterior 2/3 of tongue.
- **Special visceral efferent: motor nucleus of facial nerve:** supplies: muscles of facial expression, posterior belly of digastric, stylohyoid, platysma, stapedius, and occipitofrontalis.
- **General visceral efferent: superior salivatory nucleus** sends preganglionic parasympathetic secretory fibers to sublingual, submandibular, lacrimal, nasal & palatine glands.

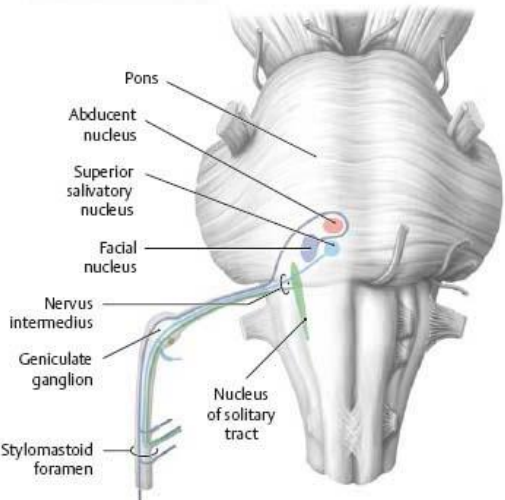


# COURSE OF FACIAL NERVE?

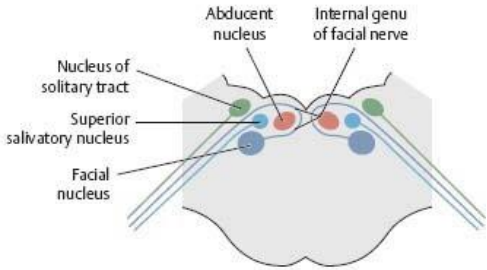


- Emerges from the cerebellopontine angle by two roots:
  - **Medial motor root** contains motor fibers.
  - **Lateral root (nervus intermedius)** contains parasympathetic & taste fibers.
- Passes through internal auditory meatus to inner ear where it runs in facial canal.
- Emerges from the stylomastoid foramen & enters the parotid gland where it ends.

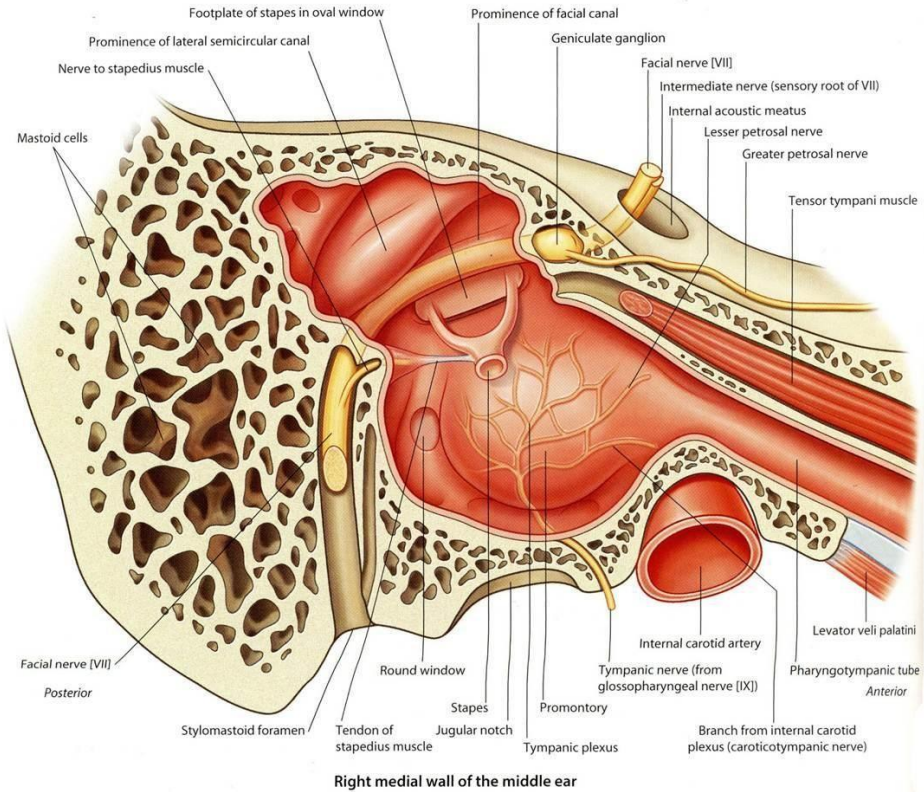
# COURSE OF FACIAL NERVE?



A Anterior view of the brainstem.



B Cross section through the pons, superior view.



Right medial wall of the middle ear

# Facial Branches

## Inside parotid gland

### *Five branches*

1. Temporal
2. Zygomatic
3. Buccal
4. Mandibular
5. Cervical

*Innervates muscles of the face*

## Once emerges from stylomastoid foramen

### *Two branches*

1. Posterior auricular innervates occipitofrontalis muscle.
2. Muscular branches innervate posterior belly of digastric & stylohyoid.

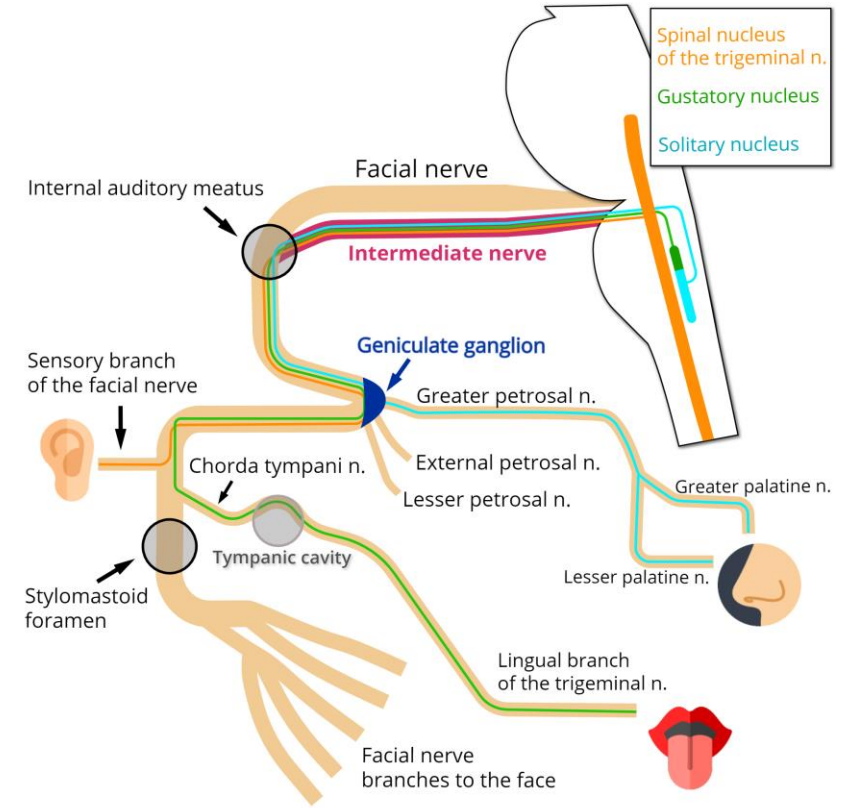
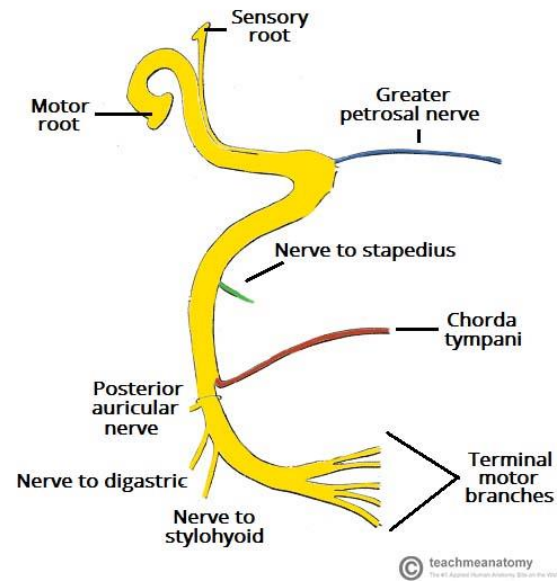
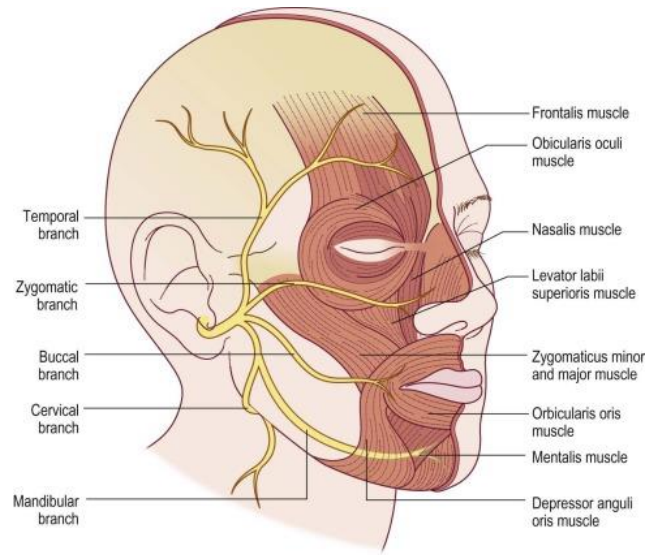
## In facial canal

### *Three branches*

1. Greater petrosal nerve carries preganglionic parasympathetic fibers to lacrimal, nasal & palatine glands.
2. Chorda tympani carries:
  - Preganglionic parasympathetic fibers to submandibular & sublingual glands.
  - Taste fibers from anterior 2/3 of tongue.
3. Nerve to stapedius to control the amplitude of sound waves from the external environment to the inner ear.

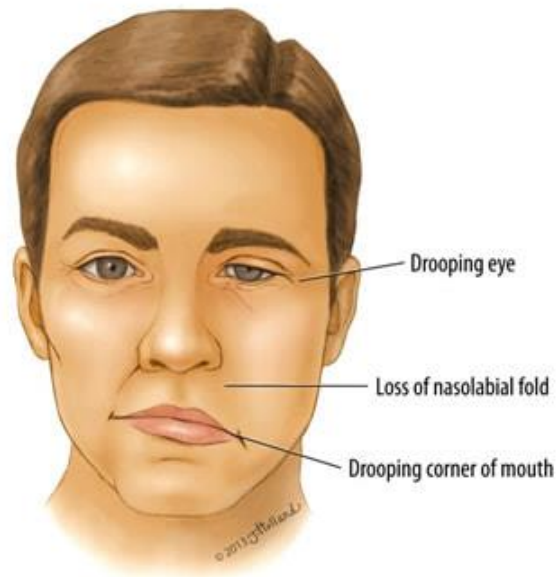
**N.B.:** Geniculate ganglion: contains cell bodies of neurons of facial nerve; its fibers carrying taste sensations from anterior 2/3 of tongue; ending in solitary nucleus in M.O. lies in internal acoustic meatus.

# Branches





# 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)
- 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 sucking,
  - Unable to show teeth or close the eye on that side.

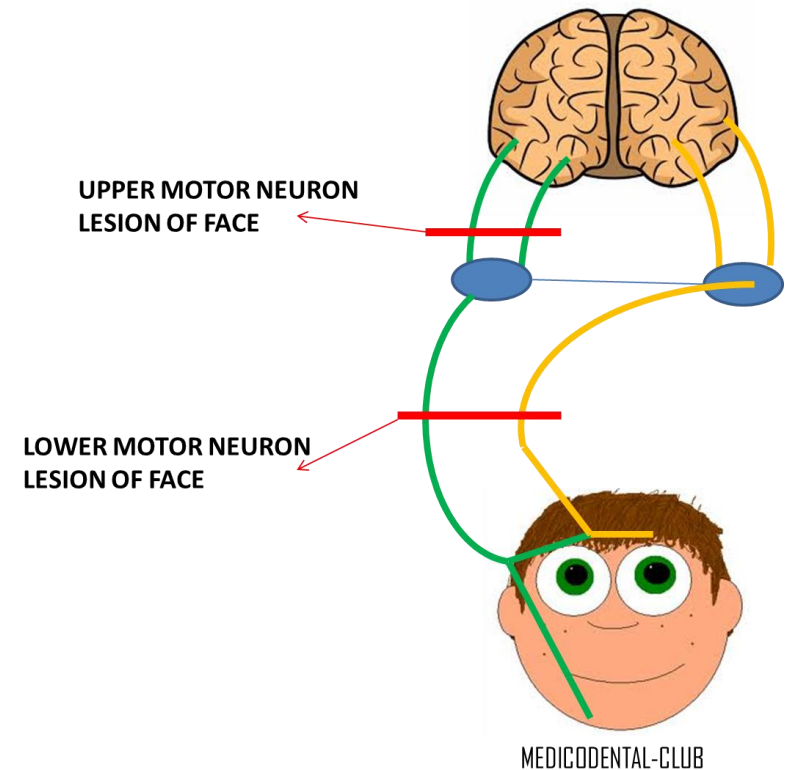
# Motor Neuron Lesions

## Lower Motor Neuron Lesion

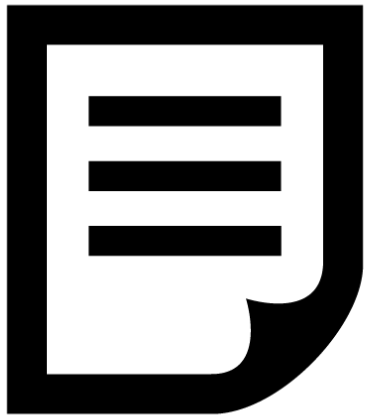
- Results from injury of facial nerve fibers below facial nucleus in internal acoustic meatus in the middle ear in the facial canal or in parotid gland.
- Manifested by complete paralysis of facial muscles on the same side of lesion.

## Upper Motor Neuron Lesion

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



# 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 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 types, 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?

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