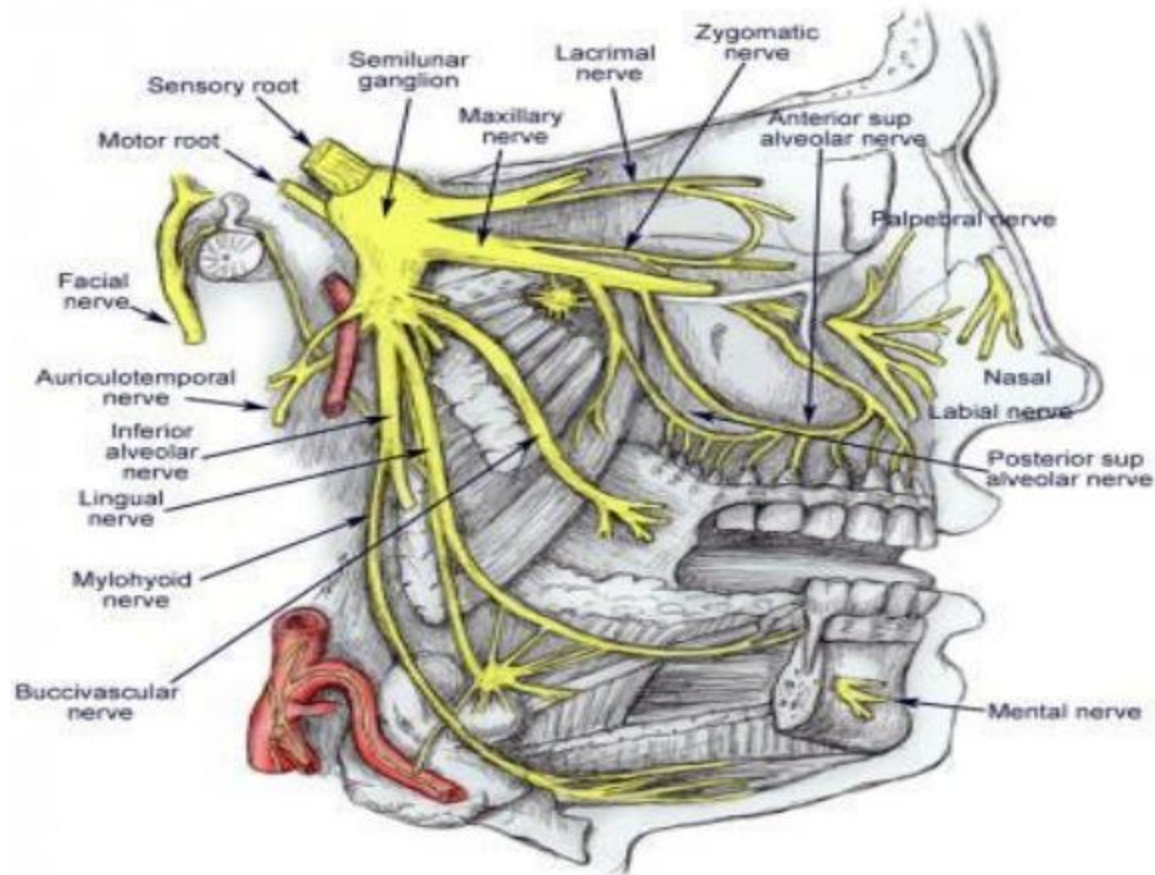
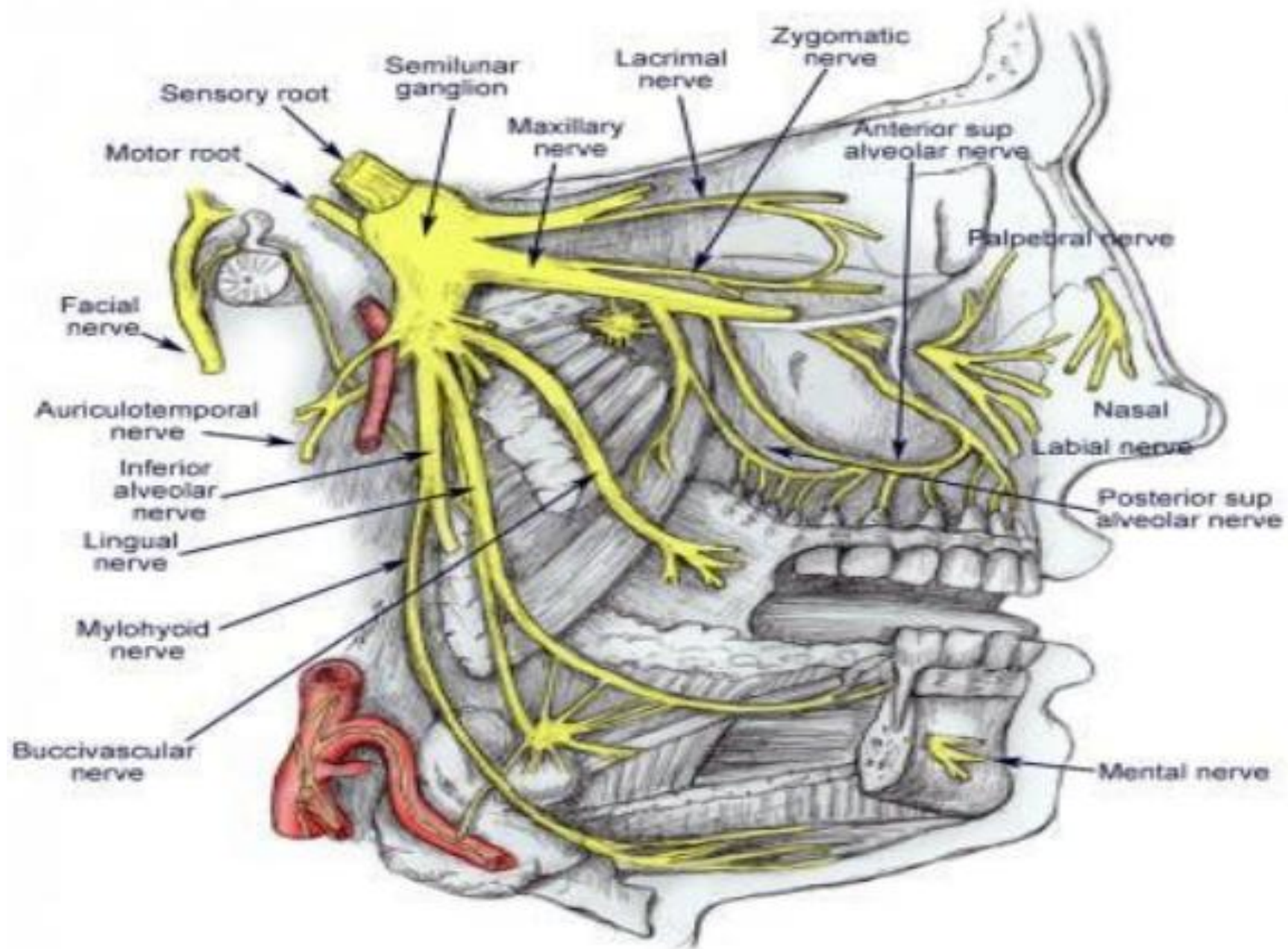


Trigeminal nerve

L 1-3





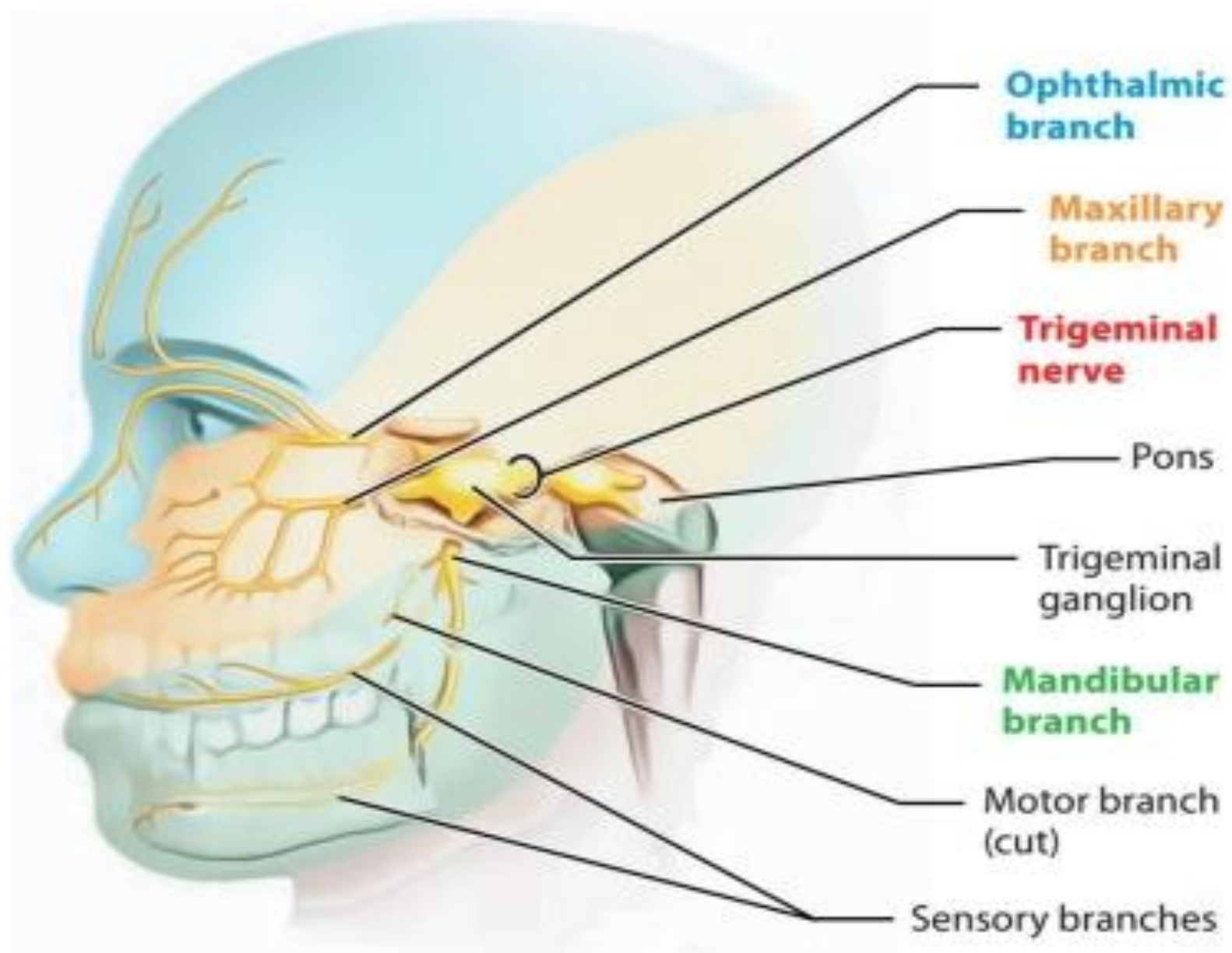
Trigeminal Nerve

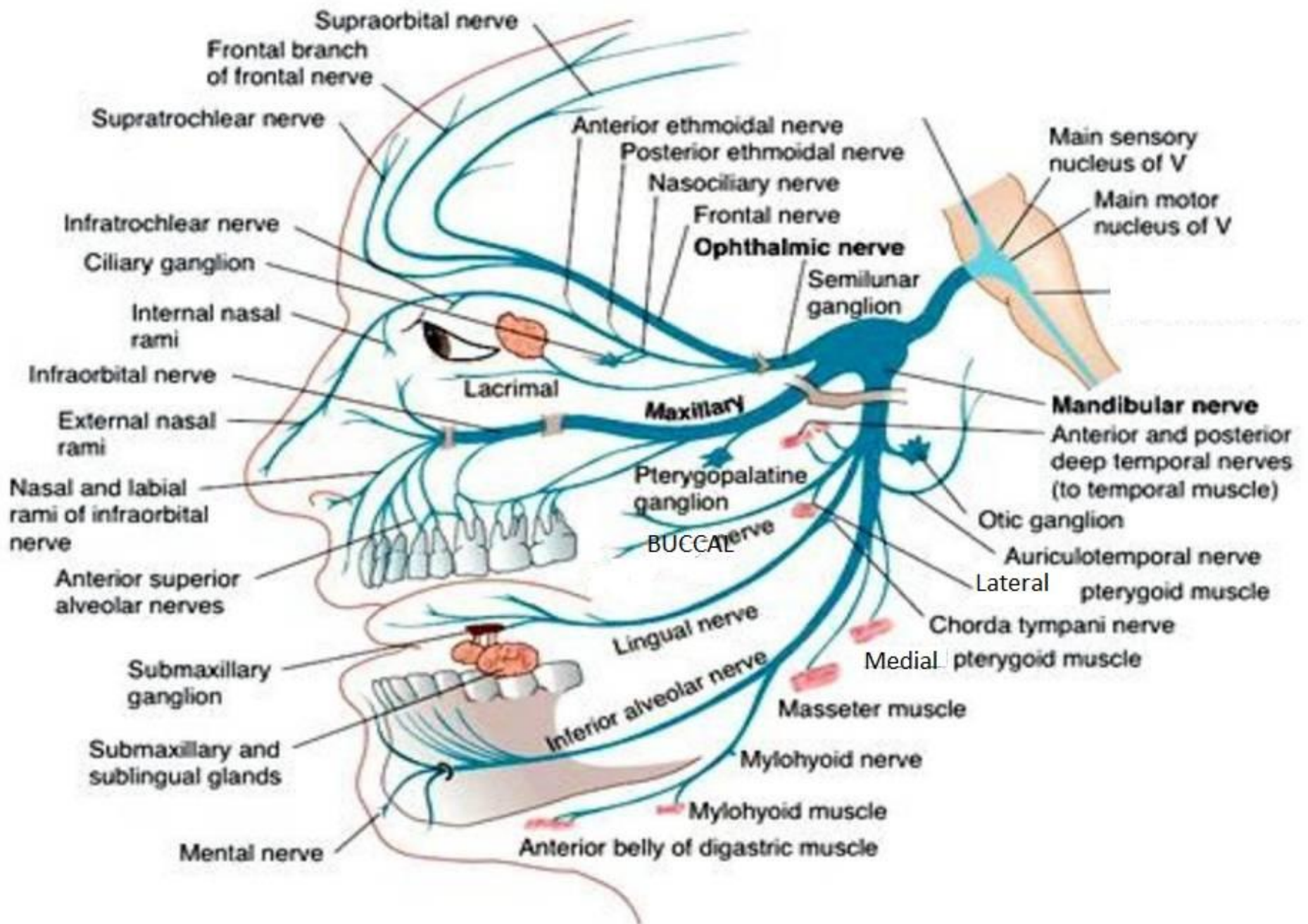
The trigeminal nerve is the largest and **most complex of the 12 cranial nerves (CNs)**. It supplies sensations to the face, mucous membranes, and other structures of the head. It is the motor nerve for the muscles of mastication.

It **exits the brain** by a large sensory root and a **smaller motor root coming out of the pons**.

It passes laterally to join the **gasserian (semilunar) ganglion in the Meckel cave**

Trigeminal Nerve is a mixed nerve consisting of both the motor and sensory fibers but mainly it's **sensory**. It is the 5th cranial nerve. It includes **three large nerves: ophthalmic, maxillary and mandibular**, therefore the name trigeminal nerve. It's a motor nerve to the muscles of mastication and many small muscles and the main sensory nerve of the **head and face**.





Origin of the TN

- **Principal sensory nucleus**
- **Spinal trigeminal nucleus**
- **Motor nucleus**

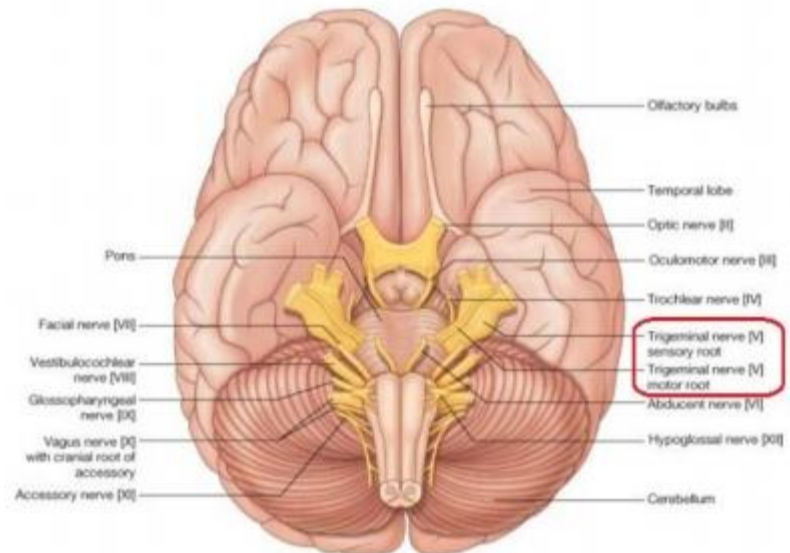
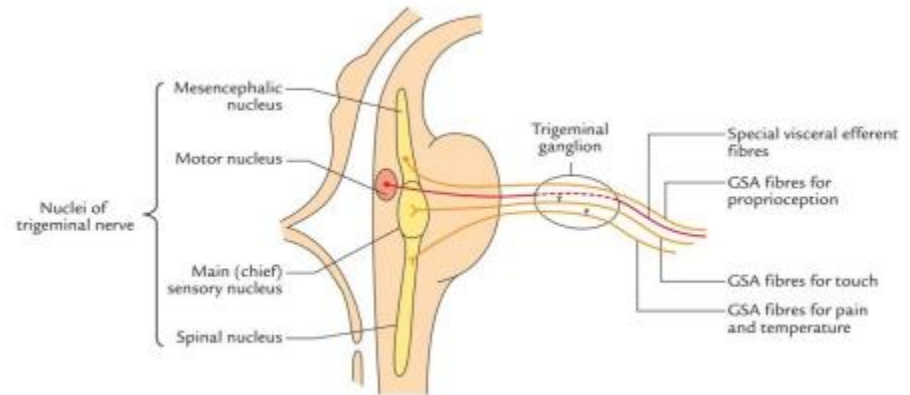
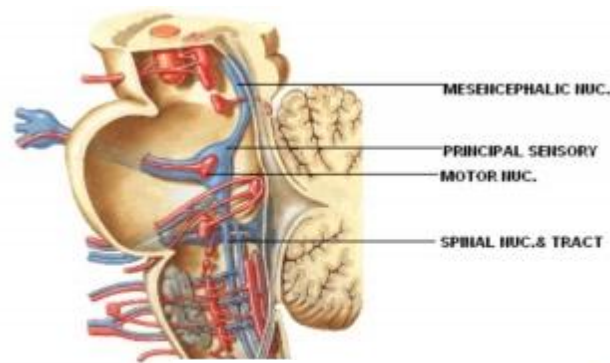
Ventral surface of pons by **two roots- motor & sensory**

Trigeminal ganglion

Three divisions: **ophthalmic**, **maxillary**, **mandibular**

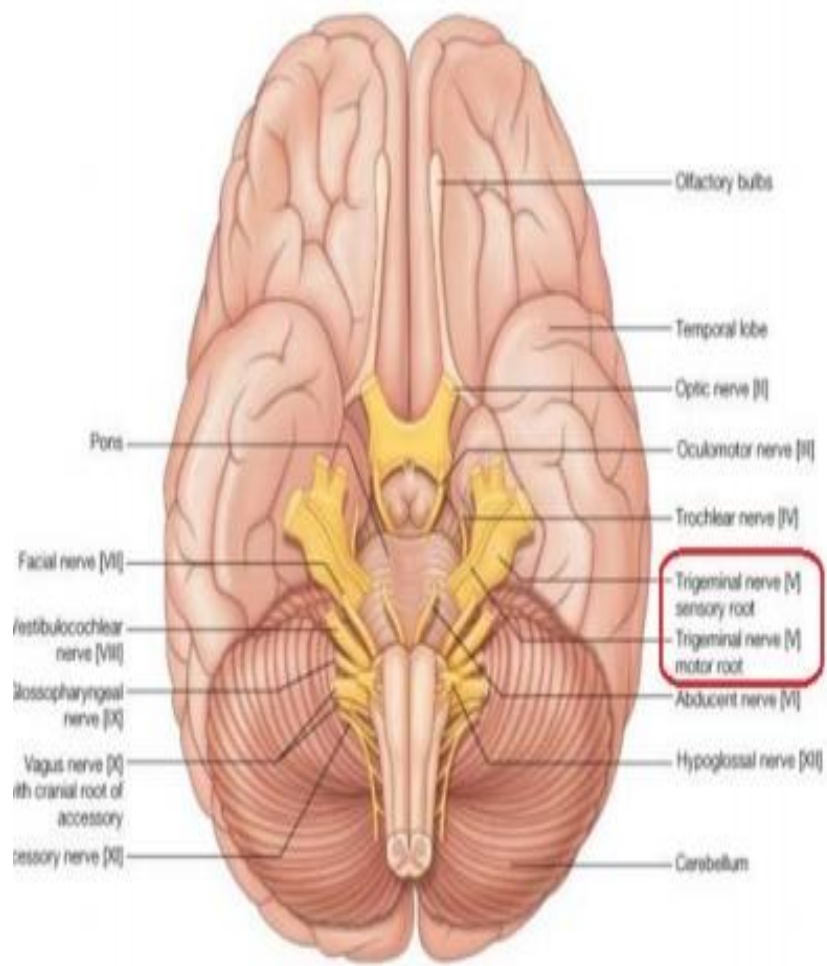
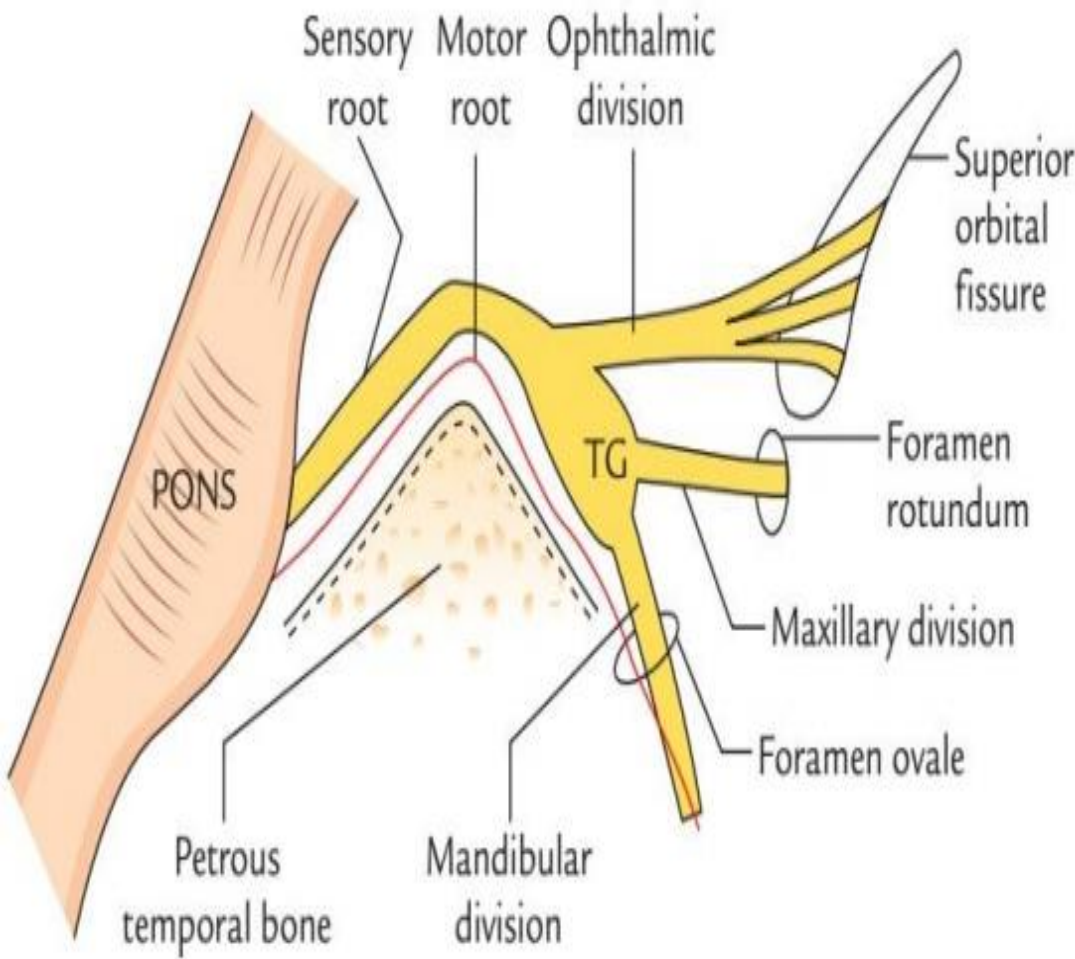
Special visceral efferent fibres :

They supply the muscles originated from the 1st **pharyngeal** arch, viz. the **muscles of mastication**, **mylohyoid**, **anterior belly of digastric**, **tensor palati** and **tensor tympani** and originate from **motor** the **nucleus** of the trigeminal nerve in the **pons**.



COURSE, RELATIONSHIPS AND DISTRIBUTION OF THE TN

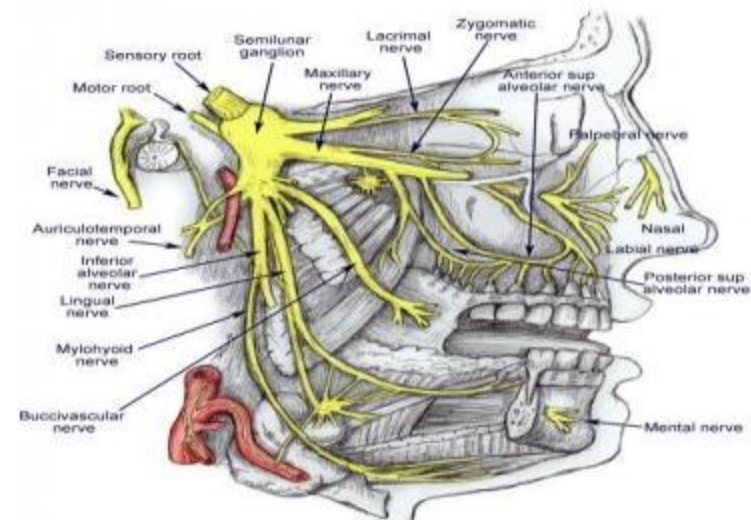
The trigeminal nerve appears by **two roots** (a smaller medial motor root and a bigger lateral sensory root) from the ventrolateral aspect of the pons .to go into the middle cranial fossa. Here it presents a rounded enlargement, the **trigeminal (gasserian) ganglion**.



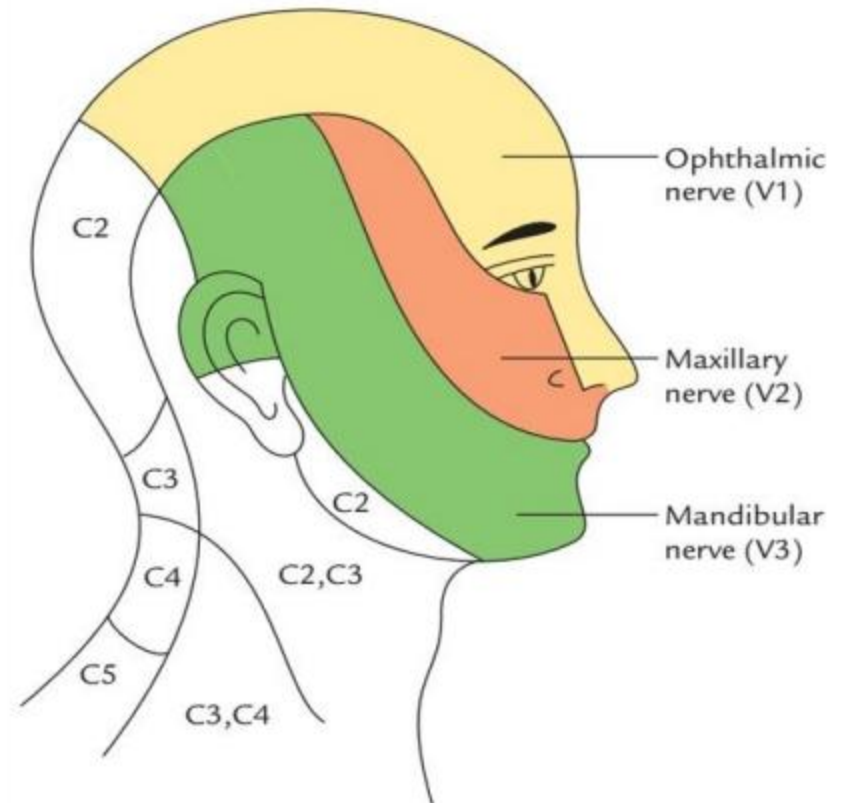
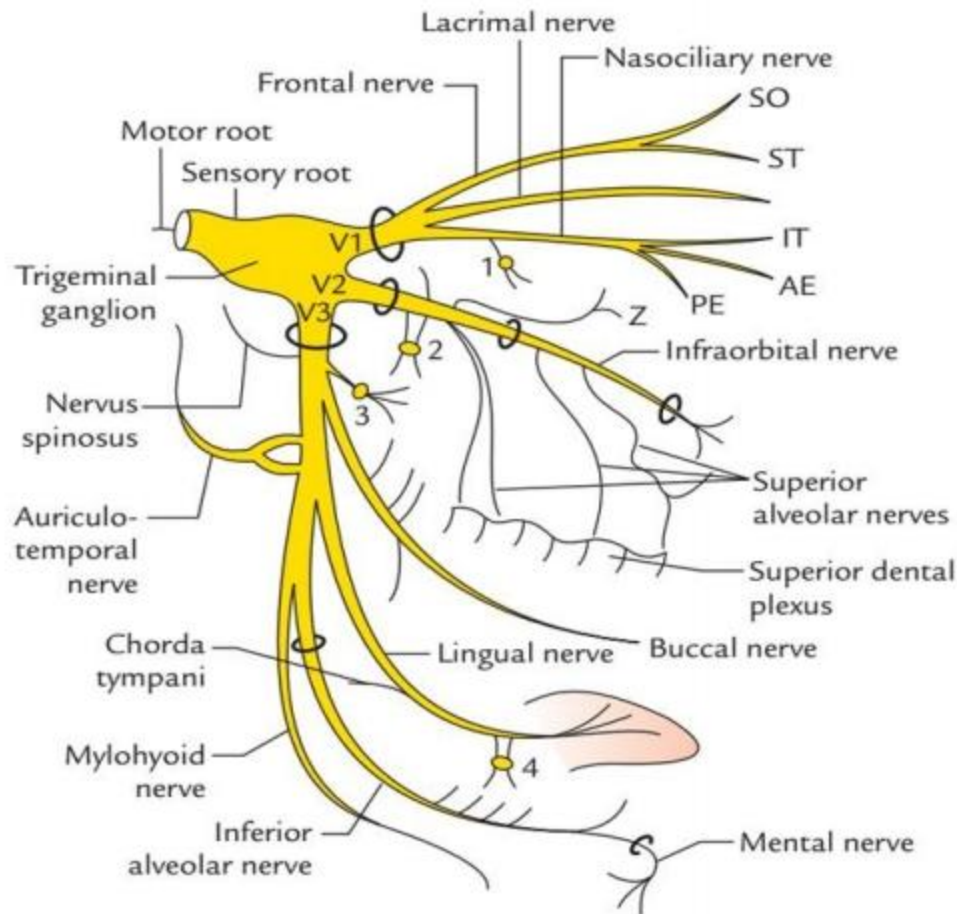
The convex distal surface of Trigeminal ganglion supplies origin to three large sections of the **trigeminal nerve- ophthalmic, maxillary and mandibular**:

- **The ophthalmic nerve** (only sensory) originates from the anterolateral aspect of the ganglion it breaks up into 3 branches: nasociliary, lacrimal and frontal. All these branches goes into the orbit via the superior orbital fissure.
- **The maxillary nerve** (just sensory) originates from the ganglion and goes into the pterygopalatine fossa via the foramen rotundum.
- **The mandibular nerve** (the largest section) originates from the trigeminal ganglion and promptly enters the temple fossa via the foramen ovale.

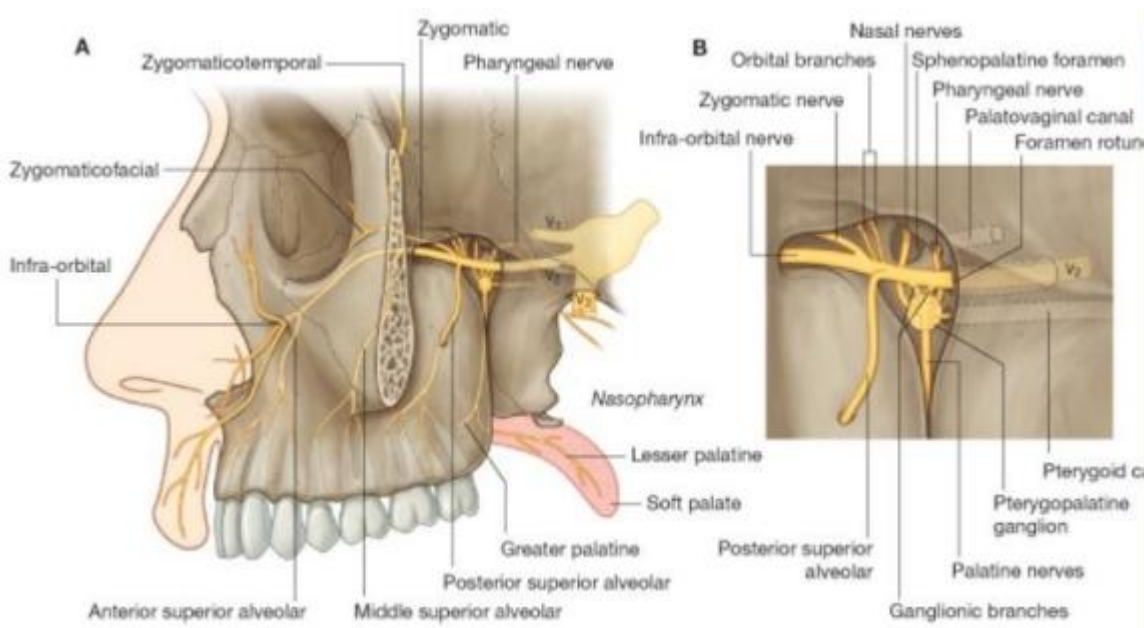
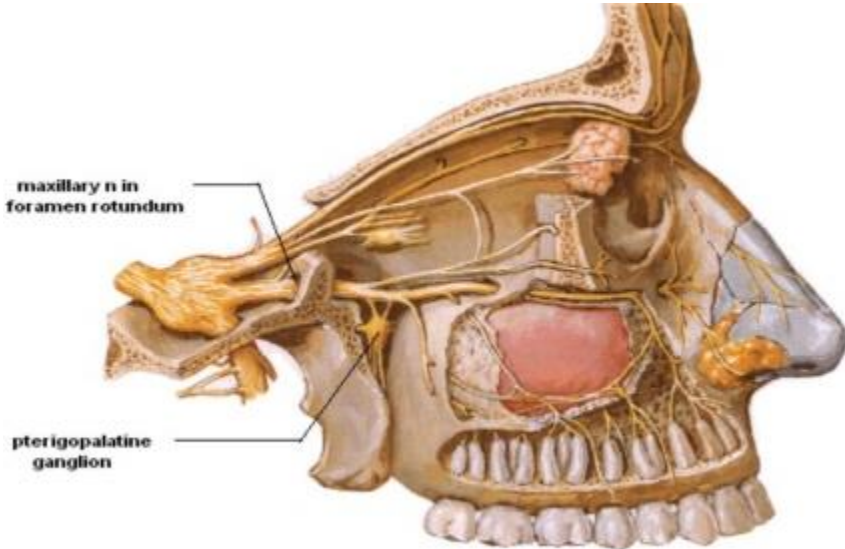
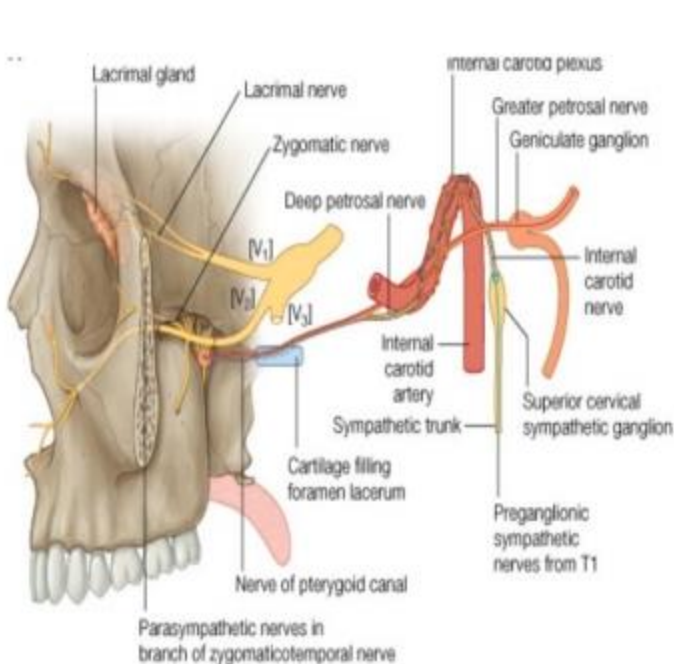
The motor root of the trigeminal nerve after appearing from the pons enters forwards and laterally deep to the sensory root and trigeminal ganglion and enters the temple fossa via the foramen ovale. After appearing from the foramen ovale, it instantaneously joins the mandibular nerve and so the mandibular nerve includes both the motor and sensory fibre



- **The ophthalmic nerve** (only sensory) originates from the anterolateral aspect of the ganglion and enters the lateral wall of the cavernous sinus where it is located below the trochlear nerve.
- In the cavernous sinus, it breaks up into **3 branches**:
- **nasociliary,**
- **lacrimal and**
- **frontal.**
- All these branches go into the **orbit via the superior orbital fissure**.



•The **maxillary nerve** (just sensory) originates from the ganglion and goes into the **pterygopalatine fossa** via the **foramen rotundum**.



Maxillary nerve branches

In **Pterygopalatine fossa**:

Ganglionic- connected to **PP ganglion**; contain lacrimal secretomotor & sensory fibres from orbital periosteum and mucosa of nose, palate and pharynx

Zygomatic- enters orbit; divides into **zygomaticotemporal** and **zygomaticofacial** branches.

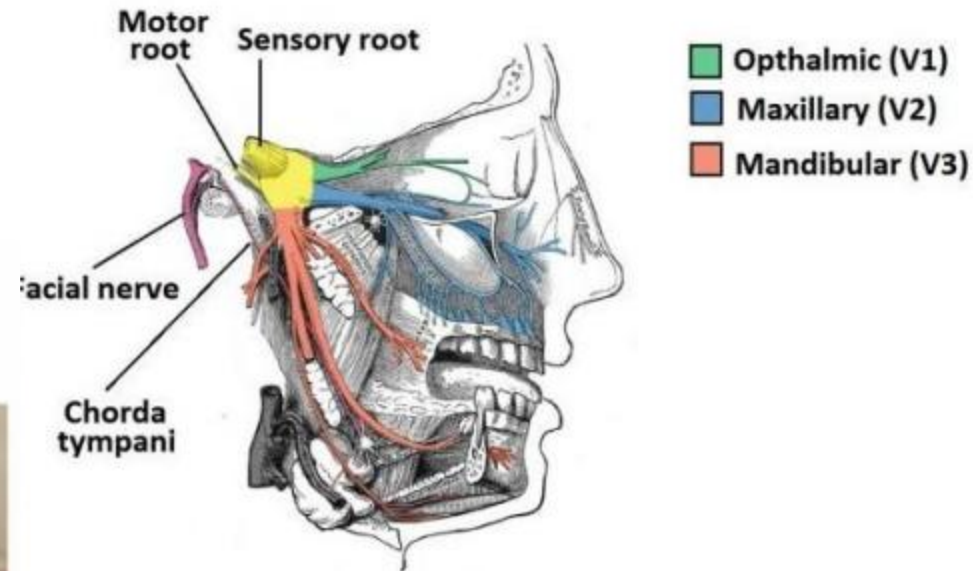
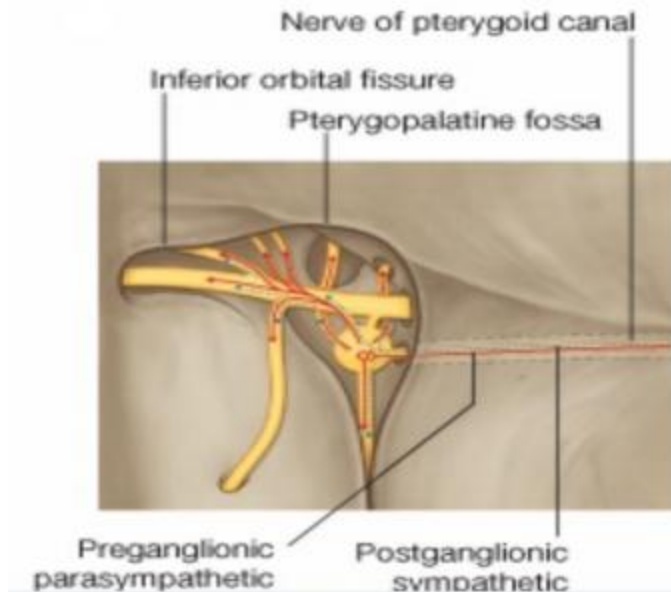
Superior alveolar nerves: Posterior superior alveolar nerve

In the infraorbital canal:

- Middle superior alveolar nerve
- Anterior superior alveolar nerve

On face:

- palpebral
- nasal
- superior labial

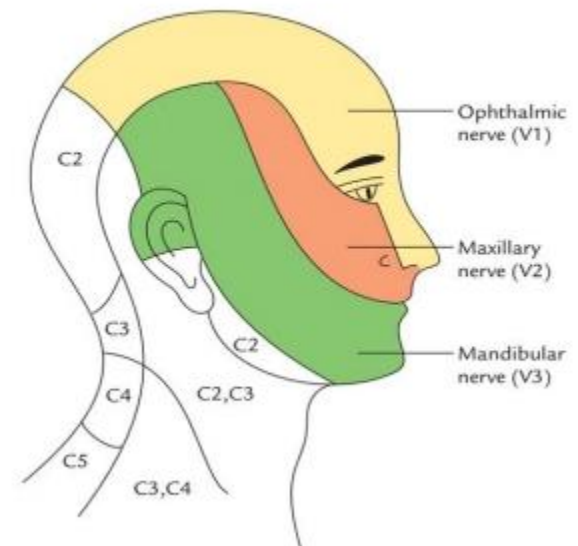
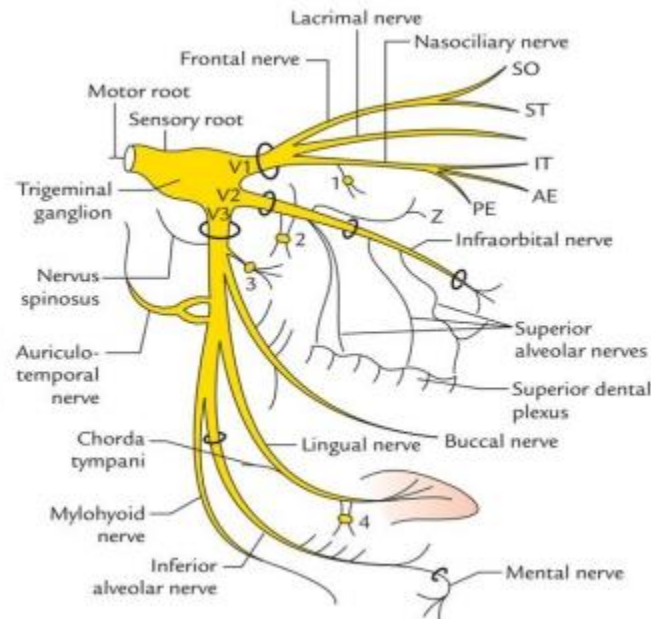
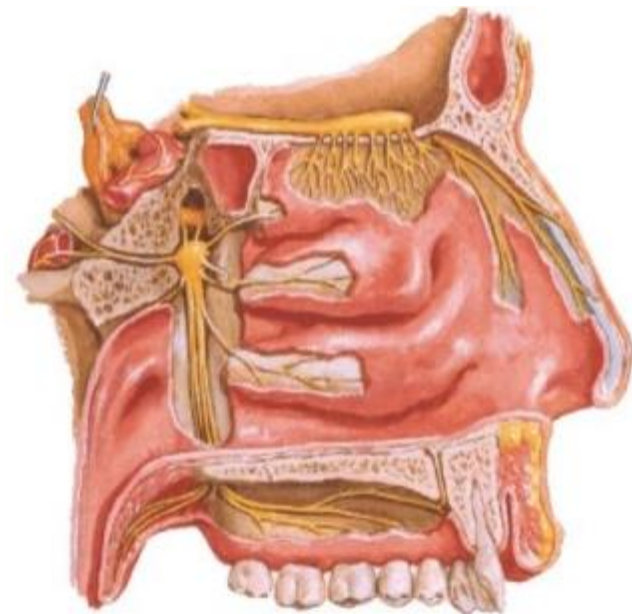


Maxillary Nerve

After arising from the trigeminal ganglion, the **maxillary nerve** passes through the lateral wall of the cavernous sinus, before leaving the skull through the foramen rotundum.

It gives rise to numerous sensory branches:

- Superior alveolar nerve (anterior, posterior and middle)
- Infraorbital nerve
- Zygomatic nerve
- Pharyngeal nerve
- Greater and lesser palatine nerves
- Nasopalatine nerve



Function of maxillary nerve:

Sensory Function

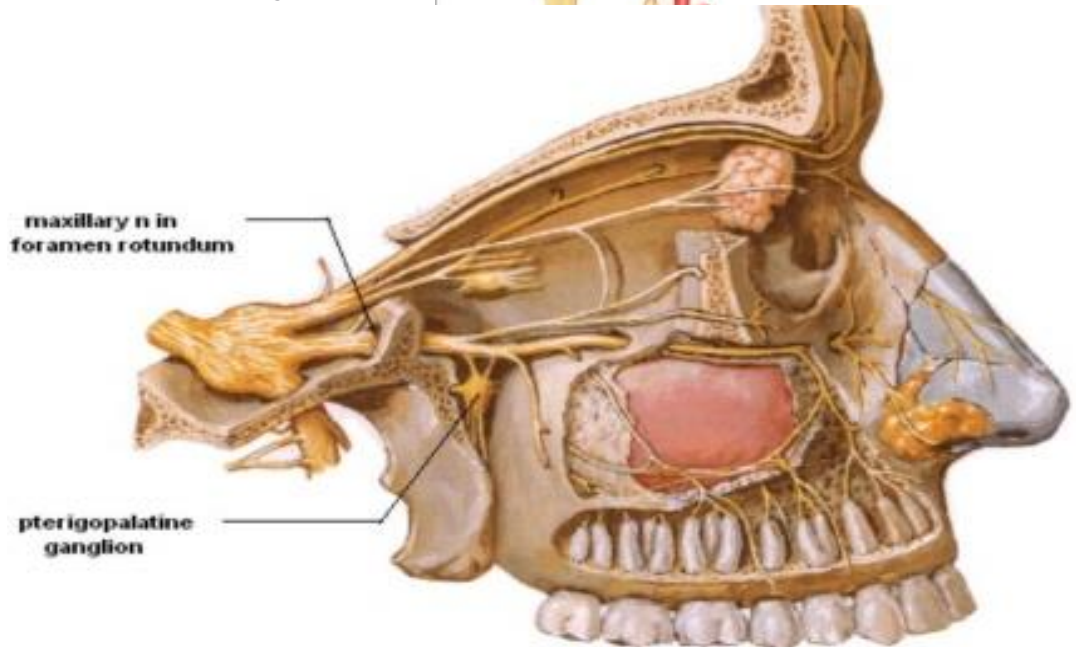
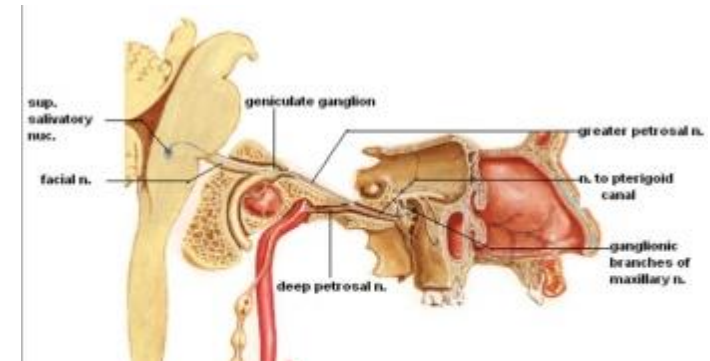
The maxillary nerve's terminal branches innervate the skin, mucous membranes and sinuses of derivatives of the **maxillary prominence** of the 1st pharyngeal arch:

- Lower eyelid and its conjunctiva
- Portion of the nasal cavity
- Cheeks and maxillary sinus
- Lateral nose
- [Upper lip, teeth and gingiva](#)
- Superior palate

Parasympathetic Function

Postganglionic fibres from the pterygopalatine ganglion (derived from the facial nerve) travel **with** the maxillary nerve to:

- Lacrimal gland
- Mucous glands of the nasal mucosa



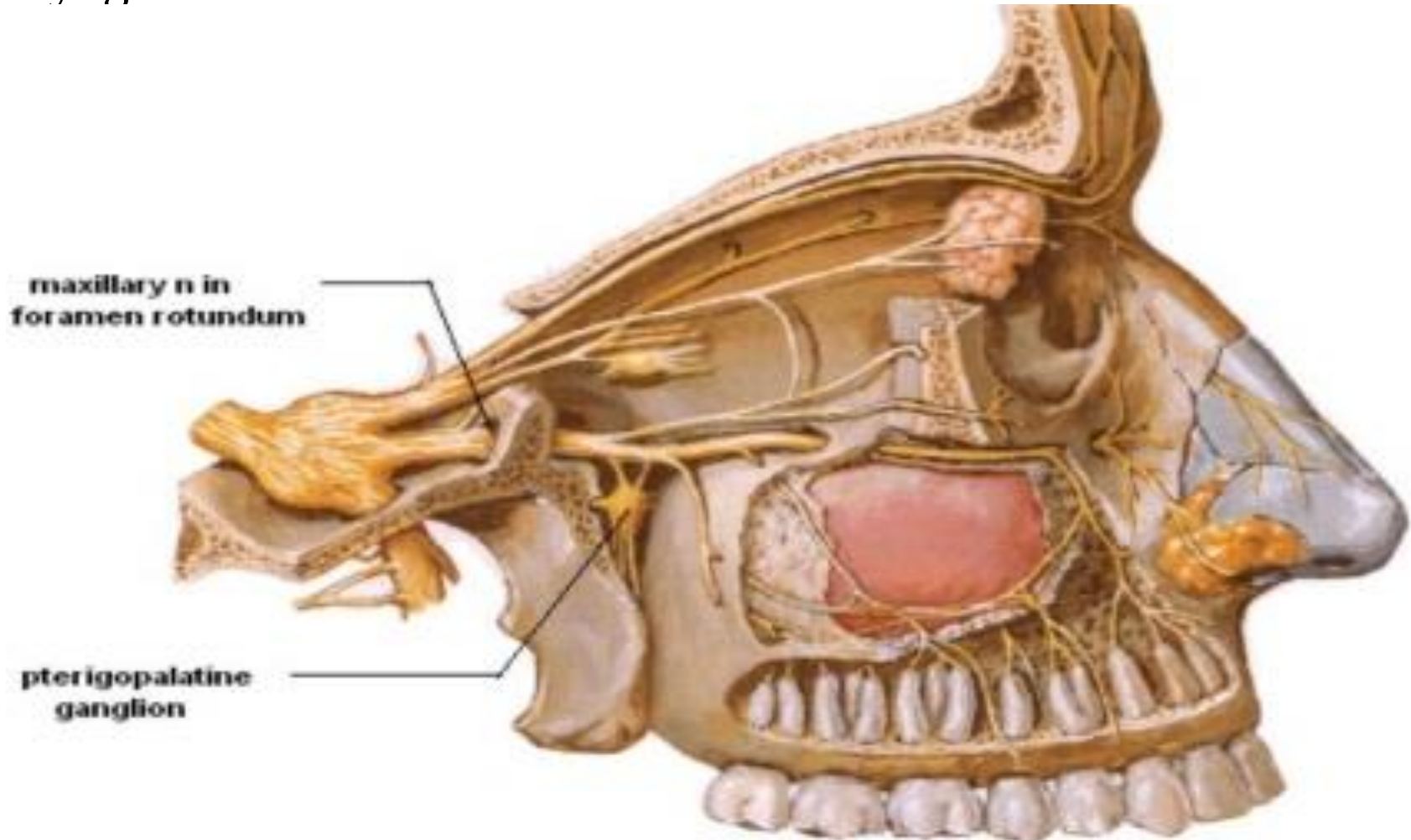
Pterygopalatine ganglion

It is parasympathetic ganglion

In the Pterygopalatine fossa •

It is responsible for lacrimal gland secretion

Also for secretion of nasal, palatine and pharyngeal mucosa



Mandibular nerve

Supplies: Teeth and gums; skin in temporal region; part of auricle; externa auditory meatus; tympanic membrane ,lower lip, part of face; **muscle of mastication**; mucosa of ant.2/3 of tongue ,mucosa of floor of oral cavity

Large sensory root

Small motor root

Anterior Trunk:

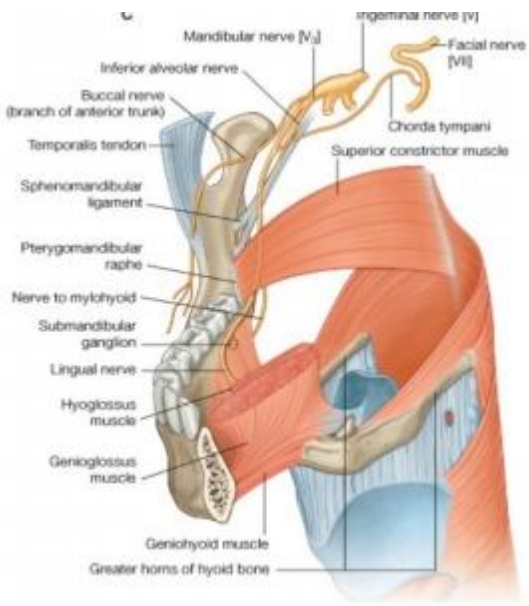
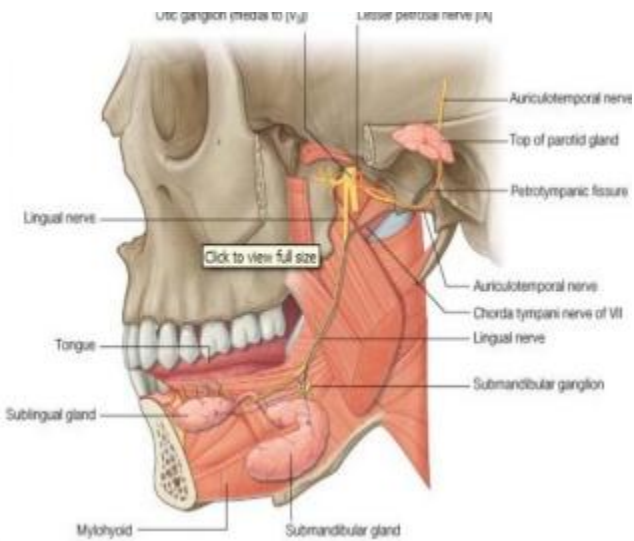
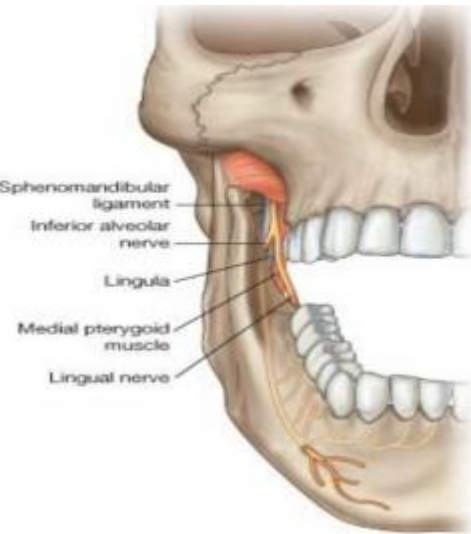
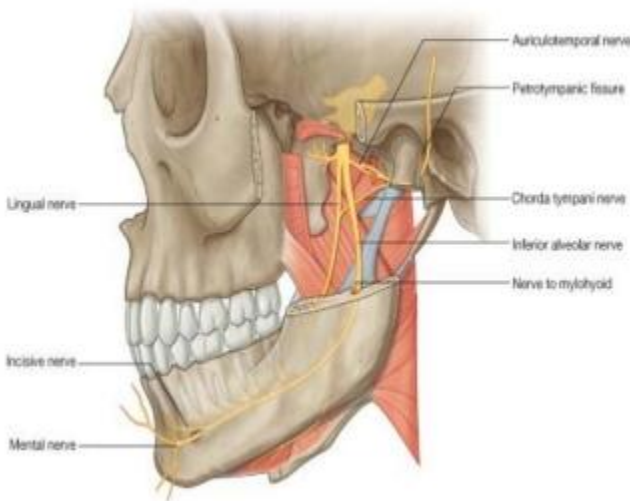
- 1. Buccal
- 2. Masseteric
- 3. Deep temporal
- 4. Nerve to lateral pterygoid •

Posterior Trunk:

Auriculotemporal

Communicates with otic ganglion and facial nerve

it gives secretory fibers to Parotid



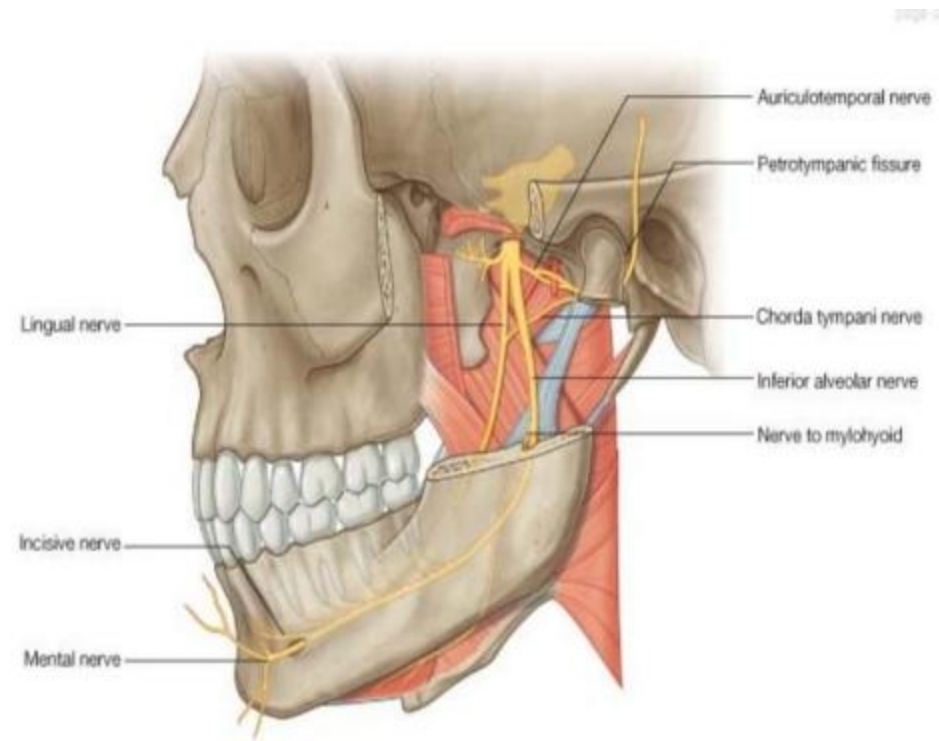
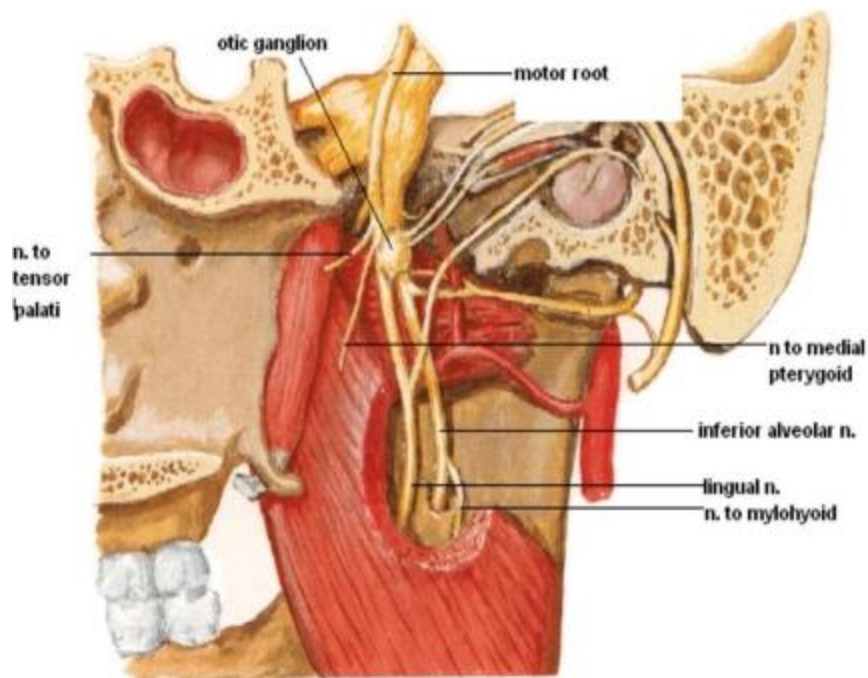
Mandibular nerve (contd.)

- Emerges from foramen ovale •Gives , nerve to medial pterygoid
- Divides in to-small anterior and large posterior

•Branches:

N. to medial pterygoid: supplies medial pterygoid; **1 or 2** filaments pass through otic ganglion and supply **tensor tympani** and **tensor palati**.

Lingual N: **Joined by chorda tympani**. **Sensory to mucosa of anterior 2/3 of tongue, floor of mouth and gums** Inferior alveolar N. **to mylohyoid**; Branches to lower teeth and Mental branch



Submandibular ganglion

- Small, fusiform, on upper part of hyoglossus
- Superficial to deep part of submand. Gland
- Connected functionally to facial nerve
- **Motor root:** sup. salivatory N.– facial nerve– chorda tympani– lingual nerve– synapse in ganglion– postgang. Secretomotor fibres to salivary glands.
- **Sympathetic root:** from plexus around facial artery– do not synapse—vasomotor to blood vessels.
- **Sensory root:** from lingual nerve- do not synapse.
- **Branches:** to submandibular and sublingual glands.

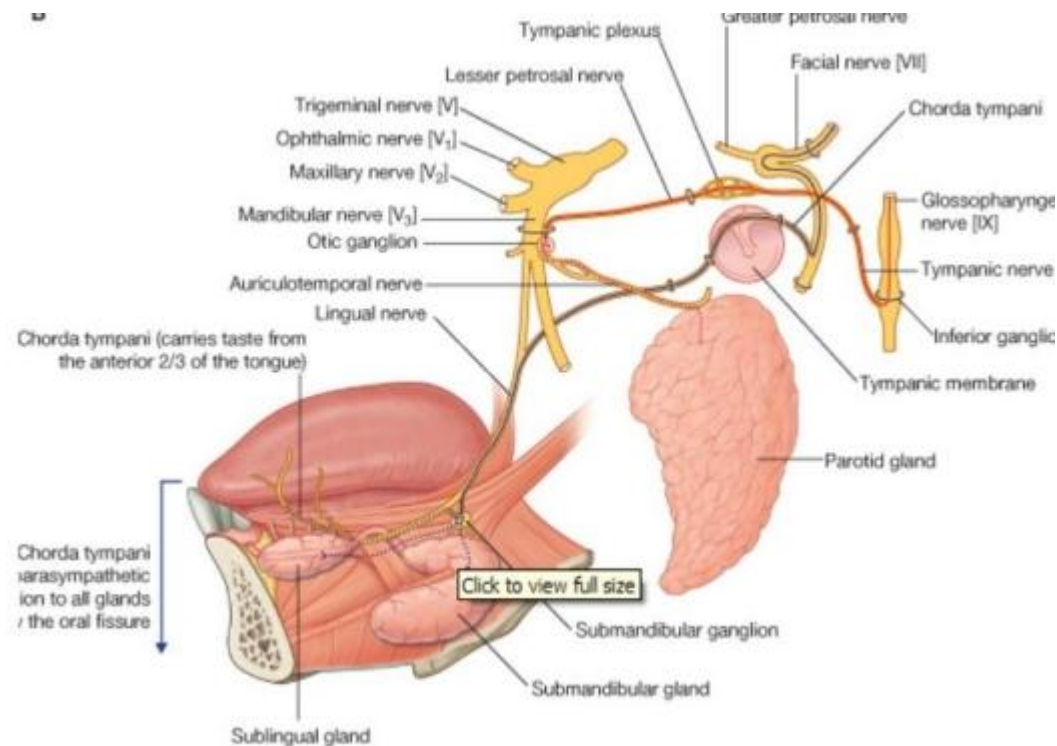
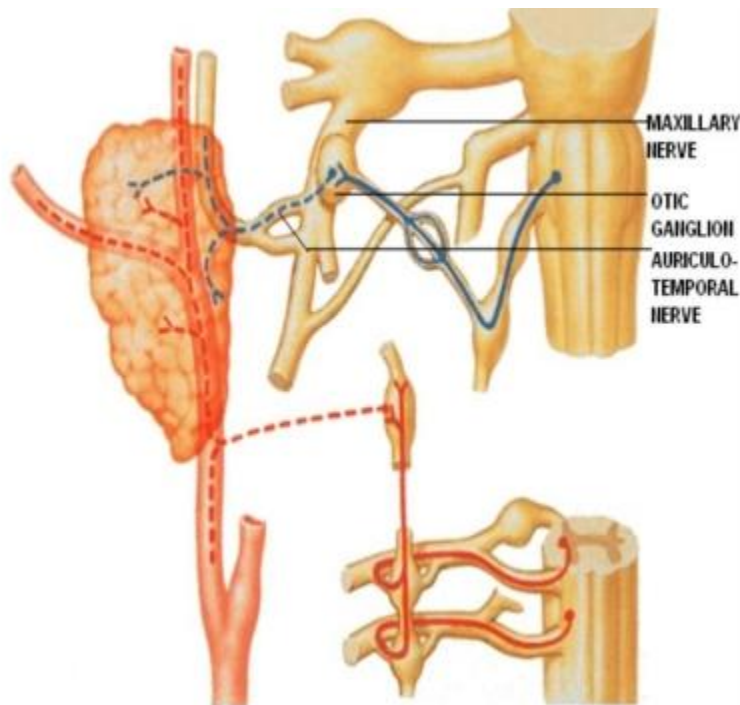
Otic ganglion

- Small, fusiform, between mandibular nerve and tensor tympani.
- Peripheral parasympathetic ganglion
- Connected functionally with glossopharyngeal nerve
- **Motor root:** Inf. salivatory N.— IX nerve— Lesser petrosal— synapse in ganglion— postgang. Secretomotor fibres to parotid gland via auriculotemporal nerve.
- **Sympathetic root:** from plexus around Middle men. artery— do not synapse— vasomotor to blood vessels.
- **Sensory root:** from auriculotemporal nerve-- do not synapse.
- **Branches:** communicating branch to auriculotemporal nerve for parotid gland

communicating branch to **chorda tympani**

communicating branch to **nerve of pterygoid canal**

Motor branch to **tensor tympani** and **tensor palati**



Clinical Relevance:

Trigeminal Neuralgia

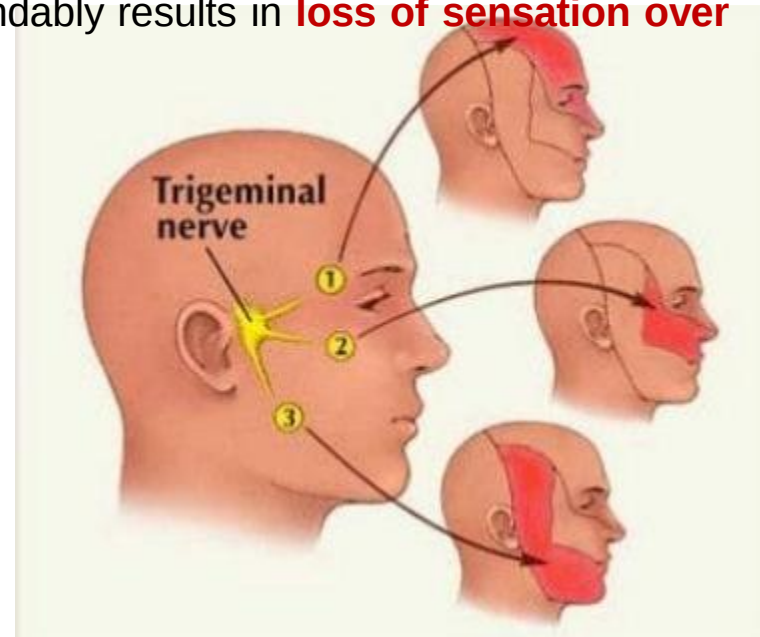
Trigeminal neuralgia is a disorder characterised by **chronic pain over the trigeminal distribution of the face**. This is an example of neuropathic pain, whereby there is damage to the nerves causing:

- **Hyperalgesia** – increased sensitivity to pain
- **Allodynia** – pain from a usually **non-painful stimulus**

As such, light touch can often trigger episodes of excruciating pain.

Its **cause is unknown** but it is thought to be the result of damage to trigeminal nerve **due to** conditions such as **multiple sclerosis, stroke or trauma**.

The pain is usually **unresponsive to typical analgesics including opioids**. As a result an **anticonvulsant** such as **carbamazepine** is often used to **reduce nervous transmission of the pain** by **blocking active voltage gated sodium channels**. If unresponsive to **pharmacological agents**, surgical destruction of the nerve is possible, but that understandably results in **loss of sensation over the face**.



Applied anatomy

- **Trauma, tumors, aneurysms or meningeal infections will cause:**
Paralysis of muscles of mastication with deviation of mandible towards the site of lesion.
Loss of **soft tactile, thermal or painful sensations on the face**
Loss of corneal reflex and sneezing reflex
- **Trigeminal neuralgia:** excruciating pain in the area of distribution; females more affected.
- Referred pain
- **Mandibular nerve block**
- Dental anesthesia (Inf. Alveolar nerve block)
- **Lingual nerve injury**