

PERIPHERAL NERVOUS SYSTEM

TRIGEMINAL NERVE

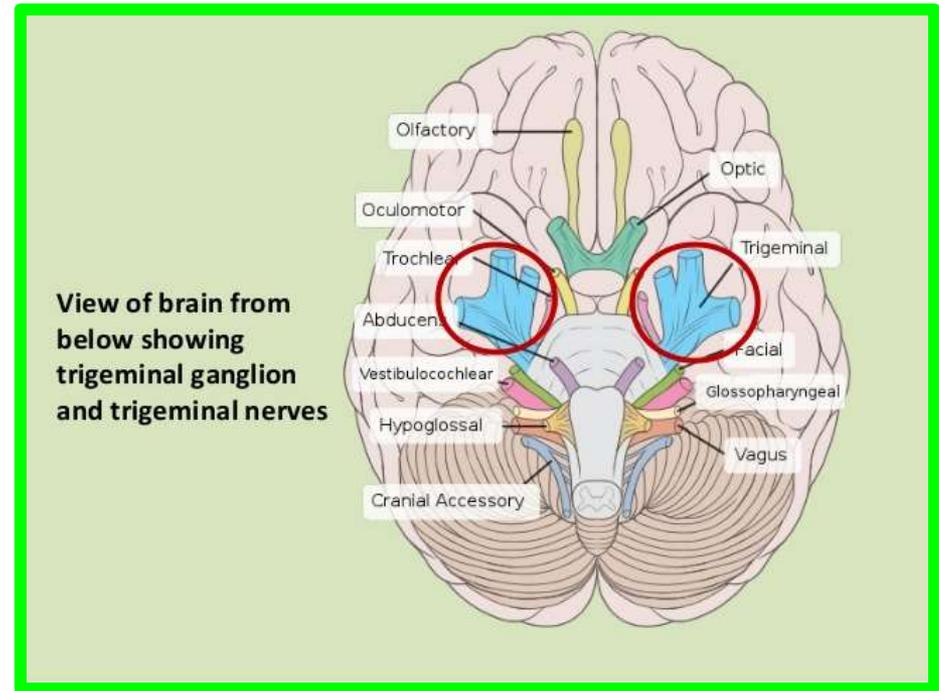
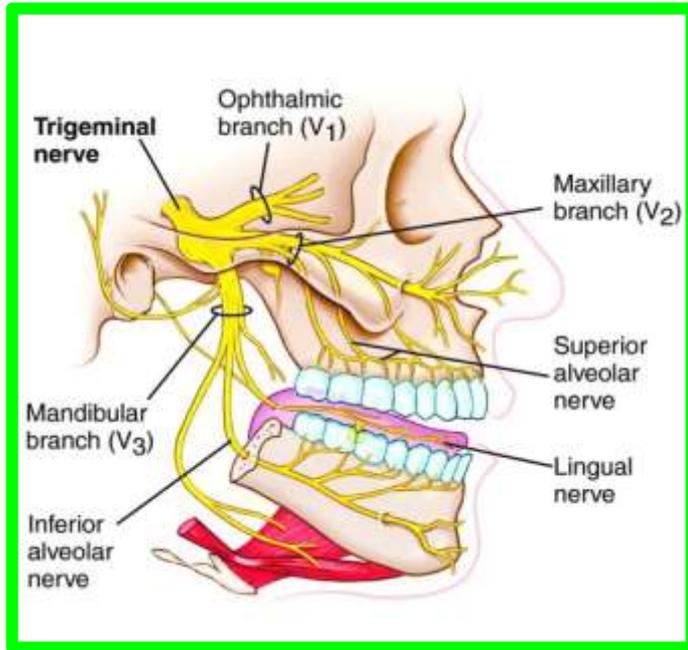
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Wednesday 2 March 2022

Trigeminal Nerve

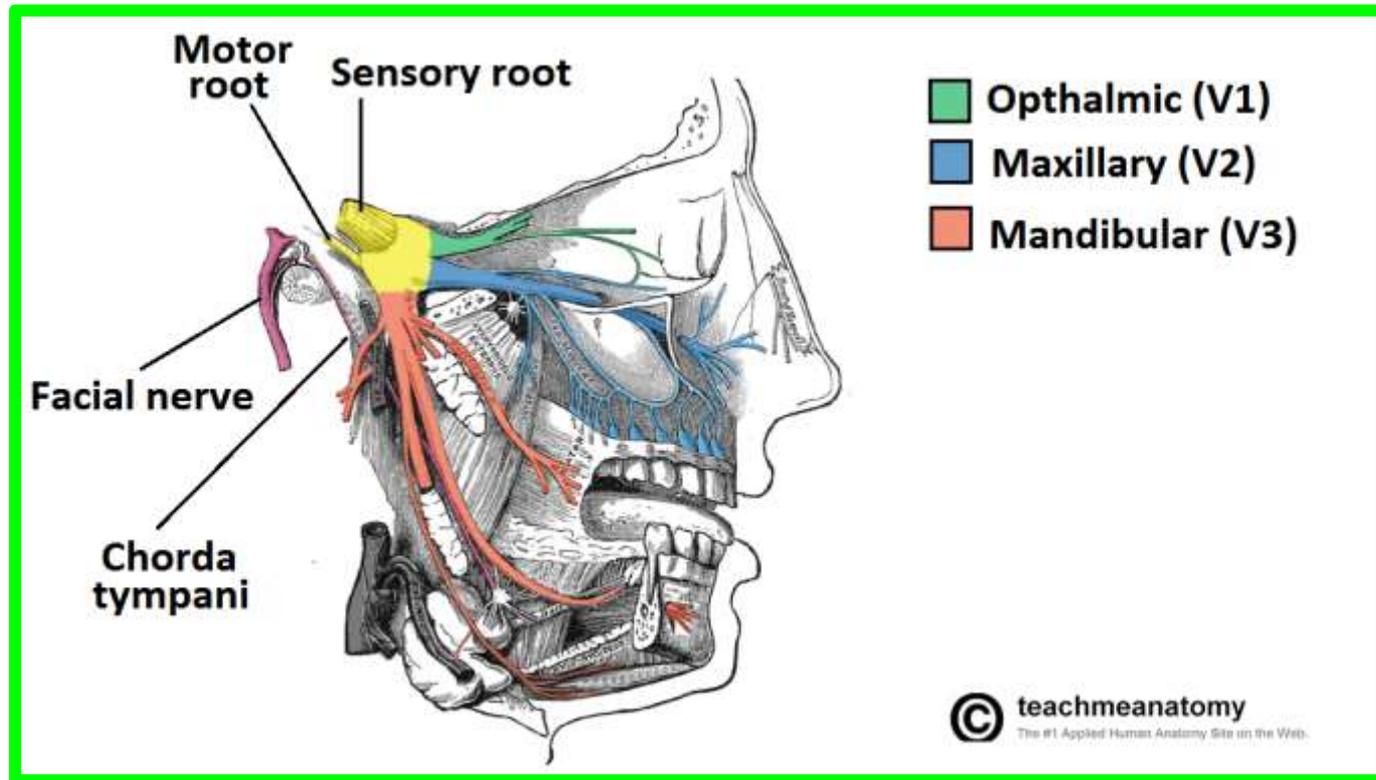
- ❖ The trigeminal nerve is the largest cranial nerve.
- ❖ It leaves the anterior aspect of the pons as a small motor root and a large sensory root



- ❖ it passes forward, out of **the posterior cranial fossa**, to reach the apex of the **petrous part of the temporal bone** in **the middle cranial fossa**.
- ❖ Here, the large sensory root expands to form **the trigeminal ganglion**

Trigeminal Nerve

- ❖ The trigeminal ganglion lies within a pouch of dura mater called the trigeminal cave. (Meckel cave)
- ❖ The motor root of the trigeminal nerve is situated below the sensory ganglion and is completely separate from it.
- ❖ The ophthalmic (V1), maxillary (V2), and mandibular (V3) nerves arise from the anterior border of the ganglion

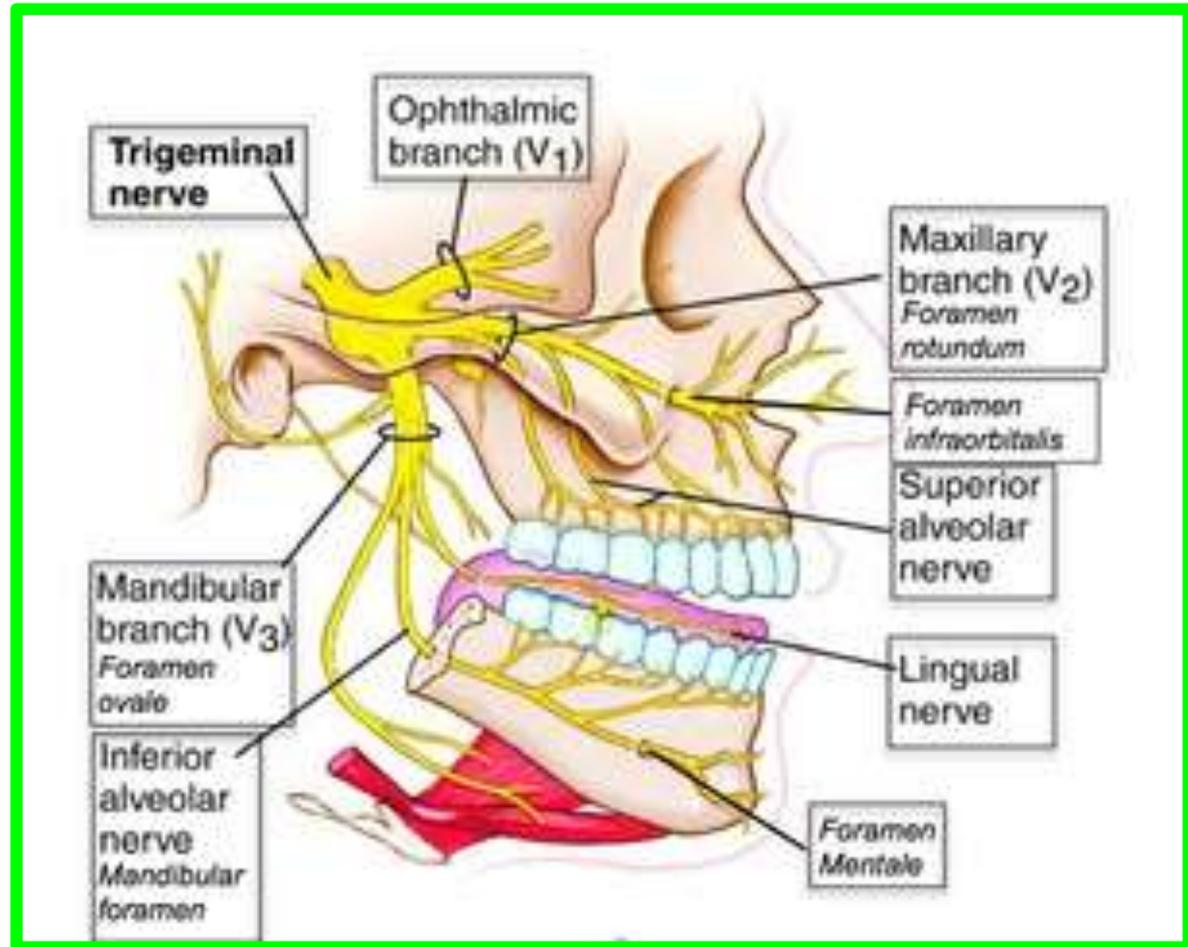


Trigeminal Nerve

Ophthalmic Nerve (V₁)

✓ Is purely sensory.
✓ It runs forward in the lateral wall of the cavernous sinus in the middle cranial fossa and divides into three branches:

- ❖ The Lacrimal,
- ❖ Frontal,
- ❖ Nasociliary nerves, which enter the orbital cavity through the superior orbital fissure



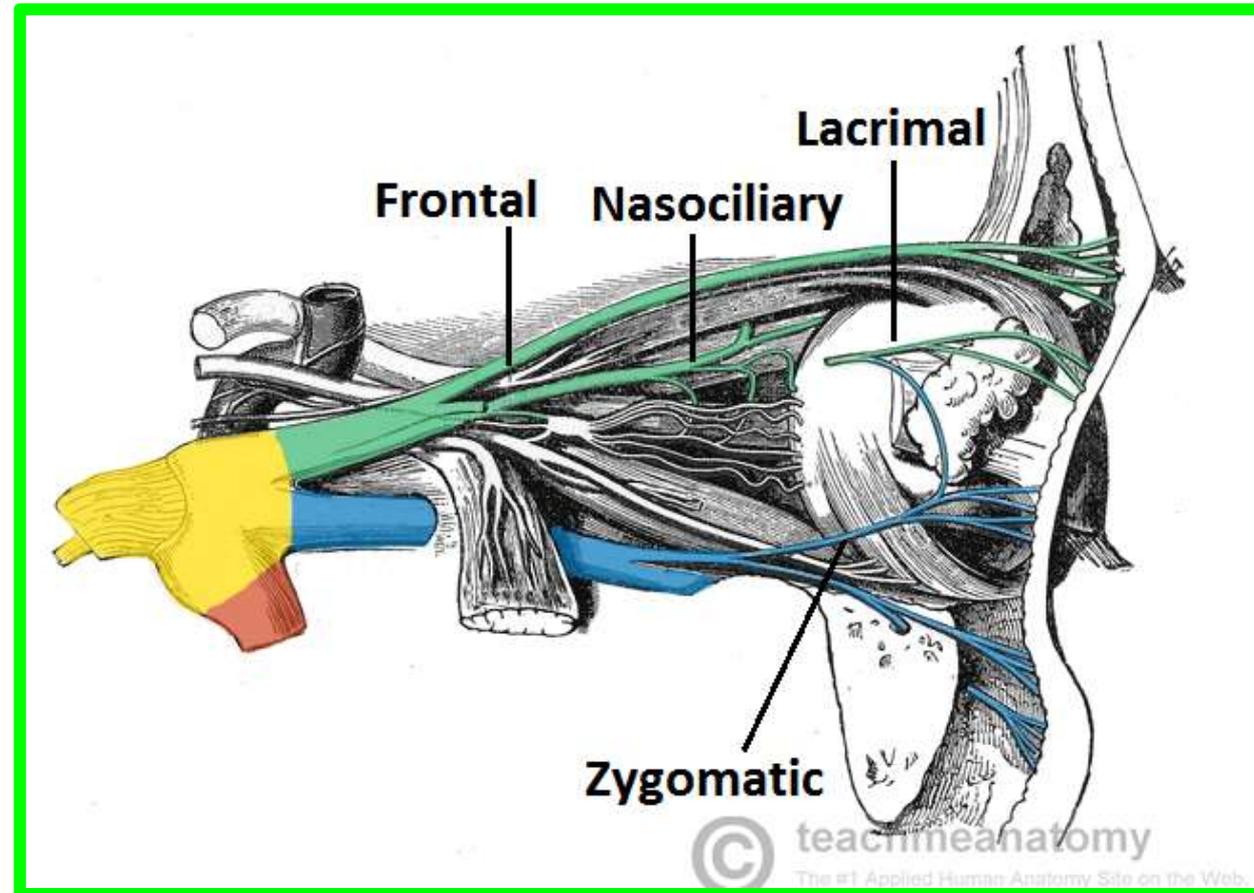
Trigeminal Nerve

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Ophthalmic Nerve (V1)

1...The Lacrimal nerve

✓ It is joined by the **zygomaticotemporal branch** of the **maxillary nerve**, which contains the **parasympathetic secretomotor fibers** to the **lacrimal gland**



✓ The **lacrimal nerve** then enters the **lacrimal gland** and gives branches to the conjunctiva and the skin of the upper eyelid.

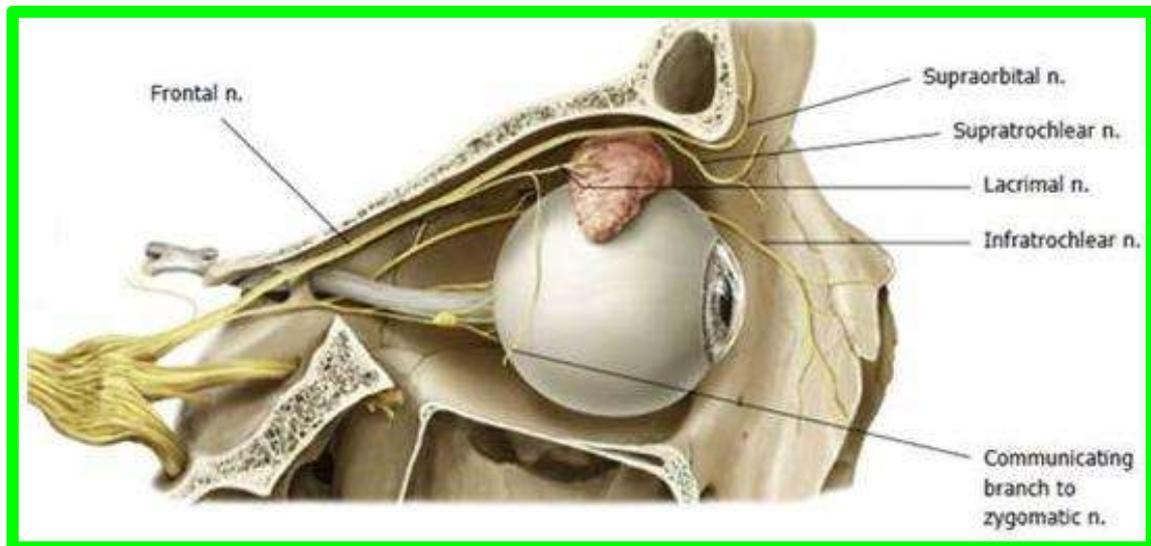
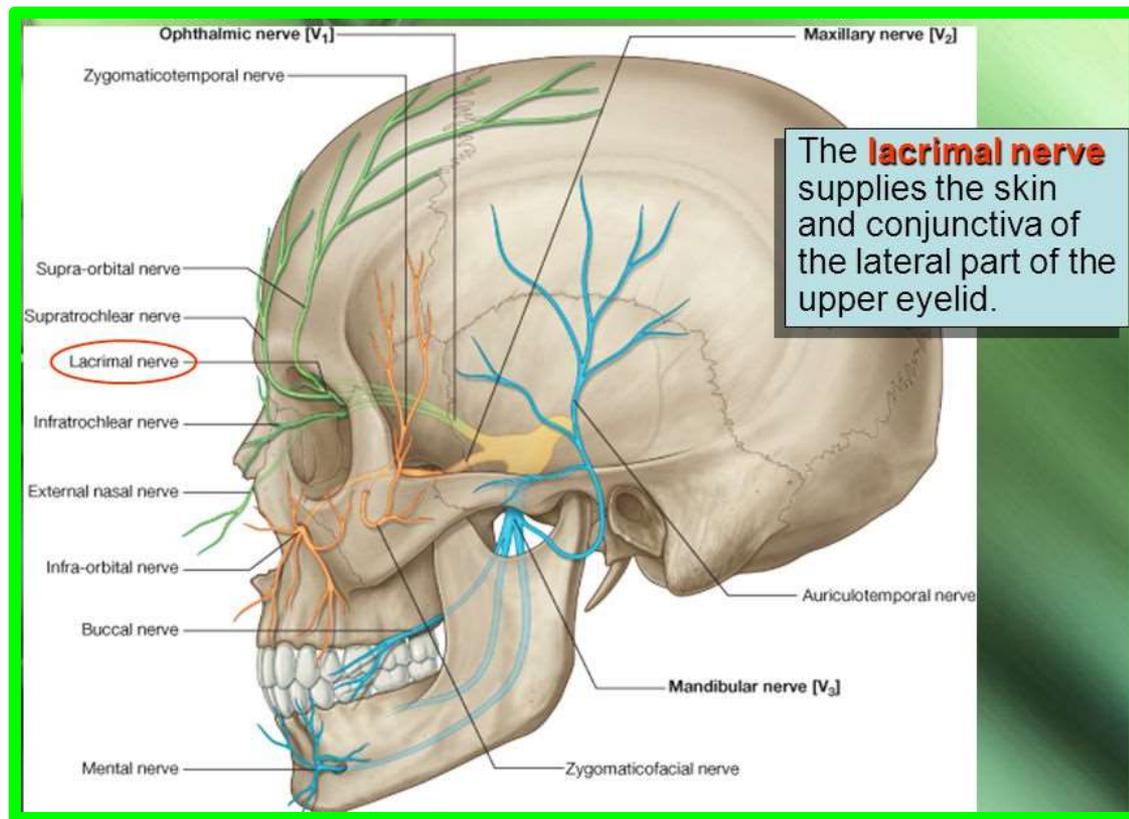
Ophthalmic Nerve (V1)

2...The frontal nerve

✓ Runs forward on the upper surface of the levator palpebrae superioris muscle and divides into **the supraorbital and supratrochlear nerves**

✓ These nerves leave the orbital cavity and supply **the frontal air sinus and the skin of the forehead and the scalp**

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Ophthalmic Nerve (V1)

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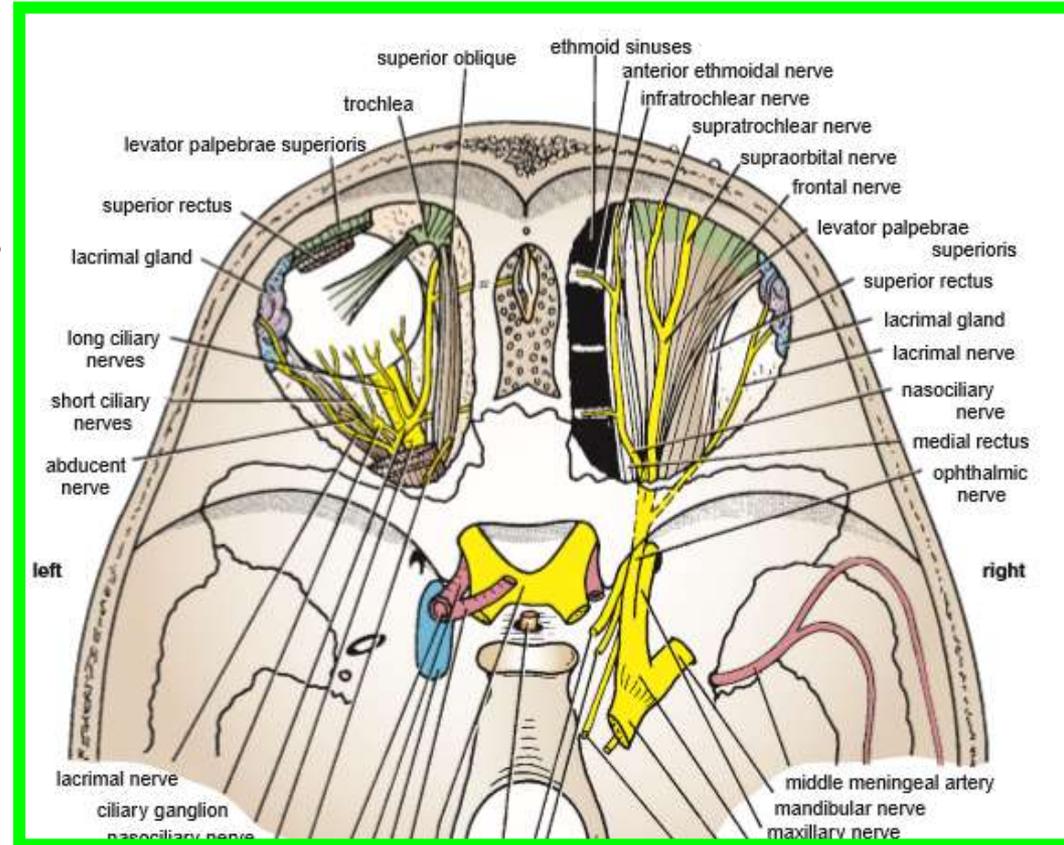
3...The nasociliary nerve

✓ Crosses the optic nerve

✓ Runs forward on the upper border of the medial rectus m.

✓ Continues as **the anterior ethmoid nerve**

✓ It then descends at the side of the crista galli to enter the **nasal cavity.**



✓ It gives off **two internal nasal branches** and it then supplies **the skin** of the **tip of the nose** with **the external nasal nerve.**

Ophthalmic Nerve (V1)

3...The nasociliary nerve

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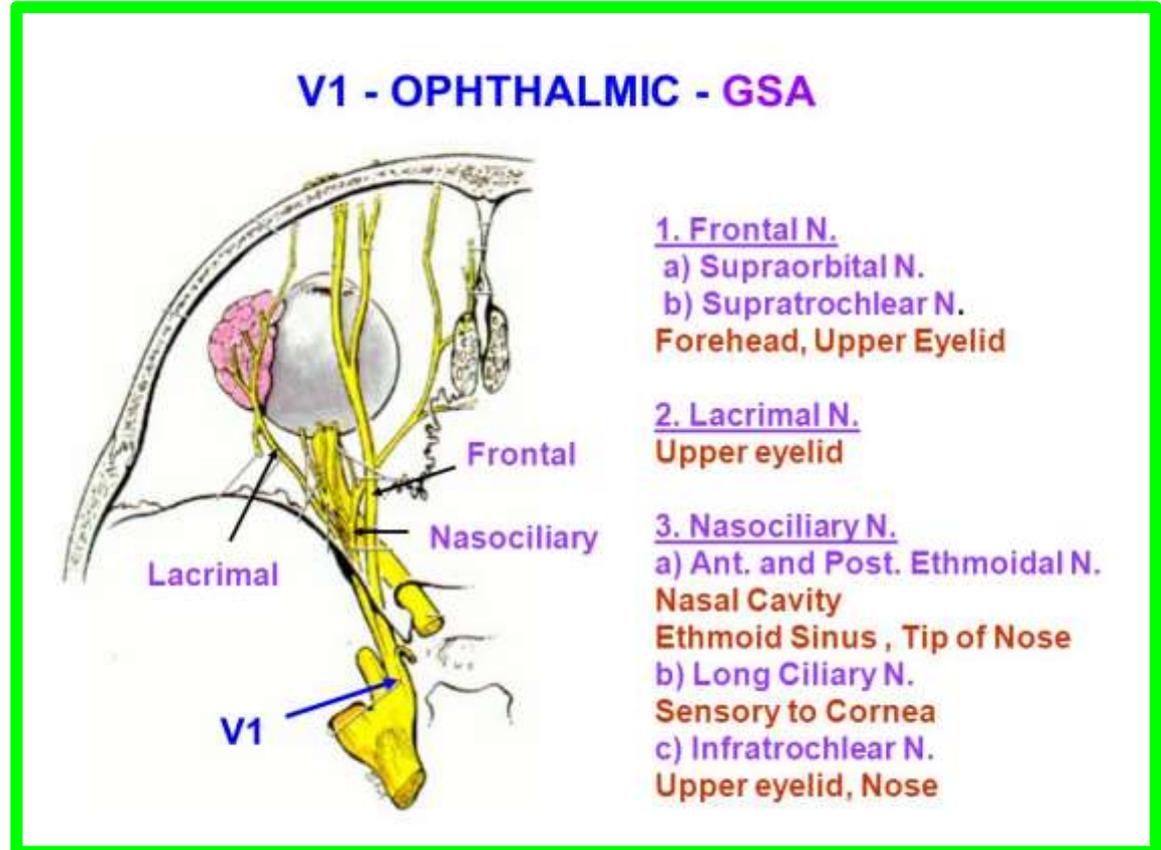
Its branches include the following:

❖ ■ Sensory fibers to the ciliary ganglion

❖ ■ Long ciliary nerves that contain sympathetic fibers to the **dilator pupillae muscle** and sensory fibers to the **cornea**.

❖ ■ Infratrochlear nerve that supplies the skin of the eyelids

❖ ■ Posterior ethmoidal nerve that is sensory to the **ethmoid** and **sphenoid sinuses**

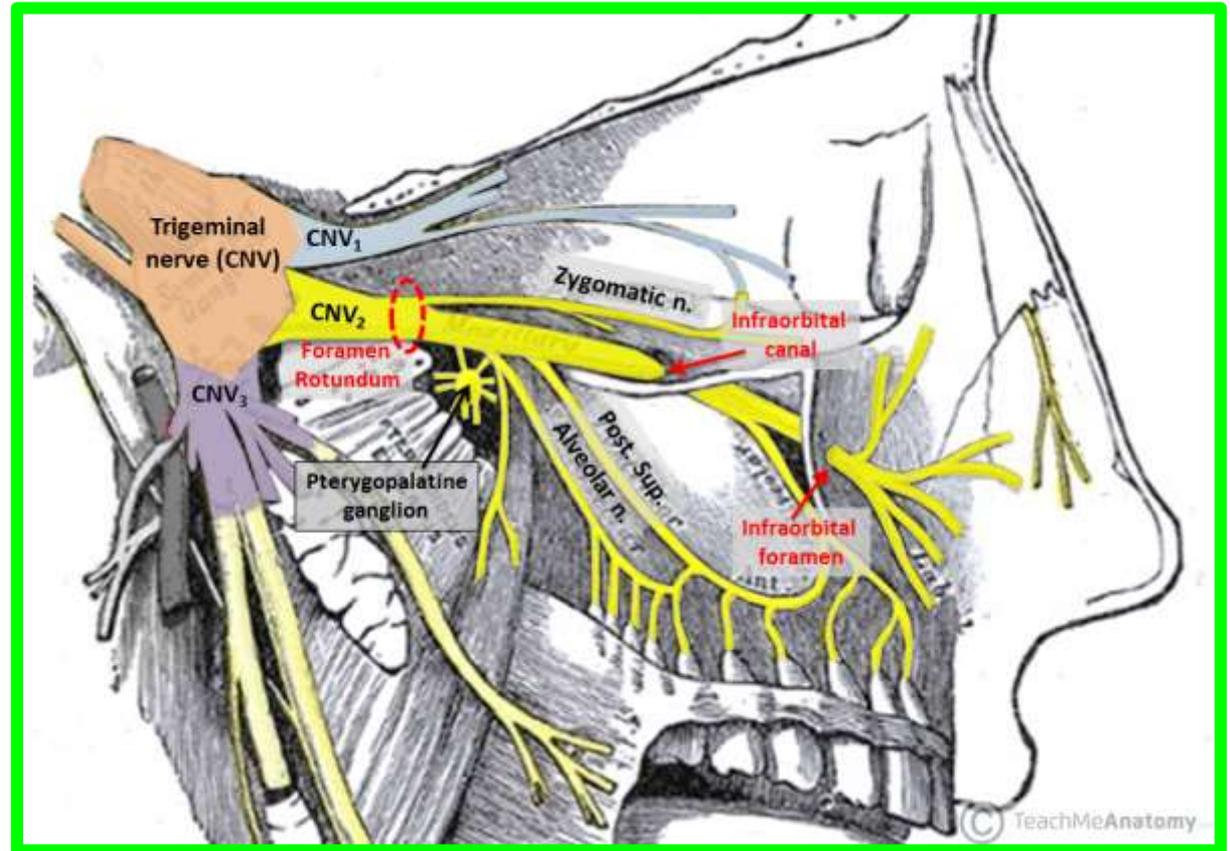


Maxillary Nerve (V2)

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✓ The maxillary nerve arises from the trigeminal ganglion in **the middle cranial fossa**

✓ It passes forward in the lateral wall of the cavernous sinus and leaves the skull through the **foramen rotundum**

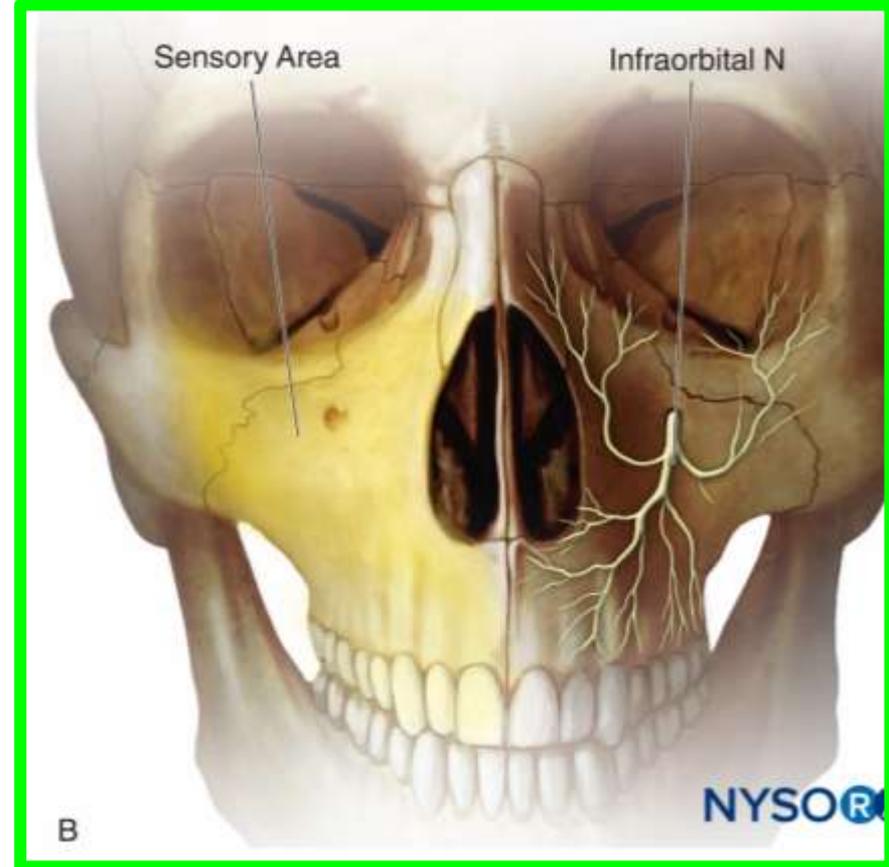
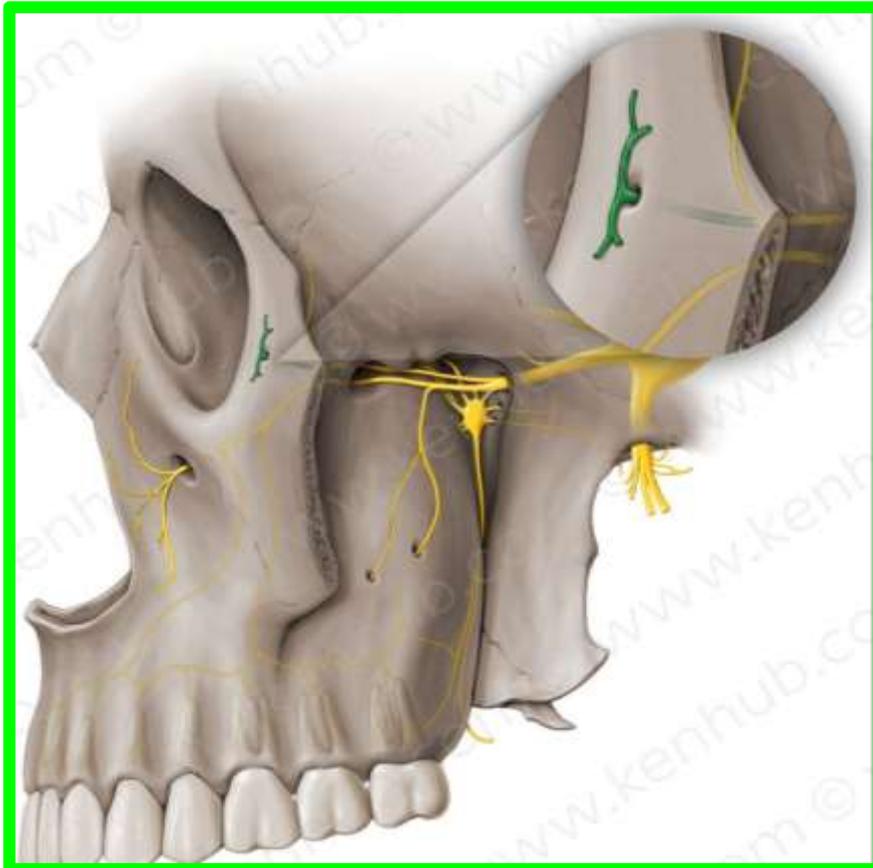


✓ It crosses the **pterygopalatine fossa** to enter the orbit through the **inferior orbital fissure**.

Maxillary Nerve (V2)

✓ It then continues as the **infraorbital nerve** in the infraorbital groove, and it emerges on the face through **the infraorbital foramen**.

✓ It gives sensory fibers to the skin of the face and the side of the nose.



Branches

- ■ Meningeal branches

- ■ Zygomatic branch which divides into **the zygomaticotemporal** and **the zygomaticofacial** nerves that supply the skin of the face

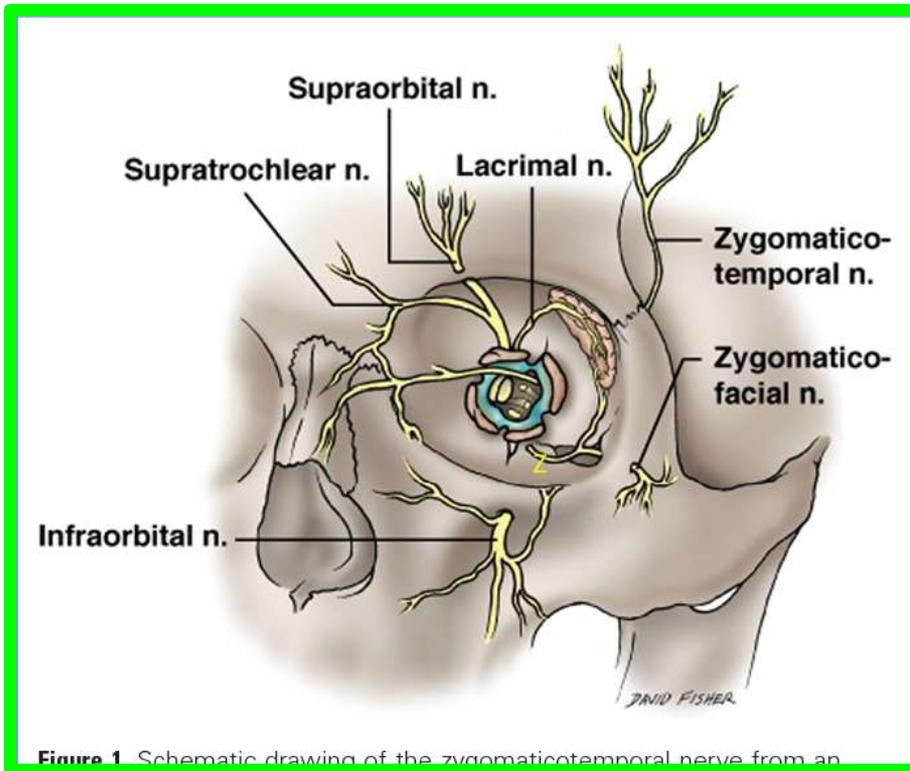
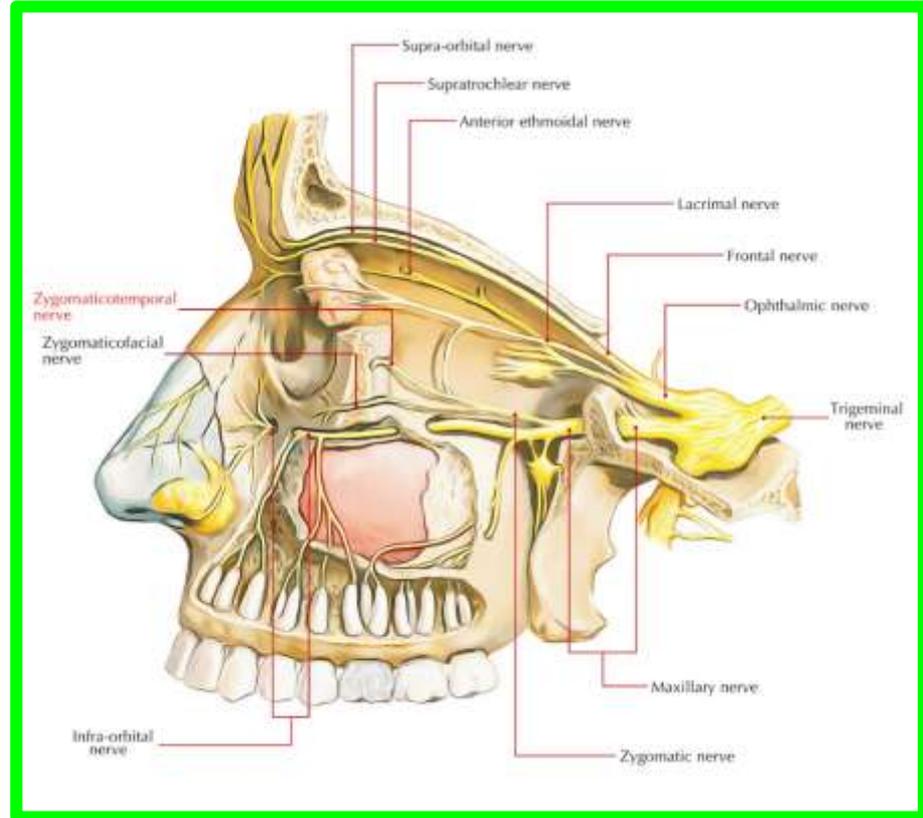


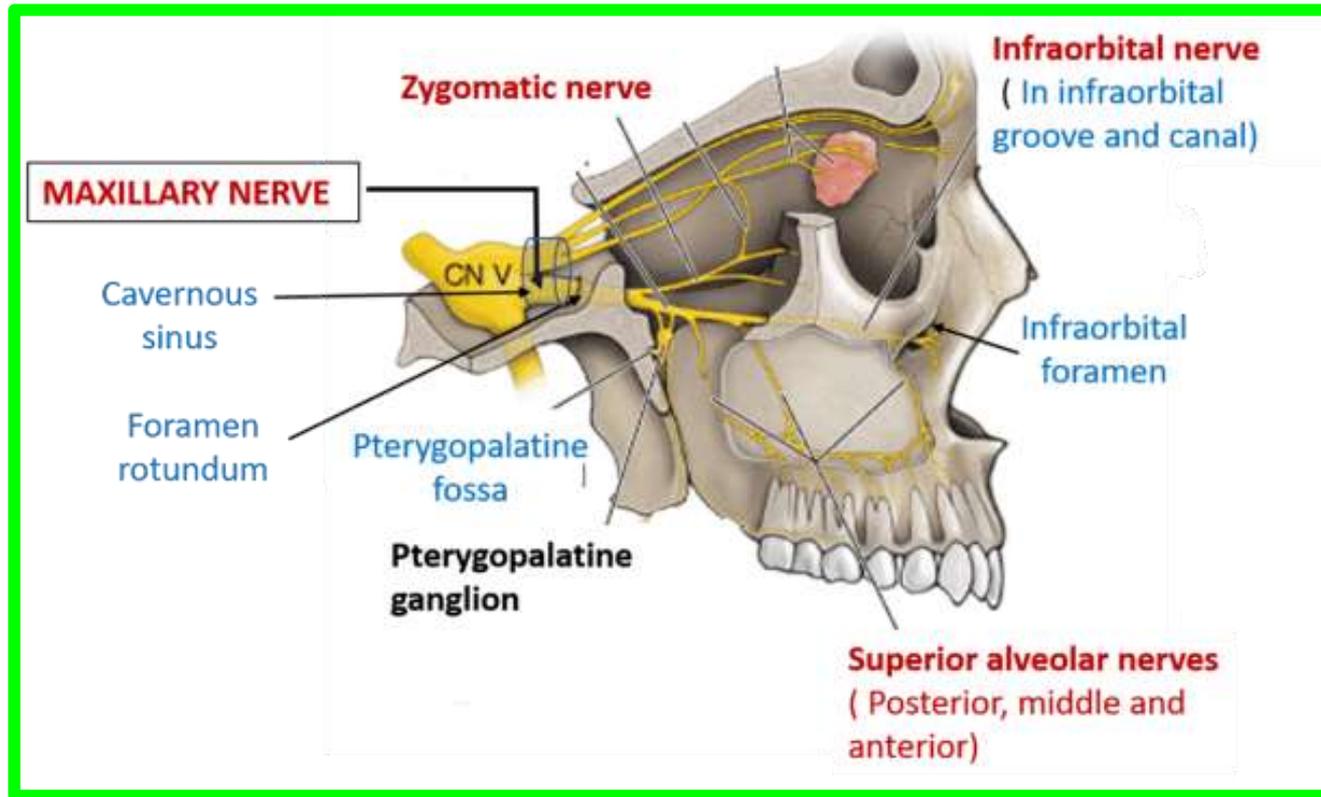
Figure 1 Schematic drawing of the zygomaticotemporal nerve from an



The zygomaticotemporal branch gives parasympathetic secretomotor fibers to the lacrimal gland via the lacrimal nerve.

Maxillary Nerve (V2)

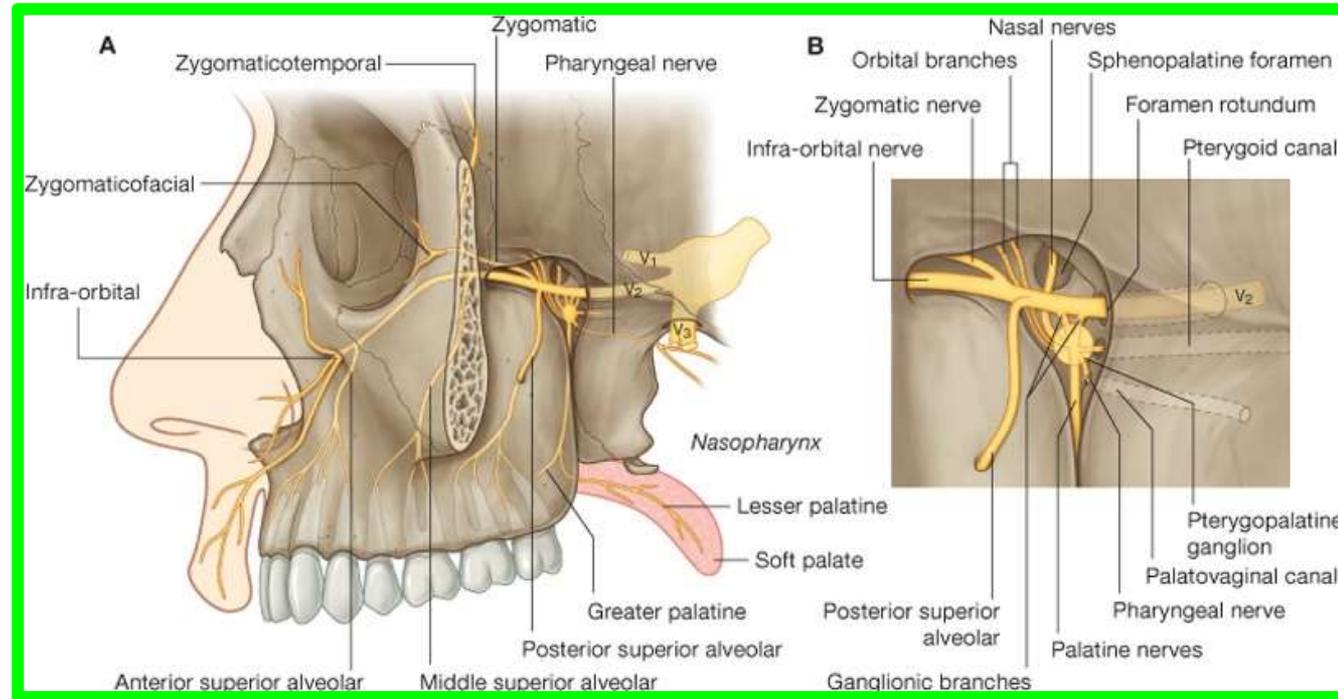
■ ■ **Ganglionic branches**, which are two short nerves that suspend **the pterygopalatine ganglion** in the **pterygopalatine fossa**.



They contain sensory fibers that have passed through the ganglion from the nose, the palate, and the pharynx. They also contain postganglionic parasympathetic fibers that are going to the lacrimal gland

■ ■ **Posterior superior alveolar nerve** which supplies **the maxillary sinus** as well as **the upper molar teeth and adjoining parts of the gum and the cheek**

■ ■ **Middle superior alveolar nerve** which supplies **the maxillary sinus** as well as **the upper premolar teeth, the gums, and the cheek**



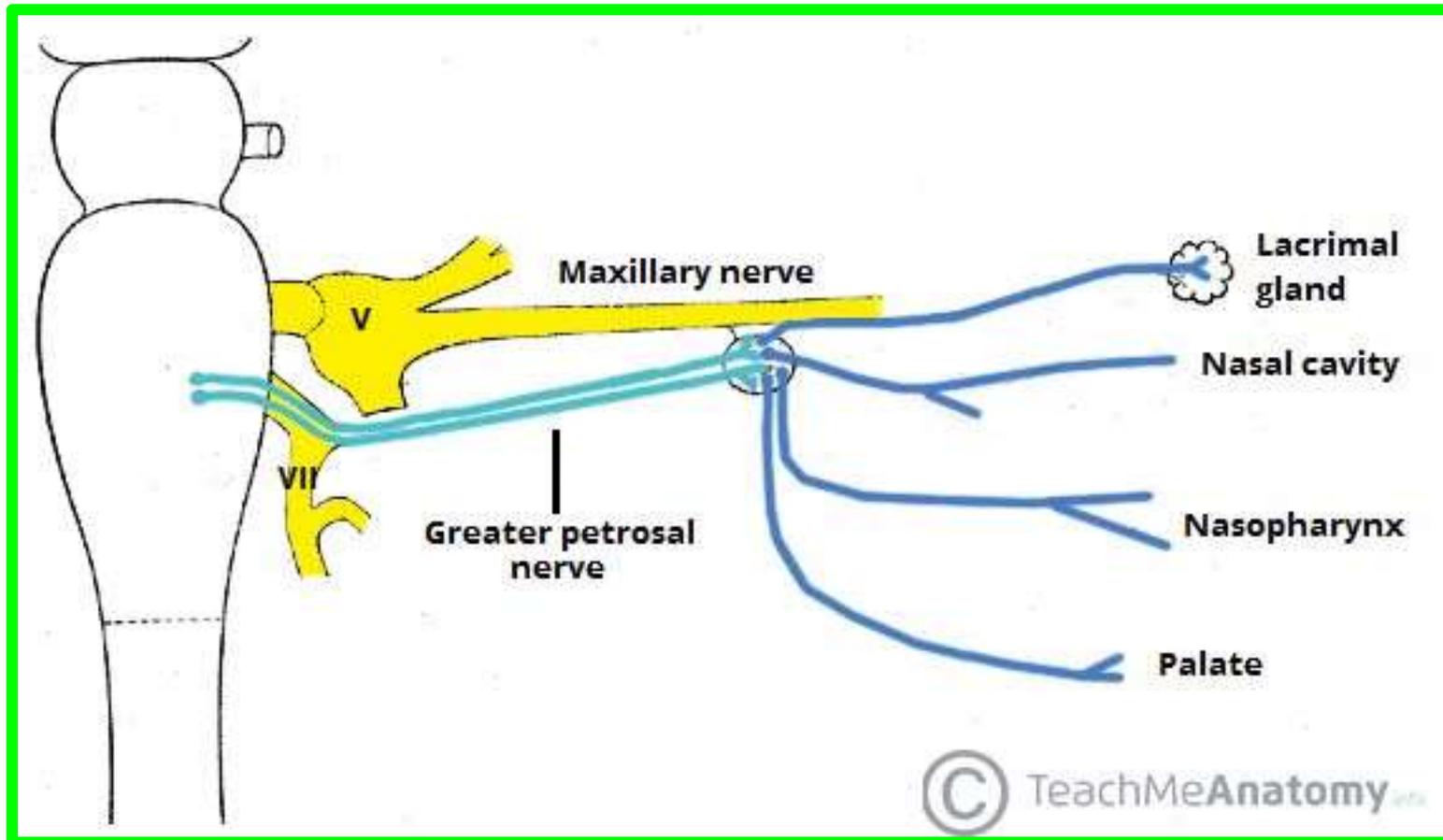
■ ■ **Anterior superior alveolar nerve**, which supplies **the maxillary sinus** as well as **the upper canine and the incisor teeth**

Pterygopalatine Ganglion

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is a **parasympathetic ganglion**, which is suspended from the **maxillary nerve** in the **pterygopalatine fossa**.

It is secretomotor to the lacrimal and nasal glands



Pterygopalatine Ganglion

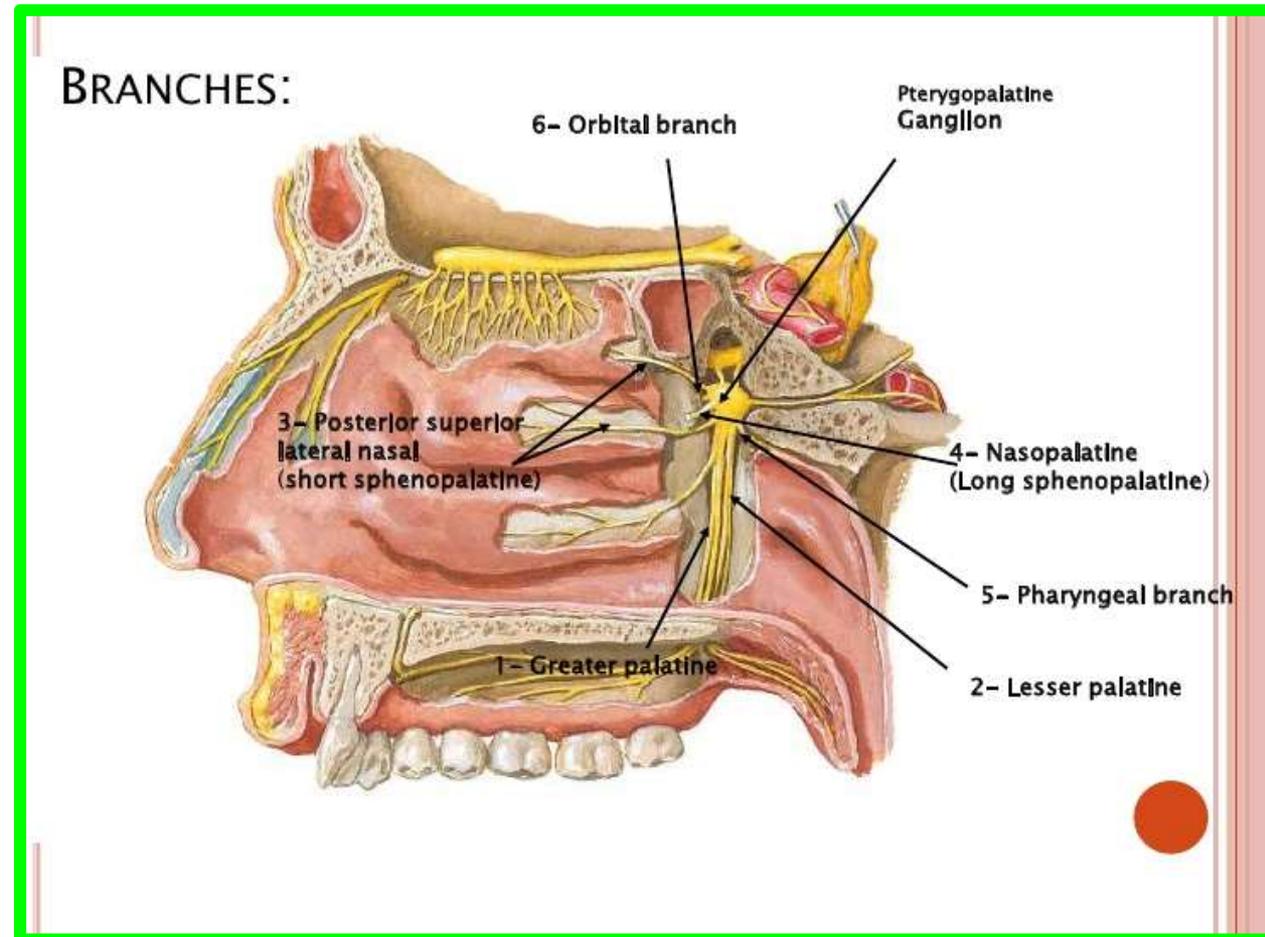
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Branches

■ ■ **Orbital branches**, which enter the orbit through the inferior orbital fissure

■ ■ **Greater and lesser palatine nerves** which supply the palate, the tonsil, and the nasal cavity

■ ■ **Pharyngeal branch**, which supplies the roof of the nasopharynx



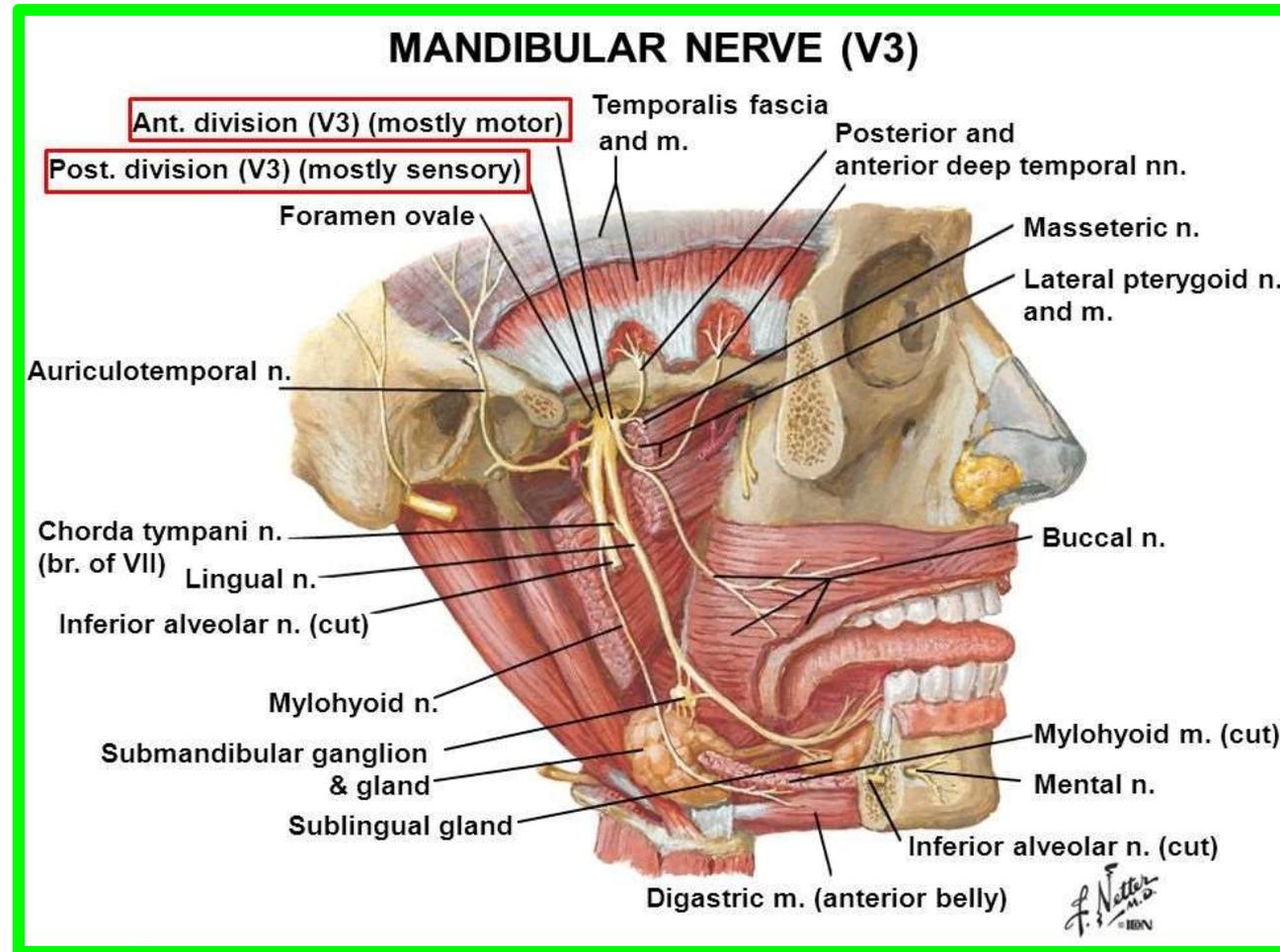
Mandibular Nerve (V3)

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✓ Is both **motor and sensory**

✓ The **sensory root** leaves the trigeminal ganglion and passes out of the skull through **the foramen ovale** to enter the **infratemporal fossa**.

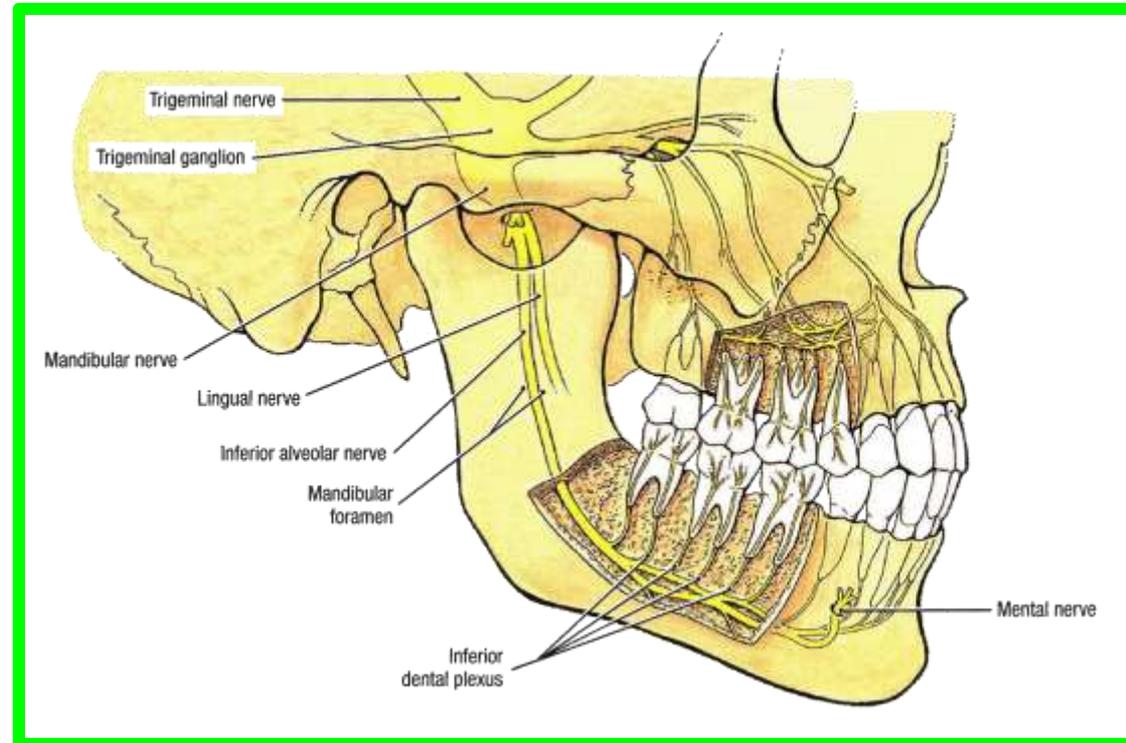
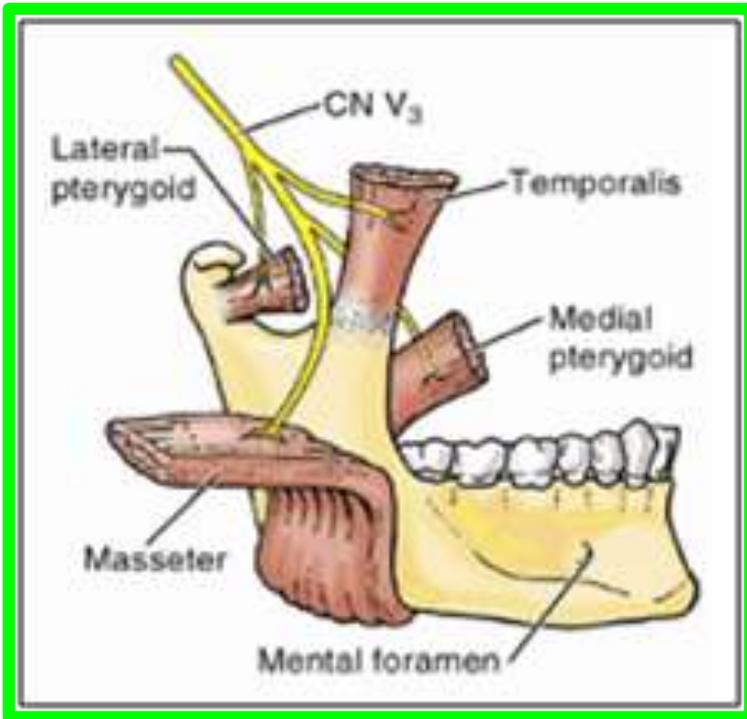


✓ The **motor root** of the **trigeminal nerve** also leaves the skull through **the foramen ovale** and joins **the sensory root** to form the trunk of the mandibular nerve, and then divides into a small anterior and a large posterior division

Mandibular Nerve (V3)

Branches from the **Main Trunk** of the Mandibular Nerve

- ■ **Meningeal branch**
- ■ **Nerve to the medial pterygoid muscle**, which supplies not only the medial pterygoid, but also the tensor veli palatini muscle

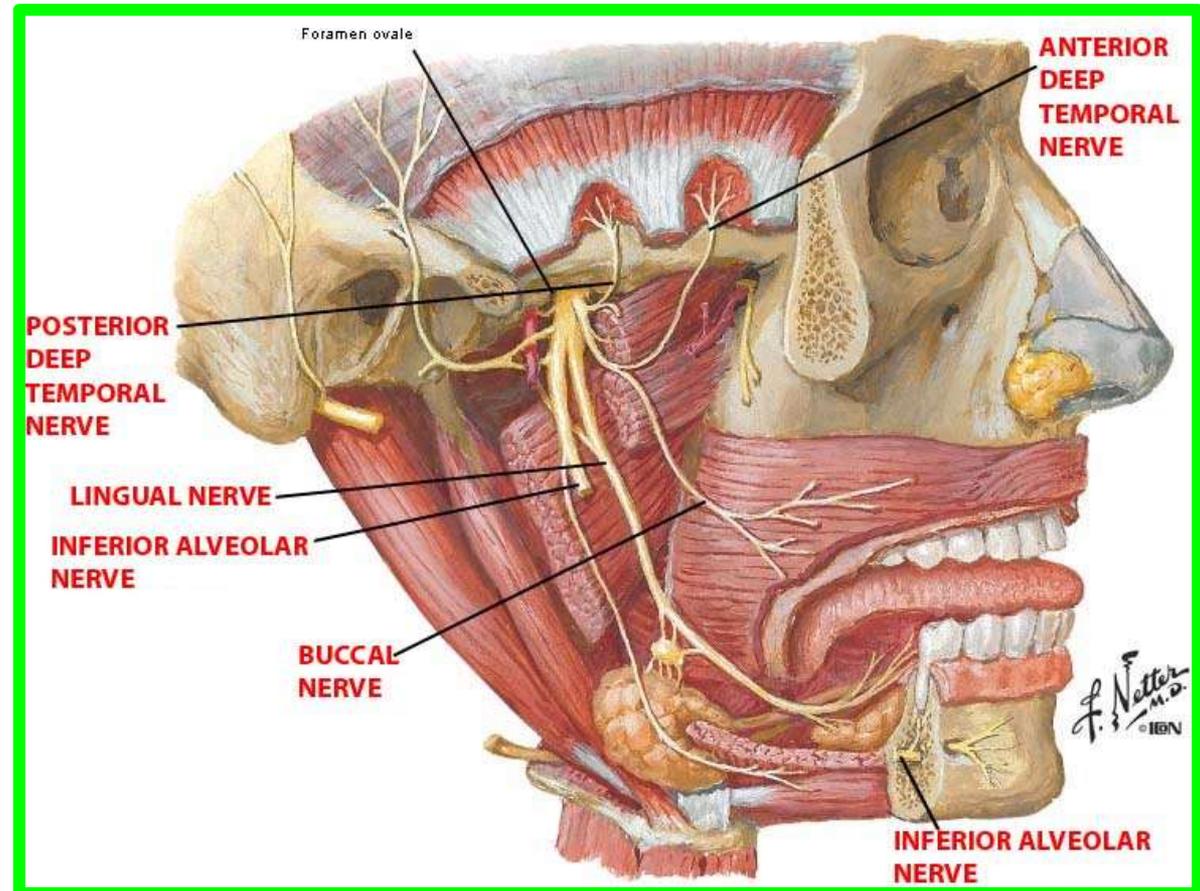


Mandibular Nerve (V3)

Branches from the **Anterior Division** of the Mandibular Nerve

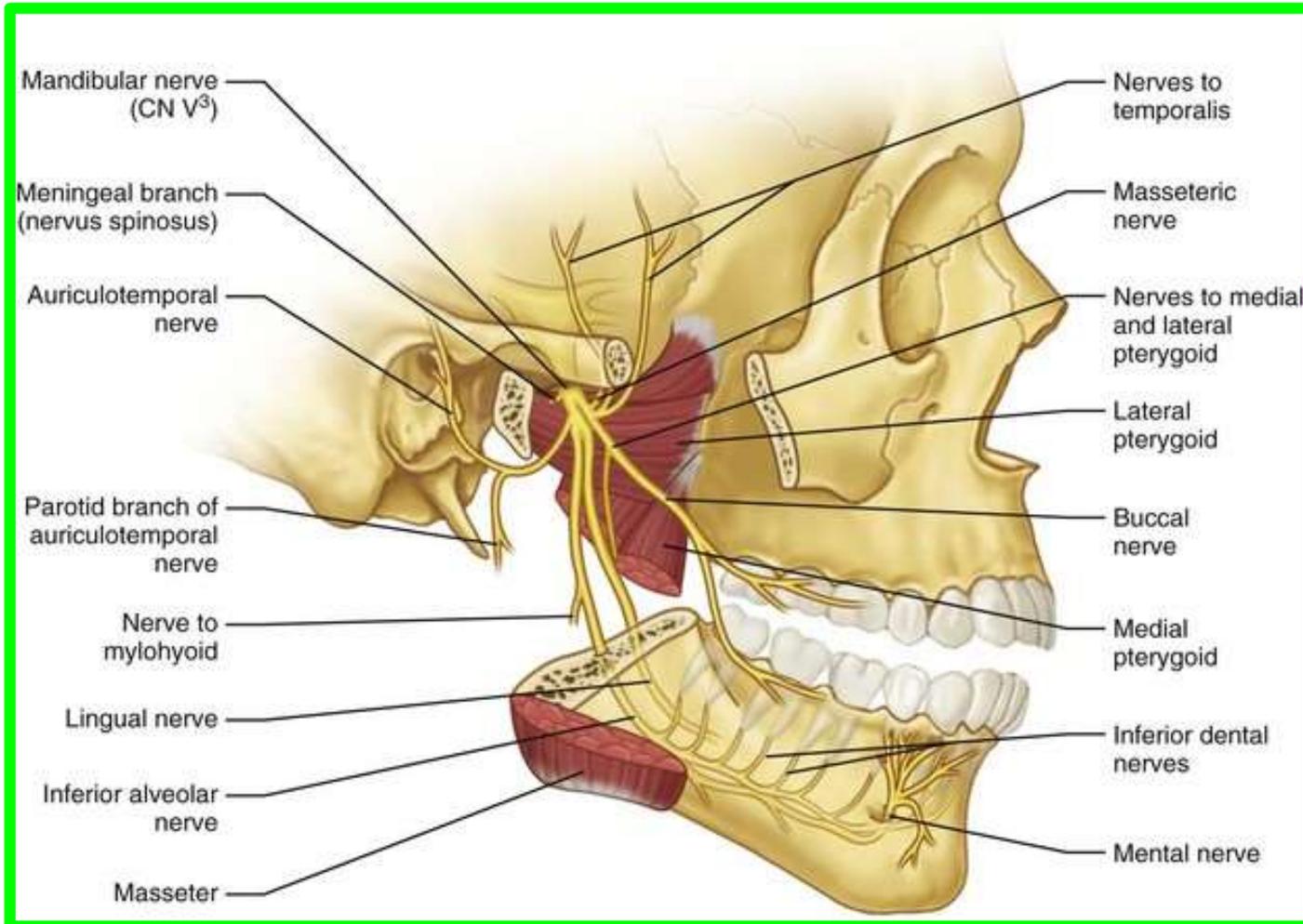
- ■ **Masseteric nerve** to the masseter muscle
- ■ **Deep temporal nerves** to the temporalis muscle
- ■ **Nerve to the lateral pterygoid muscle**
- ■ **Buccal nerve** to the skin and the mucous membrane of the cheek

The buccal nerve does not supply the buccinator muscle (which is supplied by the facial nerve), and it is the only sensory branch of the anterior division of the mandibular nerve



Branches from the **Posterior Division** of the Mandibular Nerve

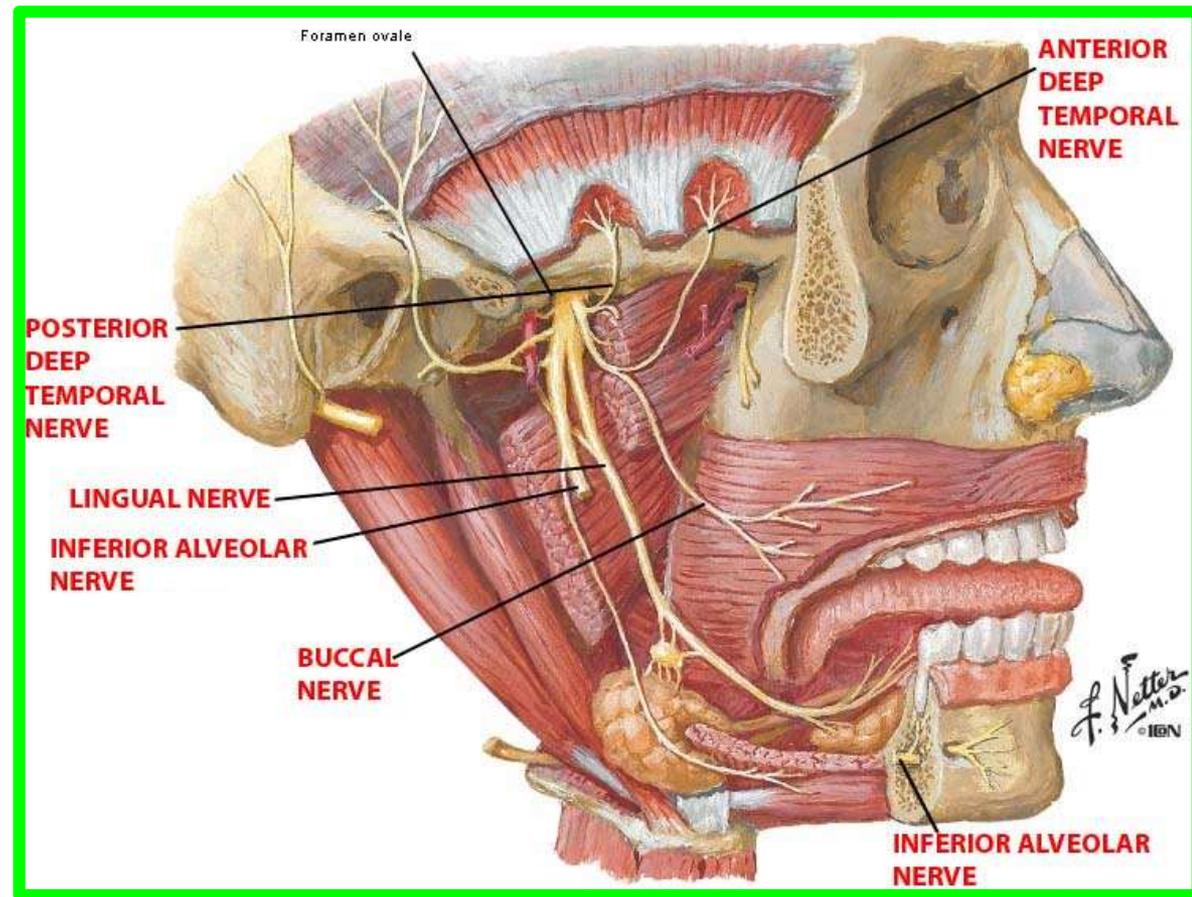
- **Auriculotemporal nerve**, which supplies the skin of the auricle, the external auditory meatus, the temporomandibular joint, and the scalp.



Branches from the **Posterior Division** of the Mandibular Nerve

■ ■ **Lingual nerve,**

It runs forward **on the side of the tongue** and crosses the **submandibular duct**. In its course, it is joined by **the chorda tympani nerve**, and it **supplies the mucous membrane of the anterior two thirds of the tongue** and **the floor of the mouth**.

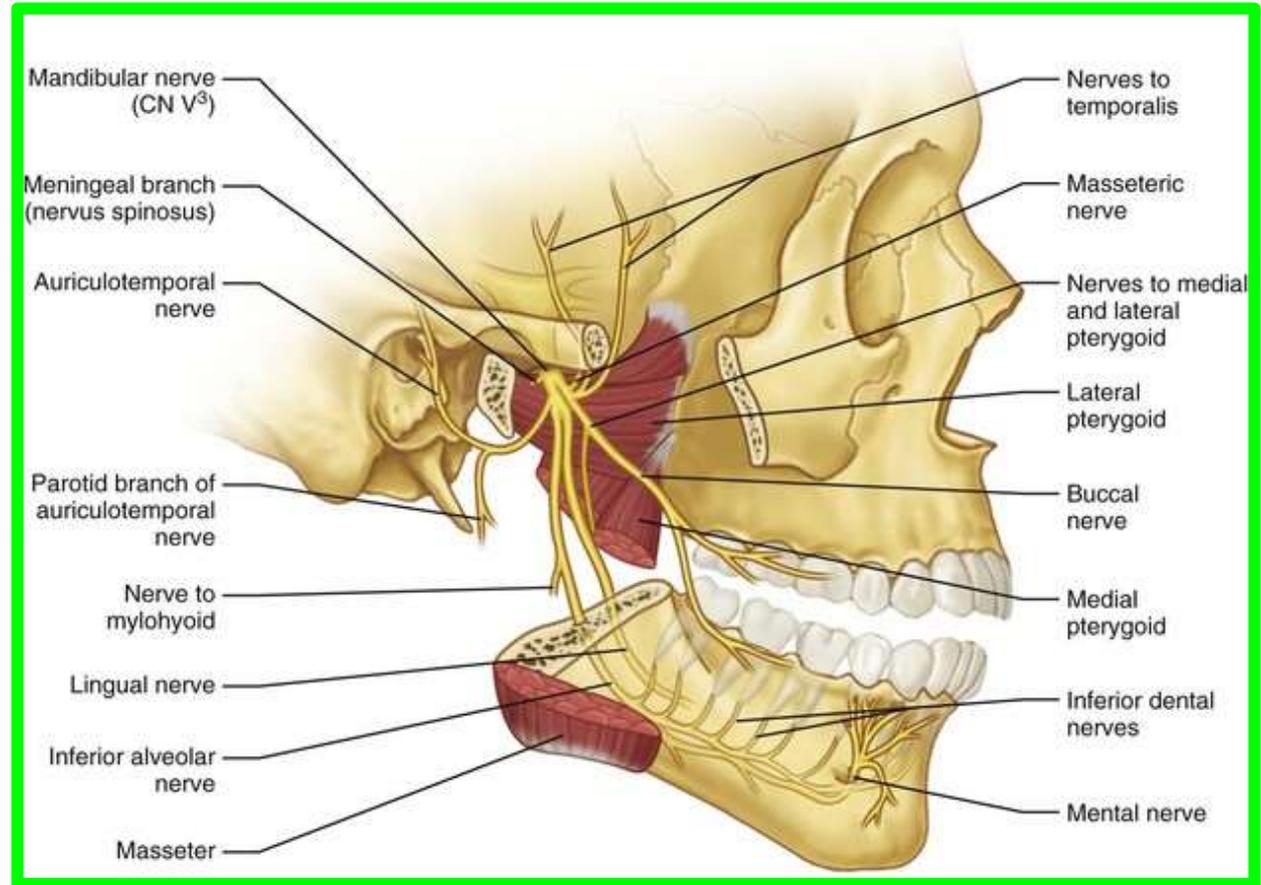


It also gives off **preganglionic parasympathetic secretomotor fibers** to **the submandibular ganglion**.

Branches from the **Posterior Division** of the Mandibular Nerve

■ ■ **Inferior alveolar nerve** which enters **the mandibular canal** to supply the teeth of the lower jaw and emerges through the **mental foramen** (**mental nerve**) to supply the skin of the chin

Before entering the canal, it gives off the **mylohyoid nerve** which supplies the **mylohyoid muscle** and the **anterior belly of the digastric muscle**.

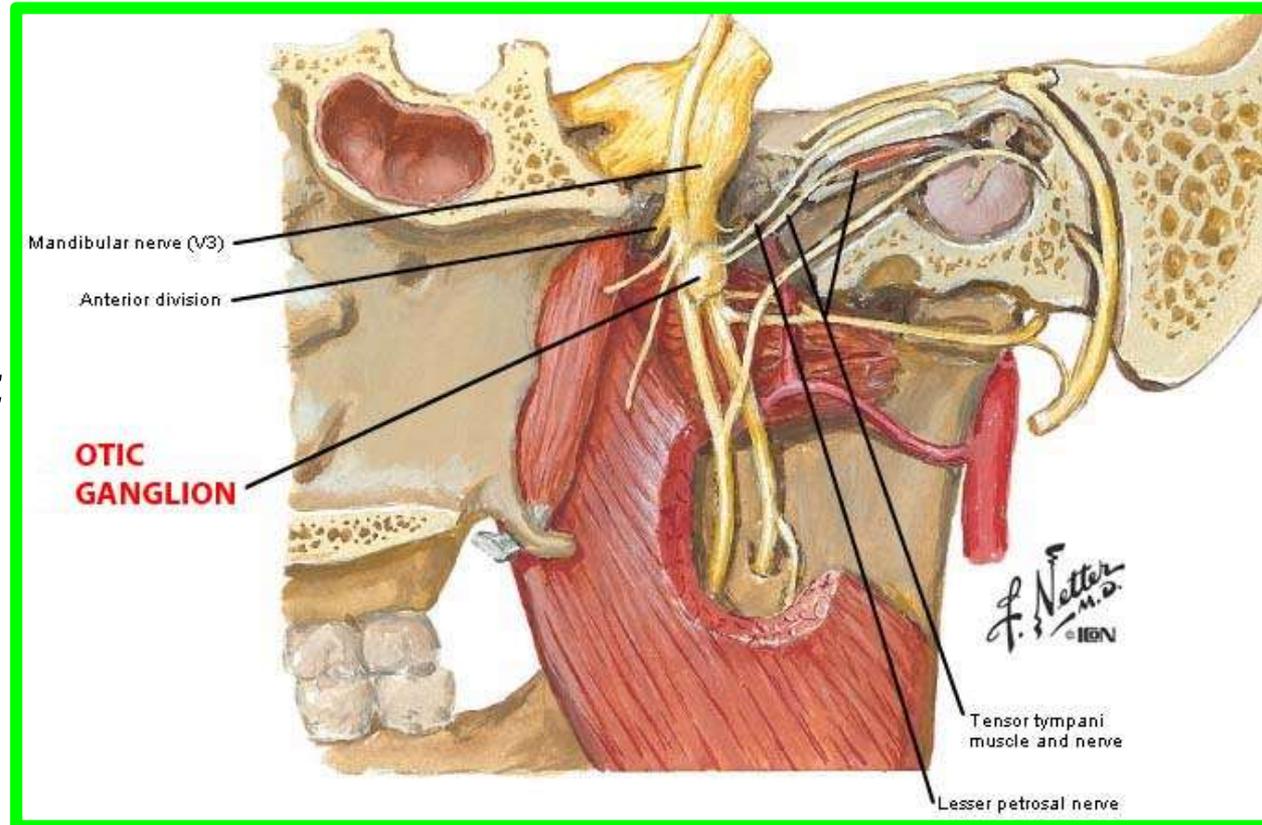


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✓ The branches of the **posterior division** of the mandibular nerve are sensory (except the nerve to the mylohyoid muscle).

The otic ganglion

is a parasympathetic ganglion that is located medial to the **mandibular nerve** just below the skull, and it is adherent to the nerve to the medial pterygoid muscle.



✓ The **preganglionic fibers** originate in the glossopharyngeal nerve, and they reach the ganglion via **the lesser petrosal nerve**

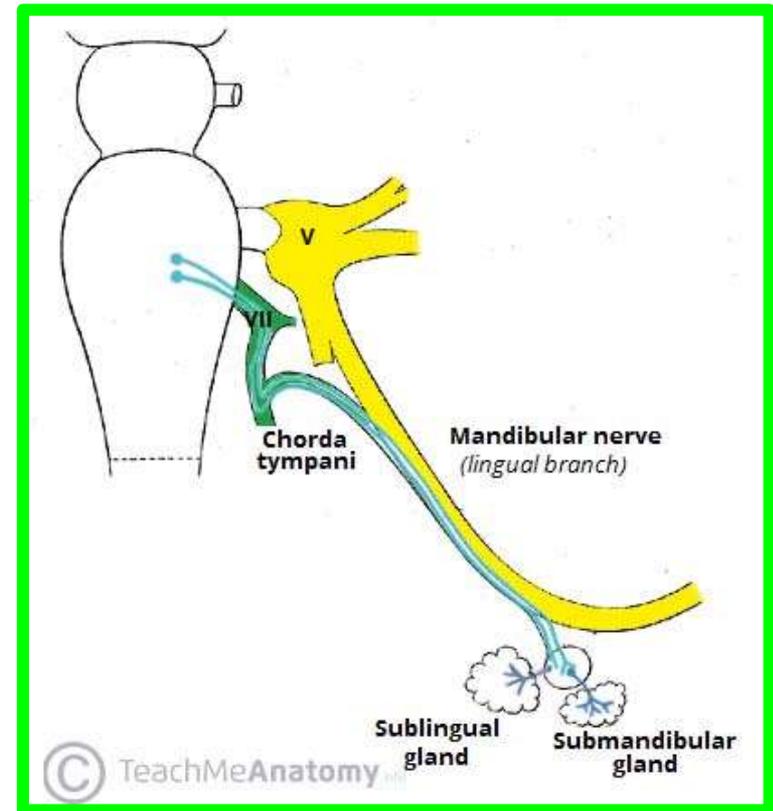
✓ The **postganglionic secretomotor fibers** reach the parotid salivary gland via **the auriculotemporal nerve**.

Submandibular Ganglion

✓ is a **parasympathetic ganglion** that lies deep to the submandibular salivary gland and is attached to the **lingual nerve** by small nerves

✓ **Preganglionic parasympathetic fibers** reach the ganglion from the **facial nerve** via the **chorda tympani** and the **lingual nerves**.

✓ **Postganglionic secretomotor fibers** pass to the submandibular and the sublingual salivary glands..



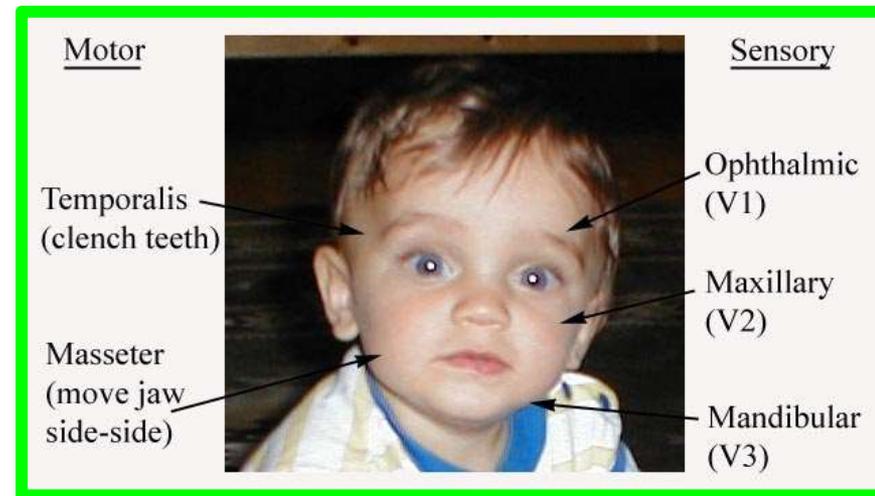
The trigeminal nerve is thus the main sensory nerve of the head and innervates the muscles of mastication. It also tenses the soft palate and the tympanic membrane

Testing the Integrity of the Trigeminal Nerve

The sensory function can be tested by using a cotton wisp over each area of the face supplied by the divisions of the trigeminal nerve



The motor function can be tested by asking the patient to clench the teeth. The masseter and the temporalis muscles, which are innervated by the mandibular division of the trigeminal nerve, can be palpated and felt to harden as they contract



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