



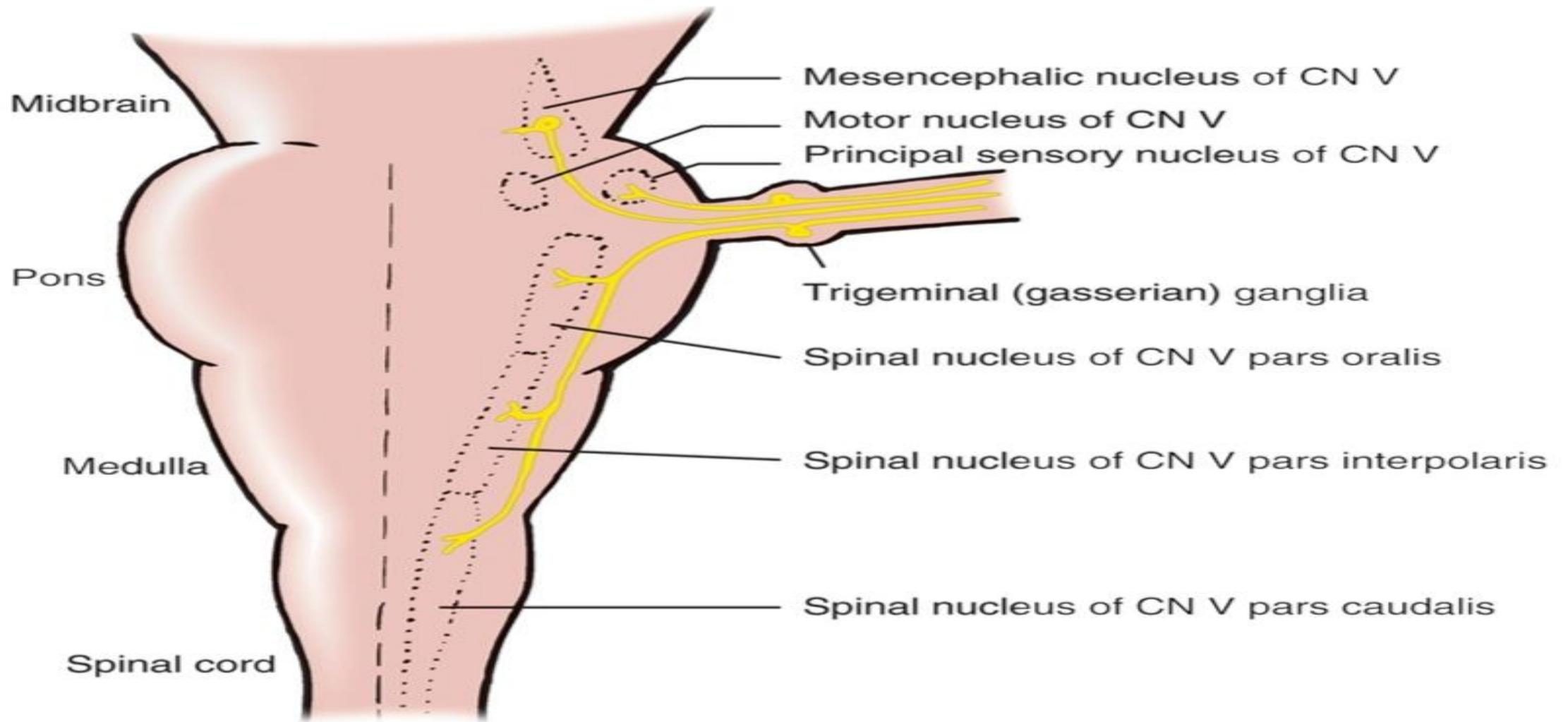
# *Cranial Nerve –v (Trigeminal nerve)*

DR SAJAD AH. TAK

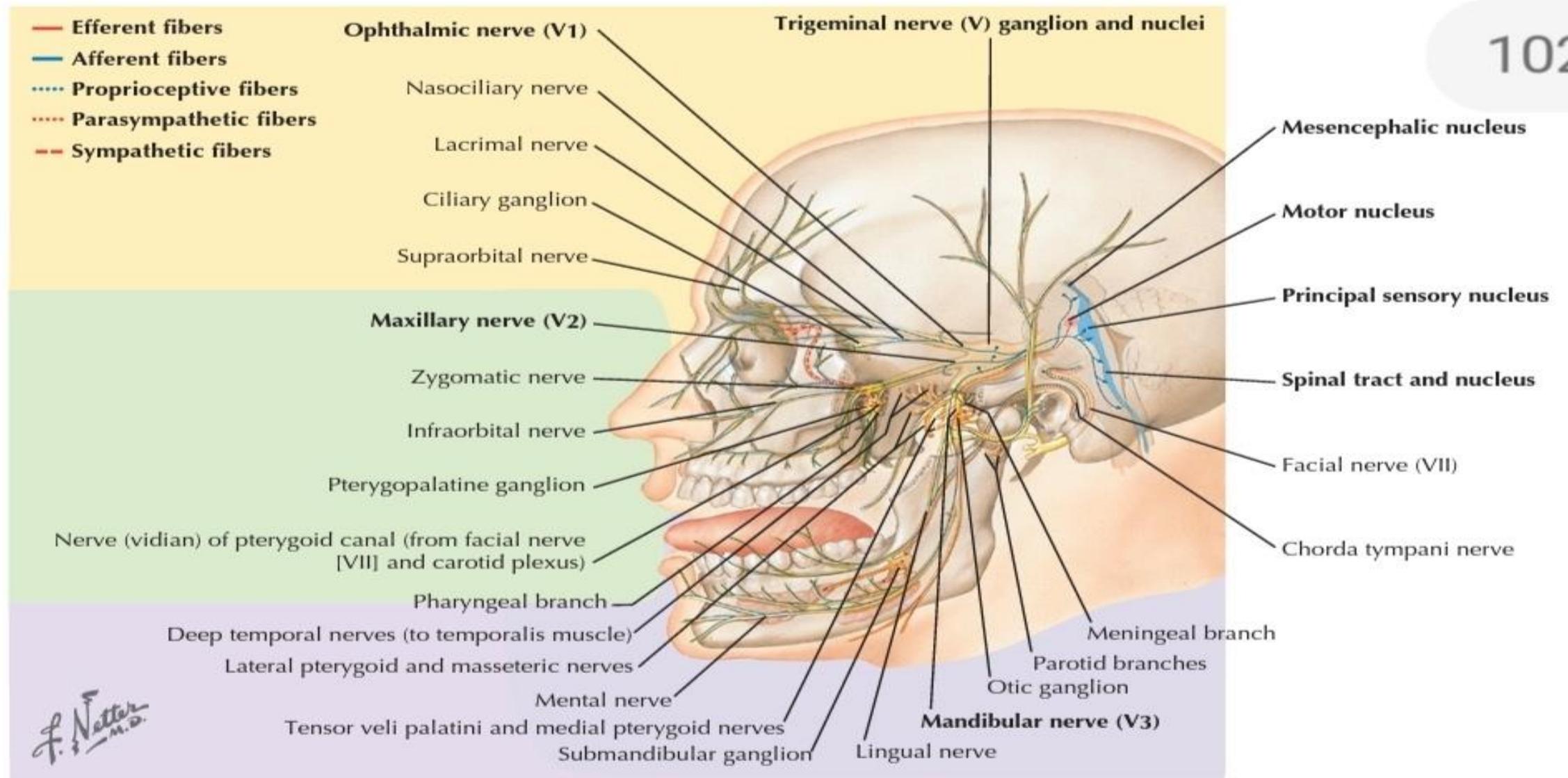
DNB-SS (NEUROLOGY)...IST YEAR

- 
- ▶ Neuroanatomy
  - ▶ Lesions of the 5<sup>th</sup> CN and their localization
  - ▶ Clinical Assessment

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- ▶ The trigeminal nerve is a mixed nerve .
  - ▶ Sensory innervation to the face and mucous membranes of the oral and nasal cavities .
  - ▶ Motor innervation to the muscles of mastication.

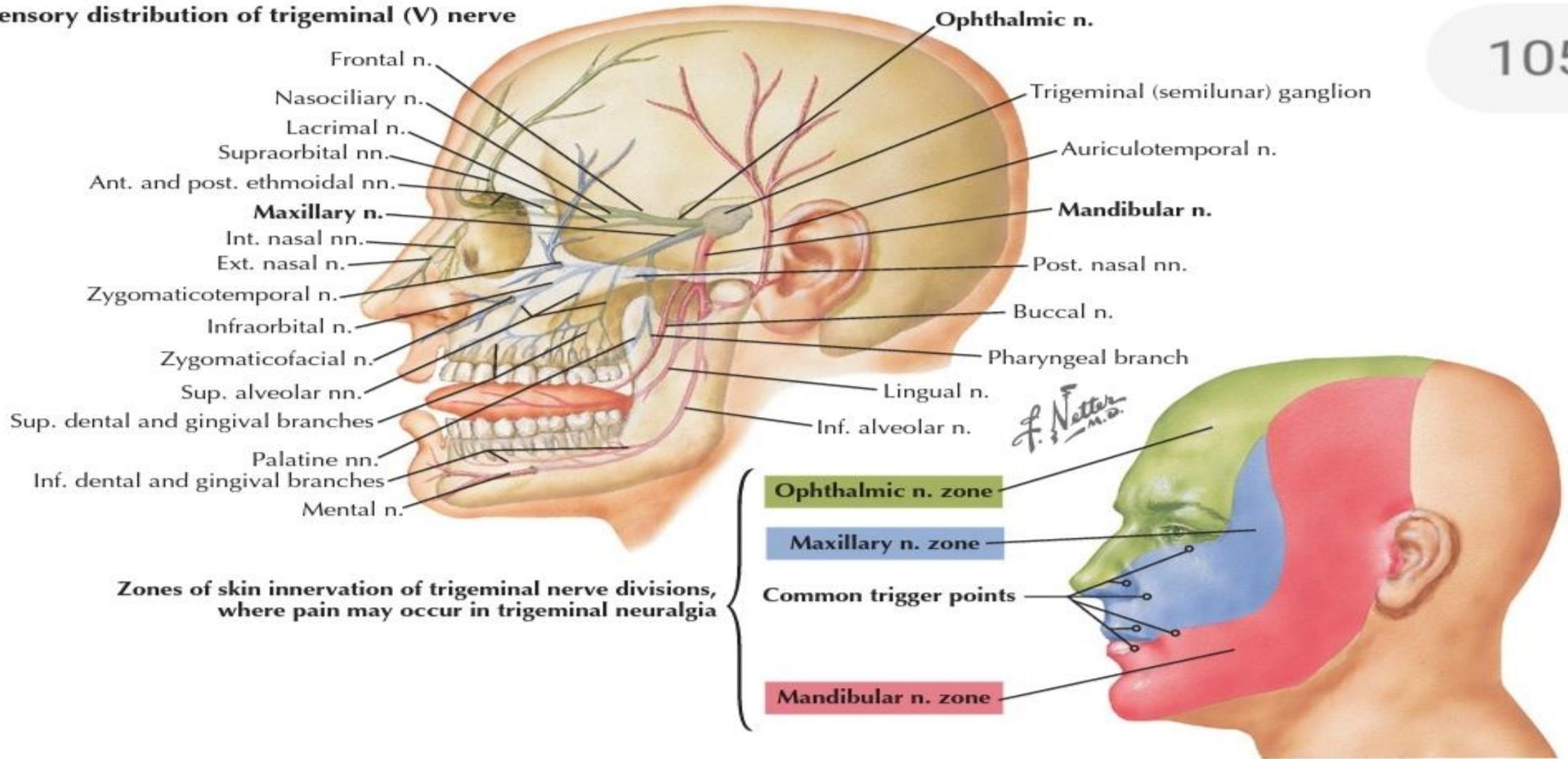


Schematic diagram of the trigeminal system. CN, cranial nerve.



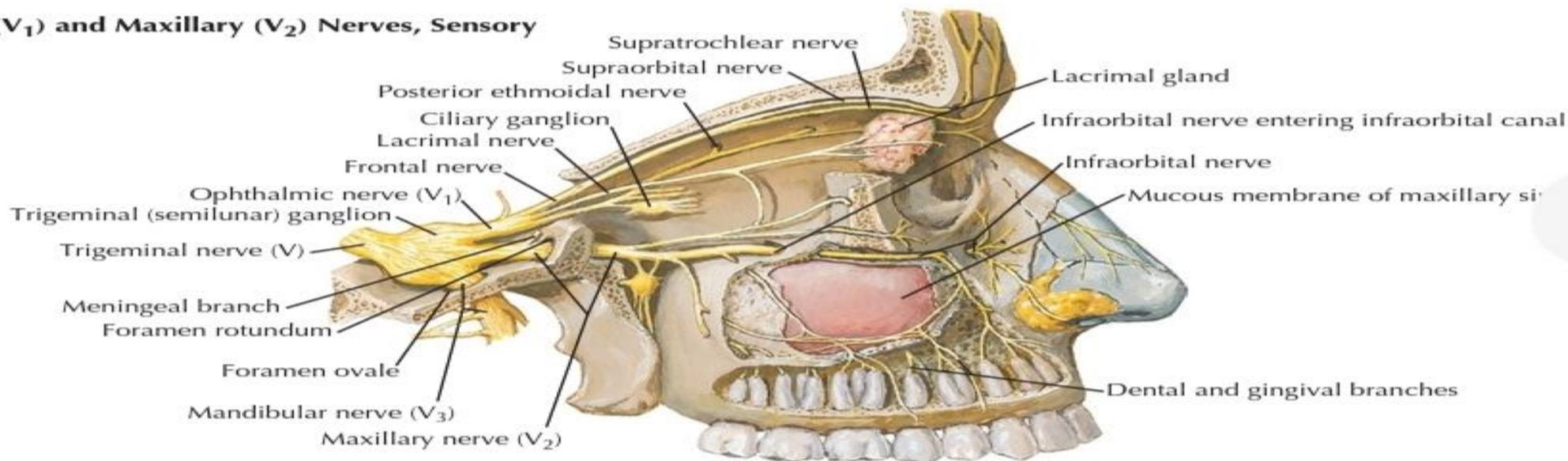
**Figure 6-1** Trigeminal Nerve (V): Schema.

**Sensory distribution of trigeminal (V) nerve**

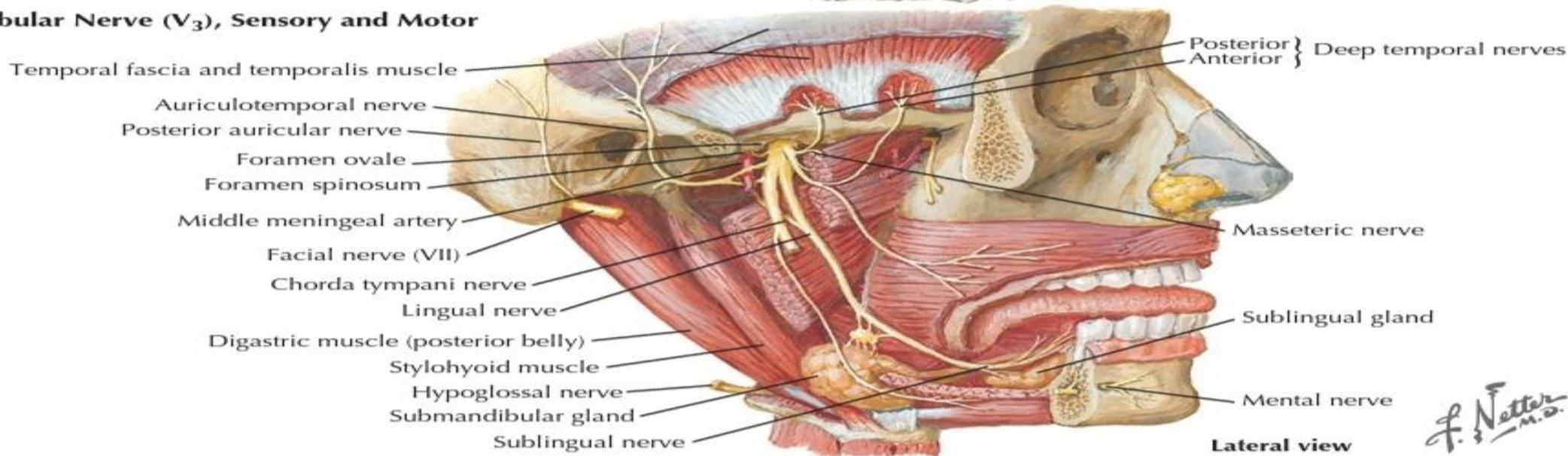


**Figure 6-4** Trigeminal Sensory Components.

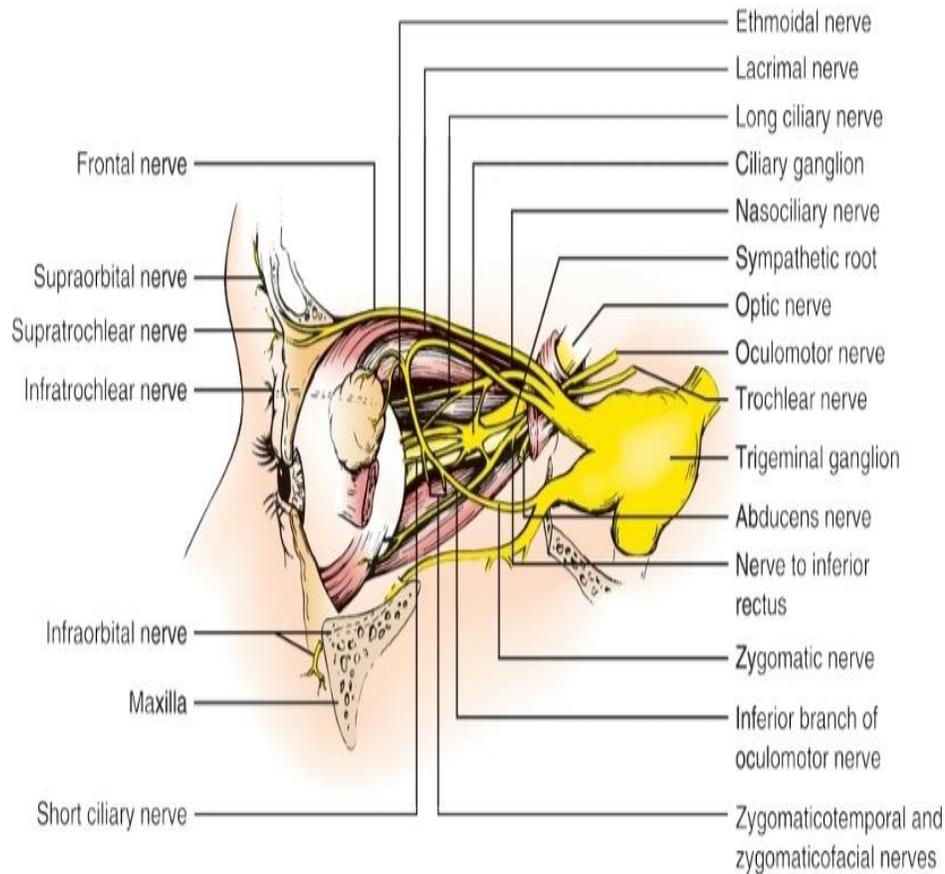
**Ophthalmic (V<sub>1</sub>) and Maxillary (V<sub>2</sub>) Nerves, Sensory**



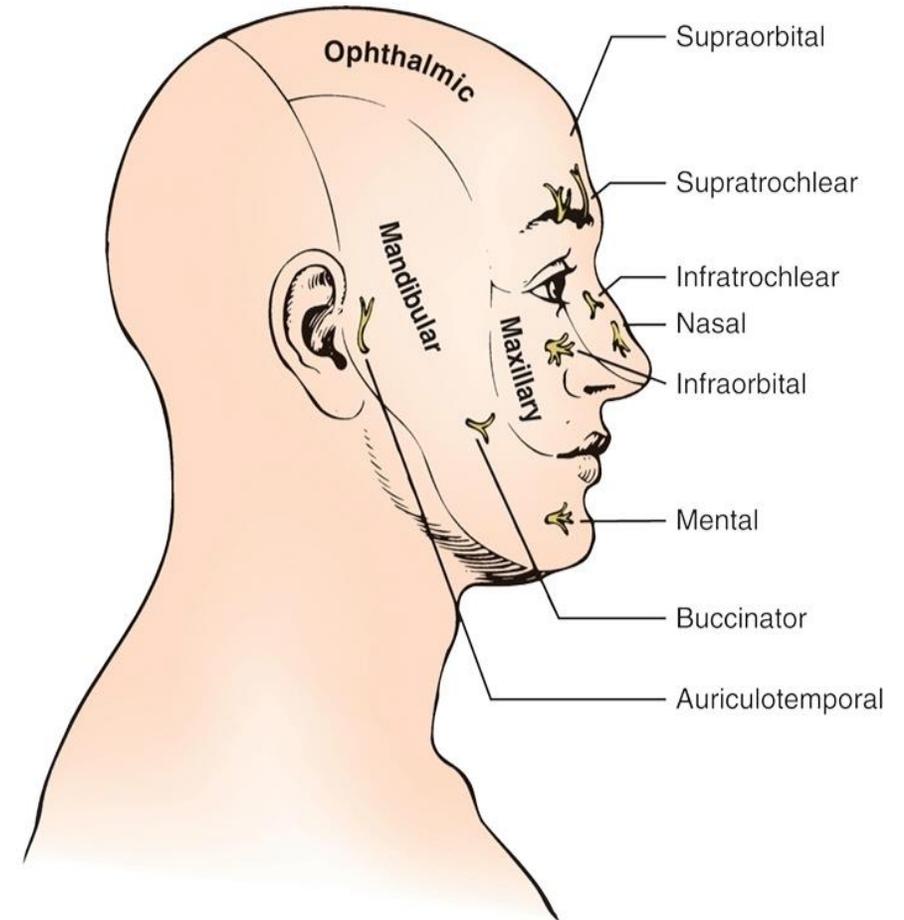
**Mandibular Nerve (V<sub>3</sub>), Sensory and Motor**



**Figure 6-2** Ophthalmic (V<sub>1</sub>), Maxillary (V<sub>2</sub>), and Mandibular (V<sub>3</sub>) Nerves.

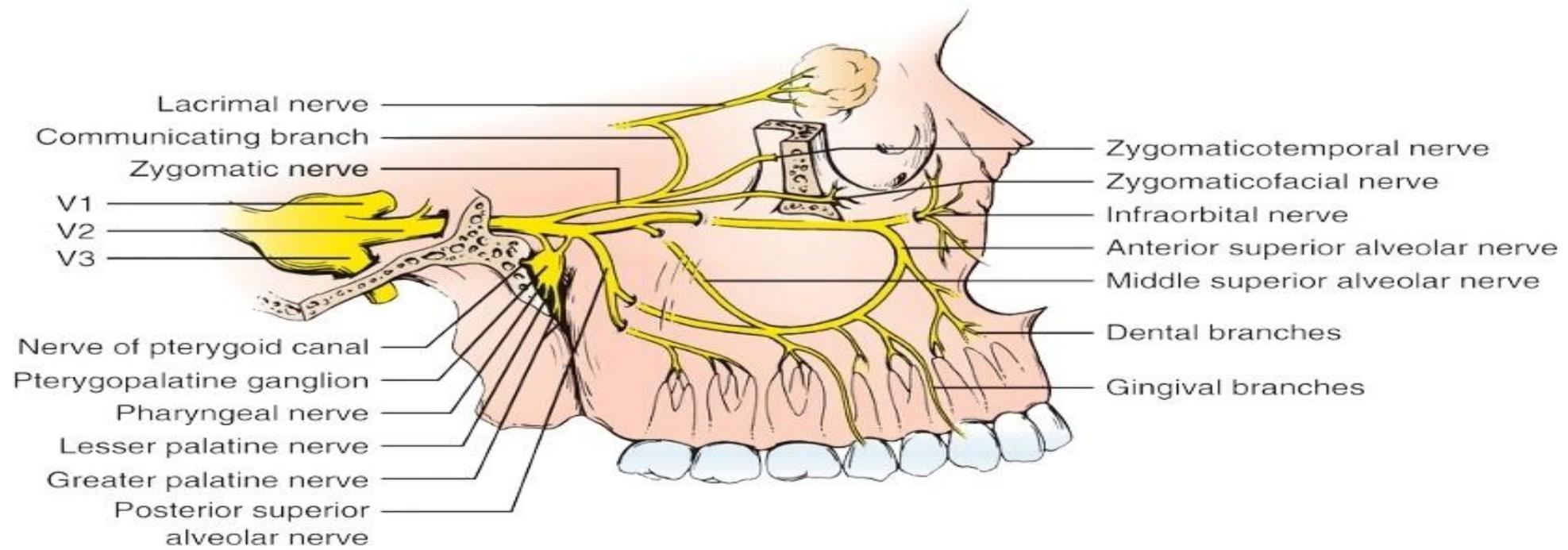


**Figure 9-2** The branches of the ophthalmic and maxillary divisions of the



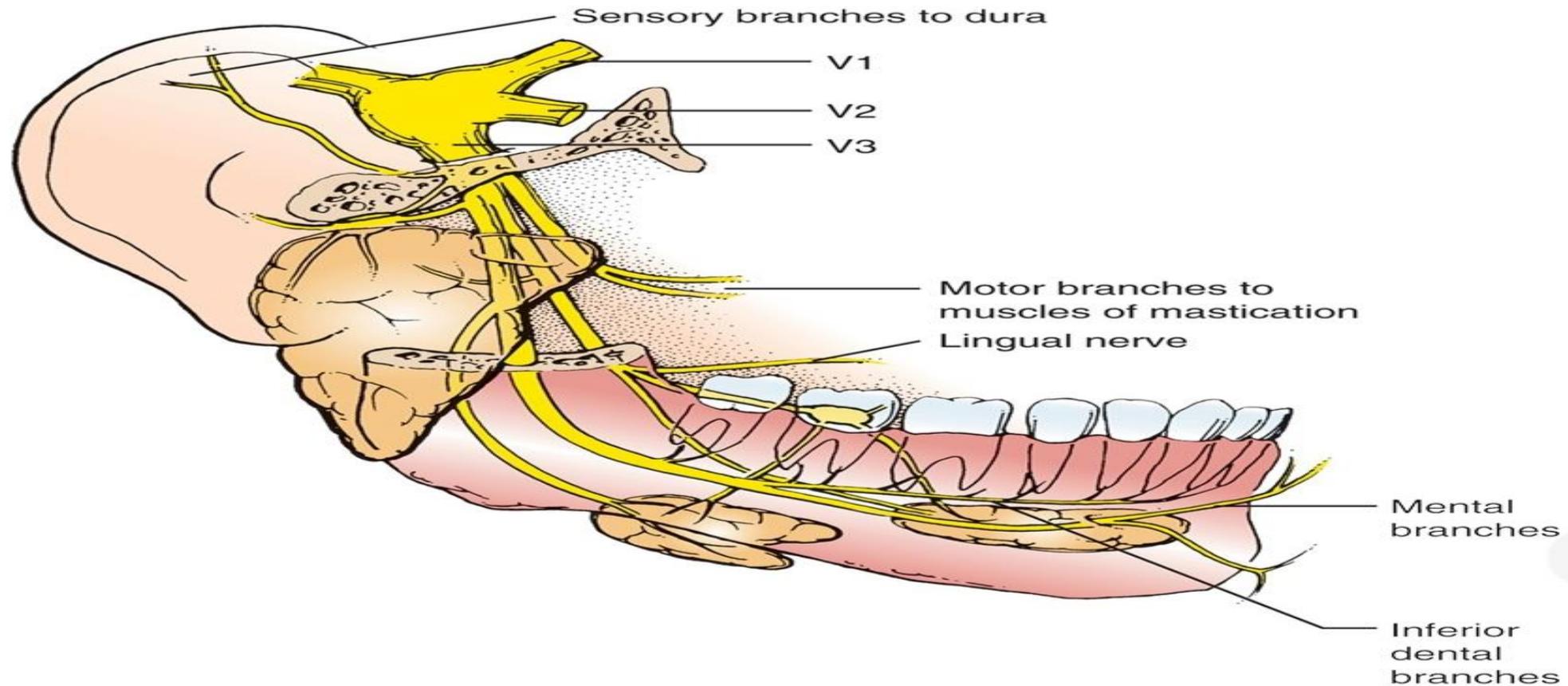
**Figure 9-3** Areas of skin supplied by the three major trigeminal nerve

The ophthalmic division therefore supplies the skin of the nose, the upper eyelid, the forehead, and the scalp (as far back as the lambdoidal suture in the midline and for 8 cm lateral to the midline) (see Fig. 9-3); the cornea, conjunctiva, and iris; the mucous membranes of the frontal, sphenoidal, and ethmoidal sinuses and the upper nasal cavity and septum; the lacrimal canals; and the dura mater of the anterior cranial fossa, falx cerebri, and tentorium cerebelli.



**Figure 9-4**  The branches of the maxillary division of the trigeminal nerve.

The maxillary division therefore supplies the skin of the lower eyelid, the lateral nose, upper lip, and cheek (see [Fig. 9-3](#)  ); the mucous membranes of the maxillary sinus, lower nasal cavity, hard and soft palates, and upper gum; the teeth of the upper jaw; and the dura mater of the middle cranial fossa (through the middle or recurrent meningeal nerve). The existence of sensory nerves



**Figure 9-5**  The branches of the mandibular division of the trigeminal

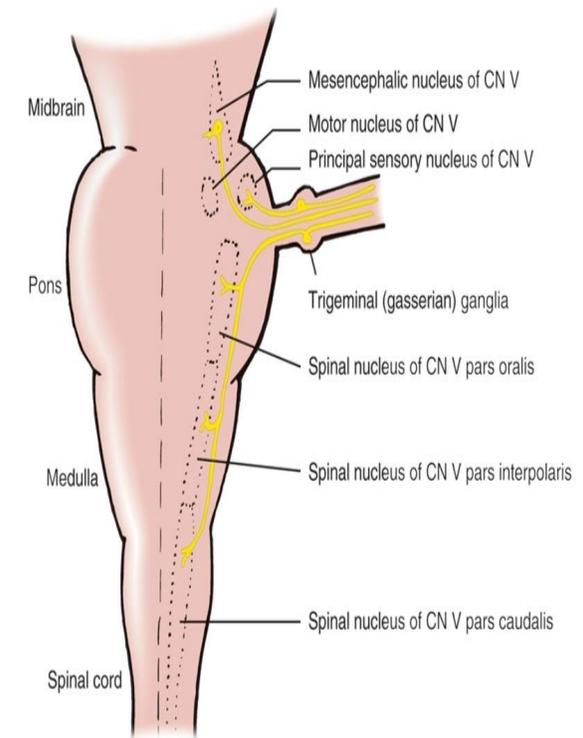
In addition to the muscles listed previously (see Motor Portion), the mandibular nerve supplies the skin of the lower lip, lower jaw, chin, tympanic membrane, auditory meatus, and upper ear (see [Fig. 9-3](#)  ); the mucous membranes of the floor of the mouth, the lower gums, and the anterior two-thirds of the tongue (*not* taste sensation, which is carried by the facial nerve); the teeth of the lower jaw; and the dura mater of the posterior cranial fossa.



▶ **Localization of Lesions Affecting  
Cranial Nerve V**

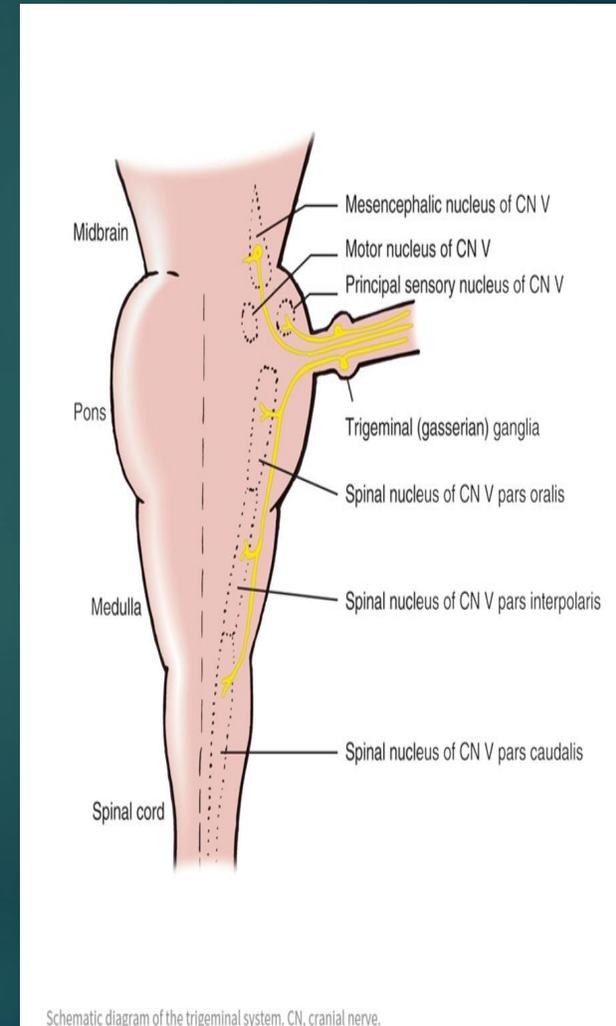
## Supranuclear Lesions

- ▶ Supranuclear control of trigeminal motor function is bilateral:
- ▶ Contralateral trigeminal motor paresis (e.g., deviation of the jaw “away from” the lesion) .....paresis may be mild(b/l motor innervation).
- ▶ Bilateral upper motor neuron lesions (pseudobulbar palsy) result in profound trigeminal motor paresis, often with an exaggerated jaw reflex.
- ▶ Thalamic lesions may result in anesthesia of the contralateral face



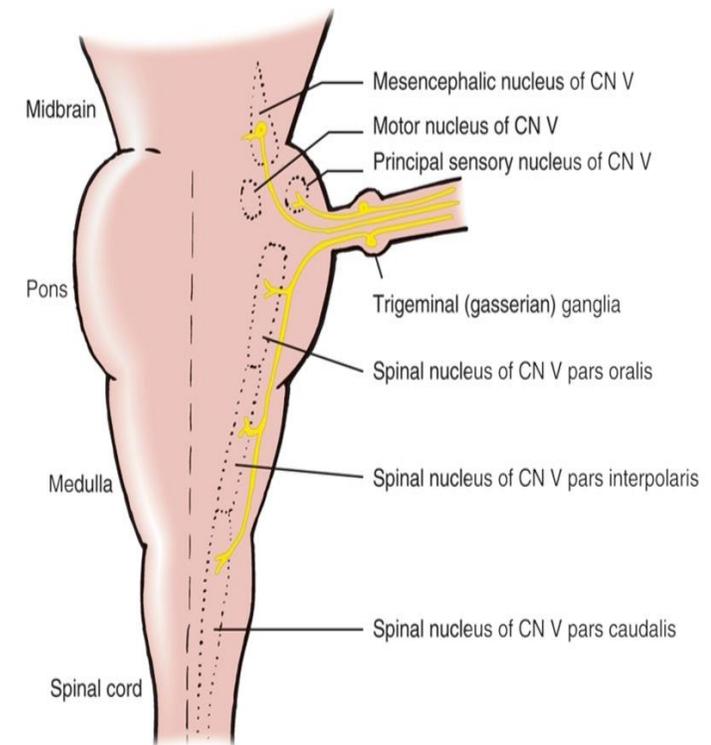
# Nuclear Lesions

- ▶ Lesions (e.g., primary or metastatic tumors, arteriovenous malformation, demyelinating disease, infarction, hemorrhage, syringobulbia) that affect the pons, medulla, or upper cervical cord.
- ▶ Diagnosed by “the company they keep” (e.g., long tract signs, and other cranial nerve involvement).
- ▶ Hemimasticatory spasm.( idiopathic ,Localised scleroderma,or following surgery for vestibular schwannoma).
- ▶ The hemifacial sensory disturbance is often associated with contralateral trunk and extremity hypalgesia and thermoanesthesia ( Lateral spinothalamic tract lies in close proximity to the trigeminal spinal nucleus).
- ▶ **Onionskin pattern of sensory loss.**
- ▶ **Lateral medullary (Wallenberg) syndrome**( spinal nucleus invol).



# Lesions Affecting the Preganglionic Trigeminal Nerve Roots

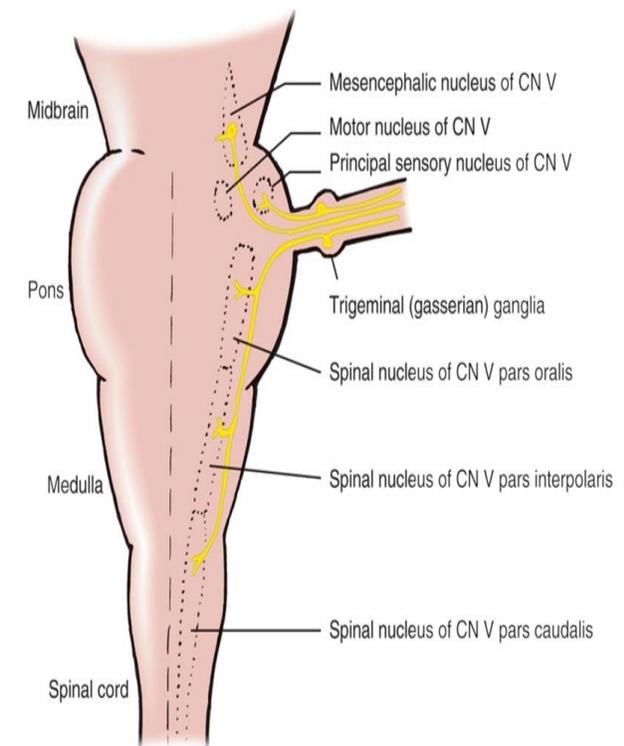
- ▶ In its cisternal course, the preganglionic trigeminal nerve root may be damaged by tumor (meningioma, schwannoma, metastasis, nasopharyngeal carcinoma), infection (granulomatous, infectious, or carcinomatous meningitis), trauma, or aneurysm.
- ▶ Preganglionic trigeminal nerve involvement is suggested by the involvement of the neighboring cranial nerves (especially cranial nerves VI, VII, and VIII).
- ▶ Presentation .... Ipsilateral facial pain, paresthesias, numbness, and sensory loss. The corneal reflex is depressed and a trigeminal motor paresis may occur.
- ▶ **Trigeminal neuralgia** (tic douloureux, Fothergill disease)....( mostly idiopathic , pathologic causes..... multiple sclerosis plaque, lipoma, brainstem infarction, cerebellopontine angle tumor, cavernous malformation, or an aberrant blood vessel, most frequently the superior cerebellar artery)



Schematic diagram of the trigeminal system. CN, cranial nerve.

# Lesions Affecting the Gasserian Ganglion

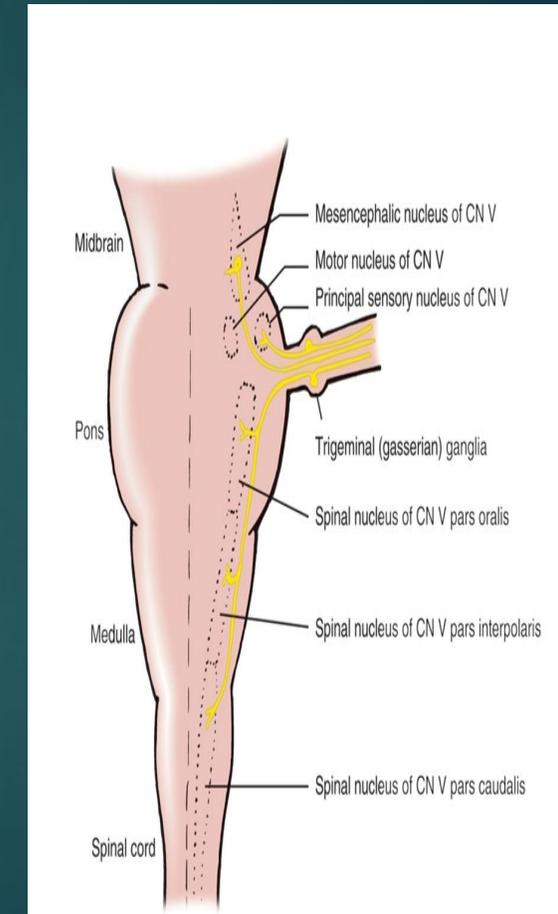
- ▶ Lesions of the middle cranial fossa (e.g., tumor, herpes zoster, sarcoidosis, syphilis, tuberculosis, arachnoiditis, trauma, abscess) may directly damage the gasserian ganglion in Meckel cave.
- ▶ Pain, often severe and paroxysmal, ( hemifacial or involve only select divisions of the trigeminal nerve ...especially the maxillary and mandibular divisions).
- ▶ A unilateral or bilateral trigeminal sensory neuropathy .... seen with Sjögren syndrome, rheumatoid arthritis, systemic sclerosis, mixed connective tissue disease, systemic lupus erythematosus, Churg–Strauss syndrome, and dermatomyositis .
- ▶
- ▶ Facial numbness with or without paresthesias, often associated with facial pain, is most often seen in a maxillary distribution.



Schematic diagram of the trigeminal system. CN, cranial nerve.

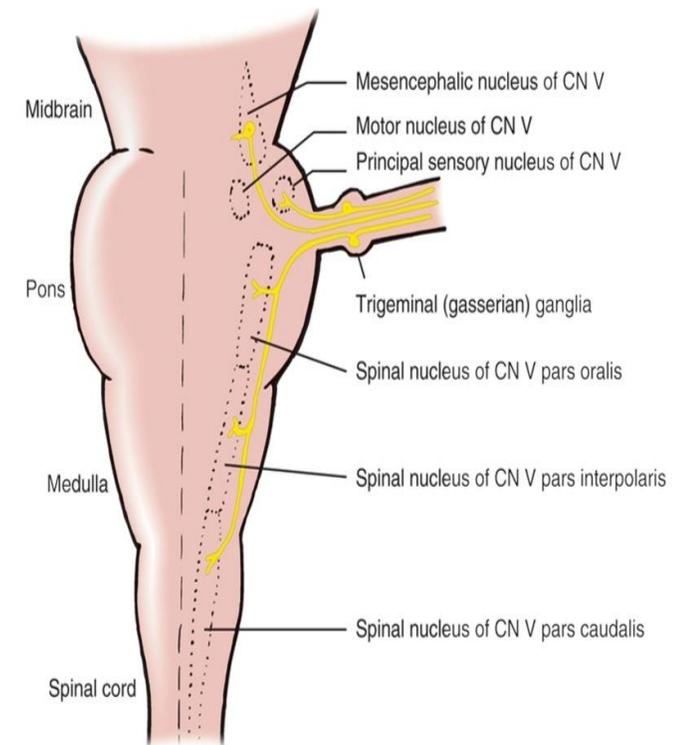
# Raeder's Paratrigeminal Syndrome

- ▶ unilateral oculosympathetic paresis( miosis and ptosis) and evidence of trigeminal involvement on the same side .
- ▶ Lesions in the middle cranial fossa, especially in the region between the trigeminal ganglion and the internal carotid artery, near the petrous apex.
- ▶ It may also be caused by lesions of the gasserian ganglion.
- ▶ The usual etiologies include tumor, aneurysm, trauma, and infection (e.g., Lyme disease)



# Gradenigo Syndrome

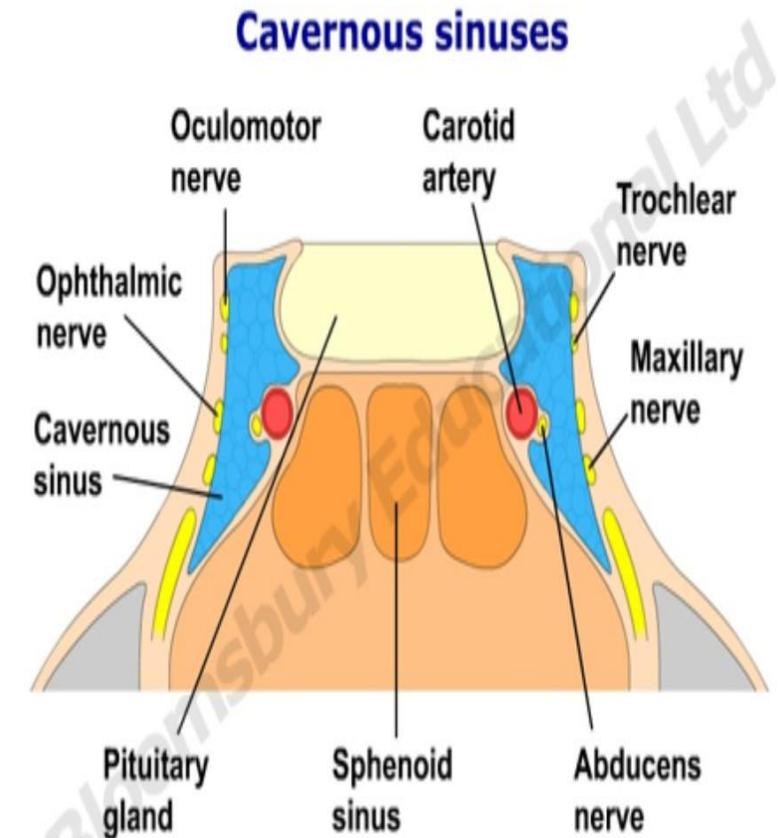
- ▶ Lesions located at the apex of the temporal bone ( especially metastasis, osteitis, or leptomeningitis associated with otitis media).
- ▶ Ophthalmic division of the trigeminal nerve and the nearby abducens nerve(Gradenigo syndrome)
- ▶ Occulospasmic paresis ( miosis, ptosis) may be associated.



Schematic diagram of the trigeminal system. CN, cranial nerve.

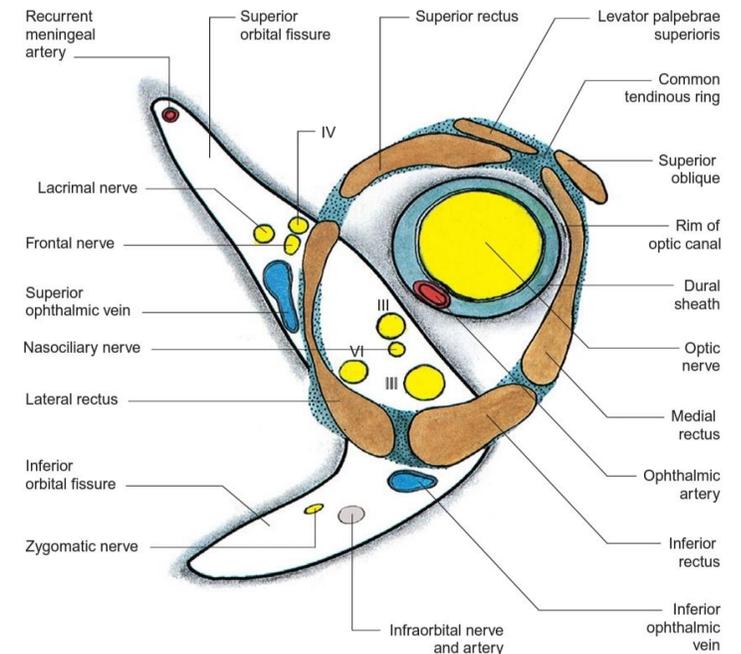
# The Cavernous Sinus Syndrome

- ▶ Lesions within the cavernous sinus (tumor, carotid aneurysm, trauma, carotid-cavernous fistula, infection).
- ▶ Total unilateral ophthalmoplegia,
- ▶ Pain, paresthesias, and sensory loss in the distribution of the ophthalmic and, less often, the maxillary divisions of the trigeminal nerve.



# The Superior Orbital Fissure Syndrome

- ▶ Complete (external and internal) ophthalmoplegia.
- ▶ Pain, paresthesias, and sensory loss in the ophthalmic cutaneous distribution.
- ▶ Occasionally, oculosympathetic paresis (without anhidrosis) may occur.
- ▶ Exophthalmos
- ▶ Blindness, due to extension of the pathologic process to involve the optic canal, may also occur.



**Fig. 11.3** The common tendinous ring with its muscle origins superimposed, and the relative positions of the nerves entering the orbital cavity through the superior orbital fissure and optic canal. Note that the attachments of levator palpebrae superioris and superior oblique lie external to the common tendinous ring but are attached to it. The ophthalmic veins frequently pass through the ring. The recurrent meningeal artery, a branch of the ophthalmic artery, is often conducted from the orbit to the cranial cavity through its own foramen. (Based mainly on the data of Whitnall, S.E., 1932. *Anatomy of the Human Orbit*, 2nd ed. Oxford University Press, London; and Koornneef, I., 1977. *Spatial Aspects of Orbital Musculo-fibrous Tissue in Man*. Swetsa Zeitlinger, Amsterdam. Provided by the late Gordon L. Ruskell, Department of Optometry and Visual Science, The City University, London.)

# Lesions Affecting the Peripheral Branches of the Trigeminal Nerve

- ▶ Trumpet player's neuropathy .
- ▶ Numb cheek syndrome ( fracture of zygoma or tumor (SCC)...infraorbital nerve invl)
- ▶ Isolated mental neuropathy (the syndrome of the numb chin or Roger sign) consists of pain, swelling, and numbness in the jaw (lower lip, chin, and mucous membrane on the inside of the lip)..... Systemic ca like lymphoreticular, breast or lung ca with metastasis to lower jaw.



# ▶ Clinical assessment



# SENSORY EVALUATION

- ▶ Exteroceptive sensation (pain, light touch, heat, and cold) is tested on the face and mucous membranes.
- ▶ Each of the three trigeminal divisions is tested individually and compared with the opposite side

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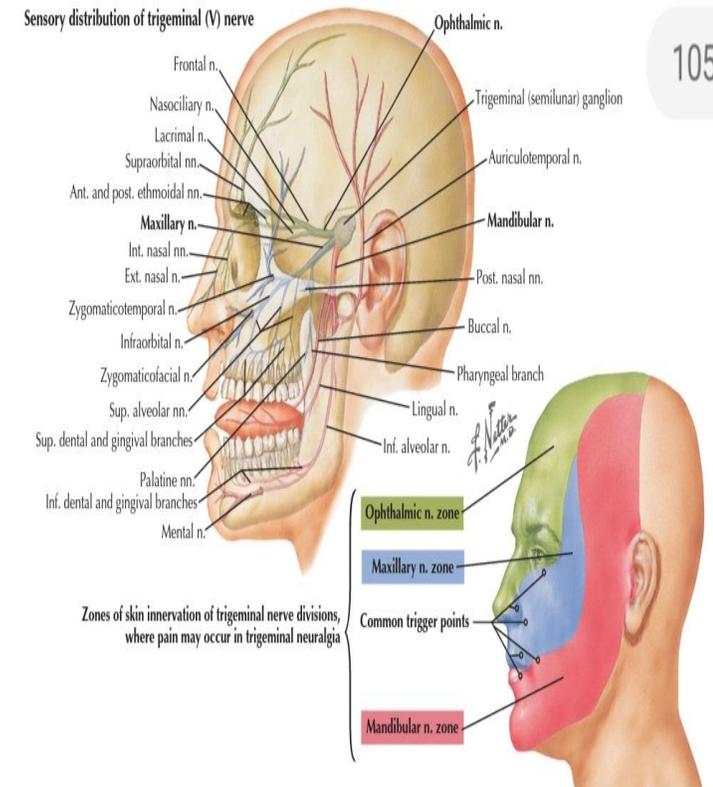
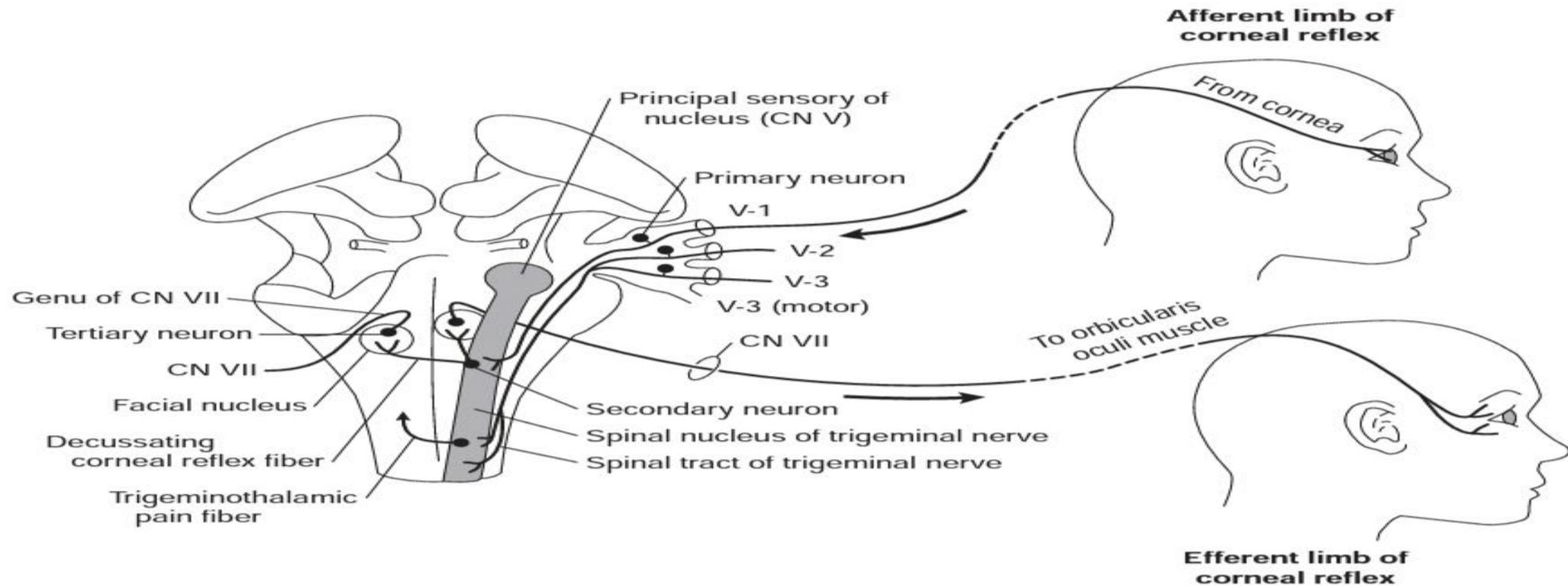


Figure 6-4 Trigeminal Sensory Components.

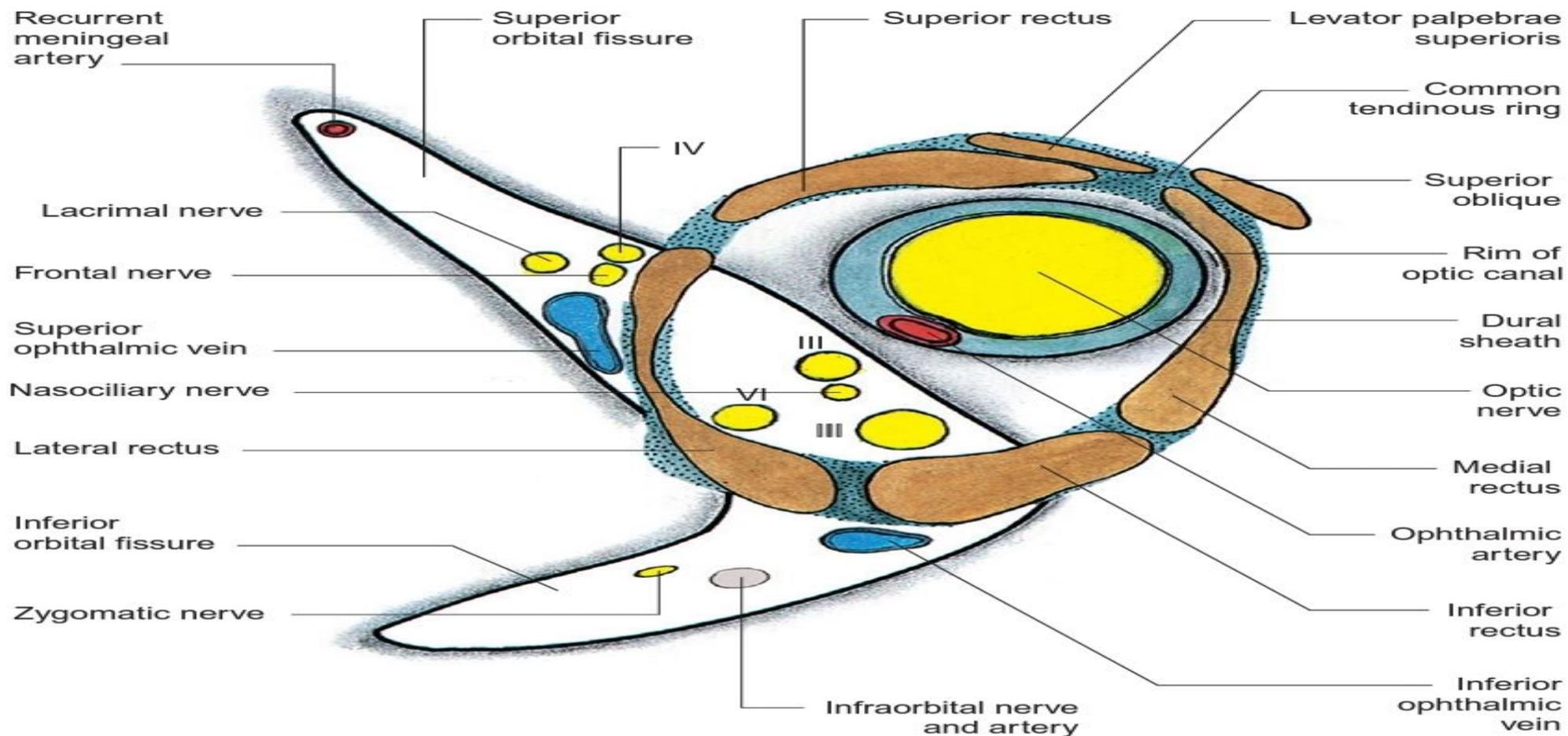
# MOTOR

- ▶ These are tested by having the patient clench the jaw (masseters and temporalis),
- ▶ move the jaw from side to side against resistance (lateral pterygoids),
- ▶ and protrude the jaw

# REFLEXES

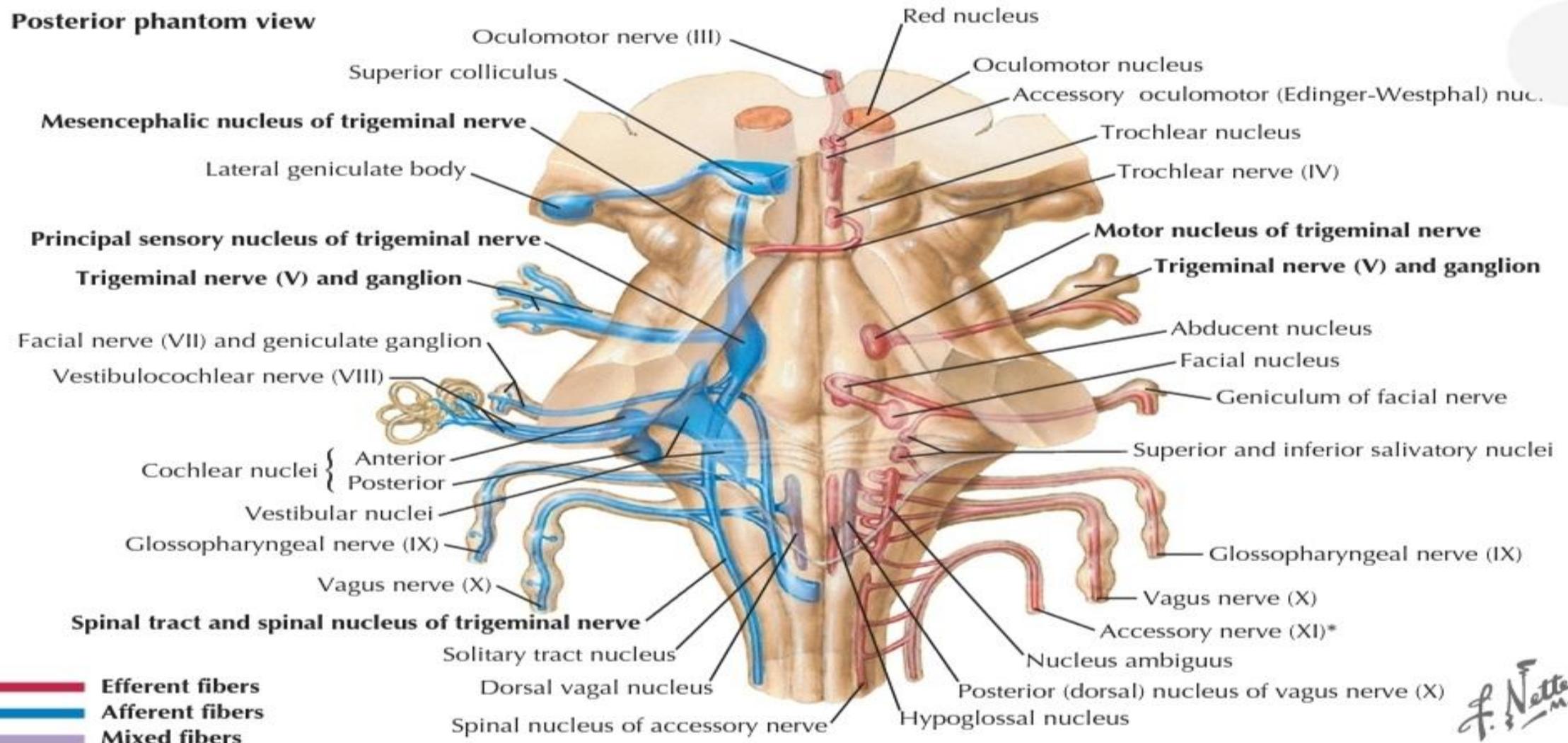


● **Figure 11-4** The corneal reflex pathway showing the three neurons and decussation. This reflex is consensual, like the pupillary light reflex. Second-order pain neurons are found in the caudal division of the spinal nucleus of trigeminal nerve. Second-order corneal reflex neurons are found at more rostral levels. *CN*, cranial nerve.



**Fig. 11.3** The common tendinous ring with its muscle origins superimposed, and the relative positions of the nerves entering the orbital cavity through the superior orbital fissure and optic canal. Note that the attachments of levator palpebrae superioris and superior oblique lie external to the common tendinous ring but are attached to it. The ophthalmic veins frequently pass through the ring. The recurrent meningeal artery, a branch of the ophthalmic artery, is often conducted from the orbit to the cranial cavity through its own foramen. (Based mainly on the data of Whitnall, S.E., 1932. *Anatomy of the Human Orbit*, 2nd ed. Oxford University Press, London; and Koornneef, I., 1977. *Spatial Aspects of Orbital Musculo-fibrous Tissue in Man*. Swetsa Zeitlinger, Amsterdam. Provided by the late Gordon L. Ruskell, Department of Optometry and Visual Science, The City University, London.)

**Posterior phantom view**



*F. Netter M.D.*

\*Recent evidence suggests that the accessory nerve lacks a cranial root and has no connection to the vagus nerve. Verification of this finding awaits further investigation.

**Figure 6-3** Cranial Nerve Nuclei in Brainstem: Schema.