

Trigeminal nerve

- CN V
- 3 divisions - ophthalmic , maxillary , mandibular
- Ophthalmic - sensory (GSA)
cornea , upper eyelid and corresponding part of conjunctiva ,
skin of forehead , scalp , nose and also mucous membrane
of paranasal sinuses & nasal cavity
passes through **superior orbital fissure**
- Maxillary - sensory (GSA)
skin of face over maxilla ,
teeth of upper jaw ,
m. m. of nose , maxillary sinus & palate
passes through **foramen rotundum**

- Mandibular division -

Motor (SVE) - muscles of mastication (temporalis ,
masseter, medial and lateral pterygoid)
mylohyoid ,
anterior belly of digastric
tensor veli palatini ,
tensor tympani

Sensory (GSA) - skin of cheek ,
skin over mandible & side of head
teeth of lower jaw & TM joint
m.m. of mouth & ant. Part of tongue

opening in skull - foramen ovale

- **Largest cranial nerve**
- ***Trigeminal Nerve Nuclei***
 - Sensory nucleus** - mesencephalic nucleus
main sensory nucleus
spinal nucleus
 - Motor nucleus**
- **Mesencephalic Nucleus**

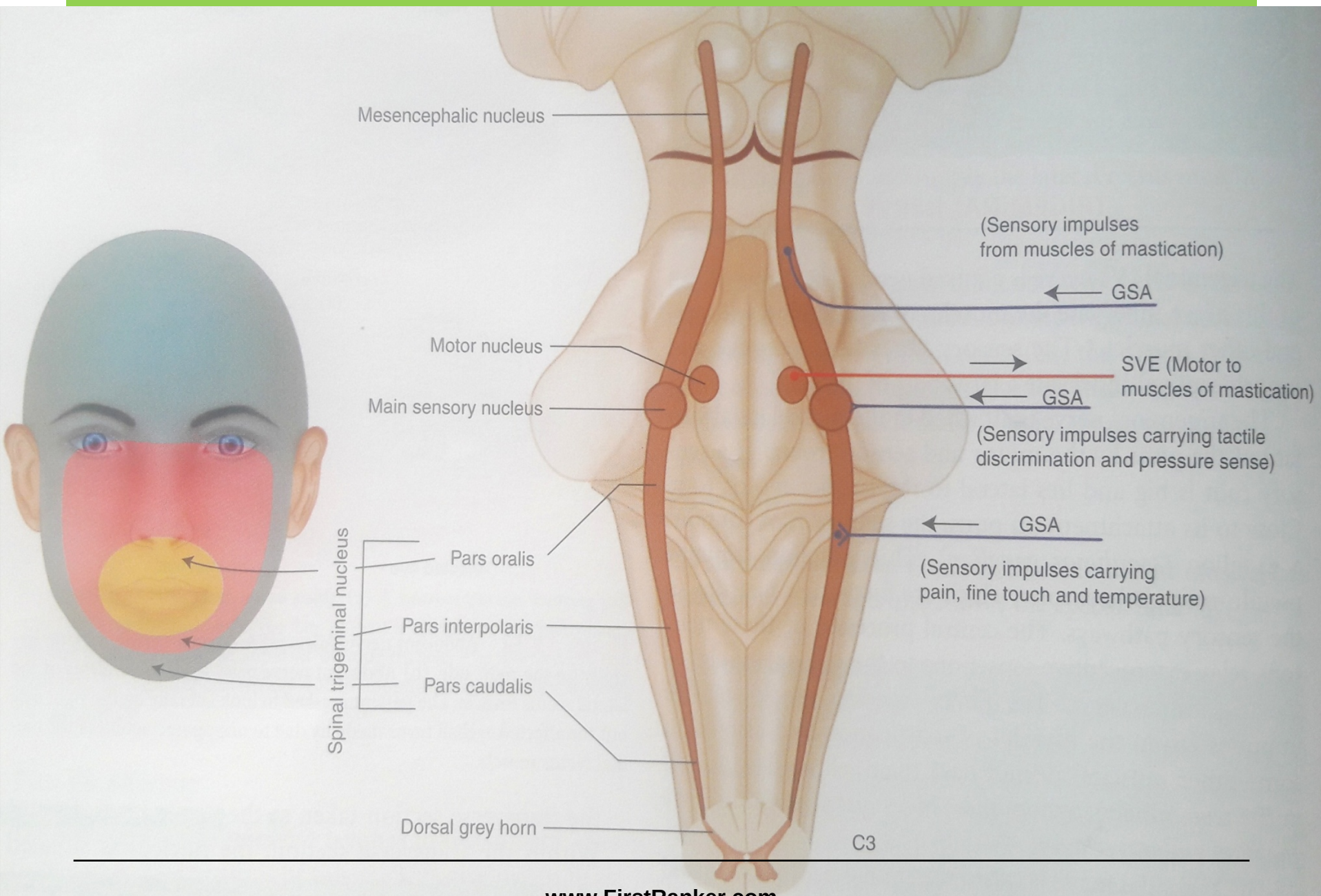
Composed of a column of unipolar nerve cells situated in the lateral part of gray matter around cerebral aqueduct. It extends inferiorly into the pons as far as the main sensory nucleus .
- **Main Sensory Nucleus**

Lies in upper part of pons in dorsolateral area of tegmentum of pons, lateral to motor nucleus .
It is continuous below with spinal nucleus.
Contains **cell bodies of fibres carrying touch and pressure senses** .
- **Spinal Nucleus**

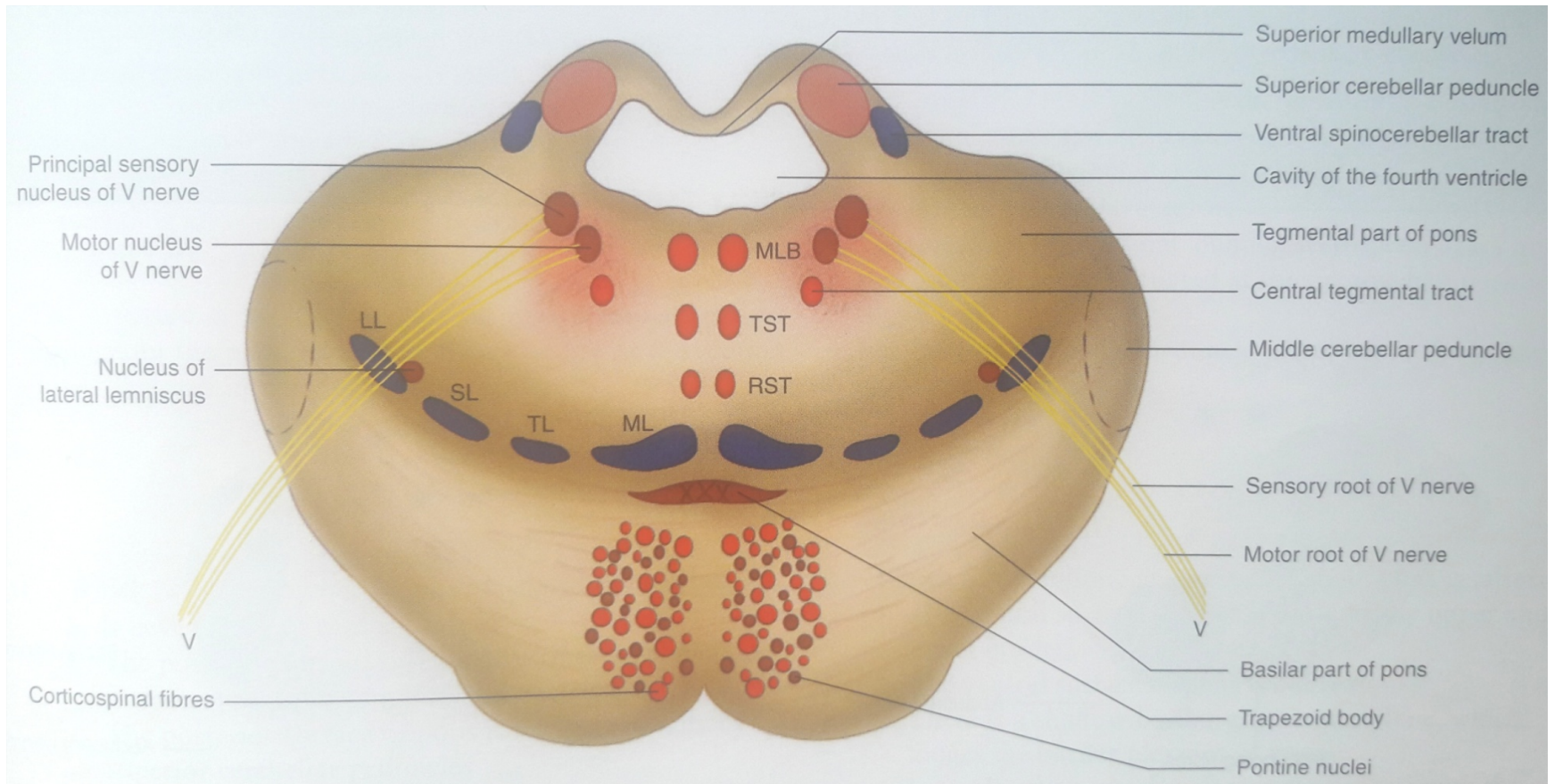
Is continuous superiorly with main sensory nucleus in the pons and extends inferiorly through the whole length of medulla oblongata and into upper part of spinal cord as far as second or third cervical segment . In spinal cord it blends with dorsal horn of spinal grey matter .
- **Motor Nucleus**

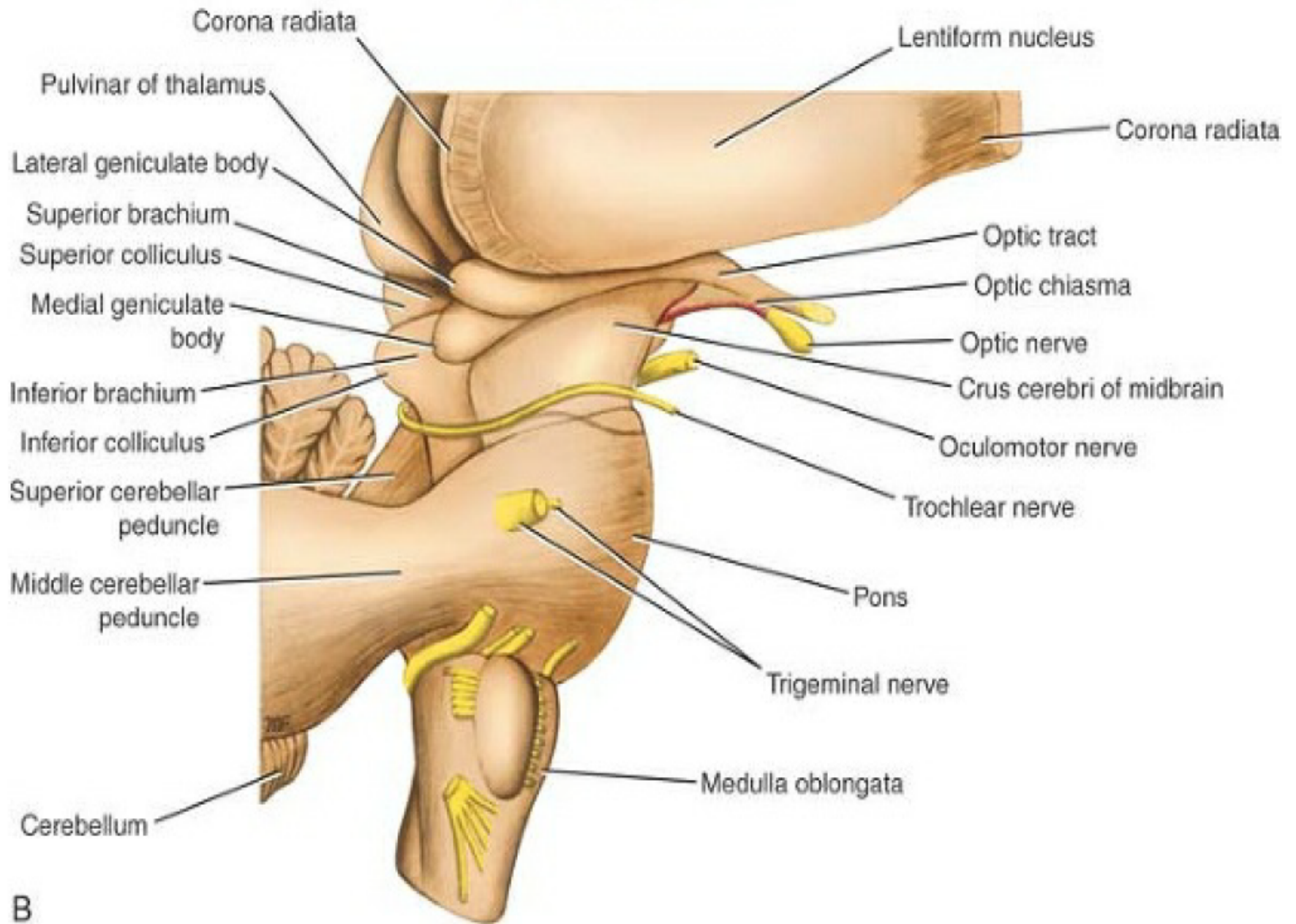
Situated in pons medial to main sensory nucleus

Nuclei of trigeminal nerve

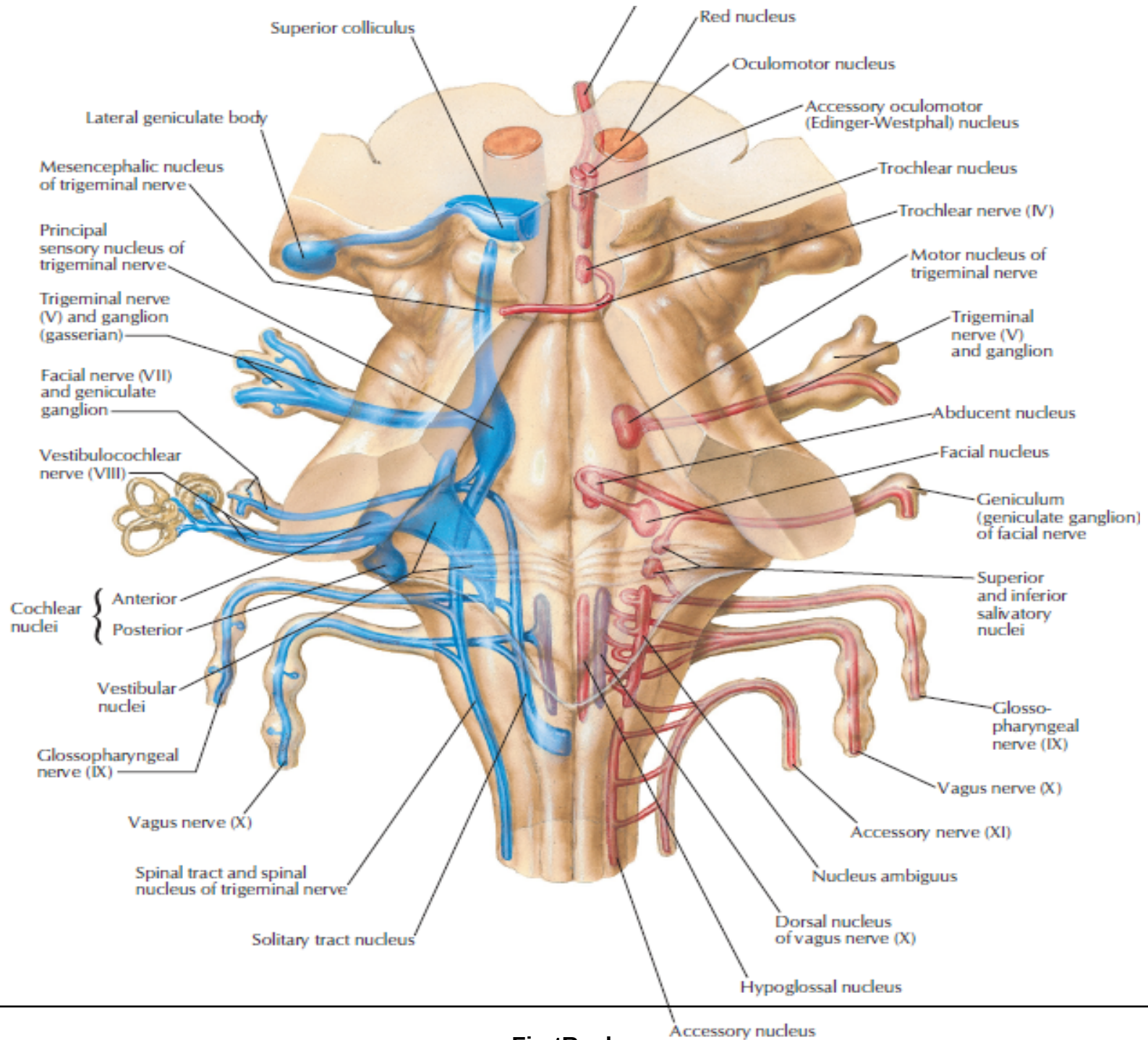


Cut section of pons





B



- ***Sensory Components of the Trigeminal Nerve***
- ***Fibers conducting pain , temperature , touch and pressure senses***

Sensations of pain, temperature, touch, and pressure from skin of face and mucous membranes travel along axons whose cell bodies are situated in **semilunar/gasserian/trigeminal sensory ganglion** .

The central processes of these cells form large **sensory root** of trigeminal nerve.

About half fibers divide into ascending and descending branches when they enter pons; remainder ascend or descend without division .

Ascending branches terminate in **main sensory nucleus**, and

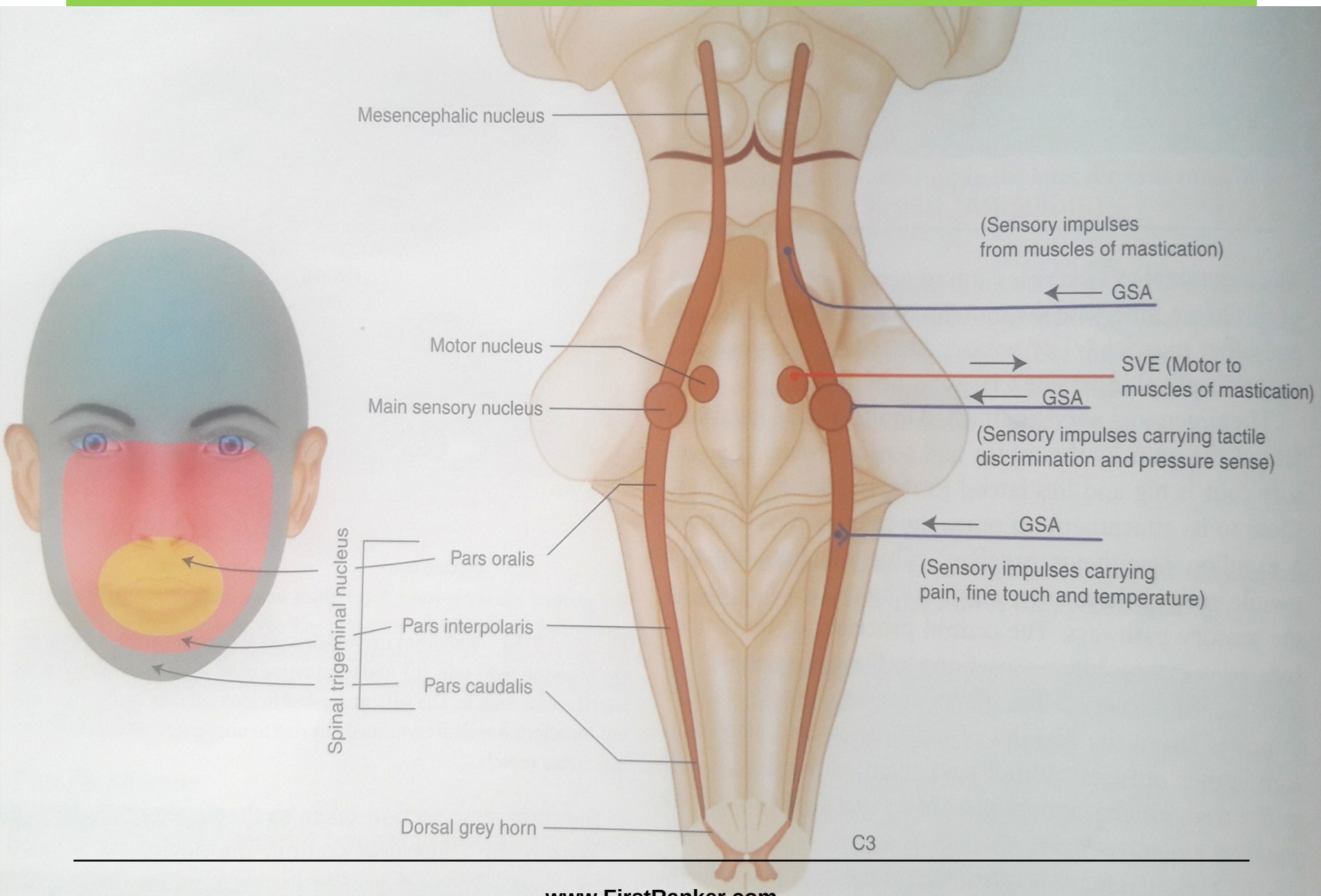
Descending branches terminate in **spinal nucleus**.

Sensations of **touch and pressure** are conveyed by nerve fibers that terminate in **main sensory nucleus**.

Sensations of **pain and temperature** pass to **spinal nucleus** .

Fibers from ophthalmic division	-	inferior part of spinal nucleus;
Fibers from maxillary division	-	middle of spinal nucleus; and
Fibers from mandibular division	-	superior part of spinal nucleus.

Nuclei of trigeminal nerve



- **Fibres carrying proprioceptive impulses**

Proprioceptive impulses from muscles of mastication and from facial and extraocular muscles are carried by fibers in sensory root of trigeminal nerve that have bypassed semilunar ganglion .

They are peripheral processes of unipolar cells of mesencephalic nucleus .

- Axons of neurons in main sensory and spinal nuclei and central processes of cells in mesencephalic nucleus now cross median plane and ascend as **trigeminal lemniscus (ventral trigeminothalamic tract)** ,

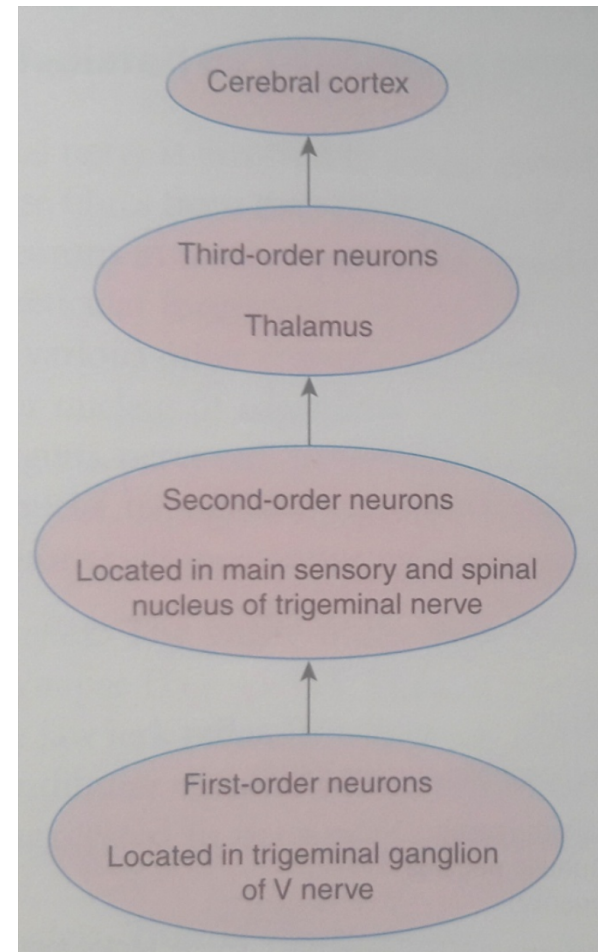
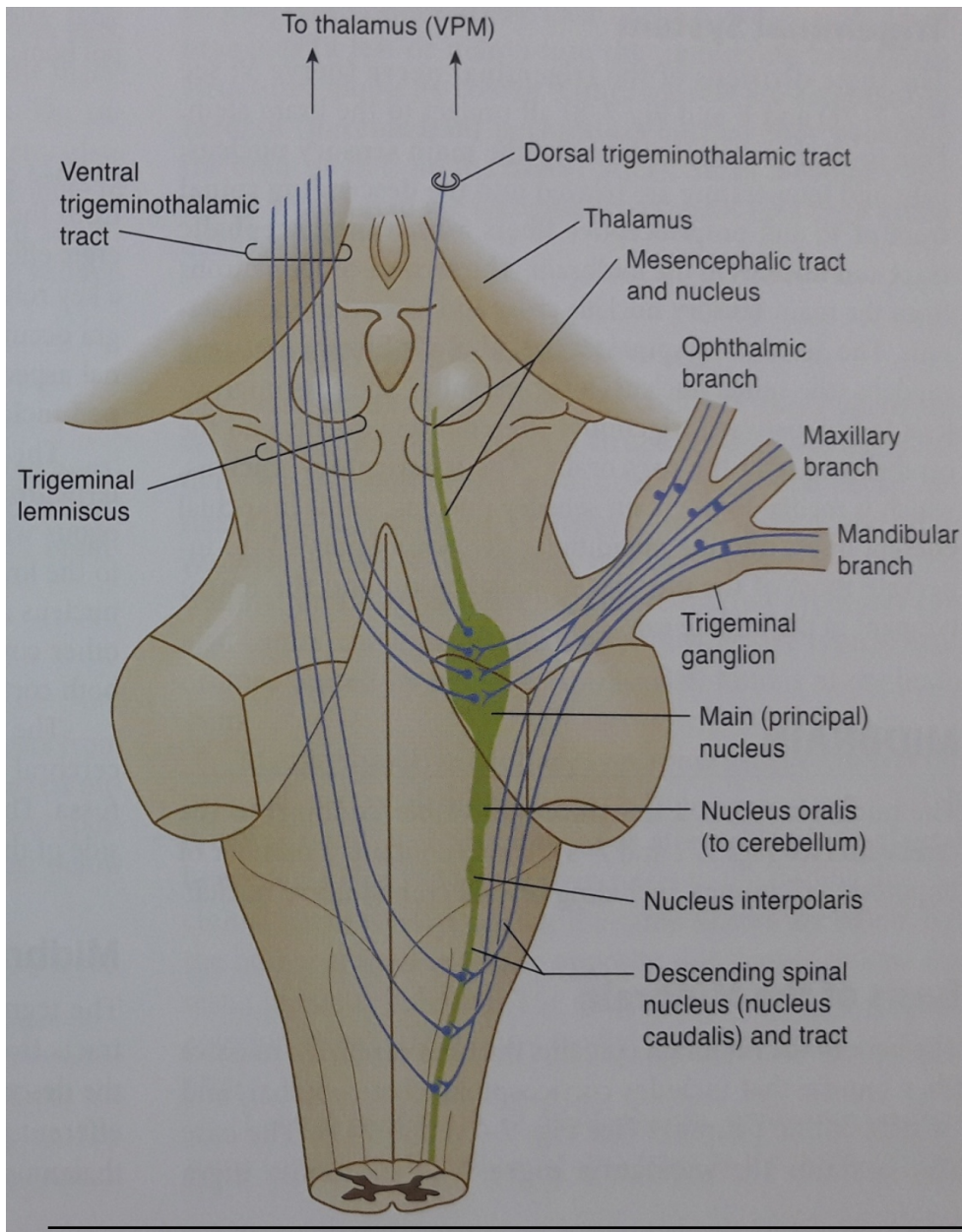
some uncrossed fibres ascend as **dorsal trigeminothalamic tract**

both terminate on nerve cells of **VPMN (ventral posteromedial nucleus) of thalamus**.

Axons of these cells (VPMN cells) now travel through **internal capsule** to

Postcentral gyrus (areas 3, 1, and 2) of cerebral cortex.

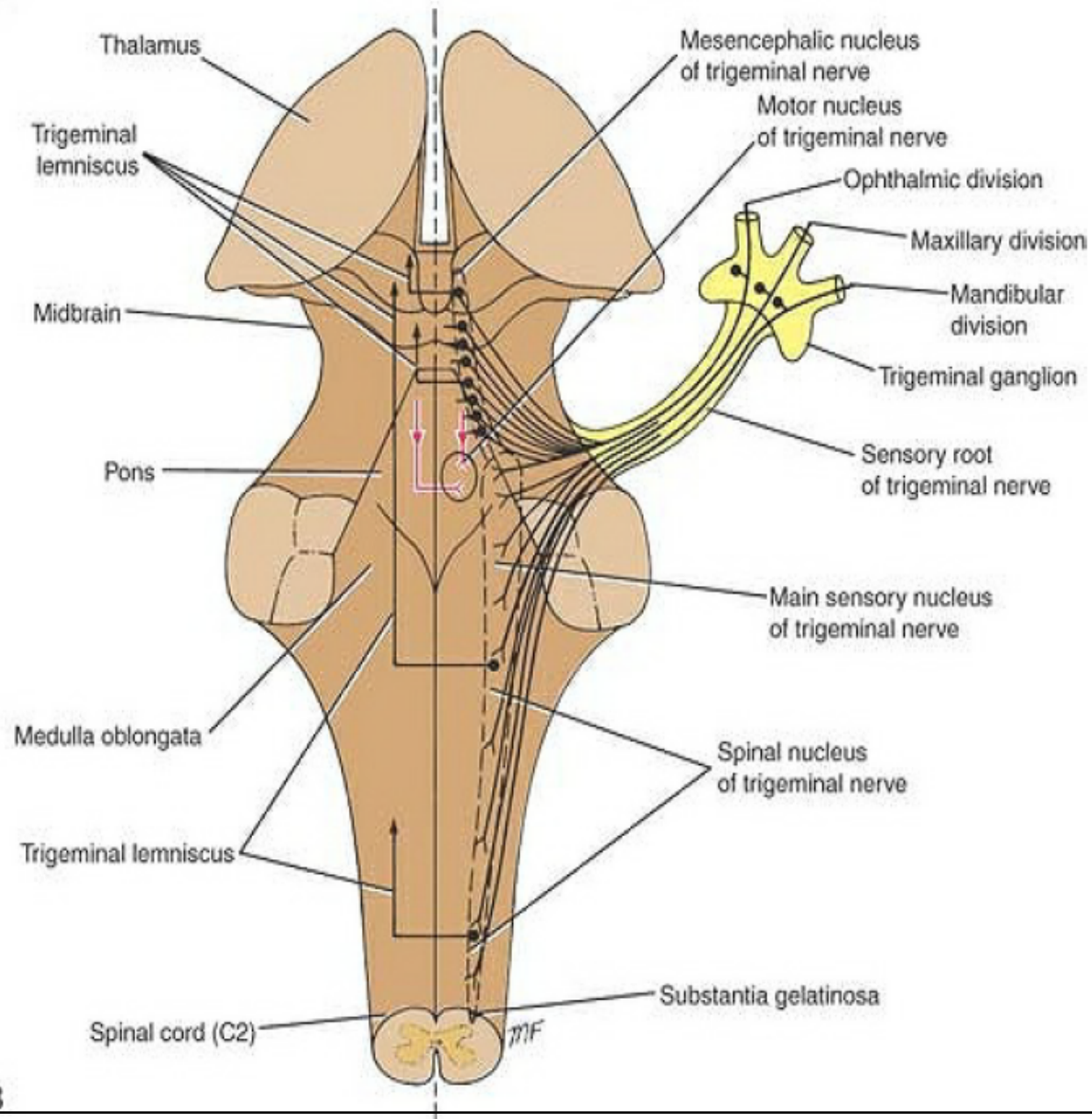
Pathway of sensory fibres



Motor Component of the Trigeminal Nerve

- The motor nucleus receives corticonuclear fibers from both cerebral hemispheres .
- It also receives fibers from
reticular formation,
red nucleus,
tectum, and
medial longitudinal fasciculus.
- In addition, it receives fibers from the mesencephalic nucleus, thereby forming a monosynaptic reflex arc.
- The cells of motor nucleus give rise to axons that form motor root.
- Motor root supplies
muscles of mastication,
tensor tympani , tensor veli palatini,
mylohyoid and
anterior belly of digastric muscle.

Trigeminal nerve nuclei in the brainstem and their central connections.



B

Distribution of trigeminal nerve

- **Ophthalmic division (GSA)**

Cornea, conjunctiva, and intraocular structures

Mucosa of paranasal sinuses (frontal, sphenoid, and ethmoid)

Mucosa of upper and anterior part of nasal septum and lateral wall of nasal cavity

Lacrimal duct

- **Maxillary division (GSA)**

Mucosa of maxillary sinus

Mucosa of posterior part of nasal septum and lower part of nasal cavity

Upper teeth and gum

Hard palate

Soft palate and tonsil

- **Mandibular division (GSA , SVE)**

Mucosa of cheek, lower jaw, floor of mouth, tongue

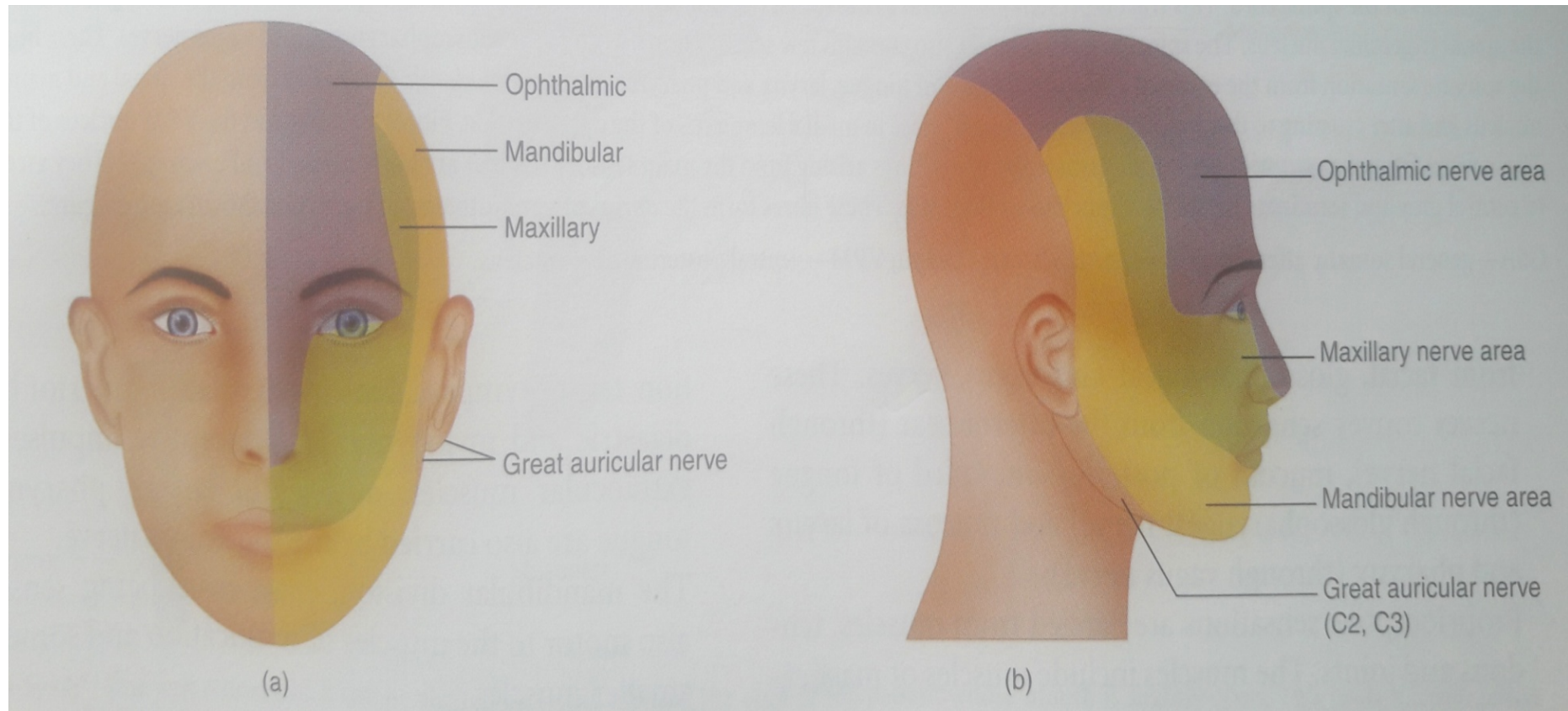
Proprioception from jaw muscles

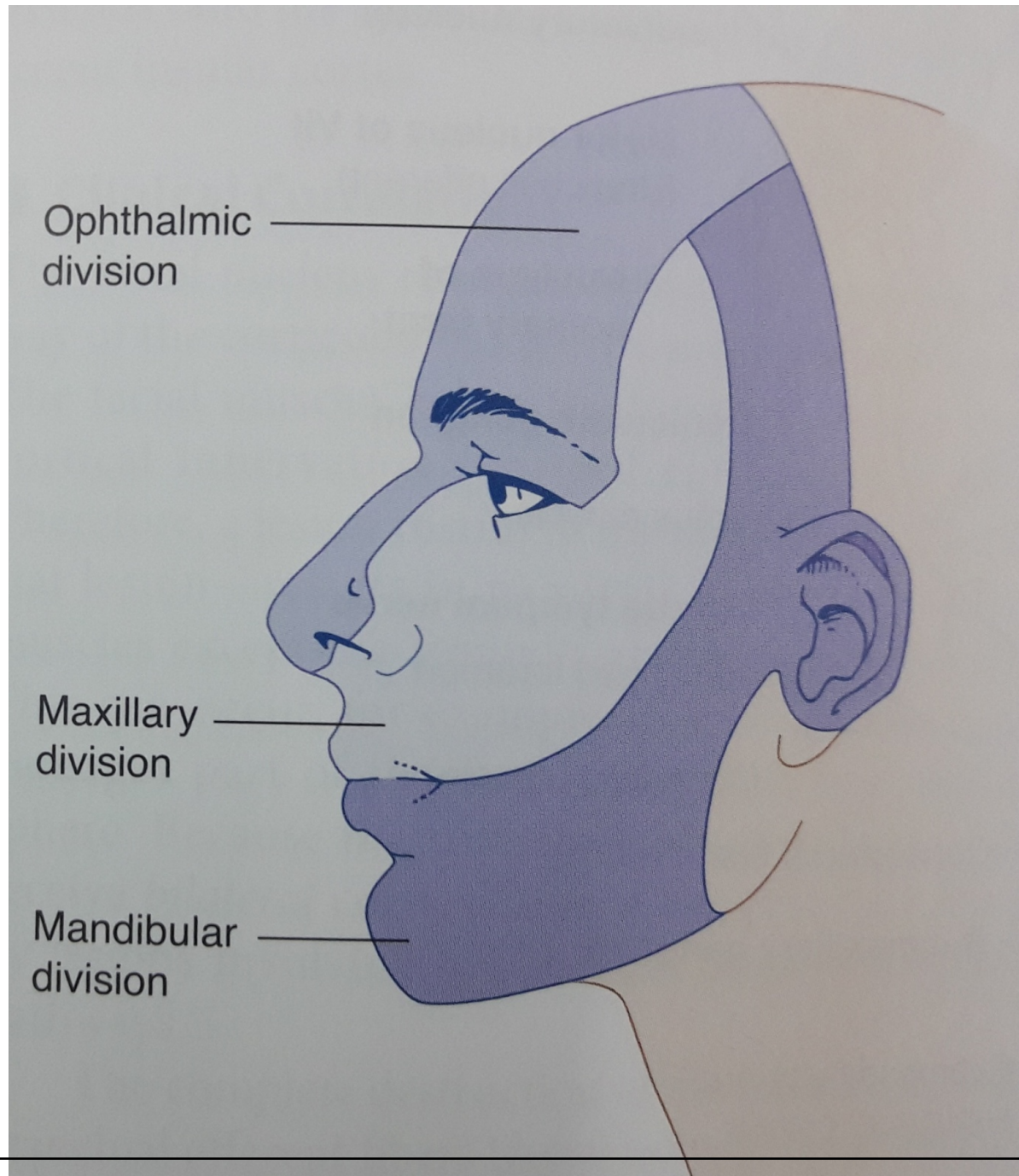
Lower teeth and gum

Mastoid cells

Muscles derived from 1st pharyngeal arch

Cutaneous distribution





Course of trigeminal nerve

- Motor nucleus ---- motor root --- mandibular division --- foramen ovale ---
infratemporal fossa ---- branches of mandibular division ---
muscles derived from 1st pharyngeal arch
- Sensory nucleus ---- sensory root ----- trigeminal ganglion ----
three divisions of trigeminal nerve ---
branches of the three divisions -----
receptors in area of distribution of the three divisions