"Trigeminal Nerve (Cranial Nerve V)"

》 Overview

- Largest cranial nerve
- Contains sensory and motor fibers
- Sensory nerve for most of the head
- Motor nerve for several muscles, including mastication muscles

"Trigeminal Nerve Nuclei"

》 Four Nuclei

1) Main sensory nucleus
2) Spinal nucleus
3) Mesencephalic nucleus
4) Motor nucleus

》 Main Sensory Nucleus

- Located in the posterior part of the pons
- Lateral to the motor nucleus
- Continuous below with the spinal nucleus

》 Spinal Nucleus

- Continuous superiorly with the main sensory nucleus in the pons
- Extends inferiorly through the medulla oblongata
- Reaches the upper part of the spinal cord to the second cervical segment

》 Mesencephalic Nucleus

- Composed of a column of unipolar nerve cells
- Situated in the lateral part of the gray matter around the cerebral aqueduct
- Extends inferiorly into the pons to the main sensory nucleus

》 Motor Nucleus

- Located in the pons
- Medial to the main sensory nucleus

"Trigeminal Nerve Sensory Components"

» Sensory Functions

- Transmits pain, temperature, touch, and pressure sensations

- Cell bodies located in the semilunar or trigeminal sensory ganglion

» Sensory Root Formation

- Central processes of nerve cells whose cell bodies are located in trigeminal ganglion form the large sensory root of the trigeminal nerve

- About half the fibers divide into ascending and descending branches upon entering the pons

- Ascending branches terminate in the main sensory nucleus

- Descending branches terminate in the spinal nucleus

» Termination of Sensations

- Touch and pressure sensations terminate in the main sensory nucleus

- Pain and temperature sensations pass to the spinal nucleus

- Ophthalmic division fibers terminate in the inferior spinal nucleus

- Maxillary division fibers terminate in the middle spinal nucleus

- Mandibular division fibers end in the superior spinal nucleus

» Proprioceptive Impulses

- Carried by fibers in the sensory root bypassing the semilunar ganglion

- Originates from unipolar cells of the mesencephalic nucleus (the only axonal process divides into a central and a peripheral process)

- Source of these proprioceptive impulses:

- Muscles of mastication
- Facial muscles
- Extraocular muscles

》 Trigeminal Lemniscus Pathway

- Axons from the main sensory and spinal nuclei cross the median plane

- Ascend as the trigeminal lemniscus to the ventral posteromedial nucleus of the thalamus

- Axons travel through the internal capsule to the postcentral gyrus (areas 3, 1, and 2) of the cerebral cortex

"Trigeminal Nerve Motor Component"

》 Motor Nucleus

- Receives corticonuclear fibers from both cerebral hemispheres.

• Receives fibers from:

- Reticular formation
- Red nucleus
- Tectum
- Medial longitudinal fasciculus

- Receives fibers from the mesencephalic nucleus, forming a monosynaptic reflex arc.

》 Function of Motor Nucleus

- Axons from the motor nucleus form the motor root.

• Supplies muscles:

- Muscles of mastication
- Tensor tympani
- Tensor veli palatini
- Mylohyoid
- Anterior belly of the digastric muscle

"Trigeminal Nerve Course"

》 Origin

• Leaves anterior aspect of the pons as:

- Small motor root
- Large sensory root

- Passes forward from the posterior cranial fossa, resting on:

- Upper surface of the apex of the petrous part of the temporal bone in the middle cranial fossa.

- Large sensory root expands to form the crescent-shaped trigeminal ganglion.

》 Trigeminal Ganglion

- Lies within a pouch of dura mater called the trigeminal or Meckel cave.

• Anterior Border of Trigeminal Ganglion Gives rise to:

> Ophthalmic nerve (V1) - contains only sensory fibers, exits skull through superior orbital fissure to enter the orbital cavity.

> Maxillary nerve (V2) - contains only sensory fibers, exits skull through foramen rotundum.

> Mandibular nerve (V3) - contains both sensory and motor fibers, exits skull through foramen ovale.

》 Sensory Fiber Distribution

- Supplies distinct zones of skin on the face from each division.

- Little to no overlap of dermatomes compared to spinal nerves.

- Motor fibers in the mandibular division mainly distributed to muscles of mastication