

"Cranial Nerves"

» 12 Pairs of Cranial Nerves (CNs):

- Originate from the brain and exit through foramina and fissures in the skull.
- Primarily supply head and neck; CN X extends to thorax and abdomen.

• Names of Cranial Nerves:

- 1) Olfactory
- 2) Optic
- 3) Oculomotor
- 4) Trochlear
- 5) Trigeminal
- 6) Abducens
- 7) Facial
- 8) Vestibulocochlear
- 9) Glossopharyngeal
- 10) Vagus
- 11) Accessory
- 12) Hypoglossal

» Cranial Nerve Organization

- Sensory Nerves: Olfactory, Optic, Vestibulocochlear.
- Motor Nerves: Oculomotor, Trochlear, Abducens, Accessory, Hypoglossal.
- Mixed Nerves: Trigeminal, Facial, Glossopharyngeal, Vagus.

» Components:

- Central motor/sensory nuclei in the brain.
- Peripheral nerve fibers that emerge from the brain, exit the skull, and reach target organs.

» Cranial Nerve Motor Nuclei

- Cranial nerve motor nuclei receive impulses from cerebral cortex through corticonuclear (corticobulbar) fibers

> Corticonuclear (Corticobulbar) Pathway:

- Originates from pyramidal cells in precentral gyrus (area 4) and postcentral gyrus.
- Descends through corona radiata and internal capsule (genu).
- Passes medial to corticospinal fibers in basis pedunculi of midbrain.
- Synapses with lower motor neurons in cranial nerve nuclei (directly or indirectly).

> Neuron Orders in Pathway:

- First-order neuron: Corticonuclear fibers.
- Second-order neuron: Internuncial neurons.
- Third-order neuron: Lower motor neuron.

> Bilateral and Crossed Connections:

- Majority of the corticonuclear fibers cross median plane to reach most cranial motor nuclei.
- Bilateral connections for all motor nuclei, except:
 - Facial nucleus for lower facial muscles.
- Hypoglossal nucleus for genioglossus muscle.

» Somatic Motor and Branchiomotor Nuclei

> Somatic and Branchiomotor Fibers:

- Axons of nerve cells in brain forming motor nuclei.
 - Innervate striated muscles.
- Equivalent to anterior gray column motor cells in spinal cord.
- Each nerve cell with axons = Lower motor neuron.

» General Visceral Motor Nuclei

> Parasympathetic Cranial Outflow:

- Part of autonomic nervous system (parasympathetic).

> Nuclei Involved:

- Edinger-Westphal nucleus (Oculomotor nerve).
- Superior salivatory and lacrimal nuclei (Facial nerve).
- Inferior salivatory nucleus (Glossopharyngeal nerve).
- Dorsal motor nucleus (Vagus nerve).

> Afferent Fibers:

- Receives descending pathways from the hypothalamus.

- Enters subarachnoid space by piercing arachnoid mater, then curves to lateral cerebral sulcus.

» Cranial Nerve Sensory Nuclei

> Sensory (Afferent) Nuclei:

- Includes somatic and visceral afferent nuclei.

> First-Order Neuron:

- Axons of nerve cells outside brain in ganglia on nerve trunks or in sensory organs (nose, eye, ear).

> Second-Order Neuron:

- Central processes enter brain and synapse with sensory nuclei cells.
- Then, axons cross midline and ascend to other sensory nuclei (e.g., thalamus).

> Third-Order Neuron:

- Nerve cells in nuclei synapse and axons terminate in cerebral cortex.

》 Side Notes:

> Location (Cranial Fossae)

- CN I: Anterior Cranial Fossa
- CN II-VI: Middle Cranial Fossa
- CN VII-XII: Posterior Cranial Fossa

> Origin

- CN I: Olfactory bulb (part of the forebrain)
 - CN II: Retina (extension of diencephalon/forebrain)
 - CN III-IV: Midbrain
 - CN V-VIII: Pons
- CN IX-XII: Medulla Oblongata

> Important Notes

- CN III, VII, IX, X have parasympathetic fibers
- CN V, VII, IX, X are mixed nerves and contribute to pharyngeal arch derivatives