7- INTERNAL STRUCTURE OF THE BRAIN STEM

Medulla oblongata

open medulla

On the ventral aspect

- 1- The pyramid is clear, with medial lemniscus on either sides of middle line dorsal to the pyramid
- 2- Inferior Olivary Nucleus a convoluted mass of gray matter lies posterolateral to the pyramids & lateral to the medial leminiscus It is concerned with the control of movement

On the dorsal aspect Lower part of the floor of the 4th ventricle

- #Inferior Cerebellar Peduncle is connecting medulla oblangata with cerebellum
- 1- Cochlear nuclei dorsal and lateral to the inferior cerebellar peduncle
- Beneath the floor of 4th ventricle lie:
  2- Hypoglossal Nucleus
  3-Dorsal Nucleus of Vagus lateral to the hypoglossal nucleus, contains preganglionic parasympathetic fibers
  4- Medial longitudinal fasciculus lies close to the midline, ventromedial to the hypoglossal nucleus, dorsal to the medial lemniscus. It links the vestibular nuclei with nuclei of extraocular ms. (3, 4 & 6 nerves) to help coordination of head & eye movements
- 5- Vestibular nuclei complex Concerned with equilibrium
  6- Nucleus Ambiguus lies dorsal to olivary nucleus gives motor fibers to constrictors of the pharynx & intrinsic muscles of the larynx
  7- Solitary nucleus lies ventrolateral to dorsal nucleus of vagus, receive taste sensation from the tongue along the facial (VII), glossopharyngeal (IX) and vagus (X) nerve

mid medulla Traversed by Central Canal

- Medial Leminiscus: Composed of the ascending internal arcuate fibers after their crossing Lies adjacent to the middle line ventral to the central canal Terminates in thalamus
- Axons of Gracile & Cuneate nuclei form the internal arcuate fibers "Sensory Decussation"
- 2- SENSORY DECUSSATION
- 1- Larger size Gracile & Cuneate nuclei

closed medulla Traversed by the Central Canal

- 1- Motor Decussation
  - Formed by pyramidal fibers, (75-90%) cross to the opposite side. They descend in the lateral white column of the spinal cord as the "lateral corticospinal tract" The uncrossed fibers form the "anterior corticospinal tract"
- 2- TRIGEMINAL SENSORY NUCLEUS & TRACT
  - The Nucleus Extends Through the whole length of the brain stem and into upper segments of spinal cord
  - The tract present in all levels of medulla oblongata is formed of descending fibers that terminate in the trigeminal nucleus
  - It receives pain and temperature from face, forehead

Mid brain

- It is divided into a dorsal part (Tectum) and a ventral part (Tegmentum) at the level of the cerebral aqueduct
- The cerebral aqueduct is surrounded by a pear shaped periaqueductal (central) gray matter
- The most ventral part of the tegmentum is the massive fibrous mass (Crus Cerebri)

superior colliculi level

- A large nucleus of gray matter that lies beneath corresponding elevation It forms part of the visual reflexes Its efferent fibers go to the anterior horn cells & to cranial nuclei 3, 4, 6, 7 & 11)
- 1. Oculomotor nucleus Situated in the central gray matter close to the median plane. The fibers of the oculmotor nerve passes anteriorly through the red nucleus to emerge on the medial side of the crus cerebri
- 2- Red nucleus: A rounded mass of gray matter that lies in the central portion of the tegmentum. Its red coloration is due to its vascularity and the presence of an iron containing pigment in the cytoplasm of its neurons. It is involved in motor control

inferior colliculi level

- Inferior colleculus is a large nucleus of gray matter that lies beneath a corresponding surface elevation, It is part of the auditory pathway, It receives fibers from the lateral lemniscus, Its efferent fibers pass to the thalamus
- 1. Trochlear nucleus lies in the central gray matter close to the median plane just posterior to the medial longitudinal bundle, The fibers of the trochlear nerve decussate in the superior medullary velum
- 2- Decussation of the superior cerebellar peduncles in the mid line
- 3. Substantia nigra: Occupies the most ventral part of the tegmentum, It consists of pigmented, melanin containing neurones ,It projects to the basal ganglia. Its degeneration is associated with Parkinson's disease Mask Face
- 4- ASCENDING LEMINISCI #Composed of Spinal (Lateral & anterior spinothalamic tracts), Trigeminal (Lateral & medial), Lateral lemniscus,Medial lemniscus
- 5- CRUS CEREB consists entirely of descending cortical efferent fibers (Frontopontine, Corticospinal & corticobulbar and Temporopontine Fibres)

Pons

rostral

- 1- Superior Medullary Velum Passes between the two peduncles & forms the roof of the 4th ventricle
- 2- Medial longitudinal fasciculus Lies close to the midline beneath the floor of the 4th ventricle

caudal

- Divided into an anterior part (Basis Pontis) & a posterior part (Tegmentum) by the Trapezoid Body
- Trapezoid Body (consists of acoustic fibres from cochlear nuclei to ascend into midbrain as lateral lemniscus and terminate in inferior colliculus)
- 1- Pontine Nuclei Are small masses of nerve cells, receive cortico pontine fibers (involved in motor activity) ,Their axons form the transverse pontocerebellar fibers which pass to the contralateral side of the cerebellum through middle cerebellar peduncles
- 2- The ascending fibres of the medial lemniscus become separated from the pyramid and displaced dorsally, The Medial Lemniscus rotates 90 degrees and lies almost horizontally
- 3- spinal nucleus & tract of Trigeminal
- Deep origin of cranial nerve nuclei:
  4- Abducent nucleus
  5- Facial motor nucleus
- 6- Motor nucleus of the trigeminal nerve: Lies in the lateral part of the floor of the 4th ventricle
- 7- Main sensory nucleus of the trigeminal nerve: Reaches its maximum extent in the pons and it lies lateral to the motor nucleus
- 8- Superior cerebellar peduncles form the lateral boundary of the 4th ventricle

RETICULAR FORMATION

It is a complex matrix of nerve fibers & small groups of nerve cells that extends throughout the brain stem

RETICULAR TRACTS

- Reticular Activating system: Formed of some of the ascending fibers of the reticular formation, They activate the cerebral cortex through the thalamus
- Reticulo spinal tracts: Influence a muscle tone & posture

RETICULAR NEURONES

- Raphe Nuclei Midline reticular nuclei, Its ascending fibers to the cerebral cortex are involved in the mechanisms of sleep, Its descending fibers to the spinal cord are involved in the modulation of Pain
- Locus Ceruleus Pigmented neurons that lie in the tegmentum of the caudal mid brain & rostral pons, It is the main noradrenergic cell group of the brain

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