CNS
Brain stem II

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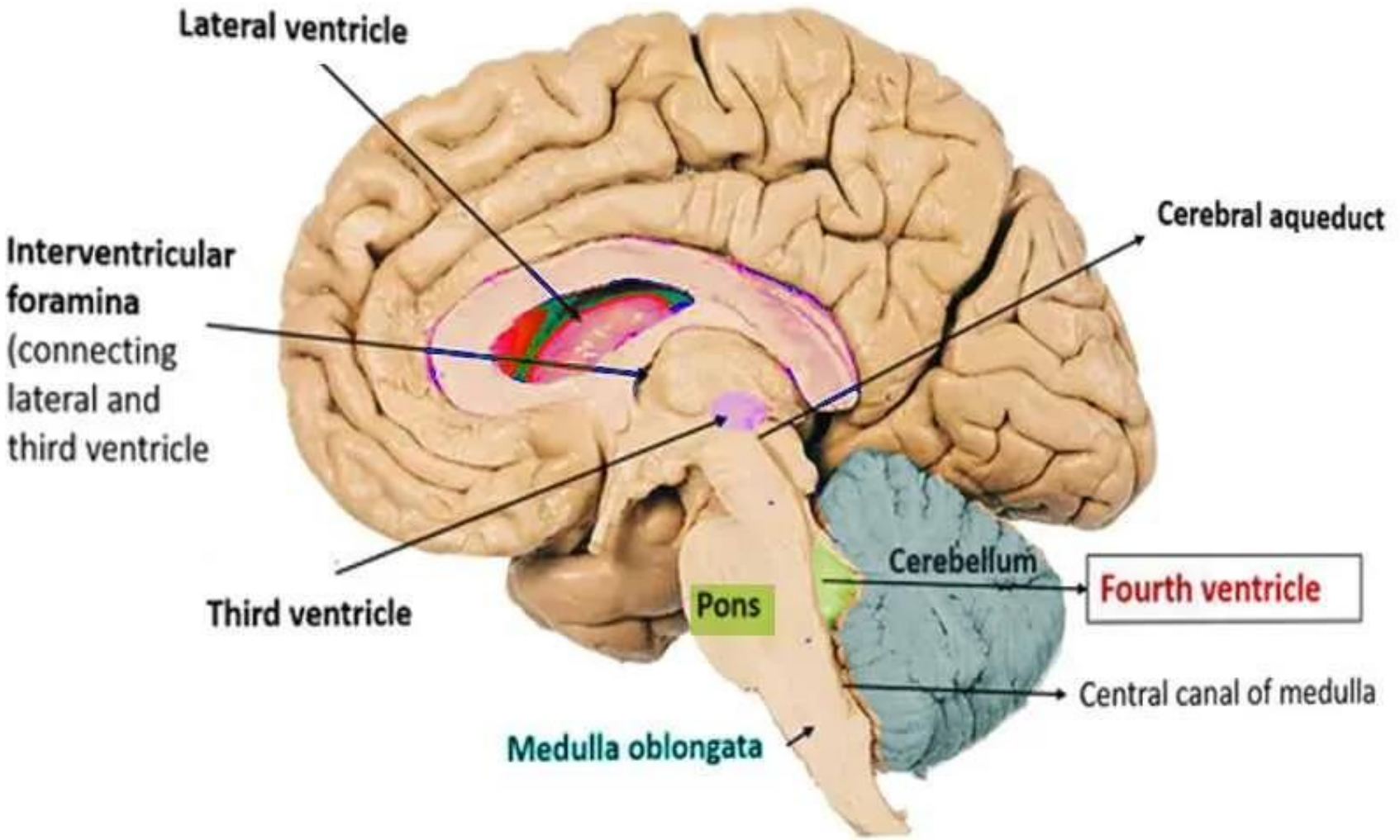
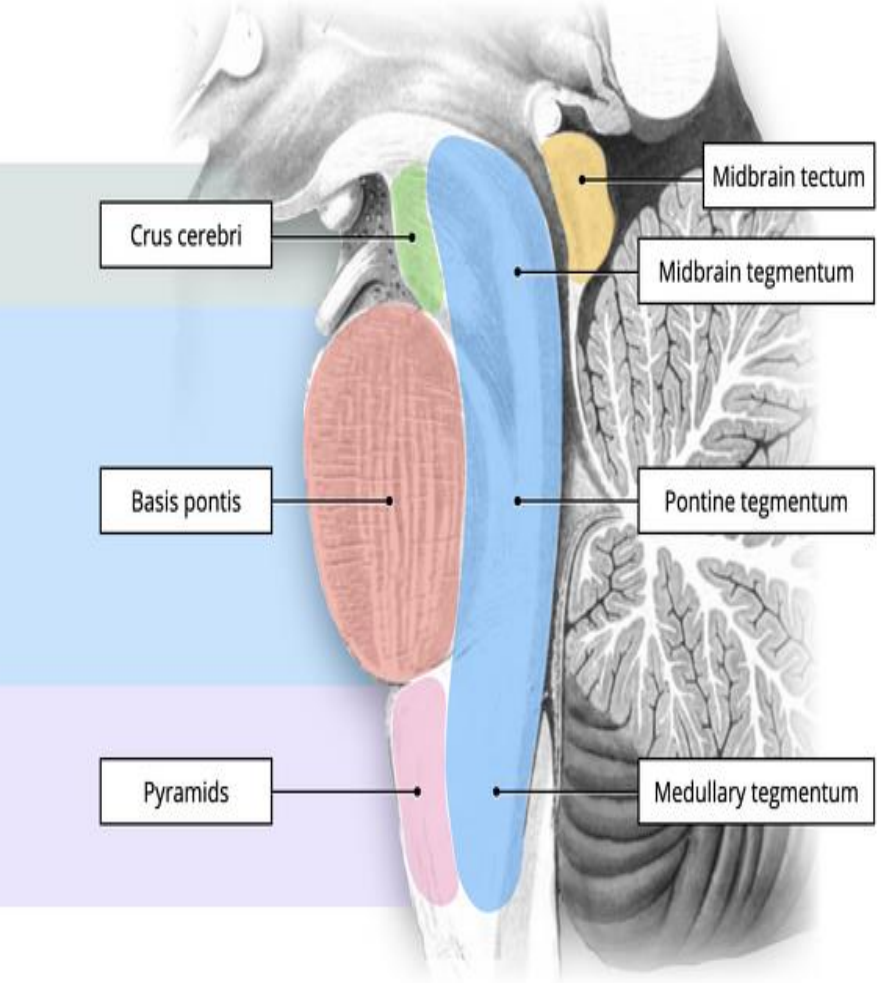
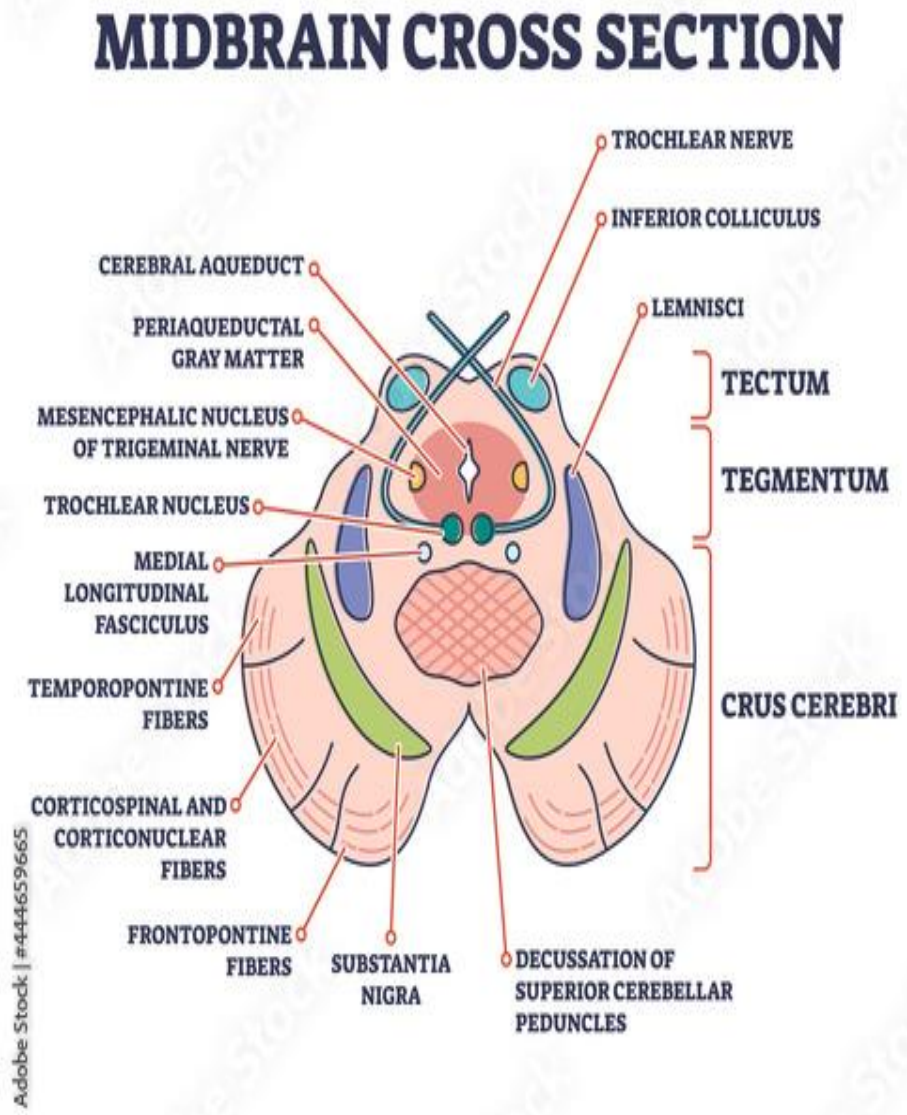

Lateral ventricle
Interventricular foramina (connecting lateral and third ventricle
Cerebral aqueduct
Third ventricle
Cerebellum
Fourth ventricle
Pons
Central canal of medulla
Medulla oblongata

Brainstem



Adapted from illustration from "Sobotta's Textbook and Atlas of Human Anatomy" 1908, now in the public domain.



The midbrain

The narrow cavity of the midbrain is aqueduct of sylvius which connects the 3rd and 4th ventricles.

-The mid brain consists of:

A) Tectum: It is posterior to aqueduct of sylvius. It consists of superior and inferior colliculi. The aqueduct is surrounded by a central grey matter.

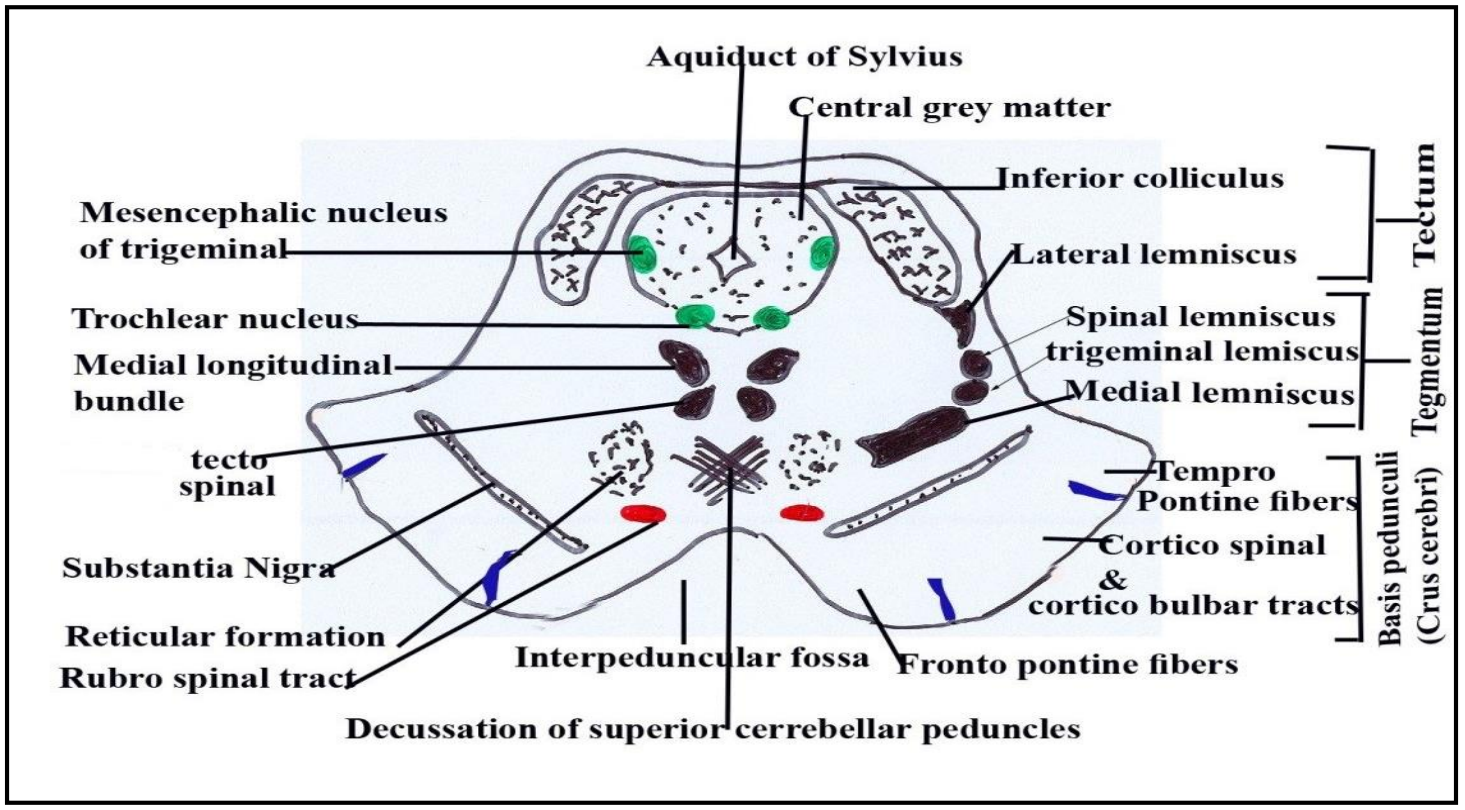
B) Cerebral peduncles: Each is divided into

1-Tegmentum (Posterior part) which is continuous across the median plane.

2- Basis pedunculi (anterior part) crus cerebri which are separated by interpeduncular fossa.

- Basis pedunculi and tegmentum are separated from each other by a pigmented area of grey matter (extrapyramidal tract), the substantia nigra in which the nerve cell bodies contain melanin granules.

Mid-brain at the level of inferior colliculus:



I- Mid-brain at the level of inferior colliculus

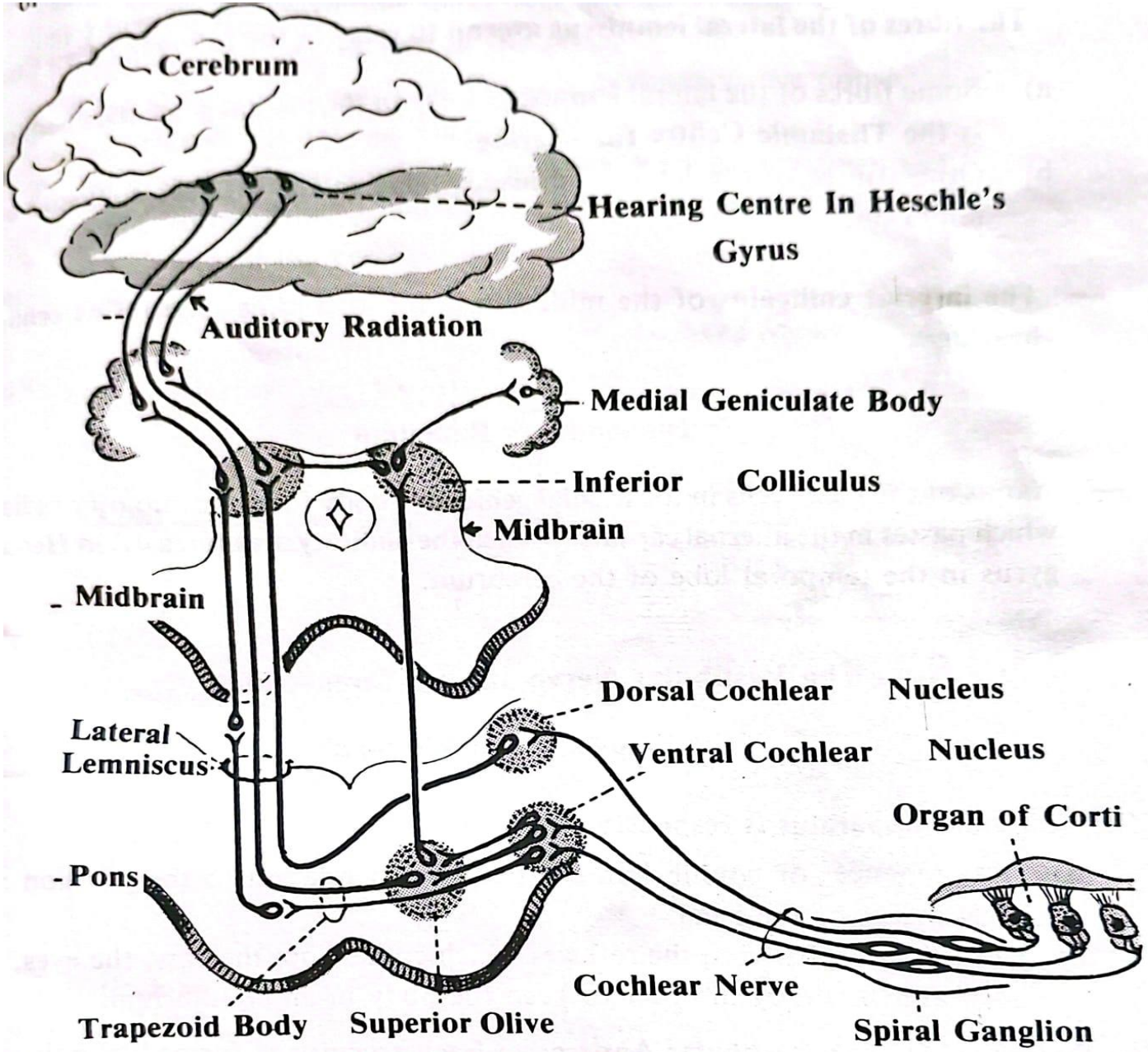
It consists of the following structures:

- The tectum contains the **inferior colliculi** which are the center for auditory reflexes (cochlear pathway).
- Inferior colliculus receives afferent fibers from: lateral lemniscus and give efferent fibers to: tectospinal, tectobulbar, opposite colliculus, medial geniculate body.
- **Histologically,** the inferior colliculus consists of a central grey matter of nerve cell bodies (nuclei) surrounded by white matter of afferent nerves.
- - The aqueduct is surrounded with **quadrangular area** of grey matter which contains: 1. Trochlear nucleus (IV) 2. Mesencephalic nucleus of V nerve.
- **Anterior to grey matter and close to midline there are**:

o Medial longitudinal bundle (M.L.B) (posterior)

o Tecto-spinal tract (more anterior)

o Decussation of superior cerebellar peduncles (S.C.P) is present in midline of anterior part of tegmentum.



Auditory Pathway (Trapezoid body and Lateral Lemniscus)

- **Reticular formation** is present lateral to the decussation of S.C.P.

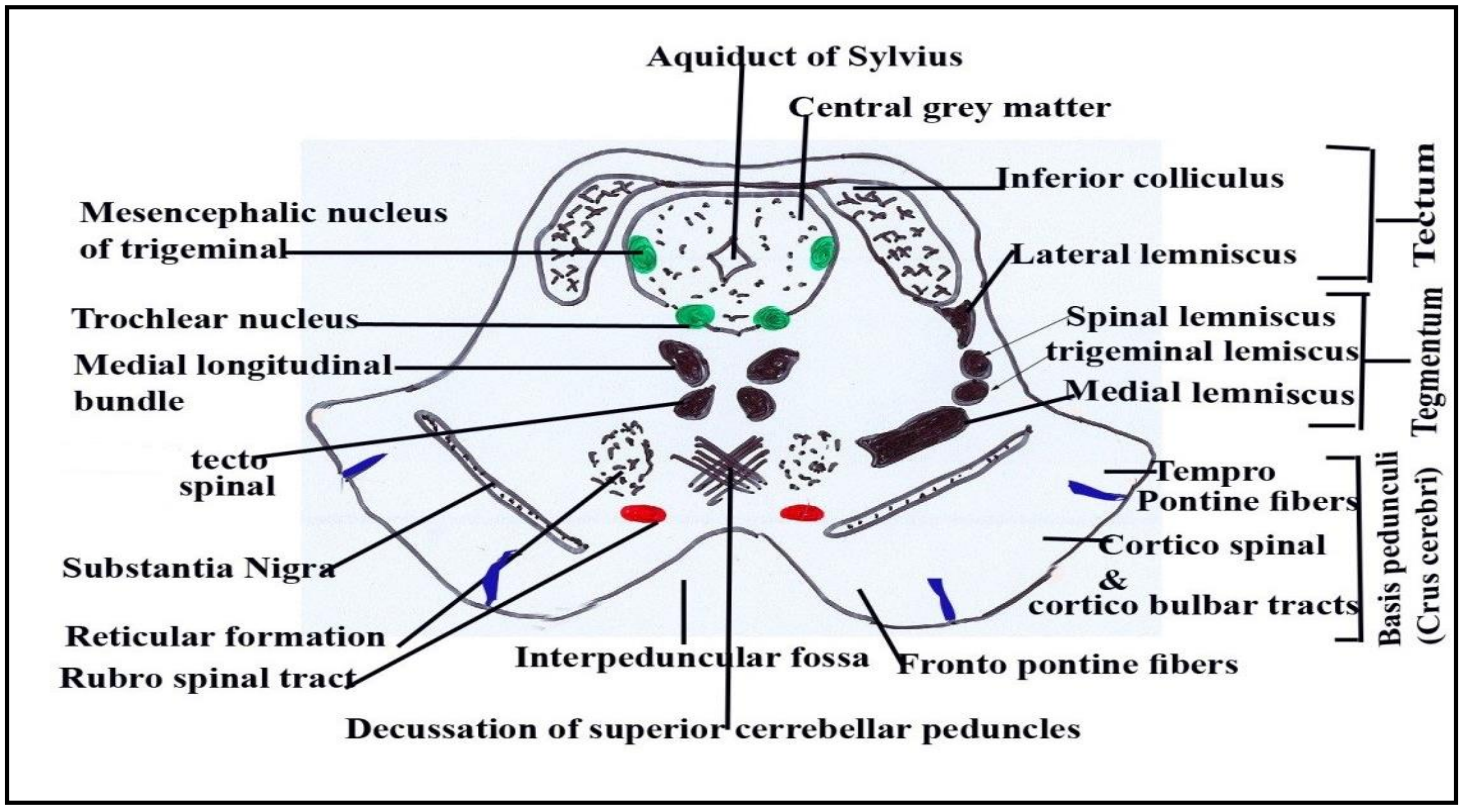
- **The four leminisci** present in antero–lateral part of tegmentum namely:1. Medial lemniscus 2.Trigeminal lemniscus 3. Spinal lemniscus 4.Lateral lemniscus

- **Substantia nigra** separates the tegmentum & the Basis pedunculi (crus cerebri).

- **Basis pedunculi** consists of descending fibers from the cerebral cortex to the cranial nerve nuclei (**corticobulbar**), to the spinal cord motor nuclei (**corticospinal**) & to the cerebellar cortex via pontine nuclei (**corticopontine**).
- They are arranged from medial to lateral as follow:

1. The frontopontine fibers.
2. The corticospinal and corticobulbar fibers (middle 3/5).
3. The tempropontine fibers

Mid-brain at the level of inferior colliculus:



II – Midbrain at the level of superior colliculus

It consists of the following structures:

- Tectum contains the **superior colliculi** which are center for vision reflexes (correlation of impulses from the retina with the body movements to control eye movements and direction of visual attention).

- The superior colliculus is formed of nerve tissue arranged **in 7 layers** or strata (4 are mainly white [album] & 3 are mainly grey [grisium])

- The aqueduct is surrounded by **pear shaped area** of grey matter which contains:

1. Main motor occulomotor nucleus III.
2. Edinger-Westphal nucleus III.
3. Mesencephalic nucleus of trigeminal nerve V.

The top three layers are called superficial:

1. Lamina I, the stratum zonale, is a thin layer consisting of small myelinated axons together with marginal and horizontal cells.

2. Lamina II, the stratum griseum superficiale ("superficial gray layer"), contains many neurons of various shapes and sizes.

3. Lamina III, the stratum opticum ("optic layer"), consists mainly of axons coming from the optic tract.

Next come two intermediate layers:

4. Lamina IV, the stratum griseum intermedium ("intermediate gray layer"), is the thickest layer, and is filled with many neurons of many sizes. This layer is often as thick as all the other layers together. It is often subdivided into "upper" and "lower" parts.

5. Lamina V, the stratum album intermedium ("intermediate white layer"), consists mainly of fibers from various sources.

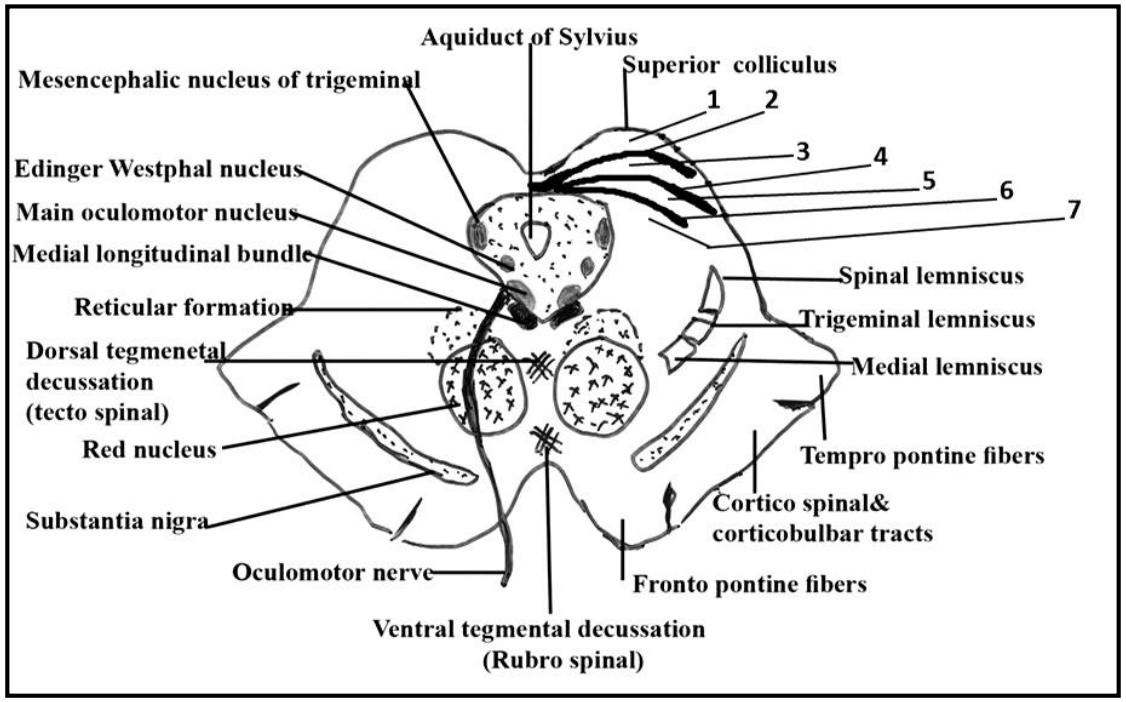
Finally come the two deep layers:

6. Lamina VI, the stratum griseum profundum ("deep gray layer"), consists of loosely packed neurons and myelinated fibers.

7. Lamina VII, the stratum album profundum ("deep white layer"), lying directly above the periaqueductal grey matter, consists entirely of fibers.

- M.L.B. anterior to the gray matter and close to the midline.
- **Dorsal tegmental decussation** of tecto-spinal tract. Tectospinal tracts arise from the tectum and cross immediately, and then descend to the spinal cord.
- **Ventral tegmental decussation** of rubrospinal tracts. The rubrospinal tract arises from the red nucleus in the midbrain and crosses immediately in the ventral decussation then descend in the spinal cord.
- **Red nucleus**; two large masses of gray matter on either side of midline.
- Reticular formation present lateral & posterior to the red nucleus.
- Presence of **only 3 lemnisci**; medial lemniscus, trigeminal lemniscus and spinal lemniscus.
- Substantia nigra.
- The basis pedunculi.

Midbrain at the level of superior colliculus:



Substantia Nigra

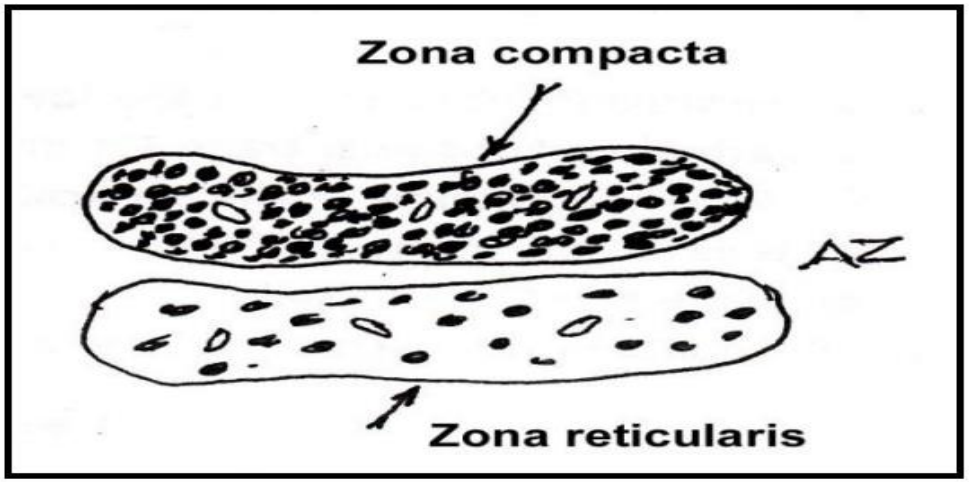
- Dark pigmented motor nucleus between tegmentum and crus cerebri on each side in midbrain, it is one of extrapyramidal nuclei.
- The neurons of substantia nigra are multipolar and its cytoplasm contains numerous membrane-bound granules of neuromelanin pigment.

- These pigments are very little at birth, increasing during childhood and rising with increasing age. Functionally, it may sequester metals such as iron, as well as toxic organic compounds.

2- It is divided into:

a) Dorsal compact part (Zona Compacta) rich in cells containing melanin pigment that form dopamine (inhibitory effects on corpus striatum).

b) Ventral reticular part (Zona Reticularis) poor in cells that contain iron compounds.



N.B.

- Loss of Dopamine leads to Parkinsonism treated by L-DOPA.
- Brain of a patient with Parkinson's disease shows abnormal pallor of the substantia nigra correlating with loss of the pigment-containing neurons.

Red Nucleus

1- It is a mass of gery matter, present in midbrain at the level of superior colliculus.

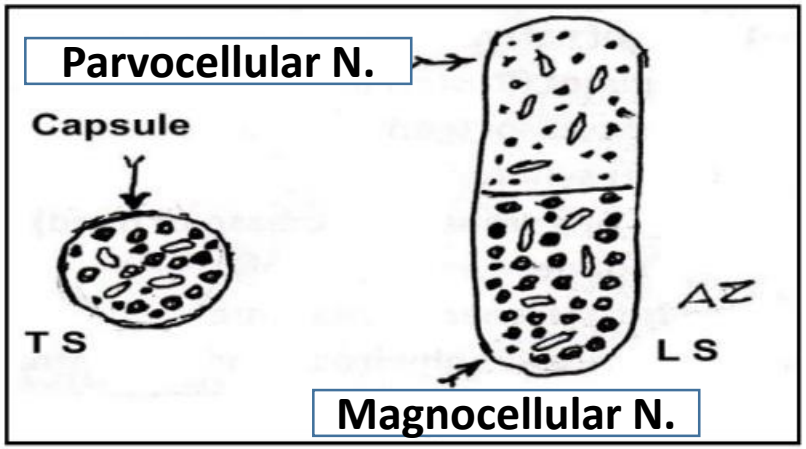
2- Red nucleus is a motor nucleus, red yellowish in color due to high vascularity and iron compounds.

3- It is one of extrapyramidal centers. It is oval or rounded in shape in transverse section

4- It is divided into:

a- Upper recent part

b- Older caudal (lower) part



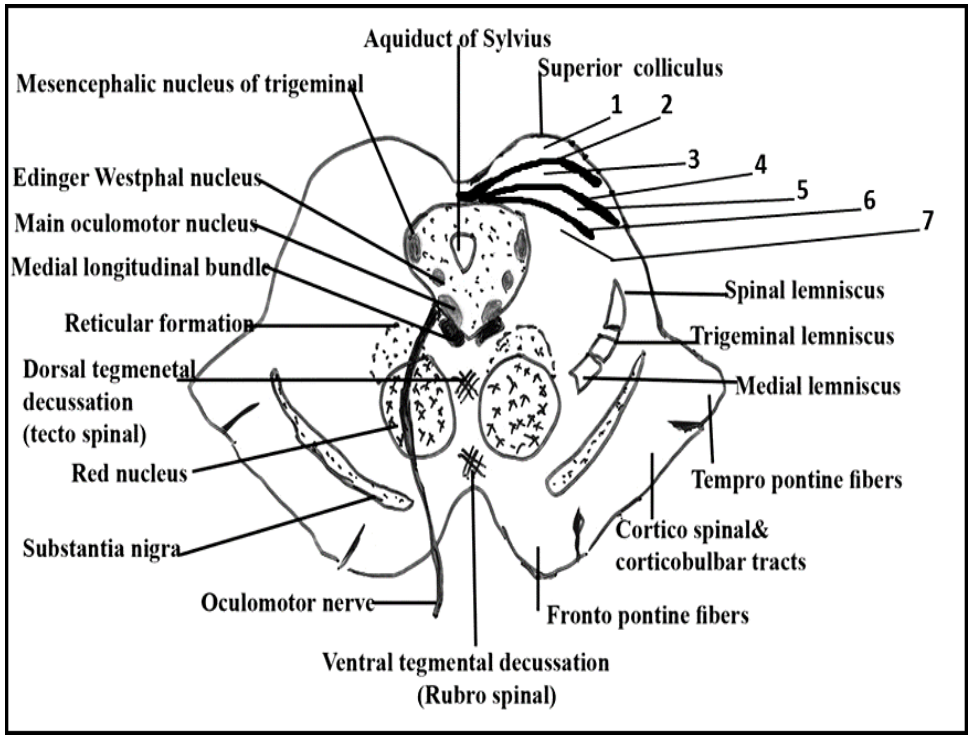
- The upper part of red nucleus (parvocellular N.) is formed of small nerve cells separated with myelinated nerve fibers. These fibers come mainly from cerebrum, cerebellum, subthalamic nuclei.

- The lower part (magnocellular N.) contains large nerve cells which give origin to the fibers of rubrospinal and rubrobulbar tracts.

- The nucleus is traversed mainly by :

a) Occulomotor nerve roots

b) Superior cerebellar peduncle after decussation

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