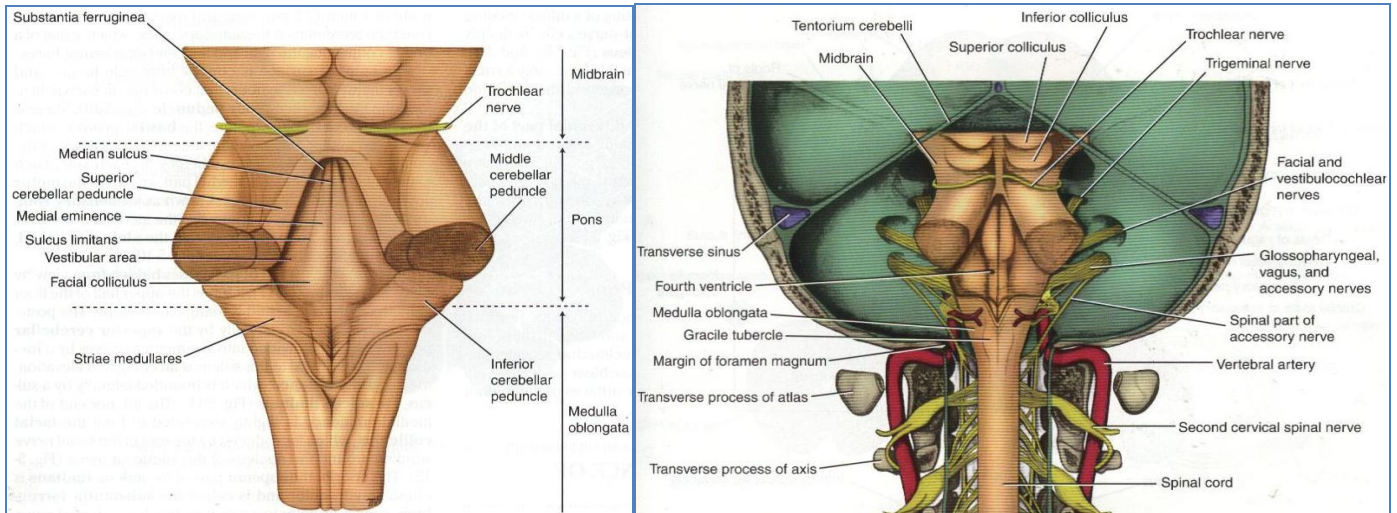


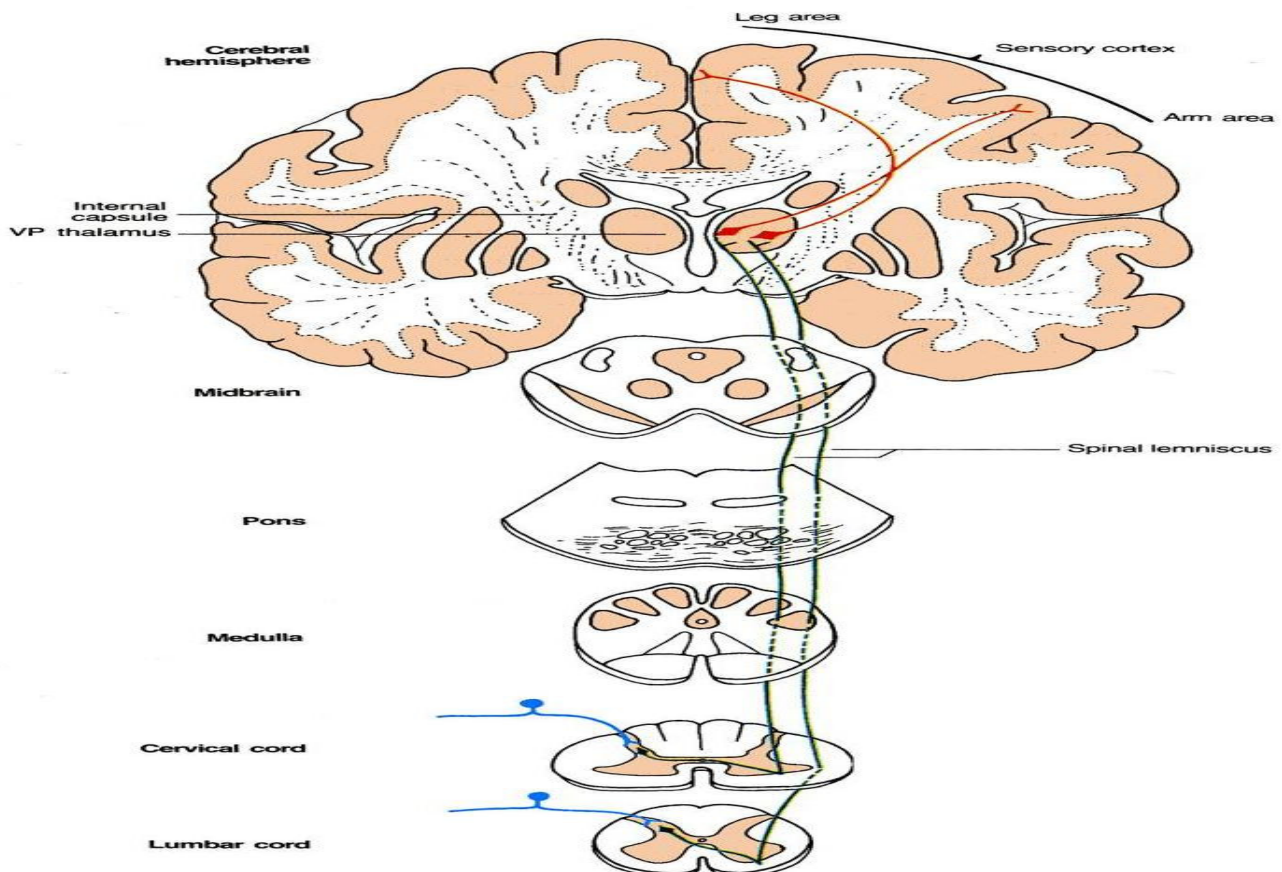
BRAINSTEM

GROSS ANATOMY OF THE BRAIN STEM ATTACHMENT OF THE CRANIAL NERVES :

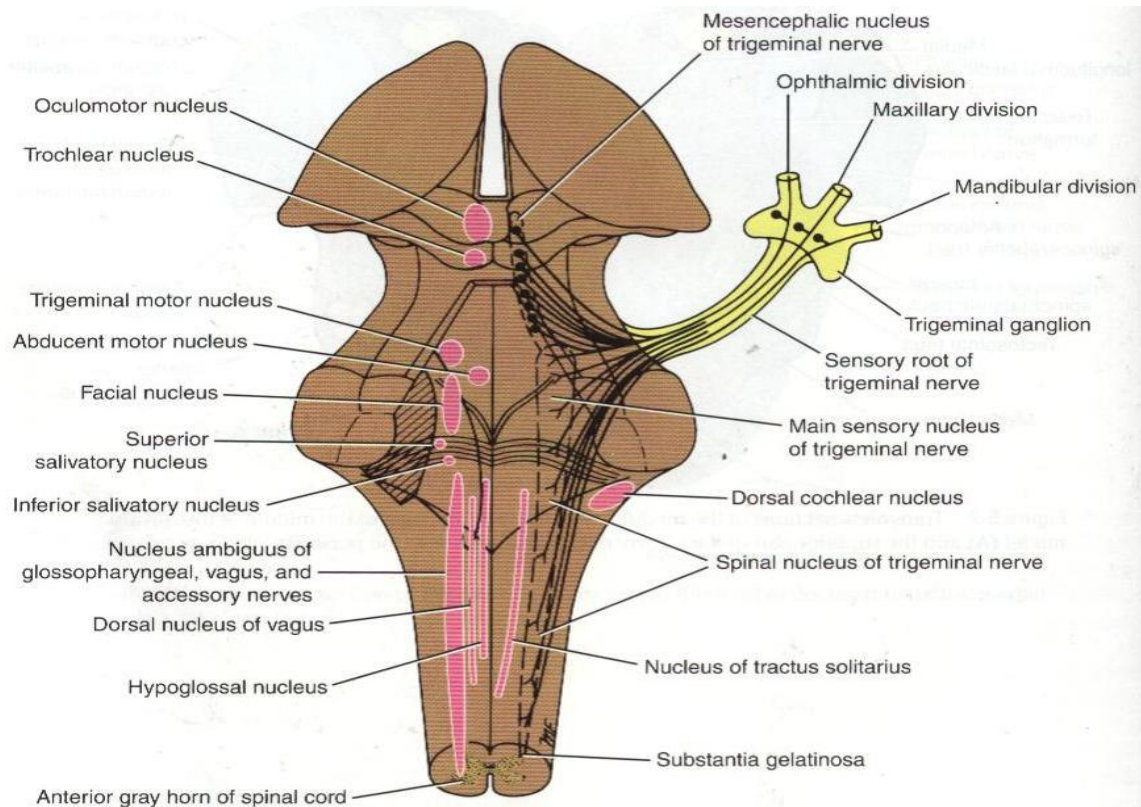
- The brain stem consists of the : **Medulla oblongata, Pons, and Midbrain.**
- The brain stem lies upon the basal portion of the occipital bone (**clivus**) and is connected to, and largely covered by, the cerebellum.
- *Caudally*, the medulla is continuous with the spinal cord at the level of the foramen magnum.
- *Rostrally*, the midbrain is continuous with the diencephalon of the forebrain.



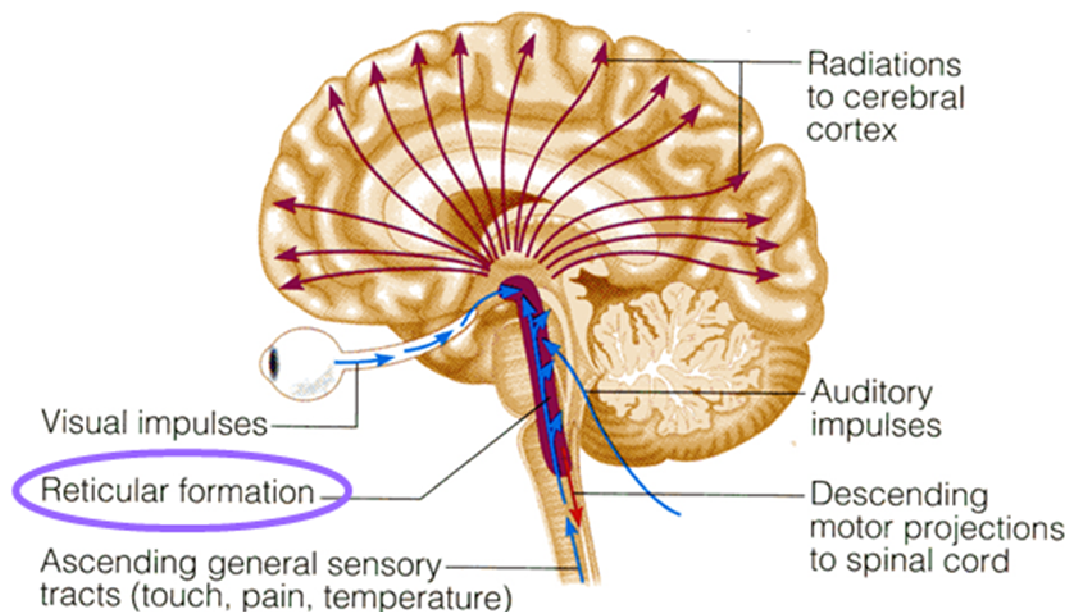
- The brain stem contains numerous **ascending and descending fibre tracts.**
- Some of these **pass throughout its whole length**, having their origin in the spinal cord or cerebral hemisphere, respectively; others have their origin or termination within brain stem **nuclei.**
- N.B. : **BULB = BRAIN STEM** (corticobulbar, bulbar palsy).



- Certain of these **nuclei** receive fibres from, or send fibres into, **cranial nerves**, ten pairs of which (III-XII) attach to the surface of the brain stem.
- These are known as the **cranial nerve nuclei**.

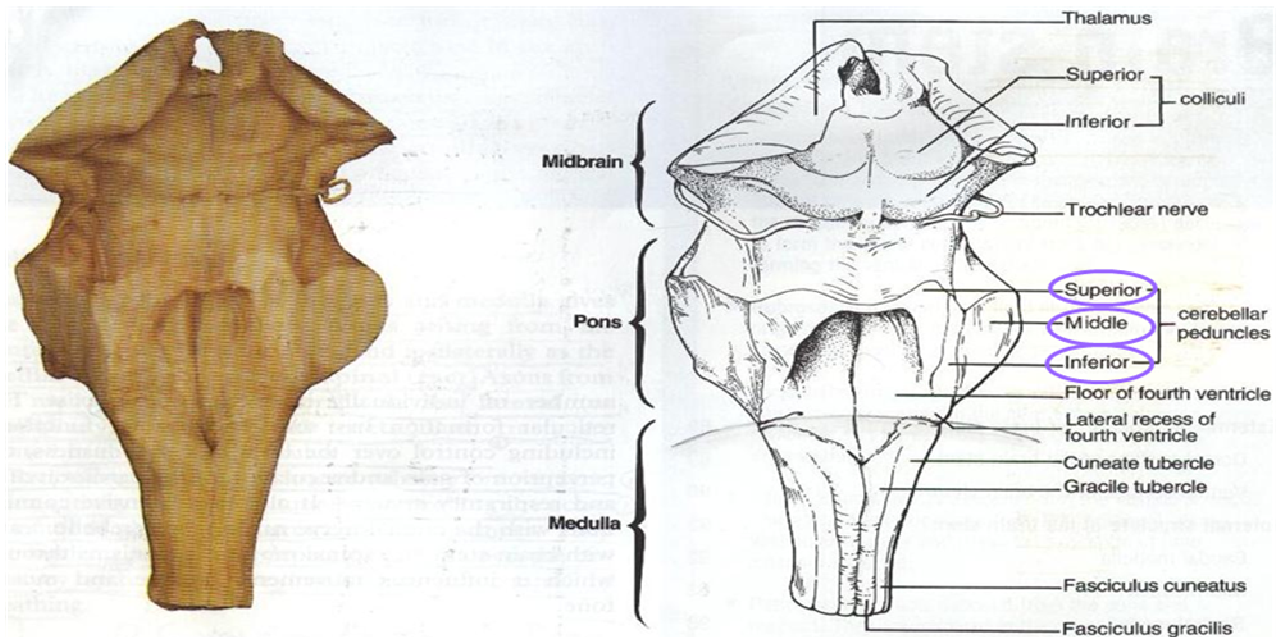


- In addition, the brain stem contains a complex and heterogeneous matrix of neurones known as the **reticular formation**, within which a number of individually identified nuclei exist.
- The reticular formation has several important functions, including **control over the level of consciousness**, the **perception of pain** and **regulation of the cardiovascular & respiratory systems**.
- It also has extensive connections with the cranial nerve nuclei, the cerebellum and with brain stem and spinal motor mechanisms through which it influences movement, posture and muscle tone.

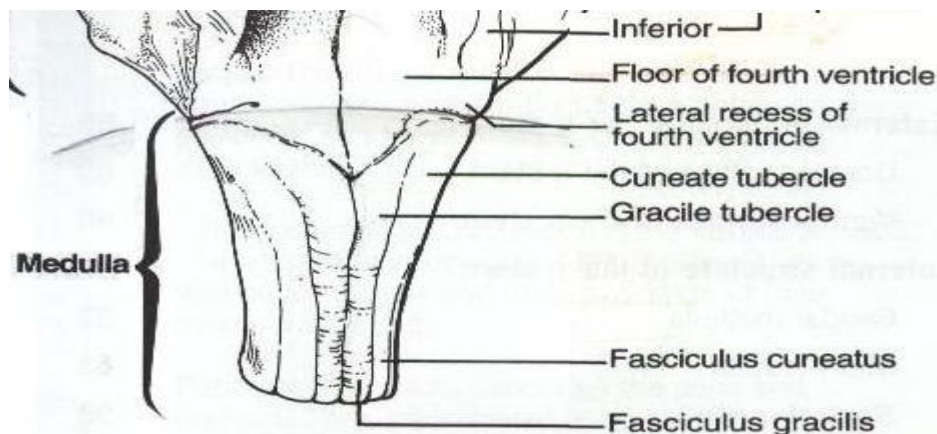


A) EXTERNAL FEATURES OF THE BRAIN STEM – DORSAL SURFACE :

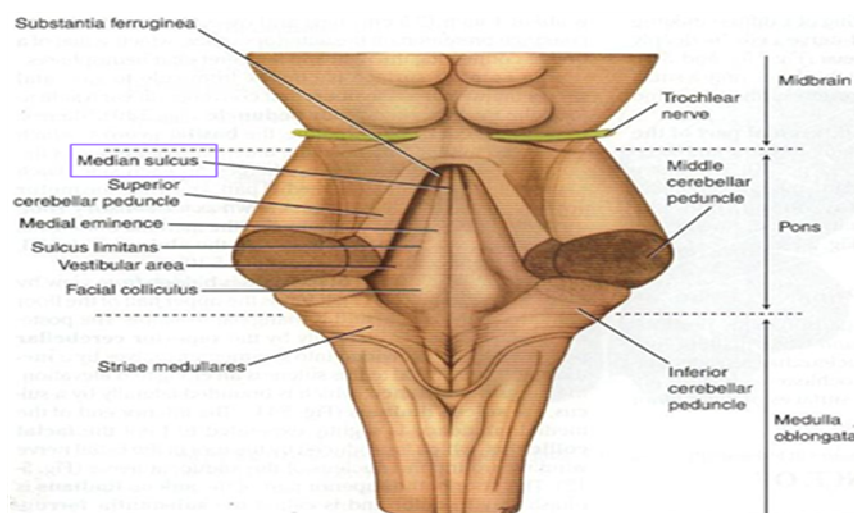
- The dorsal surface of the brain stem can be viewed if the overlying cerebellum is removed by cutting the three pairs of **peduncles**, or nerve fibre bundles, by which it is attached on each side.



- In the caudal part of the medulla, the **dorsal columns** (**fasciculi gracilis and cuneatus**, containing first-order sensory neurones) continue rostrally from the spinal cord.
- They terminate in the **nuclei gracilis and cuneatus**, the locations of which are marked by two small elevations, the **gracile and cuneate tubercles**.

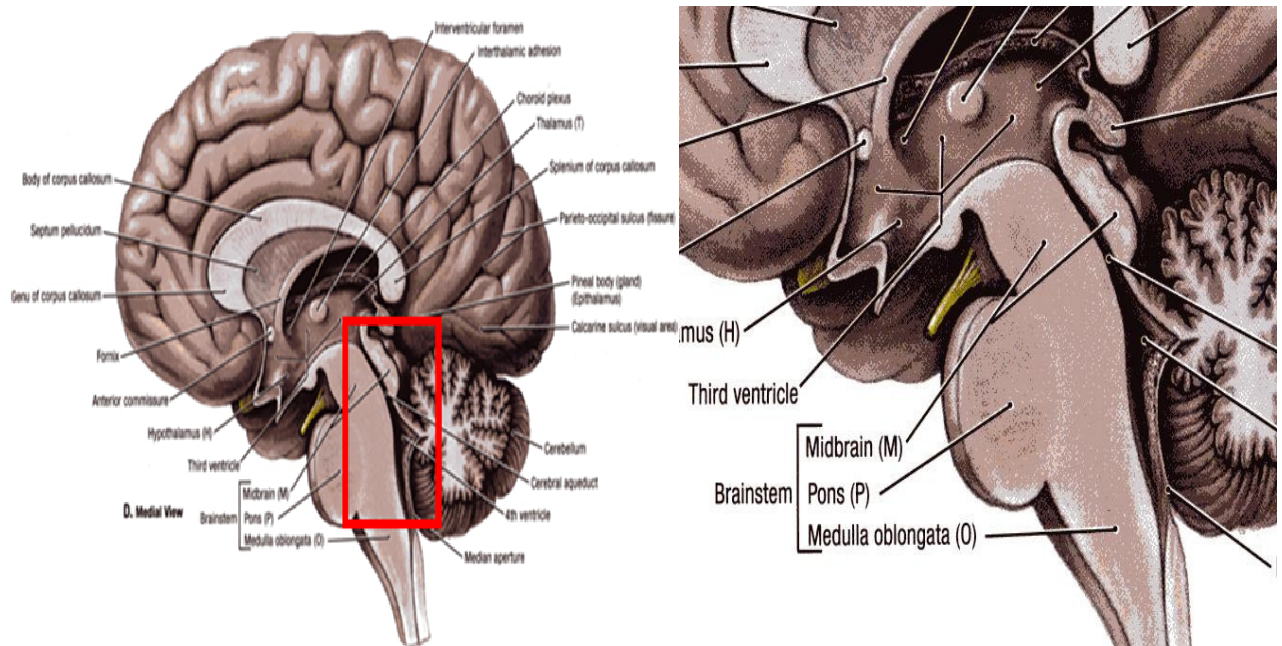


- On the dorsal surface of the medulla, the midline is marked by a **dorsal median sulcus**, continuous with that of the spinal cord.

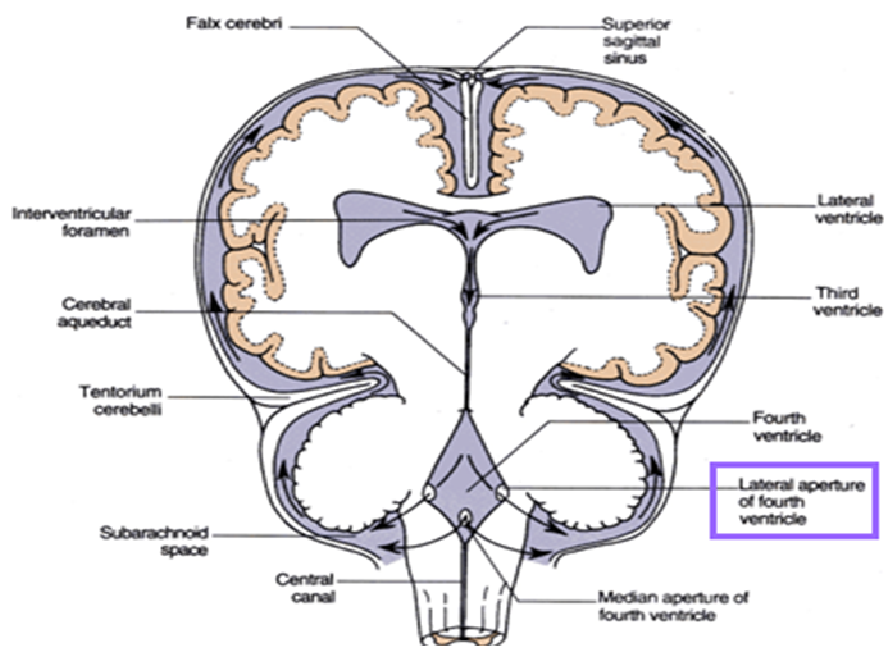


CLOSED AND OPEN MEDULLA :

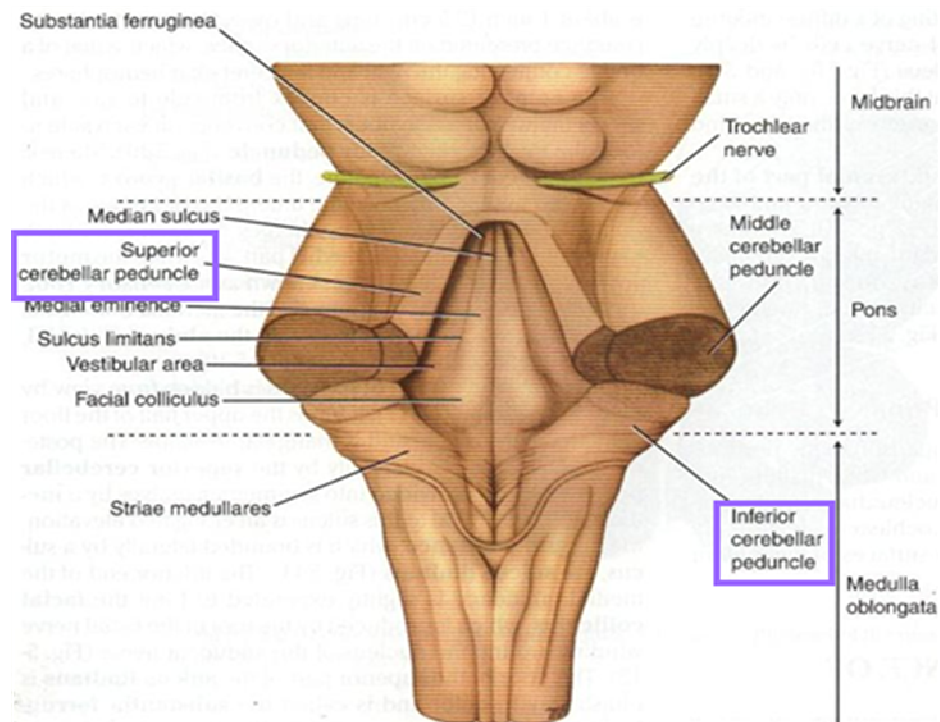
- The caudal two-thirds of the medulla contains the rostral continuation of the **central canal** of the spinal cord and is, therefore, sometimes referred to as the '**closed**' portion of the medulla.
- In passing rostrally, the central canal moves progressively more dorsally until, in the rostral medulla, it opens out into the fourth ventricle.
- This portion is sometimes referred to as the '**open**' medulla.



- The **transition from medulla to pons** is not clearly delineated on the dorsal surface of the brain stem but, approximately, the caudal third of the floor of the fourth ventricle constitutes the dorsal aspect of the **rostral medulla**, while the rostral two-thirds of the ventricular floor is made up of the dorsal aspect of the **pons**.
- The **floor of the fourth ventricle** forms a shallow, rhomboid depression on the dorsal surface of the rostral medulla and the pons.
- The fourth ventricle is widest at the level of the pontomedullary junction where a **lateral recess** extends to the lateral margin of the brain stem.
- At this point the small **lateral aperture (foramen of Luschka)** provides passage for CSF within the fourth ventricle to reach the subarachnoid space surrounding the brain.

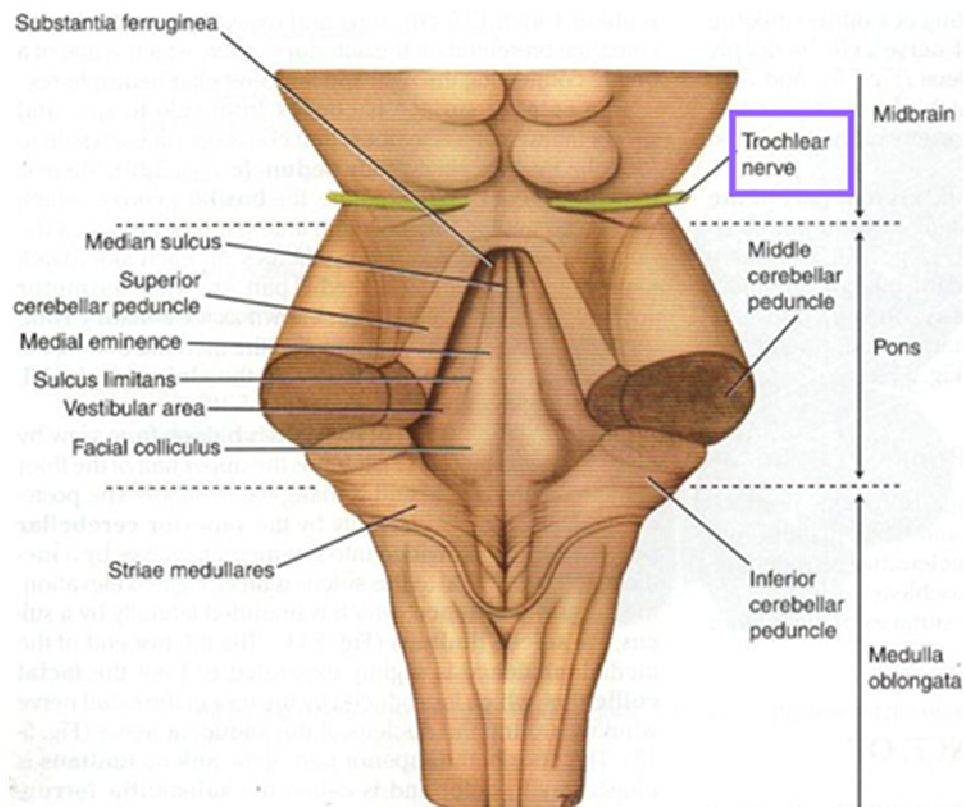


- The lateral walls of the rostral part of the fourth ventricle are made up of the **superior and inferior cerebellar peduncles**, connecting the brain stem with the cerebellum.
- In the rostral pons, the walls converge until, at the pontomesencephalic junction, the fourth ventricle becomes continuous with a small channel, the **cerebral aqueduct**, which passes throughout the length of the midbrain.



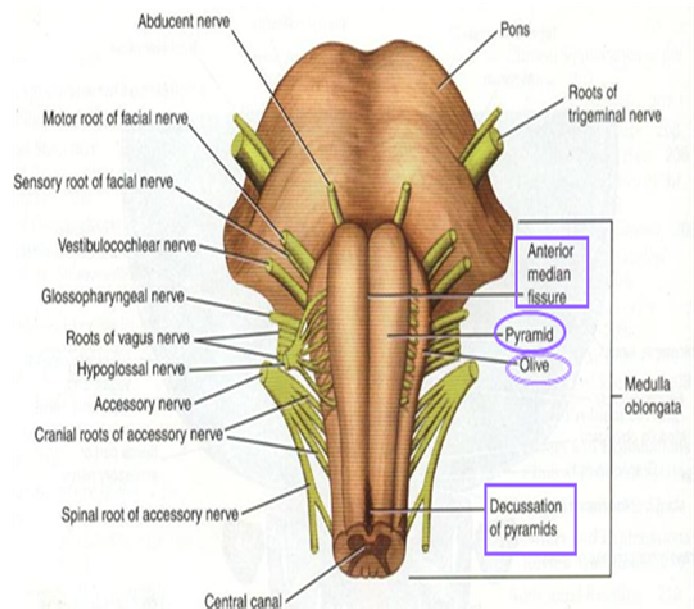
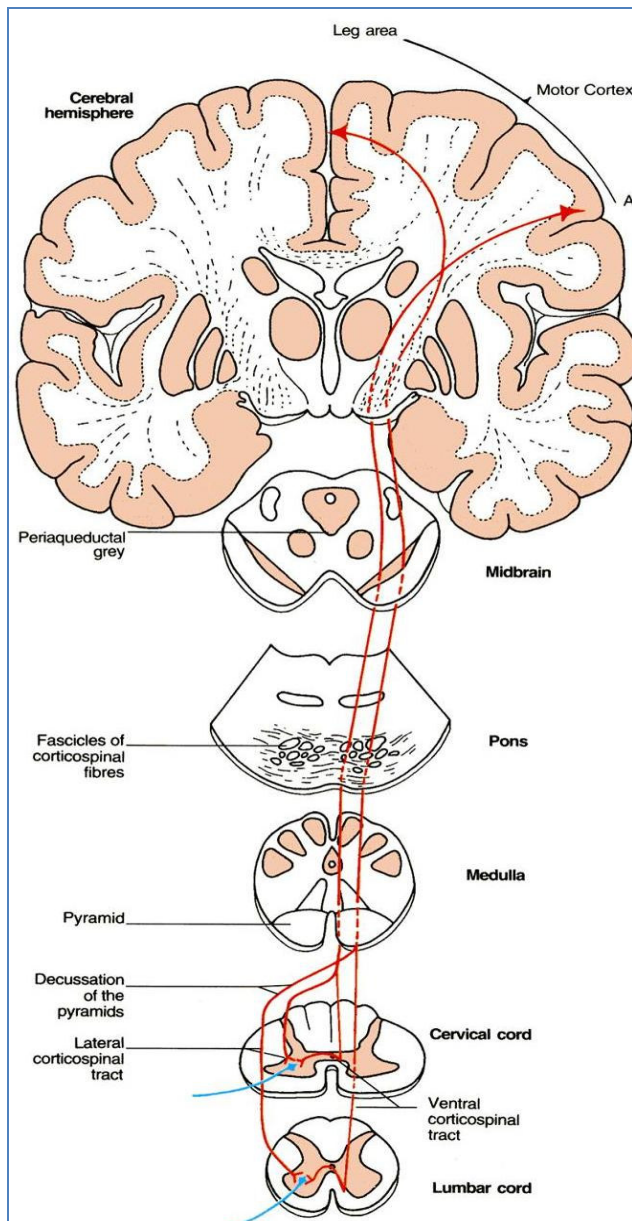
DORSAL ASPECT OF THE MIDBRAIN :

- The dorsal aspect of the **midbrain** is marked by four paired elevations: the **superior and inferior colliculi**, which are parts of the visual and auditory systems, respectively.
- The **trochlear nerve** (CN IV) emerges immediately caudal to the inferior colliculus.



B) EXTERNAL FEATURES OF THE BRAIN STEM – VENTRAL SURFACE :

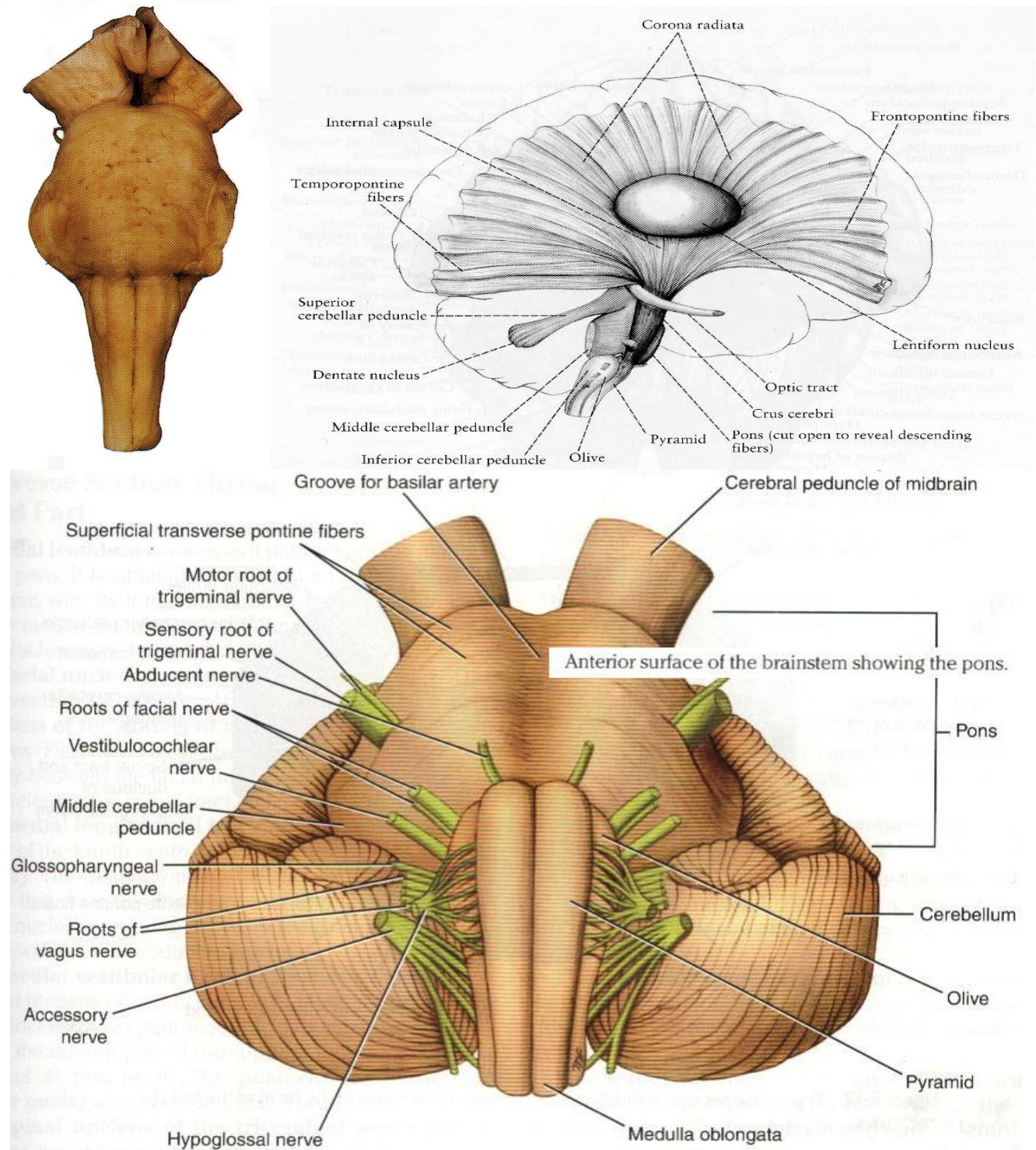
- On the ventral surface of the medulla, prominent longitudinal columns, the **pyramids**, run on either side of the **ventral median fissure**.
- The pyramid gives its name to the underlying **pyramidal or corticospinal tract**, which consists of descending fibres originating from the ipsilateral cerebral cortex.
- In the caudal medulla, 75-90% of these fibres cross over in the **decussation of the pyramids**, partly obscuring the ventral median fissure as they do so, to form the **lateral corticospinal tract** of the spinal cord.
- Lateral to the pyramid lies an elongated elevation, the **olive**, within which lies the **inferior olivary nucleus**.
- This has connections primarily with the cerebellum and is involved in the control of movement.



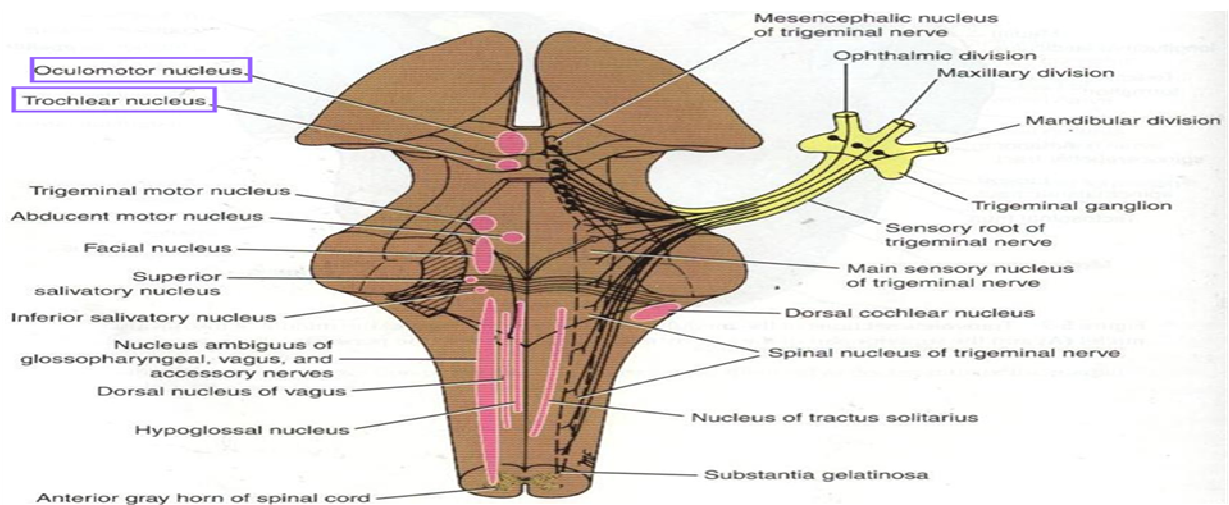
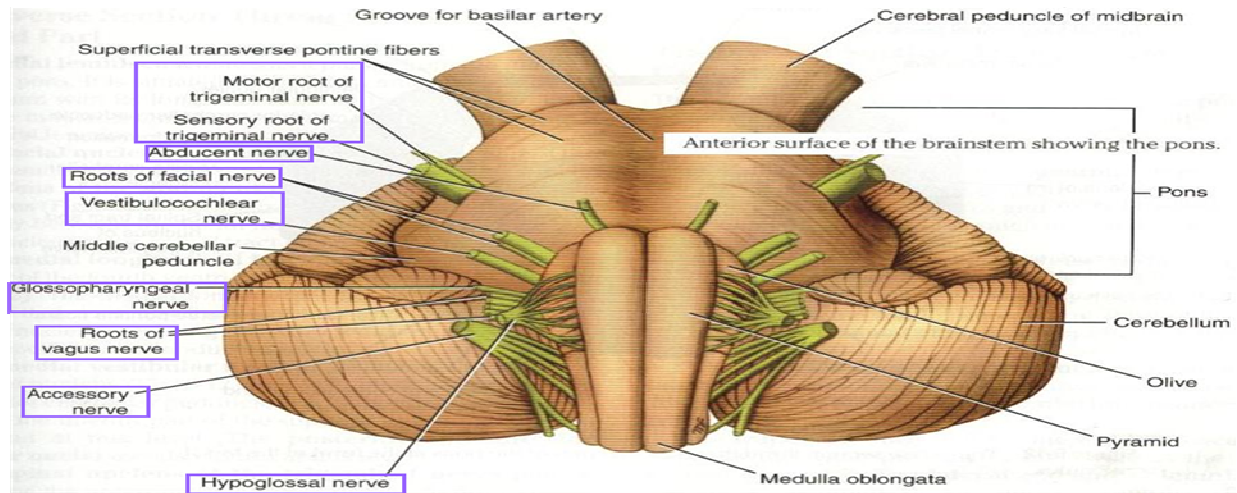
- The transition from medulla to pons is clearly delineated on the ventral surface of the brain stem.
- The ventral part of the pons is dominated by a transverse system of fibres (**the transverse pontine fibres / pontocerebellar fibres**) that originate from cells in the ventral pons (**pontine nuclei**) and pass through the contralateral middle cerebellar peduncle to enter the cerebellar hemisphere.
- The pontine nuclei receive **corticopontine fibres** from the cerebral cortex (including the motor cortex) and constitute an important connection between cerebral and cerebellar cortices involved in the **coordination of movement**.

VENTRAL SURFACE OF MIDBRAIN :

- The ventral surface of the midbrain consists, on either side, of a massive column of descending fibres, the **crus cerebri** or **basis pedunculi**.
- In the midline, the two crura cerebri are separated by a depression called the **interpeduncular fossa**.
- The crus cerebri is continuous rostrally with the **internal capsule** of the cerebral hemisphere and consists of corticobulbar and corticospinal fibres that have left the cerebral hemisphere via the internal capsule on their way to the brain stem and spinal cord.
- They are primarily motor in function.



CRANIAL NERVE FROM VENTRAL SURFACE :



REMEMBER THESE POINTS :

1. The brain stem consists of the medulla oblongata, pons and midbrain.
2. On the dorsal aspect of the brain stem can be seen the dorsal columns, the floor of the fourth ventricle and the superior and inferior colliculi.
3. The dorsal aspect of the rostral medulla and the pons form the floor of the fourth ventricle; the lateral and median apertures of the fourth ventricle permit the passage of CSF into the subarachnoid space. The cerebral aqueduct runs through the midbrain, beneath the colliculi.
4. On the ventral aspect of the brain stem can be seen the pyramids, transverse pontine fibres and the crura cerebri.
5. The inferior, middle and superior cerebellar peduncles connect the cerebellum to the medulla, pons and midbrain, respectively.

THE END

LoveTomy Team 426
Team leader : Dr. hams

Omar H

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Dr. S

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SELF QUIZ

1- The archaic term 'bulb' is applied to the :

- a. Medulla oblongata.
- b. Pons.
- c. Midbrain.
- d. All of the above.
- e. Non of the above.

2- Regarding the brainstem, all are true EXCEPT :

- a. The brain stem lies upon the basal portion of the occipital bone.
- b. The midbrain is continuous with the diencephalon of the forebrain.
- c. The brain stem contains numerous ascending and descending fibre tracts.
- d. The dorsal aspect of the midbrain is marked by 4 paired elevations.
- e. The brain stem contains a complex & homogeneous matrix of neurones known as the reticular formation.

3- The reticular formation has several important functions :

- a. Control over the level of consciousness.
- b. Perception of pain.
- c. Regulation of the cardiovascular system.
- d. Regulation of the respiratory systems.
- e. All of the above.

4- Which of the following statements regarding ventral surface of brain stem is incorrect :

- a. The pyramids run on either side of the ventral median fissure.
- b. All pyramidal tract fibers cross over in the decussation of the pyramids.
- c. The olive has connections primarily with the cerebellum.
- d. pontocerebellar fibres pass through the contralateral middle cerebellar peduncle to enter the cerebellar hemisphere.
- e. The crus cerebri is continuous rostrally with the internal capsule of the cerebral hemisphere.

1. d	2. e	3. e	4. b
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MATCHING

- | | |
|----------------------------------|---|
| a. Two crura cerebri | 1. Primarily motor in function |
| b. The olive | 2. Continuous with the diencephalon of the forebrain |
| c. Pontine nuclei | 3. Within which lies the inferior olivary nucleus |
| d. Corticobulbar & corticospinal | 4. Separated by interpeduncular fossa |
| e. The midbrain | 5. Receive corticopontine fibres from the cerebral cortex |

a. 4	b. 3	c. 5	d. 1	e. 2
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