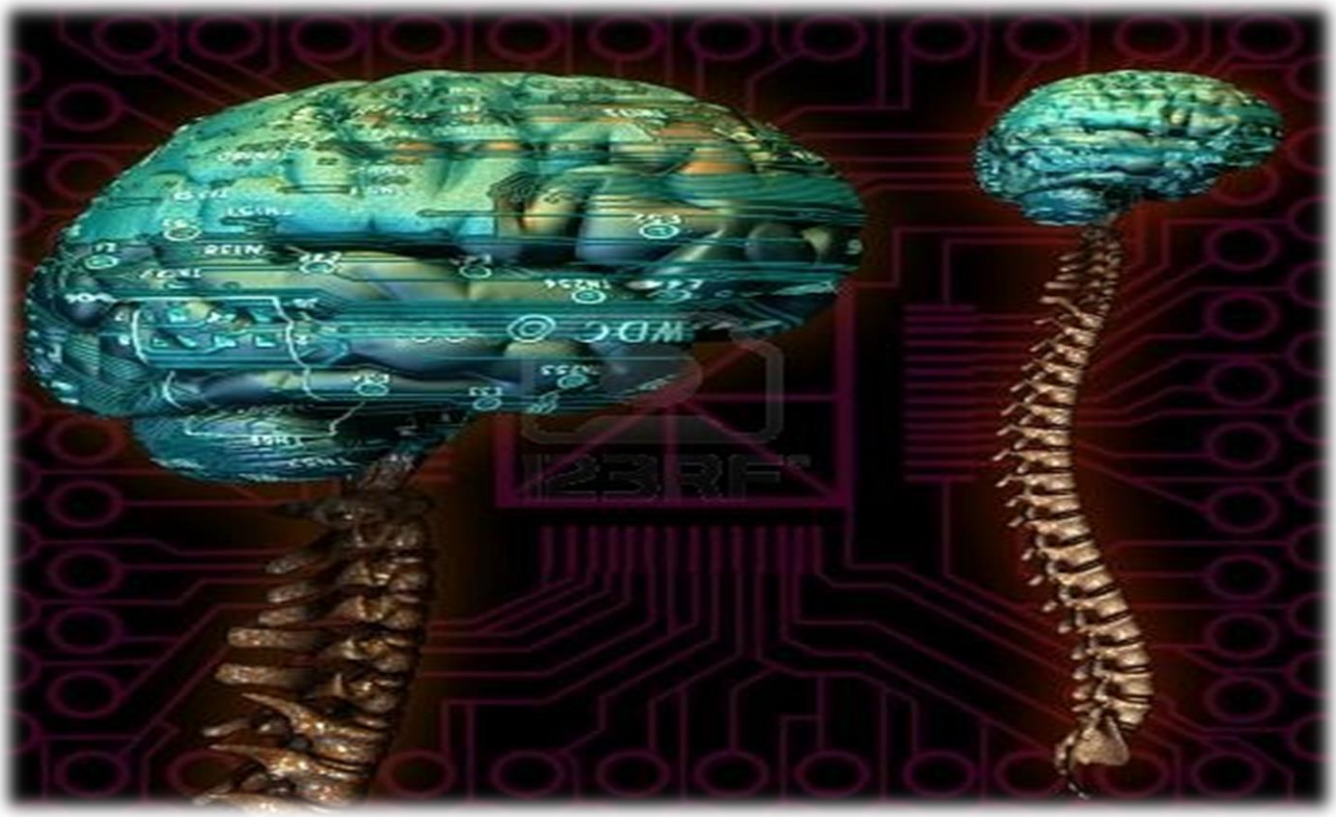
CNS Block



LECTURE (10)

LECTURE (EXTERNAL FRATURES OF BRAIN STEM)

Done by: Ashwag A. AL-Harbi

Reviewed by:Yasser A. Al-hazzani

If there is any mistake please feel free to contact us:
Anatomyteam32@gmail.com

Both - Black
Male Notes - BLUE
Female Notes - GREEN
Explanation and additional notes - ORANGE
Very Important note - Red

Objectives:

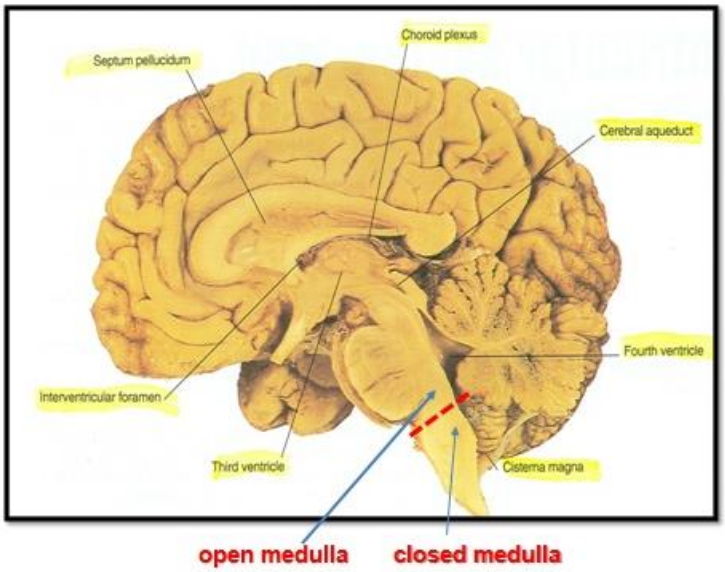
At the end of the lecture, students should:

- *List the **components** of brain stem.*
- *Describe the **site** of brain stem.*
- *Describe the **relations between components** of brain stem & their **relations to cerebellum**.*
- *Describe the **external features of both ventral & dorsal surfaces** of brainstem.*
- *List **cranial nerves emerging** from brain stem.*
- *Describe the site of **emergence** of each cranial nerve.*

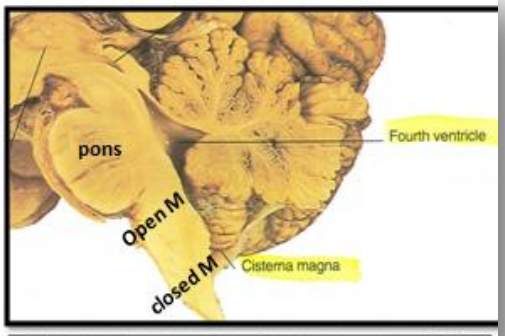
Note: slides of female and male are same except these tow slides (in female)

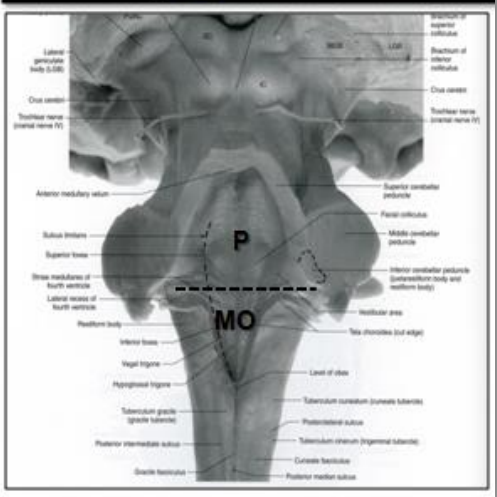
MEDULLA – DORSAL SURFACE

- The features differ in the caudal part (closed medulla) and the cranial part (open medulla)



- The dorsal surface of open medulla and pons lie in the caudal 1/3rd and the rostral 2/3rd of the floor of the 4th ventricle respectively.





DEVELOPMENT OF BRAIN:

✓ **The brain develops from the1/3 cranial part of neural tube.**

Brain growth faster than the spinal cord

✓**The cranial part divides into 3 parts:**

FOREBRAIN: (more cranial part): subdivides into:

1-Two cerebral hemispheres (cavities: 2 lateral ventricles).

2-Diencephalon (cavity: 3rd ventricle):

Thalamus, hypothalamus, epithalamus&subthalamus

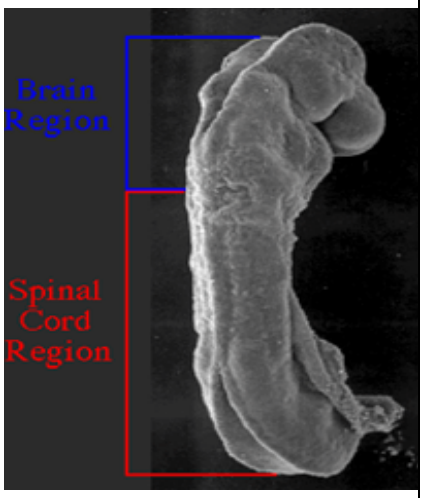
MIDBRAIN: (central part) (cavity: cerebral aqueduct)

HINDBRAIN: (caudal part) (cavity: 4th ventricle): subdivides Into

1 -Pons.

2 -Cerebellum

3 - Medulla oblongata



neural tube

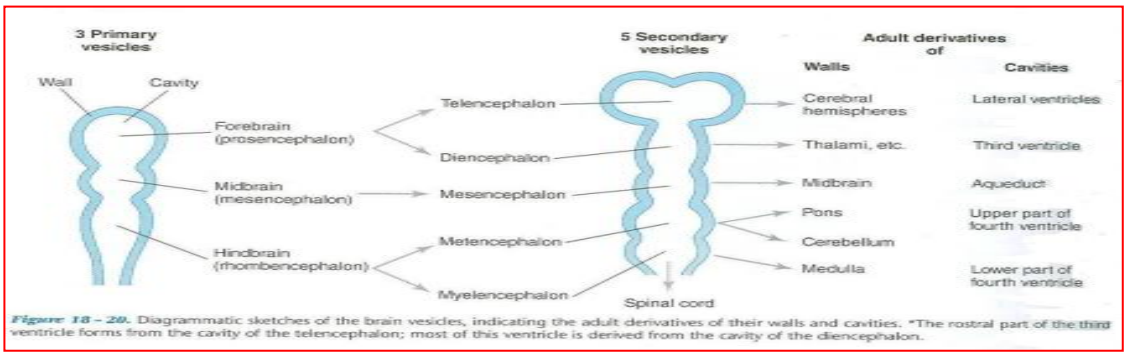


Figure 18 – 20. Diagrammatic sketches of the brain vesicles, indicating the adult derivatives of their walls and cavities. *The rostral part of the third ventricle forms from the cavity of the telencephalon; most of this ventricle is derived from the cavity of the diencephalon.

*** Brain makes a big dilation called (Brain vesicle) then will divide into 3 different portions.**

That's mean single vesicle divides into 3 vesicles > each vesicle has one cavity.

FOREBRAIN:

The lateral cavity will divide into 2 portion, then these lateral cavity connection to gather to open in 3rd ventricle.

MIDBRAIN:

Growth slowly remains small (small canal) this will lead to small structure cavity.

HINDBRAIN:

Growth faster, ventral portion give pone and medulla oblongata, dorsal portion give Cerebellum.

There is a large cavity sits between bone and muddle and cerebellum.

So, 2 *lateral open on* 3rd *cavity connected through* cerebral aqueduct with 4th ventricle.

BRAIN STEM

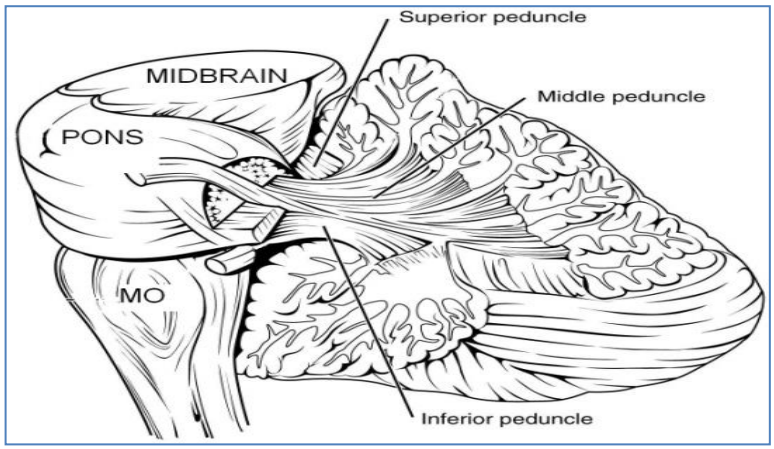
The brain stem is the region of the brine that connects the cerebrum with the spinal cord

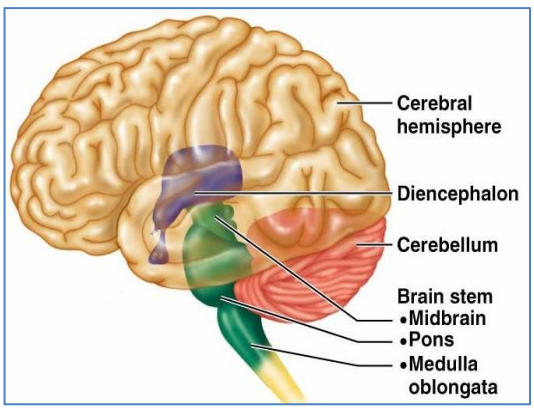
✓ ***SITE:*** ***It lies on the basilar part of occipital bone (clivus)***
In Front of Forman magnum

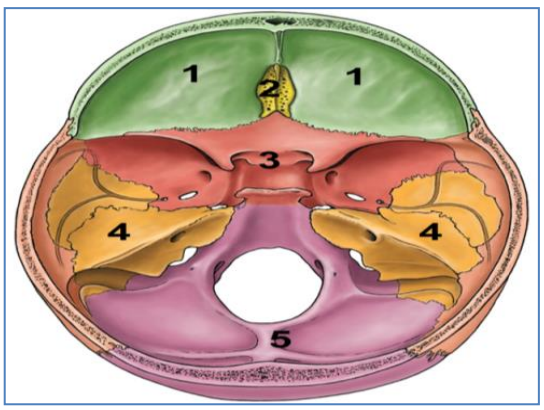
****Any fracture at base of brain may damage brain stem (brain stem sit on clivus).***

✓ ***PARTS:*** ***From above downwards:***
Mid brain, pons & medulla oblongata

✓ ***CONNECTIONS WITH CEREBELLUM:****(dorsal to brine stem)*:
Each part of brain stem is connected to cerebellum by cerebellar peduncles (superior, middle & inferior).





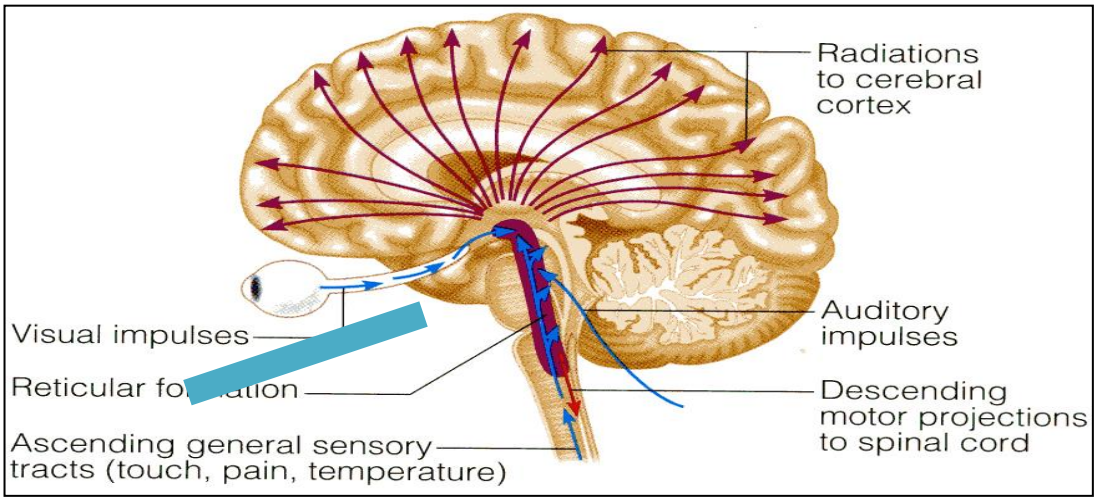


FUNCTIONS OF BRAIN STEM

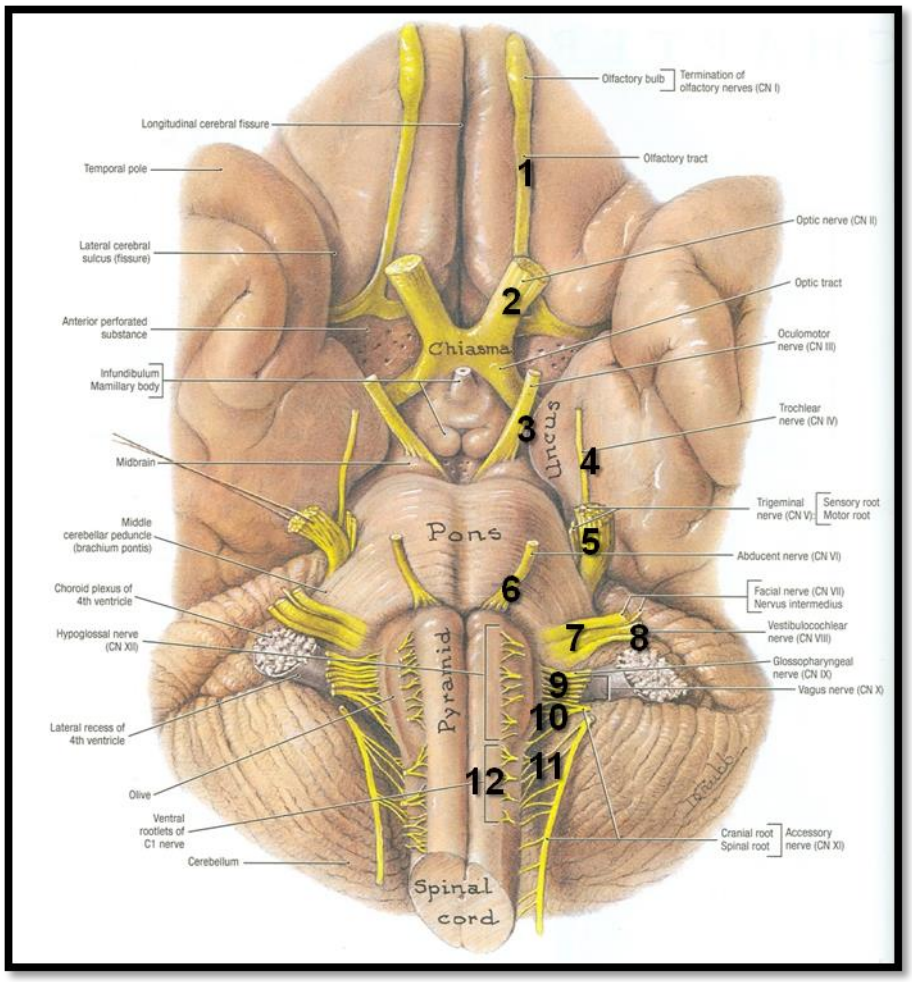
- ✓ ***Pathway of tracts between cerebral cortex & spinal cord.***
- ✓ ***Site of origin of nuclei of cranial nerves (from 3rd to 12th).***
- ✓ ***Site of emergence of cranial nerves (from 3rd to 12th).***
- ✓ ***Contains groups of nuclei & related fibers known as reticular formation(network)responsible for: control of level of consciousness, perception of pain, regulation of cardiovascular & respiratory systems***

Function of reticular formation is:

Let you know what happen around you



BRAIN – VENTRAL SURFACE



From 3rd to 12th nerves attached to brain stem on ventral except 4th nerve attached to brine stem on dorsal.

MEDULLA – VENTRAL SURFACE

❑ Ventral median fissure:

- Continuation of ventral median fissure of spinal cord
- Divides the medulla into 2 halves
- The median fissure interrupt by fiber decussation
- Its lower part is masked by decussation of most of pyramidal (corticospinal) fibers (75%-90%).

❑ Pyramid:

- An elevation, lies on either side of ventral median fissure
- Produced by corticospinal tract

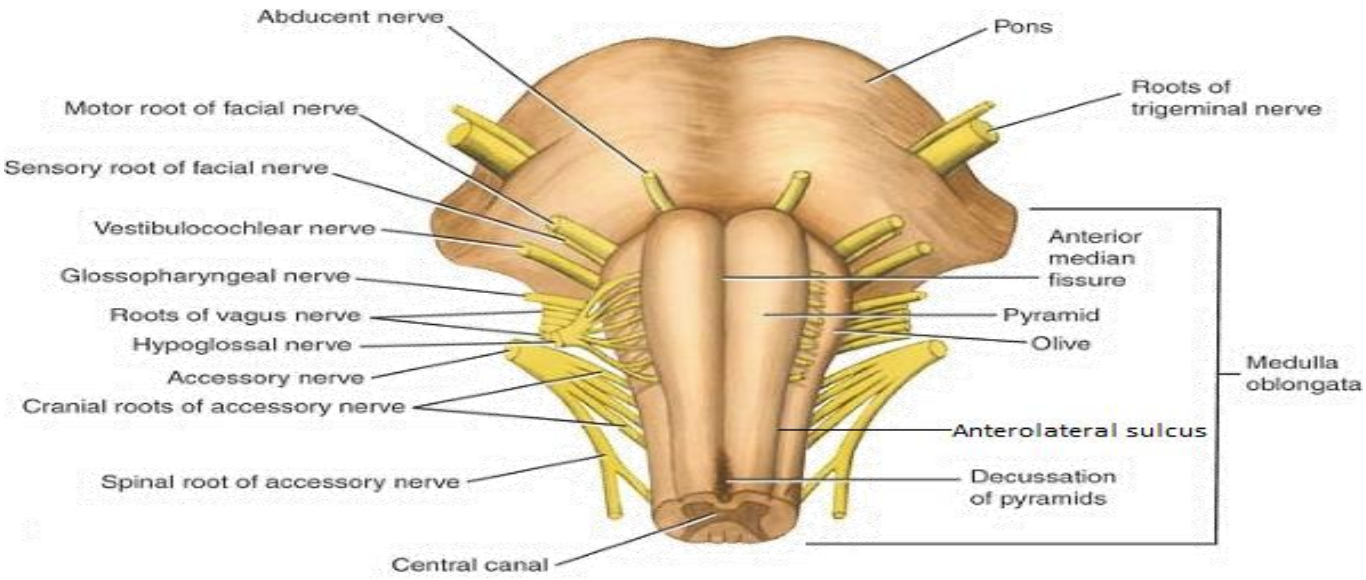
❑ Olive:

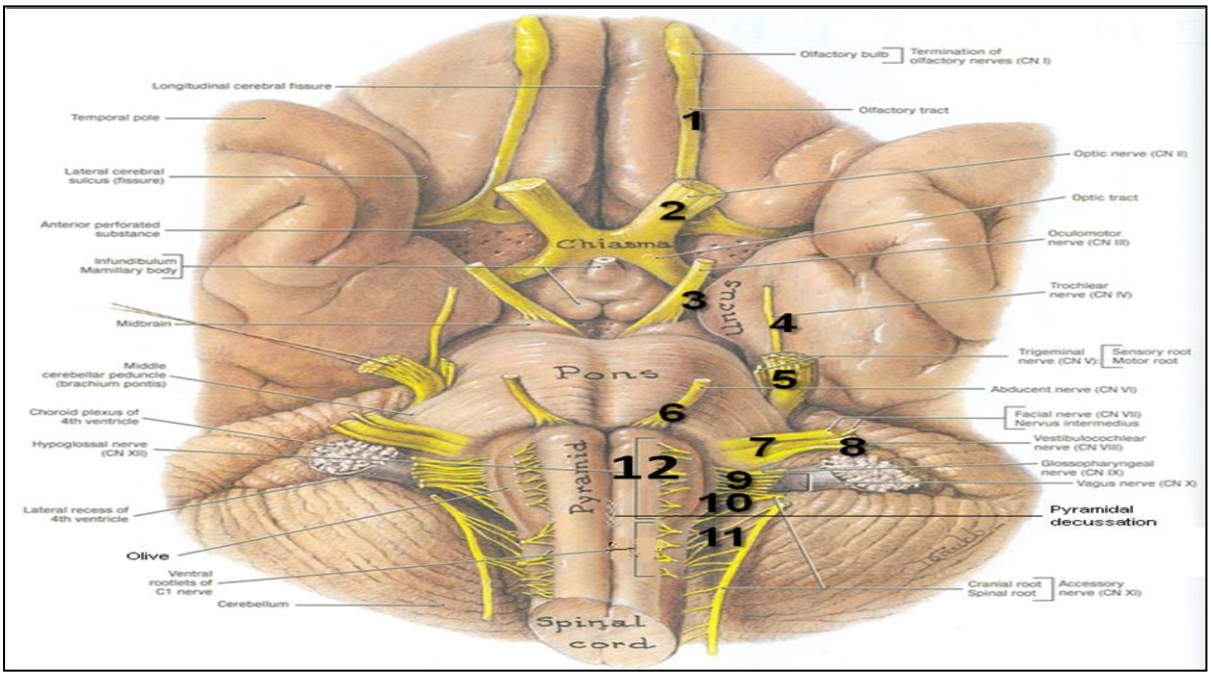
- A small elevation lies lateral to the pyramid.
- Produced by inferior olivary nucleus (important in control of movement)

❑ Nerves emerging from Medulla (4 nerves):

- Hypoglossal (12^{th}): from sulcus between pyramid & olive
- Glossopharyngeal (9^{th}), vagus (10^{th}) &cranial part(come from brine) of accessory (11^{th}): from sulcus dorsolateral to olive (from above downward)

MEDULLA – VENTRAL SURFACE





PONS – VENTRAL SURFACE

❑ **Basilar sulcus**

- It divides the pons into 2 halves, occupied by basilar artery.

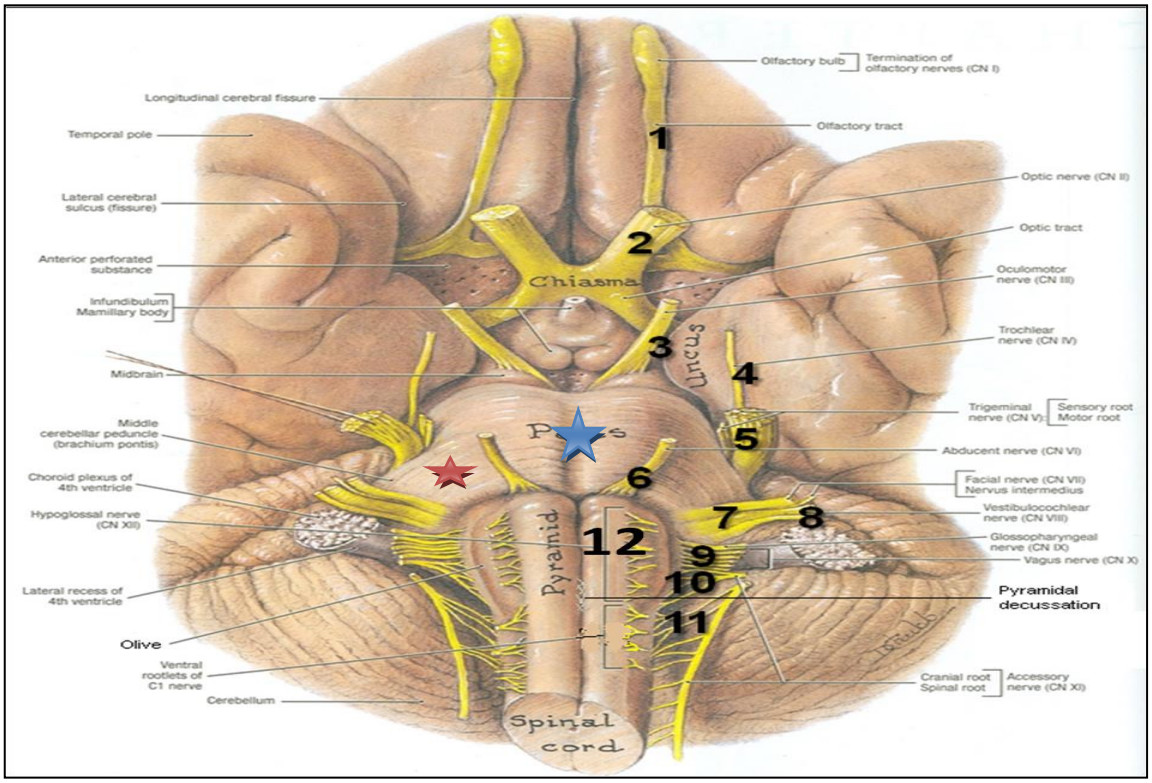
❑ Transverse pontine (pontocerebellar) fibers: (from pons to cerebellum)

- Originate from pontine nuclei (small mass of neuronal collection scared in the bone), cross the midline & pass through the contralateral middle cerebellar peduncle (that bindle fiber connect the cerebellum to the pons) to enter the opposite cerebellar hemisphere .

❑ Nerves emerging from Pons (4 nerves):

- Trigeminal (5th): from the middle of ventrolateral aspect of pons, as 2 roots: a small medial motor root & a large lateral sensory root.
- Abducent (6th): from sulcus between pons & pyramid. Most madly
- Facial (7th) &vestibulocochlear (8th): at cerebellopontine angle (junction between medulla, pons & cerebellum). Both nerves emerge as 2 roots: *from medial to lateral:* motor root of 7th, sensory root of 7thvestibular part of 8th&cochlear part of 8th

PONS – VENTRAL SURFACE



MID BRAIN – VENTRAL SURFACE

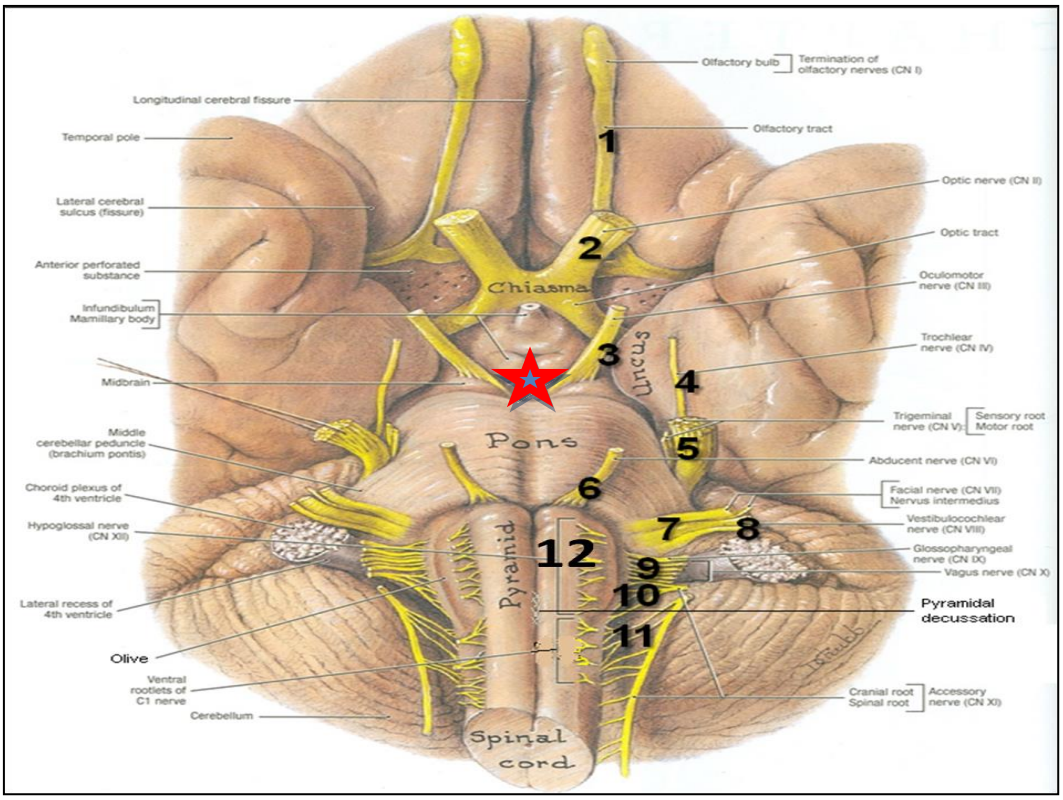
❑ large column of descending fibers

- (Crus cerebri or basis pedunculi), on either side, separated by a depression called the interpeduncular fossa. ★

❑ Nerve emerging from Midbrain (one):

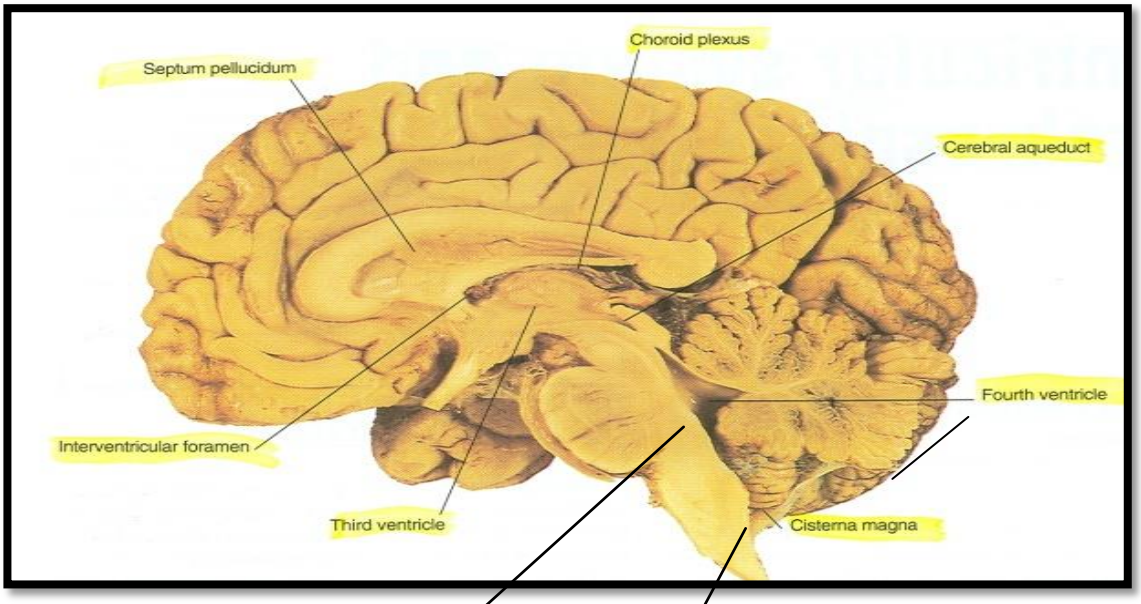
- Occulomotor (3rd): from medial aspect of crus cerebri, lateral to interpeduncular fossa.
-

MID BRAIN – VENTRAL SURFACE



MEDULLA – DORSAL SURFACE

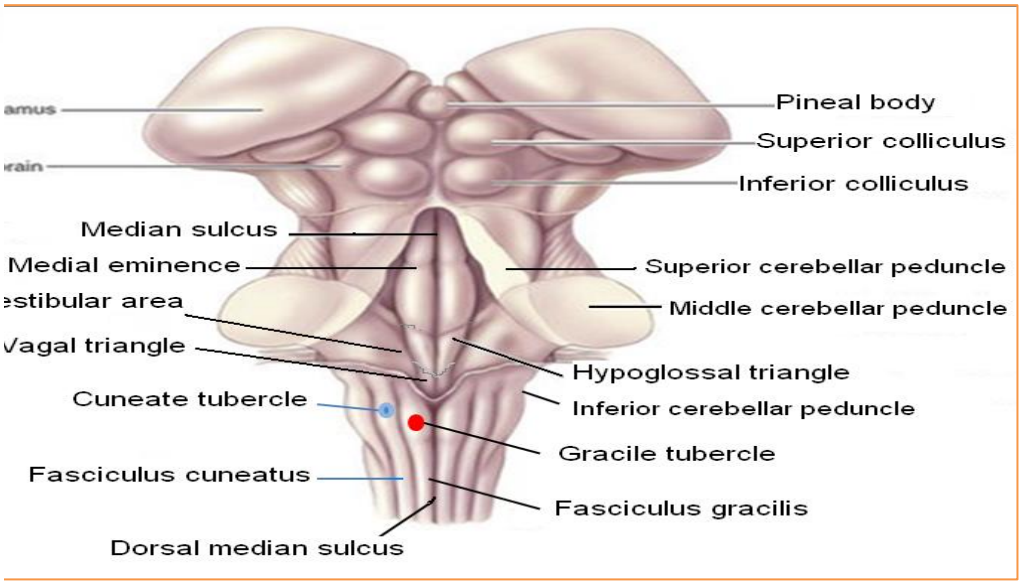
- The features differ in the caudal part (closed medulla) and the cranial part (open medulla)



Open medulla, closed medulla

CLOSED MEDULLA

- **Cavity: central canal.**
- **Composed of:**
  - **Dorsal median sulcus: divides the closed medulla into 2 halves.**
  - **Fasciculus gracilis: on either side of dorsal median sulcus.**
  - **Gracile tubercle: an elevation produced at the upper part of fasciculus gracilis, marks the site of gracile nucleus.**
  - **Fasciculus cuneatus: on either side of fasciculus gracilis.**
  - **Cuneate tubercle: an elevation produced at the upper part of fasciculus cuneatus, marks the site of cuneate nucleus.**



*not take a part in the formation of 4 ventricles.

*It's Continuous with spinal cord

OPEN MEDULLA

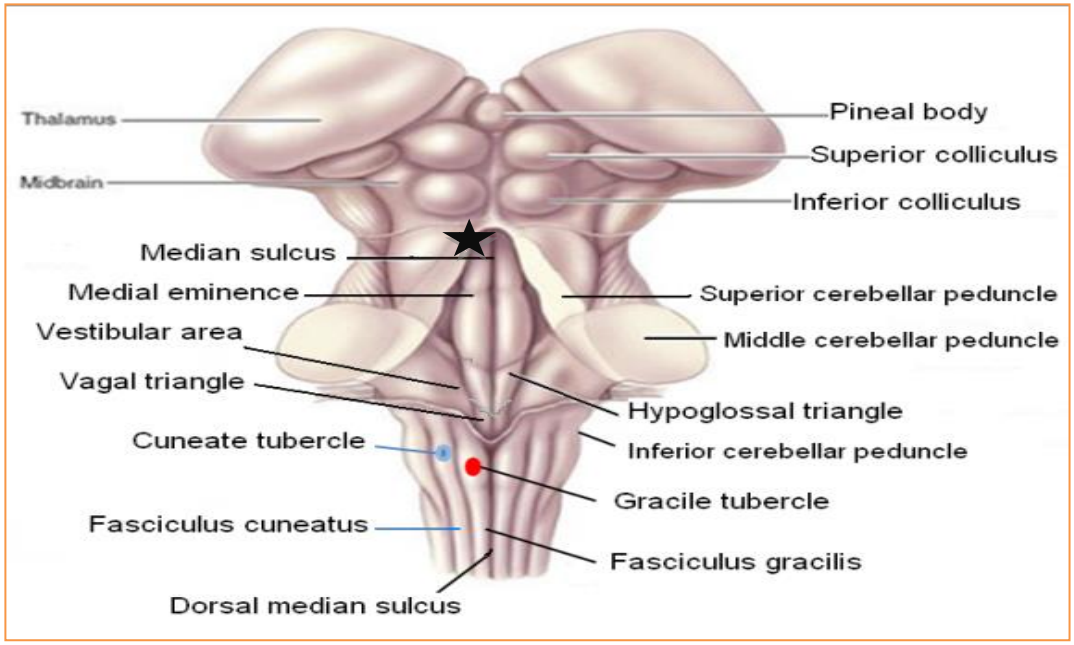
- **Cavity: 4th ventricle**
- **On either side, an inverted V-shaped sulcus divides the area into 3 parts *(from medial to lateral):***

1. **Hypoglossal triangle: overlies hypoglossal nucleus.(upper)**
2. **Vagal triangle: overlies dorsal vagal nucleus.(lower)**
3. **Vestibular area: overlies vestibular nuclei lateral to sulcus.**

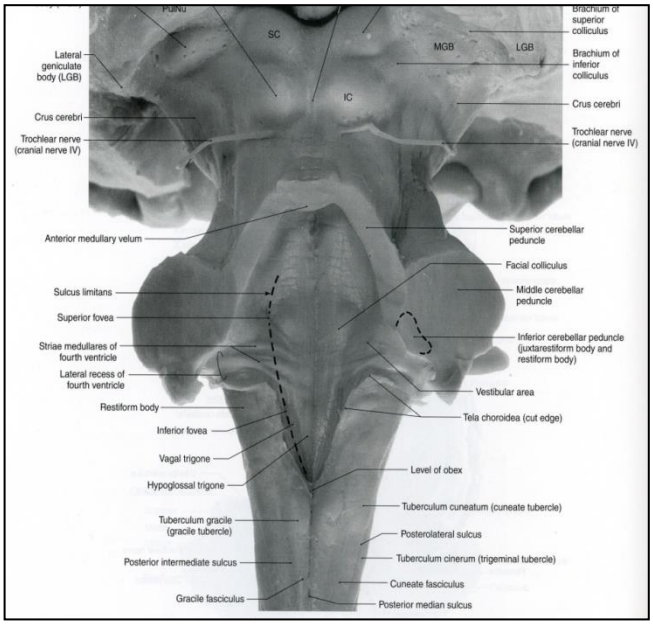
***all these nuclei sit on floor of 4th ventricles**

PONS – DORSAL SURFACE

- **Separated from the medulla by an imaginary line passing between the caudal margins of middle cerebellar peduncle.**
- **On either side, a sulcus divides the area into 2 parts *(from medial to lateral):***
  - **Medial eminence& facial colliculus ★ : overlies abducent nucleus.**
  - **Vestibular area: overlies vestibular nuclei.**



- **The dorsal surface of open medulla and pons lie in the caudal 1/3rd and the rostral 2/3rd of the floor of the 4 th ventricle respectively**



MID BRAIN – DORSAL SURFACE

Marked by 4 elevations:

1. **Two superior colliculi: concerned with visual reflexes.**
2. **Two inferior colliculi: forms part of auditory pathway.**

❑ **Nerve emerging from Midbrain (one):**

- **Trochlear (4th): just caudal to inferior colliculus (The only cranial nerve emerging from dorsal surface of brain stem).**

SUMMARY:

***The brain stem is composed (*from above downwards)* of: midbrain, pons & medulla oblongata which are continuous with each other, with diencephalon above & with spinal cord below.**

***The brain stem is connected with cerebellum through three pair of cerebellar peduncles.**

***The brain stem is the site of cranial nuclei, the pathway of important ascending & descending tracts & the site of emergence of cranial nerves (from 3rd to 12th).**

***Cranial nerves (with the exception of 4th) emerge from ventral surface of brain stem.**

Question Excerpt:

1. The 3th and 4th Cranial nerves emerge from :

A.medulla
B.pons
C.midbrain
D.cerebellum
E.foot

2. Trigeminal nerve emerges from :

A.medulla
B.pons
C.midbrain
D.cerebellum
E.back

3. One of cranial nerves emerges from the cerebellopontine angle :

A.CN III
B.CN VI
C.CN V
D.CN VII
E.CN IV

4. Where is the location of The interpeduncular fossa :

A.MIDBRAIN
B.PONS
C.MEDULLA

5. Which is the cranial nerve exits through the interpeuncular fossa :

A.III
B.IV
C.V
D.VI
E.XL

6. Which is the CN exits through the dorsal side of the brainstem :

A.IV
B.V
C.III
D.VI

7.The 4th CN caudal to :

A.SUPERIOR COLLICULUS
B.INFERIOR COLLICULUS
C.INTERMEDIATE COLLICULUS
D.MIDDLE COLLICULUS

8.The facial calculus is the little bump in the _____ ventricle

A.2ND
B.4TH
C.3RD
D.1ST
E.5TH

Q	Answer
1	C
2	B
3	D
4	A
5	A
6	A
7	B
8	B

GOOD LUCK

Anatomy Team Leaders:

Fahad AlShayhan & Eman AL-Bediea.