

*7th lecture*

*External Structure Of Brain Stem*

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# BRAIN STEM

## \*External features\*

### \*Development of brain:

- ❑ The brain develops from the cranial part of neural tube:.

The cranial part divides into 3 parts

#### FOREBRAIN

1)Two cerebral hemispheres.

cavities: (2 lateral ventricles).

2)Diencephalon

(cavity: 3<sup>rd</sup> ventricle) :  
*thalamus,*  
*hypothalamus,*  
*epithalamus &*  
*subthalamus*

#### Midbrain

(cavity:  
cerebral  
aqueduct).

#### Hindbrain

(cavity: 4<sup>th</sup> ventricle):  
subdivides into:  
Pons ,cerebellum ,  
medulla oblongata

## \*Brain Stem\*

### ❑ Site:


- It lies on the basilar part of occipital bone (clivus).

### ❑ Parts: From above downwards:


- Mid brain, pons & medulla oblongata.

### -Connection with the cerebellum:

Each part of the brain stem is connected to the cerebellum by cerebellar peduncles.

superior cerebellar peduncle  Midbrain.

middle cerebellar peduncle  Pons.

inferior cerebellar peduncle  Medulla oblongata

### *\*Functions of Brain Stem\**

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

## **\*Medulla\***

### -Ventral surface-

#### **\*Components\***

##### *olive*

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

##### *pyramid*

-An elevation, lies on either side of ventral median fissure  
-Produced by **cortico-spinal tract**.

##### *Ventral median fissure*

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

#### **\*Nerves emerging from Medulla (4**

##### **1)Hypoglossal**

(12<sup>th</sup>): from sulcus **between pyramid & olive**

**2)Glossopharyngeal** (9<sup>th</sup>),

**3) vagus** (10<sup>th</sup>).

**4)cranial part of accessory** (11<sup>th</sup>):

\*(9,10,11 cranial part); from sulcus **dorsolateral to olive** (from above downwards).

## - Dorsal Surface-

*Caudal part*  
(closed medulla)

*Cranial part*  
(open 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**.

- ❑ **Cavity:** 4<sup>th</sup> 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.
  2. **Vagal triangle**: overlies dorsal vagal nucleus.
  3. **Vestibular area**: overlies vestibular nuclei.

## *\*Pons\**

### -Ventral surface-

*Component*

*Nerves emerging from  
Pons (4 nerves):*

#### - Basilar sulcus:

Divides the pons into 2 halves, occupied by basilar artery

-Transverse pontine (**pontocerebellar**) fibers:

- Originate from pontine nuclei, cross the midline & pass through the contralateral middle cerebellar peduncle to enter the opposite cerebellar hemisphere.

1) **Trigeminal (5<sup>th</sup>)**: from the middle of ventrolateral aspect of pons, as 2 roots: a small medial motor root & a large lateral sensory root.

2) **Abducent (6<sup>th</sup>)**: from sulcus between pons & pyramid.

3) **Facial (7<sup>th</sup>)**

4) **vestibulocochlear (8<sup>th</sup>)**.

-The 7 & 8 nerve are at

**cerebellopontine angle**

(junction between medulla, pons & cerebellum). Both

nerves emerge as 2 roots:

from medial to lateral: motor root of 7<sup>th</sup>, sensory root of 7<sup>th</sup> vestibular part of 8<sup>th</sup> & cochlear part of 8<sup>th</sup>.

### -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.



## *\*Midbrain\**

*Ventral  
surface*

*Dorsal  
surface*

*Component*

-large column of descending fibers (**crus cerebri** or **basis pedunculi**), on either side, separated by a depression called the interpeduncular fossa.

*Nerve emerging from it:*

-**Oculomotor (3<sup>rd</sup>)**: from medial aspect of crus cerebri.

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

## *\*Important note\**

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



### **\*SUMMARY\***

- 1) 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.
- 2) The brain stem is connected with cerebellum through three pair of **cerebellar peduncles**.
- 3) The brain stem is the site of cranial nuclei, the pathway of important ascending & descending tracts & the site of emergence of cranial nerves (from 3<sup>rd</sup> to 12<sup>th</sup>).
- 4) Cranial nerves (with the exception of 4<sup>th</sup>) emerge from ventral surface of brain stem.

### **-QUESTION 1-**

□ **The cranial nerve that emerges from dorsal surface of midbrain is:**

1. Oculomotor (3<sup>rd</sup>).
2. Trochlear (4<sup>th</sup>).
3. Abducent (6<sup>th</sup>).
4. Facial (7<sup>th</sup>).

## -QUESTION 2-

### ☐ Regarding the medulla oblongata:

1. The pyramid is lateral to olive.
2. The hypoglossal nerve is the most lateral nerve emerging from it.
3. The cuneate tubercle is lateral to gracile tubercle.
4. The cerebellum is connected to it by middle cerebellar peduncle.

★Good Luck★