

# CNS

Doctor 2021



## Anatomy Sheet (5)

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# CEREBRUM 1

In the last lectures we discussed the basal nuclei  
(the beginning of the forebrain)

The brain has

1) Forebrain :

**Diencephalon – the center part**

**Telencephalon - has the outermost layer called cerebral cortex**

and the subcortical white matter which contain the basal nuclei  
(Collection of cell bodies)

2) Midbrain

3) Hindbrain

Now let's discuss the cerebrum :

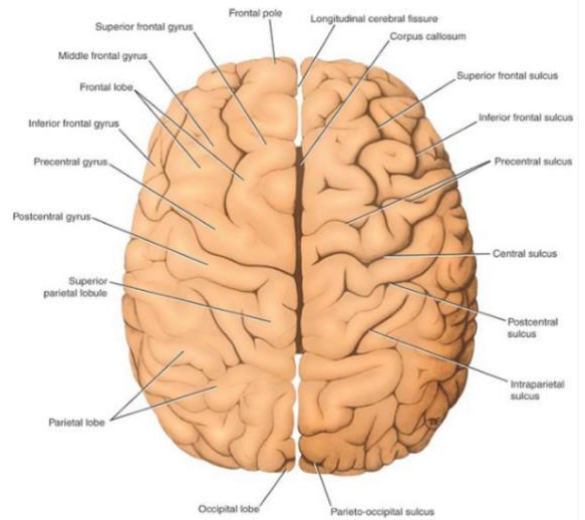
**Superior view of the cerebrum, it divides into left and right**

**Cerebral Hemispheres by the longitudinal fissure which contains:**

- **Flax cerebri – one of the folds of dura matter**
- **Anterior cerebral arteries -one of the blood supply for the brain**

We have 3 layers of meninges :

- Dura matter is the outermost layer of the maninges covering the brain, has two layers (outer ,inner) firmly attach to each other but in certain places they split giving spaces for the dural venous sinuses , the inner layer of the dura matter descends in the deep grooves or fissures of the brain like the longitudinal fissure forming what called falx cerebri
- Arachnoid matter
- Pia matter – the deeper layer and firmly attach to the surface of the brain



# CEREBRAL HEMISPHERES

Each hemisphere is divided into lobes :

**Frontal – the most anterior**

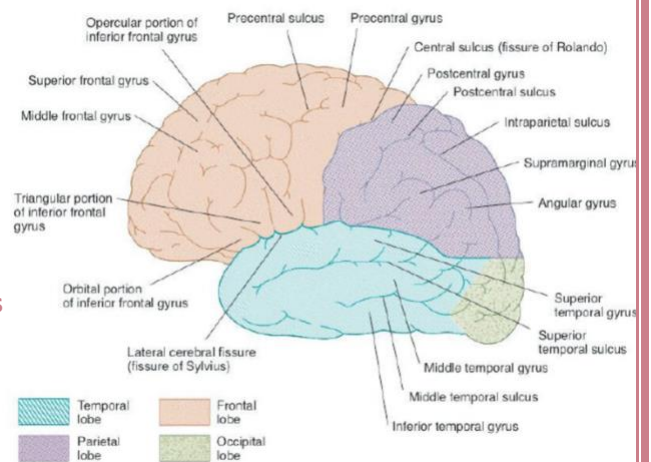
**Parietal – posterior to the frontal lobe**

**Temporal – located inferiority**

**Occipital – the most posterior**

The outer surface of each cerebral hemisphere is characterized

By the presence of Gyri or folds ( raised up ) and sulci or fissures  
( deeped in ) to increase the surface area for function .



# THE MAIN SULCI

1) Central sulcus

-From the lateral view it runs superiorly then downward and forward

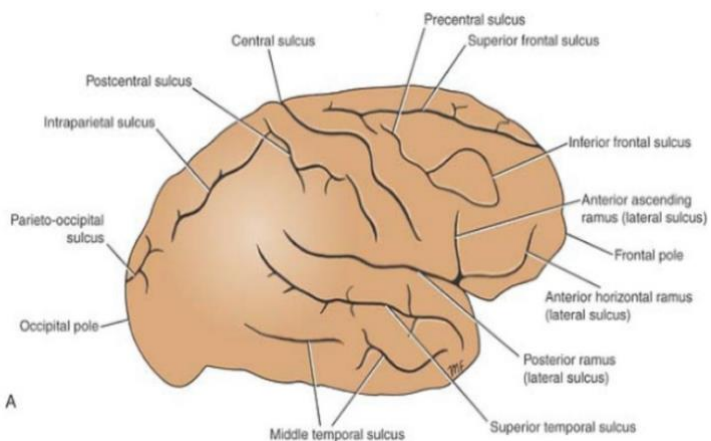
- Divides the frontal lobe anteriorly from the parietal lobe posteriorly
- The only sulcus that forms indentation on the superiomedial aspect and the only one between two parallel gyri

## 2) Lateral sulcus or fissure which has :

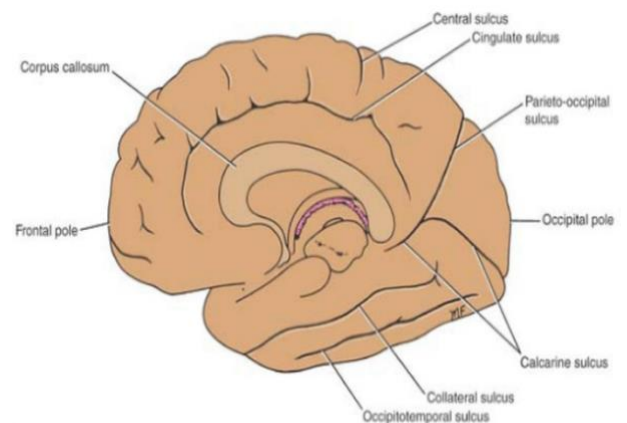
1) **Stem** – the major part and divides the cerebrum into frontal and parietal lobe superiorly from the temporal lobe inferiorly

2) **Three rami** :

- anterior horizontal ramus
- anterior ascending ramus
- Posterior ramus



Lateral view



Medial view

## 3) Parieto-occipital sulcus

Separate the parietal lobe from the occipital lobe, we can visualize this sulcus just on the medial surface because on the lateral surface there is no true separation between the parietal and occipital.

It begins on the superior medial margin of the hemisphere, then runs downward and anteriorly on the medial surface

**Note 1** : in the medial aspect there is a structure called corpus callosum which is white matter- the biggest commesural fibers in the brain connecting the right hemisphere with left one.

**Note 2**: the cerebral white matter divides into three kinds:

- 1) Commesural fibers connecting right hemisphere with left hemisphere
- 2) Projecting fibers connecting lower centers with higher centers or vice versa
- 3) Association fibers connecting two parts within the same hemisphere

## 4) Calcarine sulcus

Begins under the posterior end of the corpus callosum and arches upward and backward to reach the tip of the occipital lobe ( called occipital pole)

We discussed the main sulci in the cerebrum, parieto-occipital and calcarine sulcus can be visualized from the medial view only, now let's discuss the main sulci in each lobe :

# FRONTAL LOBE

Anterior to the central sulcus and superior the the lateral sulcus

### Three sulci :

- **Precentral sulcus** : parallel ( anterior) to the central sulcus ( pre means anterior )
- **Superior frontal sulcus** : close to the midline
- **Inferior frontal sulcus**

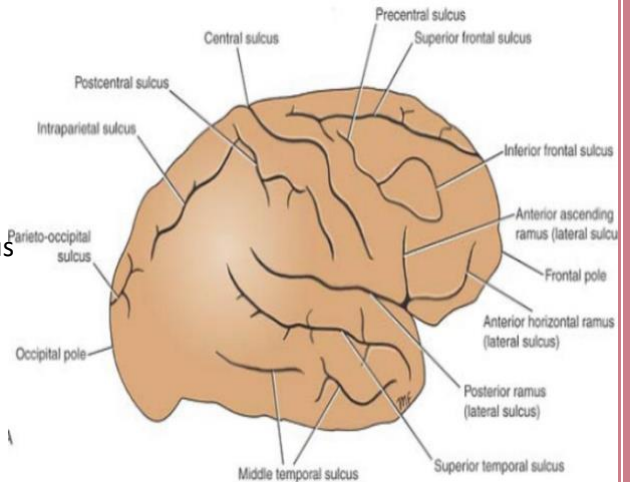
**Note** : Those are the major sulci but in general all the surface has sulci and gyri

### These sulci separate the frontal lobe into four gyri :

- **Precentral gyrus** – anterior to the central sulcus

It is a Pure anatomical term , but functionally we call it Primary motor cortex

- **Superior frontal gyrus** - between the longitudinal fissure  
And the superior frontal sulcus
- **Middle frontal gyrus** - between superior and inferior sulcus
- **Inferior frontal gyrus** -the last one



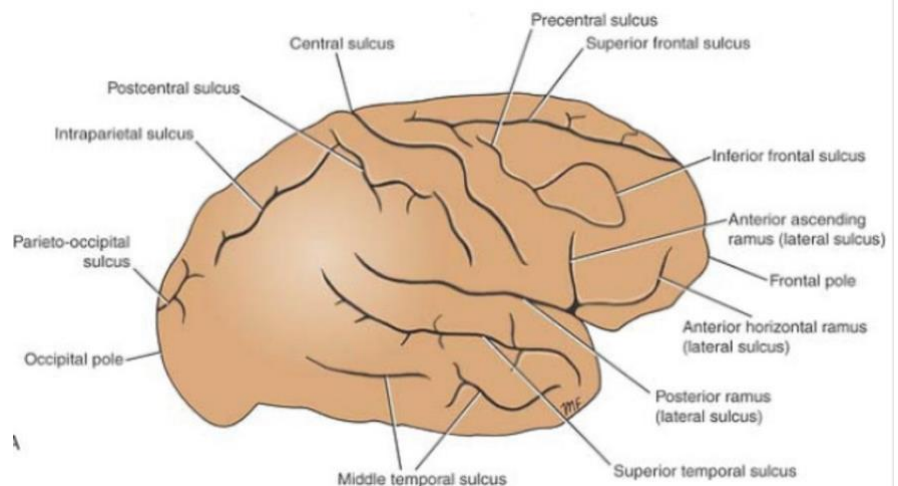
## PARIETAL LOBE

Posterior to the central sulcus and superior to the lateral sulcus , has two sulci and three gyri

- **Two sulci** :
- **Postcentral sulcus** : parallel ( posterior ) to the central sulcus (post means posterior )
- **Intraparietal sulcus** : divides the parietal lobe into two gyri or lobules: superior and inferior parietal lobule or gyrus

### Three gyri :

- **postcentral gyrus** :between the central sulcus and postcentral sulcus , functionally called primary somatosensory cortex S1
- Superior parietal lobule or gyrus
- Inferior parietal lobule or gyrus



# TEMPORAL LOBE

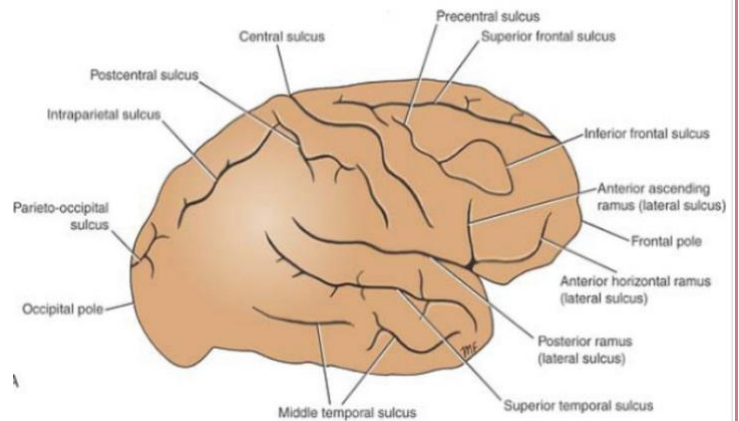
Located just inferior to the lateral sulcus (or the posterior ramus of lateral sulcus ) and seen on the lateral view

## Two major sulci :

- Superior temporal sulcus
- Middle temporal sulcus

## Three gyri:

- **Superiotemporal gyrus** : between lateral sulcus and superior temporal sulcus
- Middle temporal gyrus
- Inferior temporal gyrus

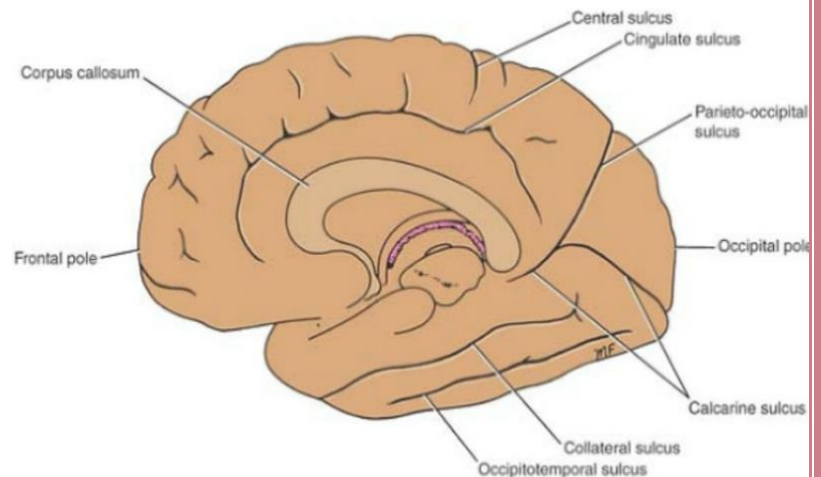


# CINGULATE GYRUS

On the medial view of the cerebral hemisphere, we can see the corpus callosum -commesural fibers- and the cingulate gyrus that begins beneath the anterior end of the corpus callosum forms an arch above it and continues until reaches its posterior end .

Lies between

- Callosal sulcus -closer to corpus callosum
- Cingulate sulcus – above



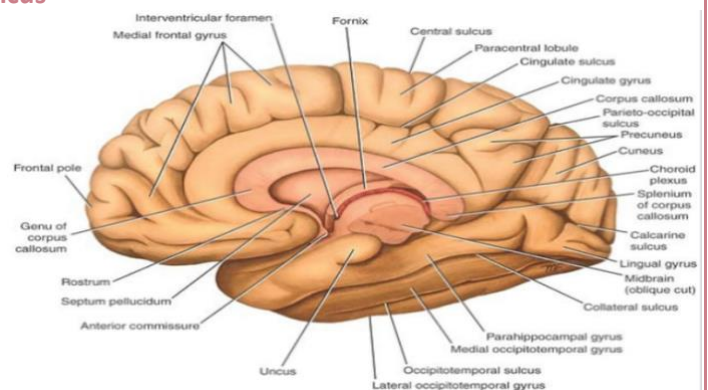
**Note 1** : cingulate gyrus is very important part of limbic system,as we said in the lateral spinothalamic that is related to the pain and temperature , it has widespread cortical termination and one of them is the cingulate gyrus , It is related to emotional component of the pain.

**Note 2**: limbic system in general has two major functions: emotions and mechanisms of recent momory .

# PRECUNEUS

On the medial view we can see: corpus callosum, cingulate gyrus, cingulate sulcus, callosal sulcus , calcarine sulcus ,parieto- occipital sulcus.

Anterior to the parieto- occipital sulcus : **precuneus** , It is bounded anteriorly by the posterior end of the cingulate gyrus and posteriorly by the parieto- occipital sulcus



# CUNEUS

Posterior to the parieto- occipital sulcus : **cuneus ( part from the occipital lobe )** , It is bounded above by the **parieto- occipital sulcus** and inferiorly by the **calcarine sulcus** and posteriorly by the **superior median**.

On the medial surface inferiorly (Parts from the temporal lobe ) We have 2 sulci and 3 gyri :

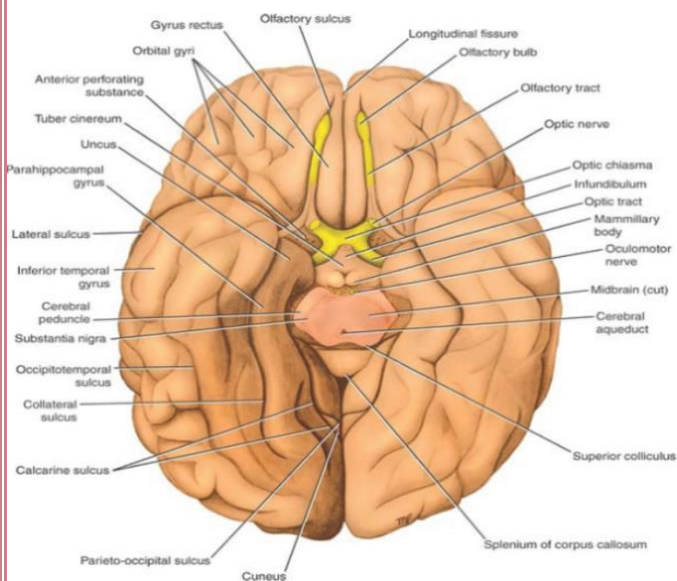
## Sulci :

- **Collateral sulcus** :on the inferior surface of the Hemisphere runs anteriorly below the calcarine sulcus, closer to the midline , separates the parahippocampal gyrus from the medial occipito-temporal gyrus
- **Occipito-temporal sulcus** : medial to it we have medial Occipito-temporal gyrus and lateral to it the lateral Occipito-temporal gyrus.

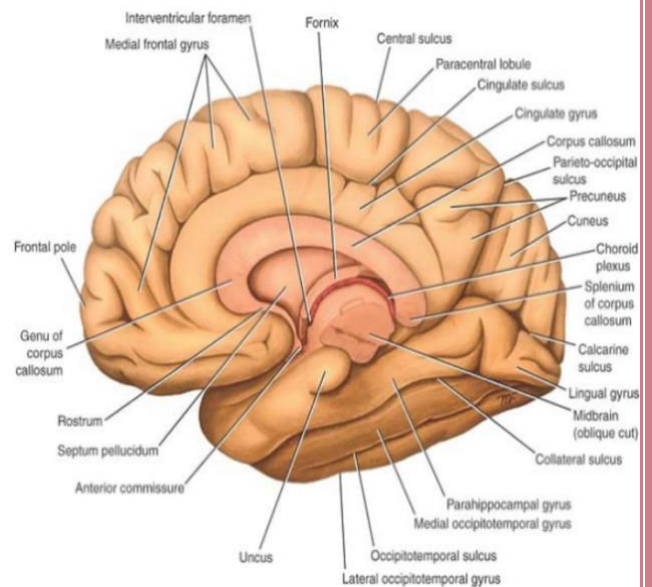
## Gyri :

- **Parahippocampal gyrus** : It is medial to the collateral sulcus( closer to the midline) and has a structure in it's anterior end called **uncus**
- **medial Occipito-temporal gyrus** :bounded medially by the collateral sulcus and laterally by the Occipito-temporal sulcus
- **lateral Occipito-temporal gyrus** : lies lateral to the Occipito-temporal sulcus
- **Note** : we have another gyrus on the inferior surface called **lingual gyrus** located between the collateral

sulcus and the calcarine sulcus



Inferior view



Medial view

We discussed the sulci and gyri in each lobe ( pure anatomical names) , now we will discuss the functional areas in each lobe :

Before that we should know that each lobe has a general function :

- **Frontal lobe ( motor lobe )** : has a motor function and motor areas like ,primary motor area, premotor area ,frontal eye field , motor speech area, **All of them are motor functions.**
- **Parietal lobe ( sensory lobe )** : has a sensory function and areas like , primary somesthetic area ( area12) , sensory association area (area 57 ) .
- **Temporal lobe ( Auditory lobe )** : primary Auditory area and secondary Auditory area.
- **Occipital lobe ( visual lobe )** : primary visual area and secondary visual area .