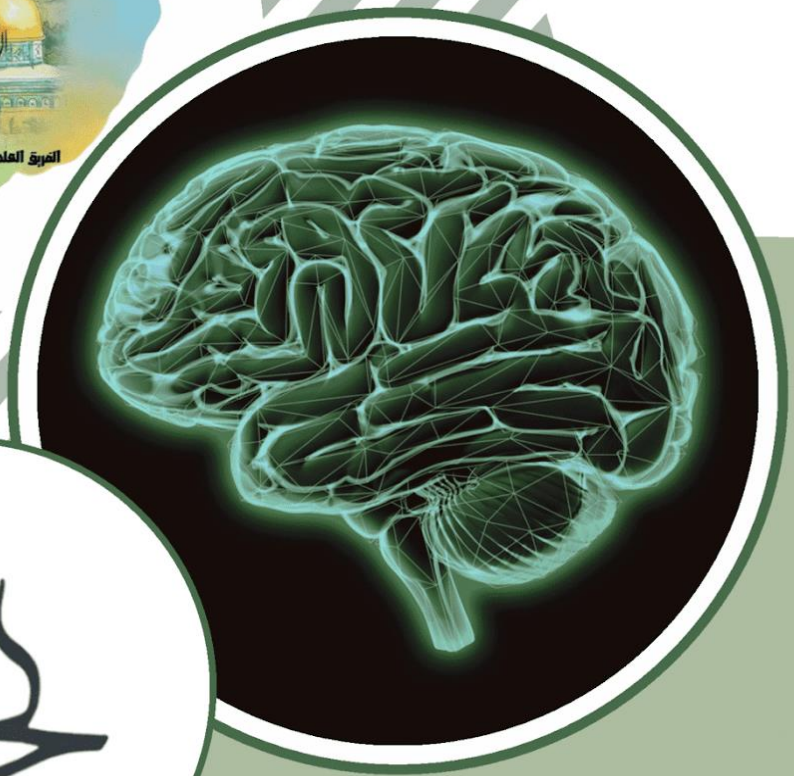
CNS ANATOMY

DOCTOR NOTES



LECTUR NO. 1

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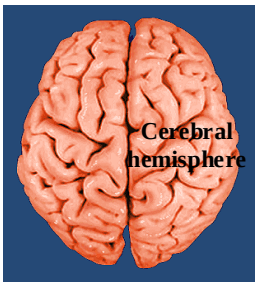
Pages from 18-20 are included in the exam material and explained at the end of the course in the Embryology Lectures.

Note that the table on page 20 is very important, and many questions in the exam will come from it (e.g., Where is the telencephalon/diencephalon developed from?).

Now let's start this lecture:

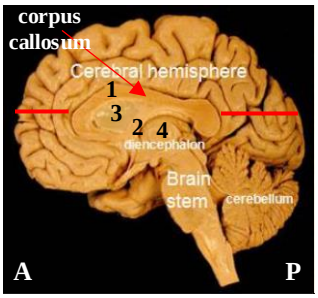
1.1 The Brain:

Figure (1)



The brain consists of 2 hemispheres (Right and Left), see figure 1 , separated by the **longitudinal fissure**. If it is cut, you will see the **commissural fibers** (inner connecting parts that connect different areas in the opposite hemispheres), the most important and larger one is the **1. corpus callosum** (the white pointed structure in figure 2).
It is important to know the anterior from the posterior side in order to name its parts (roughly, you can see that the space in front of the anterior side is shorter than the posterior. Besides, you can differentiate from the brain stem since it is projected posteriorly).

Figure (2)



Why is this junction between these two hemispheres important ?
So the right and left sides can work dependently (a split brain is a defect of separated sides of the brain in which the patient can't do coordinated movements, like wearing one side of a t-shirt and forgetting the other, flipping the brush to the wrong side. **One of its reasons is a lesion in the corpus callosum).**

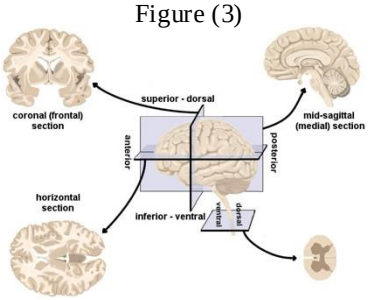
Underneath, there is a structure called the **2. fornix commissural** (smaller).
-**Functions**: Mostly controls emotions, slightly a role in memory and smell.

Between these two structures, there is a very thin layer of gray matter called the **3. septum pellucidum**, which acts as a certain for the lateral ventricle.

-**Function**: The human brain weighs 1.5 kg. The spaces inside (the **4 ventricles**) and the CSF between (circulated regularly one to twice daily by producing and secretion), plus there is no lymph or lymphatic vessels, so through the CSF, waste products are being washed away. Two ventricles are located in the **right and left** hemispheres (one in the left and the other in the right, or vice versa it doesn't matter).
The **third one** is between the right and left thalamus, which is seen in the coronal and horizontal sections.
The **last one** is between the cerebellum and the back of the pons and open medulla.

Below, we can see the secretory of the brain, the **4.thalamus**.
-**Function:** Sense of olfaction, despite that it bypasses it not inserted on it .

Figure (3)

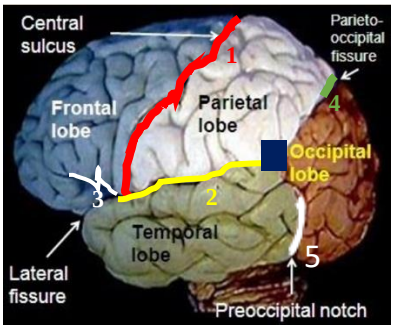


Below, there is the midbrain, pons, medulla, and behind, there is the cerebellum (called the little brain since it consists of 2 cerebellar hemispheres too that are connected by vermis).

-Differentiate between: 1.The sagittal section. 2.The coronal section (short and wide) 3.The horizontal section (an anteroposterior cut)(tall and thin) (important). Check this extra figure:

1.2 Divisions:

figure (4)



Four anatomical lobes (frontal, parietal, occipital, and temporal) figure 4

Each pair of them is separated by a structure called sulcus,
A **sulcus** is a groove in the depth of the brain; mainly, it is a stable and constant structure in all human beings.
A **fissure** is deeper than a sulcus.
A **gyrus** refers to an elevation on the brain (the more neural synapses there are, the more elevations appear (gyrus folds and numbers), which indicates a higher IQ level), so it's not a stable structure in the lobes for each human being.

The **1.central sulcus** divides each cerebral hemisphere into two roughly equal parts.
It starts on the medial side (1 cm of the medial surface of the brain) and then curves completely into the lateral side until it meets the posterior ramus of the lateral fissure.
The **2.posterior ramus of the lateral fissure** is called "posterior" because it is located posteriorly, but at its end, it curves into the anterior side, which gives rise to the **3.anterior ramus of the lateral fissure.**
The stem of the lateral fissure is located on the inferior surface.
The **4.parieto-occipital fissure** is located completely on the medial side.

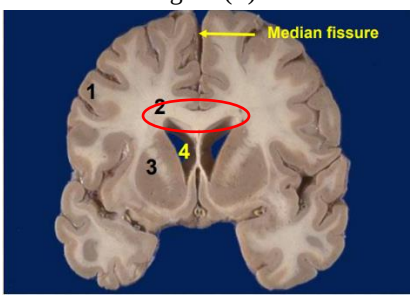
The **5.pre-occipital notch**:
An imaginary line can be drawn by connecting these two structures(4+5), which will separate the brain into **four anatomical lobes**:

- In front of the central sulcus: The frontal lobe — •Motor
- Between the central sulcus and the parieto-occipital fissure: The parietal lobe — •Sensory
- Behind the parieto-occipital fissure and the imaginary line: The occipital lobe — •Vision
- Below the posterior ramus of the lateral fissure: The temporal lobe — •Auditory and memory

Each lobe is labeled separately because each has a **specific function** respectively above:

1.3 The coronal section:

figure (5)



Hidden structures can be seen here and can't be seen in the sagittal section: ventricles, basal nuclei.

-**Gray matter**: balance and motor coordination (e.g., **cerebellum; ataxia or a lesion there will prevent the person from performing specific detailed movements).**
-**Basal nuclei(3)**: highly coordinated consequential movements in space are planned before the person makes an actual move.
-**Cerebral cortex(1)**: integration, long-term memorization, and, most importantly, consciousness and alertness.
-Alertness: the act of being awake; it is the responsibility of the reticular formation.
-Consciousness: the act of being aware of what's happening around you.
If a person is in a coma, they will be alert but not aware (alertness without consciousness).
-**The lateral ventricle(4).**
-The **anterior part of the corpus callosum(2)** (away from the brainstem) can be clearly seen in the horizontal section of the brain.

1.4 Cerebral cortex:

More about cerebral cortex layers
Not an exam material

Layers	Components	Schematic	Afferents		Efferents
I – Molecular	Axons and Dendrites (Cell processes)		From other regions of Cortex and Brainstem	Epomedicine.com	To other regions of cortex (Intra-cortical Association functions)
II - External granular	Densely packed Stellate cells + Small pyramidal cells				
III – External pyramidal	Loosely packed Stellate cells + Medium pyramidal cells				
IV – Internal granular	Densely packed Stellate cells only			+ From Thalamus	
V – Internal pyramidal	Large pyramidal cells only (few stellate cells) – Giant Pyramidal cells of Betz			+ From Brain stem	To Brain stem & Spinal cord (Projection fibers)
VI - Multiform	Multiple sized pyramidal cells + Loosely packed stellate cells				To Thalamus

Betz cells are triangular in shape
pyramidal fibers are projected from it towards the spinel tract (4, but mainly 5)

1.5 The frontal lobe:

Parallel to the **central sulcus**, in front of it, there is a sulcus called the **1.precentral sulcus**.
Another sulci: The **2.superior** and **3.inferior frontal sulci**.
The posteroanterior ascending stem on the inferior surface (4 parts).
The 1.**precentral gyrus is the motor area 4**.
Gyri: 2.**Superior 3.medial 4. inferior gyri.**

-The inferior part is divided into: orbital (close to the orbital surface), triangular (between the ascending and anterior parts), and opercular.

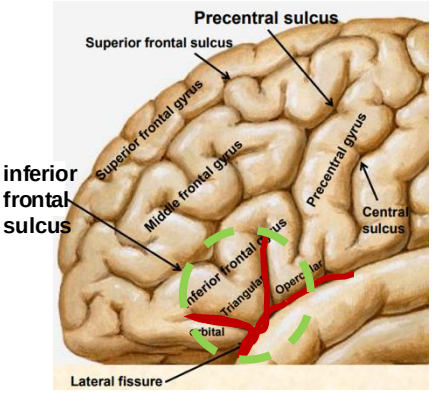


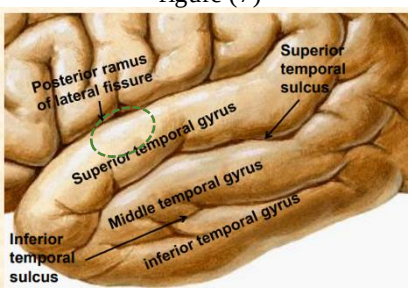
figure (6)

Inside this circle there are Areas 44 and 45, Broca's area (fluid speech in different muscles).
A lesion there (motor aphasia) won't affect the whole speech process; instead, the patient won't be able to form a complete sentence, just random words. This is opposite to a person who has a lesion in the language area, where they can speak a fluid sentence, but it won't be meaningful.

1.6 The temporal lobe:

figure (7)

It contains 2 sulci : **Superior & inferior temporal sulci**.
• The 2 sulci divide the temporal lobe into 3 gyri:
superior, middle & inferior temporal gyri.



Inside this circle there is Area 41or 42 (receives information from both ears)(role of cerebralization: which indicates that each side of the body is controlled by the opposite hemisphere, a lesion there will cause paralysis in the contralateral side (contralateral hemaplasia))
However, this is not the case here, since this area receives information from both ears so general reduction in hearing accuty will happen.

-The temporal lobe, especially the hippocampus, is crucial for **short** memory functions

1.7 The insula (Island of Reil):

Actually there is a 5th lobe called the insula, locates on the **lateral** side, can be seen when the posterior ramus of lateral fissure is removed
It is an egg shape gyri

-**Function:** important for gestation and autonomic function of the brain (not emotional) which means the act toward pain like sweating, headache or tachycardia**.**

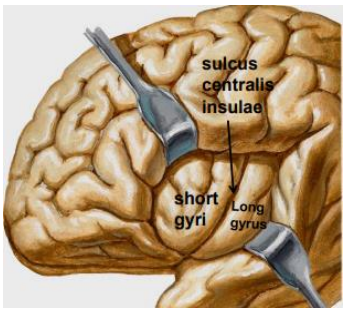


figure (8)

1.8 The parietal lobe:

Postcentral sulcus: parallel to & one finger behind the central sulcus.
Postcentral gyrus: Between the central & postcentral sulci.(has the somatosensory area 321)
Intraparietal sulcus(sometimes called fissure): Begins at the middle of the postcentral sulcus & divides the remaining part of the parietal lobe into:
Superior parietal lobule and **Inferior parietal lobule**: Is further divided into: **Supramarginal gyrus**: Above the upturned end of the post ramus of lateral fissure.
Angular gurus: Above the upturned end of superior temporal sulcus area 39: Wernicke's area (Area 39, 40, supramarginal, angular gyrus, and posterior part of auditory area 22) Involved in calculations, and recognizing subjects from their partial parts.

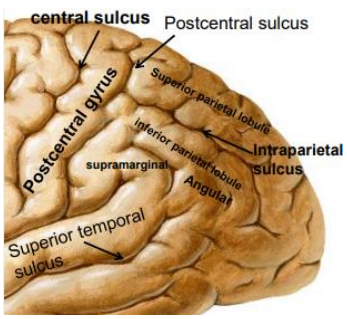


figure (9)

V2

Page 3 edit in the first pic
Page 3 lateral ventricle not 3rd
Page 5 posterior ramus not fissure