The cerebrum

By StudyAid Presenter



The cerebrum

- Four lobes •
 - Frontal lobe
 - Parietal lobe •
 - Occipital lobe •
 - Temporal lobe •
- Each lobe has it's own specific • set of functions
- •
- White vs gray matter White = tracts, connections between the brain's structures
 - Gray = neuronal cell bodies •



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Important gyri and sulci

- Precentral gyri (primary motor cortex)= in front of the central sulcus, postcentral gyrus (primary somatosensory cortex) = behind the central sulcus
- Parieto-occipital sulcus separates parietal and occipital lobes
- Transverse fissure separates occipital lobe and cerebellum





Frontal lobe and important structures

- It is the largest lobe
- Contains four main gyri
 - Superior frontal
 - Middle frontal
 - Inferior frontal
- Other important gyri
 - Orbital gyrus
 - Gyrus rectus





Motor areas

The motor areas of the brain include

- Primary motor cortex Premotor cortex
- Supplementary motor area (SMA)
 HIGH YIELD: Primary motor

cortex is part of the precentral gyrus, directly in front of the central sulcus

Primary motor cortex - simple distal functions Premotor cortex + SMA - complex functions : planning, sequencing, ordering



Broadmann was one of the first to note distinct fields in the motor cortex





Broca's area and the FEFs

Broca's Aphasia (Non-Fluent Aphasia) - YouTube



Broca's area is an area of the brain present on the inferior frontal gyrus Broca's aphasia is characterized by slow, effortful speech

The FEFs are present on the superior frontal gyrus and they control saccadic eye movement.

The FEFs control medial and lateral recti and are involved in saccadic eye movement



Medial surface of the brain

Important structures

- Paracentral lobule, named because it contains the CENTRAL sulcus (HIGH YIELD)
 - Contains parts of precentral and postcentral gyri
 - Iherefore has both motor and sensory functions
 - Involved in urination, defecation, somatosensation of the distal limbs
 - LESION to this part of the brain will lead to
 - Contralateral limb weakness
 - Urinary incontinent
 - Babinski sign

- Other important gyri;
 - Cingulate gyrus, hugging the corpus callosum
 - Cuneus anteriorly, by the parieto-occipital sulcus, posteriorly by the calcarine sulcus (HIGH YIELD)
 - Precuneus pre, i.e in front of the cuneus
 Subparietal sulcus, inferior to it
 - Lingual gyrus, underneath the calcarine fissure





Temporal lobe

- Located beneath the lateral fissure (separation between the frontal and temporal lobe)
- Made up of three gyri
 - Superior, middle and inferior temporal gyri
- Areas
 - Primary auditory cortex
 - Auditory association cortex
 - Wernicke's area
 - Primary olfactory cortex



More about the temporal lobe

- Long term memory formation
 - Through communication with the hippocampus
- High-auditory processing
 - Holds the primary auditory cortex
 - Receives sensory information from the ears and secondary areas
- Language recognition and comprehension
 - Wernicke's area plays a key role

REMEMBER TO BE ABLE TO LOCALIZE THIS VERY IMPORTANT STRUCTURE (HIGH YIELD) Insula

The hidden lobe of the brain Located deep within the lateral sulcus



Wernicke's aphasia:

- Receptive aphasia
 - . Comprehension 0
 - Difficulty understanding spoken and written 0 language
 - Effortless (as opposed to Broca's aphasia) Grammatically incorrect 0
 - 0
- https://youtu.be/3oef68YabD0?si=JwyxdSnU st3r7ULZ&t=6



Parietal lobe

- Important anatomical areas
 - Parieto-occipital sulcus separates parietal and occipital lobes
 - Inferior and superior parietal lobules
 - Important areas in spatial awareness (later)
 - Supramarginal gyrus
 - Angular gyrus





Sensory areas: primary somatosensory cortex

- Despite the name, the primary somatosensory cortex acts as the sensory hub of the brain.
- On top of nociception, vibration, it also detects proprioception
- Destination of major sensory tracts such as the dorsal column medial lemniscus (DCML) tract and the spinothalamic tract
- Superior and inferior parietal lobules are involved in spatial awareness
 - Clinical correlation: Lesions in this area lead to hemineglect syndrome





Occipital lobe

- Located at the **posterior** part of the cerebral hemisphere.
- Bounded by the **parieto-occipital sulcus** (medially) and **occipital notch** (laterally).
- Main gyri:
 - Cuneus (above calcarine sulcus)
 - Lingual gyrus (below calcarine sulcus)

Clinical correlation

Lesions to this area can cause: Cortical blindness, homonymous hemianopia and visual hallucinations

Primary visual cortex

- Receives input from the retina via the optic radiation
- Visual association areas
 - Interpret color, motion, depth





Case study

- Mr. James T
- Age: 68 years History: Hypertension, Type 2 diabetes
- Presentation: sudden onset of confusion, right-sided weakness, and slurred speech •
- On examination;
 Right-sided hemiparesis (face and arm > leg)
 Expressive aphasia (non-fluent, effortful speech)
 Gaze preference: eyes deviated to the left
 Decreased sensation on the right face and arm

 - face and arm Reflexes: upgoing right plantar (Babinski +)



What is your next step?



- •
- NeuroimagingAcute ischemic infarct in the left middle cerebral artery (MCA)

Case continued

Finding	Cerebral Area Involved	Explanation
Right hemiparesis (face/arm)	Left precentral gyrus (motor cortex)	Contralateral motor deficit due to upper motor neuron lesion
Expressive aphasia	Left inferior frontal gyrus (Broca's area)	Located in dominant hemisphere (usually left); responsible for speech production
Right sensory loss	Left postcentral gyrus (somatosensory cortex)	Contralateral loss of sensation in MCA distribution
Gaze deviation to left	Frontal eye field in left hemisphere	Eyes deviate toward the lesion side in acute stroke
Positive Babinski sign	Corticospinal tract involvement	Indicates upper motor neuron damage, consistent with motor cortex infarct





