



22nd Lecture

Cerebral Hemisphere

PHYSIOLOGY TEAM – 430

This Lecture is done by:

Sulaiman Al-Faraj

Shahad Al-Muhanna

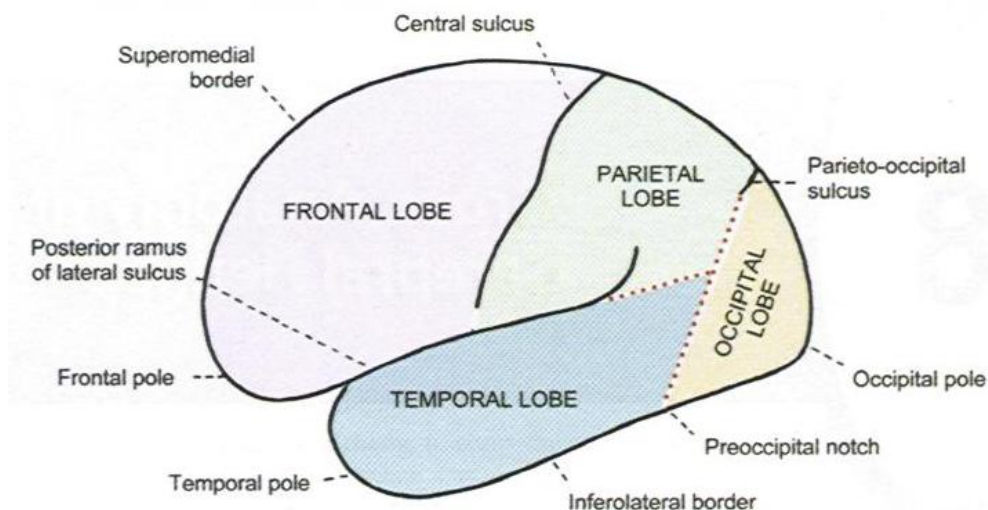
Cerebral functions

- **Cerebrum (cerebral cortex):**

- It's the largest portion of the brain and it has 2 hemispheres connected by the corpus callosum. In the middle, there is longitudinal fissure, which contain Superior sagittal vein made of dura mater.
- Outer cortex of gray matter and interior white matter except for a few small portions
- **Dominant hemisphere:**
 - ✓ **Right handed person** → it is the **left hemisphere (Most People)**
 - ✓ **Left handed person** → it is the **left hemisphere also except a little portion**
- Arterial supply comes from base and goes around the cerebrum.
- **Dominant hemisphere (Left) called :** Categorical hemi
- **Non Dominant hemisphere (Right) called:** Representational hemi (Appreciate things)

- **Cerebrum lobes:**

- 1- Frontal Lobe
- 2- Parietal Lobe
- 3- Temporal Lobe
- 4- Occipital Lobe



Notes:

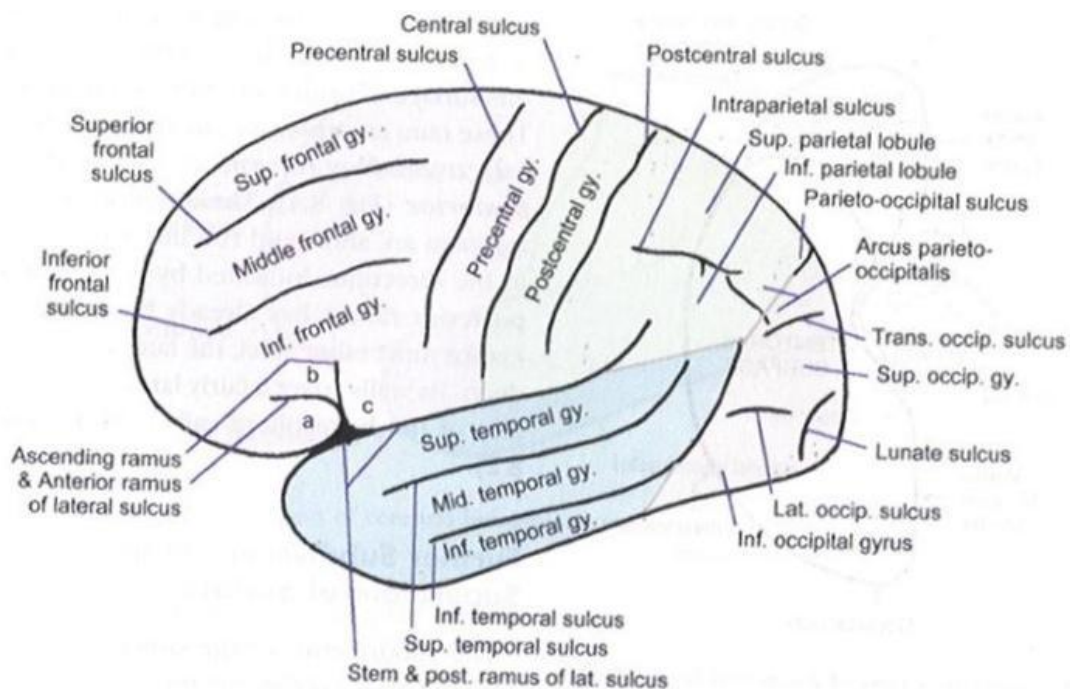
- The central sulcus separates the frontal and the parietal lobes
- In front of the central sulcus is precentral gyrus and behind it is the postcentral gyrus
- The lateral sulcus between temporal and frontal lobes

- **Frontal lobe:**

- ✓ MOTOR
- ✓ Centers of thinking
- ✓ Problem solving intelligence
- ✓ Decision making
- ✓ Verbal communication
- ✓ Speaking ability
- ✓ Elaboration of thoughts

- **Motor areas of the cerebral cortex:**

1. Primary Motor Cortex
2. Premotor Cortex
3. Supplementary motor area
4. Prefrontal area
5. Broca's Area



1. Primary Motor Cortex: Motor area 4 (Brodmann's area 4):

- Located in the precentral gyrus
- Body is represented Upside down (inverted)
- Crossed (each control contralateral side of the body)
- Execution of fine discrete skilled movements

2. Supplementary motor area:

- Located in frontal lobe medial and lateral side
- Works together with premotor cortex for Programming and planning of motor sequences of movements
- Bimanual (bilateral) coordinated movements for movements that require both hands.

Note:

Primary motor area and supplementary motor area have increased blood supply during movements

3. Premotor cortex: (area 6) (motor association area):

- Located on lateral surface of frontal lobe in front of area 4
- Coordinate of complex movement.
- Control gross subconscious movements.

4. Prefrontal Area:

- Half of frontal lobe (Big area)
- Planning for the voluntary activity and making decisions and personality (how to behave)

5. Broca's Area:

- Found in only one hemisphere (often the left), located posterior to the inferior frontal gyrus. Function is speech formation

Note:

- Para-central lobule:

Higher center of micturition also contribute with leg paralysis

- **Parietal lobe:**

- **Primary Somatosensory Cortex:**

It receives sensory information from contralateral side of body except face is bilaterally represented in both sides.

- **It has two areas:**

- **Dominant area:** calculation and language
 - **Non dominant area:** spatial orientation (Drawing)

- **Temporal lobe:**

- Area of hearing is in the superior temporal lobe.
 - **Wernicke's area:** speech understanding
 - **Hippocampus:** for memory
 - **Limbic system:** controlling the autonomic activity
 - **Insula:** lies deep in the temporal lobe, which have these functions:
 - ✓ Integration of sensory information (pain)
 - ✓ Coordinating the cardiovascular responses to stress

Note:

Internal capsule:

Group of fibers and its relations are: medially the thalamus and caudate nucleus and laterally by lentiform nucleus

- **Occipital lobe:**

- **The primary area responsible for:**

- ✓ Vision
 - ✓ Coordination of eye movements

- **Visual association area is responsible for:**

- ✓ Recognition of objects
 - ✓ Perception of color, depth, motion, and other aspects of vision.

Lobe	Function	Effects of damage		
		Cognitive/behavioural	Associated physical signs	Positive phenomena
Frontal	Personality Emotional control Social behaviour Contralateral motor control Language Micturition	Disinhibition Lack of initiation Antisocial behaviour Impaired memory Expressive dysphasia Incontinence	Impaired smell Contralateral hemiparesis Frontal release signs	Versive seizures Focal motor seizures (Jacksonian march) Continuous partial seizures (epilepsia partialis continua)
Parietal: dominant	Language Calculation	Dysphasia Dyscalculia Dyslexia Apraxia Agnosia	Contralateral hemisensory loss Astereognosis Agraphaesthesia Contralateral homonymous lower quadrantanopia Asymmetry of optokinetic nystagmus (OKN)	Focal sensory seizures

Parietal: non-dominant	Spatial orientation Constructional skills	Neglect of non-dominant side Spatial disorientation Constructional apraxia Dressing apraxia	Contralateral hemisensory loss Astereognosis Agraphaesthesia Contralateral homonymous lower quadrantanopia Asymmetry of OKN	Focal sensory seizures
Temporal: dominant	Auditory perception Language Verbal memory Smell Balance	Receptive aphasia Dyslexia Impaired verbal memory	Contralateral homonymous upper quadrantanopia	Complex hallucinations (smell, sound, vision, memory)
Temporal: non-dominant	Auditory perception Melody/pitch perception Non-verbal memory Smell Balance	Impaired non-verbal memory Impaired musical skills (tonal perception)	Contralateral homonymous upper quadrantanopia	Complex hallucinations (smell, sound, vision, memory)
Occipital	Visual processing	Visual inattention Visual loss Visual agnosia	Homonymous hemianopia (\pm macular sparing)	Simple visual hallucinations (e.g. phosphenes, zigzag lines)