

Parietal Lobe Syndrome: Disturbance of visual, memory, reading and writing disturbances.

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- ▶ In the human, **the parietal lobe** is situated posterior to the frontal lobe, anterior to the occipital lobe and superior to the temporal lobe.
 - ▶ Within it are brain areas that process somatosensory information, spatial attention, visual-motor transformations, numerical computations, and language , including reading.
 - ▶ **Primary somatosensory cortex** lies in the postcentral gyrus, adjacent to the central sulcus. This is the main cortical area to receive information from the body about **proprioception** (information about body and limb position) and **touch**.
 - ▶ Lesions of **posterior parietal cortex (PPC)** in humans result in a constellation of symptoms often referred to as the **“Parietal syndrome”**.

Balint's syndrome


- ▶ Balint's syndrome usually results from damage to both parietal lobes which causes:
- ▶ **Oculomotor Apraxia:** The inability to intentionally move your eyes towards an object.
- ▶ **Optic Ataxia:** Patient has difficulty in making accurate and appropriate visually guided movements, including the grasping of objects they can recognize and describe.
- ▶ **Visual Simultagnosia:** An inability to see the whole picture. Instead, if you have Balint's syndrome, you only see parts of the whole. For example, when shown a picture of a house, you would only see a window, a door, a wall, and so on, but not the entire house.

Directional hypokinesia

- ▶ **Directional hypokinesia** (DH) is found after both frontal and inferior parietal lesions.
- ▶ DH involves a **prolongation of reaction-** and **movement-time**, as well as an increased inaccuracy of reaching to visual targets in the contralesional part of space, regardless of the limb used.


APRAXIA

- ▶ Apraxia in general has been defined as the “inability to perform certain subjectively purposive movements or movement complexes with conservation of motility, of sensation and of coordination”.
- ▶ Apraxia is typically the result of parietal lobe damage, and several types have been identified, including **ideational**, **ideomotor**, and **constructional apraxia**.
- ▶ In **ideational apraxia** there is a failure to perform a complex series of actions, such as an inability to perform the sequence movements needed to fold a piece of paper and place it inside an envelope.

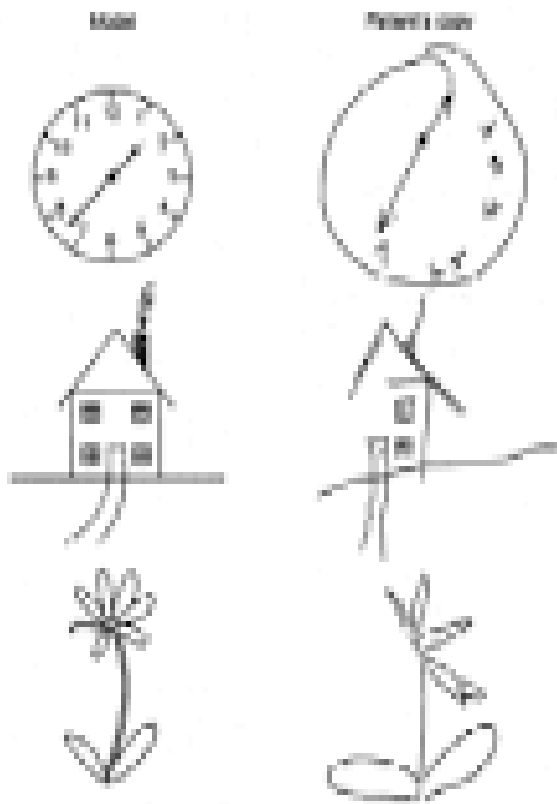
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- ▶ In **ideomotor apraxia** the patient cannot execute a familiar action on verbal command or by imitation.
 - ▶ The inability to copy a visual model, either by drawing or by physical assembly, is central to the definition of **constructional apraxia (CA)**.
 - ▶ It can be assessed through complex figure and block design tests.
 - ▶ The copies that patients produce are spatially disorganized, in the sense that components are often put into incorrect spatial relationships with respect to one another so that the spatial structure of the object is lost.

Hemispatial neglect

- ▶ Lesions in the parietal lobe of **the nondominant (usually the right) hemisphere** tend to have a striking effect on the awareness of space. Thought to be due to deficits in the mechanisms underlying visual attention, patients can exhibit signs of **hemispatial neglect** or **extinction**.
- ▶ Patients with this disorder fail to consciously perceive stimuli or events that occur in the side of space opposite their damaged cerebral hemisphere.
- ▶ A patient with neglect tends to ignore the spatial world on the contralateral side (**usually the left side** of visual space). For example, they may draw a clock with the numbers 1 to 12 all on the right side of the circle or they may draw an object, but leave out features on the left side.
- ▶ Clinical tests of hemispatial neglect include the line bisection, object cancellation, and copying tasks.
- ▶ In the **line bisection task**, patients are instructed to place a mark on a line where they perceive the midpoint of that line to be. Patients with right cortical damage place a mark that is frequently deviated toward the right end of the line.

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- ▶ In **object cancellation tasks**, patients are instructed to draw a line through each of a relatively large number of stimuli printed on a page. Patients with right parietal damage typically fail to draw lines through (‘cancel’) objects printed on the left side of the page.
 - ▶ Neglect is also evident in **copy tasks** – for example neglect patients with right cortical damage typically fail to include features belonging to the left part of scenes or objects.
 - ▶ In making their self-portraits, neglect patients omit to draw the half of their face contralateral to the damaged cerebral hemisphere.
 - ▶ **Extinction** : Extinction is a more subtle deficit in which patients do not notice a visual or tactile stimulus on their affected side (usually the left) when simultaneously presented with a similar stimulus on their intact side, but they are able to notice it when presented alone.

Copying:




Spontaneous drawing:



Agnosia

- ▶ Lesions of the left angular gyrus or disconnection of this area from the occipital lobes results in an inability to recognize familiar objects through the visual modality. The patient is able to recognize the object through another modality such as touch. This deficit is termed as **visual object agnosia**.
- ▶ Understanding of a complex scene or a picture may be impaired as in **simultagnosia**. The patient is able to describe the picture in parts, but is unable to sum up the totality of a scene.
- ▶ Recognition of objects through touch is impaired in parietal lesions, known as **tactile agnosia or astereognosis**. Familiar objects placed in the hand are not recognized.

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- ▶ **Finger agnosia** is another condition wherein the patient is unable to name or identify the fingers which are touched. The patient is unable to identify his/ her own fingers and the fingers of the examiner. This is an inability to recognize body parts, is bilateral in nature and associated with left parietal lesions.
 - ▶ **Anosognosia**, also called "lack of insight," is a symptom of severe mental illness experienced by some that impairs a person's ability to understand and perceive his or her illness.
 - ▶ An inability to recognize a paralyzed limb as belonging to oneself.
 - ▶ **Prosopagnosia**, the inability to recognize familiar faces visually is associated with right parietal lesions.

VISUAL MEMORY

- ▶ **Right parietal lesions** are associated with disturbances of visual memory.
- ▶ Memory of places or locations i.e., **topographical memory** is disturbed in right parietal lesions.
- ▶ The patient is unable to locate familiar places on a map.
- ▶ Independent of the memory deficit, patients with **left parietal lesions** get lost in familiar surroundings which are termed as **route finding difficulty**. It can occur even in their own homes, the patient is able to verbally recall the route but gets lost while traversing it.
- ▶ Another parietal deficit which is **left-right disorientation**. Here the patient gets confused between the left and right sides. Identifying one's left or right side is difficult. The patients are confused when asked to identify the examiner's left or right side.

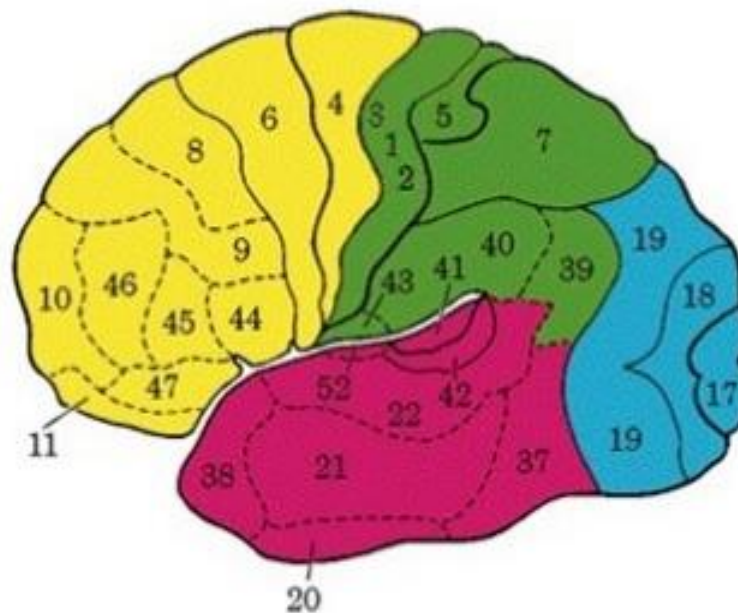
Reading & Writing disturbances

- ▶ The left parietal lobe, in particular the **angular gyrus** is important for writing, reading and calculation, the semantic lexicon is situated here.
- ▶ lesions cause damage to the lexicon following which comprehension of oral and written language is affected.
- ▶ In most people, the left side is the dominant hemisphere. Together with the temporal lobe, regions of the **inferior parietal lobule** in the dominant hemisphere are involved in **language comprehension**.
- ▶ If the angular gyrus is disconnected from the visuo- perceptual centers of the occipital lobe, only **alexia** is present. It is characterized by **impaired reading**.
- ▶ Disconnection of the left angular gyrus from the motor engrams situated in the inferior parietal lobule results in **agraphia**.

- ▶ **Writing difficulty or agraphia** may be part of visuo- perceptual disorders when it is known as *spatial agraphia*.
- ▶ If the patient is unable to write because of inability to construct two dimensional figures, then it is known as *apraxic*.
- ▶ Difficulty in calculation or **acalculia** has two components, *spatial acalculia* is present when the patient is unable to place numbers properly and is associated with right parietal lesions.
- ▶ **Difficulty in arithmetic** is associated with left parietal lesions.
- ▶ *Gerstmann's syndrome* is associated with left parietal lesions, specifically of the angular gyrus. It consists of **acalculia, agraphia, finger agnosia and left- right disorientation**.

Parietal Topography

- Postcentral Gyrus (1,2,3)
- Superior Parietal Lobule (5, 7)
- Supramarginal Gyrus (40)
- Angular Gyrus (39)



THANK YOU