

White Matter Disconnection

1. Definition

- **White matter disconnection** is the disruption of neural pathways linking different brain regions, caused by injury, disease, or surgery.

2. Causes

Cause	Examples
Trauma	Diffuse axonal injury
Surgery	Resection of brain tissue (e.g., epilepsy surgery)
Stroke	Ischemic damage to white matter tracts
Tumors	Compression or infiltration of tracts
Neurodegeneration	Multiple sclerosis, Alzheimer's disease

3. Consequences

- **Memory impairment** (e.g., disconnection of hippocampal tracts). - **Language deficits** (e.g., arcuate fasciculus injury). - **Motor weakness** (e.g., corticospinal tract disruption). - **Executive dysfunction** (e.g., frontoparietal pathway damage).

4. In Epilepsy Surgery

- Cognitive decline may occur due to injury to white matter pathways even when gray matter resection is limited. - Key affected tracts:

- **Uncinate fasciculus**
- **Inferior longitudinal fasciculus**
- **Fornix**

5. Assessment Techniques

Method	Description
Diffusion Tensor Imaging (DTI)	Maps white matter tracts via water diffusion
Tractography	3D reconstruction of pathways
Lesion-symptom mapping	Correlation between injury site and clinical symptoms

Summary

White matter disconnection disrupts brain network communication, leading to functional

impairments. Preserving critical white matter tracts is essential in neurosurgery and neurorehabilitation.

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