Extrahippocampal Temporal Lobe Epilepsy Surgery

1. Definition

Extrahippocampal Temporal Lobe Epilepsy Surgery. - Seizures arise from temporal lobe regions **outside the hippocampus**: temporal neocortex, temporal pole, parahippocampal gyrus, fusiform gyrus.

2. Surgical Objective

- **Resect** or **disconnect** the epileptogenic zone while:

- Achieving **seizure freedom**.
- Minimizing **neurocognitive deficits** (memory, language).

3. Surgical Techniques

Technique	Description
Lesionectomy	Resection of visible lesion without extensive lobectomy.
Tailored Cortical Resection	Removal based on mapping to preserve function.
Anterior Temporal Lobectomy (ATL)	Classical approach, sometimes excessive for extrahippocampal cases.
Selective Amygdalohippocampectomy (SAH)	Only if mesial structures involved (not typical for pure extrahippocampal TLE).

4. Preoperative Evaluation

- **MRI**, **tractography**, **functional MRI**. - **EEG** and/or **stereo-EEG (SEEG)**. - **Neuropsychological testing**.

5. Challenges

- Difficult localization of foci. - Risk of **verbal memory** and **language deficits**. - Importance of preserving **structural connectivity**.

6. Outcomes

- **Seizure freedom**: 60–80%. - Cognitive outcomes depend on lesion location, extent of resection, and patient factors.

Summary

Extrahippocampal TLE surgery removes epileptogenic zones outside the hippocampus using individualized, function-sparing techniques, aiming for seizure control and cognitive preservation.

Retrospective observational studies

Foit et al. investigated the associations between structural connectivity and postoperative memory performance in extrahippocampal TLE surgery.

In total, 55 patients (25 females, 30 males; mean age 29.8 ± 14.5 years; epilepsy duration 7.9 ± 10.5 years, 31 left, 24 right TLE) with extrahippocampal TLE undergoing hippocampal-sparing surgery were evaluated with standardized pre- and postoperative neuropsychological testing. Lesion volumes intersected with Human Connectome Project-derived tractography data were employed to assess the structural connectivity integrity via voxel-based and connectome-informed lesion-symptom mapping to identify cortical and white matter structures associated with cognitive outcomes.

Post-surgery, the widespread structural disconnection of several major white matter pathways was found, correlating with verbal memory and delayed recall. Additionally, the structural disconnection of the ipsilateral temporal lobe white matter was further associated with hippocampal atrophy.

The study highlights the role of structural connectivity alterations in postoperative memory decline in extrahippocampal TLE surgery. These findings expand the traditional understanding of hippocampal integrity in memory function towards the importance of broader structural networks. Individualized, connectome-informed surgical approaches might protect neurocognitive function [1)]

Foit et al. provide important evidence that white matter disconnection — not just hippocampal damage — contributes to memory decline after extrahippocampal TLE surgery. The application of connectome-based analysis represents a major methodological advance and calls for more individualized surgical planning to protect neurocognitive function.

However, the retrospective nature, heterogeneous patient cohort, and absence of functional imaging temper the generalizability of the findings. Future prospective, multimodal studies are needed to validate and extend these important results.

1)

Foit NA, Gau K, Rau A, Urbach H, Beck J, Schulze-Bonhage A. Linking Memory Impairment to Structural Connectivity in Extrahippocampal Temporal Lobe Epilepsy Surgery. Neurol Int. 2025 Mar 31;17(4):52. doi: 10.3390/neurolint17040052. PMID: 40278423.