Temporal lobe epilepsy surgery

Classification

1. By Anatomical Target

Type of Surgery	Target Area	Indication
Anterior Temporal Lobectomy (ATL)	Anterior 3–5 cm of temporal lobe including amygdala and part of hippocampus	Mesial TLE with hippocampal sclerosis
Selective Amygdalohippocampectomy (SAH)	Amygdala and hippocampus	Mesial TLE with cortical sparing
Temporal Lesionectomy	Visible lesions (tumors, dysplasias)	Lesional epilepsy
Extrahippocampal Temporal Lobe Epilepsy Surgery	Lateral (neocortical) temporal structures	Neocortical TLE
Multiple Subpial Transection (MST)	Surgical transections without tissue removal	Adjunct for eloquent cortex cases

2. By Surgical Approach

Approach	Technique Description	Common Uses
Transsylvian	Via Sylvian fissure to mesial structures	SAH
Subtemporal	Below temporal lobe, cortex-sparing	Alternative SAH approach
Transcortical	Through temporal cortex to mesial areas	ATL, lesionectomy

3. By Purpose

- **Curative Surgery** (e.g., ATL, SAH, lesionectomy) - **Palliative Surgery** (e.g., MST)

4. Special Techniques

- **Laser Interstitial Thermal Therapy (LITT)**: MRI-guided minimally invasive ablation. - **Responsive Neurostimulation (RNS)**: Device-based targeted electrical stimulation.

Summary

Temporal lobe epilepsy surgery is classified based on **anatomical target**, **approach**, and **intent**. Technique choice depends on **seizure focus**, **lesion presence**, and **cognitive preservation goals**.

Complications

Temporal lobe epilepsy surgery complications.

Keyhole corticoamygdalohippocampectomy

Patients who had a keyhole approach for temporal lobe epilepsy with over 2 years follow-up were compared with all patients who had selective amygdalohippocampectomy performed in a non-keyhole fashion over the same time period. Rates of seizure freedom were comparable in the 17 patients with keyhole surgery and the 34 individuals who had a non-keyhole approach. However, patients treated with keyhole surgery were discharged from the hospital earlier than non-keyhole patients (p=0.04), and with a shorter operative time (p=0.0001). The restricted keyhole surgical exposure has not limited the ability to perform surgery for temporal lobe epilepsy with favorable results on reducing the seizure tendency, and patients may be benefited by a minimal access technique with a more rapid recovery from surgery [1].

Yang et al. described operations they were performed through a 6-cm vertical linear incision and a low 2.5-cm keyhole craniotomy at the anterior squamous temporal bone. Resection of the anterior-most portions of the middle and inferior temporal gyri provided a cylinder-like corridor to the mesial temporal lobe. Identification of the temporal horn through a basal approach was followed by resection of the amygdala, uncus, and hippocampus-parahippocampal gyrus.

A 9-year series included 683 patients with a minimum follow-up duration of 2 years. Surgery times were short (range, 1 h 35 min to 2 h 30 min). Only a small percentage of patients had complications (1.76 %), and the rate of Engel Class I seizure-free outcome was 87 %. No overt speech problems or visual field deficits were identified. Compared with the most popular conventional trans-middle temporal gyrus approach, this technique can make the operation easier, safer, and less traumatic to functional lateral neocortex [2].

Magnetic resonance (MR)-guided stereotactic laser ablation

see Magnetic resonance image-guided laser interstitial thermal therapy for epilepsy.

Separately, Laser interstitial thermotherapy (LITT) has found a role in the treatment of temporal lobe epilepsy because it allows the creation of a precise lesion along the amygdala and hippocampus. Although seizure control rates appear to be somewhat inferior to open temporal lobectomy and selective amygdalohippocampectomy, the procedure is generally well tolerated, and because of its minimally invasive nature, it has the potential to reach a large segment of epilepsy patients who would be good surgical candidates but have shied away from open surgery.

Temporal lobectomy

Temporal Lobe Resection for Epilepsy

Selective amygdalohippocampectomy

The advantage of selective amygdalohippocampectomy (SAH) over anterior temporal lobectomy (ATL) for the treatment of temporal lobe epilepsy (TLE) remains controversial. Because ATL is more extensive and involves the lateral and medial parts of the temporal lobe, it may be predicted that its impact on memory is more important than SAH, which involves resection of medial temporal structures only. However, several studies do not support this assumption. Possible explanations include task-specific factors such as the extent of semantic and syntactic information to be memorized and failure to control for main confounders [3].

Case series

see Temporal lobe epilepsy surgery case series.

1)
Boling W. Minimal access keyhole surgery for mesial temporal lobe epilepsy. J Clin Neurosci. 2010 Sep;17(9):1180-4. doi: 10.1016/j.jocn.2010.01.030. Epub 2010 Jun 11. PubMed PMID: 20541416.
2)
Yang PF, Zhang HJ, Pei JS, Lin Q, Mei Z, Chen ZQ, Jia YZ, Zhong ZH, Zheng ZY. Keyhole epilepsy surgery: corticoamygdalohippocampectomy for mesial temporal sclerosis. Neurosurg Rev. 2015 Aug 16. [Epub ahead of print] PubMed PMID: 26277790.
3)
Boucher O, Dagenais E, Bouthillier A, Nguyen DK, Rouleau I. Different effects of anterior temporal lobectomy and selective amygdalohippocampectomy on verbal memory performance of patients with epilepsy. Epilepsy Behav. 2015 Nov;52(Pt A):230-5. doi: 10.1016/j.yebeh.2015.09.012. PubMed PMID: 26469799.