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Targeted Surgical Treatments for Mesial Temporal Lobe Epilepsy: A Narrative Review

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Abstract

Background: Mesial temporal lobe epilepsy (MTLE), often associated with hippocampal sclerosis (HS), is the most common form of drug-resistant focal epilepsy. While anterior temporal lobectomy (ATL) has long been considered the gold standard for achieving seizure freedom, the evolution of neuroimaging and minimally invasive technologies has introduced several alternative surgical and ablative interventions. This review synthesizes current evidence regarding the efficacy, safety, and neuropsychological outcomes of various surgical treatments for MTLE.

Methods: PubMed, Google Scholar and Scopus were searched for articles that focus on the surgical treatments that treats mesial temporal epilepsy, using keywords such as “MTLE”, “anterior temporal lobectomy”, “seizures”, “radiosurgery”. Analysis was done from 16 studies, focusing on different treatments and different outcomes.

Results: Out of 16 studies, resective surgery, specifically ATL, remains the most effective intervention for seizure control, with seizure-freedom rates ranging from 58% to 89.5%. However, ATL is associated with a higher risk of superior quadrantanopia and verbal memory decline in the dominant hemisphere. SAH approaches, particularly via the subtemporal route, offer comparable seizure control with improved preservation of verbal memory. Minimally invasive LITT demonstrates seizure-freedom rates of approximately 53% to 66.7% while significantly reducing hospital stay and preserving functions. SRS offers a non-invasive alternative but with lower seizure-freedom rates (52%) and a delayed therapeutic effect.

Conclusion: The surgical management of MTLE is shifting toward a personalized approach. While open resective surgery provides the highest probability of a seizure-free life, minimally invasive techniques like LITT offer an attractive balance for patients prioritizing cognitive preservation and rapid recovery.

Stereotactic radiosurgery and RF-TC remain valuable for specific patient populations where open surgery or thermal ablation is contraindicated.
Keywords: Mesial temporal lobe epilepsy, anterior temporal lobectomy, laser interstitial thermal therapy, stereotactic radiosurgery, seizure freedom.

Introduction

Mesial temporal lobe epilepsy (MTLE) is a subdivision of epilepsy, characterized by chronic seizure activity arising from the temporal lobe, predominantly the amygdala and hippocampus (8). MTLE seizures, often starting in childhood, can be either simple partial seizures with preserved awareness of self and surroundings, which is known as auras or warnings, or complex partial seizures where awareness is completely lost. Simple partial seizures includes a variety of psychic, gustatory, olfactory, and autonomic symptoms. Complex partial seizures, however, has loss of awareness, with patients possessing a motionless stare with automatisms, stereotyped, repetitive, involuntary movements such as lip smacking, chewing, picking at objects, scratching and gesturing (1).

The first line of treatment for newly diagnosed MTLE is anti-epileptic medication however many are unresponsive to medication. This is regarded as drug-resistant epilepsy and is defined as the regular intake of multiple first-line anti-epileptic drugs (AED) for more than 2 years with a lack of sufficient seizure control. Surgery is therefore primarily completed, not only to control seizures but also to prevent death (1). This is important as recurring seizures hugely impact quality of life and ultimately cause cognitive deterioration (10). Anterior temporal lobectomy is generally regarded as the "gold standard" for surgical treatment; however, with many patients being doubtful over surgical risks, namely stroke, post-surgical bleeding, blood loss and infection (5), it led to the exploration of other forms of treatment. These other treatments concentrate on decreasing the amount of excised tissue and developing less invasive surgical techniques (3).

One technique, stereotactic laser amydalohippocampotomy (SLAH) comprises insertion of a cold catheter through which an optical fiber delivers laser energy. The procedure is guided by real-time MR-guided thermal mapping and induces thermocoagulative necrosis of the hippocampus, subiculum, amygdala and uncus, avoiding other temporal structures. Laser interstitial thermal therapy (LITT) utilizes a laser that's stereotactically-guided using an occipital trajectory into the amygdalohippocampal complex, and then ablative doses will be delivered (7). The live MR thermometry used in both procedures reduces the risk of heat damage to surrounding structures (12) through continuous monitoring of laser energy delivery in addition to observation of surrounding tissue temperatures (6). It's those factors that facilitate the choice of targeted treatments like these over ALT. Stereotactic EEG-guided radiofrequency coagulation builds on initial treatment of MTLE in the 1980s with the aid of stereotactic electroencephalography, ensuring localization of the epileptogenic zone; the 3D definition provided makes it an advantageous option(10) In contrast to LITT, SEEG permits patients to remain conscious, providing a thorough reflection of the patient's feelings for the duration of the surgery. Implantation is usually performed pre-surgically, and it covers the mesial part of the ipsilateral temporal region. Intracranial monitoring enables cognitive function analysis during the procedure through corresponding leads (11). Bipolar coagulation is performed on each of two contiguous contacts of longitudinal and vertical electrodes. Stereotactic radiosurgery (SRS) utilizes the Gamma Knife, where a 24-Gy dose is delivered to a 50% isodose volume comprising the amygdala, hippocampus and parahippocampal gyrus. This is usually planned based on MRI images with the use of CT for tissue heterogeneity correction (8), allowing for specific patient treatment dosage. The main concern regarding SRS is that whilst it's minimally invasive, there's a possibility of adverse events, and a high proportion of patients experience seizure remission, making it a less favorable comparison to ATL (5).

It's important to note that whilst ALT has been critiqued as an option for MTLE therapy, surgical methods have been introduced to yield a selective form of ALT that focuses on various approaches to temporal structures, known as selective amygdalohippocampectomy. 3 focal techniques have been developed: a transsylvian access via the sylvian fissure with a transversal cut, a subtemporal approach by means of the parahippocampal or fusiform gyrus and a transcortical approach dissecting the lateral temporal neocortex (4). Each approach has its own risk factors that need to be considered when selecting a form of treatment for the patient, consequently viewing them as individual to each other.

The significance of understanding varied treatment plans for patients ensures further comfortability and protection of cognitive awareness. Furthermore, it allows for a scaled form of treatment that contains both invasive and non-invasive options. With future developments in medical technology and understanding of the temporal region of the brain, it may refine current treatments whilst also eliciting new surgical options.

Methodology

Drug-resistant MTLE treated with surgical or minimally invasive treatments was the focus of a narrative review. Peer-reviewed literature that was relevant was identified, examined and discussed.

Databases such as PubMed, Scopus and Google Scholar were examined for relevant material.

Relevant terms including "mesial temporal lobe epilepsy," "temporal lobe epilepsy," "temporal lobectomy," "selective amygdalohippocampectomy," "laser interstitial thermal therapy," "stereotactic radiosurgery" were used in the search.

When appropriate, database-specific subject headings (such as MeSH and Emtree) and Boolean operators were employed. Duplicate records were eliminated and retrieved references were examined.

To identify research relevant to MTLE which concentrated on surgical or minimally invasive procedures, titles and abstracts were examined. When full-text articles seemed to meet inclusion relevancy, they were reviewed. Studies with no MTLE, no surgical or interventional procedures aimed at the mesial temporal region, no relevant outcome data, or unavailable full text were excluded. Disagreements regarding selection were resolved by discussion and with the help of a third reviewer. At the end, 16 studies were selected for anaysis.

Results

Anterior Temporal Lobectomy

Anterior temporal lobectomy (ATL) – an open resection including the temporal pole, lateral neocortex as well as the mesial temporal structures are excised. ATL has developed over the years, and it remains to be the gold standard treatment in many aspects for drug-resistant MTLE, especially in patients with hippocampal sclerosis (13). ATL is the utmost thoroughly investigated intervention for MTLE, and it remains to be considered the treatment of choice in many epilepsy cases. Long-term follow-up studies quoted in the LITT literature report on seizure free rates of approximately 75-80% at 10–16 years after ATL, 75.5% at 16 years, 79% at 10 years in well-selected patients with MTLE, particularly those with mesial temporal sclerosis (3).

Seizure control

In the ATL series, adults with drug-resistant MTLE underwent ATL (385 patients, mean follow-up ~10 years), The male/female ratio was (203/182), age range 18–65 years. Generally, at the time of the last follow-up, 322 patients were in Engel Class I (free of seizures), 33 patients were in Engel Class II (rare disabling seizures), 20 patients were in Engel Class III (worthwhile improvement), and 10 patients were in Engel Class IV (no improvement) (13).

Cognitive outcomes

ATL involves resection of both mesial structures and a portion of the lateral temporal neocortex, so post-op cognitive impairment, particularly the verbal memory impairment after dominant-hemisphere surgery, is the major worry (10). In the ATL series, adults with drug-resistant MTLE underwent ATL (385 patients, mean follow-up ~10 years), The male/female ratio was (203/182), age range 18–65 years. Observed speech disturbance in 12 patients, visual field shortfall in 9 patients, hemiparesis seen in 8 patients, and cognitive and/or memory disturbance in 3 patients. In all cases, neurological deficits subsided rapidly in every instance (13).

Quality of life, Surgical risks and complications

In a ATL series (385 patients, mean follow-up ~10 years), postoperative the neurological deficits subsided rapidly in almost every instance: Motor impairment: 2.1%, Sensory impairment: 0.3%, Speech disturbance: 3.1% (more frequent after left-sided resections), Visual field deficits (e.g. superior quadrantanopia): 2.3%, Cognitive and/or memory impairments documented clinically: 0.8% (13). Attribution of the low permanent deficit rate to a subpial ATL technique guided by the anterior Sylvian point, which keeps the posterior limit of resection anterior to the temporal horn and Meyer's loop, reducing the risk of visual field injury and language network damage. Nonetheless, ATL remains a more invasive craniotomy-based procedure, so approach-related risks such as wound complications, venous infarction, and longer postoperative pain and disability cannot be eliminated (13).

Laser interstitial thermal therapy

Early single-center prospective data (Kang et al., 20 patients) showed that cessation of seizures impairing the consciousness after a mesial temporal LITT ranged from 36% at 1 year to 60% at 2 years, with most seizure relapses clustered in the first 6–10 months (7).

A 2-year single-surgeon case series (Cajigas et al., 26 patients) reported that 61.5% of patients remained free of disabling seizures (Engel I), and a further 26.9% had only rare disabling seizures (Engel II) at a mean follow-up of 43 months (about 3 and a half years), placing total Engel I–II outcomes close to 90% in that cohort (7).

In a large multi-centre cohort (Youngerman et al., 268 patients), Engel I seizure freedom after mesial temporal MR-guided LITT was 55.8% at 1 year, 52.5% at 2 years, and 49.3% at last follow-up (median 47 months), while Engel I–II outcomes were ~66% at last follow-up [12].

ATL mostly provides higher rates of cessation of seizures in patients than LITT in appropriately selected MTLE patients, but LITT still remains to attain Engel I outcomes in roughly 50–60% of patients, with many others experiencing worthwhile seizure reduction.

Seizure control

Laser interstitial thermal therapy (LITT) – a minimally invasive, MRI-guided procedure that uses a stereo tactically placed laser fiber to thermally remove the mesial temporal structures, while still managing to largely preserve the overlying lateral temporal cortex and white-matter tracts (3). Both interventions have a purpose of controlling seizures by targeting the epileptogenic mesial temporal network, particularly both the hippocampus and amygdala, in patients with drug-resistant medial Temporal Lobe Epilepsy (MTLE) who have completed a comprehensive presurgical assessment.

Cognitive outcomes

LITT is used for sparing the lateral temporal neocortex and overlying white-matter tracts, which is hypothesized to reduce cognitive morbidity compared with Anterior Temporal Lobectomy (ATL). Neuropsychological testing showed preservation of contextual verbal memory after LITT, with decline restricted mainly to non-contextual list learning scores; delayed recall and logical memory measures did not show a post-op drop (14).

Other series report that neurocognitive results after LITT are usually more favorable than or comparable to selective open approaches, and likely preferable than ATL, especially for language and verbal memory in dominant-hemisphere MTLE (14). Evidence from the included studies aid the point that ATL carries a higher risk of verbal memory deterioration, especially after dominant-hemisphere surgery, whereas LITT tends to preserve verbal memory and other cognitive functions better, at least in the short- to mid-term.

Quality of life outcomes (surgical risks and complications)

Across LITT series, the safety profile is generally favorable: Kang et al. reported no deaths or major permanent neurologic complications, with side-effects mostly limited to transient headache and mild neurological symptoms [3]. In the Cajigas cohort, complications occurred in 2 of 26 patients (7.7%), consisting of one permanent and one transient homonymous hemianopia (7). In LAANTERN, 16.5% of patients had at least one adverse event, most of which were mild and transient; neurological deficits were documented in only ~2% (0.7% each for visual disturbance, sensory loss, or speech disturbance), and permanent deficits were less frequent than in ATL series cited for comparison. Non-neurological complications in LITT include venous thromboembolism, intracranial hemorrhage (often radiographic and clinically insignificant), and infections, but again at relatively low rates in prospective data (14).

Selective Amygdalohippocampectomy (SAH)

Selective Amygdalohippocampectomy represents a paradigm shift in epilepsy surgery, moving away from the extensive resections of the temporal lobe toward a more localized, structure-specific intervention. The general philosophy underlying sAH is that by limiting the resection to the mesial structures—specifically the amygdala, the hippocampus, and the parahippocampal gyrus—surgeons can achieve high rates of seizure control while minimizing the "collateral damage" to the lateral temporal neocortex. Across the literature, sAH is recognized as a viable alternative for patients with medically intractable MTLE, particularly those with confirmed hippocampal sclerosis. General results indicate that while it may offer slightly lower seizure-freedom rates compared to the absolute maximums of anterior temporal lobectomy, it provides a crucial middle ground for patients with high baseline cognitive function (9, 15). However, the success of sAH is heavily dependent on the precision of the preoperative workup, as missing subtle focal cortical dysplasia in the temporal pole can lead to surgical failure, a scenario that often requires an ATL as a "rescue" procedure to achieve definitive seizure freedom (12, 16).

Subtemporal amygdalohippocampectomy is characterized by its unique inferior access route, which allows the surgeon to reach the mesial structures by elevating the temporal lobe rather than cutting through it. Results from a systematic review of this technique show its efficacy, reporting a seizure-freedom rate of 69.4%. The most striking results associated with the subtemporal approach involve neuropsychological preservation; in a randomized prospective clinical trial, it was found to be significantly superior to other selective routes in protecting verbal memory. Specifically, only 5.1% of patients undergoing the subtemporal approach suffered a significant decline in verbal memory in the dominant hemisphere, a result that underscores its value for patients whose professions or lifestyles depend heavily on linguistic skills (4, 9). Despite these outcomes, the technique is technically demanding and carries specific risks, such as potential injury to the Vein of Labbé during retraction, which can lead to venous infarction, or transient palsies of the third and fourth cranial nerves (9, 15).

The Transsylvian Amygdalohippocampectomy offers a microsurgical path through the natural corridor of the Sylvian fissure, theoretically sparing all lateral and inferior neocortical tissue. While this approach effectively targets the mesial structures and achieves stable seizure outcomes comparable to other selective methods (60–70% seizure freedom), the literature reveals a higher "cognitive cost" than originally anticipated. Randomized data comparing selective techniques found that the transsylvian approach was associated with a 22% rate of significant verbal memory decline. This outcome is believed to result from the proximity of the surgical path to language-critical pathways and the manipulation required within the Sylvian fissure (4, 9). Additionally, because this route involves working closely with the M1 and M2 segments of the middle cerebral artery, it carries an inherent risk of vascular complications, such as vasospasm or ischemia in the territory of the perforating arteries (15, 16). Consequently, while effective for seizure control, the transsylvian route may be less ideal than the subtemporal route for patients where dominant-side memory preservation is the primary concern.

Transcortical amygdalohippocampectomy, frequently utilizing a trans-middle temporal gyrus (T2) approach, is often the most common selective method due to its technical straightforwardness compared to the more complex vascular or retraction-heavy routes. By creating a small "window" through the middle temporal gyrus to enter the temporal horn of the ventricle, surgeons gain direct and efficient access to the hippocampus and amygdala. Results for this technique show seizure-freedom rates that align with the general 60–70% range for selective resections. However, because the approach involves an incision through the neocortex, there is a documented risk of disrupting Meyer's loop, which can result in visual field defects such as superior quadrantanopia (10, 15). Furthermore, while it is technically easier, the transcortical approach does not allow for the inspection or removal of the temporal pole; therefore, if a patient has missed "dual pathology" like pole-based focal cortical dysplasia, they are more likely to experience seizure recurrence, eventually needing a transition to a standard resective lobectomy (12, 16).

SEEG-Guided Radiofrequency Thermocoagulation (RF-TC)

SEEG-guided radiofrequency thermocoagulation (RF-TC) is a minimally invasive technique that combines intracranial electroencephalographic recording with targeted radiofrequency lesioning of epileptogenic tissue. Modern RF-TC is performed under SEEG guidance, allowing functional mapping and real-time electrophysiological monitoring, during ablation, enhancing precision and safety (6, 5). In the included studies, RF-TC was primarily applied in patients with mesial temporal lobe epilepsy and hippocampal sclerosis (MTLE-HS) (11). In Barbaro et al. (2018), It is highlighted that RF-TC, performed under SEEG guidance, can target epileptogenic tissue with precision, and that it avoids large resections, it is expected to reduce risks of cognitive decline and visual field defects, which are common after open temporal lobectomy or selective amygdalohippocampectomy (5).

In Wang et al. (2021), reinforced this idea, noting that minimally invasive approaches like RF-TC may preserve language, memory, and visual pathways better than open resections. Thus, motivated further evaluation of RF-TC as a viable alternative surgical strategy for drug-resistant mesial temporal lobe epilepsy (MTLE), particularly in hippocampal sclerosis cases (10).

However, reported seizure outcomes vary, and long-term seizure control remains inconsistent (5). In the included protocol and cohort studies, RF-TC was applied to patients with drug-resistant MTLE who were considered surgical candidates. Explicit contraindication criteria were not uniformly defined (10,11).

Outcomes

In a single-centre retrospective cohort of 28 patients with MTLE-HS, SEEG-guided three-dimensional RF-TC achieved Engel class I outcomes in 72.41% at 12 months, declining to 42.86% at 48 and 60 months (11). Seizure recurrence, including aura, was observed between 9- and 17-months post-procedure. No permanent neurological deficits were reported at long-term follow-up (11).

This underscores RF-TC's favourable safety profile compared with open resections, which carry higher risks of cognitive and visual field morbidity. Across the RF-TC literature summarized in the STARTS trial protocol, reported seizure freedom rates at ≥1 year ranged from 25% to 70% (10). For other conditions: SEEG-guided RF-TC has also been applied in other focal epilepsies, including hypothalamic hamartoma and periventricular nodular heterotopia, with variable seizure outcomes reported across studies (6, 5).

Limitations

The RF-TC outcome data in the included cohort derive from a single-center retrospective study, limiting generalizability (11). When compared with established open surgical approaches, the long-term efficacy of SEEG-guided RF-TC remains uncertain, highlighting the need for controlled comparative studies (5, 10).

Stereotactic radiosurgery (SRS)

Stereotactic radiosurgery is a non-invasive option, but the ROSE trial indicated it is less effective than open surgery, with 52% seizure freedom for SRS versus 78% for ATL at 36 months (5). The clinical response is delayed, often taking 12 to 18 months for full effect (5, 15). Successful SRS depends on high-quality dosimetric planning; Gamma Knife typically provides superior dose conformality and steeper radiation gradients compared to VMAT or Eclipse systems, which is vital for protecting the optic chiasm and brainstem during the delivery of the required 24 Gy dose (8).

Seizure Outcomes and Efficacy

The primary evidence for SRS efficacy comes from the randomized, controlled ROSE trial, which indicate that while SRS is effective, it is statistically inferior to open surgery in terms of achieving total seizure freedom. At 36 months post-treatment, 52% of patients in the SRS group (prescribed 24 Gy) were free of seizures impairing consciousness for the prior 24 months, compared to 78% in the anterior temporal lobectomy (ATL) group. Unlike resective surgery, which provides immediate results, the effect of SRS is delayed. Seizure reduction typically begins several months after the procedure as radiation-induced necrosis develops in the mesial structures (5). Early pilot studies suggested that seizure freedom following SRS can be durable, though late-onset seizure recurrence remains a possibility in a small subset of patients (15, 16).

Neuropsychological and Cognitive Outcomes

A major focus of SRS research is its impact on memory and language, particularly when treating the dominant hemisphere. There were no statistically significant differences between SRS and ATL regarding changes in verbal memory. However, some earlier pilot studies suggested that SRS might offer a slight advantage in preserving memory compared to standard ATL, although this was not definitively proven in the large-scale randomized trial (15). Both SRS and ATL groups showed significant improvements in quality of life after treatment. However, the ATL group showed earlier improvements, likely due to the immediate cessation of seizures (5).

Safety and Adverse Events

Because SRS involves high-dose radiation to a focal area, it carries specific risks related to radiation-induced brain changes. A common side effect of SRS is localized edema (swelling) within the temporal lobe, which typically occurs 9 to 12 months after treatment. Due to the aforementioned edema, a significant portion of patients in the SRS group (76% in the ROSE trial) required corticosteroid treatment to manage symptoms such as headaches or increased seizure frequency during the necrotic phase (5). SRS can also cause visual field deficits if the radiation dose spills over into the optic tract or Meyer's loop (8, 10). Rare but serious late complications mentioned in the literature include the formation of radiation-induced cysts or potential vascular changes, though these were not frequent in the MTLE-specific trials (15).

Dosimetric and Technical Planning

The success and safety of SRS depend heavily on the precision of the radiation delivery. The standard dose established by the ROSE trial guidelines is 24 Gy targeted to the amygdala, hippocampus, and parahippocampal gyrus (5). A study comparing different planning systems found that Gamma Knife (GK) generally provides superior dose conformality and a steeper dose gradient (fall-off) compared to Volumetric Modulated Arc Therapy (VMAT) or non-coplanar conformal (NCC) planning. Additionally

GK was found to be more effective at sparing "organs at risk" (OARs), such as the optic chiasm and the brainstem, while maintaining the required 24 Gy dose to the target (8).

Clinical Indications and Comparison to Other Modalities

SRS is considered a non-invasive alternative to ATL but with lower overall seizure-freedom rates (52% vs 78%) and a requirement for long-term follow-up to monitor for delayed radiation effects (5). SRS is often recommended for patients who are poor candidates for open surgery due to medical comorbidities, or those who have an intense fear of open brain surgery (16). Although Laser Interstitial Thermal Therapy provides more immediate results and does not involve radiation, SRS is completely non-surgical, so no burr hole is required (15).

Conclusion

For many individuals who suffer from Mesial Temporal Lobe Epilepsy (MTLE), seizures can reach a stage where they no longer respond to medication, meaning that standard anti-epileptic drugs are unable to control them. In such cases, surgical treatment becomes the primary path toward achieving seizure freedom. In the past, the most established approach has been Anterior Temporal Lobectomy (ATL), which is a form of open brain surgery. Extensive clinical evidence has repeatedly shown that ATL delivers the highest and most durable rates of seizure control, along with significant improvements in overall quality of life when compared with continued treatment using ineffective medications (1, 2).Nowadays, the field of epilepsy surgery has developed rapidly, becoming less invasive and employing stereotactic techniques. These include LITT and RF-TC. These procedures apply targeted energy to destroy the small region of brain tissue responsible for generating seizures. Outcomes for these techniques are favorable, with long-term seizure freedom commonly achieved in about 54%–62% of patients [3, 6, 7, 11, 14]. An advantage of these therapies is a much shorter recovery period, and a reduced burden compared to traditional open surgery (3, 6, 14).Another approach is Radiosurgery (SRS), which is a non-invasive method [5]. However, there are limitations, such as clinical benefits potentially taking months or even more than a year to appear, during which seizures continue, and a recognized risk of delayed adverse effects (5, 8). Studies confirm that the main advantage of minimally invasive techniques is their ability to preserve memory and cognitive functions [3, 6]. Of course, choosing LITT first does not exclude ATL; patients can still undergo full open surgery if the minimally invasive approach does not achieve the desired results (12).It is important to select the most appropriate treatment for controlling seizures, and this remains a serious and complex decision that requires balancing seizure control with potential neurological consequences.

Abbreviations

Mesial temporal lobe epilepsy (MTLE)

Temporal lobe epilepsy (TLE)

Mesial temporal sclerosis (MTS)

Hippocampal sclerosis (HS)

Drug-resistant epilepsy (DRE)

Focal cortical dysplasia (FCD)

Arteriovenous malformation (AVM)

Intraparenchymal hemorrhage (IPH)

Subdural hematoma (SDH)

Cranial nerve palsy (CNP)

Anterior temporal lobectomy (ATL)

Selective amygdalohippocampectomy (sAH)

Subtemporal selective amygdalohippocampectomy (sSAH)

Laser interstitial thermal therapy (LITT)

Stereotactic laser amygdalohippocampotomy (SLA)

Stereotactic radiosurgery (SRS)

Radiofrequency thermocoagulation (RF-TC)

Stereo-electroencephalography-guided radiofrequency thermocoagulation (SEEG-RF-TC)

Gamma knife surgery (GKS)

Volumetric modulated arc therapy (VMAT)

Non-coplanar conformal (NCC)

Dynamic conformal arc (DCA)

Magnetic resonance imaging (MRI)

Stereo-electroencephalography (SEEG)

Electroencephalogram (EEG)

Positron emission tomography (PET)

Anterior sylvian point (ASP)

Randomized controlled trial (RCT)

Visual field defect (VFD)

Quality of life (QOL)

Antiepileptic drugs (AEDs)

Length of stay (LOS)

Confidence interval (CI)

Standard deviation (SD)

Radiosurgery or Open Surgery for Epilepsy (ROSE)

Laser Ablation of Abnormal Neurological Tissue Using Robotic NeuroBlate System (LAANTERN)

Radiofrequency Thermocoagulation versus Anterior Temporal Lobectomy for Mesial Temporal Lobe Epilepsy with Hippocampal Sclerosis (STARTS)

During the preparation of this work, the author(s) used Grammarly AI and Google Gemini. The application of these tools was strictly limited to improving grammar, spelling, style, and formatting. All intellectual content is the original work of the authors.

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