

Laser Interstitial Thermal Therapy (LITT): seizure outcomes for intractable mesial temporal lobe epilepsy

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Abstract

Rationale

Laser Interstitial Thermal Therapy (LITT) is a novel, minimally invasive alternative to conventional surgery for patients with medically and surgically intractable epilepsy. We describe seizure outcomes and complications in our cohort of patients from MRI-guided stereotactic LITT.

Methods

We prospectively tracked our institution's LITT cases for medically intractable epilepsy from October 2014 to October 2016 at Stanford Health Care. Intraoperative imaging was used in all cases to confirm accuracy of the stereotactic target before initiating the ablation in MRI. A total of 27 patients were treated with LITT and we included 22 cases of mesial temporal ablations, all had an occipito-temporal laser trajectory approach. We excluded 5 cases: 2 had generalized atonic seizures and 3 had extra-mesial temporal targets. Seizure frequency, Engel classification and post-operative complications were assessed in the immediate post-operative period and at follow up ranging from 2 months to >24 months (average 13 months).

Results

Among the 22 patients with mesial temporal targets, ages ranged from 19 to 70, with 10 (45%) patients above age 50. There were 11 men and 11 women. MRI showed unequivocal mesial temporal sclerosis (MTS) in 16/22 (73%) of the cases. Phase II monitoring with intracranial electrodes was performed in 4/22 (18%) cases. Eight targets were in the right anterior hippocampus, 14 in the left anterior hippocampus with an average burn length of 3.7cm. The catheter required repositioning in 4 cases, and in one of those cases the catheter was repositioned twice. One patient was lost to follow-up.

All 21 patients have had > 50% reduction in baseline seizure frequency and 15/21 (71%) have had a > 90% reduction in baseline seizure frequency. Although times for follow-up are variable, to date, 11/21 (52%) have achieved an Engel Class I outcome and all but one of these patients had unequivocal MTS. Excluding perioperative seizures, 8/21 (38%) patients have had complete seizure freedom (Engel Class IA) and all had MTS. Seizures only occurred with medication

withdrawal in 3/21 (14%) patients (Engel Class ID). Seven out of 21 (33%) patients achieved an Engel Class II outcome with only rare disabling seizures. Three out of 21 (14%) patients achieved an Engel Class III outcome with worthwhile improvement and reduction in seizures and seizure intensity. There were no patients with Engel Class IV outcomes including no worsening seizures.

One patient (5%) had 1 seizure in the immediate peri-operative period during admission but she did not take her prescribed anti-seizure medication the morning of the procedure. There were 5 patients (24%) with perioperative seizures within the first 14 days after ablation. There was complete seizure freedom in 16/22(76%) patients between the perioperative period through 3 months after ablation. One patient developed focal status epilepticus contralateral to the right anterior hippocampal ablation 16 days after surgery. Rates of complete seizure freedom post-ablation were: 14/20 (70%) at 6 months; 7/14 (50%) at 9 months; 5/13 (38%) at 12 months. Between 3-6 months post-ablation, 15/20 (75%) reported no seizures. Between 6-9 months post-ablation, 10/14 (71%) reported no seizures. Between 9-12 months post-ablation, 10/14 (71%) reported no seizures. Between 12-24 months post-ablation, 6/11 (54%) reported no seizures. After > 24 months, 2/6 (33%) reported no seizures. In 10/21 (48%) patients, anti-seizure medications were reduced either in dose or total number of drugs.

Four patients (18%) had non-seizure related post-ablation complications. One patient had a right homonymous hemianopsia that improved over time to a superior quadrantanopia. In a case of targeting error for the left anterior hippocampus that required catheter repositioning twice, the patient developed a transient partial CN III palsy and aseptic meningitis with status migrainosus eventually responsive to valproic acid. Other minor complications included a self-limited ileus and headache in a patient with migraines pre-operatively. Seventeen of 22 (77%) patients were discharged on post-operative day 1.

Conclusions

To date, all patients undergoing LITT for intractable mesial temporal epilepsy have had a > 50% reduction in baseline seizure frequency with a majority 71% achieving > 90% reduction in baseline seizure frequency. A total of 11/21 (52%) patients achieved an Engel Class I outcome and all but one had unequivocal MTS. Seven of 21 (33%) achieved Engel Class II; 3/21 (14%) Engel Class III and no patients had an Engel Class IV outcome.

Complications of LITT for intractable epilepsy patients were uncommon and largely transient; one permanent visual field deficit has occurred. Thus, LITT appears to be a safe, well-tolerated procedure that offers the majority of intractable mesial temporal epilepsy patients seizure freedom at least in the short-term. Though seizures are likely to recur with longer term follow-up, there is a durable and significant reduction in seizure frequency.

Continued and perhaps increased dosing of peri-operative antiepileptic administration should be considered given 24% of our patients had perioperative seizures within the first 14 days after ablation.