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Case Report

Visual Laser Ablation of Mesial Temporal Lobe May Bring Satisfactory Seizure Control

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Abstract

Minimal invasive epilepsy surgery has been granted more value in recent trend of epilepsy care. Due to the complexity of phase II study, Laser Interstitial Thermal Therapy (LITT) is indeed effective and valuable technique for epilepsy seizure control and subsequent life quality improvement in population with less probability of seizure-free after standard temporal lobe resection. Our case with relatively low cognitive function has benefited from such surgical approach. A resting fMRI with confirmation of poor hippocampus function provides a supportive result for the decision of left hippocampus-amygdala ablation. The surgical outcome in this case is satisfactory.

Keywords: *LITT; Temporal Lobe Epilepsy; Mesial Temporal Lobe*

Introduction

Epilepsy is the fourth common neurological disease affecting nearly 1% of the world's population. Approximately thirty- percent of these patients have intractable seizures regardless of maximal medical management [1]. Mesial temporal sclerosis (MTS) is a key feature of intractable temporal lobe epilepsy (TLE) [2]. MRI imaging can detect with characteristic changes, including severe atrophy, hyperdensity FLAIR signal and structural alteration. Treating these patients' seizures by removing temporal lobe has been standard therapy for this population. Computation analysis of resting fMRI and Diffusion Tensor Imaging (DTI) have brought new ways to identify the epileptogenic area or confirm the functional disconnection after surgery. It is concluded that white matter structural integrity in TLE is disturbed more severely in the ipsilateral than in the contralateral hemisphere, and tracts closely connected with the affected temporal lobe are most disturbed [3]. Resting functional MRI was also found useful to detect decreased connectivity to ipsilateral structure and paradoxically increased connectivity on the opposite side [4,5]. In patients with VEEG confirmed bilateral temporal epilepsy or temporal lobe epilepsy with early frontal lobe involvement, the seizure-free outcome is relatively low. Due to the invasive nature of phase II study, patients with these findings through VEEG study may not choose further evaluation.

Minimal invasive approach with LITT is therefore a valuable method to bring reasonable benefit to patient by reducing seizure frequency without going through risks associated with phase II study and relatively large resection.

Case Report

45-year-old right-handed male with history of developmental delay, cognitive impairment, type 2 diabetes, hypertension and obstructive sleep apnea has had seizure disorder since age of two. Before that, he had infantile spinal meningitis, which was considered probable

etiology. His semiology consists of screaming, hand flop, and face twitch following short period of staring for about one minute. Dyscognition or partial loss of consciousness was often seen by his mother.

The patient had tried multiple anti-seizure drugs, including phenobarbital and phenytoin, unable to reach full seizure control. Over last five years, levetiracetam was added to his regimen of lamotrigine and zonisamide. Complex partial seizure frequency was about two to five times per month before pre-surgical evaluation. Patient underwent evaluation with video-EEG, MRI of brain and inter-ictal PET scan of brain. The result was concordant with finding of left mesial temporal abnormality. The neuropsychology test showed relative low IQ. He is basically taken care by his mother with frequent disturbing seizures.

Therefore, patient and his mother eventually agreed to have minimal invasive laser-ablation of left mesial temporal lobe since his video-EEG study showed left mesial onset temporal lobe seizures. He came to our clinic for follow-up over last year multiple times.

He has had a few short complex partial seizures over last year when his zonisamide was stopped and levetiracetam was reduced. We increased doses of anti-seizure drugs thereafter, his complex partial seizure frequency has been reduced to about once per six months as reported during the one-year follow-up visit. His mother and he were both satisfactory with the outcome.

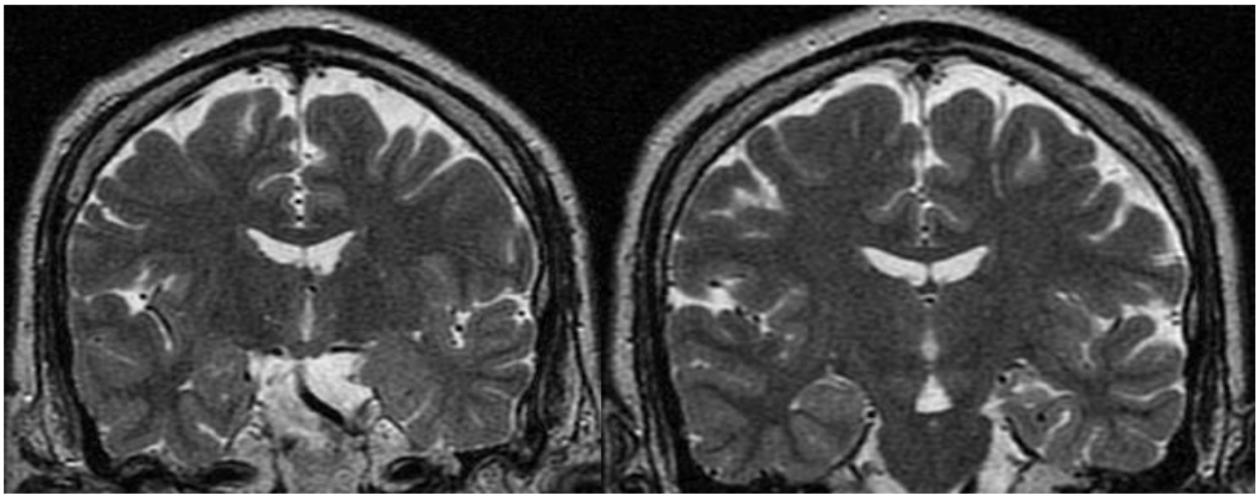

Figure 1: *MRI of brain imaging study showed left mesial temporal sclerosis.*

Resting state fMRI (rs-fMRI) Values ROI	Value (0-1)
BWL	0.428
BWR	0.405
L hippocampus-left amygdala	NaN
R hippocampus-right amygdala	0.479
L hippocampus- left thalamus	-0.091
R hippocampus- right thalamus	-0.377

Table 1: *Resting state functional MRI result was used for functional evaluation.*

genucc	0.703627
spleniumcc	0.840487
cing R	0.240593
cing L	0.114602
ILF R	0.527239
ILF L	0.582367
UF R	0.412438
UF L	0.217544
SLF R	0.511296
SLF L	0.425027

Table 2: *Functional anisotropy analysis showed decreased volume mostly in UF and cingulum on left side (by ~50%).*

Figure 2: *Post-surgical MRI showed ablation of left hippocampus and amygdala (T2W1).*

Discussion and Conclusion

Minimal invasive epilepsy surgery has been granted more value in recent trend of epilepsy care. Patient with long-history (>10 yrs) of temporal lobe epilepsy is one of the most common type of cases with intractable epilepsy in our tertiary care epilepsy clinic. Due to the complexity of phase II study and relatively low likelihood of seizure-free outcome in this population, LITT is indeed effective and valuable technique for epilepsy seizure control and subsequent life quality improvement. Our case with relatively low cognitive function has benefited from such surgical approach. Post-surgical rsfMRI and DTI confirmed functional disconnection. The surgical outcome in this case is satisfactory as Engel 1B at one-year clinic follow-up. Future prospective study on the merit of this management in cases with relatively low cognitive function and long-term history of epilepsy (longer than ten years) may be needed. Others include VEEG confirmed bilateral temporal lobe epilepsy or temporal lobe epilepsy with early frontal lobe involvement may possibly fit in this approach. More studies may be needed to verify its effectiveness in these scenarios.

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