■ Multimedia teaching material

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Epileptic Disorders

Laser ablation for refractory mesial temporal lobe epilepsy

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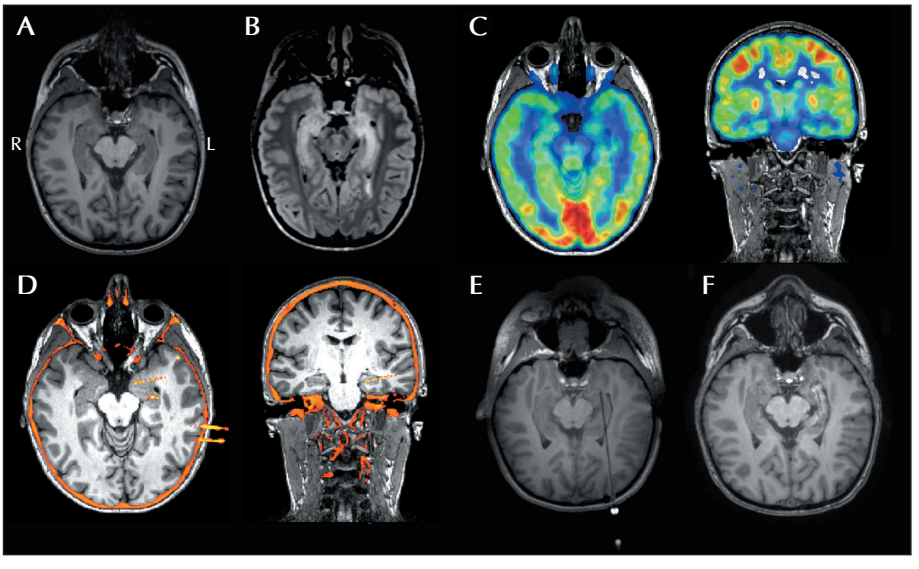
We report a 41-year-old high-functioning, right-handed, White, English-speaking, cisgender woman with drug-resistant focal epilepsy due to left hippocampal sclerosis (*figures 1A-B*). Seizures occurred weekly and were characterized by right hemibody "heaviness", expressive aphasia and unawareness. Video-EEG showed left temporal seizures with electroclinical delay; FDG-PET revealed mild left mesio-temporal hypometabolism (*figure 1C*). Neuropsychological testing reflected strong cognitive abilities with intact naming and verbal memory and variable visual memory. Unilateral, left-sided stereo-EEG (*figure 1D*) with typical anterior temporal coverage (*i.e.*, sampling the following left-sided structures: orbito-frontal region, insula, temporal pole, temporal mesial structures, cingulate and lingual gyrus) was performed to refine seizure onset localization due to the above-mentioned electroclinical delay and absence of typical ictal manifestations associated with left mesial



■ **Figure 1.** Imaging summary. Brain MRI axial T1-weighted (A) and T2 FLAIR (B) sequences show left mesio-temporal hyperintensity and mild volume loss suggestive of early left mesial temporal sclerosis. Head FDG-PET (C), axial and coronal planes, shows mild left mesio-temporal hypometabolism. Stereo-EEG (D) plan with left frontotemporal coverage. Intraoperative LiTT trajectory (E) and postoperative brain MRI T1-weighted sequence (F).

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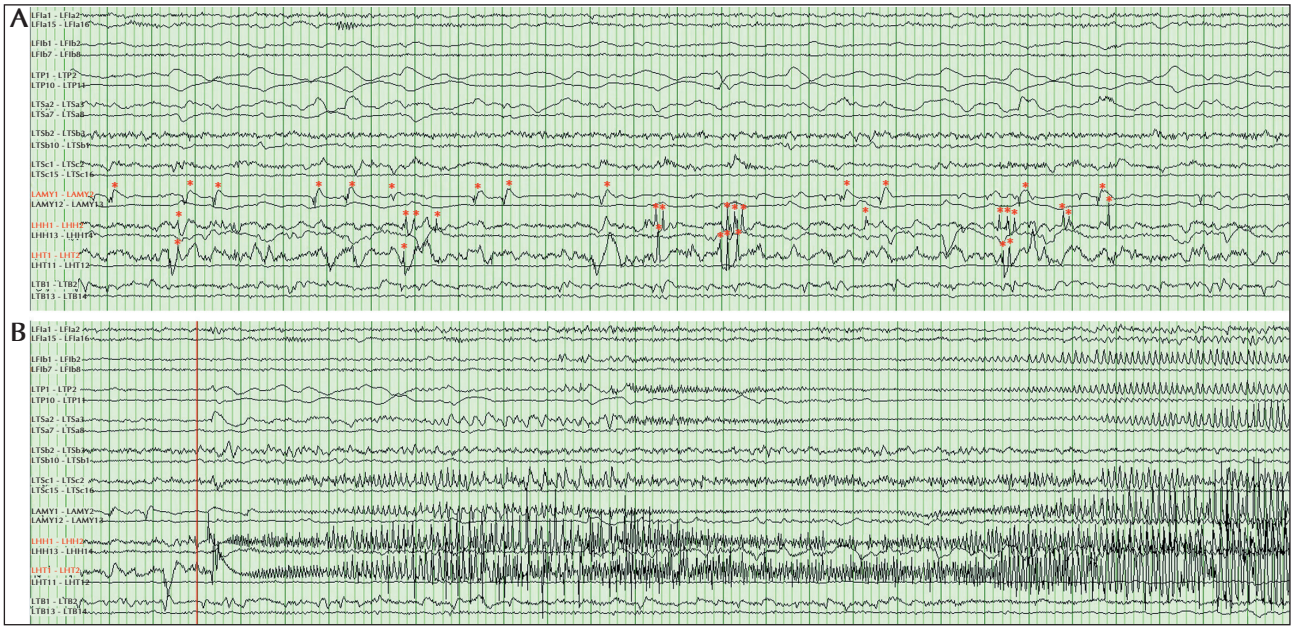

■ **Figure 2.** Stereo-EEG recordings (sensitivity 150 uV/mm, LF 1 Hz, HFF 70 Hz, notch off, timebase 15 mm/sec). (A) Interictal spikes and polyspikes in the left hippocampus (LHH and LHT) and left amygdala (LAMY) (red asterisks). (B) Electroclinical seizure characterized by low-voltage fast activity (>20 Hz) at the left hippocampus (LHH and LHT) with subsequent spread to the left amygdala (LAMY) and left posterior cingulate (LTSc); notably, there was no involvement of extra-mesial temporal depth electrodes at onset.

▼ **Table 1.** Key neuropsychological outcomes using laser interstitial thermal therapy (LiTT) vs. predicted probability of decline associated with left temporal lobe resection (LTLR).

Domain/Test name	8 months pre-op** Age: 41			6 months post-op** Age: 42			Pre- to post-op change in z-score	Predicted outcome with LTLR [2, 3, 4]	Case-specific conclusions
	Raw	*SS*	*z*	*Raw*	*SS*	*z*			
Intellectual Ability									
Test of premorbid functioning*	55	112	0.8						High average premorbid abilities
Language									
Boston Naming Test (BNT)* Item 48 replaced	58	110	0.64	57	106	0.38	-0.26	33% probability of clinically relevant naming decline of ≥ 5 raw score points	Naming abilities remained strong and essentially stable following LiTT. LiTT may offer equivalent, if not better, post-operative naming outcomes when compared to typical LTLR.
Verbal memory									
Wechsler Memory Scale - 3rd ed. (WMS-III)*									

▼ **Table 1.** Key neuropsychological outcomes using laser interstitial thermal therapy (LiTT) vs. predicted probability of decline associated with left temporal lobe resection (LTLR) (*continued*).

Domain/Test name	8 months pre-op** Age: 41			6 months post-op** Age: 42			Pre- to post-op change in z-score	Predicted outcome with LTLR [2, 3, 4]	Case-specific conclusions
	Raw	*SS*	*z*	*Raw*	*SS*	*z*			
Verbal Paired Associates									
Recall I	25	12	0.67	19	10	0.00	-0.67	-	Initial learning and memory were mildly suppressed, but delayed memory remained flawless (8/8) with no observed decline following LiTT. LiTT appears equivalent or better than LTLR for outcomes.
Recall II	8	13	1.00	8	13	1.00	0.00	42% probability of decline of ≥ 3 scaled score points on Recall II	
% Retention	100	12	0.67	100	12	0.67	0.00		
6-Trial Selective Reminding Test (SRT)*								Post-op raw score predictions	
Total Recall	53	98	-0.16	47	86	-0.92	-0.76	-	On this most hippocampally-dependent task, there was a decline in delayed recall following LiTT, approximating predicted decline following LTLR. For additional encoding measures (LTS and CLTR), LiTT outperforms the predicted probabilities.
Long-Term Storage	41	89	-0.74	53	103	0.20	0.94	25	
Continuous Long-Term Retrieval	32	91	-0.60	26	85	-1.01	-0.41	14	
Delayed Recall (/12)	9			4			Raw = -5 points	4	
Recognition (/24)	23			21				-	
Visual memory									
Wechsler Memory Scale - 3rd ed. (WMS-III)*									
Faces									Visual memory performances improved following LiTT procedure. There are no available predictive models for visual memory for LTLR.
Recall I	36	9	-0.33	44	16	2.00	2.33	-	
Recall II	36	9	-0.33	44	14	1.333	1.66	-	
% Retention	100	12	0.67	100	12	0.667	0.00	-	
7/24 Spatial Recall Test									
Immediate Recall	27	83	-1.1	26	80	-1.35	-0.25	-	
Delayed Recall	3	78	-1.45	7	112	0.82	2.27	-	

*Age-Based Standard Scores (Mean = 100; sd = 15).
**Testing completed via virtual (telehealth) visit during the COVID pandemic; every attempt was made to simulate standardized administration procedures via video-audio conferencing.

temporal epilepsy. Stereo-EEG confirmed left hippocampal seizure onset with a low-voltage fast activity pattern consistent with likely response to laser interstitial thermal therapy (LiTT) (*figure 2*) [1]. The patient underwent left hippocampal LiTT (*figures 1E-F*) and has been seizure-free for eleven months. Repeat neuropsychological evaluation at six months post-LiTT revealed stable naming, improved visual memory and

stable/variably reduced verbal memory compared to baseline (*table 1*). LiTT cognitive outcomes were similar or better compared to available predictive probability models of left temporal resection [2-4]. LiTT is associated with shorter admissions/recovery and potentially better neuropsychological outcomes, and is therefore a reasonable alternative to resective surgery for refractory mesial temporal epilepsy [5-7]. ■

Supplementary material.
Summary slides accompanying the manuscript are available at www.epilepticdisorders.com.

Disclosures.
F. Nascimento is a member of the Epileptic Disorders Editorial Team. V. Kokkinos, B. Emerton, L. Bolden, A. Malik, L. Moura, and R. Richardson report no disclosures relevant to the manuscript.

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TEST YOURSELF

(1) Laser interstitial thermal therapy (LiTT) is associated with shorter admissions/recovery and potentially better neuropsychological outcomes compared to resective surgery for refractory mesial temporal epilepsy.

A. True
B. False

(2) There may be prognostic value in the use of intracranial EEG in patients who are candidates for hippocampal laser interstitial thermal therapy (LiTT).

A. True
B. False

Note: Reading the manuscript provides an answer to all questions. Correct answers may be accessed on the website, www.epilepticdisorders.com.