**Supplemental Digital Content. Text.**

Methods

*MR Imaging Sequences*

MRI studies were performed on a 3T scanner (Discovery MR750; GE Medical Systems, Milwaukee, WI) using a 32-channel head coil. High-resolution T1-weighted (3D BRAVO, TR = 8160ms, TE = 3180ms, TI = 400ms, acquisition matrix = 256 × 256, voxel size = 1.0 × 1.0 × 1.0 mm3) and T2-weighted (3D CUBE, TR = 2500ms, TE = 73ms, acquisition matrix = 256 × 256, voxel size = 1.0 × 1.0 × 1.0 mm3) images were acquired as a part of standard clinical care for patients undergoing epilepsy surgery. MR thermometry (2DFT, TR = 22.5ms, TE = 10ms, acquisition matrix = 256 × 128, pixel size = 0.9375 × 1.875 mm, slice thickness = 3mm, number of echoes = 1, flip angle = 30°, pixel bandwidth = 78.125Hz, temporal resolution = 2.88s) images were acquired concurrently with laser ablation.

*MR Thermometry Reconstruction*

To determine temperature changes at different region of interests (ROI), we performed thermometric analysis of intraoperative temperature data in 23 patients. Thermometry data was not available in 3 patients. A hybrid re­ferenceless and single baseline subtraction model was used for temperature estimation1. The thermometry images had dimensions of 256 × 256 pixels, with the resolution being 0.9375 × 1.875 mm. The phase encode direction had lower resolution because only 128 lines in the center of k-space were acquired while the outer 128 lines were zero padded. The images were reconstructed with a single baseline, followed by referenceless constant and linear phase term corrections. The thermal coefficient used for proton resonance frequency shift was -0.00909 ppm/°C. A baseline image was acquired prior to each ablation.

*Anatomical Identification of the Oculomotor and Trochlear Nerves*

For each subject (total N = 26) on the side of the planned ablation, we identified the oculomotor nerve (CN III) and the trochlear nerve (CN IV) in the axial and coronal planes and confirmed its identity as a nerve by comparing T1 BRAVO and T2 CUBE images. Using preoperative images in the coronal plane, we measured the distance between CN III and the uncus and between CN IV and the parahippocampal gyrus at their closest approach. The distance measurements made using the T1-weighted and T2-weighted images were averaged. Given the voxel size of the MR images are 1.0 x 1.0 x 1.0mm, we subsequently categorized the distances into 4 bins: <1mm, 1-2mm, 2-3mm and 3-4mm. These assessments and measurements were independently validated by two attending neuro-radiologists who were blinded to patient’s clinical information (MW, SHP).

*Statistical Analysis*

Two-sample t-tests were used to compare ablation parameters between patients with CN palsy and patients without. Chi-squared test was performed to determine if the proportion of patients who experienced CN III or CN IV palsy was influenced by the nerves’ distance to the mesial temporal lobe. To determine if heating at the mesial temporal lobe border was significantly different between those with CN palsy and those without CN palsy, we conducted two-sample t-test. We limited the comparison to only erves that were 0-1mm of the tissue border. This was done to control for distance as a confounder as all affected CNs were 0-1mm of the tissue border. Statistical significance was considered at an alpha level of 0.05.

1. Grissom WA, Rieke V, Holbrook AB, Medan Y, Lustig M, Santos J, et al: Hybrid referenceless and multibaseline subtraction MR thermometry for monitoring thermal therapies in moving organs. **Med Phys** **37**:5014–5026, 2010