

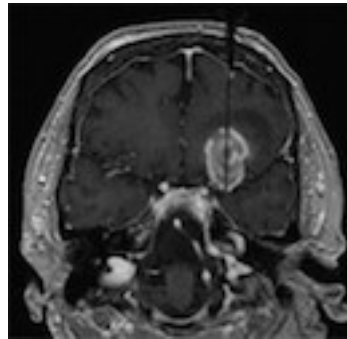
INTRODUCTION

Magnetic Resonance Guided Laser Induced Thermal Therapy (MRgLITT) is a minimally invasive method to treat a wide range of intracranial pathologies. Ablation extent is estimated through the Arrhenius model and pixel-shift of ablated tissue on MRI. A thermal damage estimate (TDE) is plotted over a 2D cross section of the lesion containing the laser catheter. This study evaluates the accuracy and reliability of the TDE in predicting ablation extent.

METHODS

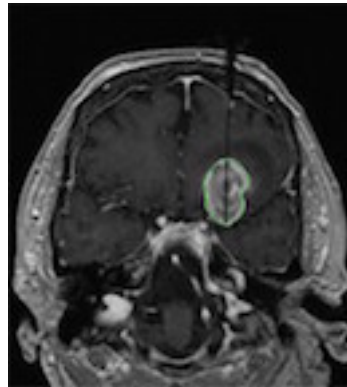
Only cases with clear ablation borders and primarily single laser catheters were included. On the post-operative axial T1 contrast enhanced image, the slice corresponding to the intraoperative image for the TDE was acquired. The intraoperative TDE image was obtained from the system console. OsiriX DICOM Viewer was utilized to for cross sectional ablated area on the post-op MRI. ImageJ was utilized to measure estimated area of ablation on the intraoperative TDE image. Two raters performed all measures. Statistical testing included Pearson correlation and the student's t-test.

FIGURE 1



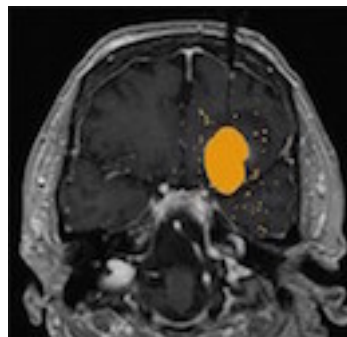
In-Plane Laser Catheter

FIGURE 2



Post-Ablation Scan - Measuring / Defining Area of Ablation

FIGURE 3



Thermal Damage Estimate

RESULTS

A total of 32 patients were included with an average age of 49. 62.5% were female. Pathology included primary and metastatic brain lesions, along with mesial temporal lobe sclerosis and chronic pain (cingulotomy). Measured ablated area strongly correlated between raters ($r=0.93$, $p<0.0001$). The measured TDE on intraoperative imaging also shared a strong correlation between the two raters ($r=0.97$, $p<0.000001$). There was no significant difference between TDEs and post-ablation ablated area ($p=0.40$) and TDE correlated to ablated area closely ($r=0.84$, $p<0.001$).

CONCLUSIONS

The TDE is an accurate and reliable measure of actual ablated area in MRgLITT. Future studies should incorporate larger numbers of patients and assess the reliability of the TDE in cases where multiple lasers are used on the same lesion.

LEARNING OBJECTIVES

- The main learning objective is to determine whether the TDE is an accurate and reliable method of measuring laser ablation damage.
- This is the first known study examining the accuracy of the TDE using human intracranial cases.