

# Laser Interstitial Thermal Therapy: Predictive Value Between Overlap Of Hyper-Thermic Field Of Treatment With Significant White Matter Fibres Tracts As Manifested In Post-Op motor deficit

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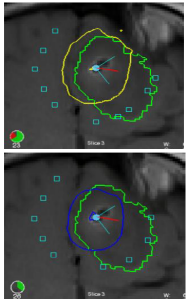


## Introduction

Laser interstitial thermal therapy (LITT) has revealed promising preliminary results in treatment of difficult to access (DTA) tumors. There is limited data regarding clinical outcome as it correlates with hyper-thermic field exposure to the corticospinal tracts (CST), we evaluated the clinical relevance of thermal exposure to functional white matter tracts.

### TDT Lines

- Extent of thermal changes of the treatment field is demonstrated by the software as *thermal-damage-threshold* (TDT) lines
- Yellow TDT line** = 2 minutes of 43°C (or shorter intervals of higher temperatures)
- Blue TDT line** = 10 minutes of 43°C (or shorter intervals of higher temperatures)



## Methods

We retrospectively evaluated 36 DTA tumors, which underwent LITT therapy. Thirty-six patients underwent LITT, using NeuroBlate System in Cleveland Clinic (4/2011 to 4/2013). Of those, 24 patients who had pre-op DTI were included (16 glioma, 3 metastasis, 4 radiation necrosis). One patient with post-operative ICH and motor deficit as a direct result was excluded. Extent of hyper-thermic field is delineated by the software as thermal-damage-threshold (TDT) lines, which include white TDT-line (60 min at 43°C), blue TDT-line (10 min at 43°C), and yellow TDT-line (2 min at 43°C). Fiber tracking was conducted for motor fibers of upper extremities (UEM), lower extremities (LEM), as well as pre-motor fibers (PM). Pre-operative MRI and TDT-lines were imported to iPlan software for volumetric analysis. The maximum surface area of overlap between fibers of the UEM, LEM, PM as well as the TDT-lines of white, blue, and yellow were analyzed in three planes of axial, coronal, and sagittal imaging. Clinical review was conducted for post-op motor deficit with either complete or partial resolution. The degree of thermal exposure to the each of the CST correlated with manifestation of post-op motor deficit.

## Results

Median age was 58 years, with 41.7% male (5) and 58.3% female (7). Overlap of TDT lines in number of patients treated were as follows: white (UE:6, LM:7, PM:6), blue (UE:9, LE:10, PM:2), yellow (UE:12, LE:10, PM:10). Median overlap of yellow TDT lines with UM, LM, PM, were 1.9 mm<sup>2</sup>, 1.5mm<sup>2</sup>, 2.6mm<sup>2</sup> respectively, blue TDT lines with UM, LM, PM, were 0.4mm<sup>2</sup>, 1mm<sup>2</sup>, 1.8mm<sup>2</sup> respectively, and white TDT lines with UM, LM, PM, were 0.1mm<sup>2</sup>, 0mm<sup>2</sup>, 0mm<sup>2</sup>, respectively. Deficits with complete resolution of motor movements of arms (3), and legs (3), as well as deficits with partial resolution of arms (2), and legs (1) were evaluated. In three occasion permanent motor deficit, thermal exposure of white, blue, and yellow lines were =2.2m<sup>2</sup>, =4.6mm<sup>2</sup>, =5.9mm<sup>2</sup>respectively.

## Learning Objectives

By the conclusion of this session, participants should be able to: 1) better understand LITT therapy 2) be able to demonstrate the importance of CST and TDT overlap

## References

## Conclusions

Based on the above results, permanent deficit can be noted in minimal overlap of TDT lines and CST, therefore, in pursuing LITT therapy, there is a need for conformal treatment of tumor borders without overlap to white motor tracts.

