

**Introduction**

Surgical resection is a cornerstone in the initial treatment of brain tumors. Studies, particularly in high-grade gliomas, have demonstrated increased survival when resection is performed. This is true even of subtotal resections. Unfortunately, for patients with thalamic brain tumors, traditional surgical resection introduces a high degree of morbidity and mortality. Left with few surgical options, these patients have overall survival rates similar to unresected lobar tumors. Laser interstitial thermal therapy (LITT) provides a surgical option for this patient population.

LITT utilizes a stereotactically placed laser probe that induces hyperthermic ablation of brain tissues monitored in real-time with MR thermometry. Few studies have explored its use exclusively in thalamic tumors.

We present here our experience in treating thalamic tumors at our institution between 2012 and 2017 using LITT therapy

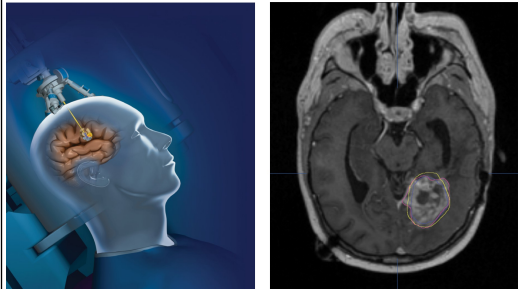
**Objective**

To describe and analyze our institutions experience with laser interstitial thermal therapy (LITT) for thalamic tumors

**Methods**

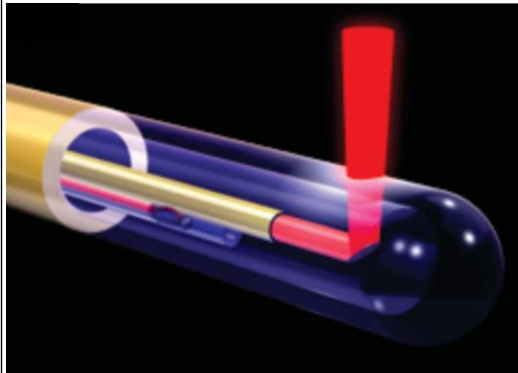
- Study design: Retrospective chart review. Data obtained from electronic medical records.
- N=13 consecutive patients from 2012 to 2017
- Platform: Neuroblate (Monteris)

**Figure 1 – Neuroblate system schematic**



(Left) Laser probe is stereotactically inserted. Intraoperative, real-time thermometry MRI is used to monitor the ablation. (Right) Plan software allows manual contouring of tumor (pink). Thermal damage threshold lines are shown in blue and yellow

**Figure 2 – Side-firing laser of Neuroblate system**

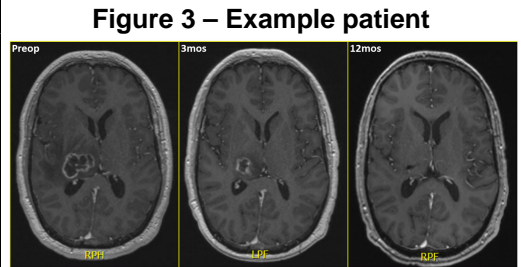


The system utilizes an Nd:YAG 1064nm side firing laser. The outer core is cooled with CO2 gas to prevent overheating

**Results**

Table 1 - Patient characteristics	
Characteristic	n
Patients	13
Mean age	53.6
Female	6
High grade gliomas	11
Glioblastoma	7
Anaplastic astrocytoma	2
Metastases	2
Prior surgery/radiation	1
Average largest dimension	3.4cm
Average tumor volume	12cc

Table 2 – Outcomes	
Outcome	n
Average length of stay	3 days
Average operative time	293.9 mins
TDT yellow line coverage (43C, 2min)	96.4%
TDT blue line coverage (43C, 10min)	92.8%
Tumor volume change at 3 months	-0.429
Perioperative morbidity	6
Perioperative mortality	2
Disease progression (RANO criteria)	12
Time to progression	2.78 mos



48 year old male with R thalamic GBM. The patient underwent LITT therapy with a single trajectory, and post-operative scans at 3 month and 12 month interval demonstrate significant reduction in tumor burden.

**Results**

Table 1 shows patient characteristics. Mean age was 53.6 and most patients had histopathologically confirmed GBM thalamic tumors. The average tumor volume was 12cc. Table 2 shows outcomes of our 13 patients. Notably, length of stay was short (3 days). Coverage (as percentage of total tumor volume) was high. Morbidities were mostly worsening hemiparesis though 2 patients developed hydrocephalus requiring shunt. 2 patient died from an ICH in the perioperative period

**Discussion**

Thalamic tumors carry a significant baseline morbidity due to their important location. In our experience with 13 thalamic tumors, LITT is a surgical option that is effective at significantly decreasing radiographic tumor burden after treatment. 2 perioperative mortalities in our case series occurred early in our institution's experience. Both patient's had tumors with greater than 3cm in maximal dimension. We subsequently used 3cm as a rough cutoff for consideration for LITT therapy in deep seated tumors. Our overall outcomes are slightly worse compared to the literature, though most reports include superficial (e.g. lobar) and a higher proportion of low-grade tumors.

**Conclusions**

Laser interstitial thermal therapy (LITT) is a feasible surgical option for patients with thalamic tumors. Generally, LITT should only be cautiously performed on thalamic tumors greater than 3cm. Larger studies specifically addressing thalamic tumors and LITT need to be performed.