



Laser Interstitial Thermal Therapy as a Treatment for Patients with Difficult-to-Access Glioma

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Introduction

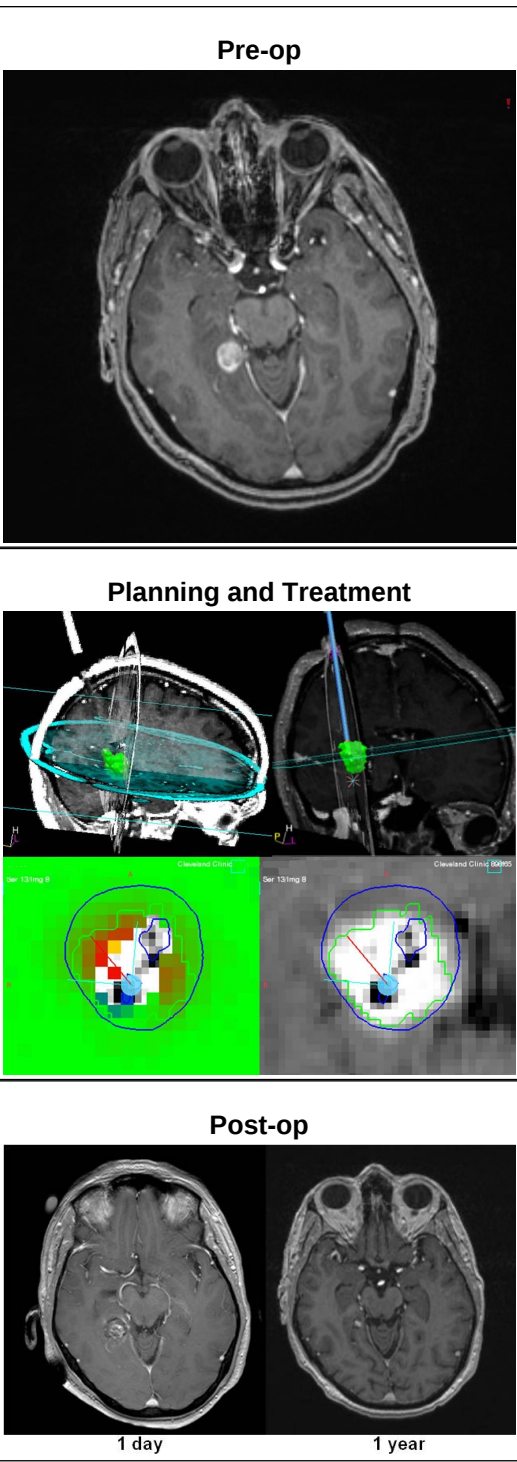
The treatment of difficult-to-access (*DTA*) glioma remains challenging. Radiation and chemotherapy have limited efficacy when used alone, however Laser Interstitial Thermal Therapy (*LITT*) can be used to decrease tumor burden. There are limited data in the literature reporting outcomes of LITT for gliomas. In this study, recent results of LITT for *DTA* glioma patients are reported.

Methods

- Fourteen consecutive patients with *DTA* glioma were treated with LITT in the Cleveland Clinic from 5/2011 to 2/2012. Five patients with glioblastoma (*GBM*), 7 with anaplastic glioma (*AG*), and 2 with low grade glioma (*LG*) were evaluated
- LITT was performed using the NeuroBlate® device (Monteris Medical, Winnipeg). In breif, laser emission was used to raise the tumor temperature to kill zone temperature (*KZT*) which monitored by intra-op real time MR-thermography
- Patients were treated with post-op chemotherapy (*Chemo*). Radiation therapy (*RT*) performed in cases of upfront treatment
- Patient characteristics and treatment outcomes were reviewed

Results

Illustrative case: Right temporal *GBM* in pre-op MRI (top image), treated with LITT (middle images) with 100% coverage by *KZT* (blue line) which resulted in decrease enhancement 1 day after surgery (bottom left) and no recurrence after 1 year (bottom right)



Patient Characteristics

Age	• Median: 47 years • Range: 19-79 years
Gender	• Female: 6 patients (43%) • Male: 8 patients (57%)
Type of Treatment	• Upfront: 3 <i>GBM</i>, 2 <i>AG</i>, 1 <i>LG</i> • Salvage: 2 <i>GBM</i>, 5 <i>AG</i>, 1 <i>LG</i>
KPS at Treatment	• 70: 1 patient (7%) • 80: 5 patients (36%) • 90: 8 patients (57%)
Neurological Symptoms	• Asymptomatic: 7 patients (50%) • Symptomatic: 7 patients (50%)
Tumor Location	• Frontal: 9 patients(2 right,7 left) • Temporal:4 patients(3 right,1 left) • Thalamus:1 patients (right)
Tumor Volume	• Median: 5.4 cm³ • Range: 0.7-37 cm³

Treatment Characteristics

Surgery	• Estimate of blood loss: Median 37cm³ (10-120) • Duration of surgery: Median 8.5 hours (4-14)
Laser	• Number of trajectories: 1 in 4 patients, 2 in 8 patients, 3 in 2 patients • Actual laser time: Median 3 hours (1-5.5)
Treatment Volumes	• Tumor volume received > 48°C: Median 99% (75-100%) • Tumor volume received > 52°C (<i>KZT</i>): Median 94% (57-100%)
Post-op Period	• Post-op pain : Median 1.75/10 (0 - 5/10) • Post-op hospital stay: Median 2.5 days (2-13)
Complications	• Complications happend in 4/14 patients • 1 <i>DVT</i>, 1 paresis, 1 ventriculitis, and 1 hydrocephaly with no post-op mortality
Adjuvant Treatment	• <i>Chemo</i>: started in 11/14 of patients after a median of 2 weeks • <i>RT</i>: started in 4/5 of newly diagnosed high grade gliomas
Follow-up	• Median follow-up(f/u): 7.1 months (3-14) • Death: 2 <i>GBM</i> patients died after 5 and 8 months

Outcomes

NO.	%of <i>KZT</i> *	Chemo	RT	Progression	Last f/u
1.r [†] <i>GBM</i>	96%	No	No	4 months	Expired-5m
2.n [~] <i>GBM</i>	100%	Yes	Yes	No	13 months
3.n [~] <i>GBM</i>	61%	Yes	Yes	5 months	Expired-8m
4.r [†] <i>GBM</i>	65%	Yes	No	3 months	11 months
5.n [~] <i>GBM</i>	99%	Yes	Yes	No	9 months
6.r [†] <i>AG</i>	100%	Yes	No	No	14 months
7.r [†] <i>AG</i>	100%	Yes	No	2 months	5 months
8.r [†] <i>AG</i>	91%	Yes	No	8 months	11 months
9.r [†] <i>AG</i>	100%	Yes	No	No	12 months
10.n [~] <i>AG</i>	64%	Yes	Yes	4 months	6 months
11.r [†] <i>AG</i>	88%	Yes	No	4 months	7 months
12.n [~] <i>AG</i>	57%	No	No	3 months	3 months
13.n [~] <i>LG</i>	98%	No	No	No	7 months
14.r [†] <i>LG</i>	73%	Yes	No	No	7 months

* : Percentage of tumor volume recieved *KZT*, [†] : Recurrent, [~] : Newly diagnosed

Conclusions

- As it's been shown in above figure, **4/5** of patients who treated with **≥99%** coverage of the tumor volume by the *KZT* (patients 2,5,6,7,9) and received appropriate post-op chemo (+*RT*) had no progression after a median of **12** months f/u. This could be translated to the concept of surgical extent of resection in gliomas
- LITT is a minimally invasive procedure with a low intraoperative blood loss or sustained morbidity
- Despite being a preliminary report, these results show that LITT, in conjunction with other treatment modalities, is a promising therapy for *DTA* gliomas and should be considered as a treatment option for patients who are poor candidates for open surgery