

Laser Ablation in Stereotactic Neurosurgery (LAISE): A Multi-Institutional Retrospective Comparison of LITT in Patients with Primary and Metastatic Brain Tumors

Andrew E. Sloan MD FACS; Stephen B. Tatter MD, PhD; Alireza Mohammadi MD; Kevin D. Judy MD; Sujit S. Prabhu MD, FRCS; Darren S. Lovick MD; Roukoz B. Chamoun MD; Veronica Chiang MD; Eric C. Leuthardt MD
University Hospitals Case Medical Center Neurological Institute and Seidman Cancer Center

Introduction

Laser Interstitial Thermotherapy (LITT) is a minimally invasive procedure for treatment of primary tumors (PT) and metastatic brain tumors (MT). Here we describe multi-institutional results in 138* patients treated with LITT for PT or MT.

LAISE captured data on 144 patients; 98 had primary tumors (of which, 97 had gliomas, 1 had meningioma), 40 had metastatic tumors, and 6 patients had "other" lesion types (including 3 epilepsy, 2 radiation necrosis with unknown original tumor type, and 1 unknown "recurrent tumor")

Methods

De-identified retrospective data in patients undergoing LITT were analyzed using standard methods.

Study design

Inclusion Criterion: Patient had no prior treatment with NeuroBlate, was willing and able to provide informed consent /release of personal health information or IRB waiver was granted to collect study information

Exclusion Criteria: none

Study Outcome Measures

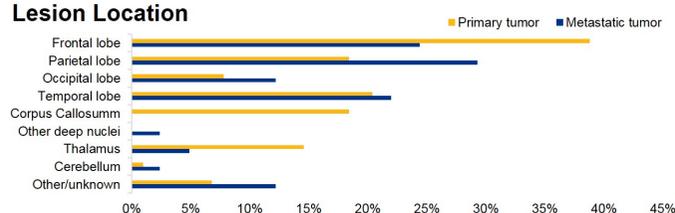
- Procedural Success, Progression-Free Survival (PFS), Overall Survival, Karnofsky Performance Score (KPS)

Learning Objectives

1) Describe the importance of LITT; 2) Discuss the indications for LITT; 3) Identify the difference between LITT for primary tumors and metastatic tumors

Results

Lesion Location



Lesion depth	Metastatic Tumor	Primary Tumor	P value
Superficial	31.7%	16.5%	0.0426
Deep	22.0%	47.6%	0.0047
Unknown	43.9%	33.0%	0.2194

The majority of PT were within deep regions of the brain, while MT were more likely to be superficially located. MT patients were more likely to have historical lesions in the brain stem (7.2% vs 0%; p=0.0084)

LITT was most commonly performed due to "non-resectable tumor" in PT versus "Inability to tolerate radiation" in MT (p < 0.05). 70% of MTs were recurrent and 47% of PTs were new (p < 0.05), Lasing time and ICU were longer in PT patients (p < 0.005); PT patients were more likely to be discharged to a rehab center (p = 0.0081).

Post-treatment outcome was similar in both groups, though MT patients more commonly had increased acute weakness (p = 0.043) and pain (p < 0.05). Primary tumor patients were more likely to continue steroids or start anticonvulsants (p < 0.03), but this was not related to tumor depth or volume.

82.5% of MT patients and 88.8% of PT patients met the criteria for procedural success* (p = 0.3206)

*Defined as a completed procedure without a complication persisting at discharge

Measure	Metastatic Tumor (N=40)	Primary Tumor (N=98)	Metastatic vs. Primary P-value
Female	55.0%	44.9%	0.2811
Male	45.0%	55.1%	0.2811
Age (Mean)	59.1 ± 12.0 (39) 59.0 (28.0, 87.0)	53.8 ± 16.1 (95) 56.0 (1.0, 82.0)	0.0409
Ethnicity			
Hispanic or Latino	13.5% (5/37)	8.9% (8/90)	0.5211
Non-Hispanic	86.5% (32/37)	91.1% (82/90)	0.5211
Race			
White	75.0%	84.7%	0.1798
Asian	0.0%	2.0%	1.0000
African American	15.0%	3.1%	0.0178
Unknown	2.5%	4.1%	1.0000
Smokers (Current or former)	76.9% (30/39)	45.4% (44/97)	0.0008
History of Kidney disease	20.5% (8/39)	8.2%	0.0338
Other Sig. Med Problems	80.0%	49.5% (48/97)	0.0013

The median age of MT patients was greater than PT patients (p < 0.041), but there were no differences in gender. A majority of MT patients had a history of smoking or kidney disease.

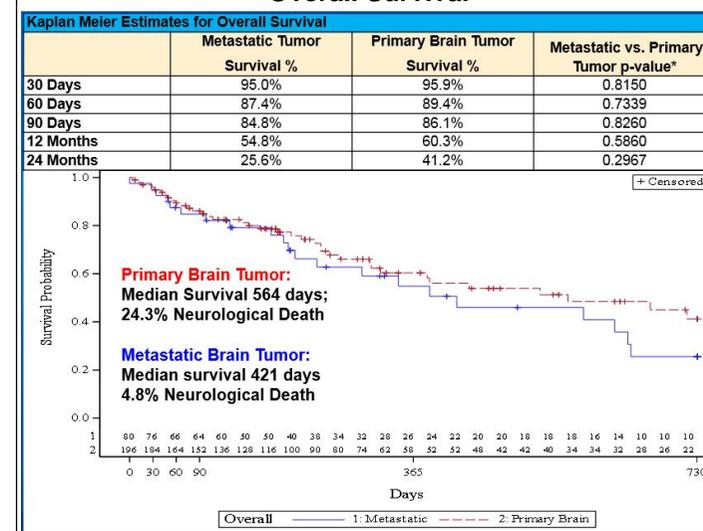
MT and PT patients had similar median baseline KPS. Baseline pre-op deficits were more commonly mild in PT patients and moderate in MT patients (p = 0.0264).

PFS was difficult to assess due to low imaging submission. Three (3) patients had progression identified at 85, 186, or 275 days from the LITT procedure. There was a registry-wide local progression free survival of 85% (17/20).

Neurological and Post-treatment Outcomes

Measure	Metastatic Tumor (N=40)	Primary Tumor (N=98)	Metastatic vs. Primary P-value
Baseline KPS	80.0 (60.0, 90.0) N=9	90.0 (60.0, 100.0) N=38	0.2037
Last Follow-up KPS	70.0 (10.0, 90.0) N=10	70.0 (30.0, 90.0) N=45	0.6982
Average duration of follow-up (days)	300.9 ± 240.3 210.0 (0.0, 731.0)	287.9 ± 235.4 223.0 (4.0, 731.0)	0.7705

Overall Survival



Conclusions

LITT is useful for both primary and metastatic tumors. The indications for LITT were different in the two groups--primary tumors had longer lasing times, ICU length of stay, and were more likely to be discharged to a rehab facility. Conversely, outcomes were similar in both groups.