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Staged Laser Interstitial Thermal Therapy for the Surgical Treatment of Insular Glioma: a Case Series

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Introduction

Insular gliomas pose one of the most significant challenges in neurosurgical oncology due to the complexity of the surrounding functional and microvascular anatomy. Despite current surgical and technological advancements, resection of insular gliomas can lead to potentially severe neurological morbidities. Laser Interstitial Thermal Therapy (LITT), either alone or combined with surgery, presents a less invasive cytoreductive approach for treating insular gliomas.

Objective

In this work we describe the first-ever reported series of patients with insular gliomas treated with staged LITT operations with or without subsequent craniotomy.

Methods

We reviewed a retrospective institutional database to identify patients with insular glioma who underwent staged LITT operations with or without subsequent craniotomy. From the compiled list of 11 patients, we obtained clinical, histopathological and volumetric lesion characteristics for each patient. Procedural characteristics, morbidity, overall survival (OS) and progression-free survival (PFS) were further assessed.

Results

From the 11 insular glioma patients included in this study the average age was 42 (SD = 12.5 years) with 8 (73%) patients that had left sided tumors and 6 (55%) patients had high grade insular gliomas. A total of 26 surgical procedures were performed with 21 ablations and 5 ablations that were followed by subsequent craniotomy. With regards to operative outcomes, the median tumor volume (cc) of our patient group was 31.5 (9.58-97) and the extent of tumor resection with laser ablation was on average 96.2% (SD = 8.5). Assessing post-operative morbidities, our group found OS to be 15.7 months (SD=10.3) and PFS to be 11.7 months (SD=7.5). Of the 21 ablation-only procedures performed, in the peri-operative period (3-5 days) neurological deficits were found in 9 (43%) post-ablation cases however there were 0 post-ablation cases with neurological deficits in the long-term (>3months). Of the 5 procedures where laser ablation was followed with subsequent craniotomy, neurological deficits were found in the peri-operative period in all 5 post-resection cases (100%) and there were neurological deficits in the long-term period found in 2 of them (40%).

Conclusions

We present the first ever reported series of insular gliomas treated with staged LITT operations. Through conducting this study our group found that staged treatment of insular gliomas with LITT is safe, effective and a minimally invasive option that avoids the potentially severe neurological compromises associated with conventional surgical resection approaches. Usage of stages of LITT to directly target high-risk insular glioma regions presents a novel treatment approach that may facilitate the maximal safe treatment of these otherwise significantly surgically challenging lesions.