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The Safety and Efficacy of Laser Interstitial Thermal Therapy for Newly Diagnosed Deep-Seated Low-Grade Glioma: A Pilot Study Comparing Outcomes With a Surgical Cohort

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Abstract

Background and objectives: Laser interstitial thermal therapy (LITT) has emerged as a minimally invasive alternative to open craniotomy for patients deemed unsuitable for surgery due to deep-seated or eloquent lesion location, age, frailty, or comorbidities. However, its use in newly diagnosed deep-seated low-grade glioma (nLGG) has not been elucidated. We aimed to evaluate the safety and efficacy of LITT for deep-seated nLGG compared with a similar surgical cohort.

Methods: We retrospectively reviewed patients with unifocal, deep-seated nLGG treated with either LITT or surgical resection between 2013 and 2024. Demographic, perioperative, and follow-up data were compared between groups. Kaplan-Meier assessed progression-free and overall survival outcomes. To address baseline tumor volume differences, a subset analysis was performed using a greedy nearest-neighbor algorithm to generate a 1:1 matched cohort based on tumor volume.

Results: A total of 15 patients in the study group (median age 46 [IQR: 34-53] years, 40.0% men) were compared with 51 patients (median age 38 [IQR: 29-54] years, 43.1% men) in the control group. There were no significant differences in in-hospital complications ($P = .999$), 30-day complications ($P = .999$), or complications between 30 days and 3 months ($P = .713$), new postoperative motor or speech deficits (0.999) between groups. Postoperative adjuvant chemotherapy (23.1% vs 46.9%, $P = .217$) and radiation (23.1% vs 44.7%, $P = .210$) rates did not differ significantly. Among high-risk patients, time to adjuvant chemotherapy (64.7 vs 77.7 days) and radiation (36.0 vs 53.6 days) was earlier in the LITT group, although not statistically significant. Kaplan-Meier analysis showed no statistically significant differences in progression-free survival or overall survival between groups. On matched pair analysis, there remained to be no statistically significant differences in outcomes observed between LITT and craniotomy groups.

Conclusion: This pilot study is the first to suggest that LITT is a safe treatment option for patients with deep-seated nLGG, offering comparable outcomes with surgical resection.

Keywords: Deep-seated; LITT; Low-grade glioma; Newly diagnosed; Open craniotomy.

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