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Ultrasound-Guided Resection of High-Grade Gliomas: A Single-Arm Meta-Analysis

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Abstract

Background: High-grade gliomas (HGG) present a challenge in neuro-oncology, often necessitating surgical resection for optimal management. Ultrasound (US) holds promise in achieving better Gross Total Resection (GTR) and improving outcomes. This meta-analysis systematically evaluates literature providing robust evidence on the use of intraoperative Ultrasonography (iUSG) in HGG resection.

Methods: Following PRISMA guidelines a comprehensive search was made across PubMed, Embase, Cochrane, and Web of Science utilizing terms related to iUSG for HGG resection. The meta-analysis examined randomized trials and observational cohort studies on iUSG-guided HGG resection. GTR, subtotal resection, and post-resection complications were assessed. Statistical analysis, employing R software for a single proportion analysis with confidence intervals (CI) of 95%, I^2 statistics for heterogeneity, and the Instrumental Variables (IV) method with Restricted Maximum Likelihood (REML) for a random effects model.

Results: 178 patients were included in our study. GTR overall rate in patients with iUSG-guided resection was found to be 64% (95% CI: 46 - 81%). Two-dimensional (2D) US remains dominant at 80% against other options of US. Complications were reported at a 15% rate (95% CI: 7 - 23%).

Conclusion: Our study provided robust data on the utilization of iUSG-guided resection regarding the attainment of GTR and the complications related to resection. However, challenges like outcome heterogeneity and limited complication reporting highlight the need for further research to optimize iUSG in HGG treatment. Long-term follow-up studies on patient survival and post-surgery quality of life will complement existing literature, guiding clinical practices in managing HGG.

Keywords: High-Grade Gliomas; Tumor Resection; Ultrasound.

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