

Review

*Neurosurg Rev.* 2025 Dec 16;49(1):74. doi: 10.1007/s10143-025-03998-w.

# Impact of awake mapping on extent of resection and neurological outcomes of Low-grade gliomas: a systematic review and Meta-analysis

Saravanan Sadhasivam <sup>1</sup>, Sreekanth Velpula <sup>2</sup>, Laxmi Prasanna <sup>2</sup>, Rajnish Kumar Arora <sup>2</sup>, Girish Menon <sup>3</sup>, Suresh Narayan Nair <sup>4</sup>

PMID: 41398134 DOI: [10.1007/s10143-025-03998-w](https://doi.org/10.1007/s10143-025-03998-w)

## Abstract

Awake surgery with intraoperative mapping (AwS) of the eloquent brain by electrical stimulation has become an integral part of glioma surgery. However, the impact of AwS on the extent of resection (EOR) of low-grade gliomas (LGGs) is controversial. This systematic review aims to investigate the effect of AwS on resection and neurological outcomes in patients with LGGs. We performed a literature search in PubMed, Embase, and Scopus. All studies that compared AwS with surgery under general anesthesia (GA) in adult patients with LGGs were included. The ROBINS-I ("Risk Of Bias In Nonrandomised Studies of Interventions") was used for assessing the quality of the studies. Risk ratio (RR) and standardized mean difference (SMD) with 95% confidence intervals (CI) were used to calculate the effect size for binary outcomes and continuous variables, respectively. Ten studies have been included in the systematic review and meta-analysis. They included 735 patients, with 401 in the AwS group and 334 in the GA group. We did not find a significant difference in tumor volume on the preoperative MRI (SMD: -0.14; 95% CI: -0.31 to 0.03;  $p=0.11$ ). The mean volumetric EOR did not differ between the two groups (SMD: 0.79; 95% CI: -0.24 to 1.81;  $p=0.13$ ). The early motor (RR: 0.50; 95% CI: 0.16 - 1.51;  $p=0.23$ ) and overall neurological outcomes (RR: 0.67; 95% CI: 0.23 - 1.93;  $p=0.46$ ) were comparable between AwS and GA groups. The late neurological outcome, including motor and language deficits, was significantly better with AwS (RR: 0.27; 95% CI: 0.13 - 0.54;  $p=0.0002$ ). Our meta-analysis suggests that overall EOR is comparable between AwS and asleep surgery for LGGs. Although there is no significant difference in early neurological outcome, patients undergoing awake surgery for LGGs have better overall neurological outcomes in the long term.

**Keywords:** Awake craniotomy; Awake surgery; Intraoperative brain mapping, general anesthesia; Low-grade gliomas; Meta-analysis; Neurological outcome.

© 2025. The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature.

[PubMed Disclaimer](#)