Review Childs Nerv Syst. 2023 Nov 18. doi: 10.1007/s00381-023-06208-4.

Online ahead of print.

Biopsy of diffuse midline glioma is safe and impacts targeted therapy: a systematic review and meta-analysis

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PMID: 37980290 DOI: 10.1007/s00381-023-06208-4

Abstract

Purpose: To quantify the safety and utility of biopsy of pediatric diffuse midline glioma (DMG).

Methods: This study was conducted in accordance with PRISMA guidelines. PubMed, Embase, Scopus, and Web of Science were queried for relevant articles from inception until June 2023. Two reviewers identified all articles that included diagnostic yield, morbidity, and mortality rates for pediatric DMG patients. Studies that did not present original data or were not in English or peer-reviewed were excluded. Meta-analysis was conducted in R using Freeman-Tukey or logit transformation and DerSimonian-Laird random-effects models. The risk of bias was assessed using the Newcastle-Ottawa Scale. A protocol for this review was not registered.

Results: We identified 381 patients from ten studies that met all criteria. DMG biopsy is safe overall (0% mortality, 95% CI: 0-0.6%; 11.0% morbidity, 95% CI: 4.8-18.9%) and has a high diagnostic yield (99.9%, 95% CI: 98.5-100%). The use of stereotactic biopsy is a significant moderator of morbidity ($p = 0.0238$). Molecular targets can be identified in approximately 53.4% of tumors (95% CI: 37.0-69.0%), although targeted therapies are only delivered in about 33.5% of all cases (95% CI: 24.4-44.1%). Heterogeneity was high for morbidity and identification of targets. The risk of bias was low for all studies.

Conclusion: We conducted the first meta-analysis of DMG biopsy to show that it is safe, effective, and able to identify relevant molecular targets that impact targeted therapy.

Keywords: Biopsy; Diffuse midline glioma; Meta-analysis; Systematic review; Targeted therapy.