

Meta-Analysis

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# Surgery alone versus surgery plus adjuvant radiotherapy for WHO grade 2 meningioma: meta-analysis of reconstructed time-to-event data

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## Abstract

**Introduction:** WHO Grade 2 meningiomas present diagnostic and management challenges. Surgery, particularly gross total resection (GTR), is crucial, often followed by adjuvant radiotherapy (RT); however, there are clinical equipoise and ongoing randomized trials of RT after GTR.

**Methods:** This systematic review evaluates the efficacy of gross total resection (GTR) and GTR plus adjuvant radiotherapy (RT) for WHO grade 2 meningiomas, adhering to PRISMA guidelines. It excludes irrelevant studies, conducts a thorough search until January 2024, and specifically analyzes overall survival (OS) and progression-free survival (PFS) outcomes for WHO grade 2 meningiomas. Statistical analysis adopts a two-stage approach with the R package "IPDfromKM," and quality assessment is conducted using the ROBINS-I tool.

**Results:** In our analysis of 23 studies involving 3822 WHO grade 2 meningioma patients, GTR + RT resulted in a significantly longer PFS (HR: 0.849, 95% CI: 0.730 to 0.988,  $p = 0.035$ ) compared to GTR alone. Although OS trended better with GTR + RT (HR: 0.79, 95% CI: 0.57 to 1.11,  $p = 0.173$ ), the difference was not statistically significant, suggesting the need for further investigation.

**Conclusion:** Our study reveals a benefit to adjuvant RT for improving PFS for WHO grade 2 meningiomas. Integrating molecular characteristics into treatment strategies will refine the management of these tumors in the future.

**Keywords:** Atypical meningioma; Cancer; Meningioma; Radiation; Radiotherapy.

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