

Benefits of Pre-Operative Embolization in Surgery for Hypervascular Spinal Tumors: A Meta-Analysis

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Introduction

Hypervascular tumors present a surgical challenge, due to their substantial intraoperative blood loss. Although preoperative embolization is often employed to mitigate intraoperative bleeding, its consistent advantage has not been conclusively demonstrated across existing studies. The purpose of this meta-analysis is to appraise the evidence comparing surgical outcomes with and without preoperative embolization.

Materials and Methods

Following the PRISMA guidelines, PubMed, Cochrane, and Google Scholar were accessed and explored until May 2025. Articles were included if they reported comparative studies evaluating perioperative outcomes of preoperative embolization (E) versus no embolization (NE) in the surgical treatment of hypervascular spinal tumors. A sub-analysis was performed based on whether studies reported no statistically significant difference in surgical invasiveness between the two groups.

Results

Fifteen studies met the inclusion criteria, including 225 patients in group NE and 340 in group E. When all studies were analyzed collectively, no significant differences were observed between the NE group and E group for any of the outcomes. However, in the subgroup of studies that reported no statistically significant differences in surgical invasiveness, there was no significant difference in blood loss ($p=0.75$) between the NE group and E group. In contrast, in the other subgroup of studies, the NE group showed greater blood loss (mean difference=283.08 ml; 95% CI: 2.21– 563.95, $p=0.05$).

Conclusion

Pre-operative embolization was not associated with consistent benefits in surgical outcomes for hypervascular spinal tumors. While some studies reported reduced blood loss with embolization, these findings were limited to analyses lacking control for specific surgical characteristics. This suggests that the perceived advantages may reflect confounding factors rather than the true effect of embolization. However, surgical equipoise remains and the decision to embolize should be individualized based on surgical and patient-related factors.