

Perioperative Complications Following Surgery For Metastatic Spine Disease: A Systematic Review And Meta-Analysis Of Contemporary Literature

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Introduction

Surgery for metastatic spine disease carries significant morbidity risk, but comprehensive analysis of complication patterns across different surgical approaches remains limited. Contemporary literature shows varying complication rates, potentially reflecting differences in patient selection, surgical techniques, and reporting standards. This systematic review aimed to comprehensively analyze perioperative complications following metastatic spine tumor surgery (MSTS) across different surgical approaches, providing evidence-based benchmarks for clinical decision-making.

Materials and Methods

A systematic literature search across PubMed, Cochrane database, and Epistemonikos was conducted on February 8, 2025 for studies published between 2015-2025 reporting perioperative complications following MSTS. Data extraction encompassed patient demographics, tumor characteristics, surgical approaches (open, minimally invasive surgery, hybrid), and detailed complication profiles. Studies were stratified by surgical approach for comparative analysis. Statistical analysis included descriptive statistics and meta-analysis of complication rates.

Results

From 692 initial articles, 133 studies met inclusion criteria, encompassing 77,338 patients with mean age 61 years and 41% female representation. The overall complication rate was 42.56% (Mean: $29.97 \pm 20.27\%$) (Range: 0 – 91.87%). Among surgical approaches, open procedures showed rates ranging 1 – 92%, hybrid approaches 9 – 92%, while minimally invasive procedures ranged 0 – 75%. Major complications included mortality 10.79% (0 – 18.29%), vascular and hemorrhagic events 27.49% (0 – 77.39%), respiratory and cardiac complications 23.43% (0 – 41.39%), as well as reoperation 2.53% (0 – 32.35%). Non-routine discharge occurred in 38.71% (0.51 – 67.97%) patients and readmission rate was 29.11% (2.14 – 37.46%). Major infectious complications occurred in 3.29% (0 – 18.18%). Minor cement complications occurred in 20.45% (1.45 – 51.35%) and minor neurological complications occurred in 19.42% (2.04 – 48.98%).

Conclusion

This comprehensive systematic review demonstrates substantial perioperative complication burden following metastatic spine tumor surgery, with significant variation across surgical approaches. The wide statistical ranges emphasize heterogeneity in patient populations and surgical techniques. These evidence-based benchmarks support informed surgical planning, patient counseling, and targeted quality improvement initiatives in this vulnerable patient population. Future research should focus on standardized complication reporting and risk stratification tools.