Risk Factors for Wound-Related Complications Following Surgery for Primary and Metastatic Spine Tumors: A Systematic Review and Meta-Analysis

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Poster # 2018

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Introduction

• Spinal surgery for primary and metastatic tumors carries a significant risk of postoperative complications at the surgical wound site.

• Previous work has not compared potential risk factors that may differ between these etiologies.

• In this study, we conducted a systematic comparison of risk factors associated with wound-related complications for primary and metastatic tumors.
Methods

• We screened full-text publications on the outcomes of spinal tumor surgeries in the peer-reviewed English primary medical literature

• Patient characteristics, preoperative treatments, and surgical outcomes were collected for primary and metastatic tumor cohorts

• Analyses compared patients that experienced wound-related complications, such as surgical site infection or dehiscence, to controls
  – Conventional pooled analyses were conducted in Microsoft Excel (Version 16.30) to identify potential risk factors for wound complications
  – Random effects modeling and statistics were calculated for variables that were identified in the pooled analysis using R (Version 3.6.1) and the meta package
Results

- Our query identified 5,525 unique citations, from which we included 23 studies describing 5,104 patients
  - 1,936 patients underwent surgery for primary tumors with a wound-related complication rate of 8.1%
    - Malignant tumors had a complication rate of 26.9%
    - Benign tumors had a complication rate of 7.8%
  - 3,168 patients underwent surgery for metastatic tumors with a complication rate of 6.9%

Figure 1: PRISMA diagram depicting study selection process.
Results

• Primary tumors
  – Pooled analysis:
    • Previous radiotherapy was associated with fewer complications
    • Spinal level and instrumentation were associated with more complications
  – Random-effects meta-analysis:
    • Only instrumentation remained statistically significant

• Metastatic tumors
  – Pooled analysis:
    • Previous corticosteroid use, chemotherapy, radiotherapy, and spinal surgery as well as female sex and smoking history were associated with more complications
  – Random-effects meta-analysis:
    • No risk factors reached significance
Results

Figure 2: 
Forest plot to illustrate meta-analysis of risk factors in primary and metastatic spine tumor operations

Random effects modeling and hierarchical subgroup analysis employed to compare wound complication events with and without surgical instrumentation in:

A) Benign primary tumors versus malignant primary tumors

B) Primary and malignant tumors
Results

Figure 3: Forest plots to illustrate meta-analyses of risk factors in metastatic spine tumor operations

Random effects modeling employed to compare wound complication events in:

A) Males versus females
B) Preoperative chemotherapy
C) Preoperative radiotherapy
D) Corticosteroid use
Discussion

• Two sets of distinct risk factors for postoperative wound-related complication were identified for patients with primary or metastatic tumors
  – Primary tumors carried risks relating to the scale and location of the tumor operation
  – Wound-related complications in patients with metastatic tumors may be related to a number of systemic preoperative treatments and conditions

• Random effects meta-analysis demonstrated the limited generalizability of these findings due to a small, heterogenous primary literature
Summary Points

- Wound complications after spine tumor surgery can result in significant morbidity.
- Primary and metastatic spine tumor operations may carry different risk profiles.
- We conducted a systematic review and meta-analysis of the clinical literature.
- Risk factors for primary tumors were related to tumor histology and spinal location.
- Risks factors for metastatic tumors were preoperative treatments and comorbidities.