A Predictive Model of Perioperative Myocardial Infarction in Spine Surgery

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Disclosures

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Background

- Emphasis has been placed upon reducing perioperative complications in spinal operations, of which cardiac complications remain among the most devastating for patients.

- Myocardial infarction (MI), along with its predictive factors, have been understudied as a complication intra- and postoperative.

The study sought to assess the incidence and risk factors for perioperative myocardial infarction in spine surgery patients.
Materials & Methods

• **Inclusion criteria**: Patients >18 years old who underwent elective spine procedures identified in ACS-NSQIP from 2005-2016 (Isolated with CPT codes as previously published).

• A patient was categorized as having sustained a **post-surgical MI** in this study if it occurred intraoperatively or within 30 days of surgery, manifested by documentation of ECG changes or troponin greater than 3 times the upper level of the reference range.

• The relationship between MI and non-MI spine patients was assessed using **chi-squared** and **independent samples t-tests**, as appropriate.

• **Descriptive statistics**, including frequency counts for categorical variables and means and standard deviations, were calculated to summarize demographics and clinical profiles such as spinal diagnoses and comorbidity.

• **Univariate/multivariate analyses** were run to assess predictive factors of MI in spine surgery patients.

• **Logistic regression with stepwise model selection** was employed to create a model to predict MI occurrence.

  – Two-sided p-values <0.05 were considered to be statistically significant. All analysis was conducted in SPSS version 23.0
Results: Overview

- 436 patients undergoing elective spine surgery were identified as having an acute Spine-MI
  - Mean age: 69.07±10.4 years
  - 42% Female
  - 30.39±6.22 kg/m²
- Incidence of MI did not change significantly from 2010 to 2016 (0.2% to 0.3%, p=0.298).
Results: MI Onset Distribution

Shows the distribution of MI onset from day of operation to 30-days postop. Most common onset was 1-3 days postop.
Results: Surgical Comparison

<table>
<thead>
<tr>
<th>Population Comparison</th>
<th>Spine-MI</th>
<th>Non-Spine-MI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinal Fusions^</td>
<td>76.3%</td>
<td>58.4%</td>
</tr>
<tr>
<td>Smith-Peterson Osteotomies</td>
<td>5%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Three Column Osteotomies</td>
<td>0.9%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Decompression Procedures</td>
<td>26.4%</td>
<td>41.6%</td>
</tr>
<tr>
<td>Revision Surgeries</td>
<td>5.3%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Invasiveness Scores*</td>
<td>3.41</td>
<td>2.73</td>
</tr>
<tr>
<td>Operative Time (mins)</td>
<td>211.6</td>
<td>147.3</td>
</tr>
</tbody>
</table>

Comparison of characteristics of the 196,523 elective spine patients observed who had a myocardial infarction (Spine-MI) and those that did not (Non-Spine-MI).

*Only characteristic with p=0.003, all other characteristics p<0.001.
^Mean of 1.03 levels fused.
Results: Predicting MI in Spine Patients

- Mortality rate for Spine-MI patients was 4.6% vs. 0.05% for the population (p<0.001).
- Multivariate modeling for Spine-MI predictors yielded an AUC of 83.7%:
  - History of diabetes mellitus
  - Cardiac arrest
  - Peripheral vascular disease
  - Past blood transfusion
  - Dialysis-dependence
  - High preoperative platelet count
  - Superficial surgical site infection
  - Length of stay
Conclusions

• A model with good predictive capacity to predict MI after spine surgery now exists.
• Predictive modeling of myocardial infarction following spine operations can aid in risk-stratification of patients, consequently improving preoperative patient counseling and optimization in the peri-operative period.