Blood Transfusion During Total Ankle Arthroplasty Is Associated With Increased In-Hospital Complications And Costs

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Financial Disclosures

- The following relationships exist:
  - Royalties and stock options
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    - B. Ponce – Mitek, Tornier, Acumed
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    - B. Ponce – Arthrex, Mitek, Tornier
Introduction

• Total ankle arthroplasty (TAA) is an effective treatment for end-stage ankle arthritis
  – TAA first attempted in the 1970s, but early surgeries had very poor results
  – Modern TAA - 10 year survivorship of 77%
  – TAA procedures are increasing in utilization, with a >1000% increase in the last two decades

3. Pugely et al. Foot Ankle Int, 2014
Introduction

• The need for postoperative blood transfusion for acute blood loss anemia is one potential consequence of TAA
• Multiple studies have associated blood transfusions with increased complications in hip and knee arthroplasty
  – Little is known of its effect in ankle arthroplasty
  – The purpose of this study is to explore outcomes associated with perioperative blood transfusion in TAA using a large national database
Methods

• Nationwide Inpatient Sample (NIS) database 2002-2012
• 19,190 patients receiving TAA identified
  – 294 (1.5%) received a blood transfusion
• Univariate analysis:
  – To determine patient and hospital factors associated with blood transfusion
• Multivariate analysis:
  – To determine if blood transfusion was associated with other inpatient complications after controlling for confounding variables
Patient and Hospital Characteristics (p<0.05)

- Transfused population were:
  - Older Age
    - 65.8 vs 61.9 years
  - More likely female
    - 29.6% vs 54%
  - More likely to be African American
    - 14.1% vs 3.6%
  - More likely to have Medicare
    - 62.2% vs 46.9%

- Transfusions occurred at a higher percentage in the South
  - 46.9% versus 31.5%
Patient Comorbidities Associated with Increased Risk of Transfusion

<table>
<thead>
<tr>
<th>Comorbidity</th>
<th>Blood transfusion</th>
<th>No transfusion</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>54.2</td>
<td>51.4</td>
<td>0.348</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>6.1</td>
<td>1.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>11.9</td>
<td>11.8</td>
<td>0.936</td>
</tr>
<tr>
<td>Peripheral vascular disease</td>
<td>5.1</td>
<td>0.9</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Chronic pulmonary disease</td>
<td>3.4</td>
<td>3.9</td>
<td>0.762</td>
</tr>
<tr>
<td>Obesity</td>
<td>0</td>
<td>2.4</td>
<td>0.002</td>
</tr>
<tr>
<td>Hypothyroidism</td>
<td>18</td>
<td>11.3</td>
<td>0.001</td>
</tr>
<tr>
<td>Liver disease</td>
<td>0</td>
<td>0.7</td>
<td>0.272</td>
</tr>
<tr>
<td>Coagulation disorder</td>
<td>12.9</td>
<td>1.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Anemia</td>
<td>29.3</td>
<td>4.6</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
## Complications Associated with Postoperative Transfusion

<table>
<thead>
<tr>
<th>Complication</th>
<th>Blood transfusion</th>
<th>No transfusion</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVA</td>
<td>0.0</td>
<td>0.1</td>
<td>1.000</td>
</tr>
<tr>
<td>Coma</td>
<td>0.0</td>
<td>0.2</td>
<td>1.000</td>
</tr>
<tr>
<td>Acute renal failure</td>
<td>5.1</td>
<td>0.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Acute MI</td>
<td>1.7</td>
<td>0.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Cardiac arrest</td>
<td>0.0</td>
<td>0.1</td>
<td>1.000</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>3.1</td>
<td>0.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>0.0</td>
<td>0.2</td>
<td>1.000</td>
</tr>
<tr>
<td>Deep vein thrombosis</td>
<td>0.0</td>
<td>0.1</td>
<td>1.000</td>
</tr>
<tr>
<td>Prosthetic joint infection</td>
<td>0.0</td>
<td>&lt;0.1</td>
<td>1.000</td>
</tr>
<tr>
<td>Extended length of stay</td>
<td>35.4</td>
<td>5.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Increased cost</td>
<td>18.8</td>
<td>8.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Mortality</td>
<td>0.0</td>
<td>&lt;0.1</td>
<td>1.000</td>
</tr>
</tbody>
</table>
Resource Utilization Differences

LOS >~3 days

Charges >$43,000

Length of Stay

<table>
<thead>
<tr>
<th>Blood Transfusion</th>
<th>No Transfusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.43</td>
<td>2.45</td>
</tr>
</tbody>
</table>

Total Hospital Charges

<table>
<thead>
<tr>
<th>Blood Transfusion</th>
<th>No Transfusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>101,214</td>
<td>58,076</td>
</tr>
</tbody>
</table>
Discussion

• Our results are largely in line with the data seen after THA/TKA with regards to comorbidities and associated complications ⁴

• Prosthetic joint infection was not associated with transfusion in our study
  – This differs from some literature in THA/TKA⁵
  – This was only an inpatient analysis

• Our study found an increased risk of AMI (OR of 66)
  – In THA/TKA data, AMI is the greatest cause of 30 day mortality⁶

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⁵ Frisch et al. J Arthroplasty, 2014
Conclusions

- Perioperative blood transfusions are associated with increased inpatient complications and increased hospital costs following TAA.

- Careful preoperative assessment and medical optimization of at-risk patients should be performed in order to minimize the need of perioperative blood transfusion.
Selected References


