The Use of an Exsanguinating Tourniquet and Intravenous Tranexamic Acid to Reduce Total Blood Loss and Transfusion Rates in Unilateral Total Knee Arthroplasty

Drayton Daily
Mark A. Dodson, MD
Sara Catherine Pearson
Purpose:

Analyze post-operative outcomes of Unilateral Total Knee Arthroplasty (TKA) in patients who received an exsanguinating tourniquet with and without Tranexamic Acid (TXA). Primary outcomes were determined by transfusions and Hematocrit (HCT) levels. Secondary outcomes are Length of Stay (LOS) and any type of post-operative complications.
Exsanguinating Tourniquet

- It is reported that 95% of the blood is cleared from patient’s limb
- Arterial blood flow is occluded from entering the limb
- At release, the silicon ring is cut and tourniquet is discarded
Exsanguinating Tourniquet

- Constructed of stockinet material with a stretchable silicon ring
- Sterile, single use tourniquet
- Sizing varies from pediatric to obese patients to fit upper & lower limbs
- Tourniquet is rolled out on the limb distal to proximal
209 Consecutive Unilateral TKA Patients from January 2014 through July 2015

77 Males
- BMI Range: 19.1- 49.0
- Average BMI: 32.7 (±5.778)

132 Females
- BMI Range: 18.7- 53.5
- Average BMI: 33.4 (±6.987)
Methods

- All surgeries were performed by a single surgeon at a single surgical site
- No patients were omitted for any reason
- All 209 patients received Exsanguinating Tourniquet
- Surgeon began using Exsanguinating Tourniquet around early 2013
- Tourniquet was left in place until after bandages were applied
- No drains were used
- Prophylaxis taken to prevent deep vein thrombosis (DVT) and embolisms were 325mg of Aspirin taken once daily and intermittent compression devices applied to the feet until discharge
- Data included patient demographics, Pre and Post-operative HCT levels, Transfusion rates, LOS, and complications
- Post-op HCT levels were taken in inpatient prior to discharge
Tranexamic Acid (TXA)

- Halfway through this study 105 patients received TXA
  - 30 Males, 75 Females

- Dosing: 2 Doses of 1000mg
  - First dose 10-15 minutes before surgery
  - Final dose 10-15 minutes before tourniquet release

- Senior author began this administration to prevent blood loss and continues to do so
Pre-Operative HCT Levels

- Avg. Male
  Pre-operative HCT: 41.477 (±3.787)
  Male Range: 33.6 – 50.4

- Avg. Female
  Pre-operative HCT: 38.479 (±3.153)
  Female Range: 30.2–49.7
Results

- No reports of Deep Vein Thrombosis (DVT) or Pulmonary Embolisms (PE) at 90 days post-op

- Average tourniquet time: 86.9 minutes
Post-Operative HCT

<table>
<thead>
<tr>
<th>Post-op Hematocrit</th>
<th>AVG HCT W/O TXA</th>
<th>AVG HCT W/ TXA</th>
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<tbody>
<tr>
<td><strong>Male:</strong></td>
<td><strong>31.64 (±4.61)</strong></td>
<td><strong>34.20 (±2.68)</strong></td>
</tr>
<tr>
<td><strong>Female:</strong></td>
<td><strong>29.24 (±3.33)</strong></td>
<td><strong>30.78 (±3.07)</strong></td>
</tr>
<tr>
<td>Range: 23.9-42</td>
<td>Range: 29.1-39</td>
<td>Range: 23.8-35.8</td>
</tr>
</tbody>
</table>
Post-Operative Female HCT

TXA Usage:
- Blue = No
- Red = Yes
Post-Operative Male HCT

Line Plot
Sex-M

TXA Usage:
Blue = No
Red = Yes
Average Drop in Hematocrit:

- **Males**
  - With TXA: 6.0
  - Without TXA: 9.3
- **Females**
  - With TXA: 7.2
  - Without TXA: 9.8
Significance of HCT Data Between Patients With and Without TXA

- Significance of Female HCT With and Without TXA:
  - P value = 0.008381047
  - P-value (0.008) < 0.05

- Significance of Male HCT With and Without TXA:
  - P-value = 0.010292072
  - P-value (0.01) < 0.05

- Less than 5% probability that results are due to random chance
Average Length of Stay: 1.65 days

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<thead>
<tr>
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<tbody>
<tr>
<td>Patients W/ TXA</td>
<td>All Patients</td>
<td>Patients W/O TXA</td>
<td>Missing two patients’ discharge dates</td>
</tr>
<tr>
<td>60</td>
<td>97</td>
<td>37</td>
<td>38</td>
</tr>
</tbody>
</table>
Results: Complications

- 2 patients transfused—3 total units were transfused between the two patients
- Neither of the patients received TXA
- Both patients were males and diagnosed with anemia pre-operatively
  - Pre-Operative HCT levels were 34.0 and 34.8
- Both transfusion patients were 80 years of age or older
- BMIs were 27.3 and 26.3 respectively

- The 2 complications were post-op infections
  - 1st Case: 2 months after DOS
    - I&D with poly exchange
    - Implants still retained and patient is doing well
  - 2nd Case: 7 months after DOS
    - I&D with poly exchange
    - Implants still retained and patient is doing well

- No other patient readmissions
Conclusion

- This study supports the single-use, exsanguinating tourniquet in controlling blood loss in Unilateral Total Knee Arthroplasty.
- Less than 1% of patients received a post-operative blood transfusion.
- This study shows the trend of post op HCT with the use of TXA along with an exsanguinating tourniquet to reduce blood loss.
- Both patients that received a blood transfusion were not administered TXA.
- The data presented from this study supports the use of an exsanguinating tourniquet with TXA to TKA compared to other published norms.
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