Blood Transfusion in Aortic Root Surgery Impairs Mid-Term Survival

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Abstract: 3697
Aortic Root Replacement 2014-2020

Redo Operation
- De novo operation: 315
- Redo operation: 269

Root Replacement Type
- Biological CVG: 176
- Freestyle: 18
- Homograft: 155
- Mechanical CVG: 1
- Prosthesis Sparing: 3
- VSRR: 1

Total: 585
Blood Transfusion

- >60% transfused nationally
- Associated complications
  - Hemolytic reactions
  - Allergic transfusion reactions
  - Transfusion-associated circulatory overload (TACO)
  - Transfusion-related acute lung injury (TRALI)
  - Infectious transmission
- Blood conservation strategies
Aim

- Primary Aim:
  - Mid-term survival
- Secondary Aim
  - Morbidity
  - Hospital length of stay
Method

- Retrospective review
  - March 2014 to July 2020
  - >18 years old
  - 761 patients

- Propensity score matching
  - No blood transfusion vs. intra/postoperative RBC transfusion
  - 23 baseline and operative characteristics
  - 158 matched pairs
Propensity Score Matching

Covariate Balance

- Year
- Age
- Male
- BMI
- White
- Black
- CVA
- HTN
- CAD
- Lung Disease
- LVEF
- Diabetes
- HLD
- ESRD
- Bicuspid Aortic Valve
- Connective Tissue Disorder
- Redo Sternotomy
- Emergent Status
- Root Replacement Type
- Concomitant Arch
- Pre-op HGB
- CPB Time
- Cross Clamp Time
- Lowest Temperature

Before matching

After matching

Mean Differences

Before matching

After matching

Sample

Unadjusted

Adjusted

Covariate Balance
Mid-Term Survival

Overall Survival Probability

Number at risk

<table>
<thead>
<tr>
<th>Years</th>
<th>No Transfusion</th>
<th>pRBC Transfusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>158</td>
<td>158</td>
</tr>
<tr>
<td>1</td>
<td>111</td>
<td>104</td>
</tr>
<tr>
<td>2</td>
<td>86</td>
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<td>3</td>
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<td>4</td>
<td>33</td>
<td>39</td>
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<tr>
<td>5</td>
<td>16</td>
<td>26</td>
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</tbody>
</table>

p = 0.014
pRBC Location

p = 0.21

Overall survival probability

Years
0 1 2 3 4 5

Number at risk
Intraoperative
Postoperative
Intra- and Postoperative

<table>
<thead>
<tr>
<th>Years</th>
<th>Intraoperative</th>
<th>Postoperative</th>
<th>Intra- and Postoperative</th>
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<tbody>
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<td>0</td>
<td>27</td>
<td>61</td>
<td>42</td>
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<tr>
<td>1</td>
<td>17</td>
<td>61</td>
<td>42</td>
</tr>
<tr>
<td>2</td>
<td>13</td>
<td>44</td>
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</tr>
<tr>
<td>3</td>
<td>10</td>
<td>33</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td>23</td>
<td>9</td>
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<tr>
<td>5</td>
<td>6</td>
<td>15</td>
<td>5</td>
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</tbody>
</table>
Number of Units

Overall survival probability

0 0.5 1 1.0

Years

0 1 2 3 4 5

p = 0.00085

Number at risk

No Transfusion
1-3 pRBCs
3-6 pRBCs
7+ pRBCs

<table>
<thead>
<tr>
<th>Years</th>
<th>No Transfusion</th>
<th>1-3 pRBCs</th>
<th>3-6 pRBCs</th>
<th>7+ pRBCs</th>
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<tbody>
<tr>
<td>0</td>
<td>139</td>
<td>83</td>
<td>32</td>
<td>33</td>
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<tr>
<td>1</td>
<td>102</td>
<td>57</td>
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<td>23</td>
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<td>2</td>
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<td>17</td>
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<td>4</td>
<td>5</td>
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</table>

Stanford Medicine
## Secondary Outcomes

<table>
<thead>
<tr>
<th>Variable</th>
<th>RBC Transfusion</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>No, N = 158&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Yes, N = 158&lt;sup&gt;1&lt;/sup&gt;</td>
<td>p-value&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Operative mortality</td>
<td>0 (0%)</td>
<td>3 (1.9%)</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>&gt;24 hour ventilation</td>
<td>23 (15%)</td>
<td>41 (26%)</td>
<td>0.012</td>
<td></td>
</tr>
<tr>
<td>Hemodialysis</td>
<td>0 (0%)</td>
<td>10 (6.3%)</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td>3 (1.9%)</td>
<td>3 (1.9%)</td>
<td>&gt;0.9</td>
<td></td>
</tr>
<tr>
<td>Pacemaker</td>
<td>6 (3.8%)</td>
<td>7 (4.4%)</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Reoperation for mediastinal hemorrhage</td>
<td>0 (0%)</td>
<td>6 (3.8%)</td>
<td>0.030</td>
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</tr>
<tr>
<td>ICU length of stay (days)</td>
<td>2.0 (2.0, 3.0)</td>
<td>3.0 (2.0, 6.0)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Hospital length of stay (days)</td>
<td>6 (6, 8)</td>
<td>8 (7, 14)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Hgb at discharge (g/dl)</td>
<td>9.20 (8.30, 9.90)</td>
<td>8.80 (8.30, 9.60)</td>
<td>0.3</td>
<td></td>
</tr>
</tbody>
</table>

<sup>1</sup> n (%); Median (IQR)

<sup>2</sup> Fisher's exact test; Pearson's Chi-squared test; Wilcoxon rank sum test
Conclusion

- **Primary Aim**
  - 5-year survival decreased
- **Secondary Aim**
  - Prolonged ventilation
  - Hemodialysis
  - ICU and Hospital length
  - Mediastinal hemorrhage