Intraoperative management by a craniofacial team anesthesiologist is associated with improved outcomes in children undergoing craniofacial reconstructive surgery

Srijaya K. Reddy MD, MBA1, Roshan Patel MD2, Heather Gordish-Dressman PhD3, Sophie R. Pesticou MD1

1Division of Anesthesiology and Pain Medicine and 3Research Center for Genetic Medicine – Children’s National Health System / The George Washington University School of Medicine & Health Sciences, 2Department of Anesthesiology – Montefiore Medical Center / Albert Einstein College of Medicine

Introduction

There is limited data regarding the effects of a team-based approach in anesthesiology on the management and outcomes of complex pediatric surgery. The goal of this study was to determine if perioperative management by an anesthesiologist with expertise in craniofacial (CF) surgery would impact outcomes for children undergoing CF reconstructive surgery. We hypothesized that patients managed by anesthesiologists from the CF team would have fewer postoperative complications and improved outcomes compared to patients not managed by CF team anesthesiologists.

Methods

Sixty-two children with craniosynostosis undergoing major CF reconstructive surgery at Children’s National Health System between July 2013 and December 2015 were identified. Fifty-four patients were managed by a CF team anesthesiologist, while 8 patients were managed by non-CF team anesthesiologists. Primary outcome measures were intraoperative calculated blood loss, red blood cell (RBC) transfusion volume, number of blood donor exposures, crystalloid and colloid administration volume, extubation rate, and hospital length of stay (LOS). Normality of all continuous outcomes was determined and means were compared using a student’s t-test. Categorical variables were compared using a non-parametric Wilcoxon rank sum test; *Statistical comparison performed on log transformed values; #Statistical comparison performed on square root transformed values.

Results

A total of 6 CF team anesthesiologists and 6 non-CF team anesthesiologists were involved in providing care to all patients. There were no significant demographic differences between the two groups. Children cared for by a CF team anesthesiologist had significantly lower calculated blood loss, reduced RBC transfusion volume, fewer intraoperative blood donor exposures, less crystalloid volume administration, higher rate of extubation at the end of the case, fewer postoperative complications, and decreased length of ICU and hospital LOS than patients who were managed by non-CF team anesthesiologists. There was no significant difference in opioid administration, colloid volume administration, or intraoperative complication rates between the two groups.

Table 1: Summary Statistics and Comparison of Outcomes Between CF Team and Non-CF Team Anesthesiologists

<table>
<thead>
<tr>
<th>Outcome</th>
<th>CF Team Cases (N=54)</th>
<th>Non-CF Team Cases (N=8)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (months)*</td>
<td>29.3±22.9</td>
<td>12 (35)</td>
<td>0.64</td>
</tr>
<tr>
<td>Weight (kg)*</td>
<td>13.3±8.4</td>
<td>9.8 (9.1)</td>
<td></td>
</tr>
<tr>
<td>LR+NS (mL/kg)**</td>
<td>45.92±25.59</td>
<td>43.34 (25.28)</td>
<td>0.29</td>
</tr>
<tr>
<td>5% Albumin (mL/kg)*</td>
<td>11.27±8.97</td>
<td>10.12 (9.69)</td>
<td>0.37</td>
</tr>
<tr>
<td>RBC (mL/kg)^</td>
<td>19.07±12.95</td>
<td>19.23 (13.66)</td>
<td>0.003</td>
</tr>
<tr>
<td>Morphine Equiv (mg/kg)</td>
<td>0.27±0.139</td>
<td>0.245 (0.199)</td>
<td>0.64</td>
</tr>
<tr>
<td>Preop Hct (%)</td>
<td>34.4±3.2</td>
<td>3.41 (3.0)</td>
<td>0.63</td>
</tr>
<tr>
<td>Postop Hct (%)</td>
<td>32.3±4.5</td>
<td>33.0 (7.4)</td>
<td>0.76</td>
</tr>
<tr>
<td>CBL (mL/kg)**</td>
<td>40.47±22.07</td>
<td>36.90 (19.57)</td>
<td>0.002</td>
</tr>
<tr>
<td>Op time (min)</td>
<td>229±103</td>
<td>228 (125)</td>
<td>0.53</td>
</tr>
</tbody>
</table>

Table 2: Summary Statistics and Comparison of Outcomes Between CF Team and Non-CF Team Anesthesiologists

<table>
<thead>
<tr>
<th>Outcome</th>
<th>CF Team Cases (N=54)</th>
<th>Non-CF Team Cases (N=8)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASA</td>
<td>I 2 (3.7%)</td>
<td>0 (0.0%)</td>
<td>0.31</td>
</tr>
<tr>
<td></td>
<td>II 40 (74.1%)</td>
<td>4 (50.0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>III 12 (22.2%)</td>
<td>4 (50.0%)</td>
<td></td>
</tr>
<tr>
<td>Anorio Used</td>
<td>No 32 (59.3%)</td>
<td>7 (67.5%)</td>
<td>0.24</td>
</tr>
<tr>
<td></td>
<td>Yes 22 (40.7%)</td>
<td>1 (12.5%)</td>
<td></td>
</tr>
<tr>
<td>Post-op Complications</td>
<td>No 52 (96.3%)</td>
<td>7 (67.5%)</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>Yes 2 (2.7%)</td>
<td>1 (12.5%)</td>
<td></td>
</tr>
<tr>
<td># PICU Days</td>
<td>No 53 (98.2%)</td>
<td>5 (62.5%)</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>Yes 1 (1.9%)</td>
<td>3 (37.5%)</td>
<td></td>
</tr>
<tr>
<td>Exubated</td>
<td>No 0 (0.0%)</td>
<td>3 (37.5%)</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>Yes 54 (100.0%)</td>
<td>5 (62.5%)</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion

Intraoperative management by a CF team anesthesiologist is associated with improved outcomes in children undergoing CF reconstructive surgery. While some of this variability can be attributed to provider-volume relationship, experience with blood conservation techniques likely plays a role. These findings suggest that patients may benefit from a subspecialty team-based approach for these high-risk cases.