The use of pre-operative oral iron therapy to decrease intraoperative transfusion in pediatric cardiac surgery patients

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BACKGROUND

• Bleeding and blood transfusion in pediatric patients with congenital heart disease requiring surgery can be substantial2.
• Transfusion can increase the risk of complications leading to prolonged hospital stay, higher cost and increased morbidity and mortality3.
• Risks of transfusion are well recognized. However patients assigned to a lower-hematocrit group (<25%) had higher intraoperative fluid balance, higher serum lactate levels, lower nadirs of cardiac index in the first 24h and at age 1, and worse Psychomotor Development Index scores4.
• In the adult population having major surgery preoperative iron therapy has been shown to improve hemoglobin and decrease exposure to allogeneic blood6.

OBJECTIVE

• To assess whether preoperative iron therapy in pediatric patients having elective cardiac surgery will decrease exposure to allogeneic blood transfusion.

METHODS

• Retrospective study, 247 pediatric cardiac surgery patients, 2013 - 2014, weighing ≥ 12kg
• Iron supplementation was initiated by the blood conservation nurse (ONTrac) once the patient was scheduled for surgery for either acyanotic or cyanotic cardiac conditions.
• Primary endpoint was number of units of red cells transfused intra-operatively.
• Iron supplementation is categorized into three groups based on prior data on the efficacy of oral iron and guidelines for preoperative oral iron therapy.
• Multivariate regression analysis adjusting for age, sex, RACHS score, and time on bypass was used to determine differences in red cell transfusion comparing patients receiving iron 14 days or less, 15 to 60 days (reference group) or 61 days or more.
• Secondary endpoints included transfusion in the cardiac critical care unit (CCCU), length of hospital stay, and use of other blood products such as plasma and platelets.

RESULTS

• Mean (SD)number of red cells transfused intra-operatively is 1.04 units (1.51)
• Mean (SD) duration of iron therapy is 58.5 days (58.3)
• Statistically significant decrease in red cell transfusion with iron therapy longer than 14 days but no additional benefit beyond 60 days (Table 1 and Figure 1)
• Analysis of secondary outcomes revealed a decrease in frozen plasma use but not platelet transfusion and red cell transfusion intra-operatively was associated with transfusion in the CCCU along with hospital length of stay

CONCLUSION

• Preoperative iron therapy decreases intraoperative red cell transfusion.
• The efficacy may be limited to a decrease in overall transfusion but not a decrease in donor exposure.
• No further decrease in red cell transfusion beyond 60 days of oral iron.
• Surgical complexity (prolonged bypass time, increased RACHS score) may also contribute to increased exposure to allogeneic blood
• The relevance of these findings are that we can decrease blood transfusion intra-operatively, mitigating risks, conserving resources, and at the same time guide length of iron therapy for our patients.

REFERENCE


Table 1: Multivariable Effects of Length of Iron Therapy on Number of Red Cell Units Transfused

<table>
<thead>
<tr>
<th>Patient Characteristic</th>
<th>Effect Estimate (se)</th>
<th>p-Value</th>
</tr>
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<tbody>
<tr>
<td>Iron Therapy Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤14 days</td>
<td>Age</td>
<td>Sex</td>
</tr>
<tr>
<td>15 to 60 days</td>
<td>&lt;0.0001</td>
<td>0.006</td>
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<tr>
<td>&gt;60 days</td>
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</tbody>
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*Standard Error

Figure 1. Mean number of red cell units transfused by length of iron therapy