RBC Alloimmunization in Patients Undergoing Left Ventricular Assist Device (LVAD) Placement

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Introduction

Cardiac surgery has a high rate of RBC and platelet (PLT) transfusion. In patients undergoing routine cardiac surgery, the incidence of RBC and HLA alloimmunization is 5.3% and 12%, respectively. Interestingly, the greatest predictor for RBC alloimmunization in these patients is concurrent HLA sensitization.

Left ventricular assist devices (LVADs) have become an accepted and burgeoning treatment for refractory heart failure patients awaiting heart transplantation. Relative to routine cardiac surgery, LVAD placement can be associated with significant peri-operative transfusion support. Recent studies have reported HLA alloimmunization rates of 28-40% in LVAD patients. To determine whether LVAD placement is also associated with an increased incidence of RBC alloimmunization, we performed a 10 year retrospective review of all patients undergoing LVAD placement at the University of Michigan.

Methods

A retrospective analysis was performed for all patients undergoing LVAD implantation between 1997-2007. Data collected included patient name, sex, age at time of surgery, date of surgery and number of blood components transfused. Serology data included the date of the first new RBC antibody screen, antibody identification (ABID) results and HLA antibody screen (PRA). RBC and platelets transfused between 1997-2002 were a mix of leukoreduced & non-leukoreduced components. RBC and platelets transfused after 2002 were pre-storage leukoreduced. Statistical analysis and graphics were performed with commercial software (KaleidoGraph™, Synergy Software).

Results

RBC Alloantibodies in LVAD Patients

Clinically-significant RBC alloantibodies were identified in 20 patients (8.4%). In 7 patients (2.9%), RBC alloantibodies were present prior to surgery. Following LVAD placement, a total of 26 new RBC alloantibodies were identified in 15 (6.3%) patients. Antibody specificities included Rh (n=14), Kell (7), Kidd (4) and Duffy (1). 5/15 (33%) patients developed more than 1 alloantibody. The mean time interval between LVAD surgery and a positive RBC antibody screen (ABID) was 5.7 ± 3 months.

There was no significant increase in the RBC transfusion count in antibody “responders” (16.7 ± 11, P=0.05). Responders tended to be younger (45.6 vs 50.7 years, P=0.13) and male (70%, 14/20). The majority of alloimmunized patients (9/15, 60%) received only pre-storage leukoreduced blood components.

Table 1

<table>
<thead>
<tr>
<th>Component</th>
<th>Placement: n=20</th>
<th>Prior: n=7</th>
<th>P</th>
<th>t-Test</th>
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<tbody>
<tr>
<td>RBC</td>
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<td>148±14</td>
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<tr>
<td>FFP</td>
<td>100±15</td>
<td>118±18</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>PLT</td>
<td>100±15</td>
<td>133±20</td>
<td>0.05</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Figure 2: Peri-operative Blood Transfusion Support in LVAD Patients

Panels A-C, distribution of RBC, FFP and platelet (PLT) transfusion in individual patients. Panel D, Average transfusion support (mean ± SD). Mean numerical values for each component also shown. Panels E and F, Correlation between FFP (E), platelets (F) and RBC transfusion.

References


Conclusions

The incidence of new RBC alloantibodies after LVAD placement (6.3%) is equivalent to that in routine cardiac surgery (5.3%).