TRANSFUSION ISSUES IN SOLID ORGAN TRANSPLANTATION
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I. General Remarks
A. In general, ABO considerations are important in most solid organ transplants (even above HLA) and most transplants are ABO compatible; this is in contrast to PBSC transplants (HLA above ABO considerations).
B. Liver, kidney, and heart ABO incompatible transplants have been done at some centers
   - RBC Transfused: Should be of donor’s type
   - Platelet/Plasma: Should be compatible with both recipient and donor’s organ (which contains variable amounts of RBC)
   - Lymphocytes in the transplanted organs (passenger lymphocytes) may produce antibodies in the recipient, usually appear 1-2 weeks following transplantation, most commonly seen following ABO incompatible transplants, May cause positive DAT and some hemolysis. If severe, the patient can be treated with plasma exchange. Recipient can be transfused with O RBCs to increase survival of red cells, and recipient’s type of plasma/platelet.
C. Transfusion requirements are modest in most cases, except in liver transplantation, which can potentially use a huge number of components perioperatively due to underlying coagulopathy.
D. CMV seronegative patients receiving seronegative organs should receive CMV safe blood products (leukoreduced, or from CMV seronegative donors). No documented benefit to providing CMV safe products to patients who are already CMV seropositive. There is the possibility of co-infection of a new CMV strain, but due to pre-existing anti-CMV, clinical course is usually mild.
E. Transfusion-associated graft vs. host disease is rare (only 4 published cases!) despite immune suppression, therefore routine irradiation is not considered necessary at most centers.
F. Alloimmunization to HLA antigen is serious concern. It may pose difficulties in finding compatible organs, and is associated with decreased survival in kidney, lung and heart transplants, but not liver. Therefore products should be leukoreduced at least for heart, lung and kidney transplant recipients.

II. Liver Transplantation
A. May need RBCs, but also coagulation factor and platelets due to underlying coagulopathy, which is exacerbated during the anhepatic phase of the surgery
B. Plasma exchange with FFP may be considered to improve coagulation status pre-op
C. Consider intraoperative RBC salvage to reduce allogeneic RBC exposure.
D. However, nearly bloodless liver Tx have also been reported at some centers.
E. Large amount of products may be needed at the time of surgery on short notice. It is key to maintain communication and ensure that blood bank has adequate supply.

F. May be necessary to consider giving Rh positive RBC in Rh negative patients. Some reports show that they are not very likely to produce anti-D, likely secondary to the immunesuppression associated with the transplant.

G. Patients with previously existing clinically significant alloantibody against RBC antigens:
   - Ideally find 5-10 antigen negative units
   - Use antigen negative units for the first and last 5-10 units (or just the last 10 units), and antigen-unscreened units in the middle of the surgery while blood loss is rapid
   - Requires close communication between BB and anesthesiologist

H. ABO considerations and inventory management:
   - For group A and O patients, use ABO-identical RBCs
   - For group AB and B, group O RBCs may be used to conserve the more uncommon RBC types
   - The AB patient may also be a challenge with FFP transfusion (since AB FFP is uncommon, 4% of the inventory); in these patients, early group A RBC use along with AB plasma, followed by conversion to group A FFP can be considered to conserve AB plasma inventory

III. Kidney Transplantation
   A. In the past, potential recipient were transfused with blood products from the intended donor, due to the effect of transfusion-associated immunesuppression in renal transplant patients who were thus transfused before surgery. This induces “tolerance” and organ recipients who were thus transfused had less risk of rejection. However, with the advent of cyclosporine A etc. and the superior immunesuppression that can be achieved, this is no longer considered important.
   B. Erythropoietin further reduced transfusion needs of patients with ESRD.

IV. Heart Transplantation
   A. Cardiopulmonary bypass (CPB) affects platelet function and number.
   B. However routine platelet transfusion is not necessary because most patients do not experience substantial bleeding.
Table 1
Median Blood Use (Units) in Organ Transplantation

<table>
<thead>
<tr>
<th>Organ</th>
<th>Red cells</th>
<th>Plasma</th>
<th>Platelets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver (n=118)</td>
<td>12</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Heart (n=51)</td>
<td>4</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Lung</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single (n=46)</td>
<td>0-2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Double (n=30)</td>
<td>7</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Kidney</td>
<td>0-2</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 2
Recommendations for use of specialized blood components in solid-organ transplant recipients

<table>
<thead>
<tr>
<th>Type</th>
<th>CMV neg/safe</th>
<th>Filtered</th>
<th>Irradiated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kidney</td>
<td>Yes*</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Heart</td>
<td>Yes*</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Lung</td>
<td>Yes*</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Liver</td>
<td>Yes*</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

*CMV-negative recipient-organ pairs only. Components rendered CMV-safe by filtration are a reasonable substitute.