Delayed Hemolytic Transfusion Reaction - Anti-Jk⁺ Case Study

A 72 year old man received two units of red cells five days ago following a bicycling accident. Prior to this transfusion, he was transfused 40 years ago when he was wounded while serving in Vietnam. He has no other relevant medical history. At his check-up today, it was observed that the patient was slightly jaundiced and reported feeling fatigued. Blood work revealed that his hematocrit had dropped from 35% to 30%. There is no evidence of bleeding, so a Direct Antiglobulin Test was performed and found to be weakly positive. A Transfusion Reaction Work-up has been ordered.

Expected Results
EDU-03 Pre-Transfusion Red Cells, EDU-04 Pre-Transfusion Serum

<table>
<thead>
<tr>
<th>Sample EDU-03 ABO / Rh</th>
<th>Sample EDU-03 Antigen Type</th>
<th>Sample EDU-04 Antibody Screen</th>
<th>Sample EDU-04 X-match with EDU-07</th>
<th>Sample EDU-04 X-match with EDU-08</th>
</tr>
</thead>
<tbody>
<tr>
<td>O POS</td>
<td>Jk(a-)</td>
<td>Negative</td>
<td>Compatible</td>
<td>Compatible</td>
</tr>
</tbody>
</table>

EDU-05 Post-Transfusion Red Cells, EDU-06 Post-Transfusion Serum

<table>
<thead>
<tr>
<th>Sample EDU-05 ABO / Rh</th>
<th>Sample EDU-06 Antibody Screen</th>
<th>Sample EDU-06 Antibody ID</th>
<th>Sample EDU-06 X-match with EDU-07</th>
<th>Sample EDU-06 X-match with EDU-08</th>
</tr>
</thead>
<tbody>
<tr>
<td>O POS</td>
<td>Positive</td>
<td>Anti-Jk⁺</td>
<td>Compatible</td>
<td>Incompatible</td>
</tr>
</tbody>
</table>

Discussion

Fever, anemia and mild jaundice occurring most often 4 to 8 days post transfusion are common signs of a delayed hemolytic transfusion reaction (DHTR). As is seen with this patient, most cases of DHTR are secondary to an anamnestic response.

Approximately 1 to 1.6% of transfused patients develop an antibody. The primary immune response initially stimulates IgM antibody production that is followed by a transition to IgG. Over months and years, 30 to 40% of alloantibodies decrease in titer and become undetectable by routine, pre-transfusion serological tests; this results in random ABO/Rh compatible units being issued for transfusion. If the transfused red cell unit(s) has the corresponding antigen, a secondary immune response with rapid production of IgG antibody occurs. Generally, the antibody is detectable 2 to 14 days after the patient is re-exposed to the antigen. Blood group antibodies in the Kidd, Duffy and Kell systems are notorious for exhibiting this behavior. The rapidity of antibody development and characteristics of the antibody specificity influence the potential for red cell destruction. For most delayed hemolytic transfusion reactions, red cell destruction occurs through extravascular hemolysis when sensitized RBCs are removed from the circulation by the reticuloendothelial system (RES).
Delayed Hemolytic Transfusion Reaction - Anti-Jk^a Case Study (cont.)

Investigation
When a DHTR is suspected, a transfusion reaction workup should be ordered. In addition to testing a fresh sample, repeat testing of the previous sample, when available, should also be performed. The serological investigation may include ABO/Rh, antibody screen/identification, direct antiglobulin testing and elution studies. In some cases, the antibody may still be at levels undetectable in the plasma, but can be recovered and identified in an eluate. When a previously undetected antibody is identified, the transfused unit(s) should be antigen typed for the corresponding antigen. Often, a delayed transfusion reaction is asymptomatic and is only discovered when a subsequent patient sample is tested for a type and crossmatch and a “new” antibody is detected and/or the red cells have a positive DAT. This category of delayed transfusion reaction is designated delayed serological transfusion reaction (DSTR).

Frequency
Since many cases of delayed transfusion reaction go undetected, the reported frequency of DHTR/DSTR varies, but is estimated to be 1 in 2000 for both DHTR/DSTR types with the minority attributed to DHTR. Anti-Jk^a and -Fy^a are the antibodies most often associated with a hemolytic event.

References

This case study and antibody discussion was provided by Hemo bioscience (www.hemobioscience.com), the manufacturer of these Blood Bank proficiency samples.