Anti-K Delayed Hemolytic Transfusion Reaction

An order is received for two units of blood for a 65 year old woman following total hip replacement surgery. Her history includes multiple transfusions 30 years ago after a skydiving accident. The patient was previously typed as A Rh (D) - positive.

Pre-Transfusion Testing

Anti -A	Anti-B	Anti-D	Rh Control	A1 cells	B cells
4+	0	4+	0	0	4+

Participants were asked to perform an antibody screen and 2 unit crossmatch.

Two days post-transfusion, it is noticed the patient did not achieve the expected increase in hemoglobin and the bilirubin is elevated. Additionally, the patient is experiencing a low grade fever of undetermined origin. A Transfusion Reaction Work-Up is ordered. Below are the results of the Group, Type, and Direct Antiglobulin Testing.

Post-Transfusion Testing

Anti -A	Anti-B	Anti-D	Rh Control	A1 cells	B cells	Direct Antiglobulin Test
4+	0	4+	0	0	4+	2+

Participants were asked to perform an antibody screen, antibody identification, and 2 unit antiglobulin crossmatch.

Expected Results

The antibody screen performed on the patient's pre-transfusion serum Sample EDU-03 was negative. Both donor Samples EDU-05 and EDU-06 were compatible. However, the antibody screen performed on the patient's post-transfusion serum Sample EDU-04 was positive for Anti-K antibody. Donor Sample EDU-05 was not compatible, while donor Sample EDU-06 was compatible with the post-transfusion serum Sample EDU-04.

Discussion

Most transfusions are safe and effective. However, as with all medical interventions, every adverse effect cannot be accurately predicted or completely avoided. Signs and symptoms indicative of a transfusion reaction are listed on the next page.

Anti-K Delayed Hemolytic Transfusion Reaction (cont.)

Signs and symptoms indicative of a transfusion reaction include the following:

- Fever
- Chills
- Respiratory distress
- Hyper or hypotension
- Abdominal, chest, flank and back pain
- Pain at the infusion site
- Skin manifestations
- Jaundice or hemoglobinuria
- Nausea/Vomiting
- Abnormal bleeding
- Oliguria/anuria

Fever, unexplained jaundice, the absence of anticipated hemoglobin elevation post-transfusion or declining hemoglobin in the absence of bleeding days or weeks after transfusion are the most common presenting signs of a Delayed Hemolytic Transfusion Reaction (DHTR). In this case, when these symptoms were noticed a post-transfusion sample was collected and submitted to the blood bank for a Transfusion Reaction Work-Up. All hospitals and blood banks have a written protocol on the reporting and investigation of transfusion reactions. Although policies will vary, when a transfusion reaction involving a red cell product is suspected, generally the first steps are to perform a clerical check for identification errors and repeat ABO testing on the post-transfusion sample. Additional serological testing will be dictated by individual laboratory Standard Operating Procedures and include a direct antiglobulin test, elution studies, antibody detection/identification, repeat compatibility testing with pre and post transfusion samples, and investigation of hemolysis in post-reaction blood and urine samples.

Based on the serological results, this patient has an anti-K and is experiencing a delayed hemolytic transfusion reaction due to transfusion of a K + unit. Delayed hemolytic transfusion reactions usually occur from an anamnestic (secondary) response; they are rarely from a primary immune response. In 30-40% of previously immunized patients, antibody levels will fall to undetectable levels within months to years; antibodies to Kidd system antigens are especially notorious for exhibiting this behavior. Subsequent transfusion of an antigen positive unit triggers the anamnestic response with rapid production of IgG antibody over the course of a few days to weeks. The rapidity of antibody production and hemolytic potential of the antibody determine the degree of red cell destruction the patient will experience. Most

frequently the red cell destruction occurs as extravascular hemolysis. Blood group antibodies associated with DHTR include those of the Kidd, Duffy, Kell and MNSs blood group systems.

Anti-K Delayed Hemolytic Transfusion Reaction (cont.)

Anti-K

The K antigen is the original antigen of the Kell system and was the first antigen to be identified after the discovery of the antiglobulin test in 1946; its antithetical allele k was identified 3 years later. The Kell system now consists of 32 antigens expressed in different frequencies in different populations, however, the K antigen remains of prime importance in transfusion medicine as it is secondary only to D in immunogenicity. The K antigen can be detected on fetal red blood cells as early as 10 weeks and is well developed at birth. Kell antigens are not denatured by ficin, papain, trypsin or chymotrypsin, but are destroyed by a combination of trypsin and chymotrypsin. They are also destroyed by sulfhydryl reagents such as DTT, AET, 2-ME and ZZAP which contains DTT. The frequency of the K antigen in Whites is 9% and 2% in Blacks. Anti-K is the most common immune red cell antibody after those of the Rh blood group system. Anti-K is usually IgG, subclass IgG_1, and has been implicated in severe hemolytic transfusion reactions and hemolytic disease of the fetus and newborn (HDFN).

Reference

Roback, JD (ed): *Technical Manual*, 17th ed. AABB, Bethesda, MD, 2011.