Case Report:
Possible Insensitivity of the Polybrene Antibody Screen to Detect Anti-Jka

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Abstract. An acute hemolytic transfusion reaction (AHTR) occurred in a 28-yr-old gravida immediately after transfusion with leukocyte-reduced red cells. The patient gave no history of prior transfusion. Initial serologic testing by the polybrene method was negative for both antibody screening and cross-matching. Further testing by the indirect anti-globulin test (IAT) demonstrated the presence of anti-Jka antibodies. These observations suggest a limitation in polybrene testing for Jka antibodies associated with hemolytic transfusions. Caution is advised when the polybrene test is used as the sole determinant for anti-Jka.

Keywords: acute hemolytic transfusion reaction, allo-antibody Jka, polybrene screening test

Introduction

Kidd antibodies are the most common cause of delayed hemolytic transfusion reactions. Kidd antibodies are often difficult to detect because their in vivo production may be absent between provocative episodes and these antibodies often show weak in vitro reactivity. Although Kidd antibody titers tend to diminish quickly, latent antibodies can be produced abruptly following stimulation.

Case Report

A 28-yr-old gravida with ectopic pregnancy required a transfusion during her operation. She had no history of prior transfusion. Pre-transfusion antibody screening and cross-matching procedures were negative, using the manual polybrene method. However, an acute hemolytic transfusion reaction (AHTR) occurred immediately following transfusion of 100 ml of leukocyte-reduced red cells.

The patient had symptoms typical of a hemolytic transfusion reaction, including chills, flushing, restlessness, and dark urine. She became febrile (39°C) and her hematocrit decreased to a volume fraction of 0.10. No erythrocytes were seen by microscopy of the urine sediment, but a urine test for blood was strongly positive (3+). No site of hemorrhage could be identified, but hemoglobinuria and hemoglobinemia were evident in the urine and serum samples. The serum haptoglobin level was decreased. Serum total bilirubin levels before and after the hemolytic reaction were 0.4 and 18.9 mg/dl, respectively, and the serum direct bilirubin level after the reaction was 10.5 mg/dl. Serum alanine aminotransferase and aspartate aminotransferase activities were elevated mildly. The blood total leukocyte count was 1.87 × 10^9/L.

The transfusion was promptly stopped when the hemolytic transfusion reaction was recognized and supportive treatment was immediately begun, including fluid and diuretic therapy. After the acute phase, the patient had no further symptoms.

Materials and Methods

The manual polybrene test was carried out using a commercial kit (BASO, Taiwan). The direct antiglobulin test (DAT) was performed on red cells from EDTA-anticoagulated samples by the gel-test (ID LISS/Coombs, Diana AG, Spain). Serum was tested with commercial panel cells (Shanghai Blood Center, China). The genotype of the panel cells was determined by indirect antiglobulin test (IAT) (Table 1). Red cell antigen typing (ID LISS/Coombs) was performed by the gel-test with polyspecific anti-human globulin reagent (Diagnostics, Scotland). Cross-matching (CT) was performed by the gel-test (ID LISS/Coombs), using a 1% red blood cell suspension in DianaSol 2. The donor’s red blood cells were used for the major CT and the recipient’s red blood cells were used for the minor CT. The cross-matches used 50 µl of the donor’s 1%
red blood cell suspension (major CT) or 25 μl of the donor’s plasma (minor CT). After incubation for 15 min at 37°C, the tubes were centrifuged in a “DianaFuge” (Diana AG, Spain).

Table 1. The genotype of screening panel cells.

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<tr>
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<th>1</th>
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<tbody>
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<td>+</td>
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Table 2. The patient’s serologic results pre-transfusion, immediately post-transfusion, and 7 days post-transfusion.

<table>
<thead>
<tr>
<th>Serum sample</th>
<th>Antibody screen</th>
<th>Antibody identification</th>
<th>Cross-matching</th>
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<tbody>
<tr>
<td></td>
<td>Polybrene</td>
<td>AHG</td>
<td></td>
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<tr>
<td>Pre-transfusion</td>
<td>-</td>
<td>+</td>
<td>Jka</td>
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<tr>
<td>Post-transfusion (immediate)</td>
<td>-</td>
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<td>-</td>
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<tr>
<td>Post-transfusion (7 days)</td>
<td>-</td>
<td>+</td>
<td>Jka</td>
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Results

Serum samples from the patient were analyzed pre-transfusion, immediately post-transfusion, and at 7 days post-transfusion (Table 2). In addition, we cross-matched the patient’s blood with Jk(a-b+) blood and the results were negative. These data document the presence of anti-Jka in this patient.

Discussion

Polybrene has been regarded as an effective and efficient potentiating medium for detecting serologic incompatibility due to unexpected red cell allo-antibodies. Its use for routine pre-transfusion cross-matching has been recommended [1,2]. There have been a few reports of problems with the polybrene technique, such as its limitation to detect ABO incompatibility [3] and anti-K [2,4]. In southeast Asia, a major concern is the Kell blood system, where the phenotype of individuals is kk and anti-K should be negative. Additional testing is not routinely performed pre-transfusion to determine the presence or absence of anti-K.

We report a gravida with a negative antibody screen by the manual polybrene method. The patient developed a severe hemolytic reaction immediately after transfusion of 100 ml of red cells. Upon further testing, cross-matching of the patient was negative with Jk(a-b+) blood, but positive with Jk(a+b-) blood. This verified anti-Jka in the patient’s serum. In post-transfusion serum, the DAT test result was negative and the antibody screen was negative with IAT. Cross-matching was weakly positive with IAT. However, at 7 days post-transfusion, the antibody titers increased and resulted in a positive antibody screen.

In China, the frequency of Jk(a+b-) is 24.51%, that of Jk(a+b+) is 43.82%, and that of Jk(a-b+) is 31.63% [5]. Kidd antibodies are the most common cause of delayed hemolytic transfusion reactions. The polybrene antibody screening method is used widely in southeast Asia. This is the first report of an acute hemolytic transfusion reaction in a patient with a negative polybrene screen. Accordingly, we urge caution when the polybrene test is used as the sole determinant for anti-Jka in relevant patient groups.

References