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Transfusion Medicine

SEVERE HEMOLYSIS DUE TO ANTI-JK^a ALLOIMMUNIZATION IN AN ONCOLOGY PATIENT: A CASE REPORT

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ABSTRACT A 56-year-old female with carcinoma endometrium, chronic haemolytic anaemia, and paroxysmal nocturnal haemoglobinuria presented with profuse vaginal bleeding and severe anaemia requiring urgent robotic radical hysterectomy. She had received two packed red blood cell (PRBC) transfusions at an outside facility one week prior to admission. Pre-transfusion testing revealed a positive antibody screen and incompatible antiglobulin crossmatch. Owing to urgent clinical requirements, a serologically best-matched PRBC unit was transfused. Within 30 minutes, the patient developed high-grade fever, chills, and rigors, necessitating discontinuation of transfusion and initiation of a transfusion reaction work-up. Laboratory investigations demonstrated a positive direct antiglobulin test (IgG and C3d), marked haemoglobinemia, haemoglobinuria, elevated bilirubin levels, and evidence of ongoing haemolysis. Antibody identification using an 11-cell panel revealed anti-Jk alloantibody. Screening of 28 B RhD-positive donor units identified only four Jk -negative compatible units. The patient subsequently underwent surgery with transfusion support using Jk -negative PRBC units. Haemolytic parameters improved progressively with stabilization of haemoglobin, reduction in bilirubin levels, normalization of coagulation parameters, and resolution of haemoglobinuria. This case highlights the potentially severe clinical consequences of Kidd alloimmunization and the challenges associated with providing compatible blood in urgent surgical settings. Early antibody identification, maintenance of antibody history, and access to antigen-negative donor inventories are critical for safe transfusion support.

KEYWORDS : Anti-Jk^a; Kidd blood group system; alloimmunization; haemolytic transfusion reaction; delayed haemolytic transfusion reaction; antigen-negative blood;

INTRODUCTION

The Kidd blood group system comprises the antigens Jk^a, Jk^b, and Jk3 and is carried on a urea transporter protein expressed on red blood cells and renal tubular endothelial cells.[1,2] Although Kidd antibodies are less frequently encountered than antibodies of the Rh system, they are among the most clinically significant red cell alloantibodies because of their propensity to cause haemolytic transfusion reactions.[1–3]

Anti-Jk^a and anti-Jk^b are typically IgG antibodies capable of activating complement and causing both intravascular and extravascular haemolysis.[1,3] A characteristic feature of Kidd antibodies is their tendency to become undetectable over time, leading to missed identification during routine pre-transfusion testing.[3–5] Subsequent exposure to the corresponding antigen may trigger a vigorous anamnestic response resulting in delayed haemolytic transfusion reactions.[4-6]

The prevalence of Jk^a and Jk^b antigens among Indian blood donors has been reported to be approximately 81.5% and 67.4%, respectively. [7] Patients requiring repeated transfusions, including oncology and haematology patients, are at increased risk of red cell alloimmunization and may subsequently experience difficulty obtaining compatible blood.[8–11]

CASE PRESENTATION

A 56-year-old female weighing 45 kg with carcinoma endometrium, chronic haemolytic anaemia, paroxysmal nocturnal haemoglobinuria (PNH), and long-standing jaundice presented with profuse vaginal bleeding and severe anaemia. Clinical examination revealed hepatosplenomegaly, and she was scheduled for urgent robotic radical hysterectomy.[Table 1]

A request for four PRBC units was received by the blood centre. The patient had a history of transfusion of two PRBC units at an outside institution approximately one week before admission. Laboratory evaluation revealed haemoglobin of 6.2 g/dL, bilirubin of 3.7 mg/dL, blood group B RhD positive, and Rh phenotype DCce. Antibody screening using a three-cell panel was positive, and antiglobulin crossmatch testing demonstrated incompatibility.[Table 1]

Given the urgency of surgery and severe anaemia, one serologically best-matched PRBC unit was transfused. Approximately 30 minutes after initiation of transfusion, the patient developed high-grade fever, chills, and rigors. The transfusion was immediately discontinued, and a transfusion reaction work-up was initiated.

Clerical checks revealed no discrepancies. Repeat blood grouping showed no mismatch. Direct antiglobulin testing was positive (IgG 3+, C3d 1+). Antibody screening remained positive, and antibody identification using an 11-cell panel confirmed anti-Jk^a alloantibody. Laboratory findings demonstrated severe haemolysis with total and indirect bilirubin levels of 29.2 mg/dL and 24.8 mg/dL, respectively, plasma haemoglobin of 8.6 mg/dL, haemoglobinuria, and marked haemoglobinemia.[Table 2]

The requirement for urgent surgery coupled with the presence of anti-Jk^a posed a major transfusion challenge. Twenty-eight B RhD-positive donor units were screened using anti-Jk^a antisera. Only four Jk^a-negative compatible units were identified.

The patient subsequently underwent robotic radical hysterectomy with support from Jk^a-negative PRBC units. One unit was transfused intraoperatively, followed by two units postoperatively and one additional unit subsequently. Following transfusion of Jk^a-negative units, haemoglobin increased from 6.9 g/dL to 9.1 g/dL, while bilirubin levels progressively declined from a peak of 44.9 mg/dL to 11.8 mg/dL within 36 hours. Plasma haemoglobin levels decreased, haemoglobinuria resolved, and the patient remained haemodynamically stable. She was discharged on the sixth postoperative day and subsequently received planned oncological treatment. [Table 2, 3 & Figure 2]

Table 1. Patient demographics and clinical characteristics

Variable	Findings
Age	56 years
Sex	Female
Weight	45 kg
Primary diagnosis	Carcinoma endometrium
Comorbid conditions	Paroxysmal nocturnal haemoglobinuria (PNH), chronic haemolytic anaemia
Relevant history	Long-standing jaundice (~30 years)
Presenting complaints	Profuse vaginal bleeding, severe anaemia
Physical examination	Hepatosplenomegaly (16 × 18 cm)
Planned procedure	Urgent robotic radical hysterectomy
Blood group	B Rh D positive
Extended Rh phenotype	DCce
Baseline haemoglobin	6.2 g/dL
Baseline bilirubin	3.7 mg/dL
Previous transfusion history	Two PRBC units transfused at an outside hospital 7 days before admission

Antibody screening	Positive (3-cell panel: +4, 0, +2)
AHG crossmatch	Incompatible (+3)
Direct antiglobulin test (DAT)	Positive (Polyspecific +3; IgG +3; C3d +1)
Antibody identification	Anti-Jk^a
Evidence of haemolysis	Hyperbilirubinaemia, haemoglobinaemia, haemoglobinuria
Donor units screened	28 B RhD-positive PRBC units
Compatible units identified	4 Jk^a-negative PRBC units
Clinical outcome	Successful surgery, resolution of haemolysis, discharged on postoperative day 6

Table 2. Clinical timeline of transfusion events

Timeline	Clinical Event
Day −7	Two PRBC units transfused at an outside hospital
Day 0 (Admission)	Severe anaemia and vaginal bleeding; antibody screen positive; AHG crossmatch incompatible
Day 0 (Pre-operative)	One serologically best-matched PRBC unit transfused because of urgent clinical requirement
30 minutes post-transfusion	High-grade fever, chills and rigors; transfusion immediately discontinued
Day 0	Transfusion reaction work-up initiated
Day 0	DAT positive; anti-Jk^a identified by 11-cell antibody panel
Day 0	Marked haemolysis documented with haemoglobinaemia and haemoglobinuria
Day 0–1	Screening of 28 donor units performed
Day 1	Four Jk^a-negative compatible PRBC units identified
Day 1	Robotic radical hysterectomy performed; 1 Jk^a-negative unit transfused intraoperatively
Postoperative period	Three additional Jk^a-negative PRBC units transfused
36 hours after compatible transfusions	Progressive improvement in haemoglobin, bilirubin, PT/INR, plasma haemoglobin and heart rate
Postoperative Day 6	Discharged in stable condition
Follow-up Day 10	Recalled for further oncological management and radiotherapy

Table 3. Serial laboratory parameters following Jk^a-negative PRBC transfusion

Parameter	Baseline	After 1st Unit (1 h)	After 3rd Unit (24 h)	36 h
Haemoglobin (g/dL)	6.9	7.4	8.6	9.1
Total Bilirubin (mg/dL)	29.2	44.9	27.7	11.8
Indirect Bilirubin (mg/dL)	14.8	24.9	13.0	7.4
PT (seconds)	19.8	19.0	17.1	16.8
INR	1.55	1.38	1.28	1.25
Plasma Hb (mg/dL)	8.6	7.8	6.9	6.1
Heart Rate (beats/min)	177	156	142	111

Figure 1. Clinical timeline of anti-Jk^a alloimmunization and transfusion management

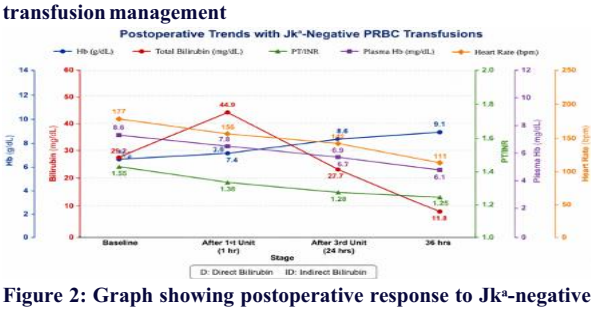

Figure 2: Graph showing postoperative response to Jk^a-negative transfusions.

DISCUSSION

Kidd antibodies are notorious for causing delayed haemolytic transfusion reactions because of their transient detectability and potent anamnestic responses.[3–6] Several studies have demonstrated that Kidd antibodies account for a disproportionately high number of delayed haemolytic transfusion reactions despite their relatively low frequency among detected alloantibodies.[4,5,12]

In the present case, previous pregnancies and recent transfusions likely acted as sensitizing events, resulting in anti-Jk^a alloimmunization. Subsequent exposure to Jk^a-positive red cells precipitated severe haemolysis. Similar cases of severe haemolytic transfusion reactions due to Kidd antibodies have been described in the literature.[12–15]

Because approximately 80% of Indian donors express the Jk^a antigen, locating antigen-negative blood units can be difficult in emergency situations.[7] This challenge underscores the value of donor phenotyping programs, antigen-negative donor inventories, and extended antigen matching strategies.[9,10,16]

Several investigators have demonstrated that prophylactic matching beyond ABO and RhD significantly reduces alloimmunization rates among chronically transfused patients.[9,10,17–20] The present case further supports the importance of extended antigen matching and maintenance of antibody histories to improve transfusion safety.

CONCLUSION

Anti-Jk^a alloimmunization should be considered in patients presenting with unexplained hemolysis following recent transfusion. Early recognition, comprehensive antibody identification, and timely provision of antigen-negative red blood cells are essential for successful clinical management. This case underscores the importance of extended antigen matching, maintenance of antibody history, and establishment of antigen-typed donor registries to enhance transfusion safety, particularly in patients requiring repeated transfusions or urgent surgical intervention..

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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