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Case report and strategies to mitigate passive hemolysis with platelet transfusions in children

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Abstract:

Mismatched platelet concentrate transfusion due to inadequately maintained inventories is relatively common and in most instances do not cause any untoward event in adults. The cases of passive hemolysis following a mismatched apheresis platelet transfusion are common but are relatively rare with platelet concentrates. We report here a case of a nine year old boy who received three units of mismatched platelet concentrates(PC) followed by acute hemolysis. On further investigation, one of the donors of the PC, who was typed as O positive, found to have high anti-A and anti-B titres of 1:128. This highlights the importance of matched platelet transfusions or modifying the product in pediatric setting, who are susceptible for passive hemolysis

Keywords:

ABO-incompatible, platelet transfusions, transfusion reaction

Introduction

Minor ABO-incompatible platelet transfusions are associated with poorer platelet count increment but also are associated with hemolytic transfusion reactions in the recipient due to incompatible plasma.^[1] The amount of plasma and the titer of anti-A, B isoagglutinins are the two most important factors that can predict the occurrence of a hemolytic transfusion reaction.^[1] Passive hemolysis due to ABO-incompatible transfusions of platelet concentrates (PC) is uncommon.

Case Report

We report the case of a 9-year-old boy weighing 35 kg, with blood group AB RhD positive diagnosed to have acute lymphoblastic leukemia (B-ALL) with extramedullary relapse and was receiving BFM ALL-REZ

protocol at our institute. He was admitted for fever and was evaluated for the focus of infection. The treating physician ordered three units of PC on day 4 of admission for platelet count of $10 \times 10^3/\mu\text{l}$ [Figure 1]. During transfusion of three units of PC among which one was group O Rh positive and other two were B Rh positive, the patient developed rash over the face and scalp, generalized itching, chills, and fever. The patient was managed conservatively with injection chlorpheniramine and paracetamol infusion. Few hours after transfusion, the patient passed bright red urine suggestive of hemoglobinuria with complaints of pain in the chest and back.

ABO and RhD testing of the patient's posttransfusion sample were consistent with the pretransfusion sample. Pre- and posttransfusion sample was negative for DAT by polyspecific IgG and C3d gel card and was negative for antibody screening (ScreenLyse, Diagast). Patients posttransfusion Hb dropped to 5.6 g/dL from 6.8 g/dL with the presence of jaundice, fluid retention,

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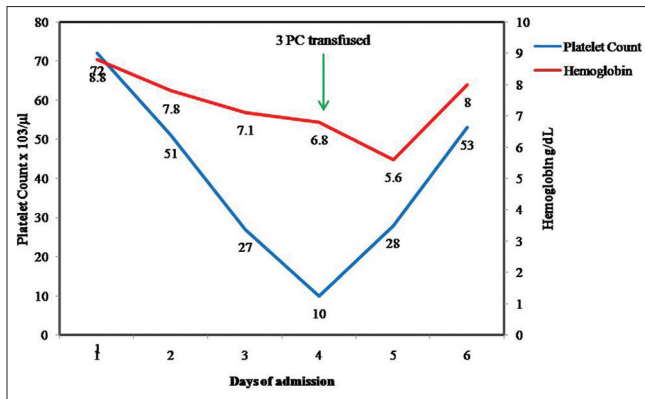


Figure 1: Blood counts of the child developing passive hemolysis during the hospital stay

elevated lactate dehydrogenase levels 340 U/L (normal 120–240U/L), and borderline RFT. There was no visible hemolysis in the supernatant of posttransfusion sample. The patient was managed symptomatically and discharged on day 6 of admission.

The donors of three PC units were called back and tested for high titer ABO antibodies. The donor sample from O PC revealed an antibody titer of 1:128 at room temperature for both anti-A and anti-B. The hemolysin test was positive for both A and B cells in the O group donor. The second donor (B positive) had anti-A titer of 1:32 and the third donor (B positive) did not turn up for testing. These findings along with the clinical symptoms and signs of acute hemolysis following transfusion can be presumably caused because of high antibody titer of anti-A and anti-B from group O PC.

Discussion

The outcome of a platelet transfusion greatly depends on ABO incompatibilities among the donor and a recipient. Platelet transfusion can be ABO identical when the same group ABO platelet is transfused, ABO compatible when the donor has antibodies (minor incompatibility), or major incompatible when the recipient has antibodies.^[2] Around 1 per 9000 minor ABO-mismatched platelet transfusions can give rise to significant acute hemolysis.^[3]

Blood group O platelets are known to cause hemolytic transfusion reactions due to high titer of anti-A or anti-B in the donor plasma when given to a non-O group, especially group A patients.^[4,5]

Majority of passive hemolysis is reported commonly in adults and only three fatalities are published in children. Among the published data in children, almost all reported fatalities were with the use of apheresis platelets or pooled random donor platelets that contain higher volumes of incompatible plasma. The lower incidences

in children are likely due to most centers adopting ABO-identical transfusion or volume-reduced platelet transfusions. However, the risk remains in children and neonates as their small blood volumes may sometimes be incapable of diluting high titers of antibody levels in the donor plasma.^[2]

Previous studies established that ABO antibody titer >100 in saline and >400 with antihuman globulin phase commonly gives rise to hemolytic reactions.^[6] Guidelines are laid which recommend reducing the plasma volumes of mismatched platelets for the use in neonates and children and antibody levels above 1 in 128 in group O serum as an alarming level to cause hemolysis.^[2] ABO-compatible platelets are recommended wherever feasible at least in the pediatric setting, but due to the shorter expiry date of platelets and smaller inventories of compatible platelets, O group PC is given to non-O group children.

Flow diagram [Figure 2] discusses the steps to mitigate the incidences of passive hemolysis during platelet transfusion in pediatric settings.

- Screen for high titers of anti-A and anti-B (titer ≥ 64) can be performed by double dilution by conventional tube technique (CTT) described in Technical Manual.^[7] Otherwise, 1 in 150 dilutions was made by adding 5 μ l plasma to 745 μ l normal saline. Two drops of diluted plasma is tested with one drop of pooled A1 cells and B cells in CTT and results were interpreted after 15 min of room temperature incubation^[8]
- PCs volume can be reduced to 10–15 mL/unit just before transfusion by centrifugation. Volume reduction for apheresis platelets is performed by connecting and transferring the contents from the apheresis bag to a satellite bag. The bags are centrifuged at 580 \times g for 20 min. Approximately 50–75 mL or proportionately higher plasma can be retained for apheresis platelets, the remaining platelets resuspended and issued with an expiry date of 4 h from the point of plasma reduction.^[9,10] Platelets must remain at room temperature, without agitation, for 20–60 min before resuspension into the remaining plasma
- Washing of apheresis platelets is accomplished either using normal saline or combination of 250 mL M-sol with 20 mL of ACD-A. After centrifugation, plasma is removed from bag to maximum extent possible, and normal saline or M-sol is added till the volume was 200 mL in the apheresis product. Carryover of plasma in washed platelets should not exceed 20 mL. Washed platelets should rest at room temperature for 20–60 min without agitation between centrifugation and resuspension. Up to 33% of the platelet yield may be lost during washing. Washed platelets expire 4 h after the start of washing.^[11,12]

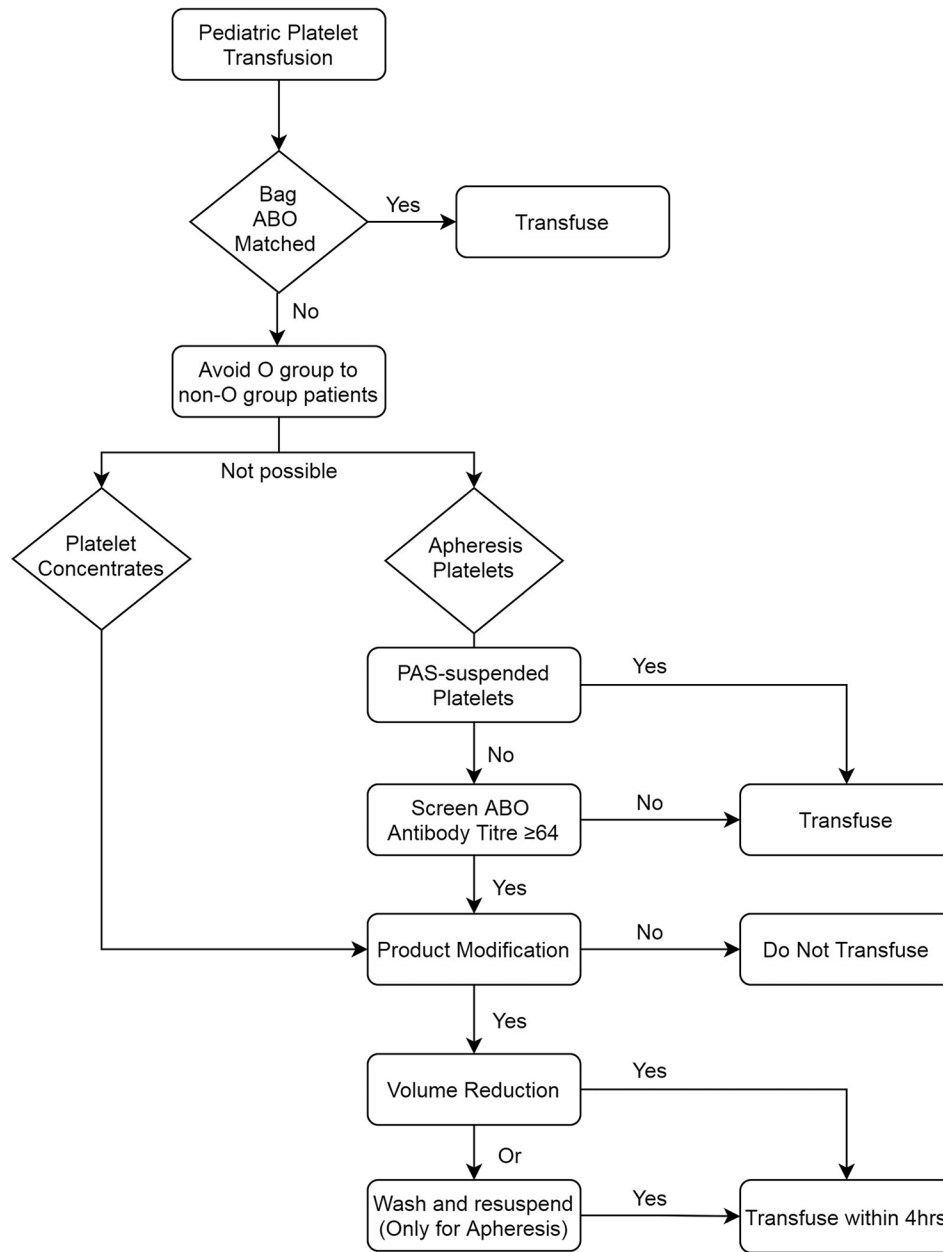


Figure 2: Flowchart to prevent passive hemolysis during platelet transfusion in children

Conclusion

The risk of passive hemolysis following an ABO-incompatible platelet transfusion remains in children, particularly with low blood volumes. ABO-incompatible platelet transfusions should be critically judged and should be avoided in children.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the legal guardian has given his consent for images and other clinical information to be reported in the journal. The guardian understands that names and initials will not be published

and due efforts will be made to conceal patient identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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