Case Report

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A conservative approach in finding compatible blood for a patient with sickle cell disease having multiple alloantibodies

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Abstract:

BACKGROUND: Sickle cell disease (SCD) patients may develop multiple alloantibodies that pose problem in finding compatible blood for transfusion and require crossmatching with large number of blood.

AIM: The aim of the present study was to find compatible blood with reduced cost by adopting a conservative approach.

MATERIALS AND METHODS: A step-by-step approach using tube technique, antibodies in original serum, and the saved test supernatant (TS) in search of compatible blood for transfusion purposes.

RESULTS: 32 years SCD patient grouped A with multiple antibodies required transfusion. A total of 641 red blood cell (RBC) units of groups A and O were crossmatched using serum and the TS by tube method. Of 138 units tested using the serum at 4°C, 124 units showed direct agglutination in the saline phase and the remaining 14 units were processed through low ionic strength solution (LISS)-IAT, of which 2 units were compatible even by the gel-IgG-card method. The TS, saved from the tests on serum, was used in an identical manner as that of the serum to screen additional 503 units by saline tube method at 4°C units showed direct agglutination of the RBCs of 428 units, hence were removed from inventory for this patient. The remaining 75 units were tested by the LISS-IAT-tube method at 37°C, of which 8 units were found compatible but only 2 units were clear compatible by the gel-IgG-card method. As such, 4 units compatible by the sensitive gel-IgG-card method were issued for transfusion purposes.

CONCLUSION: The new approach on using the saved TS consumed less of the patient's blood specimen, and the use of the tube method in screening and eliminating a large chunk of incompatible blood units has proved economical if compared with the use of the only gel-IgG-cards device in the entire maneuvering.

Keywords:

Conservative approach, multiple antibodies, sickle cell disease

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Introduction

Patients with sickle cell disease (SCD) often receive blood transfusions to overcome the sickle cell crisis.[1] Some of these patients may develop multiple alloantibodies and pose a problem in finding crossmatch compatible blood. Such a patient requires a red cell unit lacking corresponding multiple antigens. However, to find such a unit proves herculean task and one has to test innumerable blood units to find the blood unit lacking the corresponding antigens. A routine approach may obviously consume a lot much amount of the patient's blood specimen for crossmatch procedure that may yield not only an iatrogenic blood loss to the patient but also becomes expensive

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toward utilizing the consumables, for example, gel-IgG-cards. To overcome these limitations, we have maneuvered the compatibility test for a patient with SCD having multiple alloantibodies in the line of the previously described report.[2]

Materials and Methods

Grouping antisera for forward grouping were of commercial source (Tulip, India), while RBCs used for reverse grouping were in-house preparation. The other reagent RBCs used in antibody screening and identification tests were of commercial origin (Immucor, USA). The low ionic strength solution (LISS) was prepared in-house.

Standard serological methods were used in the tube for grouping, crossmatching as well as antibody screening tests (ASTs), and antibody identification tests. The patient was found to have multiple alloantibodies including anti-M (agglutinating in saline phase, optimally at 4°C) and anti-c and anti-E (reacting at 37°C in IAT phase). The crossmatching protocol was molded accordingly to test first at 4°C to select the nonagglutinating red cells, presumably the M antigen-negative units to further crossmatch by IAT at 37°C. Any unit found compatible by the tube method were confirmed by the gel-IgG-card method, being more sensitive than the tube method in the detection of antibody.

Further conservative approach was mooted through the use of recycled antibodies saved from the test supernatant (TS). The TS was harvested as described earlier.[2] This approach allowed us to get maximum results out of minimum investment in terms of the patient's blood specimen and the expensive gel-IgG-cards system.

Results

The case

A 32-year-old female patient, with SCD and liver failure, was admitted for correction of anemia before surgical treatment. Her blood specimen was referred to our blood center with a request to provide blood for transfusion. She was grouped as A, Rh. D+ by forward grouping but reverse serum showed reactivity with both A and B cells. AST on her serum was positive and the antibody identification test with an 11-cell panel on an anti-IgG gel card was inconclusive as it reacted with almost all the cells in the panel. The tube test results, however, revealed the presence of multiple antibodies in her serum. One of the antibodies reacted in the saline phase, with broad thermal amplitude (optimum strength at 4°C) with anti-M specificity. Other two specificities reacting in the LISS-IAT phase were identified as anti-c and anti-E. With this situation, it was Herculean task to find the blood units that lack all three antigens. Keeping this view in mind, we adopted a unique strategy to maneuver the crossmatch test.

A total of 641 blood units of group A and O red cells were included in the crossmatch test. Initially, the RBCs of 138 units were tested with the patient's serum by saline tube method at 4°C, of which 124 units showed direct agglutination, and 14 units did not agglutinate so were followed up for testing at 37°C by LISS-IAT-tube method that gave 2 units compatible. The TS was saved from the tests performed in the tube for further crossmatching.

The red cells from 503 blood units were tested using the TS by saline tube method at 4°C, of which 428 units showed direct agglutination and 75 units did not agglutinate and were followed up for testing at 37°C by LISS-IAT-tube method to get 8 units compatible, of which 2 units showing confirmed compatibility by the gel-IgG-card method.

The 10 units found compatible by the tube method were tested with the original serum using the gel-IgG-card method and 4 of these with clear compatibility were issued for transfusion purposes. The crossmatch strategy is depicted in Figure 1.

Discussion

Blood transfusion therapy in SCD is aimed to refurbish the oxygen-carrying capacity of the RBCs in circulation by the introduction of RBCs with normal hemoglobin Hb-A to help minimizing the complications of vaso-occlusion created by HbS.[3] Transfusion as preoperative treatment may also prevent perioperative complications.[4] Regular transfusion may protect the patients from the risk of stroke.[5] As such, blood transfusion helps supporting the management of complications of SCD.[6]

However, transfusion may be associated with the risk of iron overload, alloimmunization for foreign blood group antigens, and hemolytic transfusion reaction (HTR) due to alloantibody developed through previous transfusions.[1] Besides, if the antibody depletes beyond the detectable level and the blood units with the corresponding antigen, apparently found compatible, may produce the delayed HTR (dHTR) that may even get aggravated resulting in to the so-called bystander hemolysis of the transfused or even of the autologous RBCs.[7,8]

Some of the patients are considered good immune responders and produce multiple alloantibodies that pose difficulty to find compatible blood. Sometimes, a patient with alloantibodies and having a recent history of incompatible blood transfusion may show a positive

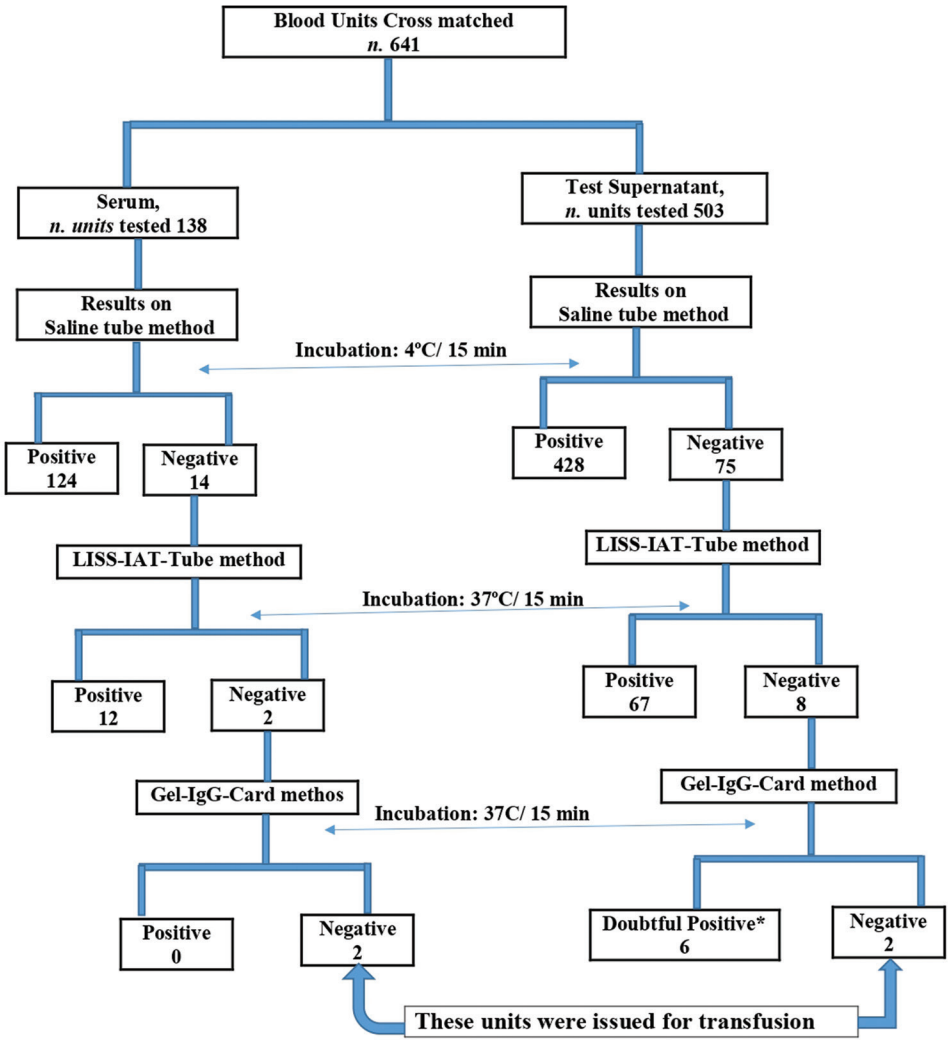

Figure 1: Flowchart showing crossmatch approach for a patient having multiple alloantibodies

DAT that may misguide in diagnosis as autoimmune hemolytic anemia by virtue of the pan-agglutinating property of the antibodies present. While a patient with autoantibody in autoimmune hemolytic anemia may tolerate the guise of the "least" incompatible blood,[9] the one with an alloimmune antibody may react to such incompatible blood to produce HTR. Such HTR may even progress to hyperhemolysis syndrome that may lead to even autologous RBCs getting destroyed.[8] It is, therefore, imperative to provide an absolute compatible blood for transfusion to such recipients.

The patient with multiple antibodies may require a large number of units to be screened to find the compatible blood units and therefore need a greater amount of blood specimens for crossmatch purposes. Repeated phlebotomy may contribute to iatrogenic blood loss to the patient who is already under stress with lower hematocrit values due to an underline condition. The crossmatch test strategy described here would certainly help in the efficient management of the patient's blood specimen. Besides, the most steps are taken use the tube method so it becomes more cost-effective as compared to the gel-card technology.

Conclusion

We consumed a total of 7 ml of the patient's serum and 26 ml of TS saved out of it in this entire exercise. Had we not used the TS, we would have consumed over 33 ml serum to screen the blood units numbering this magnitude. Besides, if we would have used the gel-card method for testing, it would have incurred enormous material costs as well. As such, the unique strategy adopted using elimination rounds of a large number of incompatible units by tube method and then, a few units found compatible by tube method were confirmed using the sensitive gel-card method, we have saved a lot of resources to make it cost-effective in finding the compatible units for transfusion to the patient having multiple antibodies.

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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Nil.

Conflicts of interest

There are no conflicts of interest.

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