Importance of Transplantation History in ABO Discrepancies

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ABBREVIATIONS: BMT = bone marrow transplantation; PBSCT = peripheral blood stem cell transplantation.

INDEX TERMS: ABO and organ transplant; ABO and stem cell transplant; ABO discrepancy.

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A complete history is important for the solution of blood bank typing problems and, with the increasing numbers of transplantation procedures, a patient's history may include transplantation at major medical centers with a subsequent return to the local community hospital. If the recipient and donor are different ABO blood types, both stem cell and organ transplantation demonstrate challenging considerations for transfusion support both during and after the procedure. Two cases are presented to demonstrate the importance of a complete history for the solution of ABO typing problems.

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CASE 1

A 53-year-old male with a history of multiple myeloma was admitted to the hospital with shortness of breath and a cough. A request for two units of packed red blood cells was received by the blood bank. A review of the patient's history showed diabetes and a stem cell transplant a year ago. Previous blood bank typing revealed a type B positive with no discrepancies. These records also showed that the patient had several previous admissions and had received transfusions of compatible B positive blood and components without complications. Because of the difference in the current blood type, A positive, and the previous type, the patient was recollected and given a second ID wrist band for confirmation. A recollected sample matched the current results and typed as A positive. Current and historical typing results are included in Table 1.

Table 1. Case 1 – current and historical ABO typing

	Anti-A	Anti-B	A cells	B cells
Current sample	3+	Neg	Neg	W+
Historical results	Neg	4+	3+	Neg

CASE 2

A 57-year-old man was admitted to the hospital unconscious and in septic shock. The patient's blood pressure at admission was 60/0 and laboratory results were: Hgb – 11.8 g/dL, Hct – 0.335 L/L, and WBC 52 x 10^9/L. Two units of packed red blood cells were ordered to treat the combination of anemia and shock. Blood type results showed an A positive with a mixed field reaction in the Anti-A. The 'mixed field' results with anti-A sera showed one large agglutinate with 'free cells' in the background. Discussion with the family revealed the patient had been admitted to a hospital in another city two weeks prior for a liver transplant. A call to that transfusion service revealed that the patient's original blood type was A positive and he had received an O positive liver. During hospitalization, the patient received 11 units of O positive blood, 14 units of fresh frozen plasma type A or AB, pooled cryoprecipitate, and type O pooled platelets.

DISCUSSION

Case 1 demonstrates ABO typing problems associated with bone marrow transplantation (BMT) and peripheral blood stem cell transplantation (PBSCT). Support for ABO mismatched allogeneic transplantations depends on whether the transplantation introduces a novel ABO antigen (major incompatibility), a novel ABO antibody (minor incompatibility), or both a novel ABO antigen and antibody (both major and minor incompatibility). In BMT and PBSCT, transfusion problems can be caused by antibodies present before transplantation or by antibodies developed after transplantation.[1-8] Since recipient derived immunoglobulins present before transplantation may persist for weeks or months, even in the presence of engraftment from the donor, a major incompatibility (novel antigen) may cause a positive direct antiglobulin test (DAT) and allo-immune hemolytic anemia.[2] Tasaki reported the presence of recipient antibody in a patient one year after transplantation.[8] This patient with unexplained hemolysis demonstrated the new blood type and a negative DAT; however, recipient antibody was present in an eluate performed on the red cells.

Red cell transfusion for BMT or PBSCT with major incompatibility (novel antigen) should initially be type O with a change to the donor type when the recipient's original antibodies disappear. If hemolysis is suspected, a DAT and an elution should be performed. The elution should be performed even if the DAT is negative and the eluate tested with A, B, and O cells to demonstrate the presence of ABO antibodies as well as other red cell antibodies.[1-3,8]

Minor ABO mismatched BMT or PBSCT (novel antibody) may be associated with immediate or delayed hemolysis. Immediate hemolysis is a result of donor plasma present in the transplant and delayed hemolysis is the result of donor lymphocyte induced antibody against the recipient's antigens.[3] Delayed hemolysis may be more common in PBSCT than in BMT because more lymphocytes are present in the transplant.[4] As in the case of major incompatibility, if delayed hemolysis is suspected, a DAT and elution should be performed and tested with A, B, and O cells.[1-3,7] A relatively high return of host-type lymphopoiesis and/or host-type hematopoiesis can occur following allogeneic bone marrow transplants and are referred to as "mixed chimeras." Mixed chimeras have a two-cell population—one from the recipient and one from the donor—and demonstrate a mixed cell blood typing reaction. However, these patients don't appear to have other immunohematologic complications.[2]

The patient in Case 1 was originally B positive and, after myeloablation, had received PBSCT from an A positive donor. This case is an example of major and minor incompatibility (novel antigen and novel antibody). Initial red cell transfusions should be type O with a change to the donor type when recipient antibodies disappear. After a year, the patient's blood type had changed to the donor type, A positive. If the patient had any indication of immune hemolysis or the presence of anti-A in the reverse type or eluate, type O cells would be recommended for transfusion. There was no indication of hemolysis in this case. The patient had a negative direct antiglobulin test and elution. In addition, the reverse type demonstrated a weak anti-B with no anti-A. Type A blood was transfused to the patient with no complications.

Case 2 demonstrates problems associated with an ABO mismatched organ transplant. Although ABO identical organs demonstrate the best survival, group O organs are often transplanted to recipients with other ABO types. ABO mismatch with organ transplantation presents different problems than BMT or PBSCT since all incompatibilities are minor incompatibilities involving novel antibodies. Donor lymphocytes in the new organ or in tissue transplanted with the new organ may continue to produce ABO or other allo-antibodies and may cause hemolysis if incompatible with the recipient's red blood cells. These donor lymphocytes and the potential for hemolysis may persist for weeks.[9-11] The frequency and severity of graft antibodies generally increase in patients treated for immunosuppression with cyclosporine only and with the amount of lymphoid content present in the donor organ.[10,11] Because of the potential for hemolysis, type O red blood cells are indicated for transfusion before, during, and immediately after ABO incompatible organ transplant.[1,11] Donor antibodies and hemolysis have been detected over a year after transplantation. Therefore, if hemolysis is suspected, a DAT and eluate should be performed.

In Case 2, the patient had a negative DAT and eluate and there was no indication of hemolysis. However, since the patient had received a liver transplant just two weeks prior to this admission, the possibility still existed that delayed hemolysis could develop due to antibodies produced by donor lymphocytes. The transfusion facility chose to crossmatch and transfuse type O red cells. The patient received two units of packed red blood cells with no complications.

These cases demonstrate the importance of a complete history from patients for resolution of ABO typing problems. Obtaining the history has become more difficult because

patients receive treatment from a variety of specialists and transplantation services and may return to the local community hospital for treatment of complications. The transfusion facility may need to contact previous physicians, medical facilities, or the patient's family, as well as obtain information from current and previous admissions. Although it may be difficult to obtain a complete history, these two cases demonstrate the necessity of complete investigation to solve typing problems and to provide the optimum blood component for transfusion.

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