Transfusion Medicine

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KEYWORDS

• Transfusion medicine • Red cells • Platelets • FFP • Blood transfusion

KEY POINTS

- Transfusion of various blood components is indicated to correct abnormalities in oxygen carrying capacity or primary and secondary hemostasis.
- Various clinical tests can be used to ensure the compatibility between donor and recipient, although there are significant risks associated with transfusion.
- Risks of transfusion include transmission of infection, transfusion-related acute lung injury, transfusion-associated circulatory overload, and various hypersensitivity and hemolytic reactions.
- Adherence to the minimum number of units needed to reverse symptoms and avoidance of transfusion unless absolutely necessary will reduce the risks associated with transfusion.

INTRODUCTION

The practice of transfusion is to replace various components of the circulating blood system in order to alleviate symptoms or prevent complications due to the deficiency of a component, such as a coagulation factor or lack of platelets. With the exception of a few recombinant coagulation factors now available commercially, transfusion involves the practice of providing blood components obtained from human donors, as no viable synthetic transfusion product exists for most indications.

CLINICAL TESTS

Several tests are commonly used in the course of assessing the need for transfusion and the most appropriate donor unit to provide to the recipient. The decision to transfuse is often based on routine tests available in any laboratory, such as the complete blood count, indicating a low value of a particular cell line, such as red cells or platelets. Alternatively, specialized testing may show abnormalities in the coagulation or fibrinolytic system, which would require transfusion of fresh frozen plasma (FFP) or a derivative, such as cryoprecipitate.

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One of the most commonly performed tests in the course of routine transfusion is the assessment of ABO type and screening for clinically significant alloantibodies. This test is commonly termed a *type and screen* and allows the transfusion service to start to narrow the choice of possible donor units. Although typing can be done to assess for a variety of red cell antigens, the most commonly performed is to look at ABO and Rhesus (or D antigen) compatibility. A sample is taken from the individual for whom the transfusion is intended and serum is separated from red cells. The serum is then mixed with red cells of known phenotype to assess for agglutination, which would suggest a significant antibody. Serum from patients with type A blood, for instance, will cause agglutination with red cells with B-antigen expression but not with A. Patients with type O blood will agglutinate with both A cells and B cells, as they have circulating antibodies to both of these antigens. Patients with type AB blood have tolerance to both antigens and, therefore, do not react to either A or B cells. Tests for blood type and antibody screening forms the basis for the concept of universal donors and universal recipients. Details of blood donor and recipient compatibility are outlined in **Table 1**.

In addition to determination of ABO type and Rhesus status, the serum is assessed for the presence of any clinically significant autoantibodies that may be present. These autoantibodies may form because of prior transfusion or pregnancy. The serum from the recipient is mixed with a panel of red cells of known phenotype. The pattern of agglutination across multiple panels allows the determination of whether a specific alloantibody exists in the intended recipient.

The direct antiglobulin test (DAT), commonly known as a direct Coombs test, is a more specific test and is not usually needed for routine transfusion practice. The test is designed to assess the presence of immunoglobulin G (IgG) or complement on the surface of patients' red cells (**Fig. 1**). A warm autoimmune hemolytic anemia will be DAT positive; the autoantibody may react with all potential donor cells, making crossmatch difficult.

INDIVIDUAL COMPONENT TRANSFUSION

Red Cells

Transfusion of red cell concentrate, sometimes referred to colloquially as packed red cells, is designed to increase the oxygen carrying capacity of the recipient due to the presence of anemia.

Table 1
Blood donor and recipient compatibility

		RBC Transfusion		Plasma Transfusion	
ABO	**Rh**	**Donates to**	**Receives from**	**Donates to**	**Receives from**
O	+	O+, A+, B+, AB+	O+, O−	O	O, A, B, AB
	−	O+, A+, B+, AB+, O−, A−, B−, AB−	O−		
A	+	A+, AB+	O+, A+, O−, A−	O, A	A, AB
	−	A+, AB+, A−, AB−	O−, A−		
B	+	B+, AB+	O+, B+, O−, B−	O, B	B, AB
	−	B+, AB+, B−, AB−	O−, B−		
AB	+	AB+	O+, A+, B+, AB+, O−, A−, B−, AB−	O, A, B, AB	AB
	−	AB+, AB−	O−, A−, B−, AB−		

Note: Rh matching is not necessary for plasma component transfusion.