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Universal Donors and Recipients are Not So Universal !

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Blood transfusion should only be used when the benefits outweigh the risks and there are no appropriate alternatives. Blood transfusion is considered safe when right blood is given to right patient at right time and right place. Right blood is screened for Transfusion Transmissible Infections and is ABO, Rh compatible.

ABO-incompatible red cell transfusion is often fatal, and its prevention is the most important step in clinical transfusion practice. There are four main blood groups: A, B, AB and O. Blood group A contains anti-B in plasma, group B contains anti-A, group O contains both anti-A and anti-B while group AB does not contain any antibody.

Anti-A and/or anti-B in the recipient's plasma binds to the transfused cells and activates the complement pathway, leading to destruction of the transfused red cells (intravascular hemolysis) and the release of inflammatory cytokines that can cause shock, renal failure and disseminated intravascular coagulation (DIC).

Donors with group O Rh negative blood are sometimes known as universal donors, this situation is not factual for every blood transfusion.

Donors with type O Rh negative have no antigen on their red cells, however, their plasma does contain anti-A and anti-B that, if present in high titer, has the potential to hemolyze the red cells of non-group O recipients. So, group O Rh negative whole blood and blood components such as fresh frozen plasma (FFP) or platelet concentrates should not be given to patients of group A, B or AB if ABO-compatible components are available.

O Rh D negative Packed Red Cells (PRBCs)

Type O Rh negative PRBCs with low titer anti-A and anti-B unlikely causes a significant reaction because of dilution. However, O Rh negative red cells with exceptionally strong anti-A, anti-B or any atypical blood group antibody may cause hemolysis of the recipients' red cells. Red cells stored in saline, adenine, glucose and mannitol (SAG-M) additive contain less than 20 mL of residual plasma, so

the risk of hemolytic reactions is very low but unfortunately, we do not have such facilities in our transfusion centers, so ABO group specific red cells is the best choice.

If ABO specific blood is not available, then the 2nd choice blood that will cause the least possible hemolysis should be given to patient (Table 1). However, in rare circumstances of excessive blood loss like trauma, massive hemorrhage or disaster management when ABO matched blood is not available, O Rh negative Packed red cells can be transfused to patient but should be replaced with group specific blood as soon as possible.

Fresh Frozen Plasma (FFP)

In case of fresh frozen plasma (FFP), the situation is reversed. The plasma of blood group O contains anti-A and anti- B and has the potential to cause hemolysis of recipient cells. However, AB plasma does not contain any anti-A or anti-B antibodies and can be given to patients of blood group A and B as a second choice. In case of group AB and O, the 2nd choice is group A as it contains anti-B which is less immunogenic and causes least possible hemolysis. Rh compatibility is generally not a concern in case of FFP as Rh antigen is only present on Red cells and FFPs does not contain any red cells.

Platelet

ABO identical platelets should be given to patients ideally. Platelet products contain both A and B antigens bound to platelets and anti-A and anti-B antibodies in the residual plasma of platelet concentrates. ABO incompatible plasma in a platelet product can cause significant hemolysis. At the same time, platelets which are ABO incompatible with the patient's plasma can cause smaller platelet count increments. If ABO specific platelet concentrate is not available, then the 2nd choice platelet that will cause the least possible hemolysis should be given to patient (Table 1). Platelet do not express Rh antigens, but platelet unit do contain some contaminating red cells which can cause alloimmunization. Rh sensitization is generally only a concern for Rh negative women of child-bearing age. In these patients, if Rh compatible platelets are not available, then infusion of anti-D immune globulin is considered.

Summary:

- In the modern era of component transfusion therapy, ABO and Rh compatible blood component transfusion should be advised to patients to prevent adverse reactions and red cell sensitization.
- 2nd choice blood components can be used in case of non-availability of ABO compatible blood components.
- O Rh D negative packed red cells should only be reserved for emergencies.

Table 1. Choice of group red cells, platelets, fresh frozen plasma (FFP) and cryoprecipitate according to recipient's ABO group

Recipient	Donors		
Patient's ABO Group	Red cells	Platelets	Fresh Frozen Plasma (FFP) / Cryoprecipitate
O			
First choice	O	O	O
Second choice		A	A or B
Third choice			AB
A			
First choice	A	A	A
Second choice	O	O	AB
Third choice			B
B			
First choice	B	B	B
Second choice	O	O or A	AB
Third choice			A
AB			
First choice	AB	AB	AB
Second choice	A or B	A	A
Third choice	O	O	B

References:

1. JPAC Joint United Kingdom (UK) Blood Transfusion and Tissue Transplantation guidelines for the Blood Transfusion Services. http://www.transfusionguidelines.org/red-book
2. American Association of Blood Banks (AABB), Technical Manual, 20th edition