TRANSFUSION MEDICINE UPDATE

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*ABO*ut Pretransfusion Testing

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Introduction

As It is widely known that the consequences of an ABO mismatch, that is, providing RBCs that display an A or a B antigen to a recipient with the corresponding antibodies, can cause severe morbidity and even mortality. Transfusion with the wrong unit of blood is the leading cause of mortality from transfusion. In this Update the different stages of sample collection and blood bank testing will be described. The reader will develop an appreciation of the need for the fastidious checking and rechecking of patient identification that occurs along the way and understand what testing the blood bank performs when a "type and screen" is ordered.

Sample Collection Requirements

Proper patient identification is essential to providing a safe transfusion. The sample must be obtained from a patient with an identification band and must be labeled at the patient's bedside with first and last name, unique identification number (e.g. medical record number), phlebotomist's initials and date/time. The sample is valid for 3 days. For outpatients this time line can be extended if the patient has not been transfused or pregnant within 3 months AND they are willing to wear an identification bracelet. If the bracelet is removed then a new type and screen is required.

When the tube of recipient's blood and requisition/order arrive in the blood bank they are compared to each other to ensure that the information is consistent. If there is any discrepancy or missing information, the specimen will be rejected and the ward notified that a recollection is necessary. Otherwise, blood bank staff will begin processing the order.

Type and Screen

Once the specimen is accepted for pretransfusion testing, the first step in ensuring serological compatibility between the donor and recipient is to perform a type and screen which takes approximately 45 minutes. It consists of two distinct tests that are independent of each other. The "type", sometimes also referred to as "group", is a test that determines which ABO antigens are present on the patient's RBCs. It is divided into two parts: the first part uses commercially available antibodies that will react with either the A or B antigens, if present, on the RBCs. Thus an AB person will react with both anti-A and anti-B, while a type O person will not react with either. The second part of the 'type" test reacts the recipient's plasma with commercially available A and B cells. Almost everyone has antibodies to the ABO antigens they lack; an O person will have both anti-A and anti-B in their plasma while an AB person will not have either anti-A or anti-B in their plasma. These two parts of the 'type" test are complimentary and are used together to establish the patients' ABO type. The patient's Rh(D) status is also determined using anti-D reagents and methodology similar to the forward typing.

The "screen" test is done to determine if the recipient has formed what are known as "unexpected" red cell antibodies. These are antibodies to non-ABO RBC antigens and are often named for the recipient in which they were first identified. These antigens have names like Kidd (Jk), Kell (K), Duffy (Fy), Rhesus (Rh) etc. and the antibodies against these antigens are accordingly named anti-Jk, anti-K and so forth. There are over 250 different antigens on a typical RBC, of which only a handful produce clinically significant antibodies which would shorten the lifespan of an antigen-positive RBC. The screen test is done by using either two or

three commercially available type O cells which between them express essentially all of the major red cell antigens. By reacting the recipient's plasma with these cells and looking for agglutination of the RBCs caused by antigen-antibody interactions, the presence of an unexpected antibody can be detected. Approximately 5% of patients have a positive antibody screen. Such patients require additional testing taking several hours to identify antibody specificity and locate antigen-negative units for transfusion.

Crossmatch

A "crossmatch" is performed to demonstrate compatibility of the donor RBCs with the recipients' plasma. It can be done serologically to ensure compatibility with non-ABO antibodies or by computer as a check on ABO compatibility. If the recipient has a negative antibody screen (has not formed unexpected antibodies) then we can use the computer to electronically match the ABO type of the recipient with a donor unit using wands and bar code technology. If a recipient has formed unexpected antibodies, we are then compelled to perform a serological crossmatch to ensure that the unit of blood lacks the antigen corresponding to the patient's antibody. The serologic crossmatch takes 30 minutes to perform. In the event that blood is urgently required and a sample is not available for a type and screen, uncrossmatched blood (always group O) can be issued, as it is lacks A and B antigens and thus can safely be transfused to most recipients (95% have negative screens).

Compatibility Requirements: Plasma, Platelets and Cryoprecipitate

Plasma- Due to the presence of ABO antibodies in units of plasma only ABO compatible units can be used. Thus, the patient's ABO type is needed for transfusion. Since plasma from AB individuals does not contain anti-A or -B antibodies, any patient can receive AB plasma and it is used for emergency transfusion in patients with unknown blood types (see table). Crossmatching of plasma is not required since there are no red cells in these products
Platelets-These products contain only trace quantities of RBCs and thus for most recipients it is safe to cross ABO groups. A 6 unit pool of group A platelets can be issued to a type O recipient as the amount of RBCs in that pool of platelets is small and their slight hemolysis is unlikely to cause serious harm. Likewise a group O pool of platelets can be issued to a group A adult safely because the amount of incompatible plasma does not cause clinical problems. The exception to this rule is in neonates with a much smaller blood volume.
Cryoprecipitate-Cryoprecipitate contains a small amount of plasma (15 ml/unit) and thus does not require ABO compatibility.

Blood Administration

The final critical step in providing a safe transfusion comes just before the blood product is administered. Again, two people are involved in identifying the recipient and correlating the information attached to the blood product and the requisition. The patient information must come from the information attached to the actual patient to be transfused. If all the information is consistent, the unit can then be hung and the transfusion started. Should there be discordance between the information printed on the blood product and that from the patient, even something as small as a misspelled name or a digit missing from an otherwise identical health care number, that unit should not be hung and the blood bank contacted immediately. Such clerical errors often occur in pairs, so someone else in the hospital might be in danger of receiving the wrong unit!

In the past 20 years the safety of blood transfusions has increased exponentially. Recognizing the dangers of transfusion transmitted viruses and bacteria, and developing sensitive tests for them has substantially restored the public's confidence in the safety of the blood products they receive.

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Patient ABO group	Compatible plasma
A	A, AB
B	B, AB
O	O, A, B, AB
AB	AB