

Pretransfusion Compatibility Testing

Introduction

- Pretransfusion compatibility testing is a series of procedures and processes to ensure the best results of blood transfusion
- The main aim of these tests is to enhance the safety of blood transfusion. In other words:
 - 1) Ensure that transfused red cells have an acceptable survival rate (and no hemolytic transfusion reaction)
 - 2) There should not be significant destruction of the recipient's own red cells

Pretransfusion compatibility tests

- ABO testing
- Rh testing
- Historical record check
- Screening for unexpected alloantibodies
- Alloantibody identification
- Crossmatch:
Immediate spin only (if no antibody currently or historically identified)
if an alloantibody has been currently or historically identified use also AHG

Identification, collection, and preparation of samples

Positive recipient identification

- The major cause of transfusion associated fatalities is clerical errors resulting in incorrect ABO groupings
- The most common cause of error is misidentification of the recipient (e.g. misidentification of recipient when blood is drawn, mix-up of samples during handling in the laboratory, and misidentification of the recipient when blood is given)
- Therefore, exact procedures for proper identification must be established

Collecting patient samples

- After positive identification, blood samples should be drawn using careful technique to avoid hemolyzing the sample
- Serum or plasma may be used for pretransfusion testing
- Tubes must be labelled before they leave the patient bedside
- When the sample reaches the lab the blood bank personnel must confirm that the information on the sample and requisition form agree

Donor samples

- Samples from donors must be collected at the same time as the full donor unit
- Samples could be collected from the segmented tubing through which the donor blood was collected (each segment is imprinted with the same number)

Compatibility testing protocols

Testing of the donor sample

- ABO and Rh grouping and tests intended to prevent disease transmission
- Screening of unexpected antibodies if the donor has a history of prior transfusion or pregnancy
- All testing must be performed using in-date licensed reagents

Testing of the recipient sample

- 1) *ABO*: the most important pretransfusion test. This must be confirmed in every possible way, if not possible use O-ve packed red cells
- 2) *Rh*: to give Rh compatible blood

Testing of the recipient sample

3) *antibody screening:*

the recipient serum or plasma must be tested for clinically significant antibodies

Antibody formation is dependent on previous exposure to foreign antigen and the patients ability to respond to it

This caused by previous transfusion, transplantation, or pregnancy

The more frequently the patient is exposed to foreign RBC antigens the more likely they will produce unexpected antibodies

Detection of unexpected antibodies is important to select the donor's RBC that will have the best survival rate and reduce the risk of transfusion haemolytic reactions

After positive screening results, antibody identification must follow to determine if the antibody is clinically significant and whether antigen negative blood should be transfused

Testing of the recipient sample

- Compare results with previous results from record
- The patient history is very important:
 - To verify the current results
 - To determine whether the patient has a history of transfusion, pregnancy, or transplantation

Selection of appropriate donor unit

- The first choice for transfusion is blood unit of the patients own ABO and Rh group (ABO group specific)
- If this is not available, the selected unit must lack any antigen which is present on the recipient RBCs.
- When the patient is given blood of different ABO group, only red cells can be given. Why?

Selection of Appropriate donor unit

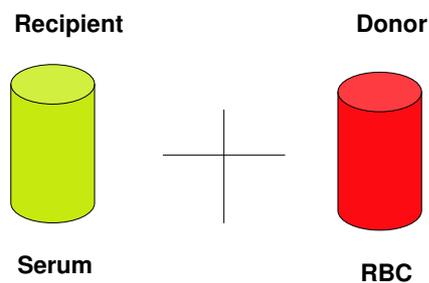
- Rh negative blood can be given to Rh positive patients, however, for good inventory management, it should be conserved for Rh negative patients
- Rh positive blood should not be given to Rh negative females in childbearing age
- Transfusion of Rh positive blood to Rh negative male and female beyond menopause is acceptable as far as no antibody is detected in their sera. This is especially if no Rh negative blood is available

Selection of Appropriate donor unit

- There are no need to provide antigen negative RBCs to patients who have antibodies which react only below 37 °C

Crossmatching testing

- Crossmatching means mixing of the patient's serum with the donor's red cells



Crossmatch testing

- Crossmatch and pretransfusion testing sometimes used interchangeably. This is wrong, crossmatch is only part of pretransfusion testing
- Originally crossmatch test preceded antibody identification
- because it was found that antibody screening can identify 99% of unexpected antibodies, some thought crossmatch test can be eliminated

Crossmatch testing

- However, crossmatching serve two important functions:
 - 1) It is a final check of ABO compatibility between donor and patient
 - 2) It could detect an antigen on the donor RBC that is not expressed by the screening cells

The crossmatch test

It consists of mixing the patient serum with the donor's red cells

It includes:

- 1) Immediate spin only (when no clinically significant antibodies are detected and no history of such antibodies)

Serum and RBCs are mixed and then centrifuged immediately. Absence of hemolysis or agglutination indicates compatibility

The crossmatch test

- 2) AHG crossmatch

When there is an antibody found in the screening test, or previous history

Causes of positive results in the crossmatch test

- 1) Incorrect ABO grouping of the patient or donor
- 2) An alloantibody in the patient's serum reacting with an antigen on the donor's red cells

If RBCs of all donors give positive results, what could be the reason?

If antibody screening test is negative but one unit RBC reacted positive, what could be the reason?

- 3) An autoantibody in the patient serum reacting with the corresponding antigen on the donor RBCs

Compatibility test in special circumstances

- In emergencies, depending on its degree, one may only type the patients blood or even transfuse O negative blood without testing. Samples should be taken anyway for subsequent testing
- If plasma is given, usually no need for compatibility testing. But if large volumes of plasma is given, a crossmatch test between the *donor's plasma* and the *patient red cells* is needed

Final remarks

- Blood must be used effectively
- The identity of the recipient must be re-established before transfusion
- Electronic crossmatch