Blood Transfusion

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Blood Transfusion

injection of a volume of blood, previously taken from a healthy person, into a patient.

Transfusion Ten Commandments

1. **Transfusion should only be used when the benefits outweigh the risks and there are no appropriate alternatives.**
2. **Results of laboratory tests are not the sole deciding factor for transfusion**
3. **Transfusion decisions should be based on clinical assessment underpinned by evidence-based clinical guidelines.**
4. **Not all anaemic patients need transfusion**
5. **Discuss the risks, benefits and alternatives to transfusion with the patient and gain their consent.**
6. **The reason for transfusion should be documented in the patients clinical record.**

Transfusion Ten Commandments

7. Timely provision of blood component support in major hemorrhage can improve outcome-good communication and team work are essential.
8. Failure to check patient identity can be fatal. Patients must wear an ID band with name, date of birth and unique ID number. Confirm identity at every stage of the transfusion process. Patients identifiers on the ID and blood pack must be identical.
9. The patient must be monitored during the transfusion.

10. Education and training underpin safe transfusion practice.

Goals of Blood Transfusion Therapy

--Use of donor erythrocytes with an optimal recovery and half life in the recipient.

--Achievement of appropriate haemoglobin level

--Avoidance of adverse reactions, including transmission of infectious agents.

Basics of Blood Groups and Antibodies

-- There are two most important in clinical practice are the ABO and Rh systems.

Blood group antigens

-- Blood group antigens are molecules present on the surface of red blood cells.

-- The genes for most blood groups have now been identified and tests based on this technology are gradually entering clinical practice.

Blood group antibodies

-- These are produced when an individual is exposed to blood of a different group by transfusion or pregnancy(alloantibodies).
-- Repeated transfusions such as thalassemia or sickle cell disease.
-- Some antibodies react with red cells around the normal body temperature of $37^{O}C$(warm antibodies).

-- Other are only active at lower temperature(cold antibodies). and do not usually cause clinical problems although they may be picked up on laboratory testing.

Testing for red cell antigens and antibodies in the laboratory

-- The ABO blood group system was the first to be discovered b/c anti-A and anti-B are mainly of the IgM immunoglobulin class and cause visible agglutination of group A or B red cells in lab mixing tests.
-- Antibodies to ABO antigens are naturally occurring and are found in everyone after first 3 months of life.
-- Many other blood group antibodies such as those against the Rh antigens are smaller IgG molecules and do not directly cause agglutination of red cells.
-- These incompatible antibodies can be detected by the antiglobulin test (coombs test) using antibodies to human IgG, IgM or components(antiglobulin) raised in lab animals.

Testing for red cell antigens and antibodies in the laboratory

-- The direct antiglobulin test (DAT) is used to detect antibodies raised in lab animals. The DAT is used to detect antibodies present on circulating red c ells as in autoimmune haemolytic anaemia or after mismatch blood transfusion.

-- Blood group antibodies in plasma are demonstrated by indirect antiglobulin test(IAT). Nearly all clinically significant red cell antibodies can be detected by an IAT antibody screen carried out at $37^{O}C$.

THE ABO system

-- There are four main blood groups.

-- All normal individuals have antibodies to A or B antigen that are not present on their own red cells.
-- The frequency of ABO groups varies in different ethnic populations.

-- For example, people of Asian origin have a higher frequency of group B than White Europeans. Individuals of blood group O are sometimes known as universal donors as their red cell have no A or B antigens . However, their plasma does contain anti-A and anti-B that, if present in high titre, has the potential to haemolyse the red cells of certain non group O recipients.

Table 2.1 Distribution of ABO blood groups and antibodies

Blood group	Antigens on red cells	Antibodies in plasma
O	none	anti-A and anti-B
A	A	anti-B
B	B	anti-A
AB	A and B	none

Transfusion reactions due to ABO incompatibility

-- ABO incompatible red cell transfusion is often fatal.

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

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Transfusion reactions due to ABO incompatibility

-- Transfusion of ABO incompatible plasma containing anti-A or anti-B usually from a group O donor can cause haemolysis of the recipient red cells, especially in neonates and small infants.

-- Red cells stored in saline, adenine, glucose and mannitol (SAG-M) additive solution contain less than 20mL of residual plasma so the risk of haemolytic reactions is very low.

-- Group O red cell components for intrauterine transfusion, neonatal exchange trnasfusion or large volume transfusion of infants are screened to exclude those with high titre anti-A or anti-B.

Transfusion reactions due to ABO incompatibility

-- Group O plasma rich 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 readily available.

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Table 2.2 Choice of group of red cells, platelets, fresh frozen plasma (FFP) and cryoprecipitate according to recipient's ABO group

Patient's ABO group	Red cells	Platelets[a]	Fresh frozen plasma (FFP)[b]	Cryoprecipitate
O				
First choice	O	O	O	O
Second choice		A	A or B	A or B
Third choice			AB	
A				
First choice	A	A	A	A
Second choice	O[c]	O[d]	AB	O or B
Third choice			B[d]	
B				
First choice	B	A[d]	B	B
Second choice	O[c]	O[d]	AB	O or A
Third choice			A[d]	
AB				
First choice	AB	A[d]	AB	AB
Second choice	A or B	O[d]	A[d]	A or B
Third choice	O[c]		B[d]	O

[a] Group B or AB platelets are not routinely available

Compatibility procedures in the hospital transfusion laboratory

-- *Group and Screen*

--Compatibility testing

-- Electronic issue

-- Blood for planned procedures

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Quality and Adequacy of Blood

Blood should be obtained from

--carefully selected regular voluntary

--non remunerated donors

-- collected, processed, stored and distributed by dedicated, quality assured blood transfusion centers.

Storage of Donor Red Cell Units

The anticoagulant preservative solutions used in blood collection to

--Prevent coagulation

--Permit storage of red cells without loss of metabolic integrity.

-- All of these solutions contain sodium citrate, citric acid and glucose, and some of them also contain adenine, guanosine and phosphate(e.g. CPD-A).

-- Introduction of additives such as AS-I, AS-3 and AS-5 permits storage of red cells for upto 42 days.