

Blood, Plasma and Plasma Expanders

Citrated Human Blood:

- Whole human blood is obtained from donors by aseptic technique, is preserved with either CPD (citrate-phosphate-dextrose) or CPDA (citrate-phosphate-dextrose-adenine) solution
- Collected blood is stored at a constant temperature between 2°C and 6°C (storage below 2°C damages the RBC and the temperature below 6°C prevent the multiplication of bacterial contaminants)
- The straw colour of the supernatant plasma serves as a convenient indicator to judge the suitability of blood sample for use. Pink or red stained plasma indicates hemolysis.
- The expiry date for blood preserved in CPD solution is 21 days and that for blood stored in CPDA solution is 35 days

Indications for blood transfusion:

- (1) Acute haemorrhage** or treating acute blood loss: When the blood loss is **mild** (25% or less of the total blood volume) a crystalloid solution should be infused in amounts 3-4 times the estimated blood loss. For **moderate blood loss** (26-50% of the total blood volume), colloid plasma expanders may be adequate. **For larger estimated blood losses**, either packed blood cells or *whole blood* are needed to achieve adequate tissue oxygenation; this may be in addition to crystalloid and colloid solutions.
- (2) To provide leucocytes in cases of agranulocytosis:** Fresh blood is preferred as the leucocytes deteriorate on storage.
- (3) Anaemia:** To reduce mortality in erythroblastosis foetalis. In the past, whole blood transfusions were used to provide RBCs, platelets and clotting factors as indicated e.g. anaemia, thrombocytopenia or bleeding disorders. However, all these uses have been superseded by use of multiple components like packed red cells, platelet concentrates and clotting factors isolated from whole blood. Thus, the donated blood can be used optimally on fractionation.

Complications of blood transfusion: • Nonhemolytic pyrexial reaction: Rigor, a common manifestation, is mostly due to imperfect sterilisation of the apparatus. In severe cases aspirin, anti-histaminics and glucocorticoids are employed. Usually, it is due to pyrogens but occasionally it can be caused by antibodies against antigens on donor leucocytes or platelets, stimulated by a previous transfusion or pregnancy.

- Allergy: It is mandatory to enquire about previous history of urticaria in the donor to prevent this complication. Antihistaminics and adrenaline are used to treat this manifestation.
- Air embolism.
- Heart failure due to hypervolemia and circulatory overload.

- Transmission of disease: (i) Acute viral hepatitis B or C (Type C virus is the infective agent most frequently transmitted by blood). (ii) Acquired immuno-deficiency syndrome (AIDS) due to HIV. (iii) Syphilis. *Treponema pallidum* does not survive refrigeration for more than three days. In an emergency, prophylactic use of penicillin can prevent this complication. (iv) Malaria.

PLASMA: Fresh plasma is prepared by separating a single unit (350 ml) of blood immediately after collection, for immediate infusion; and fresh-frozen plasma (FFP) is prepared by separating a single unit of blood within 6 hours of collection and then storing the plasma at -30°C or lower. Fresh plasma and FFP contain all the stable proteins (albumin, globulin) and the coagulation factors including Factor VIII, factor IX; their main use is to treat/prevent bleeding due to deficiencies of coagulation factors. FFP should be used within 24 hours. Ideally, ABO compatibility of FFP should be matched with the recipient.

Plasma can also be prepared by separating single units of blood individually; or by first mixing together blood of many donors (preferably small in number, say 10-12), and then separating that mixture. Such plasma may then be freeze dried and stored. Plasma prepared in this last manner lacks the labile coagulation factors but has the advantage of easy and prolonged storage upto 5 years. The use of pooled plasma is, however, discouraged because of the statutory requirement of sterilising it free of viruses. The use of plasma merely to maintain blood volume is not recommended.

NORMAL HUMAN SERUM ALBUMIN: This sterile preparation is obtained from human whole blood. It is used to raise the serum protein and reduce edema level in hypoproteinemia, in hypovolemic shock, and as a vehicle for transfusing packed red cells. It is usually non-toxic and does not interfere with normal coagulation. The 5% solution is given undiluted usually at a rate of 2 to 4 ml/min. The 25% solution can be administered undiluted or diluted with sterile saline or 5% dextrose. Undiluted solution is used to treat the presence of edema. In patients with low cardiac reserve, the rate of administration should be slow, (1 ml/min).