Blood Transfusion and Blood Products

Blood group systems

ABO System

- Most important of over 250 different antigens found on the surface of RBCs.
- Grp O – universal donor (not enough donated antibodies to cause problems).
- Grp AB – universal recipient – majority have no anti-A or anti-B antibodies...however there are A1 (80%) and A2 (20%) subgroups. Group A2/A2B form A1 antibodies

Rh system

- 5 major antigens (D, C, c, E & e) and of these the RhD antigen is highly immunogenic.
- 15% pop. Rh-ve and they can get an immune-mediated transfusion reaction.

Other groups

- Include Kell, Duffy, Kidd and may be associated with transfusion reactions.

Blood grouping

Agglutination testing (typing) pre-blood transfusion. If agglutination occurs, serum is tested further to identify antibodies present. DNA genotyping taking over from agglutination

Compatibility testing (cross-matching)

Donor red cells are mixed with patients serum to check no reaction.

Blood and blood products

Whole blood

- Largely replaced by blood component therapy. Occ used for massive transfusion when rapid correction of acidosis, hypothermia and coagulopathy is required.

Packed red blood cells

- Most plasma removed. Hct 60-70%.300ml packs. Give over ≤4hrs. Need less citrate than whole blood, last longer (5-6wks).
- Transfusion is often not considered until Hb <70g/L (or <100g/L if IHD, active bleeding)
- Single unit of red blood will typically increase Hb by 10g/L.
- Other RBC products include leucocyte-reduced components (↓febrile reactions, prevent HLA alloimmunisation, and alternative to CMV seronegative components), washed components (RBC and platelets) remove harmful plasma antibodies.

Platelets

- 50ml unit prepared from a single whole blood collection by differential centrifugation
- Shelf life of 3-5 days. Each unit can raise platelet count by 5-10x10^9/l.
- Alternatively pooled platelets (equiv to 6 single units)
- Platelets can be cross-matched to prevent loss of 10-20%.
- Indications: thrombocytopenia <5 or <50 & bleeding, ITP, DIC, massive transfusion

Granulocytes

- Indication mainly neutropenic cancer patients with unresponsive bacterial sepsis
- Shelf life 24 hours
- Need to be XM (because contain RBCs) and irradiated because many lymphocytes.

Fresh frozen plasma (FFP)

- Supernatant liquid of centrifugation of one donation of whole blood
- Frozen within 8 hours of collection to maintain the activity of factors V and VII
- 150-300ml thawed from -30°C. Often give 2 units over 1 hour.
- Uses: ↓↓multiple coagulation factors e.g. liver disease and DIC. Also to reverse warfarin.

Cryoprecipitate

- 15ml unit from slow thawing FFP (1-6°C) - has high conc of fibrinogen, VIII, XIII & vWf.
- Low levels of other factors. Often given in 6-10units batch over 1 hr total.

Albumin

- This is available as 5 or 25% sol for the treatment of hypovolaemia and low albumin.
- Cost-benefit debated (still used in liver disease ascites). Replaced by other colloids.

Immunoglobulin

- Indiations: immuno-thrombocytopenia, Guillain-Barre, Kawasaki and autoimmune haemolytic anaemias. RhD immunoglobulin in D-negative pregnancies for APH/birth.

Antithrombin III concentrate

- Use: deficiency of antithrombin III.

Recombinant activated protein C (Drotrecogin Alfa - Activated)

- Used in severe sepsis to prevent the formation of the microvascular thrombosis
- CI: internal bleeding, cerebral herniation/neoplasm, severe hepatic disease, and low plts

Factor VIIa (Recombinant)

- Uses: haemophilia A and B and in uncontrolled bleeding in a number of clinical situations.

Factor VIII fraction, dried

- Human antihaemophilic fraction for Rx and prophylaxis of haemorrhage in haemophilia A.
- Large or frequently doses in patients with groups A, B or AB can → haemolysis.

Factor VIII inhibitor bypassing fractions

- From plasma for spontaneous bleeding/surgical prophylaxis in hemophilia A and B with inhibitors.

Dried factor IX fraction

- May also contain factors II, VII, and X.
- Used in haemophilia B (congenital factor IX deficiency) or acquired haemophilia.

Factor XIII dried (Human Fibrin-stabilising Factor, Dried)

- Used in congenital factor XIII deficiency, also to promote the healing of anastomoses in gastrointestinal surgery

Protein C concentrate

- From human plasma for congenital protein C deficiency, or severe sepsis shock.

Complications of transfusion

General SE of Factor therapy include allergic reactions, chills and fever

See related article - Blood Transfusion Reactions