Adverse reactions of blood transfusion

Immunological reactions

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Reactions due to transfusion of red cells

- **Acute intravascular haemolysis:**
- Considered as a medical emergency.
- Incompatible blood transfusion (usually ABO) results in destruction of donor red cells by patient's ABO system antibodies.
- Red cell haemolysis ➔ complement activation ➔release of Hb ➔ DIC + acute renal failure.
- This reaction is fatal in 10% of cases.
- Can occur within minutes of transfusion.
- Majority of ABO-incompatible transfusion are due to clerical errors.

Reactions due to transfusion of red cells

- **Allo-immunization to red cell antigens:**
- The donor red cells are routinely matched with patient's ABO and RhD type before first transfusion.
- This means that the patient immune system may react and form antibodies against any other red cell antigens on donor red cells that he is lacking.
- This is called allo-immunization.
- It takes around 3 days to occur.
- There will be a difficulty in subsequent blood transfusions.
- Antibody screening and crossmatching should be done after 3 days post first transfusion in order to give the patient compatible blood in case he needs another transfusion.
- Allo-immunization can be avoided by limiting blood transfusion to only necessary conditions and by the use of blood transfusion alternatives (iron, EPO,..ETC).

Reactions due to transfusion of red cells

- **Delayed extra-vascular haemolysis:**
- May be caused by antibodies to several different blood group systems.
- Occurs within few days after transfusion.
- Features include fever, general malaise, and low Hb.
- Risk may be reduced before transfusion by cross-matching patient serum and donor red cells, and by antibody screening of patient serum for clinically significant Abs.

Reactions due to transfusion of red cells

- **Iron overload:**
- This risk occurs for those who receive regular red cell transfusions for months and years.
- Free iron in the body is very toxic and difficult to intoxicate by our body.
- Excess iron in the body can cause diverse tissue damage including heart and hepatic failure.
- This can be reduced by chelation therapy.

Reactions due to transfusion of WBC

- **1) None-haemolytic febrile transfusion reactions (NHFTR)**
- Occurs mostly following transfusion of blood without leucodepletion.
- Caused by anti-leucocyte antibodies in the patient reacting against donor leucocytes and activation of complement.
- Cytokines and granules released from damaged donor WBC are responsible for symptoms associated with NHFTR.
- Symptoms include flushing, pyrexia, rigors, & hypotension.
- These risks can be minimised by leucodepletion of any red cell or platelets components prior to transfusion.

Reactions due to transfusion of WBC

2) Allo-immunization

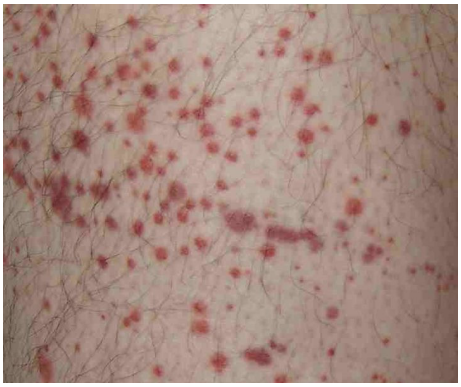
- WBC allo-immunization➔ Production of anti-HLA antibodies.
- These HLA antibodies not only destroy donor WBC (see **NHFTR)** but also can destroy any transfused platelets.
- Patient becomes **refractory** to platelets transfusions.
- In this case the patient would have to be transfused with HLA-matched platelets. (very difficult & time consuming).
- Prevention: leucodepletion of any red cell or platelets components.

Reactions due to transfusion of WBC

3) Postransfusion pupora (PTP)

- Pupora: appearance of red or purple discolorations on the skin due to bleeding underneath the skin.
- Microaggregates in blood units contain platelets and WBC.
- Platelets alloantibodies are formed in the patient against donor platelets antigens and attack donor & patient's platelets.
- This causes platelets destruction and sequestration in the spleen ➔ thrombocytopenia.
- PTP is not very common and takes usually 5-10 days to develop.
- Pre-transfusion filtration of microaggregates form blood units may minimise the risk of PTP.

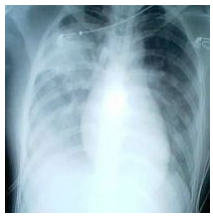
PTP



Reactions due to transfusion of WBC

4) Adult respiratory distress syndrome (ARDS)

- CAUSE: microaggregates blockage of pulmonary blood vessels.
- This can lead to damage of the lung and stiffness of alveoli due to accumulation of free radicals and lysozymes & compliment activation.
- Prevention: pre-transfusion removal of microaggregates.



5) Graft-versus-host disease (GVHD)

- Fatal condition caused by transfusion of donor WBC to an immuno-compromised patient.
- The donor WBC (graft) proliferate in patient blood and reject the host (patient) tissues.
- Prevention: gamma irradiation of red cell and platelets components prior to transfusion.

Reactions due to transfusion of platelets

1) Allo-immunization:

- Allo-immunization to platelets Ags results in production of anti-platelets antibodies.
- If platelets components are contaminated with RBC & WBC this will result in production of anti-red cell or HLA antibodies.
- **Prevention:** give only RhD Neg components to RhD neg women + leuodepeltion.

2) PTP

- Platelets antibodies in the patient to the introduced platelets antigens.
- May be life threatening ➔ thrombocytpopenia.
- If occurs, give platelets from matched donors.

Reactions due to transfusion of platelets

3) Release of histamine and serotonin

- Released from donor's damaged platelets.
- Can cause hypotension, bronchospasm, and urticaria.
- May be treated by anti-histamine.

4) Acute haemolysis

- why?
- Platelets from ABO-compatible donors.

Reactions due to transfusion of plasma

1) Anaphylactic shock reactions

- A sudden, severe allergic reaction characterized by a sharp drop in blood pressure, urticaria, and breathing difficulties
- Rare but sever with high mortality.
- Caused by IgE anti IgA in the patient serum who is IgA deficient.
- Prevention: give those patients IgA deficient plasma or wash plasma products from red cells and platelets.

Reactions due to transfusion of plasma

2) Transfusion Related Acute Lung Injury (TRALI)

- Very fatal condition.
- Caused by antibodies to PMN (granulocytes) in the donor plasma reacting against patient's PMN.
- ➔ compliment activation ➔ destruction of PMN in pulmonary BV ➔ oedema and infiltration of the lower lung.
- Prevention?

Reactions due to transfusion of plasma

3) Mild allergic reactions

- The patient develops allergy against allergens in the donor plasma.

4) **Febrile reactions:**

- Caused by cytokines released from damaged WBC in the plasma component.

5) **Acute haemolysis**:

- Caused by donor ABO antibodies in the plasma.

6) **Allo-immunization to red cell antigens:**

- Caused by the presence of small amount of red cells in FPP.