

TRANSFUSION REACTIONS

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A Transfusion Reaction is defined as any untoward event which occurs during or after transfusion of blood or blood components

Types:

- Immune or Non-immune
- Immediate or Delayed

Categories of Transfusion Reactions

- According to the time of onset
 - Immediate (Acute) – onset within less than 24 hrs
 - Delayed - onset within days or months

- According to the causes
 - Immune mediated
 - Acute
 - » Hemolytic
 - » Febrile nonhemolytic
 - » Allergy
 - » Anaphylactic
 - » Transfusion related lung injury
 - Delayed
 - » Hemolytic
 - » Allo immunisation
 - » Post Transfusion Purpura
 - » Transfusion related graft-vs-host disease
 - » Immunomodulation

– Non immune mediated

- **Acute**

- Bacterial contamination
- Circulatory over load
- Physical or chemical damage to RBCs
- Hyperkalemia

- **Delayed**

- Infections
- Hepatitis B&C
- HIV 1 & 2
- Syphilis
- Malaria
- Iron overload

- According to clinical signs and symptoms
 - Category 1 : Mild Reactions

Signs	Symptoms	Possible causes
Localized cutaneous reactions <ul style="list-style-type: none">- urticaria- Rash	Pruritus	Hypersensitivity (mild)

Category 2 : Moderately Severe Reactions

Signs	Symptoms	Possible causes
<ul style="list-style-type: none">•Flushing•Urticaria•Rigors•Fever•Restlessness•Tachycardia	<ul style="list-style-type: none">•Anxiety•Pruritus•Palpitations•Mild dyspnoea•Head ache	<ul style="list-style-type: none">•Hyper sensitivity (moderate – severe)•Febrile non hemolytic transfusion reactions<ul style="list-style-type: none">•Antibodies to white blood cellsplatelets•Antibodies to proteins including IgA•Possible contamination with pyrogens and / or bacteria.

Category: 3

Life Threatening Reactions

Signs	Symptoms	Possible causes
<ul style="list-style-type: none"> ○ Rigors ○ Fever ○ Restlessness ○ Hypotension (Fall of 20% in systolic BP) ○ Tachycardia (Rise of 20% in heart rate) ○ Haemoglobinuria (red urine) ○ Unexplained bleeding (DIC) 	<ul style="list-style-type: none"> •Anxiety •Chest pain •Pain near infusion site •Respiratory distress/ shortness of breath •Loin / back pain •Head ache •Dyspnoea 	<ul style="list-style-type: none"> •Acute intravascular haemolysis •Bacterial contamination and septic shock •Fluid over load •Anaphylaxis •Transfusion associated acute lung injury (TRALI)

In an unconscious or anaesthetized patient, hypotension and uncontrolled bleeding may be the only signs of an incompatible transfusion.

In a conscious patient undergoing a severe haemolytic transfusion reaction, signs and symptoms may appear within minutes of infusing only 5-10 ml of blood. Close observation at the start of the infusion of each unit is essential.

- **Causes of IHTRs**

- 1. Clerical error**

- 1. Incorrect labelling**
 - 2. Incorrect identity of the patient**
 - 3. Wrong blood used**
 - 4. Improper identification of patients blood sample**

- ☒ Technical error**

- ☒ Error in blood grouping and cross matching**
 - ☒ Error in detecting incompatibility**
 - ☒ Weak antibodies are not detected**
 - ☒ Destruction of recipients r3ed cells by donor antibodies**
 - ☒ Incorrect interpretation of test results**

- Causes of NIHTRS
 1. Blood infected with bacteria
 2. Thermal exposure of transfused red cells
 3. Mechanically haemolysed red cells
 4. Chemically affected red cells
 5. Hyperkalemia

- **Bacteria Contaminated Blood**
 - Blood may become contaminated by
 - 1. Bacteria from donor skin during blood collection (staphylococci)**
 - 2. Bacteraemia present in the blood of donor**
 - 3. Improper handling in blood processing**
 - 4. Defects in plastic blood pack**
 - 5. Thawing FFP in a contaminated water bath**

- Thermal exposure of transfused red cells occur when blood is cooled to -3°C or warmed to $>40^{\circ}\text{C}$
- Chemically affected blood cells occur
 1. Hypertonic saline or 5% glucose
 2. Concomitant administration of blood and drugs through a common administration slits or incorporation of drugs in to blood bag
- Hyperkalemia occurs in massive transfusion

Febrile Non Haemolytic Transfusion Reactions

- Self limiting
- Seen in multi transfused patients or multiparous women who have antibody directed against donor leukocytes
- Antibody antigen reaction activate complement and stimulate cytokines production
- Release of endogenous pyrogens

Allergic Reaction

- Foreign protein (allergen) in donor plasma react with IgE in the attached to mast cells and basophils
- Donor plasma having IgE combined with allergens in patient plasma
- Antibody antigen reaction initiate histamine release which causes allergic reaction

Anaphylactic Reactions

- Due to immediate hypersensitivity of immune system
- Caused in patients who are congenitally IgA deficient and have developed anti IgA antibodies by the sensitization from transfusion or pregnancy

TRALI –

Transfusion related acute lung injury

- **Unusual**
- **Known as non cardiogenic pulmonary edema**
- **Anti leukocyte antibodies in donor or patient plasma react with leukocyte in the pulmonary micro vascular system resulting in leukocyte emboli aggregating in lung capillaries**
- **Altered pulmonary capillary bed from activation of complement prostaglandins**
- **Lead to fluids accumulation inadequate oxygenation and reduced cardiac return.**

Delayed Haemolytic Reactions

- Alloimmunization
 - Occurs several weeks after transfusion due to incompatibility of Rh, Kell, Duffy and other systems
- Platelet incompatibility
 - occur in platelet concentrate transfusion resulting in post transfusion purpura in already immunized patients by earlier transfusion of platelets
 - Due alloantibody anti P1^{A1}

- **Graft vs. Host disease**
 - Occur if donor functional lymphocytes engraft and multiply in a severely immunodeficient recipient
 - Patients at risk of GVHD
 - **Lymphopenic patients**
 - **Bone marrow suppressed cases**
 - **Foetus receiving intrauterine transfusions**
 - **New born infants receiving exchange transfusions**
 - **Individuals with congenital immunodeficiency syndrome**
 - **Haematologic and oncologic disorders**
 - **.Pts receiving blood from relative donors.**

Non Immune Delayed Complications

- Haemosiderosis(iron overload)
 - Each red cell unit contains 200mg of iron
 - Occur in beta thalassemia major , congenital haemolytic anemias or aplastic anemia patients
 - Storage occurs in reticulo endothelial sites

- Transfusion transmitted diseases
 - HIV
 - HCV
 - HBsAG
 - HTLV
 - Syphils
 - Malaria

Management of Transfusion Reactions

- Mild reactions (category 1)
 1. Slow the transfusion
 2. Administer antihistamine IM (chlorpheniramine 0.1mg per kg)
 3. If no clinical improvement within 30 mins or if signs and symptoms worsen treat as category 2

Category 2: Moderately Severe Reactions

1. Stop the transfusion. Replace the infusion set and keep IV line open with normal saline
2. Notify the doctor responsible for the patient and the blood bank immediately
3. Send blood unit with infusion set, freshly collected urine and new blood samples (1 clotted and 1 anti coagulated) from vein opposite infusion site with appropriate request form to blood bank for laboratory investigations

4. Administer antihistamine IM and oral or rectal antipyretic (eg paracetamol 10mg per kg). Avoid aspirin in thrombocytopenic patients
5. Give IV corticosteroids and bronchodilators if there are anaphylactoid features (eg bronchospasm, stridor)
6. Collect urine for next 24 hrs for evidence of haemolyses and send to laboratory
7. If clinical improvement, restart transfusion slowly with new blood unit and observe carefully
8. If no clinical improvement within fifteen minutes or if signs and symptoms worsen treat as category 3

Category 3: Life Threatening Reactions.

- Stop the transfusion. Replace the infusion set and keep iv line open with normal saline.
- Infuse normal saline initially [20-30ml/kg] to maintain systolic BP. If hypotensive, give over in 5 min and elevate patients legs.
- Maintain air way and give high flow oxygen by mask
- Give adrenaline (as 1 :1000 solution) 0.01 mg/kg body weight by slow intramuscular injection

- Give IV corticosteroids and bronchodilators if there are anaphylactoid features.(eg bronchospasm, stridor)
- Give diuretic eg frusemide 1mg/kg IV
- Notify the doctor responsible for the patient and blood bank immediately
- Send blood unit with infusion set, fresh urine sample and fresh blood samples to the blood bank for investigation

- Check fresh urine specimen visually for signs of haemoglobinuria
- Start a 24hr urine collection and fluid balance chart and record all fluid intake and out put. Maintain fluid balance
- Assess for bleeding from puncture sites or wounds
- If there is clinical or laboratory evidence of DIC give platelets and either cryoprecipitate or fresh frozen plasma

- **Reassess. If hypotensive**
 - **Give further saline 20 to 30 ml/kg over 5mins**
 - **Give inotrope if available**
 - **Dopamine IV infusion 1µg/kg body weight/min.**
 - **Dobutamine IV infusion 1to 10 µg/kg body weight/min**
- **If urine output falling or laboratory evidence of acute renal failure (raising k⁺ ions , urea, creatinine)**
 - **Maintain fluid balance accurately**
 - **Give further frusemide**
 - **Consider dopamine infusion if available**
 - **Seek expert help. The patient may need renal dialysis**
- **If bacteraemia is suspected (rigor, fever , collapse, no evidence of haemolytic reaction) start broad spectrum antibiotics IV**

- TRALI – no specific therapy. Intensive respiratory and general support in an ICU is required.
- Posttransfusion purpura –
 - High dose cortico steroids
 - High dose IV immunoglobulin
 - Plasma exchange

- GVHD – usually fatal. Supportive treatment.
No specific therapy
- Iron overload – iron binding agents.
Desferrioxamine 20to40 mg/kg body weight.

Monitoring The Transfused Patient

1. For each unit of blood transfused, monitor the patient:
 - Before starting the transfusion
 - As soon as the transfusion is started
 - After 15 minutes
 - At least every hour during
 - On completion
 - 4 hours after completing the transfusion.

2. At each of these stages, record the following information on the patient's chart:

- Patient's general appearance
- Temperature
- Pulse
- Blood pressure
- Respiratory rate
- Fluid balance:
 1. Oral and IV fluid intake.
 2. Urinary output.

3. Record:

- Time of starting
- Time of completion
- Volume and type of all products transfused
- Unique donation numbers
- Any adverse effects.

Thank You