



The background of the slide is a microscopic view of blood. It features several red blood cells, which are biconcave and appear as reddish-orange discs. There are also white blood cells, which are larger and have a more irregular, textured appearance. The overall color palette is dominated by shades of red and orange, with some lighter, yellowish areas where the white blood cells are located.

BLOOD TRANSFUSION REACTIONS

Blood transfusion Reaction

Dr.z.khaffafpour

Pediatric Hemato-oncologist

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Classification of Non-infectious Complications of Blood Transfusion

Acute Reaction (<24 hours)

- Immune-mediated reactions include acute hemolytic transfusion reaction(AHTR)
- Febrile nonhemolytic transfusion reaction (FNHTR)
- Allergic reactions
- Anaphylactic reactions
- Transfusion-related acute lung injury (TRALI)
- Transfusion-associated circulatory overload (TACO)

FEVER

FEBRILE NONHEMOLYTIC
TRANSFUSION REACTION

HEMOLYSIS

ACUTE & DELAYED HEMOLYTIC
TRANSFUSION REACTIONS

ALLERGY

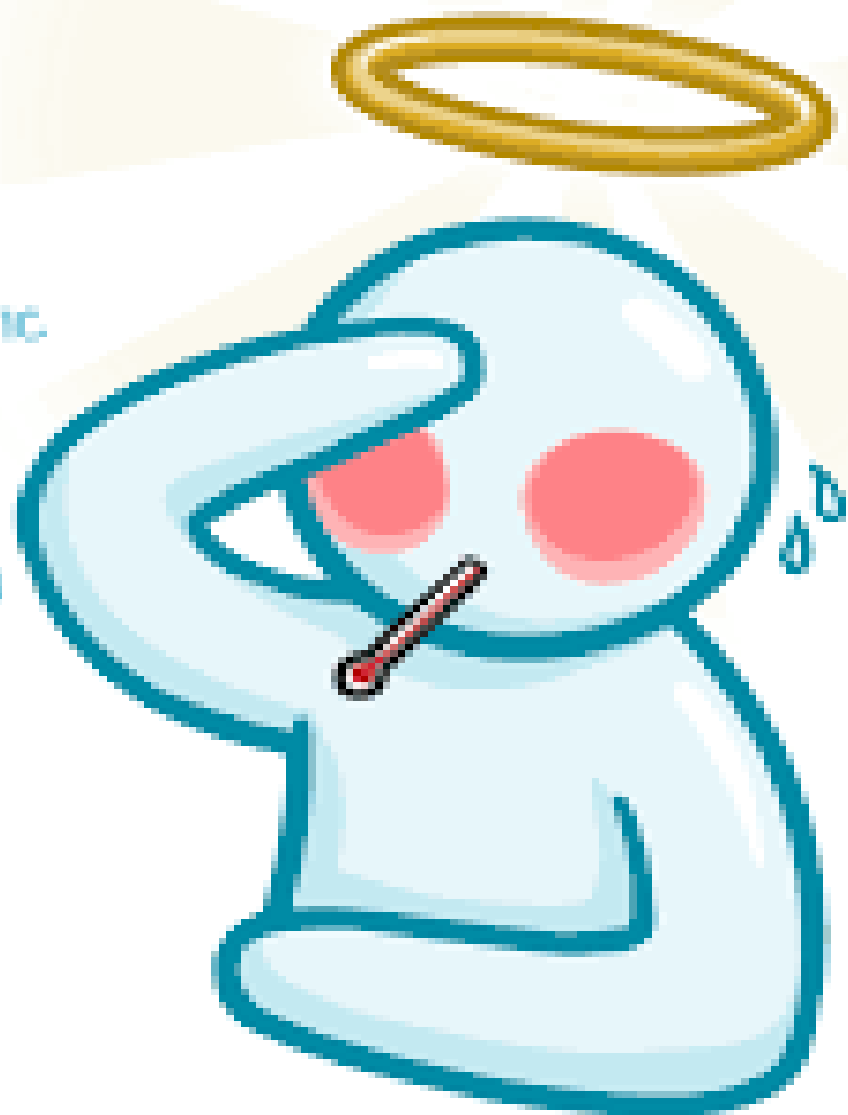
ANAPHYLACTIC TRANSFUSION
REACTIONS

LUNG

TRANSFUSION-RELATED
ACUTE LUNG INJURY (TRALI)

OVERLOAD

TRANSFUSION-ASSOCIATED
CIRCULATORY OVERLOAD (TACO)



Delayed Reaction (>24 hours)

- Immune-mediated reactions include Delayed hemolytic transfusion reaction(DHTR)
- Alloimmunization to HLA antigens
 - To platelet antigens
 - To red cell antigens
- Post-transfusion purpura (PTP)
- Non-immune reaction includes Iron overload

HTR

Acute hemolytic transfusion reaction (AHTR) (<24hrs)

Delayed hemolytic transfusion reaction(DHTR)(>24hrs).

Immunologic incompatibility between the donor RBC and the recipient, the recipient has preformed antibodies against the antigen(s) on donor RBC ABO or non-ABO antibodies.

IgM (activate complement causing intravascular hemolysis)

IgG (mainly causing extravascular hemolysis)

HTR symptoms

fever, chills, rigors, chest/back/abdominal pain, infusion site pain, nausea/vomiting, shock, dyspnea, hemoglobinuria, oliguria/anuria, and diffuse bleeding acute kidney failure, shock, DIC, or death

Laboratory findings

decreased or absent haptoglobin, elevated bilirubin, elevated LDH, hemoglobinemia, or hemoglobinuria. In addition, the peripheral smear shows acanthocytes (intravascular hemolysis) and spherocytes (extravascular hemolysis).

Immediately **discontinue the transfusion** while maintaining venous access for emergency management.

Anticipate hypotension, acute kidney injury (AKI), and disseminated intravascular coagulation (DIC).

Prophylactic measures to reduce the risk of **AKI** may include **low-dose dopamine (1-5 mcg/kg/min)**, **vigorous hydration with crystalloid solutions (3000 mL/m²/24 h)**, and **osmotic diuresis with 20% mannitol (100 mL/m²/bolus, followed by 30 mL/m²/h for 12 h)**.

If DIC is documented and bleeding requires treatment, transfusions of frozen plasma, pooled cryoprecipitates for fibrinogen, and/or platelet concentrates may be indicated.

Febrile Nonhemolytic Transfusion Reaction (FNHTR)

FNHTR is a diagnosis of exclusion. It is defined as a fever greater than 100.4°F (38°C) and a change of at least 1.8°F (1.0°C) from the pretransfusion level during or within 4 hours of transfusion.

Pathophysiology FNHTR cytokines released by white blood cells in the stored blood products

(IL)-1, IL-6, IL-8, and tumor necrosis factor-alpha (TNF α).

Management: Stop transfusion immediately. Send the transfusion reaction work-up to the laboratory. Acetaminophen to reduce fever. Exclude all other causes of fever

Allergic Transfusion Reactions (ATRs)

allergic reaction can vary from mild skin manifestations such as **hives, edema, pruritis, angioedema** to serious life-threatening reactions like anaphylaxis presenting with **hypotension** and **bronchospasm**

Anaphylaxis

Pathophysiology soluble **antigens in the donor** unit to which the recipient has been previously sensitized.. Anaphylaxis has been reported in IgA deficient individuals with **anti-IgA antibodies** receiving blood products containing IgA

- Management:** Stop transfusion immediately. Mild allergic reaction presenting with hives and urticaria can be managed by the administration of **diphenhydramine**. Severe anaphylactic reactions may require administration of **epinephrine, oxygen supplementation, and IV fluids**.

- Prevention:** diphenhydramine washing of cellular products, products from IgA deficient donors can help to prevent anaphylaxis in recipients with IgA antibodies.

Transfusion-related Acute Lung Injury (TRALI)

acute lung injury within 6 hours of transfusion and one of the leading causes of mortality associated with blood transfusion

Pathophysiology is the transfusion of plasma with **anti-HLA (1&2) or anti-HNA antibodies**

Symptom; dyspnea, hypoxemia (O₂ saturation <90% on room air), tachypnea, low-grade fever, rigors, tachycardia, hypothermia, and hypotension. New-onset bilateral pulmonary infiltrates on imaging

•**Management:** Stop transfusion. Perform chest imaging. Aggressive respiratory support with supplemental oxygen and/or positive airway ventilation, **Steroids are not helpful. Diuretics are also not helpful since the underlying mechanism is not volume overload.**

Prevention: Exclusion of plasma donation from high-risk donors such as **multiparous women** or **screening and deferral of donors with HLA antibodies.** **Leukoreduction may help prevent reverse TRALI.**

Transfusion-associated Circulatory Overload (TACO)

TACO is related to underlying medical conditions such as **heart failure and is more common in critically ill patients.**

Clinical presentation dyspnea, hypoxemia, tachycardia, hypertension. Imaging shows pulmonary edema and pleural effusion. Laboratory findings show elevation of the beta-natriuretic peptide (BNP). Symptoms and clinical presentation overlap with TRALI. the **absence of fever, elevated BNP, hypertension** (TRALI usually presents with hypotension), and **symptomatic relief with diuretics favor TACO over TRALI.**

•**Management:** Stop transfusion immediately and notify the blood bank/transfusion services. Chest imaging and BNP. Diuretics ,symptomatic relief.

Prevention: Avoid unnecessary transfusion is the best measure. Transfuse blood products at a slow rate (up to 4 hours).

Transfusion-associated graft versus Host Disease (TAGvHD)

GVHD mechanism is transfusion of viable donor T lymphocytes that are present in blood products. T-lymphocytes engraft and proliferate in the host and induce an immune response characterized by fever, rash, liver dysfunction, pancytopenia, and gastrointestinal symptoms that develop over 1 to 6 wks after a transfusion. Pancytopenia due to bone marrow aplasia is usually the cause of fatality.

Management: No definitive treatment. Immunosuppression with corticosteroids and cytotoxic agents can help up to some extent. A bone marrow transplant can be potentially curable; however, generally not an option due to the acute course of progression.

•**Prevention:** Irradiation of blood products such as RBC, Platelets, and granulocytes. Avoiding haploidentical transfusions such as from close relatives.

Alloimmunization

sensitization of the immune system to a particular antigen that is lacking in the host. Alloimmunization could be against RBC antigens, HLA antigens (present on WBC and Platelets), and (HPA) Human platelet antigen. **Rh "D"** blood group is the most significant of these groups. Other important blood groups causing alloimmunization are **Kell, Kidd, Duffy, and Rh groups (E > C > c).**

Management:

Platelets: **HLA or HPA matched platelet** products are considered in individuals with platelet refractoriness after ruling out other etiologies of refractoriness. **RBC: Crossmatched products can also be considered.**

Prevention: Leukoreduction can prevent HLA alloimmunization. Extended **phenotype matching of RBC** can be helpful. Platelet ABO matching and leukoreduction have been shown to reduce the requirement of HLA-matched platelet transfusions

Other Non-infectious Complications

Massive transfusion complication