SAWA UNIVERSITY

جامعة ساوة الاهلية
كلية التقنيات الصحية والطبية
قسم التخدير - اللجنة العلمية

مادة أسس التخدير 1 الكورس الاول

BLOOD AND BLOOD PRODUCTS (PART 2)

جامعـــــة ســـــاوة الاهلية	Sawa University
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نظـــــــري ...محاضرة رقم7

Theoretical Lecture No.7 .....

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5-platelate

- The platelet count at 1 hour post transfusion of a unit of platelets should increase by 5,000 to 10,000 platelets/μL.
- Platelets separated from plasma obtained from 4–6 donations of whole blood are often pooled to produce atherapeutic dose of platelets for an adult platelet apheresis unit, by 30,000–60,000 × 10 9/L.
- Dosage: 1 unit of platelet concentrate/10 kg body weight

Indications of platelet transfusion:

Thrombocytopenia or Dysfunctional platelets with:

1.Active bleeding

2.Bleeding tendency

- Neurosurgical procedures: 100,000 platelets/μL
- Vaginal delivery and minor surgical procedures: <50,000/μL
- Massive transfusion: < 50,000 platelets/μL
- Disseminated intravascular coagulation: 20,000–50,000 /μL

6-Cryopreciptate

- Cryoprecipitate is obtained from a single donation of FFP at about 4°C and is rich in factor VIII, von Willebrand factor (VWF), factor XIII, and fibrinogen.
- Cryoprecipitate is usually administered as a transfusion of 10 single units.
- Each unit volume (5to15-mL) unit contains over 80 units of factor VIII and about 200 mg of fibrinogen.

Indications of transfusion

- Hemophilia A
- von Willebrand disease
- Hypofibrinogemia
- Uremic bleeding

Blood Component Characteristic

	Red Cells	Platelet Concentrate	Fresh Frozen Plasma	Cryoprecipitate
Storage Temperature	2-6°C	20-24°C	-30°C	-30°C
Shelf Life	35 day	5 day	1 yr (frozen)	1 yr (frozen)
Volume	200-350	30-50 ml/unit	150-200ml/unit	10-15 ml/unit
Transfusion Interval	Transfuse within 30 min of removal from blood refrigerator. Transfuse unit over maximum of 4 hr	Start transfusion as soon as received from blood bank. Transfuse unit within 30 min	Once thawed, should be transfused within 4 hr	884 hr
Compatibility Testing Requirement	Must be compatible with recipient ABO and Rh D type	Preferably ABO identical with patient. Rh negative females under the age of 45 yr should be given Rh negative platelets	FFP and cryoprecipitate should be ABO compatible to avoid risk of hemolysis caused by donor anti-A or anti-B	
Administration	Infuse through a blood administration set—platelet concentrates should not be infused through blood sets that have been used for blood.			

Complications of blood transfusion

1) IMMUNE Complications.

2) INFECTIOUS Complications.

3) MASSIVE BLOOD TRANSFUSION Complications.

. IMMUNE Complications

A.Hemolytic reactions

- Acute hemolytic reaction.
- Delayed hemolytic reaction.

B.Nonhemolytic reactions

- Febrile reactions
- Urticarial reactions
- Anaphylactic reactions
- Post-transfusion purpura
- Transfusion-Related Acute Lung Injury
- Graft-versus-host disease

Complications of Blood Transfusion

2) Infectious (all products)

Transfusion-Transmitted Infection	Residual Risk Per Transfused Component
HIV	1 in 1,467,000
Hepatitis C	1 in 1,149,000
Hepatitis B	1 in 282,000
West Nile Virus	Uncommon
Cytomegalovirus	50-85% of donors are carriers. Leukocyte reduction is protective.
Bacterial Infection	1 in 2-3,000 (mostly platelets)
Parasitic Diseases Babesiosis, Chagas, Malaria	Relatively uncommon

3 Complications of massive blood transfusion

– Coagulopathy

– Hypothermia

– Citrate Toxicity

– Acid–Base Balance

– Serum Potassium Concentration

Immune complications

Immune complications following blood transfusions are primarily due to *sensitization of the recipient to donor* red cells, white cells, platelets, or plasma proteins.

Less commonly, the transfused cells or serum may mount an immune response against the recipient.

1. **Acute hemolytic transfusion reaction: ABO incompatibility.**
2. **Delayed HTR: incompatible red cell antigen.**
3. **Febrile non-HTR: anti-WBC antibodies in recipient.**
4. **Urticarial reactions: antibody to donor plasma proteins.**
5. **Anaphylactic: antibody to donor plasma proteins (IgA).**
6. **Transfusion-related acute lung injury (TRALI)**: neutrophil antibodies in donor product.

❖Hemolytic reactions

- Hemolytic reactions usually involve specific destruction of the transfused red cells by the recipient's antibodies. Less commonly, hemolysis of a recipient's red cells occurs as a result of transfusion of red cell antibodies.

- Hemolytic reactions are commonly classified as either **acute** (intravascular) or **delayed** (extravascular).

Acute hemolytic reaction

- Acute intravascular hemolysis is usually due to **ABO blood Incompatibility**, and the reported frequency is approximately 1:38,000 transfusions

- The most common cause is misidentification of a patient, blood specimen, or transfusion unit.
- These reactions are often **severe**, and may occur after infusion of as little as 10–15 mL of ABO-incompatible blood.
- The risk of a fatal hemolytic reaction is about 1 in 100,000 transfusions.
- In awake patients, symptoms include chills, fever, nausea, and chest and flank pain.

- **In anesthetized patients, an acute hemolytic** reaction may be manifested by

1. **a rise in temperature**, **unexplained tachycardia**, h**ypotension**, **hemoglobinuria**, and **diffuse oozing in the surgical field**.
2. D**isseminated intravascular coagulation (DIC)**
3. **Shock and kidney failure can develop rapidly**.

- The **severity of a reaction** often depends upon the v**olume of incompatible blood that has been administered.**

Management of hemolytic reaction

1. If a hemolytic reaction is suspected, the **transfusion should be stopped immediately** and the **blood bank should be notified**.
2. The unit should be rechecked against the blood slip and the patient's identity bracelet.
3. Blood should be drawn to identify hemoglobin in plasma, to repeat compatibility testing, and to obtain coagulation studies and a platelet count.
4. A urinary catheter should be inserted, and the urine should be checked for hemoglobin.
5. Osmotic diuresis should be initiated with mannitol and intravenous fluids.

Delay hemolytic reaction

Also called **extravascular** hemolysis, is generally **mild** and is caused by antibodies to non-D antigens of the Rh system or to foreign alleles in other systems such as the Kell, Duffy, or Kidd antigens.

Following an ABO and Rh D-compatible transfusion, patients have a 1– 1.6% chance of forming antibodies directed against foreign antigens in these other systems.

- The hemolytic reaction is therefore **typically delayed 2–21 days** after transfusion, and symptoms are **generally mild, consisting of malaise, jaundice, and fever.**
- The patient's hematocrit typically fails to rise or rises only transiently,in spite of the transfusion and the absence of bleeding.
- The serum unconjugated bilirubin increases as a result of hemoglobin breakdown.

- Diagnosis of delayed antibody-mediated hemolytic reactions may be facilitated by the antiglobulin (Coombs) test. The direct Coombs test detects the presence of antibodies on the membrane of red cells.
- Pregnancy (exposure to fetal red cells) can also be responsible for the formation of allo antibodies to red cells.
- The frequency of delayed hemolytic transfusion reactions is estimated to be approximately 1:12,000 transfusions.
- The treatment of delayed hemolytic reactions is primarily **supportive**

Nonhemolytic immune reactions:

- Nonhemolytic immune reactions are due to sensitization of the recipient to the donor's white cells, platelets, or plasma proteins.

- The risk of these reactions may be minimized by the use of leuko reduced blood products.

A- Febrile Reactions:

B- Urticarial Reactions:

C- Anaphylactic Reactions:

Transfusion-Related Acute Lung Injury (TRALI(

-)TRALI) presents as acute hypoxia and noncardiac pulmonary edema occurring within 6 h of blood product transfusion.
- It may occur as frequently as 1:5000 transfused units, and with transfusion of any blood component, but especially platelets and FFP.
- It is thought that transfusion of antileukocytic or anti-HLA antibodies results in damage to the alveolar–capillary membrane.
- Treatment is similar to that for acute respiratory distress syndrome with the important difference that TRALI may resolve within a few days with supportive therapy.

E-Graft-Versus-Host Disease:

- **F-Post-Transfusion Purpura:**

G-Transfusion-Related Immunomodulation:

H-Infectious complications:

- **<u>Viral Infections</u>: Hepatitis C, Acquired Immunodeficiency Syndrome (AIDS), Cytomegalovirus (CMV) and Epstein–Barr virus**
- **<u>Parasitic Infections</u>: malaria, toxoplasmosis, and Chagas' disease.**
- **<u>Bacterial Infections</u>: Both gram-positive (Staphylococcus) and gram-negative (Yersinia and Citrobacter) bacteria can contaminate blood transfusions and transmit disease.**

Any questions?