



# **ACUTE TRANSFUSION REACTIONS**



# ACUTE TRANSFUSION REACTIONS

1. Hemolytic - transfusion reaction
2. TRALI
3. TACO
4. Nonhemolytic transfusion reactions ( Febrile - allergic)
5. Transfusion - Associated graft - versus host diseases
6. Transfusion related immunomodulation



# HEMOLYTIC TRANSFUSION REACTION

1. One of the most catastrophic event
2. It is intravascular
3. Mediated by direct attack on donor cells by recipient Ab or complement
4. Only 10 ml of blood is enough
5. Mostly caused by ABO incompatibility
6. Recently barcode scanning of blood are used to decrease transfusion related errors



**TABLE 49.16** Frequency and Signs and Symptoms of Hemolytic Transfusion Reactions in 40 Patients

Sign or Symptom	No. Patients
Fever	19
Fever and chills	16
Chest pain	6
Hypotension	6
Nausea	2
Flushing	2
Dyspnea	2
Hemoglobinuria	1



1. Under G.A. : hemoglobinuria - hypotension  
bleeding diathesis may be the only clue

3. Plasma contain 2 mg / dl Hb → faintly  
pink plasma if reaches 100 mg/ dl Hb  
→ red plasma and if 150 mg / dl →  
hemoglobinuria occurs

5. Lab tests: Haptoglobin ,  
plasma and urine lab, Hb  
Br and direct anti globulin  
tests

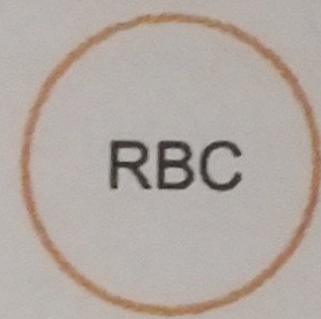
2. 50ml of incompatible blood may exceed  
the binding capacity of haptoglobin

4. Quantity of Hb in plasma ↑ → volume  
of in compatible blood transfused ↑

6. D. A. globulin can  
confirm the presence of  
hemolytic transfusion  
reaction because it shows  
Ab. is attached to  
transfused donor RBCs.

# SIGNS AND SYMPTOMS





Free hemoglobin

Hemoglobin-haptoglobin  
complex (100 mg/dL)

Reticuloendothelial system

Kidney

**Fig. 49.13** Schematic representation of the effect on hemolyzed erythrocytes (*RBC*) due to the administration of incompatible blood.



# TREATMENT

1. The renal and coagulation system more affected
2. Precipitation of Hb ( in form of acid hematin) in distal tube → mechanical tubular blockage → A.R.F.
3. Precipitation of Hb inversely related to the PH and urine flow
4. Therapy goal → u/o > 75ml/hr IV fluid and diuresis
5. Alkalization of urine to prevent precipitation of acid hematin
6. DIC commonly occur because erthrocytin activates intrinsic system of coagulation and leads to fibrin formation after that platelates and factors I , II , V , VII are consumed
7. As soon as hemolytic reaction is recognized platelet count , PT , PTT, should be checked as base and then compare with subsequent lab. value
8. hypotension during hemolytic reaction may result from activation of the kallikrein system.



## BOX 49.6 Steps in the Treatment of a Hemolytic Transfusion Reaction

1. Stop the transfusion.
2. Maintain the urine output at a minimum of 75-100 mL/h by the following methods:
  - a. Administer fluids intravenously and possibly mannitol
  - b. Administer furosemide if intravenous fluids and mannitol are ineffective
3. Alkalinize the urine
4. Assay urine and plasma hemoglobin concentrations.
5. Determine platelet count, prothrombin time, partial thromboplastin time, and serum fibrinogen level.
6. Return unused blood to blood bank for repeat crossmatch.
7. Send patient's blood and urine sample to blood bank for examination.
8. Prevent hypotension to ensure adequate renal blood flow.



# **T.R.A.L.I.**

1. Incidence is 1.3% - 3%
2. Larger transfused blood →  
↑ incidence
3. Manifest as noncardiogenic P.E.
4. Signs and symptoms appear within 6 hrs
5. Fever - dyspnea - fluid in E.T.T. and severe hypoxia are typical
6. All blood component ( esp. FFP) are implicated as inciting factors
7. The only specific therapy is to stop transfusion and supportive measures



# T.R.A.L.I.

8. Although most Pts. recover within 96 hrs , TRALI remain the leading cause of transfusion - related death
9. Identified risk factors : IL-8 level - liver surgery - chronic alcohol abuse - shock - higher peak airway pressure while mechanical ventilation - smoking and positive fluid - balance
10. Plasma or W.B from female donor, esp. multiparous donor is identified as the most common risk factor



# **T.R.A.L.I.**

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11. the decrease use of plasma from female donor has reduce TRALI ↓ incidence
12. Blood bank should provide blood component from other donor - and quarantine all unit from donor- all records should be re examined and the results of the PT's HLA should be evaluated if possible



# TACO

1. Unlike TRALI , the TACO refers to an excessive administration of blood—→ P.E.

2. LAP↑ , BNP ↑ , CVP↑

3. TRALI and TACO have overlap

4. Besides vol. overload , other risk factors include: age↑ and intraoperative fluid balance

5. Leukoreduction may play a role in TACO

6. Diuretics may be helpful



**TABLE 49.17** Comparison of definitions of TACO and TRALI per CDC Guidelines.

<b>TACO</b>	<b>TRALI</b>
New onset or exacerbation of 3 or more of the following within 6 h of cessation of transfusion: <ul style="list-style-type: none"><li>■ Acute respiratory distress (dyspnea, cough, orthopnea)</li><li>■ Elevated brain natriuretic peptide (BNP)</li><li>■ Elevated central venous pressure (CVP)</li><li>■ Evidence of left heart failure</li><li>■ Evidence of positive fluid balance</li><li>■ Radiographic evidence of pulmonary edema</li></ul>	No evidence of acute lung injury prior to transfusion AND ALI onset during or within 6 h of cessation of transfusion AND Hypoxemia defined by any of these methods <ul style="list-style-type: none"><li>■ PaO<sub>2</sub>/FiO<sub>2</sub> less than or equal to 300 mm Hg</li><li>■ Oxygen saturation less than 90% on room air</li><li>■ Other clinical evidence</li></ul> AND Radiographic evidence of bilateral infiltrates without evidence of left atrial hypertension (i.e., circulatory overload)

Adapted from the CDC, National Healthcare Safety Network Biovigilance Component. Hemovigilance Surveillance Protocol v2.5.2. April 2018.



## **NON HEMOLYTIC TRANSFUSION REACTIONS**

1. Usually are not serious
2. Categorized into febrile or allergic
3. Febrile is the most common adverse reaction to blood transfusion
4. Chills, fever - headache - myalgia - nausea - non productive cough
5. Caused by cytokines and intra cellular contents released by donor leukocytes
6. Leukoreduced blood lower  $\rightarrow$  febrile  $\downarrow$  R.
7. Less frequently other symptoms such as hypotension - chest pain - vomiting and nausea
8. A direct antiglobulin test readily differentiates hemolytic from febrile R.
9. no clear consensus exist on termination of transfusion with febrile R.



# ALLERGIC REACTION

1. Can be minor - anaphylactoid ( not mediated by IgE) or anaphylactic
2. Most allergic reaction are minor and caused by foreign protein in the transfused blood
3. The most common symptom is urticaria associated with itching and sometimes with facial swelling
4. Transfusion usually no need to be discontinued
5. Treatment by antihistamine
6. A rare form of allergic R. is transfusion of IgA to Pt with IgA deficiency→formation anti- IgA ( dyspnea - hypotension - laryngeal edema - chest pain - shock)
7. these PTs need washed RBC transfusion ( IgA free blood)



# OTHER TRANSFUSION ADVERSE EFFECTS

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graph TD; A[OTHER TRANSFUSION ADVERSE EFFECTS] --> B[1. Transfusion - associated graft-versus host disease  
(caused by donor lymphocyte)  
Treatment: irradiation of blood]; A --> C[2. Transfusion - related immunomodulation  
Treatment: leukocyte reduction of RBC's]
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1. Transfusion - associated  
graft- versus host disease  
( caused by donor  
lymphocyte)  
Treatment: irradiation of  
blood

2. Transfusion - related  
immunomodulation  
Treatment: leukocyte  
reduction of RBC's



**THE END**