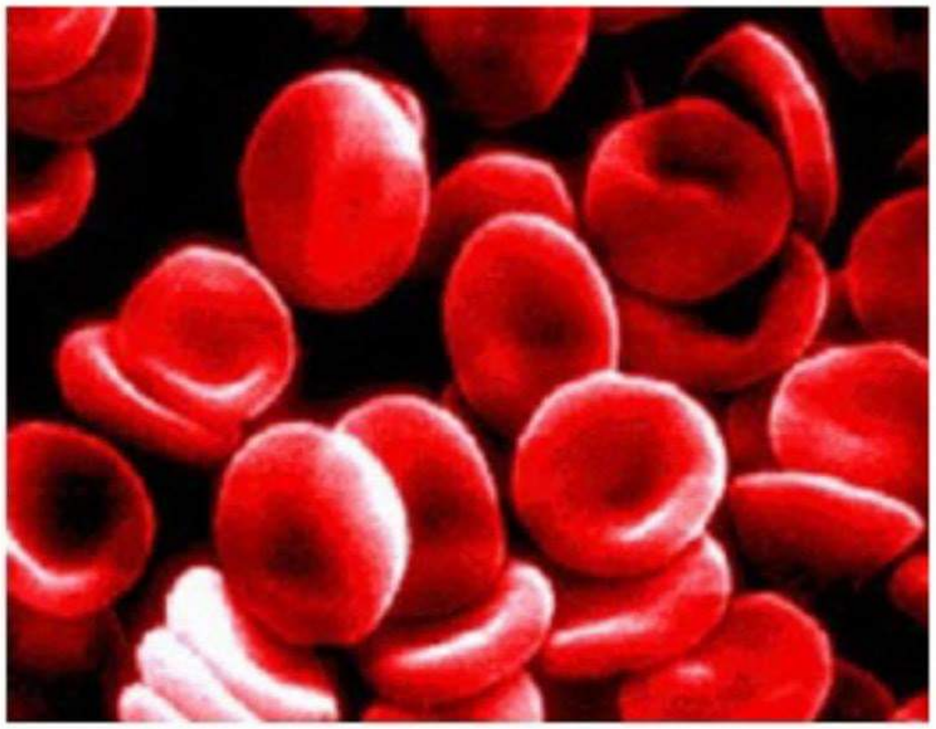
Blood transfusion



BY
SCIENCE OF MEDICINE

Topic modules

1. Blood blank practices
2. Indication to blood transfusion
3. Complication
4. Alternative strategies for management of blood loss during surgery

Blood blank practices

1. Human red cell membrane : least 300 different antigen
2. fortunately, only the ABO and the Rh systems are important in the majority of blood transfusion
3. History

   Hct.

   Infection : Hepatitis B,C syphillis HIV-1,2
   HTLV-I,II

Blood blank practices

#Crossmatching (50 min)

2) Confirms ABO and Rh typing
3) Detects antibodies to the other blood group systems
4) Detects antibodies in low titers or those that do not agglutinate easily

Blood blank practices

Antibody screen : Indirect Coombs test

(45 mins)

the subject serum + red cells

(antigenic composition) ----- red cell agglutination

Type&screen

Emergency transfusion

Type and screen vs Type and crossmatch

T&S -determines ABO and Rh status and the presence of most commonly encountered antibodies – risk of adverse rxn is 1:1000

-takes about 5 mins

T&C -determines ABO and Rh status as well as adverse rxn to even low incidence antigens – risk of rxn is 1:10,000

-takes about 45 mins

Type and screen vs Type and crossmatch

T&S:

Type O red cells are mixed with pt serum Antibody screen

T&C

Type O red cells are mixed with pt serum Antibody screen

Donor red cells are then mixed with the pt's serum to determine possible incompatibility

Blood blank practices

All units – RBC @ PRC 1unit (250 ml Hct.70%)

--platelet@ 1 unit (50-70 ml, stored at 20-24c for 5 days)

--plasma @ FFP

--cryoprecipitate @ high conc. Of factor VII, fibrinogen

Intraoperative transfusion practices

1. ***PRC***

Ideal for patients requiring red cells but not volume replacement

Only one – Increase O_2 carrying capacity

AGE	BLOOD VOLUME
Neonates	
Premature	95 ml/kg
Full-term	85 ml/kg
Infants	80 ml/kg
Adults	
Men	75 ml/kg
Women	65 ml/kg

Allowable blood loss = EBV*(Hctตั้งต้น –Hctที่ยอมรับได้)/ Hctเฉลี่ย

Hct. 30% not magic number

Jehovah" s witness

Practice guideline

$$ case series : reports of Jehovah witness; some may tolerate very low Hb< 6-8 g/dl in the perioperative period without an incresae in mortality

Practice guideline

$$ In healthy, normovolemic individual, tissue oxygenation is maintained and anemia tolerated at Hct as low as 18-25%(Hb 6-8gm%)

$$ RBC transfusion is rarely indicated when Hb> 10 g/dl and is almost always indicated when Hb< 6 g/dl

American Society Anesthesiologist : 1996

Intraoperative transfusion practices

2. ***FFP*** (initial therapeutic dose : 10-15 ml/kg)

   isolated factor deficiencies

   reverse warfarin therapy

   correction of coagulopathy associated with liver disease

   used in patients who are received massive blood transfusion *with* microvascular bleeding

   Complications (PATCH) Platelets – dec,Potassium – inc., ARDS, Acidosis,Temp dec., Citrate intoxication, Hepatiti

   >1 BV/ 24 HR> 50 % BV within 3 hrs > 150 ml/min

   antithrombin III deficiency

   TTP (Thrombotic thrombocytopenic purpura)

   Do not use for volume

Intraoperative transfusion practices

3. ***PLATELETS***

**thrombocytopenia or dysfunction platelets in the presence bleeding

* prophylactic : plt.counts below 10,000-20,000

* prophylactic preoperative : plt.counts below 50,000

*Microvascular bleeding in surgical patient with platelets < 50,000

*Neuro/ ocular surgery > 75,000

Intraoperative transfusion practices

3. ***PLATELETS***

*Massive transfusion *with* microvascular bleeding with platelets < 100,000

2 BVs = 50,000

*Qualitative dysfunction *with* microvascular bleeding (may be > 100,000)

Intraoperative transfusion practices

3. ***PLATELETS***

50 ml: 0.5- 0.6 x 10^9 platelets (some RBC's and WBC's)

Single donor apheresis OR

Random donor (x 6)

Intraoperative transfusion practices

4. CRYOPRECIPITATE

10 ml: fibrinogen (150-250 mg),
VIII (80-145 U),
fibronectin, XIII

1U/ 10kg ↑ fibrinogen 50 mg/dL (usually a 6- pack)

Hypofibrinogenemia (congenital or acquired)

Microvascular bleeding with massive BT (fibrinogen < 80-100mg/dL)
2 BVs = < 100 mg/dL

Bleeding patients with vWD (or unresponsive to DDAVP)

Alternative strategies for management of blood loss during surgery

1) Autologous transfusion
2) Blood salvage & refusion
3) Normovolemic hemodilution

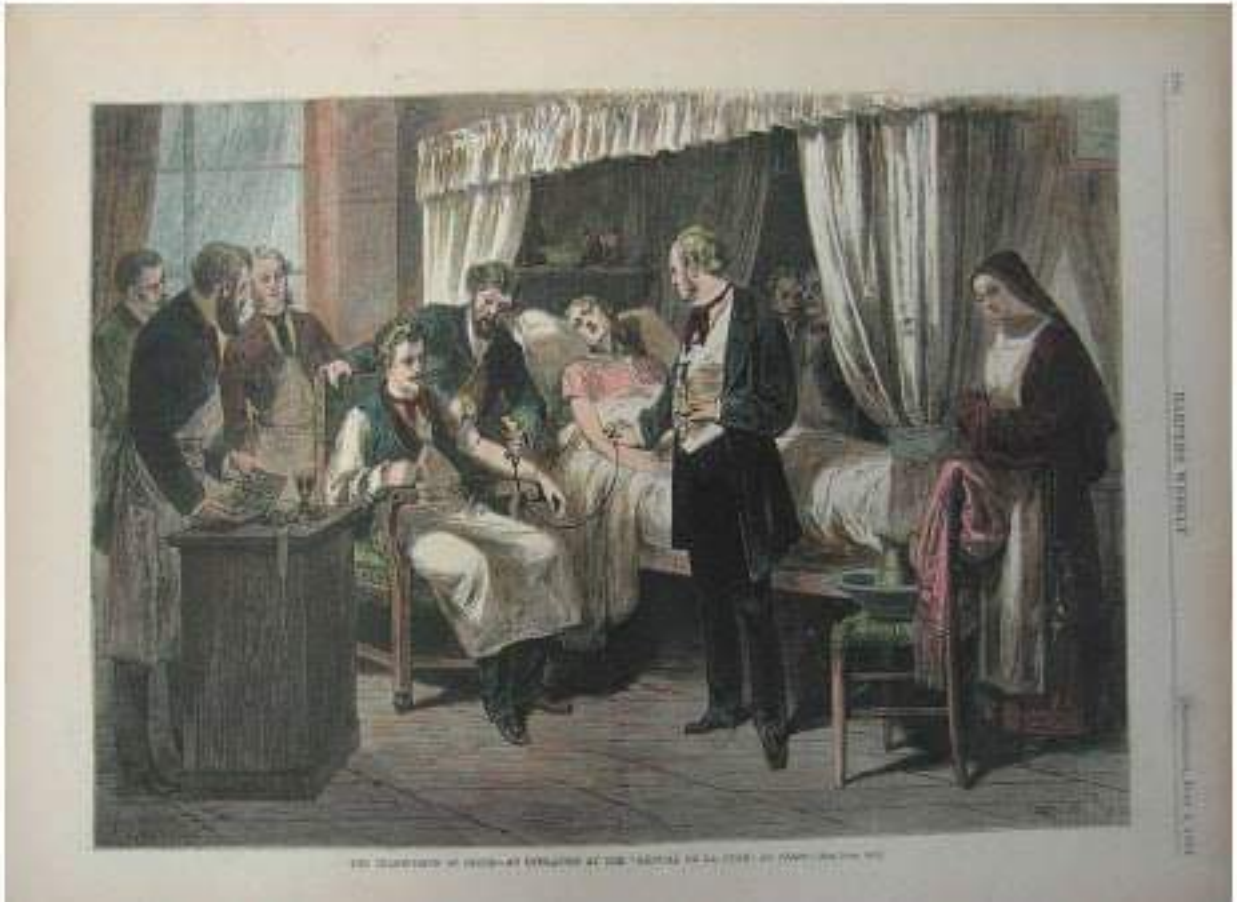
"Blood is still the best possible thing to have in our veins" - Woody Allen

Blood transfusion is a lot like marriage.

It should not be entered upon lightly, unadvisedly or wantonly, or more often than is absolutely necessary" - Beal

TRANSFUSION REACTIONS

- is any unfavorable transfusion-related event occurring in a patient during or after transfusion of blood components



TRANSFUSION REACTIONS

@RBC's !

- Nonhemolytic 1-5 % transfusions

  Causes -Physical or chemical destruction of blood: freezing, heating, hemolytic drug
  -solution added to blood
  -Bacterial contamination

  : fever, chills, urticaria

  – Slow transfusion, diphenhydramine , antipyretic for fever

- Hemolytic
  – Immediate: ABO incompatibility (1/ 12-33,000) with fatality (1/ 500-800,000)

  Majority are group O patients receiving type A, B or AB blood

  Complement activation, RBC lysis, free Hb (+ direct Coombs Ab test)

Acute Hemolytic Transfusion Reaction

Pathophysiology

Ab (in recipient serum) + Ag (on RBC donor)

↓

-Neuroendocrine responses

-Complement Activation

-Coagulation Activation

- Cytokines Effects

↓

Acute hemolytic transfusion reaction

Acute Hemolytic Transfusion Reactions

- Acute onset within minutes or 1-2 hours after transfuse incompatible blood
- Most common cause is ABO-incompatible transfusion

Signs and Symptoms of AHTR

- Chills , fever
- Facial flushing
- Hypotension
- Renal failure
- DIC
- Chest pain
- Dyspnea
- Generalized bleeding
- Hemoglobinemia
- Hemoglobinuria
- Shock
- Nausea
- Vomitting
- Back pain
- Pain along infusion vein

- Anesthesia: hypotension, urticaria, abnormal bleeding
- Stop infusion, blood and urine to blood bank, coagulation screen (urine/plasma Hb, haptoglobin)
- Fluid therapy and osmotic diuresis
- Alkalinization of urine (increase solubility of Hb degradation products)
- Correct bleeding, Rx. DIC

Laboratory investigation for AHTR

- sample from blood bag → Repeat ABO, Rh, Ab screening
- Patient sample

  Pre Tx sample → Repeat ABO, Rh, Ab screening

  Post Tx sample → Repeat ABO, Rh, Ab screening, DAT, CBC, UA, Bilirubin, BUN, Cr, Coagulation screening

- Repeat compatibility test

  - Pre Tx sample & Donor unit
  - Post Tx sample & Donor unit

- Delayed: (extravascular immune)1/ 5-10,000

  Hemolysis 1-2 weeks after transfusion (reappearance of Ab against donor Ag from previous exposure)

  Fever, anemia, jaundice

- Alloimmunization

  Recipient produces Ab's against RBC membrane Ag

  Related to future delayed hemolytic reactions and difficulty crossmatching

@WBC's!

- Europe: All products leukodepleted
- USA: Initial FDA recommendation now reversed pending objective data (NOT ↓ length of stay for ↑ expense)

- Febrile reactions
  - Recipient Ab reacts with donor Ag, stimulates pyrogens (1-2 % transfusions)
  - 20 - 30% of platelet transfusions
  - Slow transfusion, antipyretic, meperidine for shivering