BLOOD TRANSFUSION

Presenter;

Surendra Poudel
Intern, MBBS
Department of Anesthesiology
Gandaki Medical College
Pokhara ,Nepal

Objectives :

- Introduction to blood transfusion
- Indications of blood transfusion
- Blood grouping and compatibility tests
- Complications
- Blood components
- Safe transfusion procedure

Introduction

- The process of receiving blood products into one's circulation intravenously
- James Blundell: 1829- 1st successful human transfusion in woman with PPH.
- It is now a common procedure.
- Apart from whole blood, many other blood components are now available for transfusion

- However, the risk & benefit of transfusion must be considered
- The donated blood is tested to rule out infections- HCV, HBV, HIV -1 &2.
- The donor should not have uncontrolled hypertension, cardiac diseases, anemia, blood borne viral infections & extreme ages.

Indications of blood transfusion

- Major trauma with massive blood loss
  adults->20%
  children->10% of their blood volume
- Major operative procedures
  minimum acceptable Hb 10g% & Hct 35%
- Preoperatively in cases of chronic anemia requiring surgery
- Postoperatively if patient becomes severely anemic

- Following severe burn
- In septicemia
- Severe hemorrhage from pathological lesion like cancer, GIT lesions
- Patients with bleeding disorders…. Hemophilia, thrombocytopenia, liver disease

Donor criteria

- Weight….. >45 kg

- Should be fit with no serious diseases…

  HIV 1 & 2

  HBV

  Malaria

  Uncontrolled HTN , DM

Collection of blood

- Collected in a sac containing 75 ml of CPD(citrate phosphate dextrose) or SAG-M(saline adenine glucose mannitol)
- Stored in a refrigerator at 4 degree C… not in a freezer

Blood Grouping & Compatibility testing

1. ABO grouping…… most important
2. Compatibility testing;
   - *ABO & Rh typing*

     -Match ABO & Rh group of both donor & recipient

   - *Cross Matching*

     -Direct matching of recipient's serum with the donor's cells
1. Antibody screening

Why cross match?

Though ABO & Rh group is same, there are many other minor blood groups

These unmeasured blood group mismatch can cause reactions

Cross matching helps to avoid such reactions

- Full cross match- ~ 45 min.
- In emergency only type specific blood can be provided with 10-15 min.
- In emergency O group blood can be transfused
- Blood group O- universal donor
- AB- universal receiver

Complications of blood transfusion

- Transfusion reactions

a) Acute hemolytic reaction

- fever, rigor, pain abd, dyspnea, rashes, tachycardia, flushing, chest an flank pain..in alert patient;
- tachycardia, hypotension , oozing from surgical site … in anesthetised pt.
- hemoglobinuria …. confirmatory

Management of acute hemolytic reaction;

- Stop infusion and manage as emergency
- Recheck details of blood slip and send the remaining blood back to blood bank
- Maintain urine output(1-2 ml/kg/hr) by mannitol and fluid administration
- Dopamine
- Urine alkalinisation
- Hemodialysis
- Assess urine Hb , Platelet count, fibrinorn leveland Ptt and replace with blood components accordingly

b) Delayed hemolytic reaction

c) Simple pyrexial reactions- usually due to pyrogens in bag…….. Paracetamol

d) Allergic reactions- due to plasma products in donor blood

- T/t: stop transfusion, antihistaminics, steroids

- Infections

  a) viral; HIV, HCV,CMV,EBV……..

  b) bacterial; staphylococcus, pseudomonas syphilis, brucellosis, salmonella ….

  c) parasitic; malaria, toxoplasma, trypanosomiasis….

- Fluid overload and pulmonary edema
- Metabolic
  - hyperkalemia
  - hypocalcemia
  - acid base abnormalities….
    - stored blood – acidosis
    - citrate – alkalosis
- coagulation abnormalities
  - dilutional coagulopathy esp thrombocytopenia

- Hypothermia
- Immunosupression
- Tissue hypoxia
- Endotoxemia and septicemia
- ARDS
- DIC

Massive transfusion

- Defn: replacement of the patient's blood volume in 24 hours or transfusion of more than 10 units of blood over a period of a few hours.
- Significant metabolic changes can occur due to transfusion of large blood volume
  - Hyperkalemia (leakage of intracellular potassium),
  - Acidosis,
  - Hypocalcaemia,
  - Hypothermia
  - Degeneration of functional granulocytes and platelets, and deterioration of factors V and VIII.
  - Coagulopathy

Blood fractions

- Whole blood- rich in coagulation factors, metabolically more active & more physiological.

- Packed red cells- concentrated RBCs, ~50-70% hematocrit value.
  - Uses: Chronic anemia, elderly, children, where fluid overload contraindicated

Blood fractions…..

- Platelet rich plasma (PRP):
  - *Uses: Patients with thrombocytopenia or platelet dysfunction.*
- Platelet concentrate:
- Plasma : (Blood – blood cells)
- Prothrombin complex concentrate:
  - *Highly purified concentrates prepared from pooled plasma.*
    Rich source of factors- II, IX, X & VII.

Blood fractions…

- Fresh frozen plasma
  - *Plasma from fresh blood is rapidly frozen by immersing in solid CO2 & ethyl alcohol mixture*
  - *Stored at -40° C*
  - *Used in bleeding disorder, abnormal coagulation like liver disease*

- Cryoprecipitate
  - *When FFP is allowed to thaw at 4° C, a white glutinous precipitate remains*
  - *Very rich source of factor VIII, fibrinogen*
  - *Stored at -40°*

- Factor VIII/ IX concentrate
- Granulocyte concentrate
- Fibrinogen
- Human albumin 4.5%
  - replacement of protein like in severe burn, liver failure

Alternative to transfusion

- Autologous predonation:
  - Patients undergoing elective surgery requiring transfusion during surgery.
  - 2-3 unit of blood can be obtained upto 3 weeks before surgery

- Isovolemic hemodilution:
  - Removal of 1-3 unit of own's blood just before surgery & simultaneous crystalloid/ colloids infusion to restore blood volume.
  - The blood is anticoagulated, kept at room temperature & transfused when needed during surgery.

Alternative to transfusion.....

- Intra-operative cell salvage:
  - Blood from operative field is obtained, washed/filtered & retransfused.
  - Cell salvager is required
  - Contraindications: neoplasm, contamination with bacteria, ascites, amniotic fluid etc.

- Erythropoietin:
  - It is given weekly for 2 - 4 weeks before surgery
  - Increases the red cell volume/ Hb.
  - Thus, can decrease transfusion.

Safe transfusion procedures

- **Pre-transfusion testing;**
  - Identify the patient
  - Check blood group, cross match result,
  - Date of blood collection & expiry date, blood bag serial no.
  - Check each bag for evidence of damage
  - If in doubt, donot use and return to the blood bank
  - Complete the forms that document the transfusion of each pack

- Record keeping;

  - record in the patient's note the reason for transfusion , the product given,dose , any adverse effects and the clinical response
- Rate of transfusion
  - one unit over 4-5 hours
  - In emergency- rapid tranfusion, 1-2 unit in 30 min
- Warm the blood

- Instructions during transfusion- through large bore cannula, never with dextrose, calcium
- Monitoring during transfusion

  blood pressure, pulse , temperature before and 15 mins after starting each pack, then in regular intervals
- Treatment of any allergic reactions
- Be prepared for severe anaphylactic reactions

Summary

- Introduction to blood transfusion
- Indications
- Collection and storing
- Blood grouping and compatbility test
- Complications of blood transfusion
- Blood components
- Safe transfusion procedures

References

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- Class notes

Thank You