BLOOD TRANSFUSION

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Blood transfusion

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Blood transfusion

Definition

Blood transfusion is the transfusion of the whole blood or its component such as blood cells or plasma from one person to another person.

Blood transfusion involves two procedure that is –

- ***Collection of blood from donor***

And

- ***Administration of blood to the recipient.***

Blood transfusion

Purposes

- To restore the blood volume when there is sudden loss of blood due to hemorrhage.
- To raise the Hb level in cases of severe anemia
- To treat deficiencies of plasma protein, clotting factors or hemophilic globulin etc.
- To provide antibodies to those persons who are sick and having lowered immunity.
- To replace the blood with hemolytic agents with fresh blood
- To improve the leukocyte count in blood as in agranulocytosis.
- To combat infection in leucopenia

Blood transfusion

Components of blood (for transfusion)

- Each unit of blood is tested for evidence of hepatitis-b, hepatitis-c, human immuno deficiency virus I&II and syphilis.
- The blood is then processed into sub-components. These are-

- ✓ Whole blood
- ✓ Packed cell volume
- ✓ Fresh frozen plasma
- ✓ Platelets
- ✓ Cryoprecipitate

Blood transfusion

Components of blood (for transfusion)

Whole blood

- Whole blood is unseparated blood containing an anticoagulant – preservative solution.
- One unit of whole blood contains-
- 450 ml of donor blood.
- 50 ml of anticoagulant-preservative solution.
- Hemoglobin approx.12g/ml & haematocrit 35%-45%.
- No functional platelets.

Blood transfusion

Components of blood

(for transfusion)

Whole blood

- Stored between +2 and +6 degrees centigrade in a blood bank refrigerator.
- Transfusion should be started within 30 minutes of removal from the refrigerator and completed within 4 hours of commencement because changes in the composition may occur due to red cell metabolism.

Blood transfusion

Components of blood (for transfusion)

Packed Red Cells

- Packed red cells are cells that are spun down and concentrated.
- One unit of packed red cells is approx. 330 ml and has a haematocrit of 50-70%.
- They are stored in a SAG-M (saline-adenine-glucose-mannitol) solution to increase their shelf life to 5weeks at 2-6degrees centigrade.

Blood transfusion

Components of blood (for transfusion)

Fresh frozen plasma

- Fresh frozen plasma is rich in coagulation factors.
- It is separated from whole blood and stored at-40 to -50 degrees centigrade with a 2year shelf-life.
- It is the first line therapy in the treatment of coagulopathic haemorrhage

Blood transfusion

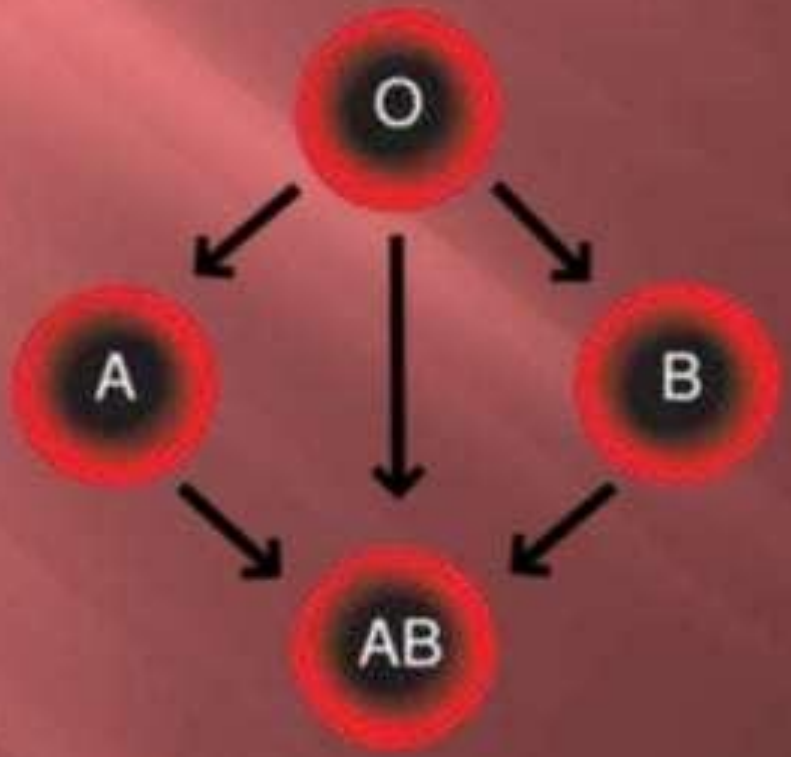
Components of blood
(for transfusion)

Cryoprecipitate

- Cryoprecipitate is a supernatant precipitate of fresh frozen plasma and is rich in factor VIII and fibrinogen.
- It is stored at -30 degrees centigrade with a 2 years shelf life.
- Indicated in low fibrinogen states (<1g/l) or in cases of factor VIII deficiency (hemophilia-a), von will brand's disease and as a source of fibrinogen in disseminated intravascular coagulation.
- Pooled units containing 3-6 gms fibrinogen in 200-500 ml raises the fibrinogen level by approx. 1g/L.
- Must be infused within 6 hours.

Blood transfusion

Blood grouping and cross matching



Blood transfusion

Blood grouping and cross matching

- Each person has one of the following blood types: A, B, AB, or O.
- O can be given to anyone but can only receive O.
- AB can receive any type but can only be given to AB.
- Also, every person's blood is either
  - Rh-positive or Rh-negative.

Blood transfusion

Blood grouping and cross matching

- The blood used in a transfusion must be compatible with the patient's blood type.
  - Type O blood is called the universal donor
  - People with type AB blood are called universal recipients
- People with Rh-positive blood can get Rh-positive or Rh-negative blood. But people with Rh-negative blood should get only Rh-negative blood.

Blood transfusion

Type of blood transfusion

- Allogenic blood transfusion (someone else blood)
- Autogenic blood transfusion (own blood)
- Exchange blood transfusion

Blood transfusion

General instruction

Regarding-

- Selection of donor
- Collection, storage and transportation of the blood
- Administration of blood to the recipient

Blood transfusion

General instruction

Selection of donor

- Donor should be free from diseases such as TB, cancer, jaundice or any other transmissible disease.
- Make sure that donor has not donated the blood within previous 90 days.
- Physically active, between the age of 18 to 65 years with an average height and weight
- Donor must have normal vital signs
- Must not have been pregnant within the last 6 months

Blood transfusion

General instruction

Selection of donor

- Hb level must be above 12gm%
- Donor should be disqualified who have history of recent dental surgery, major surgery, receipt of blood or blood component, immunization etc.
- Explain the procedure to the donor
- Blood should not be collected empty stomach, should not be dehydrated.
- Following the donation donor should be offered sweetened drink and asked to take rest at least for 1-2 hrs. to prevent fain

Blood transfusion

General instruction

Selection of donor

- Before leaving the collection centre donor must be observed for any giddiness, color changes.
- Check vital signs frequently

Blood transfusion

General instruction

Collection, storage and transportation of blood

- Donor's blood immediately after it is withdrawn should be placed in the refrigerator.
- Stored blood should be inspected daily and before use for evidence of hemolysis or bacterial contamination
- The transportation of blood in the hospital should be done within 30 minutes after it is taken from the place of storage.
- If the blood is kept at room temperature the temperature of blood will rise above 10 degree C in 30 minutes.
- If blood is not used it should be returned to the refrigerator within half an hour
- When blood is transported to distant place use precooled insulated bags to keep the temperature of blood below 10 degree C

Blood transfusion

General instruction

Collection, storage and transportation of blood

- Collection of blood from the donor is done in laboratory by laboratory technician.
- Donor's blood is collected in a sterile container containing anticoagulant solution (ACD)
- All the articles used for the collection of blood must be sterile
- Each donor unit must be labeled clear readable letters i.e.- name, donor no. ABO grouping, Rh typing, date of drawing, date of expiry and result of tests for hepatitis, and syphilis

Blood transfusion

General instruction

Administration of the blood to the recipient

- When sending the recipient's blood sample for grouping and cross matching, it must be clearly labeled with name, IP number, bed number, ward no.
- Fresh sample taken within four hrs. should be used for typing and cross matching
- A request form should accompany with blood sample and form should contain- ***name, IP no. bed no. ward no. name of the physician, exact amount of blood component required, diagnosis of the patient, any blood transfusion given earlier, if so, the group and type of blood administered any reaction observed***

Blood transfusion

General instruction

Administration of the blood to the recipient

- It is essential that the physician writes all orders for typing, cross matching and administration of whole blood or blood products.
- Prior to administration of blood two registered nurse or a physician and a registered nurse should verify all informations on the report of the cross match, unit label, and the patient's identifications. If there is any discrepancies the unit should be returned to the blood bank with remarks.
- Whole blood or blood should be transfused through an appropriate, sterile transfusion set containing a filter.
- Transfusion set should be free from air
- Use 18 gauge needle for transfusion
- No medications or other additives should be given the same IV route or should not be mixed with blood

Blood transfusion

General instruction

Administration of the blood to the recipient

- Keep the patient warm and comfortable if necessary.
- Offer bedpan before starting the procedure and as necessary.
- Record the amount of blood, type and group, rate of flow, any reaction and any medication administered

Blood transfusion

General instruction

Administration of the blood to the recipient

- If IV infusion is to be given before, after or during the transfusion always use the normal saline.
- Prior to transfusion record the vital signs of the patient to provide the baseline for further observation.
- Adjust the rate of flow to 5-10 ml per minute during the first 30 minutes of transfusion to detect any complications as early as possible.
- Allow the blood to remain at room temperature prior to administration of blood
- Watch for any complications throughout the procedure

Blood transfusion

Complication of Blood Transfusions

Definition-

Blood transfusion reaction is a systemic response by the body to blood incompatible with that of recipient

It is mainly caused due to-

- ABO incompatibility
- Allergic reactions to the WBCs, platelets, or plasma protein components of the transfused blood
- Potassium or citrate preservative in the blood

Blood transfusion

Complication of Blood Transfusions

Types of blood transfusion reactions-

- Acute hemolytic transfusion reaction
- Delayed hemolytic transfusion reaction
- Pyrogenic reaction
- Allergic reaction
- Anaphylactic reaction
- Transmission of infectious diseases

Blood transfusion

Complication of Blood Transfusions

Complications of blood transfusion-

- Circulatory overload
- Hyperkalemia
- Hypocalcemia
- Haemosiderosis
- Infiltration and Hematoma
- Thrombophlebitis
- Pulmonary embolism

Blood transfusion

Complication of Blood Transfusions

Acute hemolytic transfusion reaction

- Develops during the first 5-15 minutes.
- In hemolytic transfusion reaction circulating RBCs are ruptured with the release of hemoglobin
- Causes of acute hemolytic reaction-

✓ ABO incompatibility
✓ Rh incompatibility
✓ Improper storage of blood
✓ Uncontrolled refrigeration of blood resulting in freezing
✓ Storage beyond 21 days limit
✓ Warming of blood above 40 degree C
✓ Exposure of blood to dextrose solutions.

Blood transfusion

Complication of Blood Transfusions

Acute hemolytic transfusion reaction

- Clinical features of acute hemolytic reaction-
  - ✓ Onset of fever
  - ✓ Chills, headache, dyspnea, cynosis, chest pain
  - ✓ Nausea, vomiting
  - ✓ Increased heart rate and respiratory rate
  - ✓ Hemoglobinuria
- Complications include-
  - ✓ Hypotension followed by shock
  - ✓ Oliguria then anuria followed by renal failure

Blood transfusion

Complication of Blood Transfusions

Acute hemolytic transfusion reaction

- Nursing management of acute hemolytic reaction-
- ✓ Closely observe the patient for the first ten minutes of the transfusion.
- ✓ Since these reactions occur very rapidly, the rate of flow should be minimal.
- ✓ Discontinue the transfusion immediately when reaction is assessed.
- ✓ Inform the physician and implement the treatment as prescribed by the physician
- ✓ Inform the laboratory to do the cross matching and grouping of the blood
- ✓ Maintain IV infusion with 5% glucose or saline using a new IV set
- ✓ Large quantities of fluid is given to promote diuresis and counteract shock
- ✓ Monitor vital sign every 15 min. to assess shock and collapse
- ✓ Record fluid intake and output to assess the kidney function
- ✓ Oxygen inhalation is given to relieve dyspnea

Blood transfusion

Complication of Blood Transfusions

Acute hemolytic transfusion reaction

- Medical management of acute hemolytic reaction-
- ✓ Large quantities of fluids
- ✓ Mannitol
- ✓ Heparinization
- ✓ Oxygen and adrenaline
- ✓ Sedation
- ✓ Blood transfusion
- ✓ Hemodialysis

Blood transfusion

Complication of Blood Transfusions

Delayed hemolytic transfusion reaction

- Occurs due to incompatibility of RBC antigens other than ABO group
- It develops days to weeks after transfusion
- It is featured by persistent decrease in Hb level and low grade fever
- Many time this reaction is missed, if known inform the physician and blood blank

Blood transfusion

Complication of Blood Transfusions

Pyrogenic reactions

- It develops immediately or within 6 hrs of infusion.
- It results from pyrogenic substances from the tubings
- Causes of pyrogenic reactions-
  - ✓ Improper preparation of donor's site
  - ✓ Not following proper aseptic technique
  - ✓ Antigen and antibody reactions to WBCs and platelets contained in blood product.
  - ✓ Improper refrigeration

Blood transfusion

Complication of Blood Transfusions

Pyrogenic reactions

- Clinical features-
  - ✓ Fever with chills
  - ✓ Nausea, vomiting and diarrhea
  - ✓ Headache
  - ✓ Backache
  - ✓ Delirium, shock and renal failure
- Prevention-
  - ✓ Proper screening of donor
  - ✓ Use of disposable and pyrogen free sterile syringes and tubing for collecting and transfusing the blood.
  - ✓ Proper technique for storing the blood.

Blood transfusion

Complication of Blood Transfusions

Allergic reaction

- It develops any time or within one hour of transfusion
- Allergic reactions are the result of sensitivity of the individual to the plasma protein in the transfused blood.
- It is characterized by itching, rashes, laryngeal edema and bronchial spasm in severe cases.
- Treatment normally include injections of antihistamines and corticosteroids as necessary.

Blood transfusion

Complication of Blood Transfusions

Anaphylactic reactions

- Extremely rare but life threatening
- develops immediately after transfusion of few ml. of blood
- It is caused by idiosyncratic reaction in clients with IgA deficiency.
- It is characterized by sever cardio-respiratory features such as- dyspnea, cyanosis, tachypnea, tachycardia, hypotension and collapse.
- Immediately transfusion is stopped and inform to physician and resuscitative measures are started
- Monitor the vital signs every 15. min until patient recovers

Blood transfusion

Complication of Blood Transfusions

Complications of blood transfusion-

- Circulatory overload
- Hyperkalemia
- Hypocalcemia
- Haemosiderosis
- Infiltration and Hematoma
- Thrombophlebitis
- Pulmonary embolism

Complication of Blood Transfusions

Circulatory overload-

- Giving **whole blood** to patient with severe anemia is very dangerous as patient require the RBCs not the other component of blood and may develop circulatory overload
- Condition of heart failure may also cause the circulatory overload with blood transfusion.

Blood transfusion

Complication of Blood Transfusions

Prevention of Circulatory overload-

- Use packed RBCs instead of whole blood
- Administer diuretics prior to blood transfusion to reduce the plasma volume
- Transfuse the blood at a slow rate
- Check the patient's pulse at every 15 minutes.
- Check the patient's neck vein for fullness
- Observe the CVP, if it is greater than 10 cm of water indicates circulatory overload
- Observe for the signs of respiratory distress
- Give minimum quantity of blood at a time
- Stop the transfusion and inform to the physician if patient develops the sign and symptoms of circulatory overload.

Complication of Blood Transfusions

Hyperkalemia-

- Stored blood may cause hyperkalemia
- Blood that is one day old has plasma potassium content approximately 7mEq/litre and 21 days old blood contains about 23mEq/litre.

Complication of Blood Transfusions

Hypocalcemia-

- It develops due to citrate toxicity.
- During massive transfusion citrate in the blood combines with ionized calcium and tetany may result.
- Higher level of citrate may cause cardiac arrest.
- Treatment consist of administration of calcium gluconate to prevent or eliminate the toxic effects by neutralizing the acidosis

Blood transfusion

Complication of Blood Transfusions

Hemosiderosis-

- It is also known as iron over load
- It may develop in clients receiving frequent blood transfusion.
- Hemosiderosis is an abnormal deposition of iron in various tissues in the form of hemosiderin which is an iron rich pigment that is the product of hemolysis

Blood transfusion

Complication of Blood Transfusions

Other complications-

- Infiltration and hematoma at the site of the needle
- Thrombophlebitis
- Pulmonary embolism

Blood transfusion

Complication of Blood Transfusions

Nursing management regarding complications of blood transfusion , if occur -

- Stop the transfusion immediately
- Notify the physician
- Connect the IV line with 0.9% normal saline
- Be with the client, observe the sign and symptoms and monitor the vital signs till they become stable
- Get ready the emergency drugs such as vasopressors, antihistamine, steroids, and fluids
- Prepare for CPR
- Obtain a urine specimen and send to the laboratory
- Save the blood container and tubing for return to the bank
- Document the reactions and measures carried out.