



BLOOD TRANSFUSION

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PREFACE:

The process of transferring blood or blood components from one person (the donor) into the bloodstream of another person (the recipient) is termed as blood transfusion. Transfusion may be performed to save life and to replace blood cells or blood products because of loss of blood.



> Necessity of blood transfusion during which conditions

- a) Anemia
- b) Burns
- 1. Hemorrhage
- 2. Surgery
- e) Trauma.

Precautions: Certain precautions must be followed before and during the transfusion of blood to a patient.

> Requirement of certain precautions before the transfusion of blood

- 1. Donor must be healthy, without any diseases like :
 - a. Sexually transmitted diseases such as syphilis.
 - b. Diseases caused by virus like hepatitis, AIDS, etc.
- 2. Only transfer of compatible blood is essential before the transfusion of blood.
- 3. Slow transfusion of blood must be performed during blood transfusion because sudden enhancement infusion of blood into the body show heavy load on the heart loading to many complications.

Transfusion reaction: -

Transfusion reactions take place because of the occurrence of the ABO compatibility as well as Rh incompatibility.

> Blood substitutes: *The infusion of substance into the whole blood is termed as blood substitutes.*

Commonly used blood substitutes are:

- a) 0.9% sodium chloride solution (saline) and 5% glucose
- b) Colloids like gum acacia, isinglass, albumin and animal gelatin
- c) Human plasma.

> Exchange transfusion: -

It is nothing but the process of removal of patients blood and replacement with either fresh donor blood or plasma. It is otherwise termed as replacement transfusion. This process behaves to save the life especially in conditions namely severe jaundice as well as sickle cell anemia.

PROCEDURE:-

The procedure requires both removal as well as replacement of affected blood in stages. The exchange transfusion is performed especially in short cycles of few minutes duration, as follows:

1. The infusion of an equal quantity of fresh, prewarmed blood or plasma takes place through intravenous catheter. This procedure is performed for few minutes.
2. The process of slow withdrawal of affected persons blood occurs in small quantities of 5-20 mL based on the age and size of the person as well as severity of the condition.
3. The catheter is left in place and the repetition of transfusion takes place within few hours.
4. The contamination of this procedure takes place until the whole volume or pre-determined volume is exchanged.

Requirement of exchange transfusion during which conditions:-

- Hemolytic disease of the newborn (erythroblastosis fetalis).
- Severe sickle cell anemia.
- Severe polycythemia (replacement with saline, plasma or albumin).
- Toxicity of certain drugs.
- Severe jaundice in newborn babies, which does not respond to ultraviolet light therapy. Normally, neonatal jaundice is treated by exposure to ultraviolet rays. It breaks down the bilirubin which is excreted by liver.

Autologous blood transfusion:-

It is nothing but the collection as well as reinfusion of patients own blood. It is also termed as **self blood donation**. The conventional transfusion of blood i.e collected from human beings excluding patient is termed as **allogeneic or heterologous blood transfusion**. Especially in recent years, autologous blood transfusion became very popular. It is helpful for planned surgical procedures. The withdrawal of blood takes place in advanced and stored. Then, it is infused if need takes place especially during surgery. This type of blood transfusion is helpful in obstructing the transmission of viruses namely hepatitis B or HIV. It is capable of removing the adverse effects of transfusion reactions.

Transfusion reactions lead to mismatched blood types:-

A transfusion reaction takes place due to agglutination of the red blood cells of the donor blood. This process occurs if transfusion of one blood type into a recipient who exhibit another blood. It is rare that transfused blood is responsible for agglutination of the recipients cells because of the following cause. The plasma portion of the donor blood immediately diluted with the all the plasma of the recipient and declining the titer of the infused agglutinins to a level usually too low to exhibit agglutination. Conversation the small amount of infused blood doesn't dilute the agglutinins significantly in the recipients plasma so, the recipient's agglutinins are capable of agglutinating the mismatched donor cells. All transfusion reactions lead to the occurrence of either immediate hemolysis due to hemolysins or later hemolysins because of phagocytosis of agglutinated cells. The release of Hb takes place from red blood cells and is changed into bilirubin by the phagocytes and afterwards the excretion of bilirubin occurs in the bile by liver. If liver function is normal, jaundice does not occur. Generally jaundice happens in adult human beings, if the hemolysis of more than 400 ml blood takes place in less than a day.

Transfusion reactions lead to acute kidney shutdown:-

Renal failure occurs within a few minutes of few hours and this condition prolongs until the death of a person with renal failure. The kidney shutdown occurs because of the following three reasons:

1. The antigen-antibody reaction of transfusion reaction leads to release of toxic compounds from the hemolyzing blood and this condition leads to vasoconstriction in the kidney.
2. Circulatory shocks takes place because of the loss of circulating red blood cells in recipients in addition to toxic compounds released from hemolyzed cells and from immune reactions also. The renal blood flow and urine output also reduces because of the reduction in atrial blood pressure.
3. If the release of total amount of free hemoglobin happens into circulating blood is greater than quantity that can attach with haptoglobin (a plasma protein that attaches with small amount of hemoglobin) and much of the excess passes through glomerular membrane into the kidney tubules. If this amount is still low, the reabsorption happens through the tubular epithelium into the blood and doesn't cause harm. If it more, then only the reabsorption of small percentage takes place. Even then, the reabsorption of water takes places continuously, making the tubular hemoglobin concentration to rise so high that the precipitation of hemoglobin concentration happens and leads to the blockage of many of the kidney tubules. So, acute renal shutdown happens because of occurrence of renal vasoconstriction , circulating shock and renal tubular blockage. If the shutdown is complete and doesn't resolve, the patient came across the death within a week to 12 days, unless provided with artificial kidney.

Occurrence of acute hemolysis reactions in some transfusion reactions:-

If recipient and donor blood is not matched, immediate hemolysis of red blood cells happens in the circulating blood. In this case antibodies are responsible for making the lysis of red cells with the help of activating complete system, which releases proteolytic enzymes (the lytic complex) that breakdown the cell membrane. Instant intravascular hemolysis is far less common than agglutination subsequently delayed hemolysis.

Agglutination process in transfusion reactions:-

If blood are not matched, so that anti-D or anti-B plasma agglutinins are combined with red cells that consists of A or B agglutinogens, respectively. The agglutination of red blood cells occurs because agglutinins bind themselves to the red blood cells. The agglutinins consists of two binding sites (Ig G type) or 10 binding sites (Ig M type). A single agglutinin can bind with two or more red blood cells at the same time, there by making the cells to be bound together by agglutinin. This makes the cell to clump which is nothing but the method of agglutination. Then these clumps seals small blood vessels throughout the circulatory system. During develops hours into days, either physical deformation of the cells or bombard by phagocytic leucocytes diminishes the membranes of the agglutination cells, release hemoglobin into the plasma, which is termed as **hemolysis** of erythrocytes.

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