



KANAKIA
Health Care

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Blood Transfusion

What is blood transfusion?

A blood transfusion is a safe, common procedure in which blood is given through an intravenous (IV) line in one of the blood vessels. A blood transfusion usually takes two to three hours. A blood transfusion may also be done to supplement various components of your blood with donated blood products.

When is a blood transfusion needed?

The three main reasons why a child may need a blood transfusion are:

- Loss of blood during surgery or from an injury or an illness.
- An inability to make enough blood. Some illnesses and treatments can harm the bone marrow's ability to make blood (e.g., chemotherapy decreases production of new blood cells).
- To prevent complications from an existing blood or bleeding disorder, such as sickle cell disease, thalassemia, or anemia caused by kidney disease, hemophilia, or von Willebrand disease.

Where can blood be got for transfusion?

Blood is an expensive and a scarce commodity. It is not manufactured in factories and cannot be bought off the shelf. It can only be "donated" by one human being to another.

Blood can be procured from friends and relatives, or from volunteer donors who have donated to blood banks.

What are blood banks?

Blood banks collect, test, and store blood. They carefully screen all donated blood for possible infectious agents, such as viruses, that could make you sick.

Blood bank staff also screen each blood donation to find out whether it's type A, B, AB, or O and whether it's Rh-positive or Rh-negative. Once a compatible donor blood is chosen, a blood bank technologist will mix a small sample of the child's blood with a small sample of the donor blood to confirm that they are compatible. If they clump together, the blood is not compatible. If the blood mixes smoothly, they are.

Who can donate blood?

- Healthy persons aged 17-70 years can donate.
- Donors can give 450 ml of blood thrice a year.
- Donations for platelet pheresis can be up to 24 times a year.

Fresh Whole Blood – is it really wholesome?

The answer is NO. There are no indications except massive blood loss, and exchange transfusions.

In the first place "fresh whole blood" is not fresh, as testing for HIV, Hepatitis B, etc

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takes up five to six hours and by the time it reaches the bedside of the patient it is even longer. Thus labile clotting factors are lost. Blood has to be stored at 4 deg Celsius and in this process platelets become non-viable. It does contain plasma which can lead to volume overload, also the WBCs can cause transmission of diseases as well as the various life threatening complications of blood transfusions.

What are blood components?

The donor is bled and 450 ml of blood is drawn and collected in a sterile plastic pack. This bag is then placed in a refrigerated centrifuge. After spinning three layers are visible in the bag. The RBCs settle down, followed by a thin white layer or the buffy coat followed by a yellowish straw colored fluid, plasma. With the help of a plasma expressor the plasma is transferred to a satellite bag. This is actually platelet rich plasma. This is then centrifuged again. Two layers consisting of a bottom layer of platelets and a supernatant of plasma are formed. This plasma is then separated and frozen. This entire process should be completed within 6 hours. In countries abroad, the blood is filtered at this very stage to remove leukocytes.

What are the advantages of separating blood into components?

- Blood is a scarce resource. By splitting one unit of blood into three, several patients can be benefited.
- Separation allows for optimal storage

conditions of each component.

- Blood component transfusion provides the optimal method of transfusing patients who require large amounts of a specific component.

What are the various blood components used for transfusion?

Red blood cells

Platelets

Fresh frozen plasma (FFP)

Others

What is apheresis?

The word "apheresis" comes from a Greek term meaning to take away or to separate. The process of apheresis involves removal of whole blood from a patient or donor, passing it through an apheresis machine where the desired component is removed and re-infusion of the rest of the blood into the donor. Within an instrument that is essentially designed as a centrifuge, the components of whole blood are separated.

The components which can be separated and withdrawn are:

- Plasma (plasmapheresis): the plasma can be removed to supply clotting factors.
- Platelets (plateletpheresis): this is the most common means for supplying HLA matched platelets to patients who have become HLA sensitized and require platelets from a single donor whose HLA type matches theirs. 1 unit of single donor platelets is equivalent to 6 bags of random donor platelets.
- Leukocytes (leukapheresis): the leukocytes



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(specifically the granulocytes) can be harvested from a donor to supply granulocytes to help fight infection in patients such as neonates.

The only limiting feature in apheresis is the cost and availability of the facility.

What is leukodepletion?

The presence of leukocytes in blood products has a deleterious effect on the recipient. They are known to transmit infectious diseases, they cause febrile non-hemolytic transfusion reactions (FNHTRs), platelet refractoriness, and transplant rejection. Also graft-versus-host disease (GVHD), and immunosuppression, which may contribute to tumor recurrence and postoperative infections.

Among the infectious diseases that can be transmitted are viruses, such as CMV, HIV-I/II, and Epstein-Barr virus, and bacteria (particularly *Yersinia enterocolitica*).

Leukodepletion is a process used to filter and remove leukocytes from whole blood before transfusion.

It can be done at the bedside of the patient, using leukodepletion filters that remove WBCs from a unit of blood just like a water filter. Abroad, blood is leukodepleted even as it is being collected. Saline washing is yet another method of removing WBCs from the blood. It is labor intensive and becomes an open system and needs to be used within 24 hours. It is useful in thalassemia major children or chronically transfused patients.

What is autologous donation?

An “autologous” donation occurs when a person donates his or her own blood for personal use. This means that, since the blood is not to be used for anyone else, then units positive for infectious agents and units with irregular blood group antibodies are still acceptable for autologous donation.

However, because of the potential risk for a clerical error with mis-transfusion of an autologous unit in the inventory, units positive for HbsAg and HIV are not allowed into the Blood Bank. If an autologous unit is collected but not used by the patient-donor, then it is destroyed.

Autologous blood transfusions are useful in elective major surgeries.

Pre deposit of blood can be undertaken in the following way. Any patient with an Hb of 11 gm % or more can opt for Autologous blood transfusion. A gap of 7 days is preferable between the donation and surgery. At times more units can be collected, within a period of three weeks prior to surgery. Hematinics and a good diet are required for these patients. There are three other ways, aside from the “predeposit” of blood as outlined above, to make use of the patient’s own blood – hemodilution, cell saver and wound drainage. Autologous blood transfusion is also useful where religious beliefs do not allow donor blood transfusion. E.g. Jehovah’s Witness

What are aliquots?

For neonates and small children, the amount of blood required is very little, at times 20 cc or 30 cc etc. Generally, doctors would draw the required amount and discard the rest, or

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worse, store the rest of the bag and reuse the blood the next day. Both practices are incorrect. In the first instance precious blood is wasted and if frequent transfusions are carried out, then 5-6 ml of blood would be required for grouping and cross matching the unit, which would amount to a blood transfusion for a neonate! And would also expose him to multiple donors. In the second instance, it is unscientific practice and simply WRONG, as the blood bag is now an open system and the chances of bacteremia increase. Also the blood bag should not be stored outside the blood bank, and it may lead to hemolysis of the blood within the bag.

The answer to this problem is to request the blood bank to prepare aliquots of blood. Thus, when a donor is bled, blood is collected into a penta bag system. After collection the plasma and platelets are separated. The packed RBCs are then transferred into the various satellite bags according to the needs of the pediatrician. This being a closed system, can be stored up to 35 days, does not require drawing blood for grouping and cross matching and the child is exposed to a single donor only.

Ask the blood bank to prepare aliquotes at the time of bleeding a donor for neonates!!

What are the risks of transfusion?

Generally, blood transfusion is safe. However, there is some risk of complications, which may occur during the transfusion or after weeks, months or even years.

Acute complications

- Acute hemolytic reaction
- Allergic reaction
- Infective shock
- Anaphylactic reaction
- Coagulation problems in massive transfusion
- Febrile non-hemolytic reaction
- Metabolic derangements
- Mistransfusion (transfusion of the incorrect product to the incorrect recipient)
- Septic or bacterial contamination
- Fluid overload
- Transfusion-related acute lung injury (TRALI)
- Urticarial reaction

Delayed complications

- Delayed hemolytic reaction
- Development of antibodies to red cells (alloimmunisation)
- Development of antibodies that react with antigens of white cells or platelets
- Iron overload
- Infection
- Microchimerism
- Over-transfusion or under-transfusion
- Post-transfusion purpura
- Transfusion-associated graft-versus-host disease
- Transfusion-related immunomodulation

What is transfusion associated graft versus host disease (TAGVHD)?

In this era of HIV and Hepatitis, most people would prefer to take blood from their relatives. However, this is not an ideal situation. One cannot assume that the blood of a relative is "safer".

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Since the donor is related to the recipient, there is a sharing of HLA markers. Thus the recipient does not recognize the donor's cells as non-self and does not launch an immune attack against them. But the donor's cells now recognize the recipient as "non self" and attack the recipient's tissues especially the skin, liver, brain and kidneys – TAGVHD.

Discourage blood donation from relatives!

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