

AUTOLOGOUS BLOOD TRANSFUSION

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Introduction

- Autologous Blood Transfusion (ABT) means reinfusion of blood or blood products taken from the same patient
- Transfusion of blood taken from a donor to a recipient is called Allogenic/Homologous blood transfusion

Introduction

- ABT is not a new concept, fear of transfusion-transmitted diseases stimulated the growth of autologous programmes
- Reinfusion of blood was employed as early as 1818 & pre-operative donation was advocated in 1930s
- Blood salvaging was reported during neuro-surgical & obstetric procedures from 1936
- During the last 20 years there is a increase in the use of ABT
- Technologic advances made possible the development of safe, easy to use devices for recovery & reinfusion of shed blood

Advantages of ABT

- Can avoid many complications associated with allogenic transfusion
 - Acute hemolytic reactions
 - Allergic & febrile reactions
 - Transmission of diseases
 - Hepatitis – B
 - AIDS
 - Syphilis
 - Malaria
- Conservation of blood resources
- Avoidance of immunosuppressive effects of allogenic transfusion
- Patients with rare blood groups are particularly benefited by these techniques
- It allows the availability of fresh whole blood for transfusion

Techniques of ABT

- 3 different techniques available
 - Pre-operative blood donation
 - Acute normo-volaemic heamo-dilution
 - Intra & post-operative blood salvage
- Advantages, applications & complications vary with each technique

Pre-operative Autologous blood donation (PABD)

- Can be considered before any elective surgical procedures where a significant blood loss is expected
- In 1992 – 8% of whole blood collections in the US was Autologous blood

Patient selection

- Any patient with an adequate haemoglobin level(11g)
 - A patient weighing 50 Kg, Hb >11gm & Hct> 33% can donate 450 ml of blood safely. Those with lesser body weight can donate proportionately lesser volume
- Adolescents & children below 10 years also can be a candidate if he is cooperative
- Elderly patients can safely donate
- Obstretic patients – no adverse effects for mother & baby are reported
- A history of Hepatitis-B or AIDS is not a contraindication
- Unstable angina, severe CAD, severe aortic stenosis are considered as contraindications

Collection of blood

- Pre donation usually begins 4-5 weeks before the proposed surgery, depending on the number of units required
- Usually one donations per week is done. In 5 weeks we can have 5 units of blood
- To prevent anaemia due to donations Iron tablets are usually prescribed
- No special complications to pre-donations
 - Vasovagal reactions for which no Rx is needed
 - This is higher is women and first time donors
- Time interval between the last donation and the surgery should be more than 72 hours

Storage of Pre-donated blood

- Separately labeled as Autologous with the patient's name and ID number
- ABO & Rh typing is also done and labeled which will help in patient's identification
- Screening for Hepatitis B and AIDS are not mandatory
- No cross matching is required
- If CPDA-1 is used as preservative the blood can be stored as whole blood for 35days
- Separation into plasma and Rbc increases the shelf life to 42 days
- If more storing is required the RBC can be frozen and stored

Transfusion of Pre-donated blood

- Mere availability of pre-donated blood is not an indication for transfusion
- But a more liberal policy is usually followed, because of the lower risks
- Unused blood as a policy is discarded, but after proper screening & cross matching can be used for other patients

Complications of transfusion

- Complications include
 - Volume overload
 - Sepsis
 - Transfusion of wrong blood (clerical error)

Acute Normovolaemic Haemodilution

- Acute normovolaemic haemodilution refers to the removal of blood from the surgical patient immediately before or just after the induction of anaesthesia, and its replacement with asanguinous fluid.
- No predonation, donation is done at the time of surgery, and the lost volume is replaced by crystalloids or colloids

ANH-Advantages

- Provides fresh whole blood for transfusion.
- No biochemical alterations associated with storage.
- Removed blood is kept in the OR in room temperature, so no chance of hypothermia
- Platelet function is preserved
- No reduction in oxygen carrying capacity
- RBC loss during surgery is less as it is diluted with asanguinous fluid
- Haemodilution decreases blood viscosity , which improves tissue perfusion

ANH-Advantages

- Possible during emergency surgeries also
- Patients with systemic diseases also can undergo ANH, as they are not ideal for pre donation
- Can decrease the use of allogenic transfusions to 50 – 90 % , as we need only 1 or 2 units of blood for most of the surgeries, which is possible by ANH
- ANH is simple and less expensive than pre-donation & cell salvage

Physiology of ANH

- Withdrawal of whole blood from the patient & its replacement with fluid are
 - ↓ in haematocrit & arterial oxygen content
 - oxygen delivery to the tissue is unaffected due to increase in cardiac output
 - ↑ in cardiac output is through the ↑ in stroke volume
 - As there is no hypovolemia, usually no ↑ in the heart rate & the ↑sed cardiac output is usually due to ↓ viscosity

ANH – Patient selection

- Any patient with an adequate haemoglobin (11gm) who is expected to lose 25% of estimated blood volume
- Both children & elderly can donate, the overall health status of the patient is more important than the chronological age
- Patients for general, vascular, spine, orthopaedic, obstretic & plastic surgeries are good candidates
- Jehovah's witness patients also agree to ANH

ANH - technique

- Done after the induction of anaesthesia under monitoring.
- The amount of blood collected depends on the patients estimated blood volume, pre operative HCT and lowest HCT desired
- Volume (V) = $EBV \times Hct(i) - Hct(f) / Hct(av)$
- Eg. A pt with EBV of 5L, and a Hct 45% and a desired Hct 30%, the Volume is calculated as $V = 5L \times [45 - 30] / 37.5 = 2L$.
- Serial HCT determinations are performed during during blood removal and the surgery.
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ANH - Contra indications

- Anaemia
 - Hb < 11gm or Hct < 33% are unsuitable
- Decreased renal function is a relative contraindication, because the excretion of diluent fluid may be impaired
- Severe CAD, carotid artery disease, severe pulmonary dysfunction are relative contraindications

ANH -Technique

- Blood is withdrawn from a central or peripheral vein or radial artery.
- Blood is collected in standard blood bags containing CPD.
- Crystalloid and or colloid are infused as blood is withdrawn.
 - Crystalloid = 3 times the volume of blood removed
 - Colloids = Equal to the volume of blood removed.
 - Dextran ,albumin , Heta-starch, No significant differences
 - Crystalloids have the advantage of easily excreted by a diuretic at the time of re-infusion.

ANH - technique

- Label with pt's name , hospital number, time of removal and is numbered as 1, 2 sequentially.
- Kept inside the same operating room. At the room temperature
- Blood is re-infused after major blood loss or sooner if indicated
- The units are re-infused in the reverse order of collection, so that the first unit which has the high Hct and most clotting factors is administered last.

ANH- Complications.

- Myocardial ischemia and Cerebral hypoxia are the major potential complications, but are very rare in usual circumstances.

INTRA & POST OP BLOOD SALVAGING

- With the use of special equipments the blood is collected from the operative field and draining sites.
- Recovered blood is mixed with anticoagulant is collected in a reservoir with a filter.
- The filtered blood is then washed with saline. The RBCs suspended in the saline are then pumped into a re-infusion bag.
- Most of the WBCs, platelets, clotting factors, cell fragments and other debris are eliminated.
- Several automated devices are available for use,.

Characteristics of processed blood

- HCT of processed blood is 50 – 60% and can be varied by altering the processing parameters.
- Oxygen transport properties and survival of RBCs are equal or superior to stored allogenic blood.
- Processed blood has a high 2,3-DPG level.
- pH of salvaged blood is alkaline, and potassium and sodium levels are normal.

Complications

- Air embolism and fat embolism are important complications.
- Renal dysfunction is possibility due to the presence of free Hb and Fragmented RBCs.
- Sepsis is another serious problem.
- Presence of tumor cells in the operative field is considered as a relative contraindication, but experience with many genitourinary tumors indicate that it is acceptable.
- The major applications are .
 - Cardio-vascular surgery.
 - Liver transplantation.
 - Neuro-surgery.
 - Ortho & gynecology operations.

SUMMARY

- Autologous transfusion can significantly decrease transfusion.
- Appropriate to employ several blood conservation techniques.
- In appropriate cases pre-donation is beneficial.
- ANH is beneficial for providing fresh blood
- Routine use of intra & post op blood salvage is not justified. Newer processing devices may improve cost-effectiveness

Thank you

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