Autologous Blood Donation

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Autologous Blood Donation

Definition

- Blood collected from patient for re-transfusion at later time into the same individual is called autologous blood transfusion.

Why autologous donation?

- **Safest blood.**
- **Shortage of blood.**
- **As a part of blood sparing strategy.**
- **Individuals with rare blood groups/ irregular antibodies.**
- **Patient's apprehensions.**
- **Jehova's witnesses(JW).**

Currently, there are more than 7.5 million JW globally and around 37,913 in India, and their number is rapidly increasing.[3,4]

Advantages

- Prevents transfusion-transmitted disease.
- Prevents red cell allo-immunization.
- Supplements the blood supply.
- Prevents some adverse transfusion reactions.
- Provides compatible blood for patients with allo-antibodies.
- Provides reassurance to patients concerned about blood risks.

CONCERNS

- Does NOT eliminate risk of bacterial contamination.
- Does NOT eliminate risk of ABO incompatibility error.
- May results in wastage of blood.
- May subjects patients to peri-operative anemia and increased likelihood of transfusion.
- Is more costly in case of intra-operative and post operative collection.

Types of Autologous Transfusion

Preoperative collection

- Blood is collected and stored prior to anticipated need.

Peri-operative collection and administration

- **Acute normovolemic hemodilution:** Blood is collected at the start of surgery and then infused during or after the procedure
- **Intraoperative collection:** Shed blood is recovered from the surgical field or circulatory device then infused.
- **Postoperative collection:** Blood is collected from the drainage devices and reinfused to the patient.

Pre-operative Autologous Donation

- Blood is drawn and stored before anticipated need.
- Two or more units blood are drawn and stored prior to anticipated need.
- Should be stable patients who are scheduled for a surgical procedure in which blood transfusion is probable.

Indications of Pre-operative Autologous donation

- **Major Orthopedic surgeries: Most common**
  (Hip & Knee replacement surgeries)
- **Cardiovascular surgeries:**
  (Valve surgery & **?** CP bypass surgery)
- **Obstetric surgeries** (hysterectomy, ovarian tumour etc.)
- **Radical prostectomy, mastectomy**
- **Gatro-surgery** (Gall bladder, Gastectomy, OLT, splenectomy

Contraindications / Exclusion criteria

- Hb < 11 gm%.
- IHD, Scheduled surgery to correct aortic stenosis
- Uncontrolled hypertension (BP > 180/100).
- Myocardial infarction or cerebrovascular accident within 6 months of donation.
- Restrictive/obstructive lung disease.
- Impaired renal function.
- Coagulation disorders, Hypovolemia.
- Active bacterial infection.
- Uncontrolled Seizure Disorder

- Autologous blood should not be collected for procedures that seldom (less than 10% of cases) require transfusion, such as cholecystectomy, herniorrhaphy, vaginal hysterectomy, and uncomplicated obstetric delivery.

Pre-requisites for Pre-operative Autologous Blood Donation.

Request from attending Physician

- Written request from the Clinician is required and kept by the collecting facility.

Request includes :-

- Patient's name,
- No. of units and kind of component requested i.e. whole blood, packed cells etc.,
- Anticipated surgical date & surgical procedure,
- Clinician's comment on patient's ailment and clearance that blood donation would not affect his physical condition & physician's signature.

Information to the Donor

- General information about blood donation and regarding any special fee charged for the procedure etc.

Donor Selection Criteria

- Age – No age limits exist.
- Weight – Donors weighing 60 kg or more can donate 450 ml of blood and donors weighing less than 60 kg may donate proportionately smaller volume of blood but no more than 8-9 ml/kg body weight.

  Note: In pediatric patient of 8 years of age the weight should be 27 kg and no more than 10% of the patients blood volume should be drawn at each phlebotomy.
- Hemoglobin and hematocrit – Hemoglobin should not be less than 11.0 gm/dl and hematocrit not less than 33%.

Blood Tests:

- ABO & Rh testing
- Test for Transfusion Transmitted Disease

Frequency of donation:

- A sufficient number of units should be drawn to avoid exposure to allogenic blood
- Difference between two collections, >72 hours
- The last collection should be >72 hours before surgery

Iron Therapy

- Oral iron may be prescribed to accelerate the restoration of hemoglobin to predonation levels.
- Erythropoietins along with iron can also be prescribed to these patients but it is expensive.

Labeling of Blood Unit

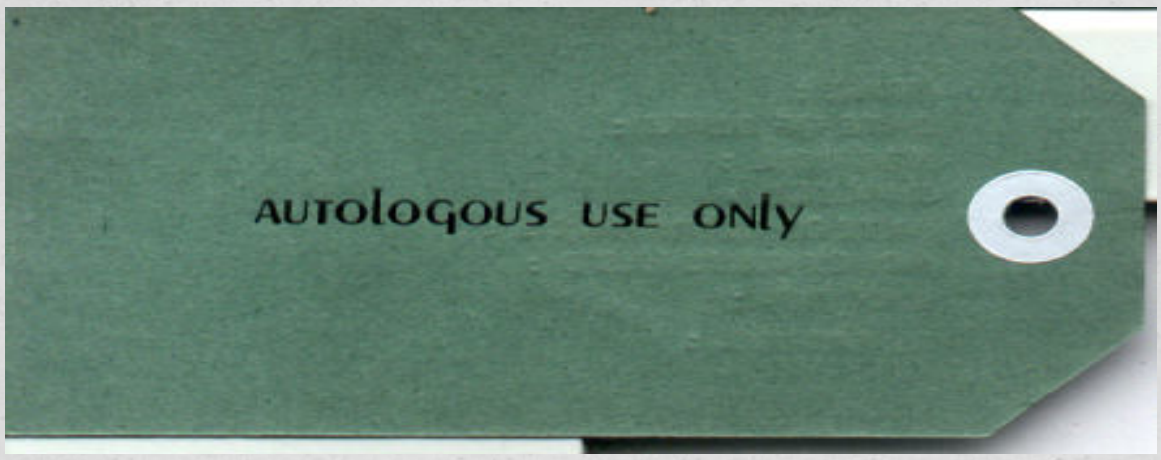
- Units should be clearly labeled with:-
  a) Donor's name.
  b) Identifying numbers, i.e. donor number.
  c) Collection & Expiration date.
  d) Patient's signature.

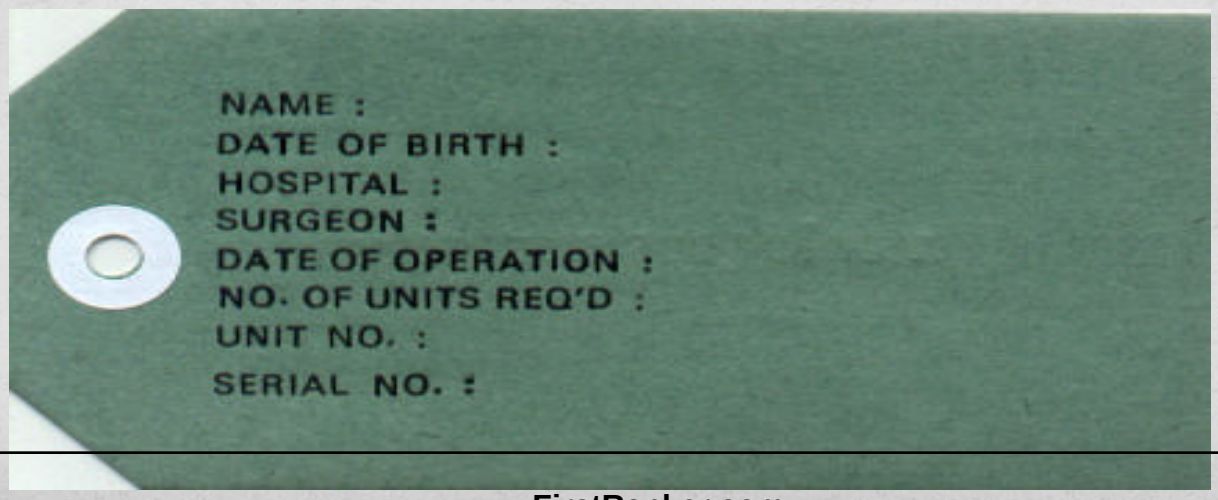
- The units should be clearly marked "FOR AUTOLOGOUS USE ONLY". It should also be labeled as Autologous Donor Blood.

- A biohazard label must be applied if the donor tests positive for HCV, HBsAg, Hepatitis B core antibodies, HIV I & II & VDRL.

- In no circumstance the blood should be used for another patient (Cross Over).

Autologous Sticker





Leap frog technique

WEEK OF COLLECTION	UNIT	RE INFUSION OF UNIT
1st	A	None
2nd	B	None
3rd	C	None
4th	D+E	A
5th	F+G	B

Acute Normovolemic Hemodilution

Definition:

It is the removal whole blood from a patient just before the surgery and transfused immediately after the surgery. It is also known as 'preoperative hemodilution'.

Acute normovolemic hemodilution

- Patients who are not anemic can have about one quarter of their blood volume withdrawn (not exceeding 20ml/kg)
- ANH is simpler, less expensive and available to patients undergoing surgery at short notice.

Indication

- Patients who can tolerate rapid withdrawal of one or several units of blood (not exceeding 20ml/kg) before the period of blood loss.

Benefits

- Lowering blood viscosity improves tissue perfusion and oxygenation.
- Reduce red cell loss at intraoperative hemorrhage.
- Provide fresh whole blood with coagulation factors and functional platelets.
- Reduce the need for allogenic blood, there by avoiding Transfusion Transmitted Diseases & immune mediated reactions.

Patient eligibility

- Attending anesthetist should determine the patient's suitability to undergo ANH.
- Patient should have near normal O2 transport capacity.
- Free from cardiovascular, respiratory and cerebrovascular diseases.
- Hb level >11g/dl
- Should obtain valid consent

Volume withdrawn

- Formula to estimate the possible volume to be withdrawn
- **Volume withdrawn=EBV x(Hct0-Hct1)/Hctav**
- EBV-estimated blood volume
- Hct0-Hct before hemodilution
- Hct1-desired Hct after hemodilution
- Hctav- average of Hct before & after hemodilution

Volume replacement

- Crystalloid,3ml for every 1ml and colloid,1ml for every 1ml should be given simultaneously as blood is withdrawn.
- Monitoring –continuous monitoring of hemodynamic variables

Labeling & Storage

- With proper identification and message “For autologous use only”.
- Keep the blood in the same operating room as the patient to preserve the platelet function.
- If it is anticipated that more than 6hrs will elapse before transfusion store at 2-6 degree C.

Documentation

- Written protocol describing policies & procedure, approved by transfusion committee.
- Anaesthetist must note on the anaesthesia record ,the amount of blood withdrawn, the amount and type of fluid infused ,amount of blood returned, along with patient’s vital signs

Procedure

- Blood collected in ordinary blood bags with 2 phlebotomies & minimum of 2 units are collected
- The blood is then stored at room temp. and re-infused in operating room after major blood loss.
- Carried out usually by anesthetists in consultation with surgeons

- Blood units are re-infused in reverse order of collection.
- **Theme behind**: Patient losses diluted blood during surgery and replaced later with autologous blood.
- Withdrawal of whole blood and replacement of with crystalloid/ colloid solution decreases arterial O_2 content but compensatory hemo-dynamic mechanisms and existence of surplus O_2 delivery capacity mechanism make ANH safe

- Drop in red cell number lowers blood viscosity, decreasing peripheral resistance and increasing cardiac output.
- Administrative costs are minimized and there is no inventory or testing cost
- This also eliminates the possibility of administrative or clerical error
- Usually employed for procedures with an anticipated blood loss is one liter or more than 20% of blood volume.

- Decision about ANH should be based on surgical procedure, preoperative blood volume and hematocrit, target hemodilution hematocrit, physiologic variables
- Careful monitoring of patient's circulating volume and perfusion status
- Blood must be collected in an aseptic manner
- Units must be properly labeled and stored

Intra-operative Blood Collection

Definition:

Whenever there is blood loss and collected inside the body cavity, it is transfused back to the patient.

- Oxygen transport properties of recovered red cell are equivalent to stored allogenic red cells
- Contraindicated when pro-coagulant materials are applied.
- Micro aggregate filter(40 micron) are used as recovered blood contain tissue debris, blood clots, bone fragments

- Hemolysis of red cells can occur during suctioning from surface (vacuum not more than 150 torr is recommended)
- Indications: Blood collected in thoracic or abdominal cavity due to organ rupture or surgical procedures.
- Contraindications: Malignant neoplasm, infection and contaminants in operative field.
- Blood is defibrinated but it does not coagulate

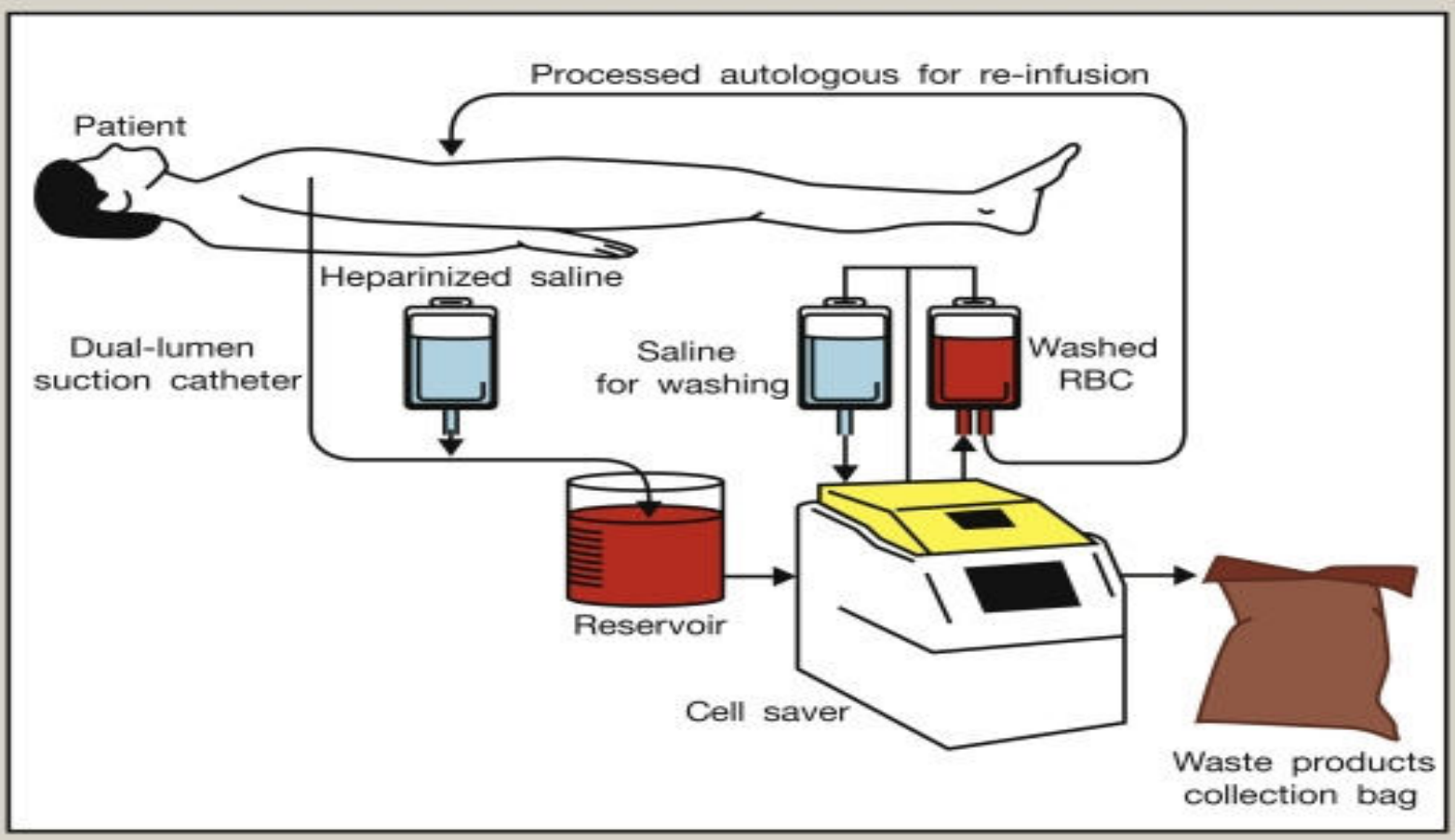
Two types of procedures are available

- One is simpler canisters type in which salvaged blood is anticoagulated and aspired, using vacuum supply into a liner bag (capacity 1900ml) contained in reusable canister and integal filter
- Other is more automated, based on centrifuge assisted, semi-continuous flow technology
- Process result in 225 ml unit of saline suspended red cells with Hct 50-60%

Postoperative Blood Collection

- Recovery of blood from surgical drain followed by re-infusion with or without processing.
- Shed blood is collected into sterile canister and re-infused through a micro-aggregate filter.
- Recovered blood is diluted, partially hemolysed and de-fibrinated and may contain high concentrate of cytokines
- Upper limit on the volume(1400 ml) of unprocessed blood can re-infused
- Transfusion should be within 6 hours of initiating collection.
- Infusion of potentially harmful material in recovered blood, free Hb, red cell stroma, marrow, fat, toxic irrigant, tissue debris, fibrin degradation activated coagulation factors and complement.

Cell salvage and transfusion



Cell Saver

Contraindications

- Malignancy
- Perforated viscera resulting in contamination of blood with fecal matter, urine, bile etc.
- When the rate of blood loss is less than 50ml per hour

Pharmacological alternatives

- Recombinant growth factors:
  - Erythropoietin.
  - GM -CSF, G-CSF.
- Red Cell substitutes.
- Desmopressin.
- Vit K.
- Fibrinolytic inhibitors.

Summary

- Each type of autologous transfusion has potential risks and benefits.
- However, when feasible, the patient should have the option to use his or her own blood.
- SOPs at each step.
- Separate inventory to avoid mix-ups.

Summary cont..

- Separate tags/ green labels to ensure that the right unit goes to right patient.
- X-match & Issue.
- Discarding unused unit and not used as allogenic because of different criteria and chances of clerical error.

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Thank You