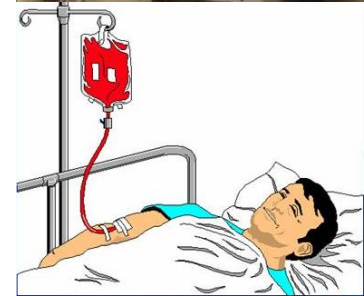




BLOOD AND BLOOD PRODUCTS TRANSFUSION IN OBSTETRICS AND GYNECOLOGY

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Transfusion Science

It involves
the procedures
and testing required
for the preparation
and transfusion
of blood
and blood products.



Components Of Blood

Cells
Plasma
molecules & ions
water

Cells

- Erythrocytes
- White cells

Granulocytes

neutrophils

Eosinophiles

Basophiles

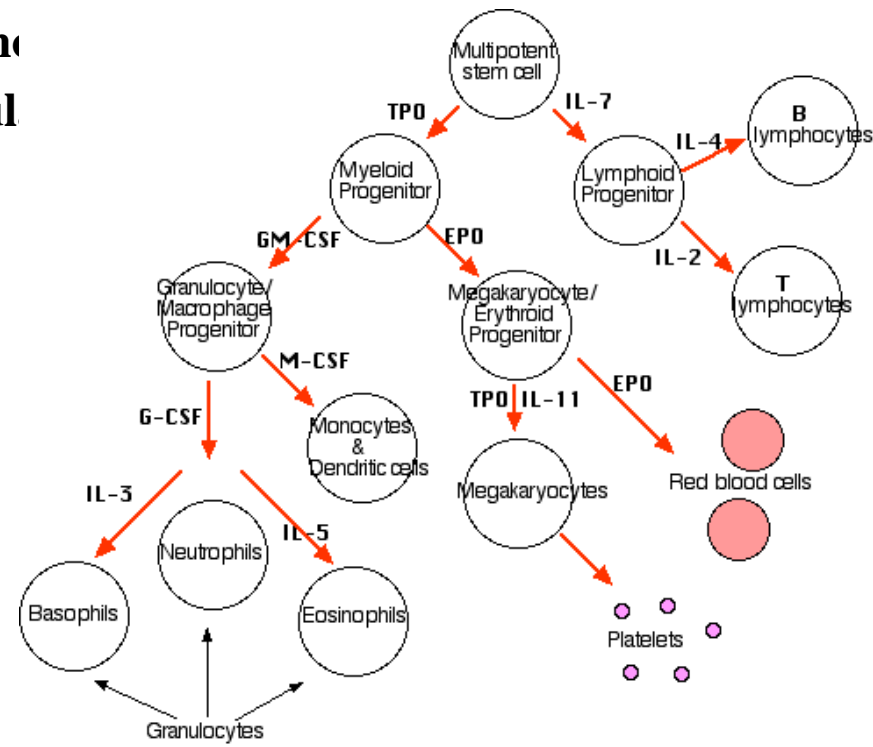
Lymphocytes


Monocytes

- Platelets

Function

- Medium of transport
 - Oxygen
 - Carbon dioxide
 - Other gases
 - Ions
 - Carbohydrates, proteins, fats
- Immune response
 - Humoral
 - cellular



Whole blood		Blood components			Plasma fractions
-Fresh -old	Packed red cells	platelets	Fresh Frozrn Plasma	Cryoprecipitate	
DIVC Massive haemorrhage Major liver trauma Bleeding associated with liver disease	-Washed RBC's <small>Pts with allergic reactions to plasma proteins</small> -Leuko-poor RBC's <small>Pts with febrile, non-hemolytic reactions to plasma WBC's</small>	when platelet count less than 50000/cmm or when massive blood loss or replacement has occurred	when PT & PTT are higher than 1.5 times control levels <small>All clotting factors; no platelets Can supplement RBC's when whole blood not available for exchange transfusion</small>	when fibrinogen level is less than 80-100mg/dl <small>Initially a tx for VW Dz, Hemophilia Now a source of fibrinogen in obstetric emergencies</small>	–Clotting factor concentrates –Immunoglobulin preparations –Saline albumin solution –Salt-poor albumin
		Platelet concentrates (1 pack/10kg) dose : 6units RDP or 1 unit SDP	normal dose: 12 - 15ml/ kg (4- 5packs)	dose: 1- 1.5 -2 packs/ 10 kg (8-10 packs)	Clotting disorders Haemophilia Liver disease

Blood in History

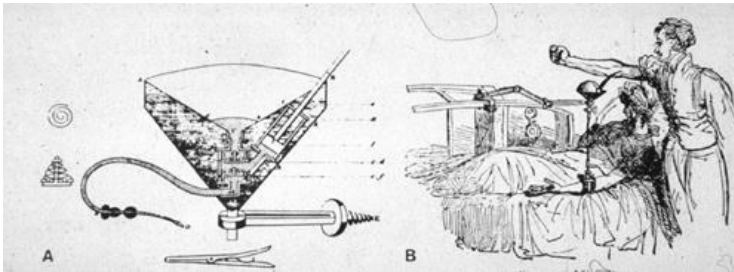
- **China, 1000 BC**
The soul was contained in the blood.
- **Egyptians bathed in blood for their health.**
- **Romans drinking the blood of
fallen gladiators to gain strength and vitality and to cure
epilepsy.**
- **the practice of bathing in blood as it cascaded from a
sacrificial bull, was practiced by the Romans.**

- Animal to animal --- Richard Lower ,1665
- Animal to human --- Jean Denis , 1667

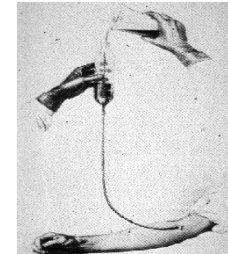
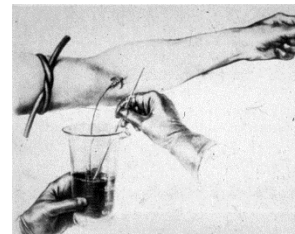


• Human to human --1818, James Blundell

-- 1900 The elucidation of the ABO blood group system by Landsteiner



-- 1914 Lewisohn - used citrate



-- 1940 Landsteiner and Wiener, in, describe Rh typing

Major Innovations in the 20th Century

- Compatibility testing
- Anticoagulant solutions
- Preservative solutions
- Refrigeration
- Blood Banks
- Venous access
- Plastic blood bags
- Component administration
- Infectious disease testing
- High-risk donor screening

Regarding Blood Transfusion in obstetrics:

TWO main causes of maternal morbidity and mortality are :

1- CHRONIC ANEMIA OF PREGNANCY

2- MAJOR OBSTETRIC HAEMORRHAGE

1- CHRONIC ANEMIA OF PREGNANCY

Chronic anemia of pregnancy is defined as :

Hb concentration below **11g/dl**
in 1st and 3rd trimester

&

Hb concentration below **10.5g/dl**
in 2nd trimester

FEW POINTS TO REMEMBER...

- * Anemia is a late manifestation of iron-deficiency
 - * Transfusion does not treat the cause of anemia
 - * Hb level **ALONE** is not the trigger for transfusion, but patient's clinical need
- Transfusion does not correct the **NON-hematological** effects of iron-deficiency as:
- Impaired neuro-muscular transmission that may lead to increased blood loss at delivery
 - Abnormal cellular function that may lead to preterm birth
 - Poor fetal growth
 - Reduced iron stores in newborn in the first year of life

2- MAJOR OBSTETRIC HAEMORRHAGE

DEFINITION

Any blood loss
occurring in the peripartum period,
revealed or concealed,
that is likely to endanger life

N.B.

Physiological & hematological changes
induced by pregnancy can hide signs of
hypovolemic shock & patient can collapse
suddenly.

Massive transfusion
is arbitrarily defined as the replacement of
a patient's total blood volume in less than
24 hours,
or as the acute administration of more than
half the patient's estimated blood volume
per hour.

- If Hb $> 10\text{g/dl}$ transfusion is rarely indicated.
If Hb $< 7\text{g/dl}$ transfusion is usually necessary.
With Hbs between 7 and 10 g/dl, clinical status, PvO₂ and
ER are helpful in defining transfusion requirements.

Response Of BP and P to Hypovolemia

Blood Volume	Percentage	Supine		Sitting	
		B.P	P	B.P	P
N	100	N	N	N	N
- 500	-5	N	N	N	N or ^
-1000	-10 : 15	N	N or ^	N or ^	^
- 1500	-20	N or v	^	v	^ or v
- 2000	- 30	v	^ or v	vv	^ or v

HAEMORRHAGE is associated
with :

48% of direct causes of obstetric
deaths

&

38% of all maternal deaths

**(MOHP National
Maternal Mortality Study 2000)**

PROTOCOL FOR MANAGEMENT OF ACUTE HAEMORRHAGE

1-Every obstetric unit should have a current **protocol** for major obstetric haemorrhage and all staff should be trained to follow it.

- **2-**Initial resuscitation with replacement

Fluids (crystalloid or colloid infusions)

is a priority

to restore blood volume

**DIC is a consequence of delayed or
inadequate resuscitation**

3-Obtain and send 2 blood samples:

- *To blood bank for grouping and crossmatching

- *To lab to obtain baseline for Hb, Htc, PT, PTT ,platelet count & fibrinogen levels

4- Inform blood bank that it is an emergency

Give **Packed Red Cell**

- **5-** Initial packed red cell infusion
 - to restore O₂ delivery to tissues
 - Give group O Rh –ve cells
should be available in 5 minutes
 - - Give group specific uncrossmatched blood
 - Give fully matched blood

Oxygen demand (consumption)

- Transfusion requirements should be based on the patient's physiologic needs, defined by their oxygen demand (consumption).
- Oxygen consumption is given by :
Where CO = Cardiac Output, CaO_2 and CvO_2 are arterial and venous oxygen content respectively.
- Oxygen delivery is :
The extraction ratio (ER) is the ratio of oxygen consumption to oxygen delivery, normally around 25%.

- Combinations of stored whole blood, packed cells, colloids & crystalloids are given to maintain blood volume or pressure at adequate levels and haemoglobin at around 7g/dl or haematocrit at 0.25

6-Component replacement therapy

according to coagulation screen

or if DIC is suspected :

Blood components

Plasma fractions

Packed red cells

platelets

Fresh Frozn Plasma

Cryoprecipitate

-Washed RBC's

Pts with allergic reactions to plasma proteins

-Leuko-poor RBC's

Pts with febrile, non-hemolytic reactions to plasma WBC's

when platelet count less than 50000/cmm or when massive blood loss or replacement has occurred

when PT & PTT are higher than 1.5 times control levels

All clotting factors; no platelets
Can supplement RBC's when whole blood not available for exchange transfusion

when fibrinogen level is less than 80-100mg/dl

Initially a tx for VW Dz, Hemophilia
Now a source of fibrinogen in obstetric emergencies

–Clotting factor concentrates
–Immunoglobulin preparations
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Platelet concentrates
(1 pack/10kg)
dose : 6units RDP or 1 unit SDP

normal dose: 12 - 15ml/ kg (4-5packs)



dose: 1-1.5 -2 packs/ 10 kg
(8-10 packs)

Clotting disorders
Haemophilia
Liver disease

7- Continuous lab & clinical monitoring to guide treatment.

During massive transfusion Monitoring

- **8-** The priority to Identify and treat cause of bleeding

Consider surgery (definitive surgical arrest of haemorrhage from major vessels) **earlier rather than later.**

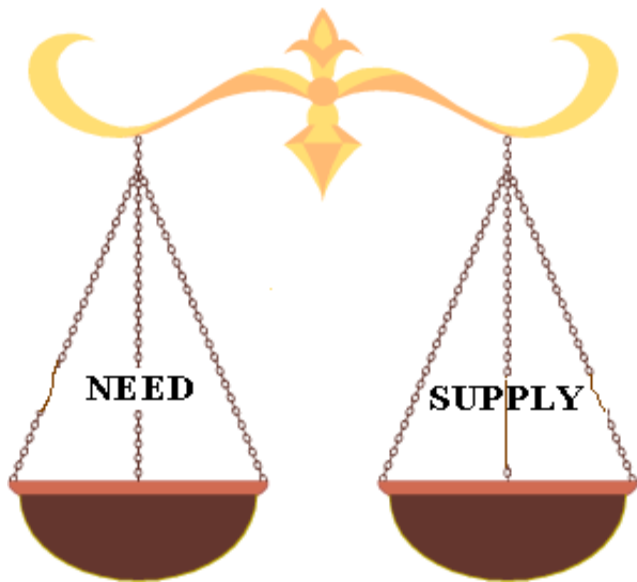
- **9-** Massive transfusion of stored whole blood can aggravate coagulopathy due to:
 - Dilutional thrombocytopenia
 - Coagulation factor depletion
 - Acidosis
 - Hypothermia

thus

- 1 unit of fresh blood for every 5 – 10 units of stored blood
- IV 10% calcium gluconate 10 mls with every litre of transfused citrated blood
- Warming blood
- Microaggregate blood filters

REMEMBER...

***THE DECISION FOR BLOOD
TRANSFUSION SHOULD
ALWAYS BE A BALANCE
BETWEEN***



Alternatives To Blood Transfusion

- Because the blood transfusions carry risks and because the blood supply is limited,
- doctors try not to transfuse when possible.
- In some cases, alternatives to blood product transfusions may be available
- volume expanders
- Growth factors
- Intraoperative or postoperative blood salvage
- Blood substitutes

Volume expanders

When a patient has lost a lot of body fluids but does not need red blood cells or other specific blood components, volume expanders may be given to prevent or treat shock caused by fluid loss.

The most common		Other			
Crystalloids		Colloids			
solutions that contain sodium		solutions that contain large molecular weight that do not readily cross capillary walls			
normal saline	lactated Ringer's	albumin	hydroxyethyl starch (HES),	dextrans	purified protein fractions

Growth factors

- Scientists have learned how to make some of these growth factors in the lab to help people with low blood cell counts.
- Growth factors can be used to raise red blood cell, white blood cell, or platelet counts.
- Unlike transfusions, growth factors often take several days to raise blood counts, so they may not be useful in people who need blood cell levels raised quickly, such as those with active bleeding.

People who have severe bone marrow disease may not respond to the growth factors because they do not have enough blood-producing cells in their bone marrow.

Some growth factors might stimulate certain types of cancer cells (such as certain leukemia cells) to grow more quickly.

Growth factors are generally much more expensive than transfusions



Anteoperative, Intraoperative or postoperative blood salvage



- Uses pt own blood prior to surgery , Remove 500 ml & store , 2 weeks later, may be transfused in op or 1000 mls taken to increase the stored amount Multiplier effect No danger of transmitted infections, infusing it back into the patient. during operation
- New intraoperative autologous technologies (autotransfusion) this lost blood can be 'salvaged' by collecting it with a special machine and infusing it back into the patient at same time.
- Also available are services that separate blood components of patient, such as platelets and plasma, during the operation. Separated platelets may be used to make "platelet gel" which acts both as a sealant and an adhesive to reduce bleeding.
- Giving a person back his or her own (autologous) blood cuts down on the need for transfusions from other donors.

Blood substitutes

- So far, there is no real substitute for human blood.
- Researchers are working to develop a blood substitute that will not have the risks of blood transfusions.
- New products, such as hemoglobin-based oxygen carriers and perfluorochemical compounds, can perform some red blood cell functions, such as carrying oxygen to tissues, but they do not replace human blood.
- Most blood substitutes are thought to be experimental and are rarely used.
- They may be used temporarily in patients whose religious beliefs do not allow them to have blood product transfusions.
- They may also benefit patients with rare blood types whose immune systems would destroy available donated blood.
- The substitutes may be used until compatible donated blood can be located, which in some cases might take several days

Complications of Blood Transfusion

- Febrile reactions
- Bacterial contamination
- Immune reactions
- Physical complications
 - Circulatory overload
 - Air embolism
 - Pulmonary embolism
 - Thrombophlebitis
 - ARDS
- Metabolic complications
 - Hyperkalaemia
 - Citrate toxicity & hypocalcaemia
 - Release of vasoactive peptides
 - Release of plasticizers from PVC-phthalates
- Haemorrhagic reactions
 - After massive transfusion of stored blood
 - Disseminated intravascular coagulation
- Transmission of disease
 - Hepatitis, CMV, EBV
 - AIDS (Factor VIII)
 - Syphilis
 - Brucellosis
 - Toxoplasmosis
 - Malaria
 - Trypanosomiasis
- Haemosiderosis
 - After repeated transfusion in patients with haematological diseases