Obstetric Haemorrhage

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Hemorrhage remains the major cause of obstetric morbidity and mortality.

- Hemorrhage >500ml (vaginal birth) = ~5-8%
  Transfusion (vaginal birth) = ~0.5%
  Transfusion (cesarean birth) = ~2%
  Severe (massive) hemorrhage (>4 units, >1500ml) = ~2/1,000 births
- 50-60% of severe morbidity in obstetrics
- >60% of all postpartum maternal ICU admissions
- The rate of severe hemorrhage is increasing, nearly doubling over the last decade
- The greatest cause of maternal mortality by far, world-wide
Collapsed Pregnant Patient in A/E

- Obstetric haemorrhage – APH, IPH, PPH
- Septic shock
- Cardiogenic shock – PE, Cardiac failure due to structural or ischaemic damage, myopathy
- Anaphylactic shock
- Amniotic fluid embolism
- Pulmonary embolism
- Vagal shock

Each diagnosis is based on its merits on different investigations. However hypovolaemia/hypovolaemic shock need to be excluded at first sight.
Why Mothers Die? Lessons from Reviews

- Denial, Delay...
- Poor quantification of blood loss
- Lack of step-wise progression
- Underutilization of non-pharmacologic approaches
- Poor and under utilization of blood products
- “Too little, too late”—Resuscitation v. Treatment
- “Old wine in new bottles”—“Whole blood” v. PRBCs
- Lack of communication
- Lack of involvement of seniors
- Lack of team work
Causes for Obs. Haemorrhage

- Antepartum H’rrhage – Bleeding after viability
  - Placenta praevia
  - Morbidly adherent placenta (MAP)
  - Placental abruption
  - Vasa praevia (Foetal exsanguinations)
- Local causes
  - Cervix – Polyps , CA
  - Vagina lesions, rupture bld vessel
Causes for Obs. Haemorrhage

- Intra partum – specially during LSCS/MAP
- Post partum – Trauma
  - Atony
  - Coagulatory defects/DIC
  - Uterine sepsis
  - Retained placenta
  - Uterine inversion
  - Amniotic fluid embolism
- Late Post partum – Sepsis, Persistent trophoblastic disease, placental polyp
It is vital to note that patient may tolerate major loss of one liter but may be collapsed at 1.2L.

### COAGULATION CHANGES

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Changes</th>
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</thead>
<tbody>
<tr>
<td>Fibrinogen</td>
<td>Increased from 2.5g/l to 5g/l</td>
</tr>
<tr>
<td>Factor 2</td>
<td>Slightly increased</td>
</tr>
<tr>
<td>Factor 5</td>
<td>Slightly increased</td>
</tr>
<tr>
<td>Factor 7</td>
<td>Increased 10 folds</td>
</tr>
<tr>
<td>Factor 8</td>
<td>Increased 2 folds</td>
</tr>
<tr>
<td>Factor 9 and 10</td>
<td>Increased</td>
</tr>
<tr>
<td>Factor 11</td>
<td>Decreased by 70%</td>
</tr>
<tr>
<td>Factor 12</td>
<td>Increased by 40%</td>
</tr>
<tr>
<td>Factor 13</td>
<td>Decreased by 40%</td>
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Bleeding time, PT, PTT is unchanged.
Pregnancy is a hypercoagulable state.
There is increased risk of thromboembolic episode.
Obstetric Hemorrhage Care Guidelines: Checklist Format

Prenatal Assessment & Planning

- Identify and prepare for patients with special considerations: Placenta Previa/Accreta, Bleeding Disorder, or those who Decline Blood Products
- Screen and aggressively treat severe anemia: if oral iron fails, initiate IV Iron Sucrose Protocol to reach desired Hgb/Hct, especially for at risk mothers.

Admission Assessment & Planning

- Verify Type & Antibody Screen from prenatal record
  - If not available, order Type & Screen (lab will notify if 2nd clot needed for confirmation)
  - If prenatal or current antibody screen positive (if not low level anti-D from Rho-GAM), type & crossmatch 2 units PRBCs
- All other patients
  - Send clot to blood bank

- Evaluate for Risk Factors (see below)
  - If medium risk:
    - Order Type & Screen
    - Review Hemorrhage Protocol
  - If high risk:
    - Order Type & Crossmatch 2 units PRBCs
    - Review Hemorrhage Protocol
    - Notify OB Anesthesia
- Identify women who may decline transfusion:
  - Notify OB provider for plan of care
  - Early consult with OB anesthesia
  - Review Consent Form

Ongoing Risk Assessment

- Evaluate for development of additional risk factors in labor:
  - Prolonged 2nd Stage labor
  - Prolonged oxytocin use
  - Active bleeding
  - Chorioamnionitis
  - Magnesium sulfate treatment
- Increase Risk level (see below) and convert to Type & Screen or Type & Crossmatch
- Treat multiple risk factors as High Risk

Admission Hemorrhage Risk Factor Evaluation

<table>
<thead>
<tr>
<th>Low (Clot only)</th>
<th>Medium (Type and Screen)</th>
<th>High (Type and Crossmatch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No previous uterine incision</td>
<td>Prior cesarean births or uterine surgery</td>
<td>Placenta previa, low lying placenta</td>
</tr>
<tr>
<td>Singleton pregnancy</td>
<td>Multiple gestation</td>
<td>Suspected Placenta accreta or percreta</td>
</tr>
<tr>
<td>54 or more vaginal births</td>
<td>&gt;4 previous vaginal births</td>
<td>Hematocrit &lt;30 AND other risk factors</td>
</tr>
<tr>
<td>No known bleeding disorder</td>
<td>Chorioamnionitis</td>
<td>Platelets &lt;100,000</td>
</tr>
<tr>
<td>No history of PPH</td>
<td>History of previous PPH</td>
<td>Active bleeding (greater than show) on admit</td>
</tr>
<tr>
<td></td>
<td>Large uterine fibroids</td>
<td>Known coagulopathy</td>
</tr>
<tr>
<td></td>
<td>Estimated total weight greater than 4 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Morbid obesity (BMI &gt;35)</td>
<td></td>
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STAGE 0: All Births: Prevention & Recognition of OB Hemorrhage

Active Management of Third Stage

- Oxytocin infusion: 10-20 units oxytocin/1000ml solution titrate infusion rate to uterine tone, or 10 units IM; do not give oxytocin as IV push
- Vigorous fundal massage for at least 15 seconds

Ongoing Quantitative Evaluation of Blood Loss

- Using formal methods, such as graduated containers, visual comparisons and weight of blood soaked materials (1gm = 1ml)

Ongoing Evaluation of Vital Signs

- If Cumulative Blood Loss >500ml vaginal birth or >1000ml C/S - OR - Vital signs >15% change or HR >110, BP >85/45, O2 sat <95% - OR - Increased bleeding during recovery or postpartum, proceed to STAGE 1
Class 3 and 4 are considered as massive obstetric haemorrhage.

## Classification of Hemorrhage in the Pregnant Patient *

<table>
<thead>
<tr>
<th>Hemorrhage Class</th>
<th>Acute Blood Loss (ml)</th>
<th>Percentage Lost</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>900</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>1200-1500</td>
<td>20-25</td>
</tr>
<tr>
<td>3</td>
<td>1800-2100</td>
<td>30-35</td>
</tr>
<tr>
<td>4</td>
<td>2400</td>
<td>40</td>
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PPH - General Outlook

**Trauma**
- Episiotomy
- Hematoma
- Ruptured uterus
  - Consider surgical repair

**Tissue**
- Retained tissue
- Invasive tissue (placenta accreta)
  - Remove manually or with curettage

**Thrombin**
- Coagulopathy
  - Coagulation studies PT, PTT, platelet, fibrinogen
- FFP, RBC, Cryoprecipitate

**Tone**
- Uterine atony

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*If at any time a patient has unstable vital signs or severe hypotension, consider:
1. Central IV line
2. MAST trousers (ABD and legs)
3. Prepare for emergency surgery

**Administer 15-methyl prostaglandin F₂α (Hemabate) 0.25 to 1 mg IM or intramyometrially; may repeat in 15 min**

If hemorrhage still not controlled:

Transfer to operating room for:
- Intrafallopian artery ligation/embolization or vasoconstriction
- Uterine artery ligation
- Hysterectomy
Initial Approach

H – Ask for Help

* Multidisciplinary Approach
* Alert –
  * Senior obstetrician
  * Anaesthetists
  * Midwives/ Nursing Staff
  * Theatre staff
  * Haematologists
  * Blood Bank
  * Hospital Porters
  * Intensive care units
Resuscitation/Management

- Remember first hour is the GOLDEN hour.
- Act adequately early involving the seniors in the multi disciplinary team.
- Two 16G large bore cannula
- Colloids, plasma components, O-ve cross matched blood, blood for grouping x match and TEG.
- HDU, ICU care
- Early surgical interventions.
- Early internal iliac ligation.
- Early embracing suture.
- Hysterectomy to be linked with B/L internal iliac ligation.
Massive Obs. Haemorrhage

Loss of more than 25% of the circulatory volume within minutes.

It is seen in MAP

- Uterine atony
- Amniotic fluid embolism
- Uterine inversion/rupture
- Uterine tears involving the uterine arteries
- Sudden precipitated labour
Management, Complications and Outcomes of 14 Cases of Cesarean Scar Pregnancy in a Tertiary Care Hospital in Sri Lanka

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2nd trimester or early 3rd trimester using ISUOG criteria for ultrasonic diagnosis of morbidly adherent placenta.
1) Thickness of the previous scar
2) Sinuses
3) Presence of Doppler signals in the bladder
Massive Blood Transfusion

• Replacement of one entire blood volume within 24 hrs
• Transfusion of >10 units of packed red blood cells (PRBCs) in 24 h
• Transfusion of >20 units of PRBCs in 24 h
• Transfusion of >4 units of PRBCs in 1 h when on-going need is foreseeable
• Replacement of 50% of total blood volume (TBV) within 3 h.
PRINCIPLES OF MANAGEMENT OF
MASSIVE BLOOD LOSS

• Management of intravascular volume loss
  • This is a vital component of blood loss management. Physiologically, haemodynamic compensatory mechanisms maintain vital organ perfusion till about 30% TBV loss, beyond which there is risk of critical hypoperfusion. Inadequate resuscitation at this stage leads to shock.
  • It is important to remember that overzealous resuscitation leading to high arterial and venous pressures may be deleterious as it may dislodge haemostatic clots and cause more bleeding.
Principles of Management of Blood and Blood Components

- Mild to moderate blood loss can be managed with crystalloid or colloid infusions alone (up to 1L).
- Further loss, dilutional anaemia and later dilutional coagulopathy.
- Plasma substitutes may have direct effects on the coagulation system particularly if used in volumes >1.5 L.
- Patients with normal coagulation factors.
- Haemostatically critical levels of platelets (50 × 10^3/mm^3), fibrinogen (1.0 g/L) and coagulation factor II, V and VII were reached at blood loss >200%, 150% and 200% respectively. Therefore, it is generally recommended that replacement of blood components be guided by thromboelastogram (TEG) and haematological opinion.
TEG

• Previously named rotational thromboelastography (ROTEG) or rotational thromboelastometry (ROTEM), is another version of TEG in which it is the sensor shaft, rather than the cup, that rotates. Blood (300 µl, anticoagulated with citrate) is placed into the disposable cuvette using an electronic pipette. A disposable pin is attached to a shaft which is connected with a thin spring (the equivalent to Hartert’s torsion wire in thrombelastography) and slowly oscillates back and forth. The signal of the pin suspended in the blood sample is transmitted via an optical detector system. The test is started by adding appropriate reagents. The instrument measures and graphically displays the changes in elasticity at all stages of the developing and resolving clot. The typical test temperature is 37°C, but different temperatures can be selected, e.g. for patients with hypothermia.
WHAT IS MASSIVE TRANSFUSION PROTOCOL (MTP)?

- MTP describes the process of management of blood transfusion requirements in major bleeding episodes, assisting the interactions of the treating clinicians and the blood bank and ensuring judicious use of blood and blood components. By developing locally agreed and specific guidelines that include clinical, laboratory, blood bank and logistic responses, clinicians can ensure effective management of massive blood loss and improve outcome.
Whole Blood vs Components

- Transfusing fresh whole blood would seem ideal but the time required to conduct safety tests on blood is long enough to cause significant depletion of coagulation factors.
- In contrary administering RBCs, coagulation factors and platelets together maintains the physiological constitution of blood and prevents deficits of one or more constituents.
- In my personal experience, I would prefer the second option as it serves what the body needs.
**Massive transfusion cntd...**

- Massive transfusion protocols are activated by a clinician in response to massive bleeding. Generally this is activated after transfusion of 4-10 units.
- MTPs have a predefined ratio of RBCs, FFP/cryoprecipitate and platelets units (random donor platelets) in each pack (e.g. 1:1:1 or 2:1:1 ratio) for transfusion.
- Blood bank ensures rapid and timely delivery of all blood components together to facilitate resuscitation. This reduces dependency on laboratory testing during the acute resuscitation phase and decreases the need for communication between the blood bank, laboratory and physician.
Limitations of Massive Transfusion Protocols

- Not standardised: The trigger for initiating the protocol as well as the optimum ratio of RBC: FFP: Platelets is controversial. Therefore practice varies from centre to centre.
- Wastage: If MTP is triggered for a nonmassive blood loss situation, it may lead to wastage of blood products.
Alternative Pharmacology

• Activated factor VII: The role of recombinant activated factor VII (rFVIIa) to manage uncontrolled bleeding is unclear. However, it can be considered as a rescue therapy in patients with life-threatening bleeding that is unresponsive to standard haemostatic therapy. When rFVIIa is used, the recommended dose is 200 μg/kg initially followed by repeat dose of 100 μg/kg at 1 hr and 3 hr

• Antifibrinolytic agents: Drugs like tranexemic acid may be useful in bleeding complicated by fibrinolysis such as cardiac surgery, prostatectomy etc. Early administration of tranexamic acid in bleeding trauma patients has been shown to significantly reduce mortality

• Cell salvage: Can be extremely useful in unanticipated blood loss and in patients with rare blood groups. This strategy is generally reserved for massive blood loss in operation theatres as asepsis can be maintained easily. However, the relative contra indications such as a possibility of contamination with infected material and malignant cells should be considered
COMPLICATIONS OF MASSIVE TRANSFUSION

• Immediate
• Inadequate resuscitation: Hypoperfusion leads to lactic acidosis, systemic inflammatory response syndrome (SIRS), disseminated intravascular coagulation and multiorgan dysfunction.
• Increased expression of thrombomodulin on endothelium, which then complexes with thrombin, which in turn leads to a reduced amount of thrombin available to produce fibrin and increases the circulating concentrations of anticoagulant activated protein C, which worsens the coagulopathy and paradoxical embolism.
Transfusion Associated Circulatory Overload:
- Low colloid oncotic pressure giving rise to interstitial edema which may lead to abdominal compartment syndrome
- Dilutional coagulopathy
- Citrate toxicity
- Hypocalcaemia
- Hyperkalemia
- Hypothermia
- Acidosis
- Respiratory failure (TRALI)
- SIRS, Sepsis
- HIV and Hep B, C, D
Preparation for massive bleeding

- Large bore intravenous (IV) access: Two peripheral IV (14gauge) cannulae or special wide bore cannulae (insertion sheath) can be sited in neck veins such as the internal jugular vein. In emergency situations, canulation of external jugular vein may be considered.
- Warming devices: In-line fluid warmers and surface warmers.
- Continuous core temperature monitoring.
- Invasive arterial pressure monitoring.
- Adequate amount of colloid (gelatins), crystalloid, infusion sets and IV calcium preparations.
- Communication with blood bank about emerging massive blood loss situation.
- Adequate manpower for sending samples for investigations and getting blood and blood products.
- Point-of-care testing is highly desirable: Arterial blood gas (ABG) and thromboelastograph (TEG). ABG with haemoglobin (Hb), electrolyte and lactate levels, repeated hourly, are useful in directing therapy.
Rapid infusion pumps or pressure bags to speed the fluid infusion rate

Postoperative intensive care: Mechanical ventilation and continuous haemodynamic monitoring are usually required due to occurrence of circulatory overload and haemodynamic/biochemical instability.
Monitoring

- Clinical monitoring: Electrocardiogram, capnometry, pulse oximetry, arterial blood pressure, core temperature, and urine output.
- Invasive arterial pressure: Invasive arterial pressure measurement allows beat-to-beat pressure measurement.
- Central venous catheters,
- Laboratory monitoring: Laboratory values should be obtained frequently. Recommended lab tests include Hb, platelet count, prothrombin time, partial thromboplastin time (PTT), fibrinogen, potassium, ionized calcium, ABG for acid base status and central venous oxygen saturation/lactate as an indicator of tissue hypoperfusion.
- Limitations of conventional laboratory testing: The time lag between collection of samples and obtaining the reports is a serious limitation in their utility during rapid on-going blood loss.
Thank You!