Antepartum & Postpartum Hemorrhage
Causes & Anesthetic Management

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Introduction

Obstetric hemorrhage is the **SINGLE MOST** significant cause of maternal **mortality** worldwide accounting for **25–30%** of all maternal deaths.


Obstetric **morbidity** was **12 per 1000** deliveries:

Morbidity may derive from:

- effects of massive transfusion,
- pharmacologic, surgical, or radiologic treatment of the cause of hemorrhage.

Life-threatening Postpartum Hemorrhage occurs in \textbf{1:1000} deliveries in the developed world

\textit{Br J Obstet Gynaecol} 1997; 104: 275–7

Obstetric hemorrhage is often 
Sudden 
unexpected 
may be associated with coagulopathy
What is approximately blood flow to the placenta at term?

- A- 500 ml/min
- B- 600 ml/min
- C- 700 ml/min
- D- 800 ml/min
- E- 1000 ml/min
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Obstetric Hemorrhage Can Be Challenging

- Bleeding can be rapid
- life threatening
- Dilution with amniotic fluid
  - can be difficult to quantify
  - Blood loss may be concealed
- Physiological changes of pregnancy
  - mask the normal clinical signs of hypovolemia
• **Massive** obstetric hemorrhage is variably defined as:
  
  – A - blood loss from the uterus > 1500ml
  – B - decrease in hemoglobin of > 2 g/dl
  – C - acute transfusion of > 2 units blood.
  – D - all are correct
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Definition of Massive Obstetric Hemorrhage

- Acute transfusion of > 4 units blood
- Blood loss from the uterus > 1500 ml
- Decrease in hemoglobin of > 4 g/dl
Definition

Antepartum

- after 24th week gestation & before delivery
- placenta previa
- placental abruption
- bleeding from vaginal or cervical lesions

Postpartum:

- Primary: within 24 h of delivery
- Secondary: 24 h to 6 weeks post delivery
- uterine atony, retained products, genital tract trauma, uterine inversion
ANTEPARTUM HEMORRHAGE
Placenta Abruption

Premature separation of a normally sited placenta from the uterine wall after the 20th week of gestation and prior to delivery.
Placenta Abruption

Classification of Abruptio Placentae

- External Abruption
- Relatively Concealed Abruption
- Concealed Abruption
Placenta abruption

• Risk factors:
  - Previous history of abruption
  - Maternal hypertension
  - Smoking
  - History of premature rupture of membranes
  - Abdominal trauma
  - High parity
  - Cocaine use
Signs and symptoms

- Vaginal bleeding.
- Lower abdominal tenderness
- Rapid abnormal uterine contractions
- Fetal heart rate abnormalities: Intrauterine death
- Maternal cardiovascular collapse
- Disseminated intravascular coagulation
Placental Abruption

- **Diagnosis**
- **Treatment**

**Clinical**

Resuscitation with oxygen and intravenous fluids
Management

The management of placental abruption, including the timing and route of delivery, depends on:

- degree of maternal & fetal compromise
- fetal presentation, gestational age.
Management

• Epidural analgesia can be offered to a patient with partial abruption as long as coagulation and volume status are considered. *Obstet Gynecol* 2006; 108: 1005–16

• Most urgent cases of placental abruption, with a non-reassuring fetal heart rate, are performed under general anesthesia. *Chestnut’s Obstetric Anesthesia Principles and Practice, 4th Edn.* Missouri: Elsevier Mosby, 2009; 825–30
Placenta Previa

Placenta previa occurs when the placenta is totally or partially inserted in the lower uterine segment.
• The classic sign of placenta previa is:
  – A- Painful vaginal bleeding during the first trimester
  – B- Painful vaginal bleeding during the second or third trimester
  – C- Painless vaginal bleeding during the first trimester
  – D- Painless vaginal bleeding during the second or third trimester
• The classic sign of placenta previa is:
  – A- Painful vaginal bleeding during the first trimester
  – B- Painful vaginal bleeding during the second or third trimester
  – C- Painless vaginal bleeding during the first trimester
  – D- Painless vaginal bleeding during the second or third trimester
Placenta previa

Diagnosis

Management

Ultrasound based on severity and fetal maturity.

High intraoperative blood loss due:

- Obstetrician incising through the placenta
- Increased risk for placenta accreta

Obstet Gynecol 2006; 107: 1226–32
Placenta Previa

• No consensus on the use of general vs regional anesthesia

Bonner and colleagues determined that most obstetric anesthesiologists preferred neuraxial anesthesia over general anesthesia in both elective and emergency situations.

*Anesthesia* 1995; 50: 992–4
• Which one is the **most life-threatening emergency** in obstetrics:
  
  • A- Uterine trauma
  • B- Uterine rupture
  • C- Retained products
  • D- Prolonged labor
• Which one is the most life-threatening emergency in obstetrics:
  • A- Uterine trauma
  • B- Uterine rupture
  • C- Retained products
  • D- Prolonged labor
• What is the most common presenting sign of uterine rupture?
  • A- Abdominal pain
  • B- Vaginal bleeding
  • C- Fetal distress
  • D- Cessation of labor
• What is the most common presenting sign of uterine rupture?
  • A- Abdominal pain: occur only in 10%
  • B- Vaginal bleeding
  • C- Fetal distress
  • D- cessation of labor
Uterine Rupture

• Incidence: 1/2000 deliveries

- **Complete**
  - All the 3 layers are involved

- **Incomplete**
  - Peritoneum remains intact
Uterine Rupture
Uterine Rupture

Most life-threatening emergencies in obstetrics

Associated with high maternal and peri-natal morbidity and mortality.

Uterine tenderness
Non-reassuring fetal heart patterns

Localized abdominal pain
Rapid onset of maternal hypovolemic shock
Uterine Rupture

Risk factors:
- Multiparity
- Previous uterine surgery
- Fetal malpresentation
- Use of oxytocin
Postpartum Hemorrhage
4 T’s RULE:

- Tone (uterine atony)
- Thrombin (coagulation disorder)
- Tissue (retained products)
- Trauma (cervical and genital tract damage during delivery)
Other risk factors

- Abnormal placentation
- Obesity
- Previous cesarean delivery
- Puerperal sepsis
• What is the most common cause of early post partum hemorrhage
• A- Uterine Trauma
• B- Uterine Atony
• C- Retained products
• D- Uterine Rupture
• What is the most common cause of early post partum hemorrhage

• A- Uterine Trauma
• B- Uterine Atony
• C- Retained products
• D- Uterine Rupture
Uterine Atony

• Lack of efficient uterine contractility after placental separation

• Risk factors:
  - Overdistended uterus
  - Polyhydramnios
  - Multiple gestation
  - Macrosomia
  - Unable to contract due to tocolytics
  - General anesthesia
  - Or
Abnormal placentation refers to abnormal attachment of the placenta to the uterine wall.

Classification → degree of myometrial invasion
Placental villi invade myometrium

Placental villi attached directly to myometrium without invading

villi penetrate myometrium, reaching serosal surface of uterus
Abnormal Placentation + Uterine atony

most common cause of postpartum hysterectomy

> 1 litre of blood
Risk of Placenta Accreta by Number of Previous Cesarean Deliveries

(Silver RM et al, Obstet Gynecol 2006)

<table>
<thead>
<tr>
<th>Prior CD</th>
<th>MFMU Accreta % (N=143)</th>
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<tbody>
<tr>
<td>None</td>
<td>0.2</td>
</tr>
<tr>
<td>One</td>
<td>0.3</td>
</tr>
<tr>
<td>Two</td>
<td>0.6</td>
</tr>
<tr>
<td>Three</td>
<td>2.1</td>
</tr>
<tr>
<td>Four</td>
<td>2.3</td>
</tr>
<tr>
<td>Five or More</td>
<td>6.7</td>
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</table>
Obstetric Trauma

Lacerations & Hematomas

- Advanced maternal age
- Operative delivery
- Breech presentation
- Multiple gestation
- Episiotomy

most common injuries at delivery
Obstetric Trauma

Small pelvic hematoma
- No evidence of hemodynamic compromise
- Conservative management

Large hematoma
- Surgical exploration, evacuation
- Ligation of vessels
- Avoid infection, septicemia, pressure necrosis, profuse hemorrhage.
Coagulopathy

• PPH can be the first indication of:
  A- Von Willebrand’s disease
  B- Prothrombin deficiency
  C- Factor V deficiency
  D- Factor VII deficiency
Coagulopathy

• PPH can be the first indication of Von Willebrand’s disease (VWD).

• Less common, bleeding disorders associated with PPH include deficiencies in prothrombin, fibrinogen, and factors V, VII, X, and XI.
Prevention of Obstetric Hemorrhage
Avoidance of prolonged labor

Minimal trauma during assisted vaginal delivery

Detection and treatment of anemia during pregnancy

Identification of placenta previa by ante-natal ultrasound examination
Management & Anesthetic Consideration
Management & Anesthetic Consideration

- Lower incidence of PPH
- Need for blood transfusion
- Maternal & fetal outcome
Another therapeutic goal

Avoid myocardial ischemia by increasing the myocardial supply–demand ratio.

A significant percentage of parturients with hemorrhagic shock:

- EKG signs of ischemia
- Decreased contractility that correlated with the severity of hemorrhage.
First line management

Call for help

1. Call:
   – Obstetric on-call team.
   – Anesthetic on-call team.

2. Alert hematologist, blood transfusion service, theatre team.
IV access: 2×14 or 16 gauge cannula.

O2 by mask, 8 L/min.

Blood for:
- Cross match (6 units of blood).
- Clotting screen (fibrinogen, APTT, PT, D-dimer).
- Base line urea and electrolytes.

Foley catheter

Monitor: pulse, blood pressure, O2 saturation, ECG, pulse oximeter.

Invasive arterial blood pressure monitoring

Central line
Anesthetic Management

- **General anesthesia**
  - Required for examination and/or surgical intervention
  - Hemodynamic stability is compromised

- **Regional anesthesia**
  - May be contra-indicated due to:
    - Maternal coagulopathy
    - Risk of neuraxial hematoma
    - Hemodynamic compromise
Anesthetic Management

Induction of general anesthesia in a severely hypovolemic patient may cause a catastrophic fall in cardiac output.

Ketamine is a suitable induction agent (1.5 mg/kg IV) as is cautious dosing of either thiopentone or propofol.

Rapid sequence induction is indicated, preferably following antacid prophylaxis (e.g. sodium citrate and ranitidine).
What effect do the following agents have on uterine tone?

- **Volatile anesthetics**
  - At 0.2 MAC: Minimal effect
  - > 0.2 MAC: Dose dependent reduction in uterine tone.

- **Ketamine**
  - Dose dependent increase in uterine tone

- **Opioids**
  - No effects on smooth muscle

- **Succinylcholine**
  - No effects on smooth muscle

- **NDMB**
  - No effects on smooth muscle
What is the MAC below which uterine response to oxytocin is preserved???
What is the MAC below which uterine response to oxytocin is preserved???

BELOW 1 MAC
How quickly should the baby be delivered under general anesthesia?

Prolonged skin incision to delivery > 8 min

&

Uterine incision to delivery time > 180 sec

have been associated with fetal hypoxia and acidosis regardless the type of anesthesia
• A longer skin incision-to-delivery interval in cesarean birth does not compromise neonatal acid-base balance

• A longer interval between hysterotomy and delivery of the fetus is not associated with a variation of indicators of neonatal wellbeing

• → give the surgeon more tranquility and help to prevent part of the iatrogenic complications associated with cesarean delivery
Correct hypovolemia

Transfusion of red blood cells

Begins with infusions of crystalloid and colloid

However, it significantly worsens existing dilutional coagulopathy and enhances fibrinolysis
**Resuscitation**

Dilutional Coagulopathy

Early supplementation of fibrinogen

Increasing ratio of fresh frozen plasma (FFP) units to RBC

Expected to control bleeding.

Whether it improves overall survival needs to be established
**First line management**  
**Volume replacement**

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<thead>
<tr>
<th>Fluid</th>
<th>Blood:</th>
<th>Coagulopathy</th>
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<tbody>
<tr>
<td>• Crystalloids</td>
<td>• Blood once available.</td>
<td>• Fresh frozen plasma if PT/APTT&gt;1.5× normal.</td>
</tr>
<tr>
<td>• Colloids</td>
<td>• 'O' Rh-negative or group specific blood if life threatening blood loss.</td>
<td>• Cryoprecipitate if fibrinogen&lt;1 g/L.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Platelet concentrates if platelet level &lt;50×10⁹/L</td>
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INTRAOPERATIVE CELL SALVAGE

• Numerous reports: safe use of intraoperative cell salvage in obstetric patients

• It has been recommended in women who refuse traditional blood transfusions as well as in other major hemorrhage situations.

• It is useful to consider cell salvage in both anticipated and unanticipated massive hemorrhage
Concerning intraoperative cell salvage: All are correct except:

A- Cell salvage is started after the majority of the amniotic fluid has been suctioned.

B- A leukocyte depletion filter should be used prior to re-infusion of the salvaged blood.

C- Cell salvaged blood contains only red cells.

D- Cell salvaged blood contains clotting factors or platelets.
Concerning intraoperative cell salvage: All are correct except:

- **A**- Cell salvage is started after the majority of the amniotic fluid has been suctioned: to decrease the risk of amniotic fluid embolism.
  
- **B**- A leukocyte depletion filter should be used prior to re-infusion of the salvaged blood: to remove additional contaminants.
  
- **C**- Cell salvaged blood contains only red cells.
  
- **D**- Cell salvaged blood contains clotting factors or platelets.
Role of Tranexamic Acid.

• The use of TXA in women with PPH decreases blood loss and maternal morbidity.

*High-dose tranexamic acid reduces blood loss in postpartum haemorrhage. Crit Care 2011;15(2):R117*

The initial dose is a slow IV bolus of 1g followed by a further 1g 4 hours later.
Role of Tranexamic Acid

- Blood loss
- Bleeding duration
- Progression to severe PPH
- Need for oxytocin administration in women undergoing cesarean delivery
Recombinant factor VIIa (Novoseven®)

Treatment of uncontrolled obstetric hemorrhage

Promote clotting in open vessels.
Effectiveness diminished by hypothermia, acidosis

Given in a dose of 90 mcg/Kg every 3 hrs for a maximum of 9 doses
Correction of electrolyte imbalance include:

- Hyperkalemia (transfused blood)
- Hypocalcemia (chelated by the citrate found in transfused FFP).
Management
Identify & treat the cause

Bimanual compression
Examine the placenta
Repair any tear

Improve the tone:
Oxytocin, Ergometrine, Prostaglandin F2α
Oxytocin

Acts within 2-3 minutes; Effect lasts about 15 – 30 min

• Give slowly: Do **NOT** give as an IV bolus

Causes vasodilation and may be especially harmful in the hemodynamically unstable patient.

• Dose and Route: IV: Infuse 20 -30 units in 1 L IV fluids at 60 drops per minute.

Ergometrine

* Causes nausea, vomiting, headache
* May precipitate severe hypertension

Avoid in PRE- ECLAMPSIA

Typical dose of 500 mcg can be given either intravenously (slowly) or intramuscularly
Prostaglandin F2 Alpha (e.g. Carboprost)

- 0.25 mg dose can be given intramuscularly, repeated to a total dose of 2 mg
- Side effects include:
  - Hypertension
  - Pulmonary hypertension
  - Bronchospasm
- Intramyometrial administration has a more rapid onset but is an ‘off-label’ use.

Use with caution in asthmatic patients
Misoprostol

- A prostaglandin E1 analogue
- Often overlooked but can prove useful in combination with the other uterotonic agents
- Can be used rectally, orally or sublingually
- The recommended dose is 800 mcg.
- Shivering and transient elevated temperature is common.
Uterotonic agent avoided in women with pre-eclampsia:

A- Misoprostol
B- Ergometrine
C- Oxytocine
D- Carboprost
Uterotonic agent avoided in women with pre-eclampsia:

A- Misoprostol
B- Ergometrine
C- Oxytocine
D- Carboprost
Failure to control bleeding...

Invasive procedures must be performed
• Perform bimanual uterine compression
Surgical Management

• Perform a uterine compression suture (e.g. B-Lynch suture).
B lynch suture

Modified B lynch suture

Multiple square
Surgical Management

• Provide hydrostatic intra-uterine balloon tamponade:
  – Bakri tamponade balloon
  – Rusch urological balloon
  – Sengstaken-Blakemore tube.
Surgical Management

- Perform surgical ligation of:
  - Uterine arteries
  - Ovarian arteries
  - Internal iliac arteries.
Surgical Management

- Perform a peripartum hysterectomy.
RADIOLOGICAL MANAGEMENT
RADIOLOGICAL MANAGEMENT

• Requires the mother to be stable enough to be transferred to a radiology suite

• **Embolisation** requires fluoroscopic guidance and Availability of an interventional radiologist with appropriate facilities and team.
RADIOLOGICAL MANAGEMENT

* May potentially reduce blood loss
* Minimal impact on future fertility

* Adverse fetal & maternal outcomes
Take Home Message ...
Maternal hemorrhage remains a leading cause of maternal morbidity and mortality.

PPH can be anticipated or unanticipated.

All mothers should have anemia diagnosed and treated in the antepartum period.
Take home message ...

- Organization multidisciplinary team
- Restoration of blood volume via large bore access using fluid and blood
- Correction of defective coagulation with blood products and factors
- Evaluation of response to treatment by hemodynamic and laboratory assessment
- Remedying of the underlying cause of the bleeding
Take home message...

There are several uterotonic drugs that can be used in combination.

Rebound hypercoagulability is an important cause of death and thromboprophylaxis should be initiated early.
• Which of the following is not a cause of primary postpartum hemorrhage?
  • a. Vaginal laceration
  • b. Endometritis
  • c. Retained products of conception
  • d. Uterine inversion
• Which of the following is not a cause of primary postpartum hemorrhage?
• a. Vaginal laceration
• b. Endometritis: is a cause of secondary PPH (presents >24 hours after delivery)
• c. Retained products of conception
• d. Uterine inversion
• The uterotonic agent avoided in asthmatic mothers:
  – A- Oxytocin
  – B- Carboprost
  – C- Ergometrine
  – D- Misoprostol
• The uterotonic agent avoided in asthmatic mothers:
  – A- Oxytocin
  – B- Carboprost: Prostaglandin F2 Alpha
  – C- Ergometrine
  – D- Misoprostol
True or False?

- Maternal tachycardia with a normal blood pressure is a reassuring sign that no major hemorrhage has occurred.
- False:
- Hypotension is a late sign of hemorrhage when 30-40% of blood volume has already been lost.
- Maternal tachycardia may be the only sign of early hemorrhage and should be investigated.