THE ANESTHETIC IMPLICATIONS AND MANAGEMENT OF MAJOR OBSTETRIC HEMORRHAGE

Dr. Jamey Morrison, DNP, CRNA
The attendees will be able to identify causes and risk factors for obstetric hemorrhage.

The attendees will be able to discuss the implications of hemorrhage in the obstetric patient.

The attendees will be able design and formulate a management plan to respond to hemorrhage in the obstetric patient.
United States
- Pregnancy Mortality Surveillance System
- Pregnancy related death defined as death of a woman while pregnant or within a year of the end of pregnancy
- Death certificates from 52 reporting areas

Note: The cause of death is unknown for 6.5% of all pregnancy-related deaths.
Remains one of leading causes of maternal death worldwide

WHO – 25-30% of maternal deaths are d/t peripartum hemorrhage

Much higher in developing countries

Has increased in developed countries

Likely d/t increase in PPH
- With proper planning often preventable
- Plan B – successful management through proper planning
- Role of anesthesia is very critical
- Plan should be a multidisciplinary approach
MOH DEFINED

- Singleton pregnancy – 500 mL in vaginal delivery and 1000 mL in cesarean
- Definitions vary from source to source and article to article
- > 2500 mL with hysterectomy or critical care needed
- Treatment of coagulopathy
- Replacement of entire blood volume or > 10 units in 24 hours
- Replacement of 50% of volume in 3 hours or loss of > 150 mL/min
THINGS WE NEED TO KNOW

- The differences maternal hemorrhage has from conventional hemorrhage
- Etiology and classifications
- Our role as anesthesia providers
HEMORRHAGE IN THE OBSTETRIC PATIENT

01  Unrecognized risk factors
02  Difficulty in assessing blood loss
03  Difficulty in early diagnosis
04  Physiology of uterine blood flow
UNRECOGNIZED RISK FACTORS

- Inappropriate clinical evaluations
- Lack of further investigation of mother
- Delayed or lack of prenatal care
- Under utilization of USG
  - Parturient may not have access to adequate prenatal care and assessment until time of birth
- Lack of vigilance in assessing blood loss and failure to consider all parturients as susceptible
BLOOD LOSS ESTIMATION

- Difficult at best even by the experienced
- Dilution by amniotic fluid
- Can be concealed
- Stafford et al. study found only 18% of cesareans were estimated correctly
**EARLY DIAGNOSIS**

- Often difficult due to natural physiology of pregnancy
  - Maternal blood volume
  - Contraction of uterus
- Compensatory measures make it imperative to recognize early

<table>
<thead>
<tr>
<th>Blood Loss</th>
<th>SBP</th>
<th>HR</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 mL</td>
<td>&gt; 100</td>
<td>&lt; 100</td>
<td>palpitations, light headedness</td>
</tr>
<tr>
<td>1500 mL</td>
<td>90- 100</td>
<td>100 – 120</td>
<td>weakness and diaphoresis</td>
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<tr>
<td>2000 mL</td>
<td>70 – 80</td>
<td>120 – 140</td>
<td>restlessness, confusion, and pallor</td>
</tr>
<tr>
<td>3000 mL</td>
<td>50 – 70</td>
<td>&gt; 140</td>
<td>lethargy and air hunger</td>
</tr>
</tbody>
</table>
UTEROPLACENTAL BLOOD FLOW

- Receives 12% of cardiac output
- 700 mL/min
- Source for rapid blood loss
- Untreated can quickly become life threatening
Normal coagulation is a dynamic equilibrium between coagulation and fibrinolysis

Pregnancy is associated with an increase in the majority of clotting factors

Platelet count decreases from destruction and hemodilution with maximal decrease in 3rd trimester

VIII, vWF, ristocetin cofactor, and factors X & XII increase

VII steadily increases and peaks at about 1000% of normal by term

Fibrinogen levels peak at around 200% of pre-pregnant levels

Decreased tPa results in a decrease in fibrinolysis
Labs to assess coagulation

- Platelet count
- PTT – VIII, IX, XI, XII
- PT – II, VII, IX, X
- Bleeding time
  - Not predictive, highly operator dependent, insensitive to platelet defects
- TEG
  - Jury is still out – sensitivity and specificity in pregnant women is still unproven in predicting neuraxial hematoma but still can be of help in detecting and guiding treatment of coagulopathy
- Fibrinogen- shown by multiple studies to be the most sensitive predictor for maternal hemorrhage
TYPES AND CAUSES OF MOH

- Broad classifications
  - Antepartum
    - Abruptio placentae
    - Placenta previa
    - Uterine rupture
  - Intrapartum
    - Abnormal placentation
    - Uterine rupture
  - Postpartum
    - 4 T's
ABRUPTION

- Premature separation from the uterus of a normally situated placenta
  - HTN
  - Multiparity
  - Uterine over distention
  - Previous abruption
  - Advanced maternal age
  - Trauma

- Increased uterine tone, abdominal pain, and premature labor

- Fetal distress is common
ABRUPTION

- Hemorrhagic shock, acute renal failure, fetal demise, and coagulopathy
- Most common cause of DIC in pregnancy
- Be aware that much of the bleeding can be concealed until patient becomes symptomatic
- Treatment is usually delivery of the fetus
- Abnormal implantation of the placenta in the lower uterine segment
  - Marginal, partial, or complete

- No invasion occurs, but is characterized by the placenta overlying the cervical os

- Presents as painless vaginal bleeding in 2nd or 3rd trimester

- Cesarean is the recommended mode of delivery

- Diagnosed with USG

- Site of abnormal implantation does not contract as well and leads to increased bleeding

- Incidence is rising due to increased cesarean and uterine surgery rate
PREVIA

Placenta
Umbilical cord
Uterus
Fetus
Cervix

Normal placenta
Low-lying placenta
Placenta previa

babycenter
APH ANESTHETIC IMPLICATIONS

- Abruptions can be delivered vaginally under close monitoring
- If labor is allowed, a thorough assessment of coagulation must be done prior to insertion and removal of catheter
- Cesarean coagulation must be assessed if time warrants
- GA with endotracheal tube is best even in hemodynamically stable patients
- High propensity of PPH
- Two large bore IVs
- Invasive monitors, cell salvage and IR should be considered
- Blood in room with rapid infuser
- Alert multidisciplinary team members
• Most common are abnormal placentation and uterine rupture

• Abnormal placentation is classified as accreta, percreta and increta
  • Previous cesarean or uterine scar
  • Low lying placenta
  • Previa

• Uterine Rupture
  • Rare, but most life threatening
  • High maternal and fetal morbidity and mortality
  • Scar dehiscence or uterine wall
ABNORMAL PLACENTATION
Figure 2 MRI of placenta percreta (fourth pregnancy).

Notes: (A) Coronal T2 MRI of the abdomen showing an irregular-looking posterior placenta, thinning of the myometrium, and discontinuity of the posterior uterine wall (arrows) with abnormal vascularity and prior hemorrhages (dashed arrow). (B) Placenta penetrating through 5×2 cm uterine wall rupture in the left cornu (arrow), as observed during the surgery.

Abbreviation: MRI, magnetic resonance imaging.
ABNORMAL PLACENTATION

- All classifications are associated with PPH
- Risen exponentially over last 50 years
- Antenatal diagnosis is imperative
  - Highly sensitive to USG
- Scheduled for cesarean with multidisciplinary approach
- Massive transfusion planned
- Possible hysterectomy
- Two schools of thought
  - SAB
  - GA
Postpartum Hemorrhage (PPH)

- Uterine atony
  - Responsible for 80% of PPH
  - Early uterotonics is paramount
  - Continuous assessment of bleeding
- Risk factors
  - Induction
  - High and prolonged exposure to oxytocin
  - Prolonged labor
  - Dystocia
  - Chorioamnionitis
  - Multiple gestation
  - Polyhydramnios
  - Macrosomia
- Retained tissue
  - Defined by WHO as lack of expulsion within 30 minutes
  - If stable, observation for additional 30 mins
  - Manual removal and/or dilation and curettage
  - Monitor closely
  - Do not waste time initiating transfusion
- **Trauma**
  - Can occur with cesarean or vaginal delivery
  - Varying degrees of injury to cervix, vagina, vulva, and uterus
  - Nulliparity, macrosomia, precipitous delivery, mechanically assisted, and episiotomies
  - Treatment is dependent on cause
  - Uterine version is also classified with trauma
    - Therapy aimed at replacing uterus
    - May require assistance from NTG or even GA
PPH

- Thrombin
  - Consumption
  - Dilutional
  - Hereditary
Anytime there is more than an ordinary blood loss “help” must be called for

- Staff RNs and midwives should be encouraged to call early for help
- Due to atony’s role in morbidity and mortality, the 3rd stage of labor must be managed closely

- Uterotonics
  - Ongoing blood loss - Must proceeded quickly to invasive measures if pharm treatment fails
    - Bimanual uterine compression
    - Uterine massage
    - Balloon tamponade
    - Uterine compression sutures
    - Surgical ligation or IR occlusion of iliac or uterine artery
    - Hysterectomy
## Uterotonics

<table>
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<tr>
<th>Medication</th>
<th>Route of Administration</th>
<th>Dose</th>
<th>Side Effects</th>
</tr>
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<tbody>
<tr>
<td>Oxytocin (Pitocin)</td>
<td>Infusion</td>
<td>20-80 μL</td>
<td>Hypotension with bolus or rapid infusion, nausea, emesis, water intoxication</td>
</tr>
<tr>
<td>Methylergonovine (Methergine)</td>
<td>Intramuscular</td>
<td>0.2 mg IM q2-4h, up to 1 mg</td>
<td>Hypertension, vasoconstriction, nausea, emesis</td>
</tr>
<tr>
<td>15-Methyl prostaglandin F₂α (Hemabate)</td>
<td>Intramuscular, intrauterine</td>
<td>250 μg q15–90 min; repeat to total of 1 mg</td>
<td>Bronchospasm, systemic and pulmonary hypertension, nausea, emesis, diarrhea, flushing</td>
</tr>
<tr>
<td>Misoprostol (Cytotec)</td>
<td>Rectal, sublingual, oral</td>
<td>600-1000 mg; single dose</td>
<td>Tachycardia, fever</td>
</tr>
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</table>
Not ideal for emergent situations

Must consider the logistics of the IR suite

2012 ACOG states unclear results

Recommends individualized plans instead of routine practice

Shrivastava et al. study revealed no significant difference in blood loss or transfusions

Has recently become a standard treatment to avoid hysterectomy
  - 80% success with 10% complication rate

Must be hemodynamically stable and resuscitated
Hysterectomy
- May be necessary with uterine rupture, abnormal placentation, or cases where other measures fail
- Aortic compression may be necessary to allow for resuscitation
- Two large bore IV’s, CVL, rapid infuser, pressure bags, cell saver and invasive monitoring
- GA versus Regional
- Anticipated
  - Counseling
  - Multidisciplinary approach
  - Cross matched
  - Optimized coagulation
  - Rare blood types
  - Massive transfusion protocol
Must be a five step approach
- Call for help – multidisciplinary team
- Restore volume
- Correct coagulopathies
- Ongoing assessment of treatment
- Treatment of underlying cause
Objective is to maintain adequate oxygenation and perfusion
  - Avoid the lethal triad of hypothermia, acidosis, and coagulopathy

- Crystalloid initially is reasonable
- Aggressive crystalloid should be avoided
- High ratio of PRBC to FFP
- Most agree that a Hgb of 7-8 is goal
VOLUME RESUSCITATION

- Platelets
  - Objectives are not well defined
  - General guidelines suggest a platelet count > 50,000 in obstetric hemorrhage
  - Should trigger at 75,000 to maintain target of 50,000
  - Risk factors were EBL > 4500, pre-E, ITP, abruption, and thrombocytopenia

- FFP
  - Given as a 1:1 ratio
  - Average from non-pregnant donors as 2g/L of fibrinogen
  - In routine replacement of PRBC plasma can dilute VII and vWF
Cryoprecipitate
- Pooled concentrate plasma product
- Recommended for acquired hypofibrinogenemia
- Also has VIII, vWF and XIII
- Fibrinogen is approximately 15g/L
- Raises fibrinogen by 0.5g/L
Recombinant activated factor VII

- First used in PPH nearly 20 years ago
- Franchini et al. found that a median dose of 71 mcg/kg reduced or stopped bleeding in 90% of patients
- No definitive recommendations
- Franchini recommend 90 mcg/kg
- Short half life and may need to be repeated every 30 minutes
- Evaluation is succession of bleeding
- Expensive
- Recommended anytime before hysterectomy
- Fibrinogen concentrate
  - Off label use
  - Stored at room temperature
  - Easy to mix
  - Easy to administer
  - 60mg/kg increases fibrinogen by 1 g/L
  - Ahmed et al. showed that it was as efficacious as cryo
  - No ABO compatibility
Cell Salvage

- Should be primed and operated by qualified staff
- Utility and safety is now well established
- Historic concerns were to maternal exposure of fetal squamous cells
- Leukocyte depletion filters remove contaminants to maternal blood levels
- Further measures are waiting until delivery of fetus and placenta
- Rho immune globulin should be administered to Rh negative women
TRANEAMIC ACID

- Synthetic lysine analogue
- Positive outcomes in trauma and surgery
- Role in PPH is controversial
- Reassuring safety profile in the WOMAN trial
- Should be an adjunctive treatment and not first line
- Stay within established safe dosing limits for obstetrics
  - 1 gm IV and may repeat once in 30 minutes

Adapted from the California Quality Care Collaborative
CONCLUSION

- Early recognition of risk factors
- Vigilant monitoring of blood loss
- Call for help early
- Have obstetric specific protocols in place
- Timely escalation through management procedures
References


QUESTIONS