Objectives

- Identify the normal changes that occur during the third stage of labor
- Discuss the interventions for active management of the third stage
- Examine the uterotonic medications and their pharmacological effects
- Review common third stage complications and their medical treatments

Background

- Relatively little thought or teaching seems to be devoted to the third stage of labor compared with that given to the first and second stages
- Within a minute, the normal delivery can become abnormal and can turn swiftly to disaster
**Definition**

- The third stage of labor begins with the delivery of the baby and ends with the completed delivery of the placenta and its attached membranes.

- The normal duration of the third stage is usually 5-30 minutes, with a mean delivery time of 8.3 minutes. Only 3.3% last >30 minutes.

- The *absolute time* limit for delivery of the placenta, without evidence of significant bleeding, ranges from 30-60 minutes.

**Significance**

- 3rd stage is usually uneventful, although significant complications can occur.

- Joint Commission 2010 ‘Sentinel Alert’ warns that half of the reported maternal deaths are preventable.

- In 2002-2004, OB Hemorrhage/PPH was leading cause of maternal mortality in California.

- Initial California Maternal Quality Care Collaborative (CMQCC) Toolkit subsequently developed in 2010.

- Current version on-line is 2015.

**Impact of OB Hemorrhage**

- In U.S. OB Hemorrhage increased 26% between 1994-2006.

- In 2013, OB Hemorrhage accounted for 25% of maternal deaths.

- 70% of hemorrhage related deaths have been found to be preventable.

- WHO estimates the U.S. Maternal Mortality Ratio (MMR) increased 136%, 12 deaths per 100,000 live births in 1990, to 28/100,000 in 2013.

- However, cardiovascular disease is replacing OB Hemorrhage as leading cause of maternal deaths.
Complications

* All women who deliver are at risk of complications in the third stage of labor

- Most common complication is Postpartum Hemorrhage (PPH)
- More than half of postpartum deaths are due to PPH and are within 4 hrs. of delivery

Other Complications include:
- Retained placenta (discussed in other lecture)
- Uterine inversion
- Placenta accreta, increta, percreta (discussed in other lecture)
- Any exploration or instrumentation of the uterus increases the risk of sepsis

Physiology

- Over the course of a pregnancy, maternal blood volume ↑50%, from 4 to 6 L
- The increase in blood volume serves to fulfill the perfusion demands and to provide a reserve for the blood loss that occurs at the time of delivery
- Blood flow from the placenta to the uterus is 600mL/min. so there is a great potential for significant blood loss in a short period of time

- Changes also occur in the coagulation system, with an ↑ in clotting factors and a ↓ in fibrinolytic activity
- Pregnancy is considered a hypercoaguable state
- Although uterine contraction is initially responsible for controlling blood loss at the placental site, clot formation and fibrin deposition occur rapidly and are essential in maintaining hemostasis and promoting involution in the days following delivery.
The 4 “T”s
Causes of Bleeding in Stage 3

Tone (70%) Uterine atony
Trauma (20%) Lacerations & vessel injuries
Tissue (10%) Abnormal placentation; Retained placental fragments
Thrombin (<1%) Inherent coagulopathies; & acquired (HELLP, DIC)

Size Changes of Uterus During the Third Stage

Mechanism of Placental Separation

● Following delivery of the fetus, uterine contractions continue and the placenta is sheared from the underlying endometrium
Signs of Placental Separation

- Lengthening of the umbilical cord
- The uterus takes on a more globular shape and becomes firmer
- The uterus rises in the abdomen
- A gush of blood occurs

Uterotonic Agents

- Several agents cause uterine contractions
- The sensitivity of the myometrium is specific to oxytocin
- Synthetic ergot alkaloids (methergine, hemabate) cause strong tetanic contraction of the uterus

- Agents that cause uterine relaxation (magnesium sulfate) can lead to dangerous bleeding following delivery

<table>
<thead>
<tr>
<th>Agent</th>
<th>Dose</th>
<th>Route</th>
<th>Dosing Frequency</th>
<th>Side Effects</th>
<th>Contraindications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxytocin (Pitocin)</td>
<td>10-40 units per</td>
<td>IV infusion</td>
<td>Continuous</td>
<td>Usual none</td>
<td>Hypersensitivity to drug</td>
</tr>
<tr>
<td></td>
<td>500/1000mL, rate</td>
<td>[142x222]</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>titrated to uterine tone</td>
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<td></td>
<td>-Mixed in NS or LR; avoid dextrose soln</td>
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<tr>
<td>Methylergonovine</td>
<td>0.2 mg/mL</td>
<td>PO tab</td>
<td>Every 2-4 hours; if no response after 1st dose, it is unlikely that add'l doses will benefit</td>
<td>Hypotension; Preeclampsia, CV disease, Hypersensitivity to drug</td>
<td></td>
</tr>
<tr>
<td>(Methergine)</td>
<td>0.2 mg/mL</td>
<td>IM (not given IV)</td>
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</tr>
<tr>
<td>Carboprost (Hemabate)</td>
<td>250 mcg (0.25 mg)</td>
<td>IM or Intramyometrial</td>
<td>Every 15-90 min.</td>
<td>N/V/D, fever, hypertension, bronchospasm</td>
<td>Caution in women w/active hepatic or cardiovascular disease, asthma or pulmonary disease</td>
</tr>
<tr>
<td></td>
<td>1mL ampule</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Misoprostol (Cytotec)</td>
<td>800 mcg SL</td>
<td>Sublingual, Rectal, PO</td>
<td>Single dose at least 2 hr prior</td>
<td>Shivering, fever, diarrhea, headache</td>
<td>Known allergy to prostaglandin E1, hypersensitivity to drug</td>
</tr>
<tr>
<td></td>
<td>800-1000 mcg PR</td>
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</tbody>
</table>

CMCC/Hemorrhage Taskforce 2015
Physiological vs Active Management of 3rd Stage (AMTSL)

- The controversy surrounding 3rd stage management exists between authorities who advocate the: (2 philosophies)
  
  + physiological (expectant)
  - versus -
  + active management approach

Physiological (Expectant) vs Active Management

<table>
<thead>
<tr>
<th></th>
<th>Physiological Management</th>
<th>Active Management (prophylactic approach)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uterotonic Pitocin</td>
<td>None; or After placenta delivered</td>
<td>With delivery of anterior shoulder, or after baby delivered</td>
</tr>
<tr>
<td>Delayed Cord Clamping</td>
<td>No clamping until after placenta is delivered</td>
<td>Early cord clamping &amp; cutting</td>
</tr>
<tr>
<td>Cord traction</td>
<td>None; placenta delivered by gravity &amp; maternal effort</td>
<td>Application of 'controlled cord traction (CCT)' with countertraction on the fundus</td>
</tr>
</tbody>
</table>

Delayed Cord Clamping

- Provides continued placental exchange over a variable period of time after birth
- AHA & AAP (2015) & ACOG (2017) recommends it should occur for at least 30-60 seconds for most vigorous term & preterm newborns
- Provides increased initial blood volume which improves Hgb levels, cardiopulmonary adaptation, cerebral & GI blood flow; and iron stores which decreases risk of newborn anemia
- In the preterm newborn, it further decreases need for tx. of hypotension & hypovolemia improving cardiovascular stability; also leads to decreased intraventricular hemorrhage & late-onset sepsis
**Delayed Cord Clamping**

- Does not increase risk of bleeding post delivery; and facilitates immediate skin-to-skin contact which enhances extrauterine transition & bonding
- Early Cord Clamping may be indicated in order to facilitate newborn assessment or resuscitation

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**Cord Blood**

- Cord blood is taken following cord clamping
- The emergence of fetal stem cell harvesting has created new issues in this area (Cord Blood Banking)
- Sometimes a segment of clamped cord is set aside for cord blood gas sampling

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**Cord Blood Gas Sampling**
Placental Delivery

- The placenta usually presents with the cord insertion and the fetal (shiny) side of the placenta.
- Assessment of the placenta and membranes as they are being delivered provides a good idea of whether they are intact, but delay detailed examination until it is clear that the uterus is well contracted and bleeding is minimal.

Separation of Amniotic and Chorionic Membranes

- Both sacs are usually adherent to each other.
- Amnion: Inner sac next to fetus. Thin, translucent, but high in tensile strength.
- Chorion: Outer sac next to uterine wall.
Placental Examination

- Examine the placenta looking for missing cotyledons suggestive of retained placental fragments
- The provider will consider whether pathological examination is warranted

Uterine Assessment

- The fundus is assessed immediately following delivery of the baby and given a baseline fundal height
- A uterotonic, preferably oxytocin (Pitocin®), is then administered usually IV
- Do not perform uterine massage before delivery of the placenta, and never apply downward fundal pressure (risk of uterine prolapse)

Fundal Exam in 4th Stage

Note:
that upper hand is cupped over the fundus; lower hand dips in above symphysis pubis & supports uterus while massaging it gently.
Uterine Exploration

- Routine exploration of the uterus is no longer recommended for normal deliveries or those following previous cesarean delivery
- The procedure increases the risk of complications, especially infectious morbidity

Fourth Stage

- 4th stage is the Period of Recovery. This stage usually lasts 1-2 hrs. after the placenta delivers
- The delivery of the placenta does not mark the end of risk for bleeding!!
- Encourage early breastfeeding to promote endogenous oxytocin release
- Once good, sustained uterine tone has been established, the presence of any bleeding from the lower genital tract can be assessed

Diagnosis of Vaginal Bleeding

<table>
<thead>
<tr>
<th>Prevalence</th>
<th>Diagnosis and Treatment Options</th>
<th>Hypothetical and Treatment Objectives</th>
<th>Evaluation Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence: 10% or more</td>
<td>Prevalent</td>
<td>Atrial fibrillation</td>
<td>Prevalent</td>
</tr>
<tr>
<td>Prevalence: 6% or more</td>
<td>Prevalent</td>
<td>Thrombosis</td>
<td>Prevalent</td>
</tr>
<tr>
<td>Prevalence: 3% or less</td>
<td>Prevalent</td>
<td>Thrombosis</td>
<td>Prevalent</td>
</tr>
<tr>
<td>Prevalence: 1% or less</td>
<td>Prevalent</td>
<td>Thrombosis</td>
<td>Prevalent</td>
</tr>
<tr>
<td>Prevalence: 0% or less</td>
<td>Prevalent</td>
<td>Thrombosis</td>
<td>Prevalent</td>
</tr>
</tbody>
</table>

* Bleeding may be light or could indicate the beginning of menstruation or postpartum bleeding.
* There may be no bleeding with a complete miscarriage.
Third Stage Complications

Postpartum Hemorrhage (PPH)

- The most common complication of the 3rd stage of labor is PPH
- PPH is defined as cumulative blood loss in a SVD > 500 mL in 1st 24 hrs. after delivery or C/S > 1000 mL or > 15% VS changes or HR ≥ 110, BP ≤ 85/45, O2 Sat < 95%, or clinical signs & symptoms
- **Primary PPH:** occurring within 1st 24 hrs.
- **Secondary/ Delayed:** occurring 24hrs.to 6-12wks.

Postpartum Hemorrhage

**GOAL:**
*Correct hypovolemia & establish homeostasis*

- Identify patients at risk
- Recognize early
- Promptly initiate treatment
- Treat underlying cause
- If unresponsive to therapy, anticipate medical/surgical intervention
PPH Interventions

- Activate OB Hemorrhage Protocol or Checklist
- Fundal massage, uterotonics, additional IV line
- Notify Charge Nurse, Provider, and Anesthesia
- VS, O2 Sat Q 5min.
- Calculate cumulative blood loss Q 5-15min.
- Weigh bloody materials (1gm=1mL)
- Careful inspection with good exposure of vaginal walls, cervix, uterine cavity, placenta
- Possibly send additional labs (T&X-match, DIC panel)
- Provider possibly evaluating for medical interventions outside of pharmacological

OB Hemorrhage Protocols

Balloon Tamponade
Other Medical Interventions

- Vaso-occlusive balloon insertion (arterial balloon occlusion)
- Uterine artery embolization
- Performed in Interventional Radiology in centers with radiologists experienced in these procedures
- Hysterectomy (last resort)
Uterine Inversion

- The risk of uterine inversion is increased in abnormalities of placentation, such as accreta, fundal cord insertions, and any condition that predisposes patients to uterine atony and prolapse
- Cord traction should never occur without countertraction or in the absence of uterine contraction
- Can occur with undiagnosed focal accreta when pulling too aggressively

If inversion is encountered, leave the placenta attached and promptly replace the uterus using the "last out, first in" principle.

Management:
- Manual replacement to restore the uterus to its normal position, if possible replace without removing the placenta
- β-mimetic agents or Magnesium infusion
- Fluid therapy
- Blood replacement products
- Possible laparotomy (a surgical incision into the abdominal wall)
Uterine Inversion

● Following uterine replacement, vigorous massage and uterotonic administration should be undertaken
● Manual removal of the placenta may be performed when the mother’s vital signs are stable unless concern exists regarding abnormal placentation
● Uterine relaxants, such as nitroglycerin, may be helpful

References

Bingham, D., Meatsop, K., Main, E. (2010). CMQCC Obstetric Hemorrhage Hospital-Level Implementation Guide. The California Maternal Quality Care Collaborative (CMQCC), Stanford University, Palo Alto, CA.
CMQCC Obstetric Hemorrhage Toolkit, Version 2.0 (March 24, 2015)

Questions???