Physiological Changes:

Caring for the Obstetric Patient

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OBJECTIVES

• Review
  • Cesarean Indications
  • Physiology of Pregnancy
  • Anesthesia: Regionals & Generals
• Case Studies
Limitations

• Not an L&D perspective

• Interest in surgical OB stems from the big black cloud that followed my night calls for a number of years!!
American Society of Anesthesiologists - ASA

Standards for PostAnesthesia Care

Standard I

ALL PATIENTS WHO HAVE RECEIVED GENERAL ANESTHESIA, REGIONAL ANESTHESIA OR MONITORED ANESTHESIA CARE SHALL RECEIVE APPROPRIATE POSTANESTHESIA MANAGEMENT.

A PostAnesthesia Care Unit or an area which provides equivalent postanesthesia care shall be available to receive patients after anesthesia care. All patients who receive anesthesia care shall be admitted to the PACU or its equivalent except by specific order of the anesthesiologist responsible for the patient’s care.
"Following major regional or general anesthesia for either vaginal or cesarean delivery, the patient should be observed in an appropriately staffed and equipped postanesthesia care unit or equivalent area, or an appropriately equipped labor, delivery, and recovery room, until she has recovered from the anesthetic. Following cesarean delivery, the same standards for postanesthesia care should apply to patients receiving major obstetric anesthesia as are applied to other surgical patients receiving major anesthesia." (American Academy of Pediatrics [AAP] & American College of Obstetrician and Gynecologists [ACOG])
Cesareans

According to the National Center for Health Statistics, 1 in 3 babies in the United States is delivered by c-section.

Last accessed 3/23
Cesareans: Maternal Issues

#1 Reason for C/Sections:
Failure to Progress or Repeat – 60%!!!
Cesareans: Maternal Issues

- Amniotic Fluid &/or Pulmonary Embolus
- Peripartum Hemorrhage w/ Hypovolemia
- Congenital &/or Acquired Heart Disease
- Prolonged Tocolytic Therapy ie. Brethine or ritodrine (arrhythmias, CHF, MI)
- PIH and/or Eclampsia
- Trauma
- Maternal infections - HIV/Vaginal warts/Herpes
- Multiple births
Cesareans: Fetal Issues

- Malpresentation - 20%
- Fetal Anomaly - 20%
- Fetal Distress
  - Fetal Hypoxia: \( O_2 \) delivery to fetus
  - Diagnosis: FHR (fetal heart rate)
  - late decelerations (bradycardia after contraction)
  - fetal bradycardia
Physiology of Pregnancy: Hematology

- hypercoagulable condition
- ↑ plasma factors: fibrinogen, VII, VIII, IX, X, XII
- ↑ blood volume
- small ↑ in RBC mass
- Increased levels of circulating progestertone
- Fe def. anemia

- Risk of thrombosis (increases over 35 YO, high BMI, predelivery immobility, infections, gestational diabetes)
  - ↓ Hb/Hct

Source: Journal of AANA
Physiology of Pregnancy: Cardiac

- ↑ cardiac output:
  - +50% during pregnancy
  - +100% during labour
  - +150% during post partum
- ↑ blood volume (40-50%)
- ↑ heart rate (10-20%)
- ↓ SVR (systemic vascular resistance 15%)

Source: Journal of AANA

- Faster induction rates
- Lower anesthetic requirements
- Tend to desaturate more quickly
- Higher blood losses associated with cesareans
- Left lateral position important to minimize aortocaval compression.
Physiology of Pregnancy:  
Cardiac & other

- Uterine pressure on IVC (inferior vena cava)
- Decrease in flow through IVC
- Decrease in blood to heart (preload)
- Decrease in diastolic and MABP

*SUPINE HYPOTENSION SYNDROME:*
Hypotension can result in fetal asphyxia

- Stomach displacement increases risk for regurgitation and aspiration
Physiology of Pregnancy: Respiratory

- Mucosal engorgement
- Deposition of fat
- Elevation of diaphragm means smaller airway
- \( \uparrow \) oxygen consumption (+20 - 50%)
- \( \uparrow \) resp. rate (minute ventilations)
- \( \uparrow \) production of carbon dioxide
- \( \downarrow \) functional residual capacity (less O2 in lungs when asleep)

Pregnant women require more efficient preoxygenation prior to GA

- Intubation is VERY complicated - must use smaller ET tubes! And very careful suctioning to prevent bleeding

Hypoxia occurs very quickly !!

\( \uparrow \text{MV and} \downarrow \text{FRC enhanced uptake of inhalational anesthesia} \)
Physiology of Pregnancy: Renal System

• $\uparrow$ renal blood flow
• $\uparrow$ GFR
• $\uparrow$ creatinine clearance
• $\downarrow$ serum creat and BUN

• More prone to dependent edema related to water and sodium retention
Physiology of Pregnancy: GI System

- ↑ intragastric pressure 2° to enlarged uterus
- Hormones ↓ esophageal sphincter tone
- 80% women in 3rd trimester have reflux/GERD
- Gastric emptying delayed during labor (especially solids!)

- Increased risk of pulmonary aspiration
- Need rapid sequence intubation
- Need anti-reflux medicine

Source: Can J Anesth 2004
GI: To Eat or Not to Eat?

Eating during labor:

A. Provides strength and promotes efficient uterine contractions?

OR

B. Increases the volume of gastric contents and potential for pulmonary aspiration?
To Eat or Not to Eat?

• Fasting leads to ketosis but there is no evidence that ketosis affects uterine function or outcome of labor.

• Light diets prevent ketosis but increase gastric volume

• Isotonic 'sports' drink do not increase gastric volume
Special Considerations

• **PIH:**
  - Generalized vasoconstriction
  - Intravascular volume depletion
  - Diffuse capillary leak
  - Hepatic Dysfunction (HELLP - Hemolysis, elevated liver enzymes, low platelet count)

• **Anesthesia:**
  - Cautious hydration
  - Abnormal coags contraindicate spinal
  - Difficult intubation
  - Mag Sulfate potentiates neuromuscular blocking agents
Special Considerations

- Maternal Hemorrhage
  - Placenta previa
  - Abruptio placenta
  - Ruptured uterus
  - Uterine atony
  - Amniotic fluid bolus
  - DIC

- Anesthesia
  - Large bore IVs
  - Type and Cross
Special Considerations

- Diabetes
  - Increased propensity to ↓BP with spinal

- Anesthesia
  - Check BS hourly
  - Reduced insulin requirements after delivery
Regional?  
Spinal/Intrathecal?  
Epidural?  
General?

Anesthesia goals:
1. Safety of mother
2. Safety of the baby
3. Comfort of the mother
4. Ability to perform the surgery under that technique
Cesareans: Anesthesia Risks

#1: Failed airway management is number one cause of maternal deaths during cesarean births

#2: Aspiration $\Rightarrow$ pneumonitis $\Rightarrow$ pulmonary edema $\Rightarrow$ death
On average, there is a 6 minute difference in time to surgical anesthesia due to the time needed for the spinal anesthetic to work.

-Can J Anes 2004
REGIONAL ANESTHESIA

- Regional anesthesia is preferred over general anesthesia
  - Obese patients
  - Short neck women
  - History of asthma or airway management issues
  - Fetal risk: elective vs semi-elective vs. emergent
Regional Anesthesia

- Important considerations
  - Increased vascularity
  - Compressed epidural space
  - Increased vascularity!
General Anesthesia: Advantages

- Given quickly/fast inductions
- Easier to control blood pressure
- Easier to control breathing once airway established
- Preferred method of delivery for patients with other contraindications (sepsis, neuro or cardiac problems, etc.)
INDICATIONS FOR GA

1. Contraindications to regional anesthesia including massive hemorrhage and hemodynamic instability
2. Significant coagulopathy and recent intake of low molecular weight heparin
3. Severe fetal “distress” in the absence of a preexisting epidural or spinal catheter
4. Failure of spinal/epidural to work
5. Cardiac diseases that would not tolerate acute sympathetic block
6. Patient refusal
Disadvantages of GA

- Mother is unconscious = no baby interaction
- GA can wear off quickly and can result in more intense realization of postop pain
- GA affects the newborn - faster delivery minimizes exposure of baby to anesthesia
Maternal mortality is greater with general anesthesia than regional anesthesia.

-Can J Anes 2004
GA RISKS in Review

1. Maternal aspiration and inability to intubate the trachea remain the major causes of maternal morbidity and mortality.

2. Fetal depression from sedation. (Although some studies have shown babies after GA often require active resuscitation but show no differences within a few minutes.)

3. Maternal hypoventilation, leading to fetal hypoxemia and acidosis.

4. Increased risk for intraoperative bleeding issues.
GA: PRE-OP Considerations

- Premed with Bicitra
- Mindful narcotic administration pre-delivery
- Maintain uterine displacement with left side lying position or hip wedge
- Avoid hyperventilation - dropping CO2 levels & ↑
  +Pressure ventilations will ↓ UBFlow
- Be aware of post partum hemorrhage
General Anesthesia

- Metoclopramide 10 mg IV plus or minus H2 blocker.
- Non-particulate antacid
- Left uterine displacement
- Preoxygenation with 100% O2
- Cricoid pressure
- Rapid Sequence intravenous induction with propofol and succinylcholine
- Intubation
- Administration of 30-50% nitrous plus 0.5 MAC of volatile agent
General Anesthesia

After Delivery
- Increase Nitrous oxide to 70%
- Turn off (or turn down to very low levels) the volatile agent
- Administer intravenous opioid and benzodiazepine
- Administer muscle relaxant (short acting non-depolarizing)
- Empty stomach with oro-gastric tube
- Reversal of muscle relaxant
- Awake extubation after verification of intact airway reflexes
MAINTENANCE AGENTS

Some inhalation agents can:

• DECREASE uterine resting tone
• DECREASE uterine muscle tension
• DECREASE spontaneous uterine activity
• DEPRESS cardiovascular activity
Clinical Practice Question

• Their OB unit wants to recover pts who have had scheduled repeat c-sections. ASPAN is a collaborating organization on AWHONN's Standards. Do you have specific guidelines or publication on this topic to help ensure that ASPAN standards are met?
“Following cesarean delivery, the same standards for postanesthesia care should apply to patients receiving major obstetric anesthesia as are applied to other surgical patients receiving major anesthesia.”

(American Academy of Pediatrics [AAP] & American College of Obstetrician and Gynecologists [ACOG])
Labor and delivery units should have equipment and personnel readily available to manage airway emergencies. (ASA)
Clinical Practice Questions

• What does ASPAN say about OB staff recovering OB pts? If an RN does the recovery, must she have ACLS?

• What does ASPAN say about PACU staff recovering OB pts?
Clinical Practice Answer

- ASPAN Standards for *Patient Rights and Environment of Care and Staffing and Personnel Management*
  - Patients ought to receive the same standard of care no matter where the care is delivered.
  - This includes a nurse with “like” competencies (ACLS Required.)
Thank you!