GENERAL ANESTHESIA FOR EMERGENCY CESAREAN SECTIONS

RCCBC Conference
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DISCLOSURES

No financial affiliations with any commercial or industrial interests
Learning Objectives

• Review
  – indications,
  – goals,
  – risks and risk management for General Anesthesia for C/S

• Formulate Anesthetic plan for General Anesthesia that will minimize the risk of morbidity to mother and infant.
GA for Emergency C/S

• Why discuss GA for Emerg C/S?
• Indications for GA for Emerg C/S
• Goals
• Risks and Risk Management
• What’s new?
• General Anesthetic plan for GA C/S
Why discuss GA for C/S?

- Anesthesia ranked 7th leading cause of Maternal mortality in USA
- Declining use of GA for C/S
- Change in demographic of Obstetric population
- Indications for GA for CS still remain
Anesthesia ranked 7th leading cause of Maternal mortality in USA

- 1.6% of all pregnancy related deaths
- Most anesthesia related deaths assoc with GA for CS
- Most anesthesia deaths related to issues airway Mx
- ↓ anesthesia related deaths since 1980’s attributed
  - Marked ↑ use of RA (fewer definite CI)
  - Limiting oral intake during labor
  - Effective aspiration prophylaxis for CS
  - ↑ use of epidural analgesia during labor
  - Recognized use alternative airway equipment for airway rescue
Other reasons discuss GA for C/S?

- Declining use of GA for C/S
  - majority emergency C/S
  - ↓ trainee/staff exposure to emergency OB Airway Mx
    ❖ Induction and Emergence

- Change in demographic of Obstetric population
  - ↑ Obesity
  - ↑ Age
  - ↑ Co-morbidities

- Indications for GA for CS will always remain
Indications for GA Emergency C/S

• Non reassuring fetal heart tracing
• Massive Hemorrhage
  – Placental Abruption
  – Uterine rupture
  – Placenta Accreta/percreta
• Cord Prolapse with non reassuring FH tracing
• Maternal Disease
  – Severe Pre-eclampsia / Eclampsia / HELLP
• C/I to Regional Anesthesia
  – Coagulopathy / Low platelet count
  – Anticoagulants
• Perceived lack of time for RA
• Failed regional
• Patient Refusal
Criteria for improved outcomes in Emergency GA C/S

- **Categorization of Urgency of CS** essential
- **Good multidisciplinary communication and Team work** is crucial
  - Prenatal and peripartum Anesthetic consultation in high risk pt
- **Preconceived plans** for dealing with anticipated/unanticipated emergencies
  - Difficult Airway
  - Cardiovascular instability
  - Massive Hemorrhage
- **Appropriate support services**
Categorisation of urgency of Caesarean section (NICE UK 2004)

Category 1     Immediate threat to life of woman or fetus
               Non reassuring fetal heart rate, fetal Ph < 7.2
               Cord prolapse, Massive hemorrhage, uterine rupture

Category 2     Maternal or fetal compromise, not immediately life-threatening
               Failure to progress with maternal / fetal compromise

Category 3     Needing early delivery
               but no maternal or fetal compromise
               Elective C/S presents in labor

Category 4     At a time to suit the woman and maternity team
               Elective C/S
Criteria for improved outcomes in Emergency GA C/S

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- Appropriate support services
Goals for GA C/S for Mother

• **Maternal**
  • Aspiration and antibiotic prophylaxis
  • Safely securing airway for optimal oxygenation/protection
  • Optimal hemodynamic control
    – cerebral, cardiac and uterine perfusion through out procedure
  • Appropriate depth of anesthesia
    – ↓ risk of awareness vs volatile effects of uterine atony
  • Uterotonics
  • Ensure safe emergence and extubation
  • Optimal intra and post op analgesia
    – PCA / TAP blocks / NSAIDS
    – ↓ risk developing post op chronic pain
Goals for GA C/S for Fetus

- **Minimize Delivery Time**
  - Induction to delivery time
  - Uterine incision to delivery time
  - Optimize anesthetic depth
    - Lower 1 min Apgar scores in neonate after GA CS
    - Anesthesia induced toxicity in developing brain
    - Optimize uteroplacental perfusion

- **Optimize uteroplacental perfusion**

- **LUD**

- **Trained practitioner for resuscitation of newborn**
RISKS OF GA FOR EMERGENCY C/S

- Pulmonary Aspiration
- Airway Management
  - Difficult / Failed Intubation / Extubation
- Hemodynamic instability ↑ or ↓
- Awareness
- Uterine Atony
- Thromboembolism
- Chronic Pain
Pulmonary Aspiration

Aspiration risk

• Very low < 0.1% of GA’s
• Induction and Emergence
  – Incompetence of GE junction
  – Delayed gastric emptying
    ◆ labor, pain, fear, ketosis, drugs and obesity
  – Gastrin secreted by placenta
    ◆ gastric volume, pH and enzyme content
Pulmonary aspiration risk Mx

- Aspiration prophylaxis is still recommended
  - Elective - 94%
  - Emergency - 64%

- Securing the airway
  - RSI - CETT - 98%

Observational study of airway management and complications in GA C/S
IJOA (2009) 17, 292-297
Review of Interventions at Cesarean section for reducing the risk of aspiration pneumonitis

- The combination of Antacids plus H2 antagonists is more effective than no intervention
- Combination is superior to antacids alone
- Antacids alone are superior to H2 antagonists alone when a single agent is used to increase gastric pH
- Study confirmed the efficacy of many different aspiration protocols using gastric PH and gastric volume as surrogates for risk of aspiration pneumonitis.

*International Journal of Obstetric Anesthesia (2011) 20, 142 148*
DIFFICULT / FAILED INTUBATION

- **Airway changes in pregnancy**
  - Swollen, friable mucosa, bleeds easily
  - Change in Mallampati scores

- **Respiratory changes in pregnancy**
  - Reduced tolerance for apnea ↑ risk hypoxia
    - ↓ FRC and ↑ metabolic rate = ↓ O2 reserve
    - ↓ time to secure airway

- ET CO₂ mirrors paCO₂ = ↓ aA gradient ET CO₂
Difficult / Failed intubation

- **Failed intubation**
  - Relatively rare complication 1:275 (0.36%)
  - Most frequent cause of mortality from GA in OB

- **Incidence Difficult Intubation (Grade 3/4)**
  - 1 - 6% in OB population
  - 1.5-8.5 in general population

- **Incidence Failed Intubation**
  - 0.13-0.6% OB population
  - 0.13-0.3% general population
Does ↑ Airway Risk Exist in OB Population?

- Rates of difficult and failed intubation similar to marginally higher in OB than general population.

- Up to 80% failed intubations - inexperienced trainees

- Most significant factor ↑ risk of difficult intubation in OB population:
  - Time Pressure - Emergency situations
    - Incomplete airway assessment
    - ↓ tolerance of apnea
    - in the setting of RSI
Risk Mx for Difficult Airway

- Risk Assessment and Prevention
- Advanced Airway Mx skills
- Difficult Airway Algorithms
- Emergency Airway Equipment
Risk Assessment

Planning for and preventing problems

• Peripartum Anesthetic consultation of high risk pts in labor
  – prophylactic epidural
• Avoidance of GA in favor Regional
• Restricted oral intake of solids in labor
• Aspiration prophylaxis
Airway Assessment

• Airway Assessment
  • Mallampatti class -
    – May change with stage of pregnancy

• Assessment of other airway risk factors
  • Obesity - positioning
  • Pre eclampsia - edema, bleeding
  • Large breasts - short handle laryngoscope
  • Lack of experienced help - emergency/out of hours
    - correct application CP
• **Difficult Airway algorithm for OB**
Difficult Intubation Algorithm

- **Cannot intubate / can ventilate**
  - LMA or LTA

- **Cannot intubate / Cannot ventilate**
  - Use LMA / LTA
  - Surgical airway only if LTA failed
Emergency Airway Equipment

- **LMA**
  - Very useful as rescue device
    - Supported by a few studies and many case reports
    - Failure rate in emergency OB about 12%

- 1067 healthy women Elec CS under GA
  - LMA 99% effective as an airway (Han et al)
Emergency Airway Equipment

- Bougie
- Glidescope
- Trachelite
- LMAC
- ProSeal LMA
  - Case reports of good success
- Intubating LMA - ILMA
  - Minimal published data in pregnant population
- Laryngeal Tube Airway S - LTAS
  - Replacing the combitube
- Fibreoptic scope
- Cricothyroidotomy kit
CARDIOVASCULAR RISKS

• Exacerbation of hypertensive response in Preeclampsia/Hypertensive/Cardiac parturients
  - Laryngoscopy, intubation, surgical stimulation and extubation
  - ↑ BP + Coagulopathy = ↑ risk intracranial hemorrhage
  - ↑ risk of myocardial O2 consumption
    - Myocardial ischemia, arrhythmias and pulmonary edema

• ↑ BP can significantly reduce in uterine blood flow

• Aortocaval compression and hypotension in supine pt
  - 15% pts near term symptomatic in supine position
  - LUD
Risk Management

• High risk Obstet patients for GA
  • Severe Pre-eclampsia BP >160/110
  • Eclampsia
  • Coagulation abN ▼platelets
  • HELLP
  • Cardiac disease/ aortic disease

• Require attenuation of hemodynamic response to laryngoscopy, intubation and surgical stimulation
Remifentanil

- Not licensed for Obstetric use
- But widely used in the Obstetric practice for providing hemodynamic stability
- Most suitable systemic opioid, rapid on/off
- Crosses placenta with definite neonatal S/E
  - respiratory depression
  - brief and self limiting
- Physician trained in neonatal resuscitation is mandatory if remifentanil to be used
- Communication
Remifentanil Dosing

• **Induction dose**
  – Remifentanil $1 \mu \text{g}/\text{kg}$ bolus

• **Infusion Dose**
  – Remifentanil $\leq 0.1 \mu \text{g}/\text{kg}/\text{min}$

• Van De Velde noted 50% incidence neonatal resp depression with infusions $0.2 \mu \text{g}/\text{kg}/\text{min}$

  – “Nothing is intrinsically good or evil, but it’s manner of usage make it so.”

  St Thomas Aquinas disputed questions on Evil
Risk Management of Awareness

- Neonatal outcome not influenced by greater depth maternal anesthesia
- Dose dependent resp depression in neonate with GA
  - reversible
  - risk/benefit ratio needs to be assessed
- No justification - low volatile concentration
  - ET volatile conc .75 MAC + 50% N2O
- Volatile relaxant effect on uterine tone
  - rapidly reversible ↓ Des/Sevo
- Post delivery of infant
  - Adequate analgesia
  - ↓ volatile required
What’s contributed to ↑ safety of GA for emergency CS

• Well trained physicians
• Emergence of excellent monitoring
• Recognized use alternative airway equipment for airway rescue
• Use ultra short acting opioids
• Better peripartum protocols
  • Pre-op Ab’s
  • Aspiration prophylaxis
  • Massive hemorrhage protocols
  • Thromboembolism prophylaxis
  • Improved post op multimodal analgesia
Summary

- Continue to be indications for GA CS
- Good risk assessment & risk management significantly reduces the problems that are associated with GA for Emerg CS
  - Aspiration prophylaxis
  - Airway management: Have a plan!
  - Attenuation of hemodynamic responses: Remifentanil
  - Balance risk of awareness vs fetal depression vs uterine contractility
  - Appropriate use of uterotonics: oxytocin
  - Prevent chronic pain: adequate intra/post op analgesia
What do you do?

- Preop AB
- PreO2 - RSI CP/BURP
- Propofol 2-4mcg/kg
- Sux 1-1.5 mg/kg - CETT
- N2O/O2/Des 0.75 Mac FiO2 0.5
- Roc 15mg
- SIMV/PSV etCO2 38-45

At delivery
- Oxytocin 2u IV bolus
- Oxytocin 20u/1L run slowly
- Fentanyl 250mcg IV
- Morpina 2-4mg bolus
- Air/O2/Des 0.5 MAC
- No reversal
- Spont vent
- Extubated on side awake

- Preop AB
- PreO2 - RSI CP
- Propofol 2-4mcg/kg
- Sux 1-1.5 mg/kg - CETT
- N2O/O2/Des 0.75 Mac FiO2 0.5
- Roc nil (only if relax issues)
- SIMV/PSV etCO2 38-45
- PSV once sux worn off
- At delivery
- Oxytocin no bolus
- Oxytocin 20u/1L run slowly
- Fentanyl nil
- Morpina titrate opiates to resp
- Air/O2/Des 0.6 MAC
- No reversal
- Spont vent
- Extubated on side awake