Obstetric Analgesia and Anesthesia

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Grand Rounds 05/15/19
Overview

- Background of analgesia and anesthesia in labor
- Available methods of A&A
- Maternal morbidity and mortality related to A&A
- Fetal Risks associated with A&A
- Clinical Considerations and Recommendations
Labor Pain

- First stage: T10 to L1
- Second stage: S2 to S4
  - Somatic (better localized)
Parenteral/Systemic Analgesia

- Inexpensive
- Do not require specialized expertise
- IV or IM
- Adverse effects: nausea/vomiting, drowsiness
- All opioids cross the placenta, possible prolonged effects
  - Loss of variability in FHR
  - Reduction in FHR baseline
  - Neonatal respiratory depression
  - Neonatal neurobehavioral changes
## Commonly Used Parenteral or Systemic Opioids

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dosage and Route of Delivery</th>
<th>Onset</th>
<th>Duration</th>
<th>Elimination Half-life (Maternal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fentanyl</td>
<td>50–100 micrograms (every hour); Alternatively, as PCA, load 50 micrograms then 10–25 micrograms Q 10–12 minutes</td>
<td>2–4 minutes IV</td>
<td>30–60 minutes</td>
<td>3 hours</td>
</tr>
<tr>
<td>Morphine</td>
<td>2–5 mg (IV); 5–10 mg (IM)</td>
<td>10 minutes IV; 30 minutes IM</td>
<td>1–3 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Nalbuphine</td>
<td>10–20 mg IV, SQ, or IM</td>
<td>2–3 minutes IV; 15 minutes SQ or IM</td>
<td>2–4 hours</td>
<td>2–5 hours</td>
</tr>
<tr>
<td>Butorphanol</td>
<td>1–2 mg IV or IM</td>
<td>5–10 minutes IV; 30–60 minutes IM</td>
<td>4–6 hours</td>
<td>2–5 hours</td>
</tr>
<tr>
<td>Remifentanil</td>
<td>0.15–0.5 micrograms/kg Q 2 minutes as PCA</td>
<td>20–90 seconds</td>
<td>3–4 minutes</td>
<td>9–10 minutes</td>
</tr>
</tbody>
</table>

Abbreviations: IM, intramuscularly; IV, intravenously; PCA, patient-controlled analgesia; Q, every; SQ, subcutaneous.
Regional (Neuraxial) Analgesia and Anesthesia

- >60% of women
- Higher rates of epidural and spinal analgesia with:
  - Higher education levels
  - White race
  - Early presentation for prenatal care
- Does not increase C/S rate
Epidural

- Local anesthetic (Bupivacaine and Ropivacaine) + Opioid (Fentanyl and Sufentanil)
- +/- Epinephrine
- +/- Sodium bicarb
Single Injection Spinal Anesthesia

- Injection of an opioid, local anesthetic, or both into the subarachnoid space
- Rapid onset and dense sensory block
- Good for patients for whom delivery is predicted to occur within an hour
- Commonly used for cesarean delivery
- Impossible to titrate level of blockade and to extend the duration of action
Continuous Spinal Analgesia

- Seldom used for labor
- Concerns about postdural puncture headache and FDA withdrawal of spinal microcatheters from the market in 1991 after reports of cauda equina syndrome
- In cases of inadvertent dural puncture when epidural attempted, the planned epidural may be converted to a continuous spinal epidural by threading the catheter into the subarachnoid space for continuous infusion
Combined Spinal-Epidural Analgesia

- Involves insertion of an epidural needle into the epidural space
- Passage of the tip of a spinal needle through this epidural
- Spinal injection
- Withdrawal of the needle
- Insertion of an epidural catheter through the epidural needle for use after the spinal analgesia wears off
Combined Spinal-Epidural Analgesia

- Advantage: RAPID onset because of the initial spinal component
- Cochrane review found no difference in patient mobility, labor augmentation, or C/S delivery between traditional epidural and CSE
- CSE has higher rates of pruritus than epidural
- CSE has higher incidence of fetal bradycardia
Local Anesthesia

- Pudendal nerve block
  - Superior Rectal Nerves: External anal sphincter, perianal skin
  - Perineal Nerve: Perineal muscles, perineal skin
  - Dorsal Nerve of the Clitoris (or Penis): External urethral sphincter
Local anesthetic

- Produce reversible blockade of nerve conduction by blocking sodium channels
- Risks: Allergic reactions and toxicity
  - Neurologic symptoms
  - Cardiac symptoms

<table>
<thead>
<tr>
<th>Local Anesthetic</th>
<th>Maximum Recommended Dose With Epinephrine</th>
<th>Maximum Recommended Dose Without Epinephrine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bupivacaine</td>
<td>3 mg/kg</td>
<td>3 mg/kg</td>
</tr>
<tr>
<td>Lidocaine</td>
<td>7 mg/kg</td>
<td>5 mg/kg</td>
</tr>
<tr>
<td>Ropivacaine</td>
<td>2 mg/kg</td>
<td>2 mg/kg</td>
</tr>
<tr>
<td>2-Chloroprocaine</td>
<td>14 mg/kg</td>
<td>11 mg/kg</td>
</tr>
</tbody>
</table>
Inhaled Agents

- Nitrous oxide
- Less effective than epidural
- Benefits:
  - Does not impair mobility
  - Does not require additional monitoring
  - Quick termination of effect once the patient removes the mask
- Transmitted to the placenta but eliminated rapidly once neonate begins to breathe
- Adverse effects: nausea/vomiting, dizziness, drowsiness
General Anesthesia

- Usually limited to emergency cesarean deliveries or scenarios in which neuraxial anesthesia cannot be performed or has already failed
- Risk of aspiration, respiratory changes, changes in anesthetic before and after delivery of the newborn
- Approach:
  - Pre-oxygenation
  - Induction agent (Propofol, Ketamine)
  - Muscle relaxant (Succinylcholine, Rocuronium)
  - Intubation
  - Anesthesia maintained with low concentrations of inhaled volatile agents (Sevoflurane, Isoflurane) until delivery of newborn
Maternal Morbidity and Mortality Related to Analgesia and Anesthesia

- A reduction in maternal deaths associated with anesthesia has been demonstrated over decades and anesthesia-related maternal death is rare in high-income countries.

- Society for Obstetric Anesthesia and Perinatology
  - Serious Complication Repository Project
    - 4 cases of epidural abscess or meningitis (incidence < 1/60,000)
    - 1 epidural hematoma (1/250,000)
    - 10 failed intubations (1/500) – no cases of aspiration
    - 58 high neuraxial blocks (1 in 4,000)
    - 27 serious neurological injuries, 7 of which were judged to be related to anesthesia (1/36,000)
    - 25 respiratory arrests, of which 16 were considered to be related to anesthesia (1/10,000)
    - 5 cases of anaphylaxis, none of which were related to anesthesia
Epidural Blood Patch
Neuraxial Anesthesia Adverse Effects

- Maternal Hypotension
  - Depends on speed of onset of neuraxial block and dose of anesthetic given
  - ~10% with low dose neuraxial block
  - Can be prevented by preloading or co-loading with crystalloid or by administering small doses of vasopressors
  - Epidural (unlike spinal) allows for a slow titration of local anesthetic

- Nausea & vomiting

- Temperature elevation or fever

- Shivering

- Urinary retention

- Reactivation of oral herpes

- Respiratory depression
Fetal Risks Associated With A&A

- Related to maternal effects such as hypotension or to transplacental passage of anesthetic drugs
- Maternal responses to untreated pain may have fetal/neonatal effects
- Newborn depression
  - Low Apgar scores
  - Respiratory depression
  - Poor muscle tone
  - Poor suckling
- RCT:
  - Elevated uterine tone: 42% of CSE vs 17% of epidural
  - 1/3 FHR abnormalities in first 15 mins after CSE
  - Rates of C/S delivery, low Apgar scores, and neonatal acidemia did NOT differ between the two groups
Which OB patients are not candidates for regional analgesia?

- Coagulopathy
  - Spinal or epidural hematoma
  - Epidural: <1/150,000
  - Spinal: <1/220,000

- Thrombocytopenia
  - > 70,000/ul
  - LDA is okay

- Space-occupying brain lesions
  - If no mass effect, hydrocephalus, or features suggestive of increased ICP
Association between epidural analgesia and maternal fever

- Generally unrelated to infection
- ~30% of patients will experience an increase in temp > 99.5 F (37.5 C)
- Rate increases with duration of epidural
- More common in nulliparous women
- No difference in rate of chorioamnionitis after epidural
- Giving prophylactic antibiotics before epidural does not reduce risk of developing fever
Risk of Cesarean Deliveries and Operative Deliveries

- Risk of cesarean delivery is NOT increased
- Risk of operative delivery IS increased
Preeclampsia

- Generally safe and well tolerated
- Reduction if circulating catecholamines during labor may make BP easier to control after epidural or CSE
- Severe PreE has protective effect against developing hypotension after spinal anesthesia. When present, it is less frequent and less severe.
- Fluid associated risk of pulmonary edema
- Thrombocytopenia associated with HELLP > same threshold of > 70,000
- Avoidance of general anesthesia if C/S becomes necessary
  - Very difficult airway – edema of soft tissues
  - Hypertensive response
  - Stroke & heart failure
Emergent C/S

- If has a working epidural: bolus dose of high-concentration local anesthetic into epidural catheter
  - Median time to achieve T4 dermatome level using lidocaine is 10 minutes
  - Bupivacaine takes a few minutes longer
  - <6% failure rate

- If no epidural:
  - Spinal
    - In expert hands, spinal time from positioning to satisfactory block = 8 minutes
  - GETA
    - 2 minutes + 3 minutes of preoxygenation
Analgesia after a C/S

- If using spinal/epidural anesthesia, postop analgesia is optimally achieved by local anesthetic
  - Morphine sometimes used, 12-24 hrs of postop analgesia, adverse effects
- Local anesthetic may be used in a few different ways:
  - Infiltrating the incision
  - Nerve block (ilioinguinal or iliohypogastric)
  - Transversus abdominis plane block (TAP block)
Transversus Abdominis Plane (TAP) Block
Breastfeeding

- Oxycodone doses > 30mg/day are not recommended in breastfeeding women
  - 5-10 mg q 4 hrs = 60 mg /day
- Monitor infants for drowsiness, sedation, feeding difficulties, limpness
Heparin or LMWH

- SQ unfractionated heparin dose of 5,000 U BID is not a contraindication to neuraxial techniques
- If patient has been taking unfractionated heparin for > 4 days, check Plt
- Prophylactic LMWH: 12 hrs after last dose
- Therapeutic LMWH: 24 hrs after last dose
- May resume LMWH > 4 hrs after catheter removal
- May resume unfractionated heparin >1 hr after catheter removal
When is it appropriate to obtain an anesthesia consultation?
References

- Practice Bulletin 209, Obstetric Analgesia and Anesthesia
- Practice Bulletin 207, Thrombocytopenia in Pregnancy
Questions?