Clinical Conundrums of Epidural Anesthesia
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Disclosure

No relevant relationship with any commercial interest

No relevant financial relationships that would bias or compromise the presentation of these materials

No off-label use of medications

Deficiencies in Clinical Practice

• Technical
  * Poor appreciation of anatomy
  * Insufficient training / experience
  * Inappropriate aseptic technique

• Administrative
  * Early discharge from hospital
  * Insufficient follow-up

Mistake Poor Outcome

Negligence

* Injury must be proven to be due to failure to act appropriately

Claims Paid

AANAF Study

<table>
<thead>
<tr>
<th>Appropriate care</th>
<th>Inappropriate care</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2,866</td>
<td>$45,000</td>
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</table>
Trends in OB Claims

- 300% increase in C/S rate
- Higher proportion of regional anesthetics
  - Increased incidence of failed/problem epidurals
- Increase in obesity
  - 50% pregnant women obese/morbidly obese
  - Increased % of claims obese group

OB Closed Claims

- More OB claims ... minor injuries
- Expectation for 'perfect' ('Baby Channel')
- Higher payments to OB
- 2 pts @ risk
- Emotionality of jurors

<table>
<thead>
<tr>
<th>OB Closed Claims</th>
<th>1970s</th>
<th>2005</th>
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</thead>
<tbody>
<tr>
<td>n=94</td>
<td>n=310</td>
<td></td>
</tr>
<tr>
<td>30% Maternal death</td>
<td>12% Maternal death</td>
<td></td>
</tr>
<tr>
<td>12% Headache</td>
<td>14% Headache</td>
<td></td>
</tr>
<tr>
<td>11% Nerve damage</td>
<td>20% Nerve damage</td>
<td></td>
</tr>
<tr>
<td>10% Maternal brain damage</td>
<td>6% Maternal brain damage</td>
<td></td>
</tr>
<tr>
<td>9% Aspiration</td>
<td>1% Aspiration</td>
<td></td>
</tr>
<tr>
<td>6% Emotional distress</td>
<td>18% Emotional distress</td>
<td></td>
</tr>
<tr>
<td>3% Back pain</td>
<td>10% Back pain</td>
<td></td>
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</table>
Aseptic Technique

- Infections are rare …
  … but disastrous !!
  … highly publicized !!
  “Dateline”, “60 Minutes”
- Gloves, mask, cap
  … Gown +/-
- Impeccable sterile technique

“Iffy” LOR

- Paraspinous muscle
- Wet glove talc = ‘glue’
- Blood clot in epidural needle
Inadvertent Epidural Injection of Non-local Anesthetic

- Main source of error:
  - Syringe swap, ampule error, epidural/IV catheter confusion
- No treatment!
- Prevention!

- Ephedrine/Neosynphrine
- Muscle relaxants
- Antibiotics
- Pitocin
- Propofol !!!


Color Coding

- Not clinically proven to prevent errors
- Growing concern by FDA, JCAHO, and Institute of Safe Medication Practices (ISMP)
- American Standard for Testing Materials (ASTM) ... ‘User Applied Drug Labels in Anesthesiology’ ... still allows grouping of like drugs by color
**Color Coding**

- May actually contribute to medication errors
  - Clinicians rely on color only... fail to **actually read** the lettering on the label
  - (red labels) *cisatracurium*... *succinylcholine*
  - (violet labels) *epinephrine*... *phenylephrine*

- Other problems:
  - Color blindness
  - Subtle distinctions in color
  - Difficulty with contrast in the background
  - Dark/poorly lit anesthetizing locations

**TALLman Labeling**

- Use of TALLman letters on labels, rather than color
- FDA requires TALLman lettering where words look alphabetically similar (generic drugs)

**Pregnancy Lordosis**

- No sig. difference in cephalic spread

**Position**

- No sig. difference in cephalic spread
Pregnant/Obese ... more cephalic spread

Normal

Ligamentum Flavum

"Disappearing" Catheter
**Clinical Frequency**

- 'Wet Tap' rate proportional to frequency of performing technique
- <5-10/month have particularly high 'wet tap' rate

Do NOT reinject CSF ... air

Air Encephalogram

Pass epidural catheter?
- Labor (-)
- C-Section (+)
- Spinal dosing
- Remove after case
  - Duramorph, IV analgesia
  - May improve dura healing

Replace at different level
- 80% still need blood patch
- 2nd wet tap
- LA enters dura rent??

Pull back needle to no CSF; pass catheter (-)
Arachnoid granulation (villus)

Epidural space

Epidural Spread

Epi. Fat
(several minutes later)

3cc + 5cc
(i.e., "test + base dose")

Osteoarthritic Changes

Young adult Elderly adult

Normal filling of intervertebral foramina ...

exposure to nerve roots
- Greaser tissue becomes more dense and firm... seals intervertebral foramina.
- Dura more permeable to L.A.?

Incomplete Block - Labor -
- Failure rate ~ 2-5%
- Inadequate block ~ 10-15% ... up to 42% in obese patients
Incomplete Block
- Labor -

- Cause ??
  - obstruction in epidural space (fat, connective tissue)
  - anatomy
  - “too much catheter”
  - patient position

Incomplete Block
- Labor -

- Treatment
  - pull catheter back 1-2 cm; redose
  - inject larger volume of dilute LA
    - late labor: increase concentration of LA
      (0.375% bupivacaine; 1.5% lidocaine)
  - add opioid +/- (may mask poor spread)
  - if no S&S of block: replace catheter
    - may require multiple replacements

  Do not try to convince yourself a block exists!
Unilateral Catheter

5 cc ... tip at intervertebral foramen / psoas muscle
10 cc ... fills epidural space

"Anterior Septum"

"Patient c/o Pain"

- Level of block
  - has it receded?
  - is it bilateral?

- Status of labor
  - has patient progressed? Pitocin
  - dilation / effacement / position / presentation

- Bladder
  - "preload"

Pain + Loss of Level

- If level of block has receded ... repaint the fence
- 5-8cc bupivacaine (0.125%-0.25%) usually adequate
  * may require more volume to 'reestablish' block
Pain + No Loss of Level
- Adequate level, evidence of block ...
  - Full bladder, progression of labor, etc
  - Increase density
  - Add opioid?
  - Consult with obstetrician

Miscellaneous Causes of Pain
- Asynclitic presentation
- Abruptio placenta

Miscellaneous Causes of Pain
- Asynclitic presentation
- Abruptio placenta
- Ruptured uterus

OMG
- 32 yo G3P2 39-2 weeks
- Uneventful spontaneous labor / SROM
- Existing LEA x 8 hours
- NRFS
- Dose for "Emergent" CS
  - 0.5% Bupivacaine
    - 5mL + 5mL + 5mL + 5mL ... over 8 minutes
- Sudden onset seizure
  - followed by asystole
Differential Diagnosis

• Bupivacaine toxicity
  • Airway management
  • Seizure suppression … Benzodiazepine
  • BCLS/ACLS
  • Difficult to control arrhythmias
    … Lidocaine NOT indicated
    … Amiodarone (antiarrhythmic) ok
  
  Fetal Asystole !!

Lipid Rescue

• Exogenous lipid provides an alternate source of binding for the lipid soluble LA

Lipid Rescue

• Lipid emulsion (20% Intralipid)
  • 1.5 mL/kg (lean body mass) over 1 minute (~100 mL)
    • Repeat x2 at 3-5" intervals
  • 0.25 mL/kg/min infusion until hemodynamically stable (~18 mL/min)
    • Max dose: 10 mg/kg over 30"

• Propofol NOT appropriate … dose too high … hypotension

Instruction (dosing) card attached to bag/bottle of lipid emulsion
• 27yo G2, P1, 38 wks gestation
• 148kg; 157cm (BMI 60 kg/m²)
• PROM
• Pitocin augmentation

• Uneventful LEA(T10) x ~6 hours
  ... then no sensory / no motor block
  ... catheter dislodged

• 9 cm dilated ... replaced with CSE
  • 500 ml IV preload
  • Planned spinal dose ...
    • Bupivacaine (plain): 2 mg (0.8 ml)
    • Sufentanil: 10 μg (0.2 ml)
  • CSE +5 minutes
    • T8 sensory block
    • No sig. motor block

• OMG
  • CSE +10 minutes
    • Non responsive to verbal commands
    • RR ... 4-6/min, very shallow
    • Faint pulse ... ~30/min
    • BP / PaO₂ not obtainable
    ... proceeds to asystole

• OMG
  • Resuscitation
    • Left tilt
    • Chest compressions
    • Assisted mask ventilation ... 100% O₂
    • Lactated Ringers bolus
      • Atropine: 1 mg
      • Ephedrine: 40 mg
• Arrest +4 minutes
  • ECG ... sinus 110 bpm
  • SBP ... 80-90 mmHg
  • PaO₂ ... 80-85%; 96-98%
  • Minimal respiratory effort
    - Naloxone: 0.4 mg (IV)

• Arrest +6 minutes
  • RR ... ~30/min, TV ~200 mL
  • Strong extremity (arm) movement
  • Hemodynamically stable
  • FHR acceptable w/ good variability
    - Proceed to SVD

• Differential diagnosis:
  • “High block”
    - Suspicious onset ... 10” after SAB
    - Low dose bupivacaine
    - Isobaric solution ... no rostral spread
      - No motor loss (upper extremity)
  • Respiratory depression
    - Spinal sufentanil
      - ... typically more gradual
    - Reversed easily with vent, O2, naloxone

• Sufentanil
  • Desired dose ... 10 μg* (0.2mL)
  • Supplied as 50 μg/mL

* Sufentanil dose reduced (50%) in obese pt
  ... now use ≤5 μg (fentanyl 10-15 μg)
- Drew sufentanil to 0.2 mL syringe mark
- Drew bupivacaine dose (0.8 mL)...
  - Also drew residual (0.4 mL) sufentanil in filter straw
- Total sufentanil dose ... 0.6 mL (30 μg)
- Total bupivacaine dose ... only 0.4 mL (1.0 mg)