Complications of Neuraxial Anesthesia –

“An Ounce of Prevention is Worth a Pound of Cure”

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Conflict of Interest Disclosure Statement

I have no financial relationships with any commercial interest related to the content of this activity.
Liability Associated with Obstetric Anesthesia

A Closed Claims Analysis


Median payment - 455K v 222K
Post Dural Puncture Headache (PDPH)

- **Postural component**

- Frontal and/or occipital

- Typically bilateral

- Associated symptoms:
  - Nausea (60%)
  - Ocular/auditory changes (13%)
    - CN palsy (VI)

http://ihsclassification.org/en/02_klassifikation/03_teil2/07.02.01_nonvascular.html
PDPH - Etiology

- Results from CSF leaking from a dural opening

- Normal - 150 ml total – 75 above/75 below

- In volunteers – removal of 10% (ie - 15 ml) results in a PDPH

PDPH - MRI

- diffuse edema of the meninges
- cerebral venous dilation
- subdural fluid collections
- enlargement of the pituitary gland
- *downward displacement of the brain – mechanical traction on CN & pain structures*

95 women with H/A > 24 hrs (2000-2005@UCMC) Mean onset H/A~3.4 days

Cause:
- Tension – type n=37 47%
- Preeclampsia/eclampsia n=23 24%
- Spinal headache n=15 16%
- Migraine n=10 11%
- Cerebral venous thrombosis n=3 3%
- Subarachnoid hemorrhage n=1 1%
Risk factors

- Age – rarely see <10 y.o. and > ~ 70 y.o.
- Gender – F > M
- Pregnant > non-pregnant
- BMI – non-obese > obese
- Size and configuration of needle
<table>
<thead>
<tr>
<th>Differential Diagnosis</th>
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</thead>
<tbody>
<tr>
<td><strong>Meningitis</strong></td>
</tr>
<tr>
<td>• Fever</td>
</tr>
<tr>
<td>• Leukocytosis</td>
</tr>
<tr>
<td>• Nuchal rigidity</td>
</tr>
<tr>
<td>• Lethargy</td>
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<tr>
<td>• Altered mental status</td>
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<tr>
<td><strong>Delayed Onset</strong></td>
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<tr>
<td><strong>Preeclampsia</strong></td>
</tr>
<tr>
<td>• Hypertension/proteinuria</td>
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<tr>
<td><strong>Intracranial</strong></td>
</tr>
<tr>
<td><strong>Pathology</strong></td>
</tr>
<tr>
<td>• Space occupying lesion</td>
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<tr>
<td>• Subdural hematoma</td>
</tr>
<tr>
<td>• Subarachnoid hemorrhage</td>
</tr>
<tr>
<td>• Cortical vein thrombosis</td>
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<tr>
<td>• Pseudotumor cerebri</td>
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</tbody>
</table>
Spinal Needle – Structure and Size

- Needle tip configuration
- ↓ needle size - ↓ incidence of PDPH
  - Much less a factor with pencil point
  - PDPH rate is same 22g – 24g Sprotte
Dural anatomy

Epidural Needle - Accidental dural puncture

115 accidental dural punctures were randomized to 3 groups:

a. Immediately resite epidural catheter
b. Pass an intrathecal cath with removal at delivery
c. Pass an intrathecal cath with removal at 24 hours
Epidural Needle - Accidental dural puncture

Incidence of PDPHA:

a. 91% resite group

b. 51% remove at delivery group

c. 6% remove at 24 hr group

Infectious complications
Medication errors

Converting to spinal after accidental dural puncture did not ↓HA or EBP

- 1/3 of resite patients received another ADP!!

Leave the catheter in SAB space:

↓ chance of a 2\textsuperscript{nd} ADP and provides rapid analgesia
Loss of resistance technique - AIR

- 3730 epidurals used LORT with air or saline
- If dural puncture occurred (~100) – a CT was done
  - 67% HA in air group
  - 10% HA in saline group

*supraspinal intrathecal air bubbles* were found in 78% of those with PDPH

Epidural Blood Patch

EPIDURAL BLOOD PATCH

• Efficacy
  – Single patch = 75-90% within 48h
  – Reconsider Dx after 2 failed blood patches

• Technique
  – At or below lowest dural rent
  – 15 – 20 mL or until discomfort
  – Supine x 2h
  – Stool softeners
The Volume of Blood for Epidural Blood Patch in Obstetrics: A Randomized, Blinded Clinical Trial

Michael J. Paech, DM,* Dorota A. Doherty, PhD,†‡ Tracey Christmas, FRCA,§ Cynthia A. Wong, MD,|| and Epidural Blood Patch Trial Group

15 v 20 v 30 ml volume

20 ml more effective than 10 ml or even 30 ml
EBP- Timing

- 71% failure rate when EBP < 24 hr after dural puncture
- 4% failure rate when EBP > 24 hr after dural puncture

Optimal timing of EBP appears to be > 24 hr in a symptomatic patient

Treatment

**Conservative 0-24 hr**
- Bed rest
- Oral analgesics
- Aggressive hydration
- Caffeine
- Observe for s&s infection, neuro deficits, extreme neck stiffness, HTN

**Invasive > 24 hr**
- Epidural blood patch
- Sphenopalatine ganglion block

Anaesthesia, 2009;64: 574–575.
Peripheral Nerve Injury

- Most common neurologic complication after labor
- Incidence 1:100-1:3000
- Associated with
  - Nulliparity
  - Prolonged labor
  - CPD
  - Non-vertex fetal presentations
  - Instrumented delivery

IJOA 2002;11:85-90
Obstet Gynecol 2003;101:279-88
Obstetric Nerve Injury

- Compression / stretching of nerve

- Intra-pelvic
  - Gravid uterus – 3rd trimester
  - Fetal passage – during labor

- Extra-pelvic
  - 2nd stage hip flexion
  - Hematoma
Anesthesia Related Neuropathy

- Direct
  - Needle trauma
  - Compression r/t hematoma or abscess
  - Injection of toxic substance

- Indirect
  - Positioning
Neurologic Deficits

- **Peripheral**
  - Nerve root to ending
  - Usually unilateral
  - Single nerve distribution
  - Crosses a dermatome

- **Central**
  - Spinal cord to nerve root
  - Usually bilateral
  - Dermatome distribution
  - Crosses a peripheral nerve
Aseptic Technique

Doc called infection source

Anesthesiologist treated women who caught meningitis

By Holly Zachariah
THE COLUMBUS DISPATCH

The anesthesiologist who treated two women who gave birth May 21 at Mary Rutan Hospital in Bellefontaine was the likely source of the bacterial meningitis that killed one of the women, the Ohio Department of Health said yesterday.

Neither the hospital nor state officials would name the doctor, but Mary Rutan President and CEO Mandy Goble said the anesthesiologist had voluntarily stopped practicing there during the investigation.

It already had been disclosed that he had not worn a mask during the procedures, something hospital officials had said was in keeping with standard practices at other facilities.

Susan Ryan Finch Simpson, 30, died one day after giving birth to a daughter at Mary Rutan. She had been transferred to Riverside Methodist Hospital in Columbus once she showed signs of sickness. Another woman who gave birth the same day also was transferred to Riverside in critical condition. Both babies were born healthy.

Officials have said both women had *streptococcus salivarius* bacteria commonly found in the mouth and respiratory tract. The women had identical strains, which meant it came from the same, single source.

While that same genetic link hasn't been made on the sample provided by the doctor pending further testing by the Centers for Disease Control and Prevention, health officials have drawn a conclusion anyway, said Kristopher Weiss, spokesman for the state health department.

“Based on the survey of the maternity ward, this lab evidence and the epidemiological investigation, we can say the person in the hospital who was tested was the likely source of the infection,” Weiss said.

Simpson's family, as well as their attorney, declined to comment.

See INFECTION Page B2
Aseptic technique

- WASH HANDS FIRST
- Remove watch – rings less clear
- Insufficient data to recommend a sterile gown
- Mask is important - especially if operator is infected

Hebl J. The importance and implications of aseptic techniques during regional anesthesia. Reg Anesth 2006;31:311-323
Skin prep

Consensus position of ASRA, ASA, and AANA:

“Chlorhexidine-based solutions should be considered the antiseptic of choice for regional anesthesia”

Reg Anesth 2006;31:311-323
Skin prep
Neurologic Complications

- > 12,000 SABs from 2006-2010
- 57 neuro complications (0.46%)
- SAB - ? etiology in 5 complications (0.04%)

Normal neuro complication rate following SAB

Syiggum, HP Reg Anesth Pain Med 2012
Chlorhexidine

“However, in the absence of clinical or extended animal investigations examining the neuro-toxic potential of chlorhexidine, the FDA has chosen not to formally approve its use for skin antisepsis before lumbar puncture.”
Anatomical Abnormalities

- Difficult identification of landmarks
  - Morbid obesity
  - Scoliosis
  - Previous back surgery

"unable to palpate or visualize bony midline or lateral landmarks"
Morbid obesity

- BMI ≥ 40 = morbid obesity in pregnancy
- MO = ASA 3 (healthy pregnancy is a 2)

↓ FRC
# Obesity – Risks and Complications

<table>
<thead>
<tr>
<th></th>
<th>Morbidly Obese (%)</th>
<th>Control (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaginal delivery</td>
<td>38</td>
<td>76</td>
</tr>
<tr>
<td>Cesarean section</td>
<td>62</td>
<td>24</td>
</tr>
<tr>
<td>Labor requiring C/S</td>
<td>48</td>
<td>9</td>
</tr>
<tr>
<td>Emergency C/S</td>
<td>32</td>
<td>9</td>
</tr>
<tr>
<td>Operative time &gt; 60 min</td>
<td>48</td>
<td>9</td>
</tr>
<tr>
<td>Prolonged delivery interval</td>
<td>25</td>
<td>4</td>
</tr>
</tbody>
</table>

Anesth Analg 1993;79:1210-8  
## Obesity – Risk for C/S

<table>
<thead>
<tr>
<th>BMI</th>
<th>Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>0</td>
</tr>
<tr>
<td>21-30</td>
<td>0.3</td>
</tr>
<tr>
<td>31-40</td>
<td>31.6</td>
</tr>
<tr>
<td>41-50</td>
<td>77.6</td>
</tr>
<tr>
<td>51-60</td>
<td>94.0</td>
</tr>
<tr>
<td>&gt;60</td>
<td>97.5</td>
</tr>
</tbody>
</table>
Morbid Obesity Predicts Difficulty?

- 427 patients
  - BMI
  - Ability to palpate
  - Ability to flex
  - Experience of practitioner

# of passes and total time required

AA 2009;109:1225-31
Anatomical Determinants
Patient Selection

- Difficult identification of landmarks
  - Scoliosis

“unable to palpate or visualize bony midline or lateral landmarks”
Scoliosis – Lateral Deformity
Scoliosis – Rotational Defect

The needle should be directed toward the *convexity* of the scoliotic curve (hump) as it is advanced from the interspinous space.
Rotational Deformity
rib-hump

Spinous process deviated to concave side

Convex side

Concave side
What about?
Previous spinal surgery

- Scar tissue
- Adhesions or obliteration of the epi space

*can block spread or increase the risk of dural puncture*
Spinal fusion and/or hardware

Consult early

- Careful examination of anatomy
- Look at radiological studies
- Obtain OP reports
- Neurological examination for persistent numbness, weakness, pain
- Documentation of pre-anesthetic interview- including risks, benefits, and alternatives
- Including, but not limited to:
  - Poor analgesia
  - Difficult, painful insertion
  - PDPH that is difficult or impossible to treat
- SAB may be preferable to an EPI
Epidural can be given below the L4 or above the L3 levels during labor.
Previous spinal surgery
What to do?

1. Place block above or below the surgical site
2. Place early to allow for increased pt cooperation and time to troubleshoot
3. CSA – place an intrathecal catheter with standard EPI equipment
4. Use multiple serial SAB’s
OB CSAs – Intrathecal Macrocatheeters

- 761 CSA placements 2001-2012
  - 653 after ADP
  - 108 intentional (obesity, difficult placement)

- No serious complications reported

*PDPH rate 41%*
Spinal fusion and/or hardware

- Positioning both during and after the block may be difficult

- Performing the neuraxial anesthesia technique could be very difficult, or in some cases, technically impossible

Instruct the patient and staff to be meticulously careful when moving and positioning - so as not to aggravate a pre-existing injury

What about – Tattoos

- Avoid the tattoo if possible
- Contraindicated if the affected skin is still healing
- Ink fragments present in 22g needles

Questions?

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