MANAGEMENT OF THE PARTURIENT WITH COMORBID NEUROLOGICAL DISEASE - PATHWAYS TO SUCCESS

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DISCLOSURES

I have no conflicts of interest
I am NOT a neurologist

I am married to a neurologist

Dr. Lee Schwamm
WHY THIS TOPIC?

- Individual neurologic diseases are rare, but parturients with neurologic comorbidities are common

- Neuraxial are the techniques of choice for labor analgesia and cesarean delivery anesthesia

- Co-existing neurologic disease can impact eligibility for neuraxial anesthesia or general anesthesia (usual care)

- Knowing basic principles facilitates anesthetic choice

“Afflictions of the central nervous system and spinal column are contraindications”
Neuraxial Blockade in Patients with Preexisting Spinal Stenosis, Lumbar Disk Disease, or Prior Spine Surgery: Efficacy and Neurologic Complications

James R. Hebl, MD,* Terese T. Horlocker, MD,* Sandra L. Kopp, MD,* and Darrell R. Schroeder, MS†

N = 937

61% radiculopathy

20% stenosis

22% h/o surgery

19% peripheral neuropathy

22% h/o surgery

21% laminectomy
1% diskectomy
0.5% spinal fusion
Increase neurological complications secondary to surgery, anesthetic technique or natural history of disease?

Conclusions

- **No Effect on Outcomes**
  - 97.1% vs. 97.6% efficacy
  - No difference in technical or neurological complications

- **Risk Complications**
  - 3.3% vs. 0.53%; $P = 0.005$
  - 60% nonsurgical etiology

- 22% h/o surgery

- 19%
OBSTETRICS VS. NON-OBSTETRICS

• Epidural Complications: 1:25,000 vs 1:3,600 (P < 0.0001)  
  Moen, et al. Anesthesiology, 2004

• Epidural/Spinal Hematoma:
  • 1:200,000 vs. 1:3,600 (P < 0.0001)  Moen, et al. Anesthesiology, 2004
  • 0:79,837 vs. 7:62,450 (P = 0.003)  Bateman, et al. Anesth Analg, 2013

• Back pain: ~40% OB patients  Breen, et al. Anesthesiology, 1994
THE SPINAL NEURAXIAL SPACE

1. Intervertebral disc
2. Vertebral body
3. Dura mater
4. Extradural or epidural space
5. Spinal cord
6. Subarachnoid space

“Catheter tips were most often found lateral to the dura in the intervertebral foramen.”

Quinn Hogan, Anesthesiology. 1999
IDENTIFYING THE LUMBAR LEVEL

Anesthesiologists correctly identify the level: 29-37% of the time!

Incidence of marker placements by ultrasound and palpation

KEY QUESTIONS

• What is/are the primary lesion(s)
• Will we hurt the lesion
  • Are the nerves abnormal
• Will the lesion hurt us
• How do we approach the patient
WHEN BAD THINGS ARE IN GOOD PLACES: DISK DISEASE

• Spread of contrast material during epidurograms with (even) uncomplicated disease is abnormal

• Success rate in these patients is high, even after surgery

• Most significant additional risk may be positioning injuries

• If new, significant deficits post-partum, then consider expert consultation +/- imaging as needed

WHEN BAD THINGS ARE IN GOOD PLACES

Syrinxes & Cysts

Vascular Lesions & Tumors

WHEN BAD THINGS ARE IN GOOD PLACES: SPINA BIFIDA OCCULTA

Failure of bony vertebrae to enclose the neural elements

- Incidence: 1/1,400-1,500 newborns in U.S.

- Spina Bifida Occulta
  - Minor defect, >20% of population
  - No herniation of neural tissues
  - Usually defect of single vertebrae
  - Typically candidate for neuraxial although placement at level of defect may theoretically lead to “wet tap”

WHEN BAD THINGS ARE IN GOOD PLACES: SPINA BIFIDA CYSTICA

If not surgically corrected, then NOT candidate for neuraxial anesthesia

WHEN BAD THINGS ARE IN BAD PLACES:

http://radiopaedia.org/cases/neurofibromatosis-type-1-5
KEY QUESTIONS

• What is/are the primary lesion(s)
• Will we hurt the lesion
  • Are the nerves abnormal
• Will the lesion hurt us
• How do we approach the patient
“DOUBLE CRUSH” HYPOTHESIS

Two low grade insults may be worse than a single site insult

Distal Denervation = DOUBLE CRUSH

= Normal

= Mild injury, single site

= Mild injury, two sites (x1 & x2)

= Severe injury, single site (X)

= Diffuse preexisting underlying neurologic disease

MULTIPLE SCLEROSIS IN PREGNANCY

- Pregnancy does not seem to affect disability progression
- Delivery mode, obstetrical complications, epidural analgesia and breast feeding do not affect postpartum relapse rate
- MS does not appear to confer higher risk of obstetric or neonatal complications

<table>
<thead>
<tr>
<th>Study First Author, Year</th>
<th>Study Design</th>
<th>Total Patients (n)</th>
<th>Neuraxial Analgesia</th>
<th>Early Postpartum Relapse Rate</th>
<th>Association of Relapse with Neuraxial Block</th>
<th>Short-Term Complications Related to Neuraxial Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achiron, 2004</td>
<td>RCT</td>
<td>108</td>
<td>79.6%</td>
<td>Varied by group because of drug</td>
<td>None</td>
<td>None reported</td>
</tr>
<tr>
<td>Bader, 1988</td>
<td>Case series</td>
<td>32</td>
<td>14 (44%) 13 (40%)</td>
<td>9 (28%)</td>
<td>Potentially greater risk with higher local anesthetic concentration</td>
<td>No higher incidence</td>
</tr>
<tr>
<td>Confavreux, 1998</td>
<td>Case series</td>
<td>223 (227 pregnancies)</td>
<td>41 (18%)</td>
<td>63 (28%)</td>
<td>No</td>
<td>None reported</td>
</tr>
<tr>
<td>Crawford, 1985</td>
<td>Case report</td>
<td>50 non-OB + 7 OB</td>
<td>57</td>
<td>1 (2%)</td>
<td>None</td>
<td>None reported</td>
</tr>
<tr>
<td>Dalmas, 2003</td>
<td>Case series</td>
<td>19</td>
<td>10 (53%)</td>
<td>5 (26%)</td>
<td>None</td>
<td>None reported</td>
</tr>
<tr>
<td>Finkelsztejn, 2011</td>
<td>Meta-analysis</td>
<td>1221</td>
<td>-</td>
<td>0.758 relapses/year</td>
<td>Not analyzed</td>
<td>Not analyzed</td>
</tr>
<tr>
<td>Kytta, 1984</td>
<td>Case series</td>
<td>56</td>
<td>3 (5%)</td>
<td>2 (3.5%)</td>
<td>Not reported</td>
<td>None reported</td>
</tr>
<tr>
<td>May, 2008</td>
<td>Case series</td>
<td>10</td>
<td>4 (40%)</td>
<td>1 (10%)</td>
<td>Not analyzed</td>
<td>None reported</td>
</tr>
<tr>
<td>Pasto, 2012</td>
<td>Case series</td>
<td>349 pregnancies</td>
<td>65 (18.5%)</td>
<td>Mean = 0.45</td>
<td>None</td>
<td>None reported</td>
</tr>
<tr>
<td>Vukusic, 2004</td>
<td>Case series</td>
<td>227</td>
<td>42 (18.9%)</td>
<td>67 (28%)</td>
<td>No, but not design to assess the risk</td>
<td>None reported</td>
</tr>
<tr>
<td>Wang, 1999</td>
<td>Case report</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>None</td>
<td>None reported</td>
</tr>
<tr>
<td>Warren, 1982</td>
<td>Case report</td>
<td>1 (2 pregnancies)</td>
<td>2</td>
<td>1</td>
<td>None</td>
<td>7 weeks hypoesthesia right leg</td>
</tr>
</tbody>
</table>
KEY QUESTIONS

- What is/are the primary lesion(s)
- Will we hurt the lesion
  - Are the nerves abnormal
- Will the lesion hurt us
- How do we approach the patient
APPLIANCES

- Why are they there?
  - Are they currently functional?
KEY QUESTIONS

• What is/are the primary lesion(s)
• Will we hurt the lesion
  • Are the nerves abnormal
• Will the lesion hurt us
• How do we approach the patient
STRATEGIES

• Informed Consent
  • Assess patient’s motivation for neuraxial anesthesia
  • Show them the data

• Consider using ultrasound
INTRACRANIAL CONTENTS

Leffert. Anesthesiology, 2013
INTRACRANIAL VOLUME: MONRO-KELLIE DOCTRINE

\[ V_{\text{Blood}} + V_{\text{Brain}} + V_{\text{CSF}} = V \]
INTRA CRANIAL VOLUME/PRESSURE
## CLUES FOR INCREASED ICP

**Table 1. Features Associated with ICP**

<table>
<thead>
<tr>
<th>Clinical Features</th>
<th>Radiologic Features on CT or MRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupillary changes or asymmetry</td>
<td>Tense dura</td>
</tr>
<tr>
<td>Eye movements abnormalities</td>
<td>Flattened gyri</td>
</tr>
<tr>
<td>Papilledema</td>
<td>Narrowed sulci</td>
</tr>
<tr>
<td>Hemiparesis</td>
<td>Effaced cisterns</td>
</tr>
<tr>
<td>Facial weakness</td>
<td>Compressed (or in obstruction, dilated) ventricles</td>
</tr>
<tr>
<td>New onset seizure</td>
<td>Lateral shift of midline structures</td>
</tr>
<tr>
<td>Decreased level of consciousness</td>
<td>(If advanced): displacement of brain tissue from one compartment to another</td>
</tr>
</tbody>
</table>

*CT = computed tomography; ICP = intracranial pressure; MRI = magnetic resonance imaging*

Leffert. Anesthesiology, 2013
Does increased ICP always mean a contraindication to neuraxial?
PHYSIOLOGIC PERTURBATIONS IMPACTING ICP

- Systole
- Inspiration
- Pregnancy
- Contractions
- Valsalva

Transient Increased ICP
IMPACT OF EPIDURAL ANALGESIA/ANESTHESIA ON ICP

Patient with elevated baseline ICP

A

Patient with normal baseline ICP

B

Hilt et al. BJA, 1986

10 mL injection of bupivacaine
INCREASED INTRACEREBRAL BLOOD VOLUME
BENIGN INTRACRANIAL HYPERTENSION

33 yo obese primip with headache and visual field defect

Alperin et al. AJNR, 2013
Does normal ICP always imply low risk of herniation after dural puncture?
ARNOLD CHIARI MALFORMATION

• Elongation and descent of cerebellar tonsils by $\geq 5$mm through foramen magnum
  - Type 1 (ACM-I) most common-spectrum of asymptomatic or have headache, ataxia, and/or sensorimotor impairment of extremities.

• May or may not have static and dynamic obstruction to CSF flow across the foramen magnum

Semple et al. Anesthesiology, 1996
<table>
<thead>
<tr>
<th>Source</th>
<th>Type</th>
<th>Case (n)</th>
<th>Diagnosis Status</th>
<th>Surgical Correction</th>
<th>Anesthetic Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chantigian et al. J Clin Anesth, 2002</td>
<td>ACM-1</td>
<td>9</td>
<td>4 Undiagnosed 5 Diagnosed</td>
<td>0/9</td>
<td>1 PDPH requiring blood patch 8 reported none</td>
</tr>
<tr>
<td>Landau et al. Anest Analg, 2003</td>
<td>ACM-1</td>
<td>1</td>
<td>Diagnosed</td>
<td>1/1</td>
<td>None</td>
</tr>
<tr>
<td>Kuczkowski et al. Can J Anest, 2002</td>
<td>ACM-1</td>
<td>1</td>
<td>Diagnosed</td>
<td>0/1</td>
<td>None</td>
</tr>
<tr>
<td>Mueller and Oro. Am J Perinat, 2005</td>
<td>ACM-1</td>
<td>4</td>
<td>All diagnosed</td>
<td>3/4</td>
<td>1 reported neck pain/spasm 3 reported none</td>
</tr>
<tr>
<td>Hullander et al. Anest Analg, 1992</td>
<td>ACM-1</td>
<td>1</td>
<td>Undiagnosed</td>
<td>0/1</td>
<td>HA and neck pain requiring blood patch</td>
</tr>
<tr>
<td>Semple and McClure. Anaesth, 1996</td>
<td>ACM-1</td>
<td>1</td>
<td>Undiagnosed</td>
<td>0/1</td>
<td>None</td>
</tr>
<tr>
<td>Nel et al. BJA, 1998</td>
<td>ACM-1</td>
<td>1</td>
<td>Diagnosed</td>
<td>0/1</td>
<td>None</td>
</tr>
<tr>
<td>Parker et al. Am J Perinat, 2002</td>
<td>ACM-1</td>
<td>1</td>
<td>Diagnosed</td>
<td>0/1</td>
<td>None</td>
</tr>
<tr>
<td>Newhouse and Kuczkowski. Arch Gynec Obstet, 2007</td>
<td>ACM-1</td>
<td>1</td>
<td>Diagnosed</td>
<td>0/1</td>
<td>None</td>
</tr>
<tr>
<td>Choi and Tygaraj. Case Report Anesth, 2013</td>
<td>ACM-1</td>
<td>1</td>
<td>Diagnosed</td>
<td>0/1</td>
<td>None</td>
</tr>
<tr>
<td>Sathi and Stieg. Neurosurgery, 1993.</td>
<td>ACM-1</td>
<td>1</td>
<td>Undiagnosed</td>
<td>0/1</td>
<td>PDPH requiring blood patch</td>
</tr>
</tbody>
</table>
Does the pt have known intracranial pathology?

Yes

Is the pt exhibiting features associated with increased ICP?

No

Is the tumor small or slow growing?

Yes

Is tumor located far away from CSF pathways (e.g. 3rd ventricle, cerebral aqueduct, foramen magnum?)

Yes

MAY BE REASONABLE TO PROCEED WITH NEURAXIAL ANESTHESIA

Patient is likely minimal to no risk of herniation from dural puncture
Does the pt have known intracranial pathology?

Yes

Is the pt exhibiting features associated with increased ICP?

Yes

Is the tumor small or slow growing?

No

Is there significant mass effect with or without midline shift?

Yes

Is tumor located far away from CSF pathways (e.g., 3rd ventricle, cerebral aqueduct, foramen magnum?)

No

DO NOT PROCEED WITH NEURAXIAL ANESTHESIA

Patient is likely at high risk of herniation from dural puncture
When neuraxial anesthesia poses a risk of herniation, is general anesthesia always better?
## EFFECTS OF GENERAL ANESTHESIA ON ICP

<table>
<thead>
<tr>
<th>Anesthetic Agents/Maneuvers</th>
<th>OB-Oriented</th>
<th>Neuro-Oriented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid Sequence Induction</td>
<td>↑↑</td>
<td>↓↑</td>
</tr>
<tr>
<td>Volatile Agents (pre-delivery)</td>
<td>↑↑</td>
<td>↓</td>
</tr>
<tr>
<td>IV Agents (pre-delivery)</td>
<td>↓↓</td>
<td>↑↑</td>
</tr>
<tr>
<td>Hyperventilation</td>
<td>↓↓</td>
<td>↑</td>
</tr>
<tr>
<td>“Awake” Emergence</td>
<td>↑↑</td>
<td>↑</td>
</tr>
</tbody>
</table>

SUMMARY

• Caring for obstetric patients with neurologic comorbidities is a team sport

• Understanding the basic physiology is of paramount importance whether or not general anesthesia is the technique chosen

• Don't throw the baby out with the bathwater!