Permanent neurologic deficit following epidural or CSE anesthesia -Case series-

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Content

• Introduction
• Methods
• Results
• Discussion
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Introduction

• CNB are used for a variety of operations

• CNB – potential benefits:
  o Improved pain relief
  o Reduction overall complications following major surgery (cardiorespiratory!)
  o Reduction in stress responses
  o Reduced surgical blood loss
  o Better tissue oxygenation and perfusion
  o Improved prevention of thromboembolic complications
  o Early return of GI function?
Introduction

• … however complications do exist!
  o Hematoma
  o Spinal cord ischemia
  o Abscess/ Meningitis
  o Direct spinal cord injury
  o Local anaesthetic toxicity

• Incidence?
  o Finland: major complication following epidural = 1/19000
  o UK single hospital report: 1/675!
  o 0.002-0.004% any permanent neurologic deficit (NAP3)
  o 0-0.08% permanent sens / mot / paresthesia (Horlocker)
Methods

• University Hospitals of Leuven (01/2000- 12/2012):
  o 15 cases -> 7 cases
• Medical expertises (10/1993- 12/2012):
  o 13 cases -> 5 cases

• Permanent > 6 months + without clear cause
• Information:
  o Demographics
  o Elements of puncturing
  o Type of surgery and positioning
  o Preoperative neurologic status
  o Evolution after CNB
  o Radiologic imaging
### Results

<table>
<thead>
<tr>
<th>Number</th>
<th>Ident</th>
<th>Surgery</th>
<th>Preoperative neurological abnormalities</th>
<th>Postoperative complication</th>
<th>Evolution</th>
<th>Puncture Type</th>
<th>Presumed level and # attempts</th>
<th>Problems</th>
<th>Initial product + dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45m28</td>
<td>L knee joint mobilization</td>
<td>Llo, no radiation</td>
<td>Monoparesis L leg, sensory deficit T10-S1, increasing limp</td>
<td>Partial recuperation motor + sensory deficit after 1y</td>
<td>CSE</td>
<td>L4-L5: 1 at</td>
<td>-</td>
<td>Spinal: hyperbaric Bu 0.5% (5 mg) + lidocaine 2% (20 mg)</td>
</tr>
<tr>
<td>2</td>
<td>37927</td>
<td>Birth</td>
<td>RLS sensory and motor deficit</td>
<td>Motor deficit disappeared after 2y, dysthia dis on 2y</td>
<td>-</td>
<td>CSE</td>
<td>L3-4: 1 at</td>
<td>-</td>
<td>Spinal: Ro 0.175% (6.25 mg) + Su 2, 25 µg</td>
</tr>
<tr>
<td>3</td>
<td>58m21</td>
<td>Laparoscopic sigmoidectomy</td>
<td>Llo, no radiation</td>
<td>T5-L3 sensory deficit, lop radiating down LUL, L2-3 distribution</td>
<td>Sensory deficit disappeared after 2y, still lop with radiation</td>
<td>PCEA</td>
<td>T9-10: 2 at</td>
<td>P + pa L leg</td>
<td>Epidural: Bu 0,25% (25 mg) [na]</td>
</tr>
<tr>
<td>4</td>
<td>29026</td>
<td>Pouchectomy</td>
<td>L L3 and L4 sensory deficit</td>
<td>Sensory deficit disappeared L0-4lm 8 y</td>
<td>-</td>
<td>PCEA</td>
<td>T10-11: 1 at</td>
<td>-</td>
<td>Epidural: Bu 0,25% (25 mg) [na]</td>
</tr>
<tr>
<td>5</td>
<td>25S15</td>
<td>Laparoscopic hemicolectomy</td>
<td>-</td>
<td>Bilateral L3 and L4 sensory and motor deficit: R-L</td>
<td>Sensory and motor deficit lasted for 2y</td>
<td>PCEA</td>
<td>T10-11: 1 at</td>
<td>-</td>
<td>Nas: injection impossible</td>
</tr>
<tr>
<td>6</td>
<td>75R22</td>
<td>Sigmoidectomy</td>
<td>Llo, no radiation</td>
<td>R.L5 motor deficit; lop radiating down right leg, L5 distribution</td>
<td>No improvement of motor deficit after 2y, still lop with radiation</td>
<td>PCEA</td>
<td>T9-10: 1 at</td>
<td>-</td>
<td>Epidural: Bu 0,25% (25 mg) [na]</td>
</tr>
<tr>
<td>7</td>
<td>50P37</td>
<td>Total knee replacement</td>
<td>Llo, no radiation</td>
<td>Motor paraplega both legs, TS-5 sensory deficit</td>
<td>Partial recuperation, only motor deficit R leg</td>
<td>PCEA</td>
<td>L2-3: 1 at</td>
<td>-</td>
<td>Epidural: Bu 0,25% (30 mg) + Su 10 µg [na]</td>
</tr>
<tr>
<td>8</td>
<td>65m24</td>
<td>Triple arthrodesis</td>
<td>-</td>
<td>Symmetric paresis lower limbs bilateral, Ankle extension and flexion bilat possible, urine retention, sensory deficit</td>
<td>Sensory deficit and urine retention disappeared, residual prox paraparesis</td>
<td>CSE</td>
<td>L3-4: 1 at</td>
<td>-</td>
<td>Spinal: hyperbaric Bu 0.5% (12.5 mg)</td>
</tr>
<tr>
<td>9</td>
<td>72Pnd</td>
<td>Right total knee prothesis</td>
<td>L motor deficit (T12-S1), sensory deficit, atonic bladder</td>
<td>Bilateral motor dysfunction and areflexia, sensory deficit still present</td>
<td>-</td>
<td>CSE</td>
<td>L2-L3 or L3-L4: -</td>
<td>-</td>
<td>Unknown</td>
</tr>
<tr>
<td>10</td>
<td>29020</td>
<td>Sectio caesarea</td>
<td>-</td>
<td>Monoparesis L leg, sensory deficit L2-S1, urine retention and constipation</td>
<td>Motor and sensory deficit diminished, urine retention and constipation lasted (cauda equina syndrome L2-S4)</td>
<td>CSE</td>
<td>L3-L4: 1 at</td>
<td>-</td>
<td>Spinal: Bu 0.5% (6 mg) + Su 1.5 µg</td>
</tr>
<tr>
<td>11</td>
<td>68Pnd</td>
<td>Radical hysterectomy with colography</td>
<td>-</td>
<td>Bilateral motor and sensory deficit</td>
<td>Still sensory deficit: bilateral, hypeflexia and motor dysfunction R lower limb</td>
<td>PCEA</td>
<td>Nd: -</td>
<td>-</td>
<td>Epidural: Bu 0,5% (100 mg) + solut. nedrol 125 mg + mor 2 mg [na]</td>
</tr>
<tr>
<td>12</td>
<td>78Pnd</td>
<td>Left total knee replacement</td>
<td>L L1-L2 sensory deficit and motor deficit: L&gt;R</td>
<td>unknown</td>
<td>-</td>
<td>CSE</td>
<td>L2-L3: -</td>
<td>-</td>
<td>Spinal: hyperbaric Bu 0.5% (15 mg)</td>
</tr>
<tr>
<td>Number</td>
<td>Intraoperative Position</td>
<td>Postoperative Position</td>
<td>Agent + dose of bupivacaine</td>
<td>Outcome of block</td>
<td>Duration (h)</td>
<td>Why stop/problem</td>
<td>Neurology/Neurosurgical cause</td>
<td>Radiologic imaging</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1</td>
<td>Lloyd-Davis decubitus</td>
<td>No pain</td>
<td>Bu 0.2%, 5mL</td>
<td>L-T10, R-T12, L1-L2</td>
<td>7</td>
<td>Monoparesis L leg</td>
<td>*T30-T11 spinal cord compression</td>
<td>CT: air bubbles along puncture track L1-L2, L4-L5, L5-S1, S1-L5, L4-L5, L5-S1, L4-L5-S1.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Lithotomy position</td>
<td>No pain</td>
<td>Bu 0.17%, 5mL/h</td>
<td>No pain</td>
<td>8</td>
<td>Motor + sensory deficit R leg</td>
<td><em>Spinal hematoma</em></td>
<td>CT: air bubbles along puncture track L1-L2 and near dura at level L1 without compression, L5-S1, MRI: facet sclerosis, right paramedian sphenoid L5-S1, L1 compression.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Lloyd-Davis decubitus</td>
<td>Pain L leg</td>
<td>Lb 0.125% + Bu 0.176%, 5 mL/h</td>
<td>Pain leg (block failure)</td>
<td>1</td>
<td>Pain leg</td>
<td><em>Extended neural block</em></td>
<td>MRI: no spinal hematoma, no spine injury, degenerative changes, sphenoid L5-S1, L4-L5, L5-S1, lumbar spinal stenosis.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Dorsal decubitus</td>
<td>No pain</td>
<td>Bu 0.176%, 5mL/h</td>
<td>T4-T10, R-T12</td>
<td>2</td>
<td>Sensory deficit RUL</td>
<td><em>Uncertain</em></td>
<td>MRI: normal.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Dorsal decubitus</td>
<td>No pain</td>
<td>Bu 0.176%, 5mL/h</td>
<td>L-T8, R-T12</td>
<td>4</td>
<td>Bilateral sensory and motor deficit</td>
<td><em>Spinal hematoma</em></td>
<td>MRI: normal.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Dorsal decubitus</td>
<td>No pain</td>
<td>Lb 0.125% + Bu 0.176%, 5 mL/h</td>
<td>L-T10, L-T14-L2</td>
<td>3</td>
<td>Motor deficit</td>
<td><em>L5 radiculopathy</em></td>
<td>MRI: right paramedian sphenoid L5-S1, lumbar kyphosis, degenerative lumbar changes, tailguy cyst S2-S3 R.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Dorsal decubitus</td>
<td>No pain</td>
<td>Lb 0.125% + Bu 0.176%, 5 mL/h</td>
<td>T11 bilateral</td>
<td>2</td>
<td>Motor + sensory deficit</td>
<td><em>Spinal cord ischemia</em></td>
<td>CT: left paramedian sphenoid L5-S1 with compression on S1 nerve root. MRI: normal.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Right decubitus</td>
<td>No pain</td>
<td>Lb 0.125% + Bu 0.5, 4 mL/h</td>
<td>T6-T12 bilateral</td>
<td>3</td>
<td>Motor + sensory deficit</td>
<td><em>Local anesthetic toxicity</em></td>
<td>MRI: no hematoma. Moderate facet arachnoid L4-L5, synovial cysts with slight impression on dural sac: No discus hernia.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Dorsal decubitus</td>
<td>No pain, no motor or sensory deficit</td>
<td>Unknown</td>
<td>No pain</td>
<td>1</td>
<td>Monoparesis L leg</td>
<td><em>Uncertain</em></td>
<td>MRI: Moderate spinal canal stenosis. No bleeding. Hypercapnia of cauda equina fibers.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Left lateral tilt</td>
<td>No pain, regression motor block</td>
<td>Bu 0.75% + 0.25% Bu 0.1mg/mL</td>
<td>No pain, L leg sensory deficit, R leg: motor</td>
<td>2</td>
<td>Motor + sensory deficit</td>
<td><em>Local anesthetic toxicity</em></td>
<td>MRI: no hematoma. Degenerative changes, sphenoid L5-S1, Lower intensity CSF: diffuse bleeding? Flow phenomenon?</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Lithotomy position</td>
<td>No pain, no motor or sensory deficit</td>
<td>Bu 0.16%</td>
<td>No pain</td>
<td>2</td>
<td>Bilateral sensory deficit</td>
<td><em>Uncertain</em></td>
<td>MRI: no hematoma.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Dorsal decubitus</td>
<td>No pain, motor recovery leg</td>
<td>Lb 0.125% + Bu 0.5mg/mL</td>
<td>No pain, motor block L-R</td>
<td>2</td>
<td>Motor deficit: L-R</td>
<td><em>Uncertain (lack of second MRI)</em></td>
<td>MRI: No epidural bleeding. No discocaudal conflict.</td>
<td></td>
</tr>
</tbody>
</table>
Discussion

Generally:
- Lack of documentation
- More females
- Complications: Ortho>Gyn

<table>
<thead>
<tr>
<th></th>
<th>Spinal Abscess</th>
<th>Spinal Hematoma</th>
<th>Anterior Spinal Artery Syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of patient</td>
<td>Any age</td>
<td>50% over 50 years</td>
<td>Elderly</td>
</tr>
<tr>
<td>Previous history</td>
<td>Infection*</td>
<td>Anticoagulants</td>
<td>Arteriosclerosis/hypotension</td>
</tr>
<tr>
<td>Onset</td>
<td>1–3 days</td>
<td>Sudden</td>
<td>Sudden</td>
</tr>
<tr>
<td>Generalized symptoms</td>
<td>Fever, malaise, back pain</td>
<td>Sharp, transient back and leg pain</td>
<td>None</td>
</tr>
<tr>
<td>Sensory involvement</td>
<td>None or paresthesias</td>
<td>Variable, late</td>
<td>Minor, patchy</td>
</tr>
<tr>
<td>Motor involvement</td>
<td>Flaccid paralysis, later spastic</td>
<td>Flaccid paralysis</td>
<td>Flaccid paralysis</td>
</tr>
<tr>
<td>Segmental reflexes</td>
<td>Exacerbated—later obtunded</td>
<td>Abolished</td>
<td>Abolished</td>
</tr>
<tr>
<td>Myelogram/CT scan</td>
<td>Signs of extradural compression</td>
<td>Signs of extradural compression</td>
<td>Normal</td>
</tr>
<tr>
<td>Cerebrospinal fluid</td>
<td>Increased cell count</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td>Laboratory data</td>
<td>Rise in sedimentation rate</td>
<td>Prolonged coagulation time*</td>
<td>Normal</td>
</tr>
</tbody>
</table>

*Infrequent findings.
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Discussion

• Specific:

1. Local anesthetic toxicity:
   • Lidocaine and tetracaine > bupivacaine
   • Preservatives/additives
   • Pre-existing neurologic deficit -> Maldistribution
   • CAVE: prolonged exposure/high concentration!

2. Spinal cord ischemia -> anterior spinal artery syndrome
   • Risk factors
   • MRI: often undetectable
   • Local anaesthetic solution:
     -> Type
     -> Vasoconstrictors
Discussion

- **Specific:**
  3. **Hematoma**
     - Hemostatic abnormality and/or traumatic needle placement
     - S/ increased motor block > LBP
     - < 8h: decompressive laminectomy
     - Obstetrics < Elderly

  4. **Trauma of the needle/catheter**
     - 0.9% paresthesias during needle placement -> 0.3% persistent pain, numbness, or weakness postoperatively
     - Misjudgment of level -> 59% of dural punctures 1-2 spaces higher
     - Often undetectable on MRI/CT
Discussion

5. Preexisting neurologic damage
   • Double crush phenomenon (higher risk of local anaesthetic toxicity or ischemia) vs comorbidities
   • High risk patients -> case-by-case decision!

Table:

<table>
<thead>
<tr>
<th>Sigmoidectomy</th>
<th>Lbp, no radiation</th>
<th>R L5 motor deficit, lbp radiating down right leg, L5 distribution</th>
<th>No improvement of motor deficit after 1y, still lbp with radiation</th>
<th>PCEA T8-9: 1 at</th>
</tr>
</thead>
</table>

MRI: right paramedian sdh L5-S1, lumbar kyphosis, degenerative lumbar changes, Tarlov-cyst S2-S3 R.
Conclusion

• Risk is very low

• No national database

• Susceptibility factors?

• Prospective study design (CNB vs General anesthesia)
  ○ We are still too easily blamed when there is no clear cut diagnosis!
References

References

- Reynolds F. Damage to the conus medullaris following spinal anaesthesia. Anaesthesia 2001;56:238-47.
Bedankt voor uw aandacht!