**Spinal & Epidural Anesthesia**

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**SPINAL ANESTHESIA (S. SUBARACHNOID SPACE)**

- excellent sensory & motor blockade below level of block.
- injection of local anesthetic and/or opiates into SUBARACHNOID SPACE.
- relatively rapid and predictable onset.

**Contraindications**

- lower abdominal, perineal, and lower extremity surgery.

**Advantages**

1. no manipulation of airway
2. no side effects of general anesthetics (nausea, vomiting, prolonged drowsiness).
3. awake patient provides valuable monitor.

**Methods**

A) **single bolus injection** - limited duration (not for prolonged procedures).
B) **continuous spinal anesthesia**
   
a) using small-bore catheters - frequent neurologic complications (local anesthetic toxicity);
   
e.g. cauda equina syndrome.

- using large-bore epidural catheters - high likelihood of postdural puncture headache.

**Local anesthetics used for spinal anesthesia**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Concentration (%)</th>
<th>Volume (ml)</th>
<th>Total Dose (mg)</th>
<th>Baricity</th>
<th>Glucose (%)</th>
<th>Duration (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIDOCAINE</td>
<td>1.5, 5, 7.5</td>
<td>1-2</td>
<td>30-110</td>
<td>Hyperbaric</td>
<td>7.5</td>
<td>30-60</td>
</tr>
<tr>
<td>TETRACAINE</td>
<td>0.25, 1.0</td>
<td>1-4</td>
<td>5-20</td>
<td>Hyperbaric</td>
<td>5.0</td>
<td>75-200</td>
</tr>
<tr>
<td>BUPIVACAINE</td>
<td>0.25</td>
<td>2-6</td>
<td>5-20</td>
<td>Hypobaric</td>
<td>0</td>
<td>75-200</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1-2</td>
<td>5-20</td>
<td>Isobaric</td>
<td>0</td>
<td>75-200</td>
</tr>
</tbody>
</table>

**Factors that determine ONSET, SPEED, LEVEL, and DURATION of spinal block**

1. Local anesthetic agent (lipid solubility, protein binding, pKₐ).
2. Volume & dose of local anesthetic; increased dose → increased cephalad spread and duration.

N.B: rapid injection leads to turbulent flow and unpredictable spread!

3. **Patient position** and local anesthetic baricity
   
   - at time of injection and until local anesthetic firmly binds to nervous tissue
   
   - CSF specific gravity ≈ water.
   
   - plain local anesthetic solutions are ISOBARIC.
   
   - local anesthetic solutions prepared in water are HYPOBARIC - ascend within CSF.
   
   - local anesthetic mixed in 5% dextrose are HYPERBARIC.

4. **Vasocorticosteroids** (epinephrine) → prolonged duration.

5. **Opioids** → prolonged analgesia → high-quality postoperative analgesia.

6. Anatomic and physiologic factors
   
   - anatomic factors that decrease relative volume of subarachnoid space (obesity, pregnancy, increased intra-abdominal pressure, prior spine surgery, abnormal spinal curvature) → higher than expected level of block.
   
   - elderly patients are more sensitive.

**Contraindications** – as for LP + severe hypovolaemia.

**Complications**

1. **Hypotension** (sometimes refractory) - consequence of sympathomectomy; H: responds readily to fluid and small doses of pressors (EPINEPHRINE).
2. Excessive cephalad spread → cardiopulmonary compromise; CPR is notoriously difficult - poor survival; H: high doses of EPINEPHRINE.
3. **Postdural puncture headache**, backache
4. **Transient radiculopathy** (esp. with use of LIDOCAINE) - painful but usually self-limited.
5. **Urinary retention**
6. **Infection**
7. **Epidural hematoma**

**EPIDURAL ANESTHESIA**

- neuraxial regional block in thoracic, abdominal, and lower extremity procedures.
- injection of local anesthetic and/or opiates into LUMBAR/THORACIC EPIDURAL SPACE.
- catheter is inserted after epidural space has been located with needle.
- catheter enables repeated boluses - suitable for lengthy procedures, postoperative analgesia.

**Complications and contraindications** – spinal anesthesia.

N.B. maintain high index of suspicion of epidural hematoma (esp. in patients on low- molecular-weight heparin (LMWH)) - back pain, lower extremity sensory and motor dysfunction, bladder and bowel abnormalities.

Epidural catheters should be placed & withdrawn at least 10-12 hours after last dose of LMWH!