Spinal & Epidural Anesthesia

SPINAL ANESTHESIA (S. SUBARACHNOID BLOCK)

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

Indications:
- lower abdominal, perineal, and lower extremity surgery.

Advantages:
1) no manipulation of airway
2) no side effects of general anesthesia (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.
   b) 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</td>
<td>1-2</td>
<td>30-100</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>0.5</td>
<td>1-2</td>
<td>15-20</td>
<td>Hyperbaric</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), see p. 2229 >>
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
   a) 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 HYPERBARIC; ascend within CSF.
   b) local anesthetics mixed in 5% dextrose are HYPOBARIC
4. Vasodilators (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 hypoventilation.

Complications:
1. Hypotension (sometimes refractory) - consequence of sympathectomy; H: responds readily to
   - flush and small doses of pressors (EPINEPHRINE).
2. Excessive cephalad spread → cardiorespiratory 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.