Spinal & Epidural Anesthesia

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**Local Anesthetics** → see [p. 2229 >>](HTTP://WWW.NEUROSURGERYRESIDENT.NET/USMLE%202/Surgery%20(2201-2250)/2229.%20Local%20Anesthetics.pdf)

Spinal Ansthesia (s. subarachnoid block)

- excellent ***sensory & motor blockade*** 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 anesthetics (nausea, vomiting, prolonged drowsiness).
3. awake patient provides valuable monitor.

Methods:

* 1. **single bolus** injection - limited duration (not for prolonged procedures).
  2. **continuous** spinal anesthesia:
     1. using ***small-bore catheters*** - frequent *neurologic complications* (local anesthetic toxicity); e.g. cauda equina syndrome.
     2. using ***large-bore epidural catheters*** - high likelihood of *postdural puncture headache*.

Local anesthetics used for spinal anesthesia:

| **Drug** | **Concentration (% )** | **Volume (ml)** | **Total Dose (mg)** | **Baricity** | **Glucose (% )** | **Duration (min)** |
| --- | --- | --- | --- | --- | --- | --- |
| Lidocaine | 1.5, 5 | 1-2 | 30-100 | Hyperbaric | 7.5 | 30-60 |
| Tetracaine | 0.25-1.0 | 1-4 | 5-20 | Hyperbaric | 5.0 | 75-200 |
| 0.25 | 2-6 | 5-20 | Hypobaric | 0 |
| 1 | 1-2 | 5-20 | Isobaric | 0 |
| Bupivacaine | 0.5 | 3-4 | 15-20 | Isobaric | 0 | 75-200 |
| 0.75 | 2-3 | 15-22.5 | Hyperbaric | 8.25 |

Factors that determine onset speed, level, and duration of spinal block:

1. Local anesthetic **agent**(lipid solubility, protein binding, pKa). [see p. 2229 >>](http://www.neurosurgeryresident.net/USMLE%202\Surgery%20(2201-2250)\2229.%20Local%20Anesthetics.pdf)
2. **Volume & dose** of local anesthetic; increased dose → increased cephalad spread and duration.

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

1. 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 anesthetics mixed in 5% dextrose are hyperbaric.

1. Vasoconstrictors (epinephrine) → prolonged duration.
2. Opioids → prolonged analgesia → high-quality postoperative analgesia.
3. 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 hypovolemia.

Complications

* 1. **Hypotension** (sometimes refractory) - consequence of sympathectomy; H: responds readily to ***fluids*** and small doses of ***pressors*** (ephedrine).
  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!

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