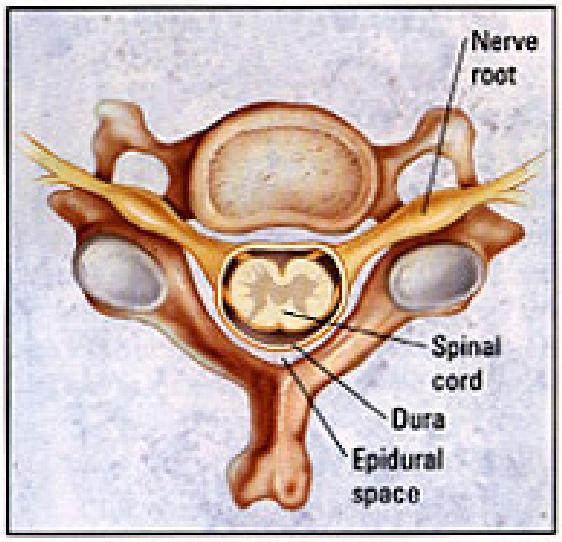
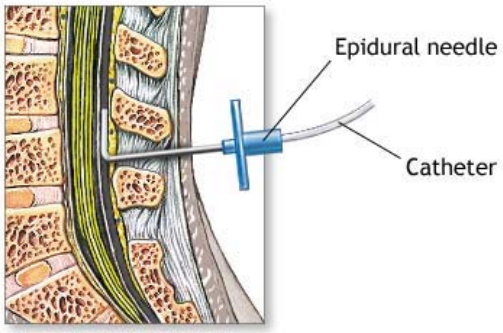
Epidural Infusion for Postoperative Pain: Critical Facts

1. **Definition**: "Epidural infusion" is the administration into the epidural space of
   - Opioid analgesics
   - Sub-anesthetic doses of local anesthetics
   - Combination of opioid analgesics and local anesthetics
   - Alpha-2 agonists such as clonidine may be seen in the future as an adjunct to epidural analgesia

2. **Anatomy**: The epidural space is a "potential space" that surrounds and protects the spinal cord.
   - contains fat, blood vessels and nerves
   - is outside the dura and does not contain spinal fluid





3. **Rationale**:
   - There is considerably less systemic exposure to opioids when the epidural (rather than intravenous) route is chosen
     - The drug is diffused through the dura, enters the spinal fluid where it begins to spread rostrally (toward the head) and is absorbed into the arteries supplying the dorsal horn
     - The drug is able to act directly at the opioid receptors in the dorsal horn of the spinal cord
     - Lower impact on GI tract
       - Less constipation
       - Less nausea and vomiting
       - Faster return to normal GI motility (normal eating and defecation) (In fact, epidural local anesthetics are known to increase bowel motility).
   - The use of combination solutions (opioid + local anesthetic) increases analgesia while decreasing the potential toxicity of higher doses of a single agent
   - Epidural analgesia is often considered superior to intravenous patient controlled analgesia, especially for major abdominal or thoracic surgery.

4. **Indications**:
   - Patients unable to use PCA
   - Major thoracic, abdominal or lower extremity vascular surgery
   - Patient placed at increased risk with systemic opioids because of co-morbidities

5. **Contraindications**:
   - Bacteremia
   - Local Infections at the epidural insertion site
   - Coagulopathy
   - Treatment with anticoagulant medications other than subcutaneous unfractionated heparin

6. **Drug selection**: the typical combination of agents used at Mass General is hydromorphone (Dilaudid, an opioid) and bupivacaine (a local anesthestic).
   - Lipophilic opioid agents are those easily absorbed through fatty tissue. The blood vessel walls, dura, and spinal cord are rich in fat, so increased lipophilicity means faster transport
   - Morphine is the least lipophilic (is hydrophilic). Slow absorption means
     - Little systemic effect
     - Delayed analgesic onset (~1 hour) because it takes longer to reach the opioid receptors in the spinal cord
     - Prolonged analgesic effect (up to 24 hours for a single injection)
     - Delayed sedation and respiratory depression (up to 24 hours after a single dose)
     - Can be given as intermittent injection
   - Fentanyl (and its close analogs) is the most lipophilic. It is characterized by
     - Rapid onset of analgesia (5 minutes)
     - Considerable systemic absorption
     - Duration of analgesia 2 hours
     - Usually given as an infusion
   - Hydromorphone has moderate lipophilicity and falls between the two opioids listed above.
     - Analgesic onset (usually 15 – 20 mintues)
     - Duration of analgesia varies depending upon the patient's activity
     - Normally given as an infusion
   - Bupivacaine (Marcaine) is a local anesthetic. At low doses it produces analgesia without motor blockade

What those local anesthetic percentages really mean		
Bupivicaine 0.1%	0.1 grams/100ml (100mg/100ml)	1mg/ml
Bupivicaine 0.25%	0.25grams/100ml (250mg/100ml)	2.5mg/ml

7. **Side effects**:
   - **Opioids: (same as for systemic administration with some exceptions)**
     - Pruritus (seems to be more common with epidurally administered opioids)
     - Increased risk of urinary retention (most patients will have a urinary catheter for the duration of the infusion)

- If the opioid reaches the brain in high concentration because of catheter placement or choice of more hydrophilic/less lipophilic opioid, sedation and respiratory depression are an increased risk

- **Local Anesthetics:**
  - Hypotension (although probably related to the patient's fluid status, usually hypovolemia is the reason for hypotension)
  - Mild sensory changes
  - Urinary retention
  - Local anesthetic toxicity would be extremely rare given the low concentration of bupivicaine used.

8. **Epidural complications**:
   - Motor weakness (decrease or turn off epidural infusion until improvement is noted)
   - Post-dural puncture headache (may occur in younger patients if a "wet tap" occurred, the catheter needle punctured the dura and CSF was noted)
   - Epidural hematoma or abscess (immediate intervention is needed)

9. **Monitoring/reassessment of a patient on an epidural infusion**: (If you have any questions regarding an epidural catheter, please page the MGH Pain Service (beeper #27246).
   - Pain score (0 – 10)
   - Sedation score—inappropriate sedation should be considered an early sign of respiratory depression until proven otherwise (see scale, below)
   - Vital signs (particularly blood pressure and pulse)
   - Lower extremity sensation and motor weakness (may be bilateral or unilateral; see scale, below)
   - Micturation (most patients will have a urinary catheter for the duration of the infusion). Foley catheters can be discontinued once the epidural infusion is off.
   - Other side effects (N/V; pruritis; constipation; mental status change). Nursing actions would be the same as for parenterally administered opioids.

Sedation level	**Motor Strength**
S = sleep, easy to arouse	4 = normal strength
1 = awake & alert	3 = lifts and holds
2 = slightly drowsy, easily aroused	2 = lifts and falls back
3 = frequently drowsy, arousable, drifts off to sleep during conversation	1 = moves on bed
4 = somnolent, minimal or no response to physical stimulation	0 = no movement

References:

1. Ballantyne J, Fishman SM, Abdi S, Eds. *The Massachusetts General Hospital Handbook of Pain Management*, 2nd ed. Philadelphia: Lippincott Williams & Wilkins, 2002.
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3. Pasero C. Epidural analgesia for postoperative pain. *American Journal of Nursing*. 2003 Oct;103(10):62-64.
4. Pasero C. Epidural analgesia for postoperative pain, part 2. *American Journal of Nursing*. 2003 Nov;103(11):43-5.