

# Perioperative Neuraxial Pain Management

Robert Montgomery, ND, RN-BC, ACNS-BC  
Associate Professor  
Anesthesiology Acute Pain Service  
University of Colorado Denver  
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## What is best option for anesthetic and post-op analgesia?

87 yo female s/p fall w/ L femur fx, to OR for ORIF

Hx: moderate dementia, CRI, COPD, HTN, CAD

- a) General anesthetic with post-op IV/PO opioids prn
- b) General anesthetic with femoral nerve block and IV/PO post-op opioids prn
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## Benefits Of Epidural Analgesia

- Provides intense, prolonged analgesia limiting the total amount of systemic opioids and decreasing the potential for opioid-related side effects.
- Earlier ambulation; decreased DVT's
- Mobilize secretions - better cough
- Earlier return of bowel function
- Decreased neuroendocrine/metabolic stress response
- Decreased Intraoperative blood loss
- Avoid Post Operative Cognitive Dysfunction (POCD)?

Ruthberg et al., 1984

Richmond et al, J of Clinical Anesthesia, 2006; Monk et al, Anesth, 2008

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## Surgical Stress Response

- Afferent neural message via spinal cord to brain
- Efferent neural traffic back to trauma site and adrenals with activation of hypothalamic-pituitary-adrenal axis
- Adrenals release catecholamines, cortisol, and other stress hormones that cause:

- Tachycardia
- Hypertension
- Hypercoagulation
- Increased metabolism
- Decreased immune function

(Liu, SS, Carpenter RL. Anesthesiology, 1995)

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## Efficacy of Postoperative Epidural Analgesia: a meta-analysis

Block BM, et al. JAMA 2003; 290:2455-2463

- Compared with parenteral opioids, epidural analgesia, regardless of analgesic agent, location of catheter placement, and type and time of pain assessment, provided:
  - better postoperative analgesia
  - greater patient satisfaction
  - less postoperative morbidity
  - improved clinical outcome

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## Contraindications

- Coagulopathies
- Anticoagulated - therapeutically
- LMWH - relative
- Skin infection at the insertion site
- CNS disease - tumor
- Spinal deformities - relative

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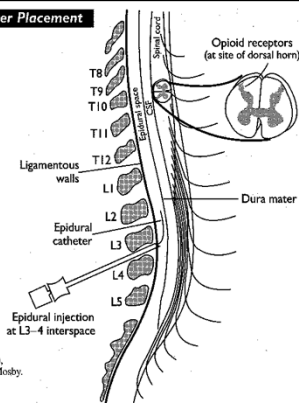
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Figure 2.5 **Epidural Needle and Catheter Placement**

Delivery of analgesics by the epidural route is accomplished by inserting a needle into the epidural space and injecting the analgesic or threading a catheter through the needle into the epidural space.



Used with permission from:  
Sinatra, R. S. (1992). Spinal opioid analgesia: An overview.  
In R. S. Sinatra, A. H. Hord, B. Ginsberg, & L. M. Preble (Eds.),  
Acute pain: Mechanisms and management (p. 107). St. Louis: Mosby.

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## Combining Opioid and Local Anesthetic: Multimodal

- Synergistic
- Allows less of each to be used in combination leading to less side effects and faster recovery

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## Local Anesthetics Mechanism of Action

- Provide analgesia by blocking generation and conduction of pain impulses as they pass through the nerve roots, just before they enter the dorsal horn of the spinal cord
- Decreases afferent traffic to CNS reducing the surgical stress response
- Degree of blockade depends on concentration and volume of local anesthetic used
- Dilute (analgesic) concentrations block pain fibers and spare sensory and motor neurons

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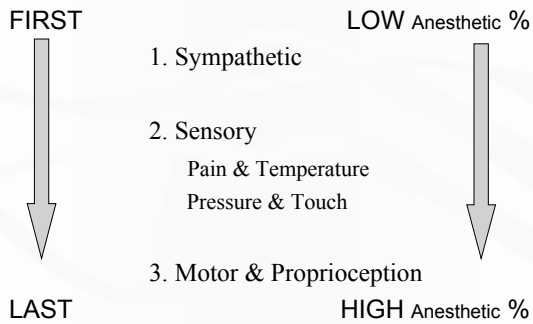
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## Sequence of Nerve Fiber Blockade Concentration Dependent



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## Local Anesthetics: Analgesia

- Bupivacaine 0.05 – 0.25%: analgesia
- Bupivacaine 0.5 – 0.75%: anesthesia
- Duration of analgesic action from bolus injection
  - Lidocaine 2%: 1-2 hours
  - Bupivacaine 0.25% to 0.5%: 3-4 hours
- Short duration of action overcome by continuous infusions
- Usual range of Bupivacaine % for Infusion:
  - 0.05% to 0.1%

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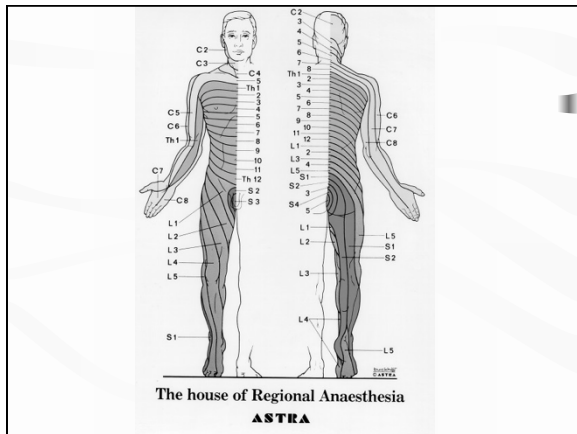
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## Opioids

### Mechanism of action

- Diffuses across the dura mater into the cerebrospinal fluid
- Binds with opioid receptors in the dorsal horn of the spinal cord and modify the transmission of pain impulses to the brain

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## Morphine

### Equianalgesia Among Routes

- Delivery of the drug close to the opioid receptors allows pain relief with smaller doses and decreased side effects

Morphine

Spinal	Epidural	Parenteral	Oral
1	:	10	:
	:	100	:
			300

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## Complications

- High spinal blockade
- IV injection
- Dural puncture - spinal headache
- Neurologic injury – rare, usually transient
- Epidural hematoma
- Infection

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## High Spinal Blockade

- Inadvertent subarachnoid or subdural injection of an excessive amount of local anesthetic
- Most at risk when test dose of local anesthetic given after catheter insertion
- Can happen at any time due to catheter migration (very rare <1 in 1000 - 0.1%)
- Also possible with delivery of large volume of local anesthetic into epidural space

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## High Spinal Blockade

- Clinical features
  - Profound degree of sensory and motor blockade developing within 5 to 15 min. of bolus injection, and to a very high dermatome level
  - Blockade of upper cervical segments → respiratory arrest due to diaphragmatic paralysis
  - Catheter migration less obvious

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## High Spinal Blockade

- Monitoring
  - Bolus injection
    - BP, HR, Pox, sensory level, motor strength q5 min x 3, then q15 min x4
  - Continuous infusion PCEA
    - BP, HR, sensory level, motor strength q4 h
- Treatment
  - Oxygen
  - Vasopressor
  - Ventilatory support

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## IV Injection

- Incidence: very rare
- Symptoms: circumoral tingling, tinnitus, dizziness, blurred vision, or tremors
- Extreme cases: seizure or cardiovascular collapse
  - Treatment: IV barbiturates, benzodiazepines, vasopressors, airway management, intralipid

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## Neurological Damage

- Extremely rare
- Usually transient symptoms

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## Epidural Hematoma

- Incidence: very rare
- Mechanism: bleeding from vasculature in epidural space causes compression on spinal cord.
- Increased risk in anticoagulated patients - especially LMWH (Enoxaparin & Dalteparin)
- Can occur spontaneously
- Symptoms: back or flank pain, LE weakness, numbness, tingling - increasing motor block

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## Epidural Hematoma

- Monitoring
  - Motor block and sensory level q 4 hr.
- Treatments
  - MRI
  - Emergency laminectomy
  - Permanent paralysis can occur in as little as 4 hours

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## LMWH and Neuraxial Blockade

- Reports of epidural hematoma in patients who receive LMWH undergoing epidural analgesia
- Regional anesthesia and post operative anticoagulation guidelines ([www.asra.com](http://www.asra.com))
  - Beyond scope of this lecture
  - ACCS Guidelines
    - For all patients undergoing neuraxial anesthesia or analgesia, we recommend appropriate patient selection and caution when using anticoagulant thromboprophylaxis

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### Summary

- Epidural analgesia has significant benefits in improving post operative outcome and recovery by controlling pain, limiting opioids, and blunting the surgical stress response
- An understanding of the mechanism of action of epidural analgesics will allow the team to provide optimal pain relief to patients
- Side effects can be managed effectively and complications minimized with appropriate monitoring and care

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