

Neuraxial Anesthesia

Prepared by:

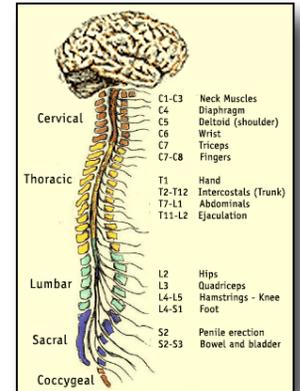
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University of Colorado Denver Health Sciences Center



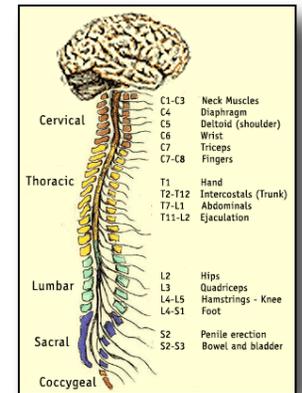
Lecture Objectives



- 💡 Discuss considerations of spinal vs epidural anesthesia
- 💡 Review the anatomy
- 💡 Understand mechanisms of action
- 💡 Review physiologic effects
- 💡 Review complications
- 💡 Sterile technique



Spinal vs Epidural: How do we decide?

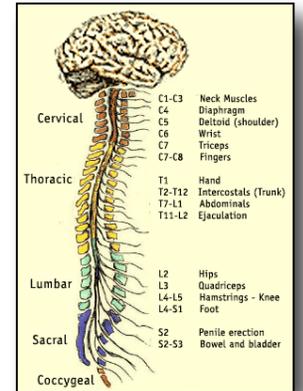


- 💡 Length of procedure
- 💡 Need for prolonged post-op analgesia?
- 💡 Comorbidities

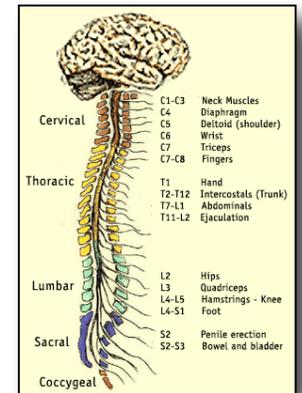


Indications

- 💡 Surgical anesthesia
- 💡 Analgesia



Surgical Anesthesia



- 💡 Lower abdominal
- 💡 OB/GYN
- 💡 Lower limb
- 💡 Perineal and rectal

Analgesia



Acute pain

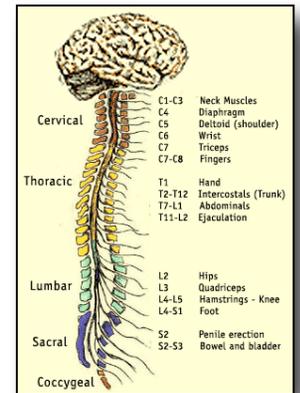
–post–op

–flail chest

–labor



Chronic pain

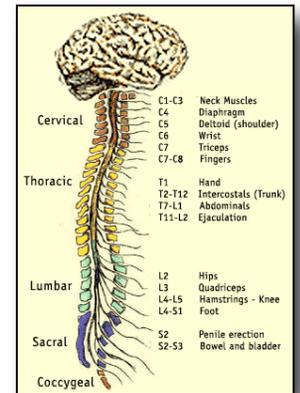


Contraindications

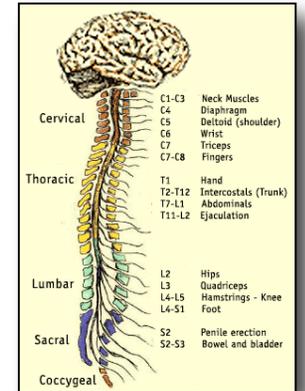


Absolute

- patient refusal
- uncooperative patient
- anatomic abnormalities
- hypovolemia
- coagulopathy
- local infection



Contraindications

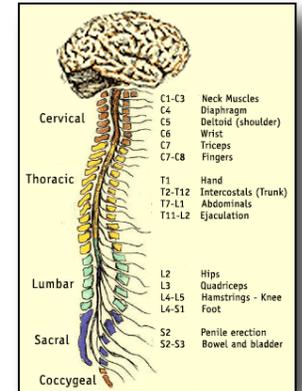


Relative

- neurologic disease
- chronic back pain
- foreign language

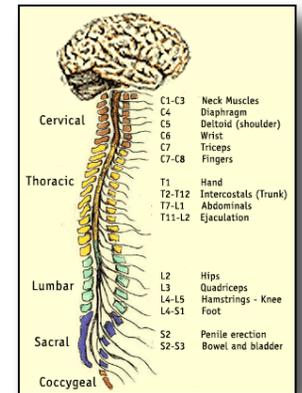
Consent:

What do we disclose?



- Failure
- Paresthesias
- Back pain
- PDPH
- Bleeding
- Infection

Anatomy



Vertebrae



Sacrum



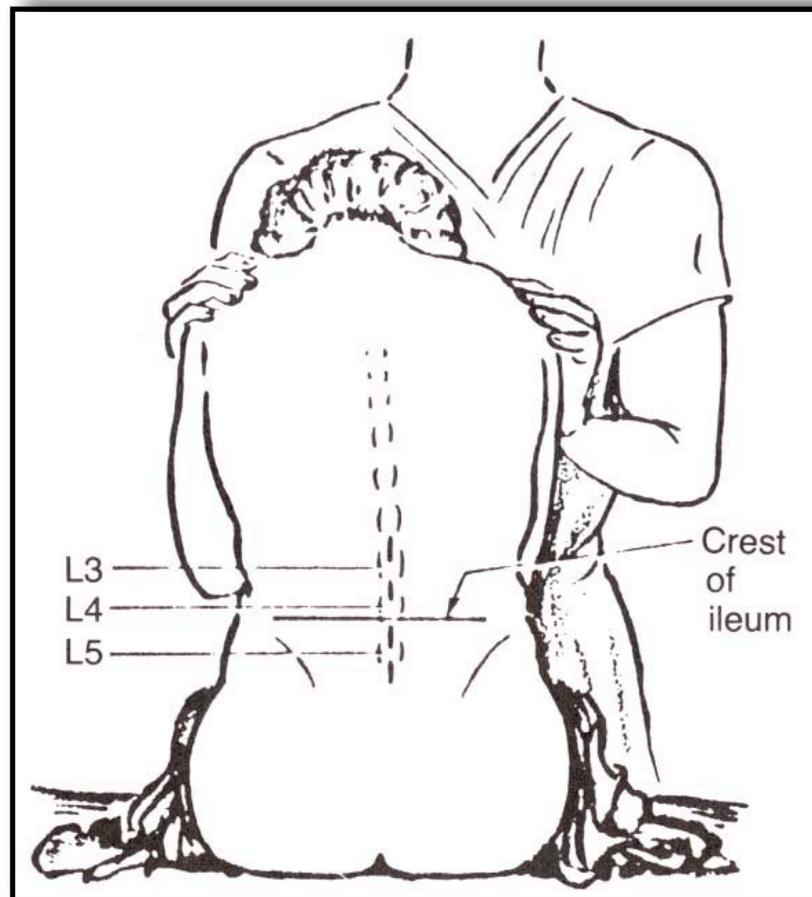
Ligaments

–supraspinous

–interspinous

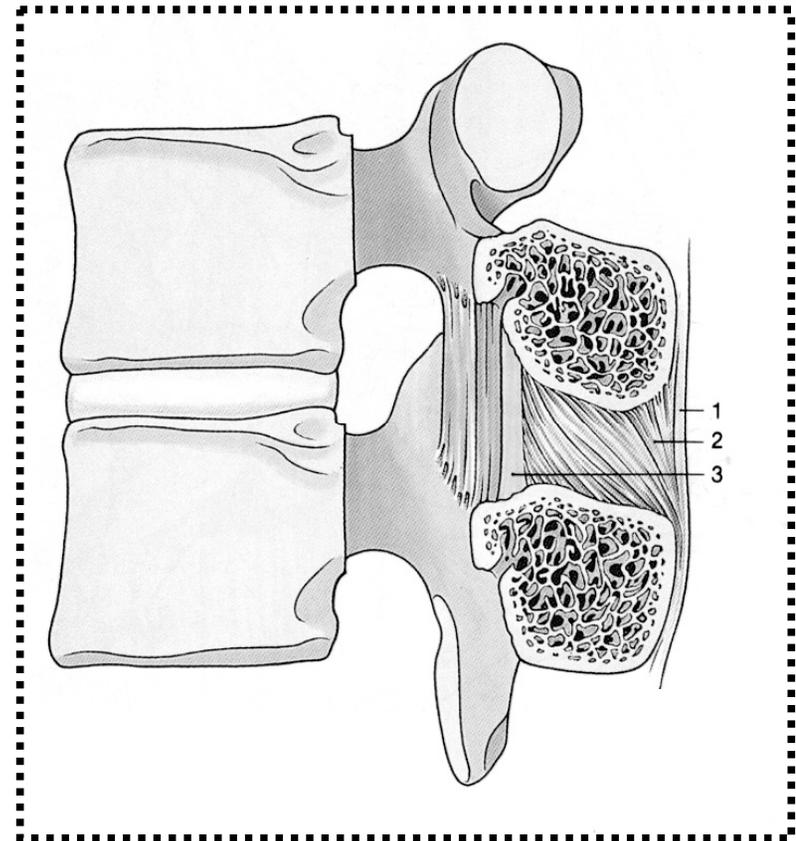
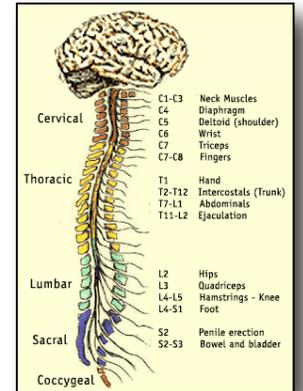
–ligamentum flavum

A line drawn between the iliac crests crosses the 4th lumbar vertebra

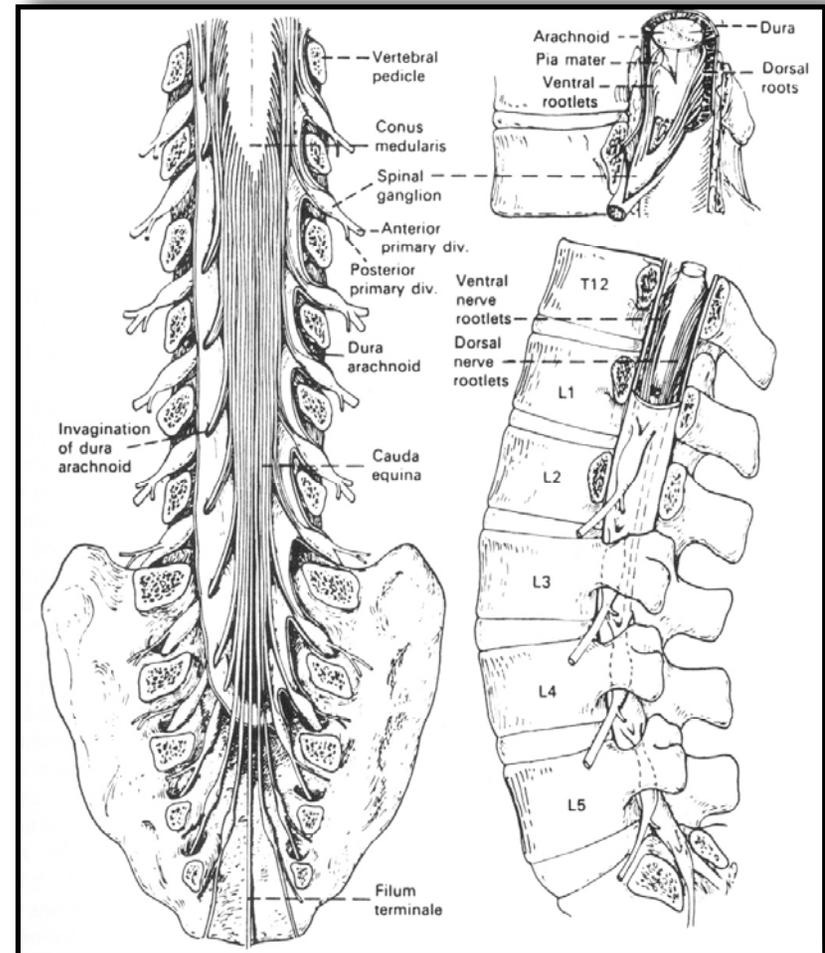


Spinal Ligaments

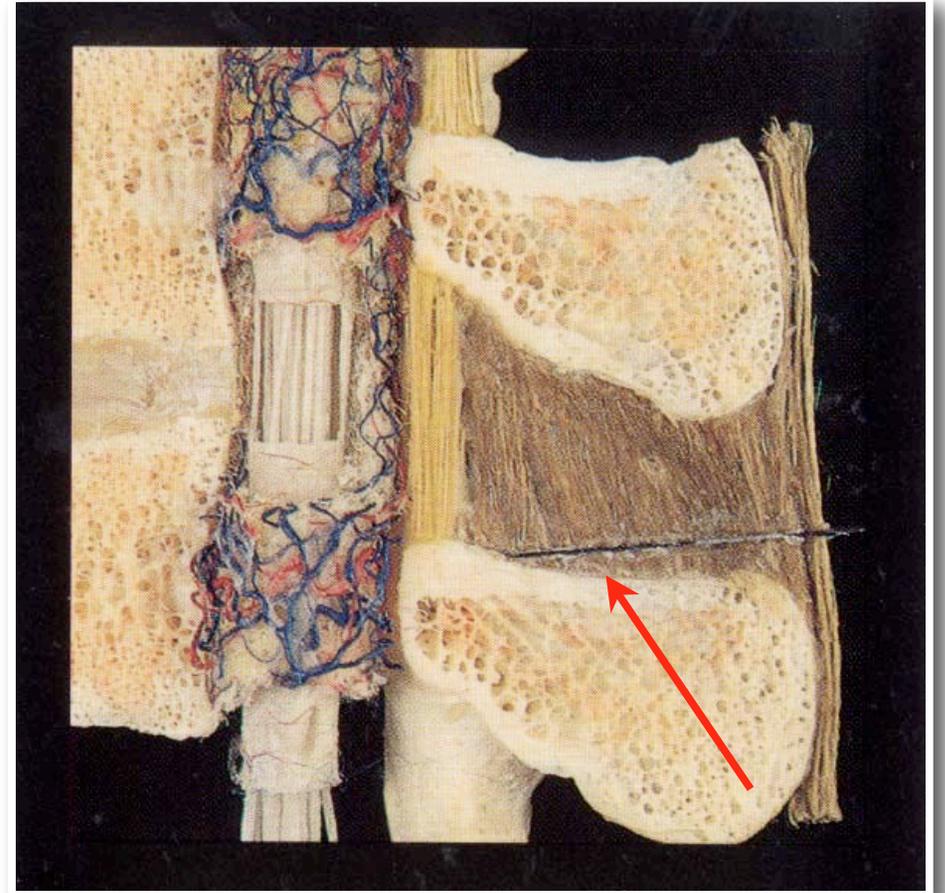
1. supraspinous
2. interspinous
3. ligamentum flavum



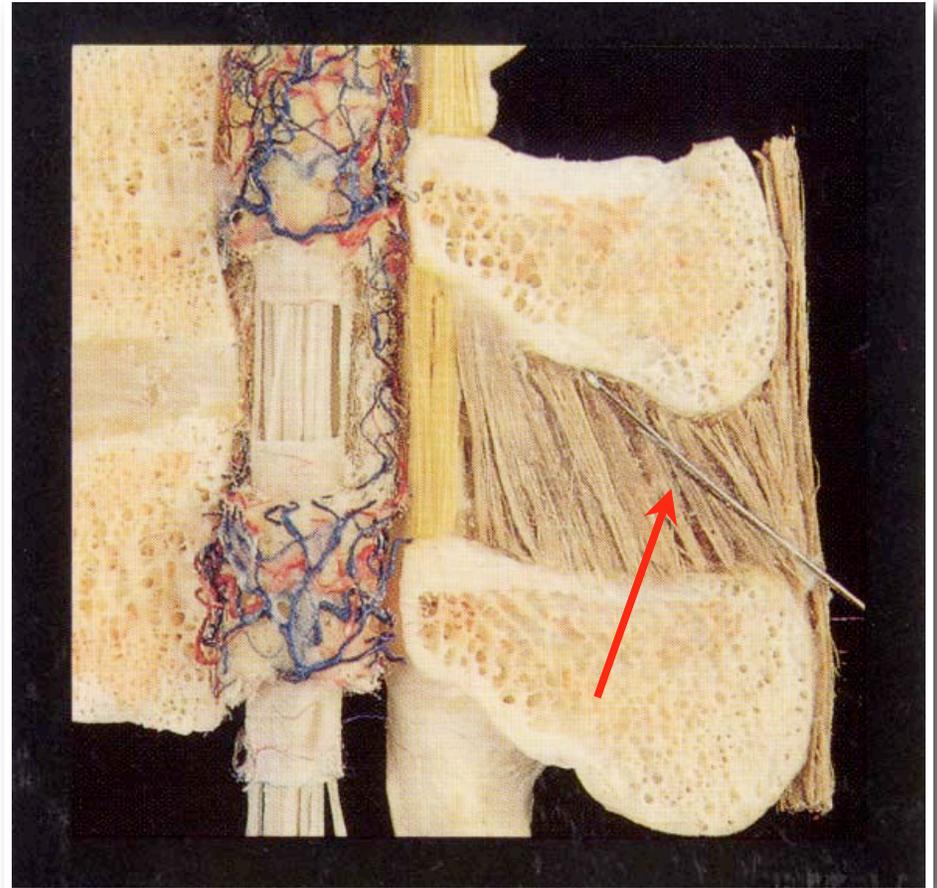
Lumbosacral Spine



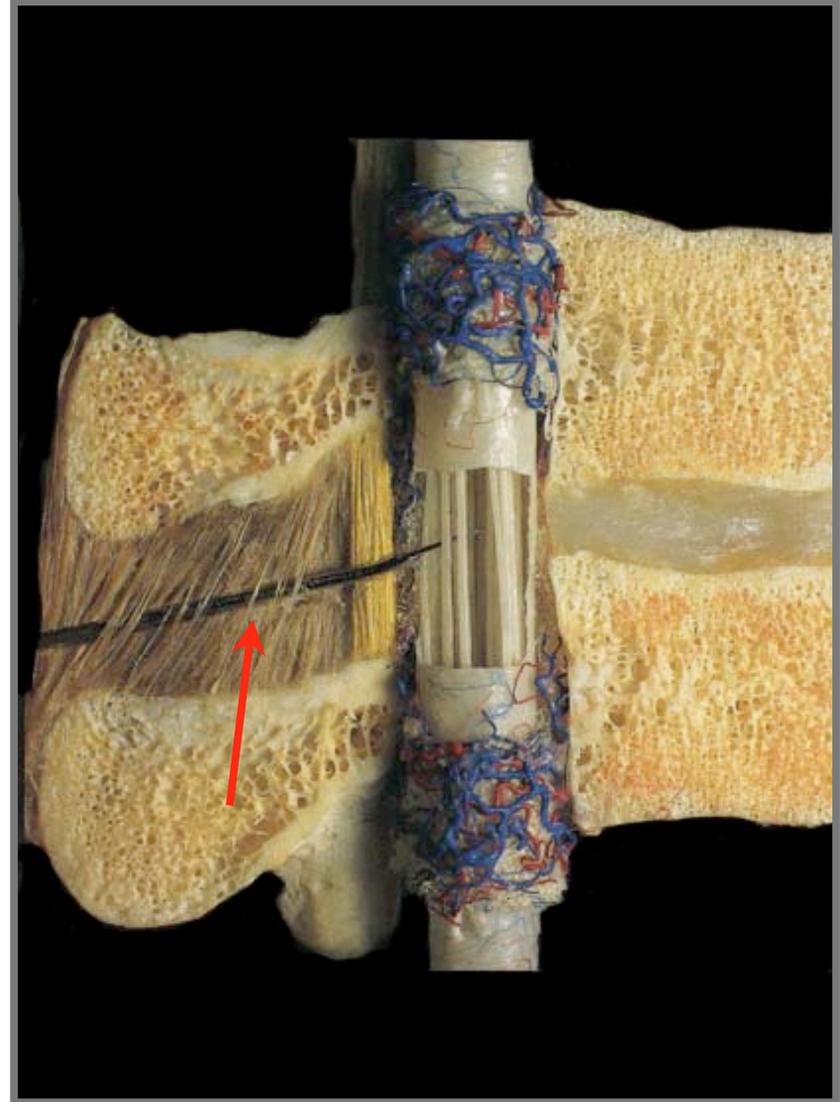
Needle Directions



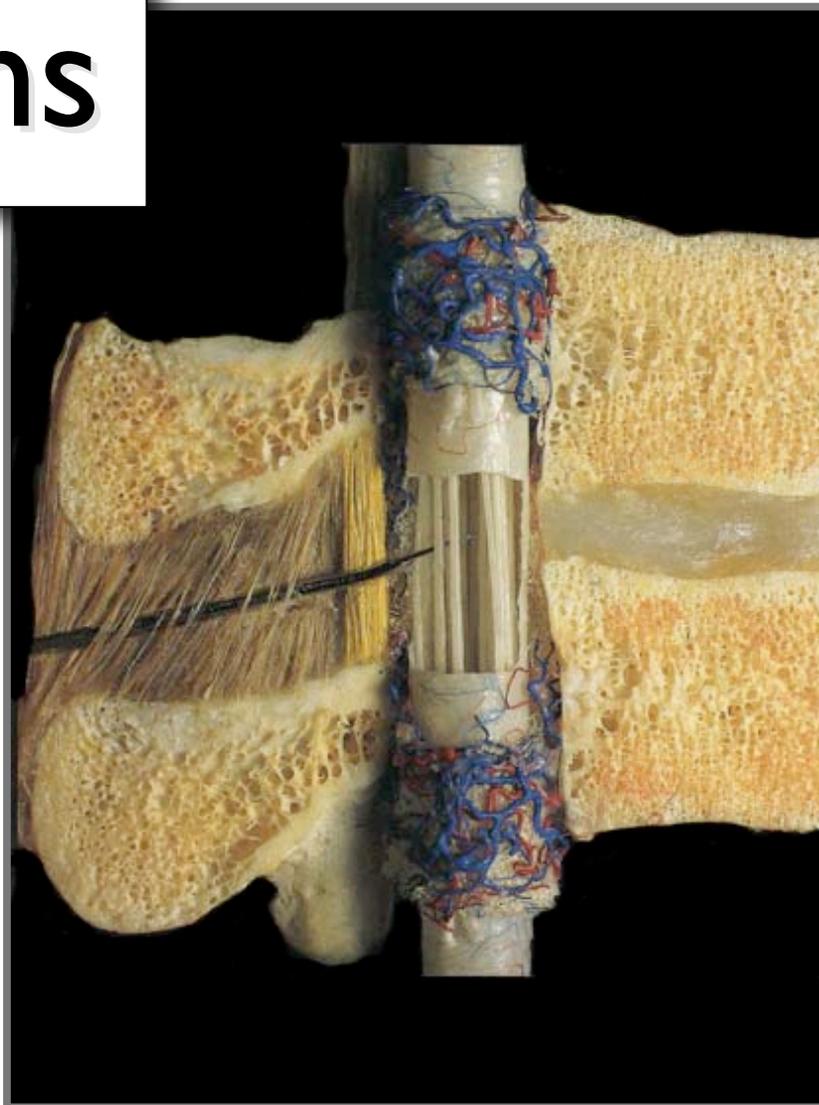
Needle Directions



Needle Directions

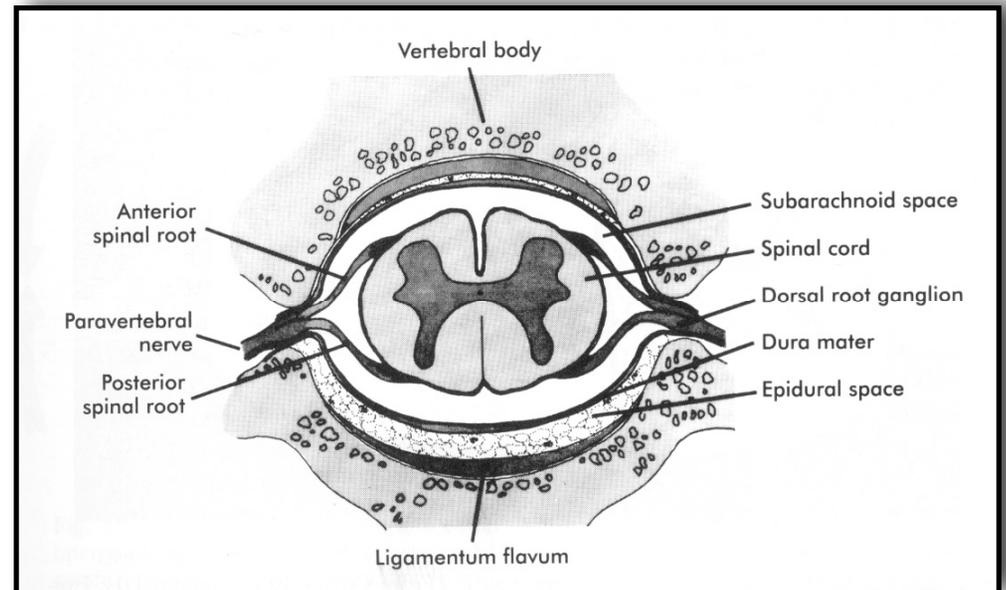


Mechanisms



Mechanism of Spinal Anesthesia

- 💡 Blockade of nerve roots
 - afferent impulses entering CNS via dorsal roots
 - efferent impulses leaving CNS via ventral roots



Major Factors Affecting Spinal Anesthetic Level



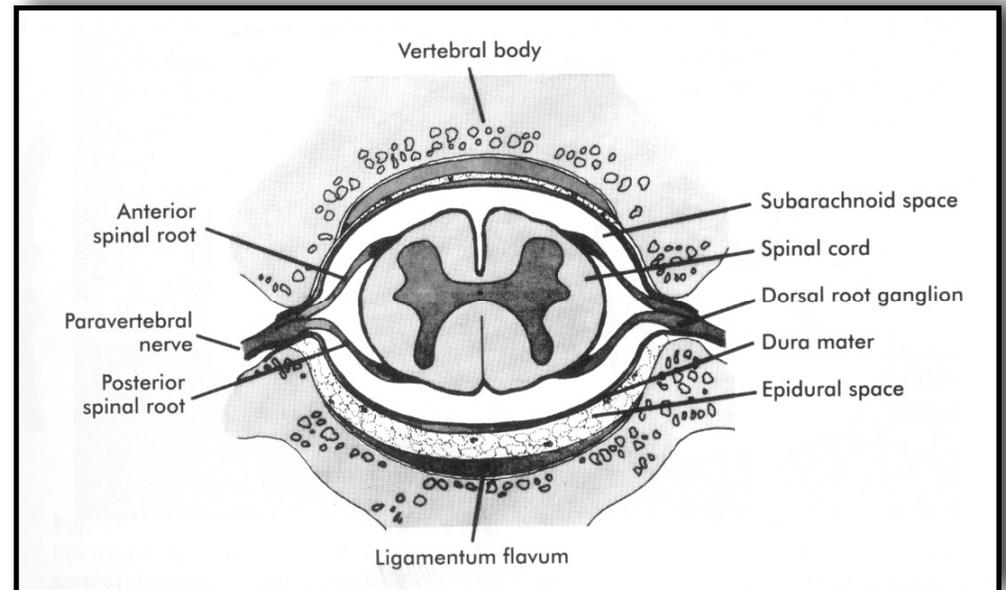
Baricity



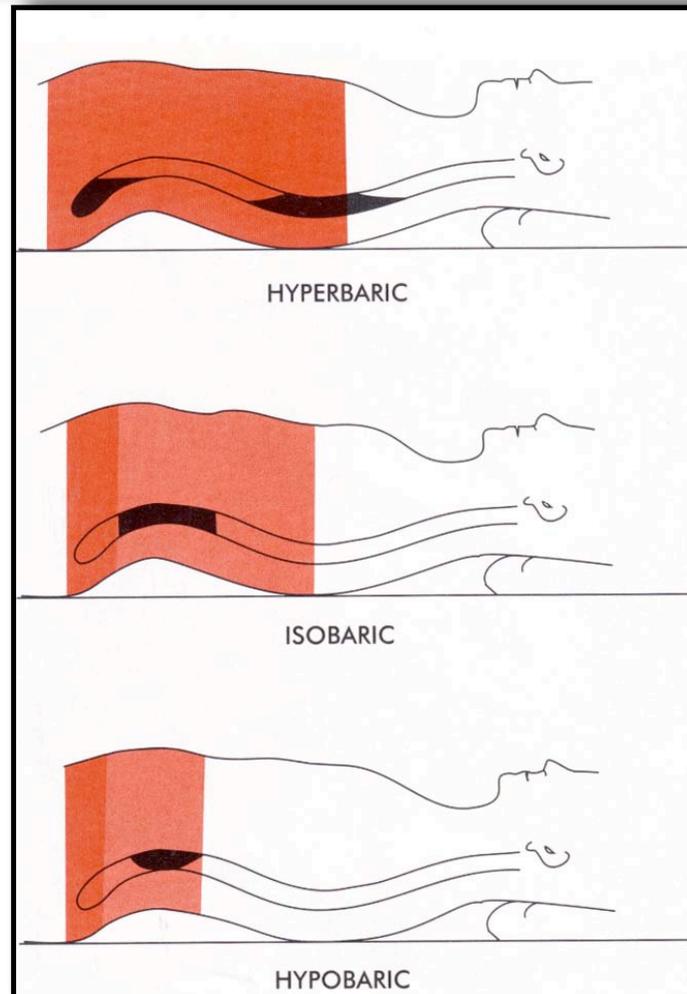
Dose



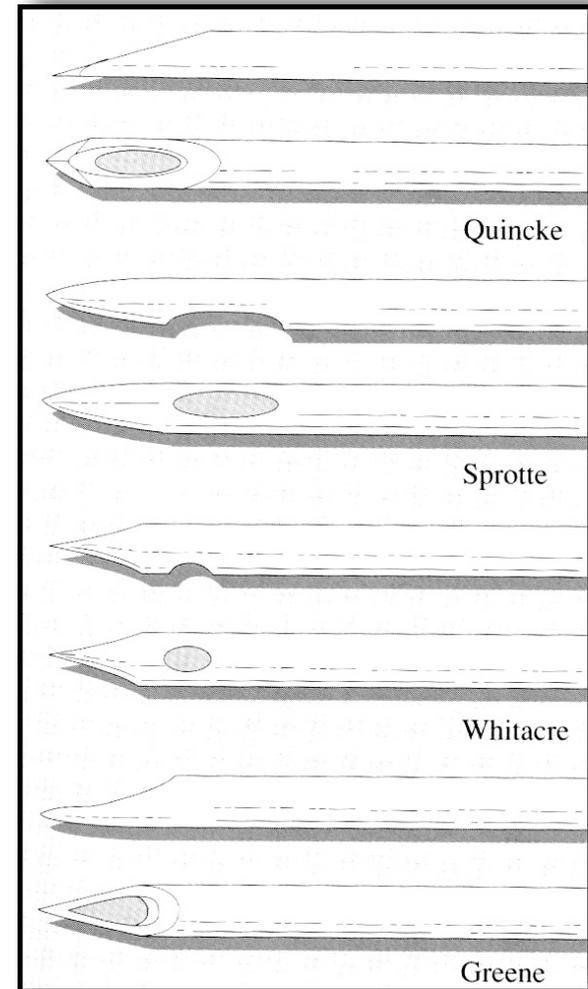
Patient position



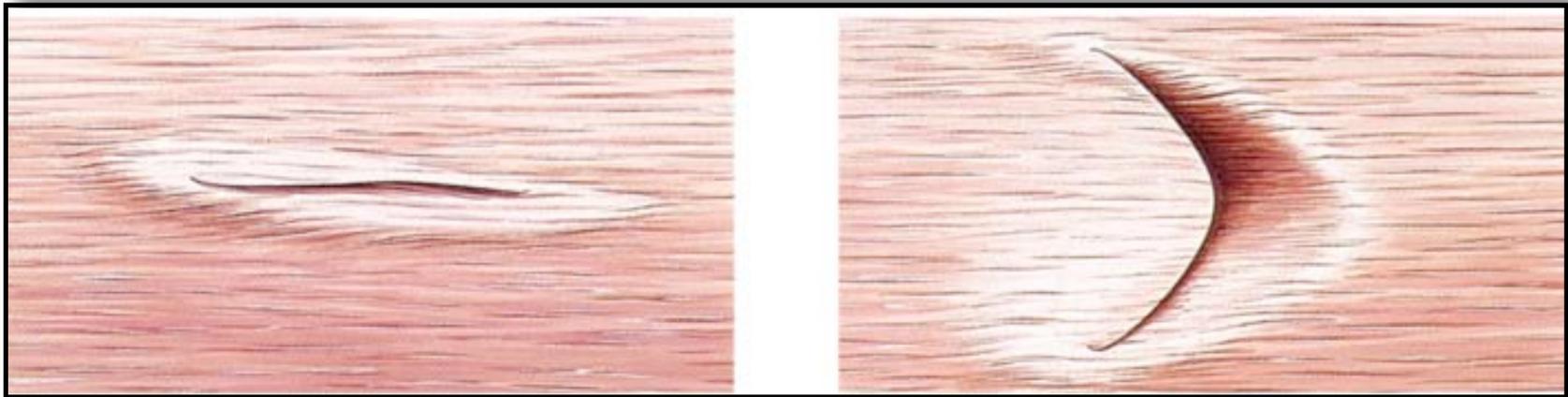
Distribution of Spinal Anesthetics



Spinal Needle Tips

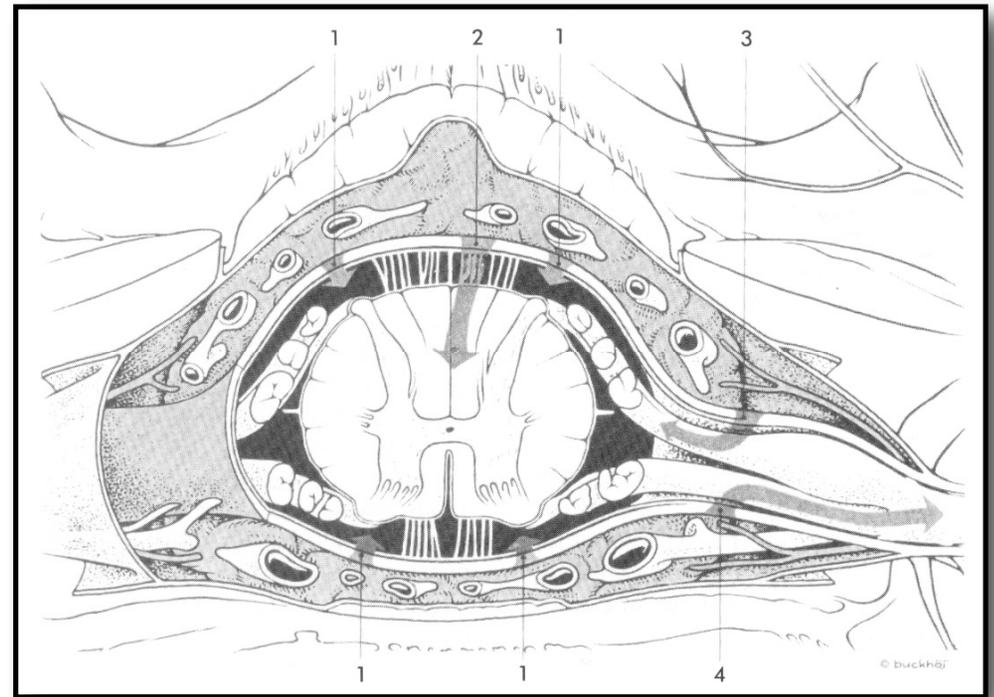


Why use a pencil point or a cutting spinal needle?



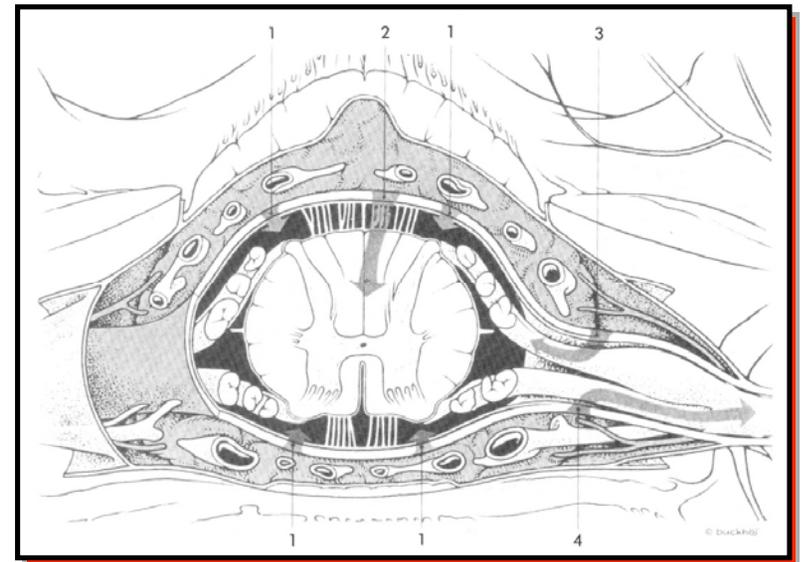
Mechanism of Epidural Anesthesia

- Diffusion to neural structures
 - through dura to CSF
 - from CSF to spinal cord
 - from dural root sleeves to nerve roots and spinal cord
 - from dural root sleeves to spinal nerves



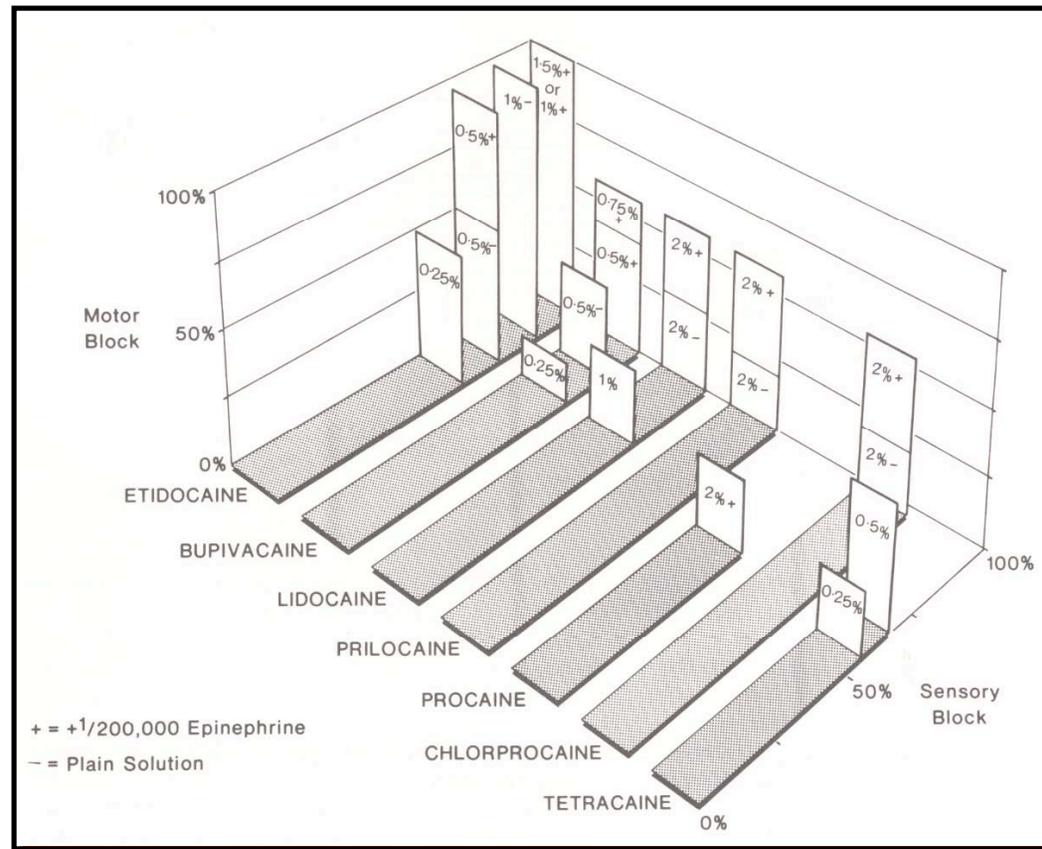
Major Determinant of Block Height

- Volume of local anesthetic



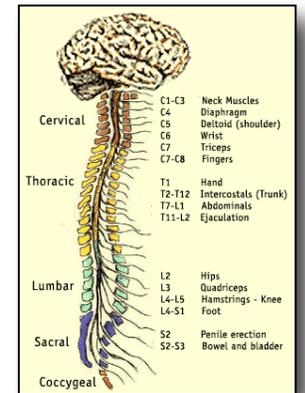
Epidural Anesthesia

Epidural: Choice of Local Anesthetic



Local Anesthetics

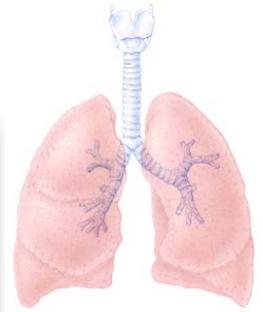




Physiologic Effects



Respiratory Effects

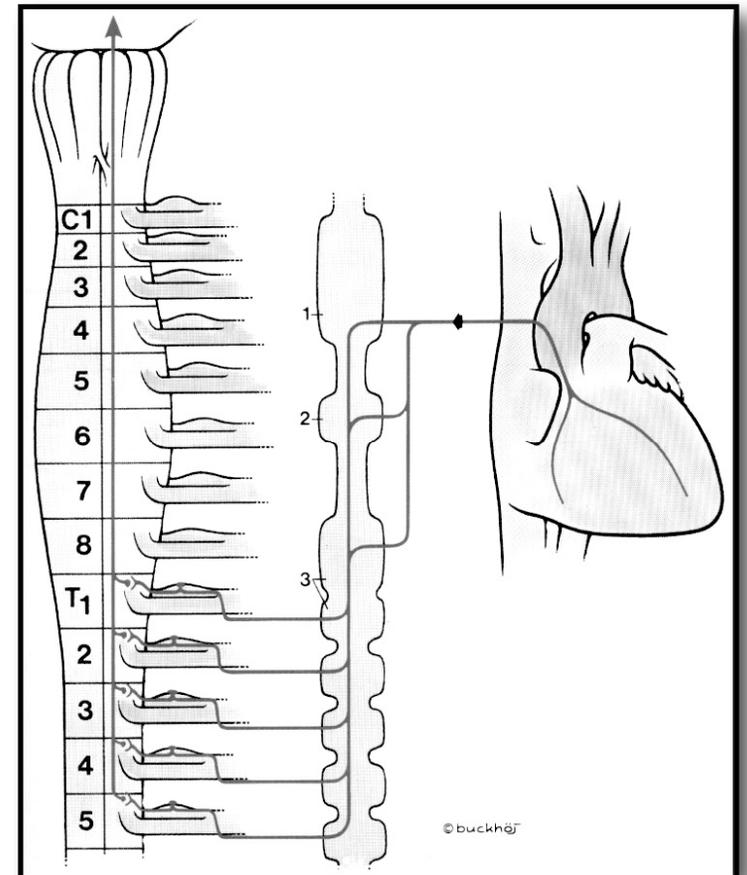


- Expiratory function reduced in proportion to anesthetic level
- Inspiratory function unchanged (diaphragm innervated by cervical plexus)

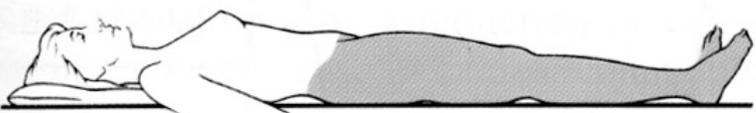
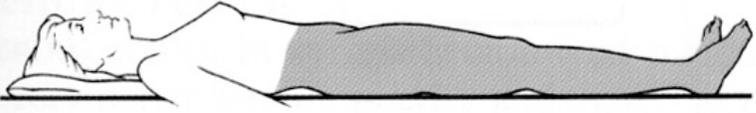
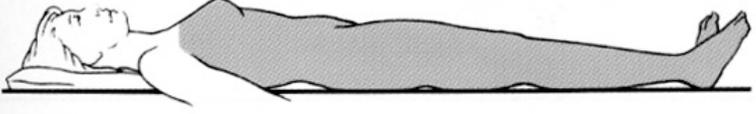


Cardiovascular Effects

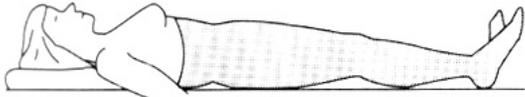
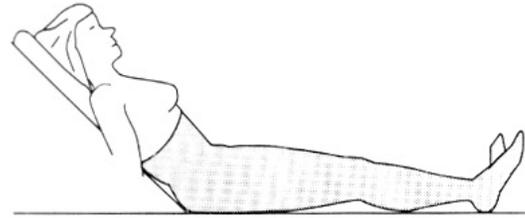
- **Hypotension**
 - related to sympathetic blockade
- **Bradycardia**
 - blockade of cardioaccelerator fibers (T1-T4) decreased outflow from right atrial chronotropic stretch receptors



Cardiovascular Changes During Spinal Anesthesia at Different Segmental Levels

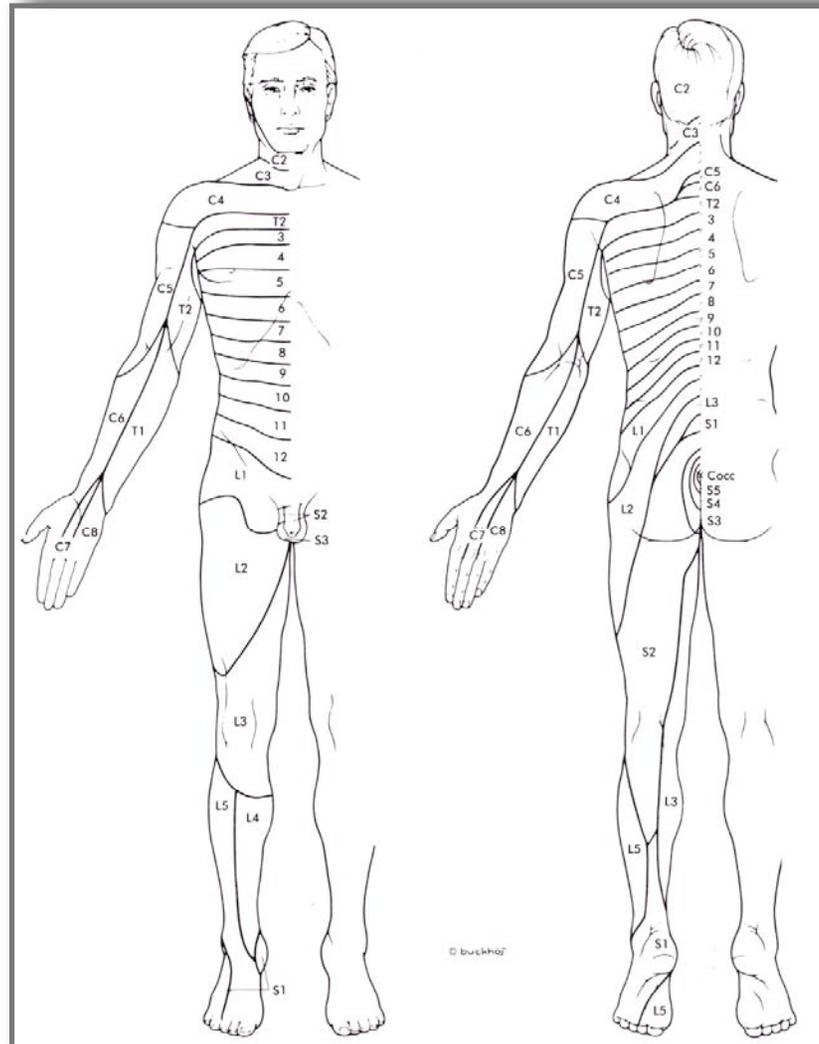
	PR	HR	CO	VR	C	MAP
	NC	NC	NC	NC	NC	NC
	↓	↕	↕	NC	NC	↓
	↓	↓	↓	↓	↓	↓

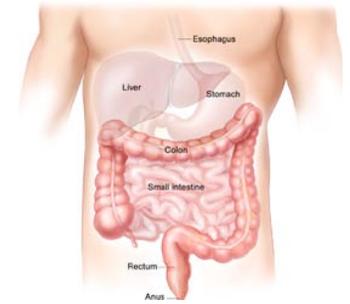
Changes in Various Hemodynamic Parameters as a Function of Epidural Anesthetic Level and Patient Position

	MAP	CO	PR
A 	+ -	+ -	+ -
B 	↓	↓	+ -
C 	↓	+ -	↓



Dermatomes





Gastrointestinal Function

- 💡 Hyperperistalsis resulting in nausea/vomiting
- 💡 Decreased hepatic blood flow



Complications

- ⌋ ? Hypotension
- ⌋ ? Bradycardia
- ⌋ ? Nausea/Vomiting
- ⌋ PDPH
- ⌋ Paresthesias
- ⌋ High/total spinal
- ⌋ Backpain
- ⌋ Bleeding
- ⌋ Infection



ASRA Guidelines

Special Articles

The Importance and Implications of Aseptic Techniques During Regional Anesthesia

James R. Hebl, M.D.

Infectious complications may occur with any regional anesthetic technique. However, those associated with neuraxial anesthesia and analgesia are of greatest concern because of their potentially devastating sequelae including meningitis, paralysis, and even death. Fortunately, the frequency of such complications appears to be relatively low. Aromaa et al.¹ reported 8 cases of bacterial infection to the spine or central nervous system (CNS) after 170,000 epidural and 550,000 spinal anesthetics, for an overall frequency of 1.1 per 100,000 blocks. However, these results are contrasted in a more recent survey by Wang and colleagues,² who estimated the incidence of epidural abscess after epidural analgesia to be 1 in 1,930 and the risk of persistent neurologic deficit to be 1 in 4,343 catheters. This enormous discrepancy and apparent increase in the number of reported complications may be explained by several factors. These include data-collection techniques, varying definitions of "infection" and/or "colonization," improved post-operative monitoring and reporting, an overall increase in the total number of epidurals being performed, or a true increase in infection rates.³ Differences in aseptic technique(s) may also account for reported differences. For example, the use of protective barriers (masks, gloves, and gowns), preprocedural handwashing, bacterial filters, and the type and concentration of skin disinfectant varies tremendously among investigations. Variables that often differ among investigations, and there-

fore make interstudy comparisons difficult, are listed in Table 1.⁴

The frequency of infection associated with peripheral nerve block remains even more undefined. Sporadic cases of localized infection and/or bacteremia have been reported after both single-injection⁵ and continuous peripheral techniques.⁶⁻¹¹ Nseir and colleagues⁷ have reported the only fatality associated with a peripheral technique and attributed specifically to an infectious etiology. A case of streptococcal necrotizing fasciitis was described after a single-injection axillary block in an elderly patient undergoing carpal tunnel decompression. However, clinicians must remain cognizant that as peripheral techniques continue to be used with greater frequency, infectious complications will undoubtedly become more common within the literature.

Sources of Injection

The etiology of infectious complications is often unclear. Potential sources may be classified as either intrinsic or extrinsic. Intrinsic sources are generally related to the underlying health of the patient and include such conditions as trauma, intravenous drug abuse, malignancy, diabetes mellitus, pregnancy, and other immune-depressed states. In a review of 39 patients with spinal and epidural infection, Baker and colleagues¹² identified several intrinsic sources of infection, with hematogenous spread from remote sites of infection accounting for over 25% of cases. *Staphylococcus aureus* was most commonly isolated (21/39 patients, 54%), followed by species of streptococci, *Escherichia coli*, and *Pseudomonas aeruginosa*. In contrast to these findings, Darchy et al.¹³ concluded that infectious foci distant to an epidural catheter site do not increase the likelihood of subsequent epidural infections. They investigated 75 patients who received care in the intensive care unit who were given epidural analgesia for more than 48 hours. Four (19%) of 21 patients with a remote infectious foci experienced a subsequent catheter-related infectious complication versus 5 of 54 (9%) patients with no remote-site

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Accepted for publication April 12, 2006.

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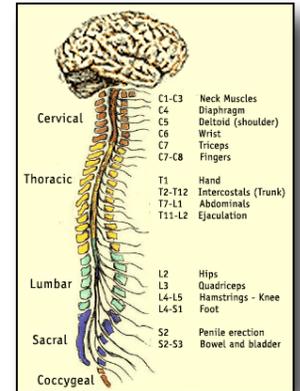
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1098-7339/06/3104-0006\$12.00/0
doi:10.1016/j.rapm.2006.04.004

<http://www.asra.com/consensus-statements/The-Importance-and-Implications.pdf>



ASRA Guidelines



- Neuraxial infection is rare but underreported.
- Handwashing reduces cross-contamination.
- Removing jewelry is prudent.
- Surgical masks reduce site contamination.
- Chlorhexidine solutions are the antiseptic of choice.





Thank You!

