Neuraxial Anesthesia

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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
Acute pain
- post-op
- flail chest
- labor

Chronic pain
Contraindications

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

Absolute
Relative
-neurologic disease
-chronic back pain
-foreign language

Contraindications
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

HYPERBARIC

ISOBARIC

HYPOBARIC
Spinal Needle Tips

- Quincke
- Sprotte
- Whitacre
- Greene
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
Changes in Various Hemodynamic Parameters as a Function of Epidural Anesthetic Level and Patient Position
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
The Importance and Implications of Aseptic Techniques During Regional Anesthesia

James R. Hebl, M.D.

Infection complications may occur with any regional anesthetic technique. However, those associated with neuralaxial anesthesia and imaging are of greater concern because of their potentially devastating sequelae, including meningitis, paraly,

sis, and even death. Fortunately, the frequency of such complications appears to be relatively low (Hebl et al., 2001). Reported cases of bacterial infection to the spine or central nervous system (CNS) after INCA epidural and TCA spinal anesthesia, for an overall frequency of 1.1 per 100,000 hospitalizations. However, these results are consistent with a more recent survey by Wang and colleagues (2019), who estimated the incidence of epidural abscess after epidural anesthesia to be 1 in 1,243 and the risk of postoperative infection to be 1 in 4,945 catheters. This discrepancy in reported incidence may be explained by several factors. These include data-collection techniques, varying definitions of “infection” and “colonization,” improved post-operative monitoring and reporting, and an overall increase in the levels of erythrocyte being performed, or a true decrease in infection rates. Differences in sepsis might also account for reported differences. For example, the use of protective barriers (masks, gloves, and gowns), prophylactic handwashing, monitors, and the type and concentration of skin disinfectants varies tremendously among investigators. Variables that often differ among investigations, and therefore make interstudy comparisons difficult, are listed in Table 1.

The frequency of infection associated with peripheral nerve block remains even more uncertain. Spinal cases of localized infection and/or bacteremia have been reported with both single-injection and continuous peripheral techniques. ASRA and colleagues have reported the only facility associated with a peripheral technique and the associated specifically to an infectious etiology. A case of deep-seated infection following a single-injection peripheral block in an elderly patient undergoing carpal tunnel decompression. Furthermore, 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 Infection

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-suppressed states. In a review of 10 patients with spinal and epidural infection, Baker and colleagues (2019) identified several intrinsic sources of infection, with hematogenous spread from remote sites of infection accounting for over 25% of cases. S. epidermidis infection was most commonly isolated (21/39 patients, 54%), followed by species of Staphylococcus, Escherichia coli, and Pseudomonas aeruginosa. In contrast to these findings, Thayer et al. (2016) calculated that patients with local skin disease or an epidural catheter site do not increase the likelihood of subsequent epidural infections. They investigated 25 patients who received care in the intensive care unit who were given epidural analgesia for more than 68 days. Post (15%) of 22 patients with a remote infection had a subcconjunctival infection versus 8 of 34 (23%) patients with no remote-site

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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.
