Lumbar Epidural Steroid Injection

5

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Abstract

Epidural spinal injections (ESI) are one of the most common treatments for chronic back pain. Injections are performed with corticosteroids with or without local anesthetics and can reduce inflammation providing pain relief, restoring function, and improving participation in a physical therapy program. They are most commonly performed at the lumbosacral level to treat lumbosacral radicular pain caused by lumbosacral disc herniation. Though thoracic back pain is less common than cervical or lumbosacral back pain it can still cause significant limitations for patients who suffer from it. Thoracic epidural steroid injections are an effective treatment for several thoracic chronic pain conditions to include disc herniation, spinal stenosis, and post thoracic surgery and thoracotomy pain (Benyamin et al., Pain Physician 15(4):E497–E514, 2012; Manchikanti et al., Pain Physician 17(3):E327–E338, 2014; Manchikanti et al., Pain Physician 24(S1):S27–S208, 2021).

Lumbar epidural steroid injections can be performed via a transforaminal, interlaminar, or caudal approach with mixed data regarding the superiority of any one approach (Ghai et al., Pain Physician 17(4):277–290, 2014; Manchikanti et al., Clin Orthop Relat Res 473(6):1940–1956, 2015; Parr et al., Pain Physician 12(1):163–188, 2009). Many physicians choose the transforaminal approach due to the ability to better target the ventral epidural space (Lee et al., Spine J 18(12):2343–2353, 2018). Risks of the transformational approach include including paraplegia and pain, with caudal ESIs being considered a safer though less targeted approach. The caudal approach carries a lower risk of thecal sac puncture and can be done fluoroscopically, with ultrasound guidance, or with a

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combination of both—mainly with fluoroscopy being used to check contrast spread in patients with prior low back surgery.

When isolated lumbar nerve root irritation is suspected, selective nerve root blocks can be performed for diagnosis and to better target the affected nerve root. Causes of nerve root irritation can include disc herniation, ligamentum flavum hypertrophy, facet hypertrophy, and osteophytes leading to nerve root irritation (Stafford et al., Br J Anaesth 99(4):461–473, 2007).

Lumbar epidural steroid injection and selective nerve root blocks are considered temporizing treatments and recurrence of low back pain is expected. They do not alter prognosis for patients with certain condition in whom surgery is indicated.

Keys to Procedure

- Recognize and optimize Anterior Posterior (AP) and Contralateral Oblique views (CLO) of the lumbar spine.
- Choose an appropriate needle entry point and optimize trajectory with fluoroscopic guidance.
- Appreciate typical tactile differences of the needle and the loss of resistance syringe during the procedure.

Anatomy Pearls

See Images 5.1, 5.2, and 5.3.

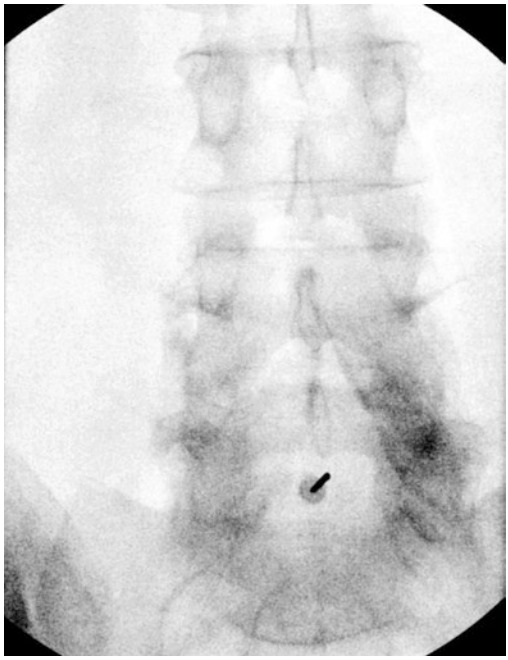

Image 5.1 AP view at L5-S1 for needle placement

Image 5.2 CLO view showing contrast spread in the epidural space

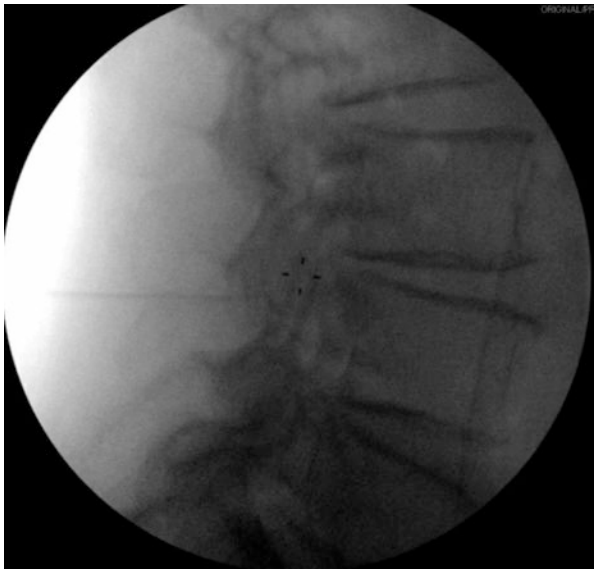

Image 5.3 Lateral needle view

Supplies and Setup

- Sterile drape
- Chlorhexidine-based soap ×3
- 20G Tuohy needle—3.5 in. or larger depending on body habitus
- Loss of resistance syringe
- Lidocaine 1% for skin—5 mL
- Preservative-free Methylprednisolone 80 mg—1 mL (consider 40 mg in patients with diabetes), or dexamethasone 10 mg
- Preservative-free normal saline—2–4 mL
- 25G 1.5″ needle for skin local
- 18G 1.5″ needle to draw up medications
- 3 mL syringe with 25G 1.5″ needle for skin local
- 5 mL syringe for injectate (2–4 mL PF normal saline + steroid)
- Optional:
  - Isovue 300—3 mL (if no allergy)
  - Separate 18G 1.5″ needle to draw contrast
  - Extension tubing (3″) for contrast
  - 3 mL syringe for contrast.

Patient Positioning

– Prone with pillow under abdomen to flex thoracolumbar spine and minimize lumbar lordosis.

How to Perform the Procedure

1. Sterilely prep over lumbar spine and drape with sterile drape.
2. Obtain a true AP view of the lumbar spine.
3. Consider small adjustments to cranial/caudal tilt to help “open” and optimize approach to interlaminar space.
4. Identify optimal entry point based on individualized patient pathology—including interspace level (commonly L5-S1 interspace) and laterality
   (a) Select based on symptom laterality and dermatomes, largest open space on fluoroscopy, and pre-procedure MRI findings
5. Anesthetize the skin at target entry site with Lidocaine 1% and insert Tuohy coaxial to the fluoroscopic beam (Image 5.1).

6. After needle is inserted 2–3 cm, switch to contralateral oblique (CLO), which is 45° oblique on the contralateral side of midline relative to the needle. Advance needle while visualizing the needle tip depth as it approaches the ventral interlaminar line (VILL). After switching to CLO view, if the needle is more than a few centimeters from the VILL, switch back and forth between an AP view and CLO view as the needle is advanced.

7. Engage the needle in the ligamentum flavum at the VILL. Confirm location of needle with fluoroscopy in the CLO view and/or the spinolaminar line in the lateral view (Image 5.2 and 5.3).
8. Use the loss of resistance technique to obtain access to the epidural space.
9. Optional: confirm location in the epidural space with contrast.
10. Tuohy should be just ventral to the VILL in CLO view or just sublaminar in the lateral view.
11. Administer injectate slowly—2–4 mL PF normal saline + steroid.
12. Withdraw Tuohy, clean area, apply adhesive dressing.

Checkpoints to Mastery

Beginner

- Adjust fluoroscopy to obtain true AP view of lumbar spine.
- Optimize fluoroscopy to "open" target space.
- Insert Tuohy and adjust to obtain coaxial view in target space.

Intermediate

- Appreciate tactile feel of tissue planes and ligaments as needle is advanced.
- Make appropriate adjustments to C-arm to obtain CLO view (Alternate—Lateral view).
- Identify ventral interlaminar line (VILL) in CLO view.

Advanced

- Transition from AP to CLO (or lateral view) when needle is close to epidural space without inadvertently entering thecal sac.
- Appreciate loss of resistance in needle and syringe when entering the epidural space.
- Confirm needle placement with contrast spread, and needle position on lateral or CLO view.

Pitt Pain Pearls and pitfalls

- Use the contralateral oblique (or lateral view) and/or contrast to confirm depth prior to injecting steroid solution as false loss of resistance is common.
- If a dural puncture ("wet tap") occurs, the most conservative approach is to cancel the procedure. Other approaches could include re-attempting at another interspace, or withdrawing the needle and approaching the same space again, confirming lack of CSF flow with aspiration prior to injection.
- Small-appearing interspaces can often be optimized by caudal/cranial tilts of the C-Arm; oblique tilts may be used to optimize paramedian approach.
- Transitioning from AP to lateral or CLO view too early may add additional procedural challenges as medial/lateral guidance is lost and cranial/caudal guidance limited.
- Loss of resistance to air can cause pneumocephalus and severe headache, minimize risk by using saline or limit amount of air injected.

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Further Reading

Atlas of image-guided intervention in regional anesthesia and pain medicine. 2nd ed. Rathmell.