Thoracic Epidural Steroid Injection

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Abstract

Epidural spinal injections (ESI) are one of the most common treatments for chronic back pain. Injections are performed with local anesthetics with or without corticosteroids 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

- Understand the relevant thoracic spine anatomy on AP and CLO.
- Understand proper patient positioning to optimize epidural space.
- Be able to perform the hanging drop or loss of resistance technique.
- Understand the complications and corrective steps if encountered.

Anatomy Pearls

Patient Positioning

See Image 4.1.

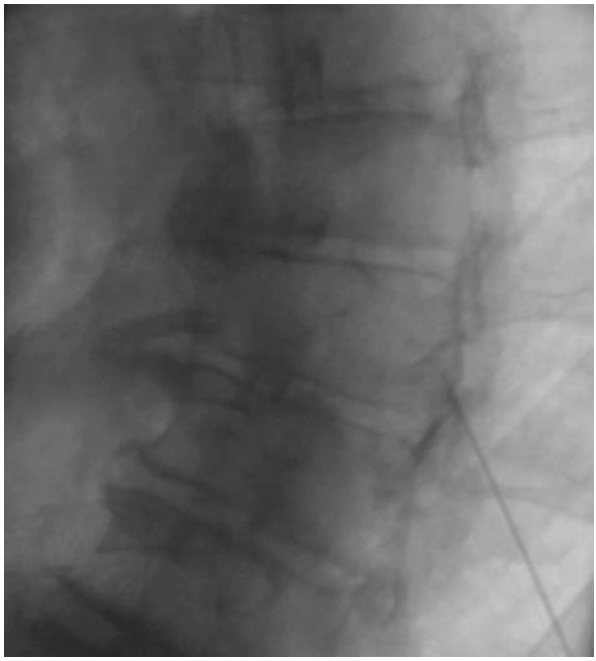

Image 4.1 CLO View of T9-10

What You Will Need

- Sterile drape
- Chlorhexidine-based soap
- 20G Tuohy needle
- Loss of Resistance syringe
- Lidocaine 1% for skin—5 mL
- Dexamethasone 10 mg—1 mL
- Preservative-free normal saline—2 mL
- Isovue 300—3 mL (if no allergy)
- 25G 1.5″ needle for skin local:
- 18G 1.5″ needle to draw up medications
- Extension tubing (3″) for contrast
- 3 mL syringe with 25G 1.5″ needle for skin local
- 5 mL syringe with extension tubing for contrast
- 3 mL syringe for injectate (0–2 mL preservative free normal saline + Dexamethasone 10 mg).

Pitt Pain Pearls

- Steeper angle required compared to other intra-laminar procedures.
- T1-T2 typically performed as alternative if anatomy precludes C7-T1 injection.

How to Perform the Procedure

1. Sterilely prep over target thoracic area and drape with sterile drape in prone position
2. Locate the anatomic landmarks to the specific thoracic interspace initially with C-arm angled with 40–50° caudal tilt from AP.
3. Square off superior endplate of vertebral body below and inferior endplate of vertebral body above targeted interlaminar space using caudad or cephalad tilt
4. Anesthetize the skin at target entry site with Lidocaine 1%.
5. Insert the Tuohy using a paramedian approach (1 cm below interspace, 1 cm lateral to spinous process on the painful side.
6. Advance Tuohy 10–15° toward midline (if paramedian) with 50–60° of cranial angulation from the axial plane toward interlaminar space.
7. Rotate the C-arm to the lateral or contralateral oblique (CLO—Image 4.1) views for further Tuohy advancement.
8. Advance Tuohy while visualizing the needle tip depth as it approaches the ventral interlaminar line (VILL) in the CLO view or the spinolaminar line in the lateral view.
9. Use a loss of resistance technique while advancing in 1–2 mm increments with intermittent CLO views as needed until epidural space reached.

10. The final needle position should be just ventral to VILL in CLO view (preferred) or just sublaminar in lateral view.
11. Confirm appropriate Tuohy placement in thoracic epidural space with 1 mL contrast and verify appropriate spread of contrast in AP and CLO (or lateral) views.
12. Administer injectate (2 mL PF normal saline + 1 mL Dexamethasone 10 mg) slowly.
13. Withdraw Touhy, clean area, apply adhesive dressing.

Checkpoints in Master

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Checkpoints to Mastery

Beginner

- Make proper adjustments on AP X-ray with cephalad and caudal vertebral endplates "squared off."
- Locate the desired thoracic interspace and be able to point it out on fluoroscopic image.
- Insert Tuohy and obtain coaxial needle view within the targeted thoracic interlaminar space.

Intermediate

- Make proper adjustments to C-arm and obtain CLO view (Alternate—Lateral).
- Identify the ventral interlaminar line (VILL), (Alternate—Spinolaminar line).
- Direct needle parallel to spinous process until approaching VILL or Spinolaminar.

Advanced

- Engage the ligamentum flavum and appreciate resistance changed at the VILL on CLO.
- Perform hanging drop or loss of resistance technique.
- Confirm correct needle placement with contrast.

Pitt Pain Pearls and Pitfalls

- Review thoracic MRI prior to the procedure to examine posterior epidural space dimensions.
- CLO less than 45° from AP can mislead one to think the needle is deeper (more ventral) than it actually is.
- Conversely more oblique than 45° can make the needle seem more shallow (dorsal) than it actually is.
- Crossing midline can compromise CLO view.
- Take into account patient claustrophobia while placing sterile towels or drapes around head.
- Be cognizant of location of ephedrine or other treatments for bradycardia/hypotension in clinic if required acutely during the procedure.
- Patients may require IV placement prior to first thoracic epidural.

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Further Reading

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Atlas of image-guided spinal procedures. 2nd ed. Furman.