Caudal Epidural Steroid Injection with Fluoroscopy

6

Sean McDermott, Hayden Hundley, and Alexander Varzari

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

S. McDermott (✉) · A. Varzari
University of Pittsburgh Medical Center (UPMC), Pittsburgh, PA, USA
e-mail: mcdermotts3@upmc.edu; varzaria@upmc.edu

H. Hundley
Flowers Hospital, Dothan, AL, USA

© The Author(s), under exclusive license to Springer Nature Switzerland AG 2023

T. Emerick et al. (eds.), *The Pain Procedure Handbook*,
https://doi.org/10.1007/978-3-031-40206-7_6

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 lateral fluoroscopic view of sacrum and target structures.
- Select appropriate entry point and needle angle—midline, appropriate cranial/caudal position, and shallow angle towards sacral hiatus.
- Appreciate tactile feel of needle entry through sacrococcygeal ligaments into epidural space.

Anatomy Pearls

See Images 6.1 and 6.2.

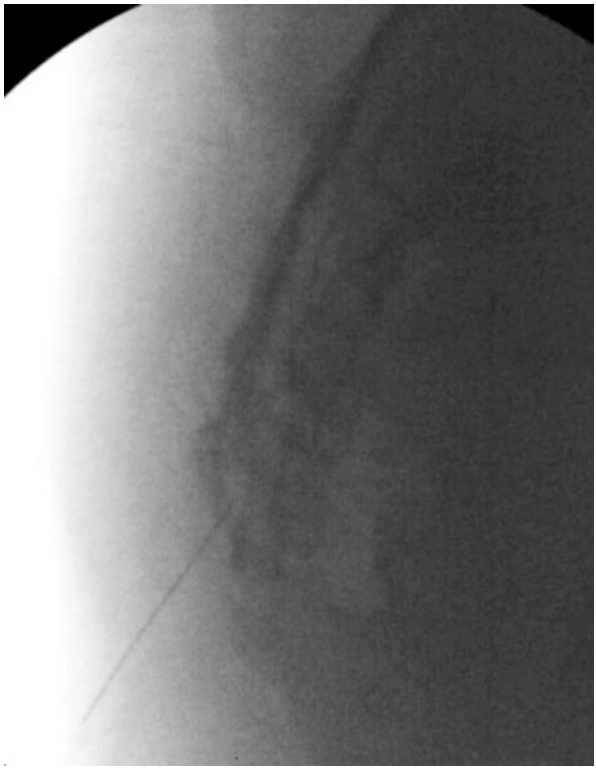

Image 6.1 Lateral view of needle entering caudal epidural space

Image 6.2 Lateral view of contrast spread into caudal epidural space

Supplies and Setup

- Sterile drape
- Topical Antiseptic (i.e. chlorhexidine/alcohol, betadine)
- 22G 3.5″ spinal or Tuohy needle
- Lidocaine 1% for skin—5 mL
- Preservative-free (PF) Methylprednisolone 80 mg—1 mL (consider 40 mg in patients with diabetes), or dexamethasone 10 mg
- PF normal saline—3–4 mL
- Bupivacaine 0.25%—2 mL (consider risks/benefits of adding local anesthetic to epidural)
- Isovue 300—3 mL (if no allergy)
- 25G 1.5″ needle for skin local
- 18G 1.5″ needle to draw medications
- 18G 1.5″ needle to draw contrast
- Extension tubing (3″) for contrast
- 3 mL syringe with 25G 1.5″ needle for skin local
- 5 mL syringe with extension tubing for contrast
- 10 mL syringe for injectate—4 mL PF normal saline +2 mL 0.25% Bupivacaine (if desired) + steroid
- Optional: pediatric epidural catheter

Patient Positioning

– Prone with pillow under pelvis to help with anatomic visualization.

How to Perform the Procedure

1. Sterilely prep over the lower lumbar spine, sacral hiatus, and coccyx and drape with sterile drape.
2. Palpate the sacral hiatus between the sacral cornua, or alternatively, use lateral fluoroscopic view to identify sacral hiatus.

3. Anesthetize the skin midline overlying the sacral hiatus with Lidocaine 1%.
4. Introduce a 22G 3.5″ Tuohy or spinal needle at less than 45° angle, in the midline, overlying the sacral hiatus.
5. Use lateral fluoroscopic view to visualize the needle angle relative to the sacral hiatus and sacrococcygeal periosteum to avoid advancing too far ventrally into the viscera or too shallow dorsally (Image 6.1). Collimation in the lateral view can help better define the image.
6. A distinct change in resistance is often felt as the needle tip passes through the sacrococcygeal ligament.
7. The angle of the needle can then be increased (to 75° or more from the axial plane) to lie closer to the plane of the sacrum, and the needle tip can be advanced an additional 1–2 cm into the caudal epidural space.

8. Optional: obtain AP view to confirm needle is midline (or directed towards symptomatic side) and below S3.
9. Optional: advance catheter through epidural needle to desired level or until resistance is met.
10. Administer 1 mL of contrast through needle or catheter (if used) to ensure appropriate spread outlining epidural space in lateral view (Image 6.2) and/or AP view.
11. Administer injectate slowly—(4 mL PF normal saline +2 mL 0.25% Bupivacaine (if desired) + steroid.
12. Withdraw needle, clean area, apply adhesive dressing.

Checkpoints to Mastery

Beginner

- Identify the sacral hiatus and cornua with palpation.
- Identify the target structures on a lateral and AP fluoroscopic view.

Intermediate

- Adjust fluoroscope to obtain optimal lateral view.
- Appreciate tactile feel of the sacrococcygeal ligaments and entry into caudal space.

Advanced

- Confirm needle placement with contrast spread pattern.
- Insert an epidural catheter through Tuohy and advance to target position.

Pitt Pain Pearls and Pitfalls

- The 25G 1.5″ needle for skin can also be used to access epidural space in patient with low BMIs and no plans for use of pediatric epidural catheter. Removing the 1% Lidocaine syringe prior to advancing the skin needle into canal avoids inadvertent injection of additional lidocaine. Some also prefer to use a 22–25 g spinal needle rather than epidural needle.
- Avoid advancing the needle too far within the caudal space to avoid a wet tap, the thecal sac typically ends around S2–S3 in adults.
- During injection, palpation with a finger above the sacral hiatus can sometimes identify a subcutaneous injection if tissue expansion is felt.
- A hemostat may be used to tent skin and identify optimal needle entry point and trajectory prior to local infiltration.

References

1. Benyamin RM, Wang VC, Vallejo R, Singh V, Helm Ii S. A systematic evaluation of thoracic interlaminar epidural injections. Pain Physician. 2012;15(4):E497–514.
2. Ghai B, Bansal D, Kay JP, Vadaje KS, Wig J. Transforaminal versus parasagittal interlaminar epidural steroid injection in low back pain with radicular pain: a randomized, double-blind, active-control trial. Pain Physician. 2014;17(4):277–90.
3. Lee JH, Shin KH, Bahk SJ, Lee GJ, Kim DH, Lee CH, Kim DH, Yang HS, Lee SH. Comparison of clinical efficacy of transforaminal and caudal epidural steroid injection in lumbar and lumbosacral

disc herniation: a systematic review and meta-analysis. Spine J. 2018;18(12):2343–53. https://doi.org/10.1016/j.spinee.2018.06.720.
4. Manchikanti L, Cash KA, McManus CD, Pampati V, Benyamin RM. Thoracic interlaminar epidural injections in managing chronic thoracic pain: a randomized, double-blind, controlled trial with a 2-year follow-up. Pain Physician. 2014;17(3):E327–38.
5. Manchikanti L, Knezevic NN, Navani A, Christo PJ, Limerick G, Calodney AK, Grider J, Harned ME, Cintron L, Gharibo CG, Shah S, Nampiaparampil DE, Candido KD, Soin A, Kaye AD, Kosanovic R, Magee TR, Beall DP, Atluri S, Gupta M, et al. Epidural interventions in the management of chronic spinal pain: American Society of Interventional Pain Physicians (ASIPP) comprehensive evidence-based guidelines. Pain Physician. 2021;24(S1):S27–208.
6. Manchikanti L, Benyamin RM, Falco FJ, Kaye AD, Hirsch JA. Do epidural injections provide short- and long-term relief for lumbar disc herniation? A systematic review. Clin Orthop Relat Res. 2015;473(6):1940–56. https://doi.org/10.1007/s11999-014-3490-4.
7. Parr AT, Diwan S, Abdi S. Lumbar interlaminar epidural injections in managing chronic low back and lower extremity pain: a systematic review. Pain Physician. 2009;12(1):163–88.
8. Stafford MA, Peng P, Hill DA. Sciatica: a review of history, epidemiology, pathogenesis, and the role of epidural steroid injection in management. Br J Anaesth. 2007;99(4):461–73. https://doi.org/10.1093/bja/aem238.

Further Reading

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