

## Background

- Neurologic injury after CESI is a rare but serious complication.<sup>1</sup>
- Etiology varies on interlaminar versus transforaminal approach.
- Mechanism of infarct injuries is hypothesized to be intra-arterial injection of particulate steroid or direct trauma leading to vasospasm.<sup>2</sup>
- Direct cord injection may lead to air being injected into the intramedullary space.<sup>3</sup>
- This case is the first described where both intramedullary air and spinal cord infarction occurred simultaneously following epidural steroid injection.

## Case Description

- 70-year-old male underwent C6-7 interlaminar epidural steroid injection at an outside facility.
- Techniques used included:
  - Contralateral oblique view
  - Loss of resistance
  - Confirmed contrast spread
  - Use of Dexamethasone
- Patient developed RUE paralysis and distal LUE weakness.
- Day 1: MRI with intrathecal air and myelomalacia.
- Week 2 : MRI showed evidence of cord infarction.
- Week 6: EMG with C5-T1 preganglionic intraspinal lesions with evidence of active denervation in all muscles.
- Patient regained function of LUE, RUE remains flaccid.



**A** MRI T2-weighted sagittal view on day 1 of injury, demonstrating intramedullary air at C2. Myelomalacia noted in right lateral intramedullary spinal cord from C2 to thoracic region. **B** MRI T2-weighted coronal view at C2 on day 1. **C** MRI T2-weighted sagittal view on day 14 after injury, demonstrating improved intramedullary gas and intramedullary enhancement longitudinally in right lateral spinal cord from C2 to thoracic region. **D** MRI T2-weighted coronal view at C5 on day 14, demonstrating intrathecal enhancement and possibly residual gas.

## Discussion

- Potential etiologies of this injury may include:
  - Direct dural and arterial puncture although unlikely given strict guideline adherence.
  - Micropuncture of dura with air bubble penetration.
  - Micropuncture in ligamentum flavum leading to a nozzle effect.<sup>4</sup>
- High volume air may lead to compression of arteries and subsequent ischemia.
- Thinner needles may increase this risk of small, unrecognizable dural puncture.
- CESI is recommended to be performed at C7-T1.<sup>5</sup>
- The least amount of sedation necessary should be utilized to ensure the patient can provide verbal feedback during the procedure.<sup>6</sup>

## Conclusion

- Our case highlights the rare but serious complication of cervical epidural steroid injections and encourages discussion of potential etiologies of these injuries and best practices to avoid them.

## References

- Seddio, Anthony E. BS<sup>o</sup>; McNamara, Katelyn F. BS. Comparable Overall Risk of Neurological Adverse Events Following Cervicothoracic Interlaminar and Transforaminal Epidural Injections: An Analysis of 1.29 Million Patients. *Spine* 50(18):p 1273-1277, September 15, 2025.
- Laredo JD, Wybier M, Laemmel E, Mirshahi M. Intra-arterial injection of particulate corticosteroids: mechanism of injury. *Skeletal Radiol.* 2023 Oct;52(10):1887-1892. doi: 10.1007/s00256-022-04273-5. Epub 2023 Jan 17.
- Hodges SD, Castleberg RL, Miller T, Ward R, Thornburg C. Cervical epidural steroid injection with intrinsic spinal cord damage. Two case reports. *Spine (Phila Pa 1976).* 1998 Oct 1;23(19):2137-42; discussion 2141-2.
- Rathmell JP, Benzon HT, Dreyfuss P, Huntoon M, Wallace M, Baker R, Riew KD, Rosenquist RW, Aprill C, Rost NS, Buvanendran A, Kreiner DS, Bogduk N, Fournay DR, Fraifeld E, Horn S, Stone J, Vorenkamp K, Lawler G, Summers J, Kloth D, O'Brien D Jr, Tutton S. Safeguards to prevent neurologic complications after epidural steroid injections: consensus opinions from a multidisciplinary working group and national organizations. *Anesthesiology.* 2015 May;122(5):974-84.
- Holder EK, Lee H, Raghunandan A, Marshall B, Michalik A, Nguyen M, Saffarian M, Schneider BJ, Smith CC, Tiegs-Heiden CA, Zheng P, Patel J, Levi D; International Pain and Spine Intervention Society's Patient Safety Committee. FACTFINDERS FOR PATIENT SAFETY: Minimizing risks from cervical epidural injections. *Interv Pain Med.* 2024 Aug 27;3(3):100430. doi: 10.1016/j.inpm.2024.100430. PMID: 39502902; PMCID: PMC11536293.