Efficacy of Cervical Epidural Steroid Injections in Preventing Eventual Cervical Fusion: A TriNetX Database Analysis

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BACKGROUND

- Cervical epidural steroid injections (cESI) are commonly used for cervical radiculopathy and provide meaningful short-term improvements in pain and disability.
- The relationship between cESI utilization and progression to surgical intervention remains unclear.
- This study evaluated whether patients undergoing cESI demonstrated different rates of cervical arthrodesis compared to patients managed without injections.

METHODS

- Retrospective cohort analysis of the TriNetX multi-institutional EHR database.
- Study period: 2019–March 2026.
- Men and women aged >18 years with qualifying cervical diagnoses were grouped by receipt of cESI.
- Cohorts were not matched.
- Primary outcome: anterior cervical interbody arthrodesis ≥1 day after the index event.
- Outcome frequencies, risk ratios, hazard ratios, and Kaplan–Meier analyses were evaluated.

DATABASE

- TriNetX real-world EHR database
- Access through Jefferson via The Cancer Informatics team and the CCSG grant
- 83 health care organizations
- 110,989,675 patients on record

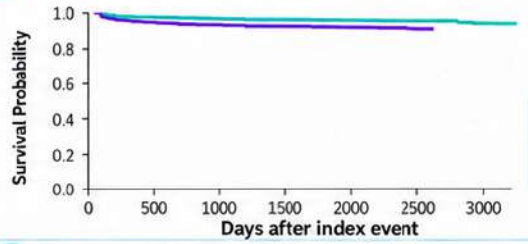
COHORT DEFINITION (INCLUSION CRITERIA)

Category	Criteria
Diagnoses (ICD-10)	Radiculopathy, cervical region (M54.12); Spondylolisthesis, cervical region (M43.12); Cervical disc disorder with radiculopathy (M50.1); Other cervical disc displacement (M50.2, M50.20); Other cervical disc degeneration (M50.3)
Imaging / Evaluation	Physical Therapy evaluation Cervical spine X-ray ≥6 views (CPT 72052); Cervical MRI without contrast (CPT 72141)
Medical Management	≥1 of: gabapentin, cyclobenzaprine, pregabalin, nortriptyline, prednisone, ibuprofen, naproxen, celecoxib, rofecoxib
Intervention Group Only	Transforaminal epidural injection (CPT 64479); Interlaminar epidural injection (CPT 62321)

STUDY COHORTS AND OUTCOMES

	Cohort	Patients in Cohort (n)	Patients with Outcome (n)	Median Survival (Days)	Survival Probability at End of Time Window	Log-Rank Test χ^2	Log-Rank Test p
1	Cohort with cESI	357	23	–	92.61%	10.422	0.0012
2	Cohort without cESI	2,719	87	–	94.51%		

KAPLAN-MEIER SURVIVAL CURVE



Log-rank
$\chi^2 = 10.422$
$p = 0.0012$

Interpretation

- Lower arthrodesis-free survival in the cESI cohort: 92.61% vs 94.51% without cESI at the reported endpoint.
- Curves differed significantly (log-rank p = 0.0012).
- Unmatched observational comparison: association does not establish causation.

PRIMARY RESULTS

Outcome	cESI (n = 357)	No cESI (n = 2,719)
Subsequent cervical arthrodesis, n (%)	**23 (6.4%)**	**87 (3.2%)**
Risk ratio (95% CI)	**2.01 (1.29 – 3.15)**	—
Hazard ratio (95% CI)	**2.10 (1.32 – 3.32)**	—

Key Finding

Patients receiving cESI had a significantly higher observed risk and hazard of subsequent cervical arthrodesis compared to those without cESI.

EXCLUSION CRITERIA

Category	Criteria (ICD-10)
Cervical disc disorder with myelopathy	M50.0
Myelopathy in diseases classified elsewhere	G99.2
Cervical spondylosis with myelopathy	M47.11
Other spondylosis with myelopathy	M47.1x (as specified)
Cervical spinal stenosis	M48.02

DISCUSSION

- The higher rate of arthrodesis in the cESI cohort may reflect **confounding by indication:**
  - More severe or refractory symptoms
  - Failed initial conservative management
  - Greater disease burden at baseline
- Unmatched cohorts may differ in baseline disease severity and treatment history.
- Unmeasured confounders: pain severity, functional status, imaging findings, patient preferences.
- Database limitations: cannot capture symptom severity, pain scores, degree of stenosis, or shared decision-making.
- Cohort size: cESI group relatively small (n = 357).
- These findings do not imply causation between cESI and surgery.

CLINICAL IMPLICATIONS

- Published evidence supports short-term symptom benefit; this study did not measure pain or function.
- This study does not establish a causal effect on surgical progression.
- cESI should be viewed as part of a multimodal treatment algorithm, not as a surgery-prevention strategy.
- Injections help manage symptoms while determining surgical candidacy.

FUTURE DIRECTIONS

- Prospective severity-matched studies.
- Identify predictors of cESI response and surgical progression.

REFERENCES

1. Borton ZM, Oakley BJ, Clamp JA, Birch NC, Bateman AH. Cervical transforaminal epidural steroid injections for radicular pain: a systematic review. *Bone Joint J.* 2022;104-B(5):567–574. doi:10.1302/0301-620X.104BS.BJJ-2021-1816.R1.
2. Benditz A, Brunner M, Zeman F, et al. Effectiveness of a multimodal pain management concept for patients with cervical radiculopathy with focus on cervical epidural injections. *Sci Rep.* 2017;7:7866. doi:10.1038/s41598-017-08350-x.
3. Armon C, Narayanaswami P, Potrebic S, et al. Epidural steroids for cervical and lumbar radicular pain and spinal stenosis systematic review summary: Report of the AAN Guidelines Subcommittee. *Neurology.* 2025;104(5):e213361. doi:10.1212/WNL.0000000000213361.
4. Kleimeyer JP, Koltsov JCB, Smuck MW, et al. Cervical epidural steroid injections: incidence and determinants of subsequent surgery. *Spine J.* 2020;20(11):1729–1736. doi:10.1016/j.spinee.2020.06.012.
5. Stout A. Epidural steroid injections for cervical radiculopathy. *Phys Med Rehabil Clin N Am.* 2011;22(1):149–159. doi:10.1016/j.pmr.2010.10.007.
6. Hasoon J, Brown A, Moaaro A, Viswanath O, Abd-Elsayed A. Risks and benefits of cervical transforaminal epidural steroid injections: a comprehensive review. *Curr Pain Headache Rep.* 2025;29:72. doi:10.1007/s11916-025-01385-0.

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