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JAI (Jurnal Anestesiologi Indonesia), Volume 18 (3), 2026

CASE REPORT

Interlaminar Cervical Epidural Non-Particulate Steroid Injection for Acute Cervical Radicular Pain: A Case Study of Clinical Effectiveness

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Received: 21th May 2025; Revised: 29th August 2025; Accepted: 10th November 2026
Available online:11th November 2026; Published regularly: November 2026

ABSTRACT

Background: Cervical radicular pain is pain that arises in the upper extremities caused by ectopic activity of afferent nociceptive or radix medulla spinalis. The pain intervention which can be done is interlaminar cervical epidural steroid injection (ICESI), transforaminal epidural steroid injection (TFSI), thermal radiofrequency (TRF), pulse radiofrequency (PRF), spinal cord stimulation (SCS), or surgery. Each modality has different benefits and side effects. The success of ICESI is still debatable. This case report aimed to evaluate the success of ICESI for cervical radicular pain.

Case: A woman, 71 years old, suffered from neck pain with radicular pain along the arm, until the palm, thumbs, and index finger on both right and left sides. The patient reported persistent pain predominantly in the palms, with an intensity of 7 out of 10 on the numeric rating scale (NRS). She felt the pain for 2 months, and it wasn't relieved with pharmacotherapy and physiotherapy. The cervical magnetic resonance imaging (MRI) showed entrapment at the radix C6. The patient was advised to undergo an operative procedure, but the patient refused it and was offered an ICESI.

Discussion: The ICESI approach has been proven to be effective in managing acute cervical radicular pain. By delivering corticosteroids into the epidural space, ICESI reduces inflammation around the affected nerve roots, leading to significant pain relief and improved functional outcomes, and allows for a broader spread of medication across multiple levels.

Conclusion: ICESI is effective for cervical radicular pain.

Keywords: acute; cervical radicular pain; epidural steroid injection; interlaminar; pain intervention

JAI_73464_2025 Copyright © 2026, e-ISSN 2089-970X

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Permalink/DOI: https://doi.org/10.14710/jai.v0i0.73464

INTRODUCTION

Neck pain is one of the most frequent complaints found in a pain clinic. The incidence of neck pain is increasing due to abnormalities of body posture and occupations that require prolonged neck flexion. Radicular neck pain refers to extremity pain with an electric-like due to irritation, nerve trauma, or compression of the cervical spinal nerve root. According to the International Association for the Study of Pain (IASP), cervical radicular pain is defined as pain occurring in the upper extremities caused by activation of ectopic nociceptor afferent fibers in the spinal nerve or spinal nerve root, or another neuropathic mechanism.[1,2]

Radicular pain must be differentiated from cervical radiculopathy. Radicular pain is a symptom caused by an ectopic nerve signal, whereas radiculopathy involves neurological abnormalities, such as changes in sensory and motor function. The location of the pain source is confirmed through selective diagnostic blocks. The most common site of cervical radicular pain occurs at C7 (45-60%), followed by C6 (20-25%), and C5 & C8 (10%).[1,3]

The treatment of cervical radicular pain depends on the onset and underlying causes of the pain. Conservative management includes the use of painkillers, such as non-steroid anti-inflammatory drugs (NSAIDs), which are recommended for short-term use due to potential long-term side effects. Additionally, anticonvulsant drugs such as carbamazepine, gabapentin, and pregabalin are often used to treat neuropathic pain.[1,4] Interventional pain management modalities for cervical radicular pain include interlaminar cervical epidural steroid injection (ICESI) or transforaminal epidural steroid injection (TFSI), thermal radiofrequency (TRF), and pulse radiofrequency (PRF) targeting the dorsal spinal nerve root using a transforaminal approach. Each interventional modality has its own benefits and potential side effects. The choice of therapy depends on the underlying pain pathology, the availability of equipment, and the expertise in performing the procedures.[1,5,6,7]

The success of the cervical epidural steroid injection (CESI) using the interlaminar approach in managing cervical radicular pain remains debatable. Therefore, this case report aims to evaluate the outcome of interventional pain therapy using ICESI in a patient with acute cervical radicular pain.

CASE

A 71-year-old geriatric woman came to the clinic with complaints of pain in the left cervical region, radiating from the shoulder to the arm, thumb, and index finger. The patient was referred by the orthopedic department with a diagnosis of cervical facet joint arthritis and multiple cervical HNP. The cervical pain

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was relieved by oral medication of Paracetamol 500 mg every 8 hours, Na-Diclofenac 50 mg every 8 hours, Tramadol 50 mg every 12 hours for 2 weeks, along with physiotherapy. The pain intensity was decreased but not significant; the pain scale decreased to 5-6 out of 10 on the Numeric Rating Scale (NRS). Subsequently, the patient was given oral methylprednisolone 4 mg every 12 hours for 1 week, along with continued physiotherapy. The neck pain improved with a pain scale of 3 out of 10 on the NRS. However, the radiating pain in the arm persisted and remained disturbing, with a pain scale of 5-7 out of 10 on the NRS. The patient began experiencing gastrointestinal discomfort, leading to NSAIDs discontinuation. Steroid therapy was continued, with the addition of ranitidine 150 mg every 12 hours. Due to persistent radicular pain, surgical intervention was suggested, but the patient declined. As a result, the patient was recommended to undergo interventional pain management using an epidural steroid injection.

The patient was suspected of having a degenerative process with VC6 and VC7 nerve root compression, as there was no history of trauma. She experienced radiating pain from the shoulders to the arm, thumb, and index finger. Physical examination revealed tenderness in the right and left lateral facet regions of the neck, with positive spurling and valsalva tests. There was no progression of neurological deficits, like numbness and weakness.

MRI findings revealed cervical spondylosis with mild scoliosis, accompanied by multiple disc herniations from VC 3-4 to VC 6-7 (Figure 1). The most prominent herniation was at the level of C5-C6, presenting as a central foraminal disc protrusion, causing mild foraminal stenosis and compressing the nerve structures, particularly at the C6 nerve root exit. A selective nerve root block was not performed to make the therapy more efficient and minimize the risk of complications. Moreover, the site of the lesion was clearly identified based on the clinical symptoms and MRI findings.

The patient underwent ICESI with the following methods: (1) Informed consent was obtained from the family, prophylactic antibiotics of ceftriaxone 1 gram were administered; (2) The patient was positioned in pronation, and standard monitoring was applied to evaluate the patient's hemodynamic during the procedure; (3) Aseptic procedure was performed at the procedure site, and a sterile drape was applied; (4) The C-Arm X-ray was positioned for guidance; (5) The cervical vertebrae were identified using the C-arm X-ray in antero-posterior and lateral views. The cervical vertebrae were counted, and a marker was placed at the interlaminar foramen between VC 5-6 or VC 6-7; (6) Local anesthesia was administered using infiltration technique with 1cc of lidocaine 2%; (7) An epidural needle was inserted at the marked site under C-Arm guidance, penetrating through the soft tissue in a tunnelling technique toward the C5-6 interlaminar foramen until the position of spinal needle was positioned appropriately (Figure 2); (8) In lateral view of C-Arm X-ray, epidural Touhy needle was advanced until the tip of the needle reached the junction between the end of the spinosus process and the beginning of the laminar edge; (9) The loss of resistant (LOR) technique using the hanging drop method was performed (Figure 3). A positive LOR indicated that the Touhy needle had penetrated through the ligamentum flavum. Confirmation of

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needle placement in the epidural space was achieved by injecting 1cc of contrast under lateral C-Arm guidance; (10) dexamethasone 1 cc (5mg) and lidocaine 1% 4cc (40mg) were injected; (11) the needle was removed, and the injection site was covered with tape (procedure completed); and (12) the patient's hemodynamics, pain, and the potential for complications were monitored for 1 hour in the recovery room. The numbness in the back area of the neck (the injection site of lidocaine 2%) was reported, but there was no headache, nausea, vomiting, difficulty breathing, or motor weakness in the upper extremities, and the patient remained hemodynamically stable. The patient was transferred to the ward for 24-hour observation.

The patient was hospitalized for 24 hours in the ward for post-procedural evaluation. During the observation, the pain scale decreased to 3 on the NRS, and the radicular pain scale was reduced to 3 on the NRS. The local physical examination and neurological examination showed no abnormalities. During hospitalization, the patient received oral Paracetamol 500 mg every 8 hours, a combination of methampyron and diazepam (1 tablet at night), and vitamin B complex once daily. The patient was discharged after ensuring there were no complications from the procedure and the pain was well-managed. The patient was sent home with the same medications and instructed to return for a follow-up one week after the procedure.

One week after the procedure, the patient reported no pain and no radicular pain. Physical examination showed no abnormalities at the procedure site, and neurological examination was normal. The patient was prescribed oral paracetamol 500 mg every 8 hours, a combination of methampyron and diazepam (1 tablet at night), and vitamin B complex once daily. The patient was advised to return for follow-up one month after the procedure or earlier if the pain recurs.

One month after the procedure, the patient reported no pain and no radicular pain. The physical examination and neurological examination revealed no abnormalities. The patient was prescribed oral paracetamol 500 mg and sodium diclofenac 50 mg, to be taken only if the pain recurs with the same intensity and duration as experienced before the procedure, along with vitamin B complex once daily. Follow-up via telephone revealed that the patient did not experience pain as previously reported before the procedure, and therefore did not take any analgesic medication. The patient was advised to return if pain recurs.

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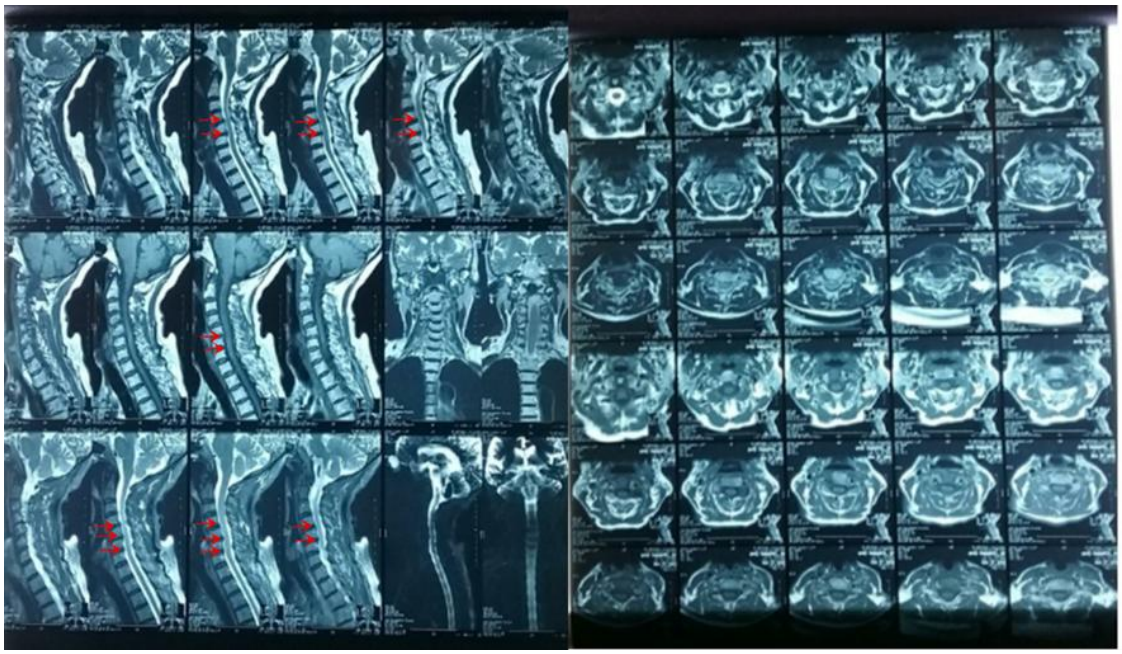


Figure 1. The MRI revealed cervical spondylosis (red arrows) with mild scoliosis, accompanied by multiple disc herniations from C3–C4 to C6–C7. The most prominent herniation was a central foraminal disc protrusion at the C5–C6 level, causing mild foraminal stenosis and compressing the nerve root structures, particularly at the exit of the C6 nerve root.

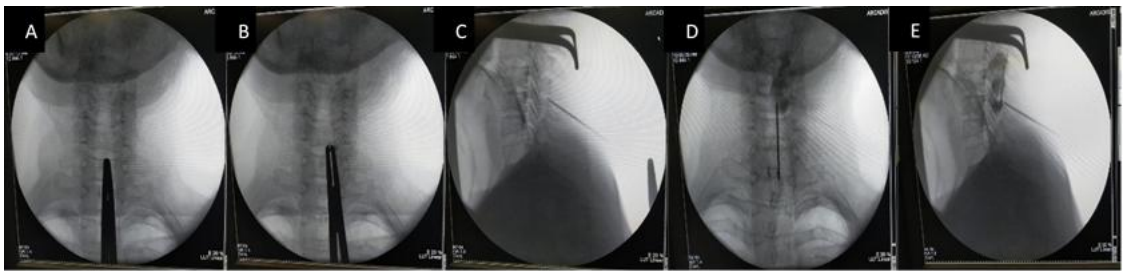


Figure 2. A. AP view marker target; B. Positioning the needle using a tunneling technique in the AP view; C. Lateral view: Evaluating the needle tip approaching the lamina; D. AP view: evaluating contrast distribution; and E. Lateral view: evaluating contrast distribution



Figure 3. Loss of resistance hanging drop technique

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DISCUSSION

The choice of pain intervention depends on the pain onset and the patient's condition. In this case, the pain was still considered acute, and it occurred for 6 weeks. According to the IASP classification, pain is defined as acute if the duration is less than 3 months.[8] This 71-year-old woman, classified as a geriatric patient with acute pain, had multiple herniations and obvious nerve compression, which must be carefully considered by the clinician in performing the surgical procedure.

There are various treatment options for neck pain, and their efficacy depends on the onset of symptoms, underlying pathology, the degree of nerve damage, and each individual's pain threshold. Conservative therapy, such as NSAIDs, is only indicated for short-term use due to the long-term potential side effects. Moreover, anticonvulsant drugs, such as carbamazepine, oxcarbazepine, gabapentin, and pregabalin, are commonly used for neuropathic pain. Although gabapentin alone without steroid injection showed unsatisfactory outcomes, gabapentin as adjuvant therapy following interventional pain steroid injection has revealed better outcomes.[1,4]

In this patient, epidural steroid injection was chosen due to a lack of optimal results from conservative treatment with medication and physiotherapy, as well as the occurrence of gastrointestinal complications caused by long-term NSAID use. Pain intervention with epidural steroid injection still has a role in cases with an acute symptom onset. Although MRI findings already indicated the need for surgery, the patient declined. Therefore, epidural steroid injection serves as an important treatment option in acute cases, acting as a bridge between conservative therapy and surgery. In addition to the epidural steroid injection, the patient was also given adjunctive therapy with methampyron and the anticonvulsant diazepam. The use of anticonvulsants as adjuvant therapy is expected to have a potentiating effect when combined with epidural steroid therapy.[4]

There are two approaches for epidural injection procedures in the cervical region, transforaminal and interlaminar approaches. Theoretically, the transforaminal approach has the advantage of allowing medication to be injected precisely around the dorsal root ganglion (DRG). This is particularly useful in cases of spondylosis, stenosis, and intervertebral disc herniation.[9] However, based on several case reports, the transforaminal approach can lead to serious complications such as vascular injection, embolism, and infarction.[10,11,12]

According to evidence-based treatment recommendations, the first-line pain intervention for cervical radicular pain is pulsed radiofrequency (PRF) of the cervical DRG, with a level 1B+ recommendation. However, if PRF DRG is not available, then epidural steroid injection using the interlaminar approach can be considered (level 2B+ recommendation). Meanwhile, the transforaminal approach is currently not recommended (level 2B- recommendation).[1] Therefore, based on the current scientific evidence, epidural steroid injection via the interlaminar approach was selected in this case, considering both the patient's condition and the available facilities.

The interlaminar approach has 2 techniques: midline and parasagittal. In cases of unilateral cervical radicular pain, the parasagittal approach provides superior outcomes compared to the

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midline technique.[13] When compared to the transforaminal approach in unilateral cases, the parasagittal approach shows no significant difference in outcomes but is more favorable due to its lower associated risks.[14] In this case, since the pain presented bilaterally, the midline interlaminar approach was used.

In this case, dexamethasone was chosen as the steroid due to its non-particulate nature and safer profile for cervical epidural injections. Non-particulate steroids, such as dexamethasone, have a much smaller aggregate molecular weight (<100 μm) compared to particulate steroids like triamcinolone (300–>500 μm), which are associated with a higher risk of embolic complications if inadvertently injected into the vasculature.[6,15,16]

Several studies have shown that non-particulate steroids are equally effective as particulate steroids in relieving radicular pain.[17,18] A retrospective study by Stephens et al. (2014) demonstrated that dexamethasone was effective in 42.1% of patients with cervical radiculopathy, with doses ranging from 8 to 15 mg.[19] However, higher doses of dexamethasone (e.g., 8 mg or more) have been associated with transient increases in blood glucose levels, even in non-diabetic individuals.[20]

Therefore, in this case, a conservative dose of 5 mg dexamethasone was selected to balance efficacy and safety. A previous study noted that dexamethasone 7.5 mg is equivalent in potency to triamcinolone 40 mg or methylprednisolone 40 mg.[21] Given this patient had no history of diabetes mellitus and normal pre-injection blood glucose levels, a 5 mg dose was considered safe and appropriate to minimize potential side effects while providing therapeutic benefit.[22]

CESI, using the interlaminar approach, has been proven to be effective in managing acute cervical radicular pain, particularly in patients who do not respond adequately to conservative treatments such as oral medications or physical rehabilitation. By delivering corticosteroids directly into the epidural space, CESI reduces inflammation around the affected nerve roots, leading to significant pain relief and improved functional outcomes. The interlaminar approach allows for a broader spread of medication across multiple levels, which can be especially beneficial in cases with multilevel involvement or diffuse radicular symptoms.

In this case, CESI provided a rapid reduction in pain and improvement in cervical function, helping to avoid or delay surgical intervention. This underscores its value as a therapeutic option that bridges the gap between conservative management and definitive surgical procedures. When appropriately selected and performed under imaging guidance, CESI is generally safe and well-tolerated, although practitioners must remain vigilant for potential complications.

CONCLUSION

CESI, using the interlaminar approach, has been proven effective in managing acute cervical radicular pain and can serve as the solution of therapy that bridges the gap of patient need between conservative therapy of medication or medical rehabilitation with the definitive therapy of surgery.

Acknowledgment

The authors would like to express gratitude to the Department of Anesthesiology and Intensive Care, The Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada and

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the Department of Anesthesiology and Intensive Care, Academic Hospital, Universitas Gadjah Mada, Yogyakarta, as well as to the patient and the patient's family for their support in this study.

Conflict of Interest

Authors declare no conflict of interest to disclose.

Declaration of Use of Artificial Intelligence (AI)

The author declares that no generative artificial intelligence (AI) tools or AI-assisted technologies were used in the writing, drafting, editing, or preparation of this manuscript. All content was written independently by the author.

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