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Epidural steroid injection in cervical spine pain – Whether "add-ons" add to the patient benefit? - A prospective study

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Abstract
Background and Aims: Chronic neck pain with or without radicular pain due to nerve root inflammation is prevalent in the adult population, causing significant functional limitations. Epidural steroid injections (ESI) have been used effectively to reduce inflammation and provide pain relief. This study aimed to assess the efficacy and safety of ESI in patients with chronic cervical pain refractory to non-steroidal anti-inflammatory drugs (NSAIDs).
Methods: This prospective study included 40 patients aged 36–54 years with a mean symptom duration of eight months, conducted at a tertiary care center. Patients received fluoroscopy-guided ESI consisting of Methylprednisolone (80 mg), Hyaluronidase (1,500 IU), Lignocaine Hydrochloride (2%), and Normal Saline (total volume: 10 ml). Pain relief and functional recovery were assessed using the Verbal Rating Scale (VRS) over follow-ups at three days, two weeks, two months, and six months.
Results: All patients reported complete pain relief at three days and two weeks, with mild injection site pain in four cases. At two months, 87.5% had complete relief, 5% reported 75% relief, and 2.5% experienced 50% relief, while 5% reported pain similar or worse than before ESI. At six months, 75% maintained complete relief, 7.5% had 50% relief, and 17.5% reported worsening pain. No major immediate or late complications were observed.
Conclusion: Epidural steroid injection is a safe and effective intervention for chronic cervical pain, providing substantial short-term relief and moderate long-term benefits with no significant complications.

Keywords: Cervical, epidural, inflammation, pain, pain relief, spine, steroid

Introduction
Chronic neck pain, with or without accompanying pain in the upper extremities, is a prevalent condition in the adult population. It carries substantial economic, social, and health-related consequences [1]. This type of pain can originate from multiple anatomical structures, including intervertebral discs, facet joints, ligaments, fascia, muscles, and the nerve root dura. However, facet joint-related and discogenic pain are among the most common causes [2].
Diwan *et al.* [3] have effectively distinguished between cervical radiculopathy and radicular pain. Radicular pain presents as a sharp, shooting, or electric-like sensation radiating to the upper extremities, typically resulting from mechanical or chemical irritation of the spinal nerve root. In contrast, radiculopathy is characterized by an objective neurological deficit, such as sensory or motor impairment or diminished reflexes [3].
Cervical epidural injections have gained increasing recognition as a therapeutic approach for managing neck pain, whether localized or radiating to the upper extremities [4]. We evaluated whether adding therapeutic agents or techniques to epidural steroid injections enhanced pain relief, functional improvement, and overall outcomes in cervical spine pain. We aimed to determine if these adjuncts improved pain control, recovery speed, and long-term efficacy.

Material and Methods
Study Setting
This prospective study was conducted in the Department of Orthopaedics and Anaesthesia at Heritage Institute of Medical Sciences, Varanasi. The procedure was performed under strict aseptic conditions in a well-equipped operation theatre using real-time fluoroscopic (C-arm) guidance.

Equipment & Imaging
A C-arm fluoroscope was used for precise needle placement under live imaging. An autoclaved dressing tray was prepared to maintain sterility throughout the procedure.

Needles & Syringes
A Tuohy epidural needle was used for epidural access, and a 10-cc syringe was utilized for injection and resistance loss confirmation.

Medications & Anesthetics
The following medications were used for pain management and anesthesia:
1. **Local Anesthetics:** 2% Xylocaine (for local infiltration) and 0.5% Lignocaine
2. **Steroid Injection:** Depomedrol 80 mg (Methylprednisolone)
3. **Epidural Cocktail (10-15 ml total volume):**
- 2 ml Injection Methylprednisolone (80 mg)
- 1 ml Injection Hyaluronidase (1,500 IU)

- 2 ml Injection 2% Lignocaine Hydrochloride
- 5 ml Normal Saline (for dilution)

Pre-procedure Medications
Injection Glycopyrrolate was administered before the procedure to reduce secretions.

Emergency Preparedness
An emergency medicine kit was kept ready to manage potential complications.

Outcome Measurement
The effectiveness of the procedure was assessed using the Verbal Rating Scale (VRS) to evaluate pain relief and patient response.

Procedure
Pre-procedure Preparation
The patient was positioned comfortably in a sitting posture with neck flexion to optimize epidural access. The C-arm fluoroscope was aligned horizontally at the cervico-dorsal spine level to obtain a clear lateral image. Strict aseptic precautions were followed, including scrubbing, painting, and draping.
Vital parameters, including heart rate, blood pressure, and oxygen saturation, were recorded before the procedure. A xylocaine sensitivity test was performed, and an intravenous (IV) line was secured. Injection Glycopyrrolate was administered pre-procedure to reduce excessive secretions and enhance procedural safety. An emergency kit was kept on standby to handle any adverse reactions.

Epidural Needle Insertion & Positioning
The C6-C7 intervertebral level was marked and confirmed under Image Intensifier (IITV) guidance. A local anesthetic (2 ml of 2% Xylocaine) was administered at the insertion site to minimize discomfort.
A Tuohy epidural needle was carefully inserted at the C5-C6 or C6-C7 level under fluoroscopic guidance. The "click" sensation was noted as the needle tip breached the ligamentum flavum, confirming entry into the epidural space. Further confirmation was achieved using the loss of resistance technique with air or saline to ensure correct needle placement.

Injection of Epidural Steroid Cocktail
Once proper needle placement was confirmed, 10-15 ml of the prepared epidural steroid cocktail was injected slowly while monitoring the patient's blood pressure and response.
The injected solution included Methylprednisolone (80 mg), Hyaluronidase (1,500 IU), Lignocaine (2%), and Normal Saline, ensuring both anti-inflammatory and analgesic effects.

Post-procedure Monitoring & Discharge
Following the injection, the patient was monitored for 15 minutes for any immediate adverse reactions or complications. Vital signs were rechecked, and stability was ensured before shifting the patient out of the operation theatre. Post-procedure instructions were provided, and the patient was scheduled for follow-up evaluations to assess pain relief, functional improvement, and overall efficacy of the procedure.

Ethical Considerations
This study was conducted following ethical guidelines, ensuring informed consent, patient confidentiality, and safety. Approval was obtained from the Institutional Ethics Committee, and all procedures adhered to standard medical protocols.

Results
Table 1 shows patient demographics, including symptom duration, age distribution, and gender breakdown. The mean age of patients was 40.2 years, with the youngest being 36 years and the oldest 54 years. The study had 18 male patients (45%) and 22 female patients (55%), highlighting a slight female predominance.

Table 1: Patient Demographics and Gender Distribution

	Parameter	Frequency (N)	Percentage (%)
Duration of symptoms	Mean Duration of Symptoms	8 months	-
	Symptom Duration Range	18 weeks to >12 months	-
Age (Years)	Mean Age	40.2 years	-
	Youngest Age	36 years	-
	Oldest Age	54 years	-
Gender	Male	18	45.00%
	Female	22	55.00%

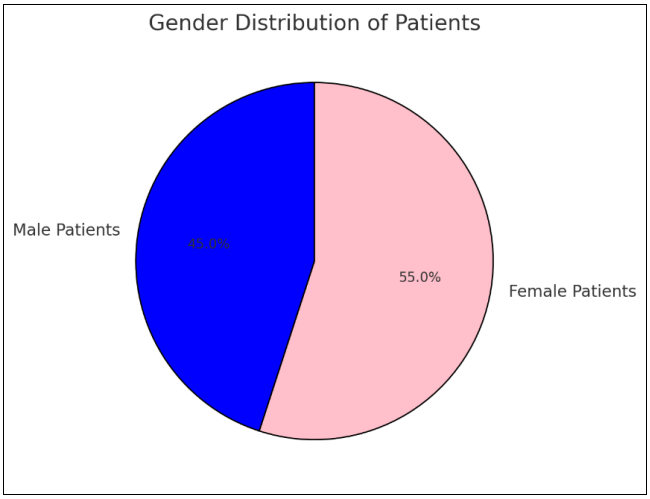

Fig 1: Patient Demographics and Gender Distribution

Table 2 shows at the 3rd-day follow-up, all 40 patients (100%) reported complete relief from pain, with only 4 patients experiencing mild pain at the injection site. By the 2-week follow-up, all 40 patients (100%) continued to experience complete pain relief and had resumed their normal daily activities. At 2 months, 35 patients (87.50%) maintained full pain relief and regular activity, while at 6 months, 30 patients (75.00%) still had complete pain relief and normal functionality.

Table 2: Complete Pain Relief & Routine Activity

Follow-up Period	Complete Pain Relief & Routine Activity	
	Frequency (N)	Percentage (%)
3rd Day	40	100%
2 Weeks	40	100%
2 Months	35	87.50%
6 Months	30	75.00%

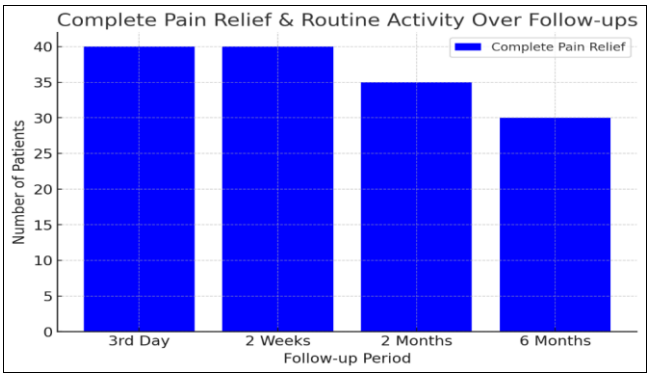

Fig 2: Complete Pain Relief & Routine Activity

Table 3 shows the number of patients experiencing more than 75% relief and those achieving more than 50% relief with the ability to perform routine activities at different follow-up intervals. The highest relief was observed at two months, with 5% of patients achieving more than 75% relief, while 7.5% of patients reported functional recovery at six months.

Table 3: Pain Relief Progression Over the Follow-up Period

Follow-up Period	More than 75% Relief		More than 50% Relief & Can Perform Routine Activity	
	Frequency (N)	Percentage (%)	Frequen y (N)	Percentage (%)
3rd Day	-	-	-	-
2 Weeks	-	-	-	-
2 Months	2	5%	1	2.50%
6 Months	0	0.00%	3	7.50%

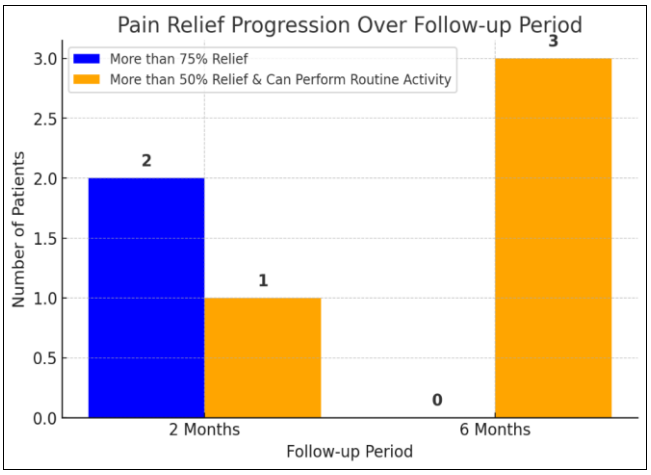

Fig 3: Pain Relief Progression Over the Follow-up Period

Table 4 shows on the 3rd day, 4 patients experienced mild pain at the injection site, but no worsening of symptoms. At the 2-week follow-up, no patients reported pain similar to or worse than before the procedure. However, by 2 months, 2 patients (5%) complained of persistent or worsening pain. At 6 months, 7 patients (17.50%) reported that their pain had returned to or worsened compared to pre-procedure levels.

Table 4: Pain Similar or Worse than Before Epidural Steroid Injection (ESI)

Follow-up Period	Pain Similar or Worse than Before ESI	
	Frequency (N)	Percentage (%)
3rd Day	4 (Mild pain at injection site)	10.00%
2 Weeks	-	-
2 Months	2	5%
6 Months	7	17.50%

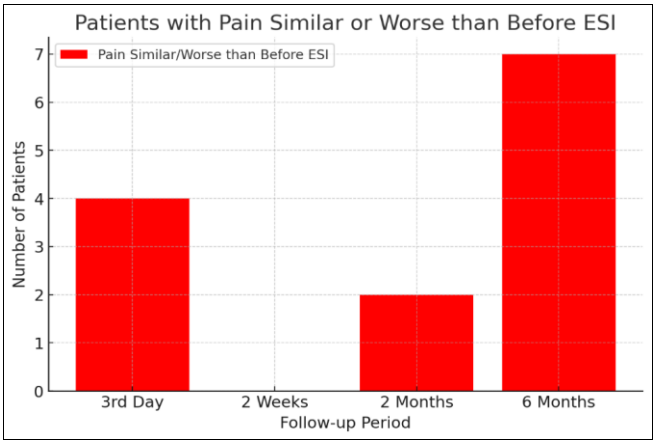

Fig 4: Pain Similar or Worse than Before Epidural Steroid Injection (ESI)

Table 5 shows throughout the entire follow-up period (3rd day, 2 weeks, 2 months, and 6 months), no immediate or late complications were observed in any of the 40 patients, confirming the safety of the procedure.

Table 5: Immediate/Late Complications

Follow-up Period	Immediate/Late Complications
3rd Day	None
2 Weeks	None
2 Months	None
6 Months	None

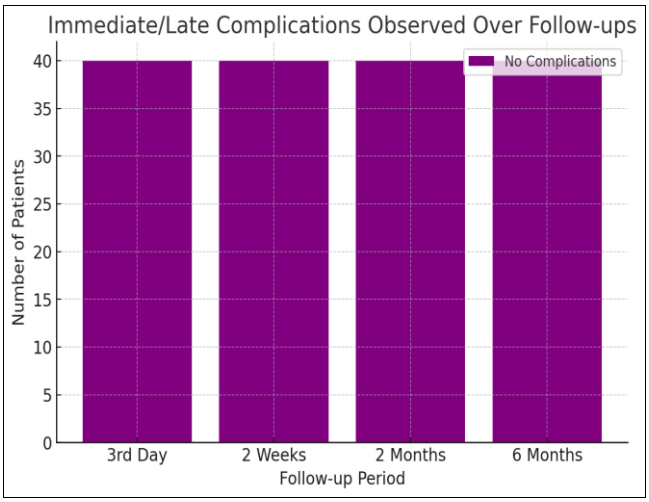

Fig 5: Immediate/Late Complications

Discussion

In our study, the mean age of patients was 40.2 years (range: 36–54 years), which was lower than Basu *et al.*'s [5] study, where the conservative group had a mean age of 45.04 years and the ACDF group had 48.13 years. Similarly, Balaji Douraiswami *et al.* [6] reported a higher mean age of 45.07 years, while Anderberg *et al.* [4] had an average of 51 years, indicating that our patients were relatively younger.

Gender distribution in our study showed 22 females (55%) and 18 males (45%), which contrasts with Basu *et al.*'s [5] male-dominant cohort (28.4% females, 71.6% males) and Balaji Douraiswami *et al.*'s [6] study, where only 20% were female. Additionally, the mean symptom duration in our study was 8 months, which was shorter than Anderberg *et al.*'s [4] 31 months. These findings suggest that early intervention and a balanced gender distribution may

contribute to favorable outcomes following cervical epidural steroid injection therapy.

We found that all 40 patients (100%) had complete pain relief by the third day, with only four patients experiencing mild injection site pain. At the two-week follow-up, all patients remained pain-free and resumed their routine activities. At two months, 87.5% of patients had complete relief, 5% had more than 75% relief, 2.5% had more than 50% relief, and 5% experienced pain similar to or worse than before the epidural steroid injection (ESI). By six months, 75% of patients had complete pain relief, 7.5% had more than 50% relief, and 17.5% reported persistent or worsening pain. Importantly, no immediate or late complications were noted in any patient.

When comparing our results with Anderberg *et al*., [4] their study on cervical ESI found that only 40% of steroid-treated patients had a positive response lasting at least seven days, and at three weeks, only 30% still experienced symptom relief. Our study demonstrated a much higher and more sustained success rate, with 87.5% achieving complete relief at two months and 75% at six months, indicating that our approach to ESI provided longer-lasting and more consistent pain relief. Furthermore, Anderberg *et al*. [4] reported minor complications, including allergic reactions and transient radicular pain, while our study observed no such complications.

Comparing our findings to Diwan *et al*., [3] their randomized trials on cervical interlaminar ESI for disc herniation and radiculitis reported 83% pain relief at three months, 82% at six months, and 72% at one year (Manchikanti *et al*.) [7]. These results closely align with our findings of 87.5% relief at two months and 75% at six months. For spinal stenosis, Diwan *et al*. found 77% relief at three months, 87% at six months, and 73% at one year, which is slightly higher than our six-month relief rate but still comparable. The study on discogenic pain showed 68% relief at three months, 67% at six months, and 72% at one year, indicating a slightly lower pain relief rate compared to our results. These comparisons highlight that our study had comparable or better short-term and long-term pain relief outcomes than the large-scale trials in Diwan *et al*.'s research.

Castagnera *et al*. [9] reported a 79.2% success rate across all follow-ups, which is slightly lower than our two-month success rate (87.5%) but comparable at six months (75%). However, their study did not differentiate between varying degrees of pain relief, making direct comparisons more difficult. Stav *et al*. [10] found a 68% pain relief rate at one year, which is significantly lower than our findings at six months. Pasqualucci *et al*. [11] showed 58.5% and 73.7% improvement in symptoms with single vs. continuous injections, which are lower than our results at two and six months.

Compared to Manchikanti *et al*., [8] which reported 72% relief at one year for both discogenic pain and post-surgery syndrome, our findings at six months (75%) are slightly higher. Similarly, their study on spinal stenosis found 73% relief at one year, closely matching our six-month results.

Conclusion

Epidural steroid injection (ESI) proved to be an effective and well-tolerated treatment for cervical spine pain, offering significant short-term relief and functional recovery. While most patients-maintained pain relief, some experienced recurrence over time. However, its safety profile, with no observed complications, supports its role as a minimally invasive, reliable, and beneficial therapeutic approach for managing cervical pain.

Strengths

This study provides a prospective analysis of epidural steroid injection (ESI) for cervical spine pain, ensuring accurate data collection. The six-month follow-up period allows for assessing both short-term and mid-term efficacy. The study highlights 100% initial pain relief with a well-defined patient cohort and no observed complications, reinforcing ESI's safety and effectiveness in clinical practice.

Limitations

The study is limited by its small sample size (40 patients), which may affect generalizability. The lack of a control group prevents direct comparison with other treatment modalities. Additionally, follow-up was restricted to six months, limiting long-term outcome assessment. Variability in patient pain perception and subjective reporting may introduce bias, requiring further large-scale, randomized trials for validation.

Conflict of Interest: None.
Funding: None.
Ethical Approval: Obtained.
Consent: Written consent secured.

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