e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2024; 14(10); 157-162

Original Research Article

Clinical Outcomes of Epidural Steroid Injections in the Management of Lumbar Spondylosis: A Retrospective Study

Amit Kumar[1], Vineeta Singh[2], D.P. Bhushan[3], Vijay Pratap Sinha[4]

[1]Senior Resident, Department of Orthopaedics, SNMMCH, Dhanbad, Jharkhand, India
[2]Senior Resident, Department of Obstetrics and Gynaecology, SNMMCH, Dhanbad, Jharkhand, India
[3]Professor and HOD, Department of Orthopaedics, SNMMCH, Dhanbad, Jharkhand, India
[4]Associate Professor, Department of Orthopaedics, SNMMCH, Dhanbad, Jharkhand, India

Received: 12-09-2024 / Revised: 25-09-2024 / Accepted: 22-10-2024
Corresponding Author: Dr Vineeta Singh
Conflict of interest: Nil

Abstract

Background: Lumbar spondylosis, a degenerative condition of the spine, is a common cause of chronic low back pain, significantly impacting quality of life. Epidural steroid injections (ESIs) are widely used as a minimally invasive treatment option; however, their efficacy in managing pain and improving function remains a subject of ongoing research.

Objective: To evaluate the clinical outcomes of epidural steroid injections in patients with lumbar spondylosis, focusing on pain relief, functional improvement, and quality of life.

Methods: This retrospective study reviewed the medical records of 100 patients diagnosed with lumbar spondylosis who received Department of Orthopaedics, SNMMCH, Dhanbad, Jharkhand, India. Pain intensity was assessed using the Visual Analog Scale (VAS), and functional outcomes were measured using the Oswestry Disability Index (ODI). Data on demographic characteristics, comorbidities, and post-procedural complications were analyzed.

Results: Significant pain relief was observed in 72% of patients, with a mean reduction in VAS scores from 7.5 ± 1.2 to 3.2 ± 1.1 at three months post-injection ($p < 0.01$). Functional improvement, as indicated by a reduction in ODI scores, was noted in 68% of patients. Age, comorbidities, and baseline pain intensity influenced the magnitude of improvement. No major complications were reported.

Conclusion: Epidural steroid injections effectively reduce pain and improve functional outcomes in patients with lumbar spondylosis. They represent a viable option for managing chronic low back pain, particularly in patients unresponsive to conservative therapy.

Keywords: Lumbar spondylosis, Epidural steroid injections, Chronic low back pain, Visual Analog Scale, Oswestry Disability Index.

Introduction

Lumbar spondylosis, a degenerative condition of the lumbar spine, is a major contributor to chronic low back pain, one of the most common musculoskeletal disorders worldwide [1]. It results from progressive age-related changes in spinal structures, including intervertebral disc degeneration, osteophyte formation, and facet joint arthritis, often accompanied by ligamentous thickening and spinal canal narrowing [2]. These pathological changes can lead to neural compression and inflammation, manifesting as chronic pain, radiculopathy, and reduced functional mobility. The burden of lumbar spondylosis is profound, with estimates suggesting that up to 80% of adults will experience low back pain at some point in their lives, significantly impacting their quality of life and productivity [3].

Traditional management of lumbar spondylosis includes conservative measures such as physical therapy, pharmacological treatment (e.g., NSAIDs, muscle relaxants), and lifestyle modifications [4]. However, in cases where conservative treatments fail to provide adequate relief, minimally invasive interventions like epidural steroid injections (ESIs) are often employed. ESIs aim to deliver corticosteroids and local anesthetics directly into the epidural space to suppress inflammation, reduce nerve root irritation, and alleviate pain [5]. These procedures have gained widespread acceptance due to their relatively low risk profile and potential for immediate symptom relief [6].

Despite their popularity, the clinical efficacy of ESIs remains a subject of ongoing debate. While some studies have demonstrated significant pain relief and

functional improvement following ESIs, others have reported limited or transient benefits [7]. This variability in outcomes is thought to be influenced by factors such as the underlying pathology, injection technique (e.g., transforaminal vs. interlaminar), and patient-specific variables like age, comorbidities, and baseline severity of symptoms. Additionally, there is limited consensus on the optimal timing and frequency of injections, as well as their role in delaying or preventing the need for surgical interventions [8].

Understanding the real-world effectiveness of ESIs is critical, particularly in resource-limited settings where access to advanced surgical options may be constrained. Retrospective studies provide valuable insights into clinical outcomes by analyzing large datasets of patients who have undergone ESIs under routine clinical conditions. These studies can help identify predictors of treatment success and guide personalized therapeutic approaches [9].

The present retrospective study aims to evaluate the clinical outcomes of epidural steroid injections in patients with lumbar spondylosis. Specifically, it examines their impact on pain intensity, functional disability, and quality of life. By analyzing real-world data, this study seeks to identify demographic and clinical factors that influence the efficacy of ESIs, providing evidence to enhance patient selection and optimize treatment protocols.

Methodology

This retrospective study was conducted at Department of Orthopaedics, SNMMCH, Dhanbad, Jharkhand, India. to evaluate the clinical outcomes of epidural steroid injections (ESIs) in patients with lumbar spondylosis. Data were collected from medical records of patients treated between 8 months. The study included 100 patients aged 30–75 years who were diagnosed with lumbar spondylosis based on imaging findings (MRI or CT) and had chronic low back pain lasting more than three months. Patients who received at least one ESI during the study period and had complete follow-up data for three months post-procedure were included. Those with prior lumbar spine surgery, spinal infections, malignancy, vertebral fractures, or neurological disorders unrelated to lumbar spondylosis were excluded.

ESIs were performed under fluoroscopic guidance by experienced interventional pain specialists. The procedure involved either a transforaminal or interlaminar approach, selected based on clinical and imaging indications. Each injection contained 2 mL of corticosteroid (methylprednisolone acetate, 40 mg) mixed with 1 mL of local anesthetic (lidocaine 1%). A maximum of three injections per patient were administered at intervals of 2–4 weeks, as clinically indicated. Pain relief and functional outcomes were assessed at baseline and three months post-intervention.

The primary outcomes of the study included reductions in pain intensity, measured using the Visual Analog Scale (VAS), and functional disability, assessed with the Oswestry Disability Index (ODI). Secondary outcomes included patient-reported quality of life improvements, the influence of demographic and clinical factors on treatment response, and the incidence of complications. Data on age, gender, comorbidities, duration of symptoms, injection approach, and the number of injections were also collected.

Statistical analysis was performed using SPSS Version 28.0. Descriptive statistics summarized baseline characteristics, while paired t-tests were used to compare pre- and post-intervention VAS and ODI scores. Multivariate regression analysis identified predictors of treatment response, and the chi-square test assessed associations between categorical variables such as age and improvement rates. Statistical significance was set at $p<0.05p < 0.05p<0.05$.

Confidentiality of patient data was maintained throughout the study, and no identifiable information was included in the analysis or reporting.

Results

Demographic and Clinical Characteristics: The Table 1 illustrates the baseline demographic and clinical characteristics of the study population. The mean age was 56.8 years (±9.3), with a male predominance (58%). Common comorbidities included hypertension (42%) and diabetes mellitus (35%).

Table 1: Demographic and Clinical Characteristics of the Study Population

Parameter	Value
Mean Age (years)	56.8 ± 9.3
Gender (Male/Female)	58% / 42%
Chronic Low Back Pain (%)	100
Radiculopathy (%)	72
Hypertension (%)	42
Diabetes Mellitus (%)	35

Pain Intensity (VAS Scores): The Table 2 shows significant pain reduction after ESIs. The mean VAS scores decreased from 7.5 (±1.2) at baseline to 3.2 (±1.1) three months post-injection (p<0.01p < 0.01p<0.01).

Table 2: Changes in VAS Scores Pre- and Post-ESI

Time Point	Mean VAS Score (± SD)	Percentage Reduction
Baseline	7.5 ± 1.2	-
3 Months Post-ESI	3.2 ± 1.1	57%

Functional Disability (ODI Scores): The Table 3 illustrates improvements in functional outcomes. The mean ODI scores dropped from 62% (±8.5) at baseline to 38% (±7.2) post-intervention (p<0.01p < 0.01p<0.01).

Table 3: Changes in ODI Scores Pre- and Post-ESI

Time Point	Mean ODI Score (± SD)	Improvement (%)
Baseline	62 ± 8.5	-
3 Months Post-ESI	38 ± 7.2	39%

Quality of Life Outcomes: The Table 4 summarizes patient-reported outcomes, with 64% reporting being "much improved," 22% "somewhat improved," and 14% reporting no improvement.

Table 4: Patient-Reported Quality of Life Outcomes

Outcome Category	Percentage (%)
Much Improved	64
Somewhat Improved	22
No Improvement	14

Influence of Demographic and Clinical Variables: The Table 5 illustrates the influence of key demographic and clinical variables on treatment outcomes. Older age (>65>65>65 years), diabetes mellitus, and higher baseline VAS scores were associated with lower rates of pain relief and functional improvement.

Table 5: Influence of Key Variables on Treatment Outcomes

Variable	Subgroup	Pain Relief (%)	Functional Improvement (%)
Age	≤65 Years	78	70
	>65 Years	62	55
Diabetes Mellitus	Present	65	58
	Absent	74	70
Baseline VAS Score	≤8	76	68
	>8	60	55

Safety and Complications: The Table 6 below highlights the incidence of complications following ESIs. No major complications were reported, while minor complications such as transient headache and localized soreness occurred in 12% of patients.

Table 6: Post-ESI Complications

Complication	Incidence (%)
No Complications	88
Transient Headache	7
Localized Soreness	5

Impact of Injection Approach: The Table 7 illustrates the influence of injection approach (transforaminal vs. interlaminar) on pain relief and functional improvement. The transforaminal approach showed slightly better outcomes.

Table 7: Impact of Injection Approach on Pain Relief

Injection Approach	Pain Relief (%)	Functional Improvement (%)
Transforaminal	75	72
Interlaminar	68	65

Duration of Pain Relief: The Table 8 highlights the duration of pain relief post-ESI. A majority of patients (50%) experienced relief lasting 1–3 months, while 40% reported relief lasting beyond three months.

Table 8: Duration of Pain Relief Post-ESI

Duration of Relief (Months)	Patients (%)
<1 Month	10
1–3 Months	50
>3 Months	40

Correlation Between Number of Injections and Outcomes: The Table 9 shows the relationship between the number of injections received and treatment out comes. Pain relief and functional improvement were highest in patients who received three injections.

Table 9: Correlation Between Number of Injections and Outcomes

Number of Injections	Pain Relief (%)	Functional Improvement (%)
1 Injection	60	58
2 Injections	72	70
3 Injections	78	75

Patient Satisfaction: The Table 10 summarizes patient satisfaction levels with ESIs. A majority of patients (55%) were highly satisfied, with only 10% dissatisfied.

Table 10: Patient Satisfaction with ESI Outcomes

Satisfaction Level	Patients (%)
Highly Satisfied	55
Satisfied	35
Dissatisfied	10

Discussion

This retrospective study highlights the clinical outcomes of epidural steroid injections (ESIs) in the management of lumbar spondylosis. The findings demonstrate significant improvements in pain relief, functional outcomes, and patient-reported quality of life, supporting the efficacy of ESIs as a minimally invasive intervention for chronic low back pain.

Pain Relief and Functional Outcomes: The results reveal substantial pain relief following ESIs, with a mean reduction in VAS scores from 7.5 ± 1.2 to 3.2 ± 1.1, reflecting a 57% improvement. This aligns with previous studies that have reported significant short-term pain relief through corticosteroid-mediated suppression of inflammation and nerve root irritation [10]. Functional improvement was also evident, with ODI scores decreasing by 39%, indicative of enhanced mobility and reduced disability. These improvements suggest that ESIs effectively address both nociceptive and neuropathic components of lumbar spondylosis-related pain [11].

Influence of Injection Technique: The study identified differences in outcomes based on the injection approach. The transforaminal approach yielded slightly superior results compared to the interlaminar approach, with higher rates of pain relief (75% vs. 68%) and functional improvement (72% vs. 65%). These findings are consistent with evidence suggesting that the transforaminal route provides more targeted delivery of corticosteroids to the affected nerve roots, enhancing therapeutic efficacy [12].

Patient-Specific Factors: Demographic and clinical variables significantly influenced treatment outcomes. Younger patients (≤65\leq 65≤65 years) and those without diabetes mellitus experienced better pain relief and functional gains. This may be attributed to reduced systemic inflammation and greater tissue responsiveness in these populations [13]. Conversely, patients with higher baseline VAS scores showed relatively limited improvement, highlighting the need for individualized treatment strategies based on symptom severity.

Duration of Pain Relief: The study found that 40% of patients experienced pain relief lasting beyond three months, while 50% reported relief for 1–3 months. This variability underscores the transient nature of ESIs and the potential need for repeat injections in select patients. However, the observation that relief extends beyond the steroid's pharmacological activity suggests additional mechanisms, such as mechanical decompression or improved neural dynamics, may contribute to sustained outcomes [14].

Safety and Tolerability: ESIs were well-tolerated, with no major complications reported. Minor adverse events, including transient headache (7%) and localized soreness (5%), were consistent with the expected safety profile of the procedure. These findings reinforce the utility of ESIs as a safe option

for patients who are unresponsive to conservative treatments [15].

Comparison with Previous Studies: The results are consistent with global literature demonstrating the efficacy of ESIs in lumbar spondylosis. For instance, similar studies have reported pain relief rates of 60–75% at three months post-injection, with functional improvements observed in 65–70% of patients [16]. However, this study uniquely highlights the influence of demographic variables, injection technique, and repeat procedures on outcomes, offering valuable insights for personalized treatment planning.

Clinical Implications: The findings emphasize the role of ESIs as an effective intervention for managing lumbar spondylosis in patients unresponsive to conservative measures. By reducing pain and improving functionality, ESIs can enhance quality of life and potentially delay or obviate the need for surgical intervention. The results also underscore the importance of tailoring treatment based on patient-specific factors such as age, comorbidities, and baseline symptom severity [17].

Strengths and Limitations: The strengths of this study include its large sample size, comprehensive assessment of outcomes, and analysis of key predictors of response. However, several limitations must be acknowledged. The retrospective design precludes causal inferences, and the reliance on medical records introduces the potential for selection and reporting bias. Additionally, the study's follow-up duration was limited to three months, preventing long-term evaluation of outcomes. Future prospective, multicenter studies with extended follow-up periods are needed to validate these findings.

Future Directions: Further research should focus on optimizing patient selection for ESIs, exploring the role of adjunctive therapies, and evaluating the cost-effectiveness of repeated injections. Long-term studies examining the durability of pain relief and the potential to prevent surgical interventions will be particularly valuable.

Conclusion

This retrospective study highlights the clinical efficacy of epidural steroid injections (ESIs) in managing lumbar spondylosis-related chronic low back pain. The findings demonstrate significant reductions in pain intensity, as reflected by a 57% improvement in Visual Analog Scale (VAS) scores, and substantial functional gains, evidenced by a 39% reduction in Oswestry Disability Index (ODI) scores. These outcomes underscore the role of ESIs as a viable, minimally invasive treatment option for patients unresponsive to conservative measures.

The study also identifies important factors influencing treatment outcomes. Younger patients (≤65\leq 65≤65 years), those without comorbidities such as diabetes mellitus, and individuals receiving transforaminal injections exhibited better pain relief and functional improvement. These findings emphasize the importance of tailoring ESI therapy to individual patient profiles to optimize results. Furthermore, the safety profile of ESIs, with no major complications reported, supports their continued use in clinical practice.

Although the benefits of ESIs are well-documented, the results of this study highlight the transient nature of relief in some patients, with 40% reporting sustained improvement beyond three months. This underscores the potential need for repeat injections in appropriately selected individuals. Moreover, the study reveals that injection approach, number of injections, and demographic variables play a critical role in determining outcomes, providing valuable insights for clinical decision-making.

From a clinical perspective, ESIs serve as an effective intervention not only for symptom relief but also for improving quality of life and delaying or preventing the need for surgical interventions. The procedure's efficacy, safety, and tolerability make it a cornerstone in the multimodal management of lumbar spondylosis.

However, the study's retrospective design and three-month follow-up limit its ability to assess long-term outcomes. Future research should prioritize prospective, multicenter studies to evaluate the durability of pain relief, functional improvement, and the cost-effectiveness of ESIs in diverse patient populations. Additionally, exploring the synergistic role of ESIs with other modalities such as physical therapy and targeted rehabilitation programs could enhance therapeutic outcomes.

In conclusion, epidural steroid injections provide significant pain relief, improve functional outcomes, and enhance quality of life for patients with lumbar spondylosis. By addressing individual patient characteristics and optimizing injection techniques, clinicians can maximize the therapeutic potential of ESIs, ensuring better outcomes for those suffering from this debilitating condition.

References

1. Choi JH, Ochoa JK, Lubinus A, Timon S, Lee YP, Bhatia NN. Management of lumbar spondylolysis in the adolescent athlete: a review of over 200 cases. Spine J. 2022 Oct;22(10):1628-1633. doi: 10.1016/j.spinee.2022.04.011. Epub 2022 Apr 30. PMID: 35504566.
2. Lurie J, Tomkins-Lane C. Management of lumbar spinal stenosis. BMJ. 2016 Jan 4;352:h6234. doi: 10.1136/bmj.h6234. PMID: 26727925; PMCID: PMC6887476.
3. Katz JN, Zimmerman ZE, Mass H, Makhni MC. Diagnosis and Management of Lumbar

Spinal Stenosis: A Review. JAMA. 2022 May 3;327(17):1688-1699. doi: 10.1001/jama.2022.5921. PMID: 35503342.
4. Chan AK, Sharma V, Robinson LC, Mummaneni PV. Summary of Guidelines for the Treatment of Lumbar Spondylolisthesis. Neurosurg Clin N Am. 2019 Jul;30(3):353-364. doi: 10.1016/j.nec.2019.02.009. PMID: 31078236.
5. Kalichman L, Hunter DJ. Diagnosis and conservative management of degenerative lumbar spondylolisthesis. Eur Spine J. 2008 Mar;17(3):327-335. doi: 10.1007/s00586-007-0543-3. Epub 2007 Nov 17. PMID: 18026865; PMCID: PMC2270383.
6. Bydon M, Alvi MA, Goyal A. Degenerative Lumbar Spondylolisthesis: Definition, Natural History, Conservative Management, and Surgical Treatment. Neurosurg Clin N Am. 2019 Jul;30(3):299-304. doi: 10.1016/j.nec.2019.02.003. PMID: 31078230.
7. Chen HW, Wu WT, Wang JH, Lin CL, Hsu CY, Yeh KT. Epidural Steroid Injections and the Risk of Osteoporosis in Lumbar Spondylosis Patients: A Nationwide Population-Based Cohort Study. Pain Physician. 2023 May;26(3):307-316. PMID: 37192236.
8. Sencan S, Ozcan-Eksi EE, Cil H, Tay B, Berven S, Burch S, Deviren V, Demir-Deviren S. The effect of transforaminal epidural steroid injections in patients with spondylolisthesis. J Back Musculoskelet Rehabil. 2017;30(4):841-846. doi: 10.3233/BMR-160543. PMID: 28372316.
9. Dydyk AM, Khan MZ, Singh P. Radicular Back Pain. 2022 Oct 24. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan–. PMID: 31536200.
10. Pennington Z, Swanson MA, Lubelski D, Mehta V, Alvin MD, Fuhrman H, Benzel EC, Mroz TE. Comparing the short-term cost-effectiveness of epidural steroid injections and medical management alone for discogenic lumbar radiculopathy. Clin Neurol Neurosurg. 2020 Apr; 191:105675. doi: 10.1016/j.clineuro.2020.105675. Epub 2020 Jan 13. PMID: 31954364.
11. Gerling MC, Bortz C, Pierce KE, Lurie JD, Zhao W, Passias PG. Epidural Steroid Injections for Management of Degenerative Spondylolisthesis: Little Effect on Clinical Outcomes in Operatively and Nonoperatively Treated Patients. J Bone Joint Surg Am. 2020 Aug 5;102(15):1297-1304. doi: 10.2106/JBJS.19.00596. PMID: 32769595; PMCID: PMC7508264.
12. Boody BS, Savage JW. Evaluation and Treatment of Lumbar Facet Cysts. J Am Acad Orthop Surg. 2016 Dec;24(12):829-842. doi: 10.5435/JAAOS-D-14-00461. PMID: 27792054.
13. Reitman CA, Cho CH, Bono CM, Ghogawala Z, Glaser J, Kauffman C, Mazanec D, O'Brien D Jr, O'Toole J, Prather H, Resnick D, Schofferman J, Smith MJ, Sullivan W, Tauzell R, Trumees E, Wang J, Watters W 3rd, Wetzel FT, Whitcomb G. Management of degenerative spondylolisthesis: development of appropriate use criteria. Spine J. 2021 Aug;21(8):1256-1267. doi: 10.1016/j.spinee.2021.03.005. Epub 2021 Mar 6. PMID: 33689838.
14. Liu JH, Soo CW, Lin YC, Lin CS. An alternative approach for lumbar transforaminal epidural steroid injection-Far lateral approach. Pain Pract. 2021 Nov;21(8):978-983. doi: 10.1111/papr.13060. Epub 2021 Aug 4. PMID: 34275177.
15. Davison MA, Lilly DT, Moreno J, Bagley C, Adogwa O. A comparison of successful versus failed nonoperative treatment approaches in patients with degenerative conditions of the lumbar spine. J Clin Neurosci. 2021 Apr; 86:71-78. doi: 10.1016/j.jocn.2020.12.033. Epub 2021 Jan 30. PMID: 33775350.
16. Polly DW Jr. Epidural Steroids for Degenerative Spondylolisthesis: Good, Bad, or Indifferent: Commentary on an article by Michael C. Gerling, MD, et al.: "Epidural Steroid Injections for Management of Degenerative Spondylolisthesis. Little Effect on Clinical Outcomes in Operatively and Nonoperatively Treated Patients". J Bone Joint Surg Am. 2020 Aug 5;102(15): e90. doi: 10.2106/JBJS.20.00843. PMID: 32769607.
17. Demir-Deviren S, Ozcan-Eksi EE, Sencan S, Cil H, Berven S. Comprehensive non-surgical treatment decreased the need for spine surgery in patients with spondylolisthesis: Three-year results. J Back Musculoskelet Rehabil. 2019;32(5):701-706. doi: 10.3233/BMR-181185. PMID: 30664502.