

Functional Outcome of Selective Transforaminal Nerve Root Block for Lumbar Radiculopathy in Intervertebral Disc Prolapse**Anuj Singh¹, Ramavtar Saini², Mukesh Teli³**¹Resident, Department of Orthopaedics, Geetanjali Medical College & Hospital, Udaipur, Rajasthan, India²Professor & Head, Department of Orthopaedics, Geetanjali Medical College & Hospital, Udaipur, Rajasthan, India³Assistant Professor, Department of Orthopaedics, Geetanjali Medical College & Hospital, Udaipur, Rajasthan, India

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Abstract**Background:** Lumbar radiculopathy secondary to intervertebral disc prolapse (IVDP) is a common cause of low back pain and lower limb radicular symptoms, resulting in significant pain, disability, and reduced quality of life. Selective transforaminal nerve root block (STNRB) has emerged as a minimally invasive treatment option for patients with persistent symptoms despite conservative management.**Methods:** This prospective interventional study included 40 patients with clinically and radiologically confirmed lumbar radiculopathy due to single-level IVDP. All patients underwent fluoroscopy-guided STNRB using a corticosteroid and local anaesthetic mixture. Pain intensity and functional disability were assessed using the Visual Analog Scale (VAS) and Oswestry Disability Index (ODI) before intervention and during follow-up. Procedure-related complications and overall clinical outcomes were also evaluated.**Results:** The mean VAS score improved significantly from 7.07 ± 1.12 pre-procedure to 1.85 ± 0.94 at one-year follow-up ($p < 0.001$). The mean ODI score decreased from 50.05 ± 9.07 to 21.60 ± 8.99 at six months ($p < 0.001$). Overall, 77.5% of patients achieved good-to-excellent outcomes. Only 5% of patients experienced minor transient complications, with no major adverse events.**Conclusion:** STNRB is a safe and effective minimally invasive intervention that provides significant pain relief and functional improvement in patients with lumbar radiculopathy secondary to intervertebral disc prolapse and may serve as an effective alternative before surgical intervention.**Keywords:** Lumbar Radiculopathy; Intervertebral Disc Prolapse; Selective Transforaminal Nerve Root Block; Visual Analog Scale; Oswestry Disability Index; Fluoroscopy.**DOI:** 10.25258/ijcpr.18.10.5

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Introduction

Low back pain is one of the leading causes of disability worldwide and imposes a substantial socioeconomic burden due to its high prevalence, associated healthcare costs, and loss of productivity. Among the numerous etiologies of low back pain, lumbar radiculopathy secondary to intervertebral disc prolapse (IVDP) is one of the most common causes of persistent pain and functional limitation in adults. It predominantly affects the economically productive age group, significantly impairing quality of life and daily activities. [1]

Lumbar radiculopathy results from compression and inflammation of one or more lumbar nerve roots, producing characteristic radiating pain along

the affected dermatome, often accompanied by sensory disturbances, motor weakness, and diminished reflexes. Intervertebral disc prolapse most frequently occurs at the L4–L5 and L5–S1 levels, where increased mechanical stress predisposes to degeneration and herniation of the nucleus pulposus through a weakened annulus fibrosus.

Besides mechanical compression, inflammatory mediators released from the herniated disc, including tumor necrosis factor-alpha and interleukins, contribute significantly to nerve root irritation and persistent radicular pain. [2-4] Initial management of lumbar radiculopathy is generally conservative and includes activity modification,

analgesics, non-steroidal anti-inflammatory drugs, muscle relaxants, and physiotherapy. Although many patients improve with conservative measures, a considerable proportion continue to experience disabling symptoms requiring further intervention. Surgery is indicated in selected patients with progressive neurological deficits or refractory pain but is associated with inherent risks and postoperative complications. Consequently, minimally invasive interventional procedures have gained increasing acceptance as an effective intermediate treatment option. [5-7]

Selective transforaminal nerve root block (STNRB) is a targeted fluoroscopy-guided procedure involving the injection of corticosteroid and local anesthetic adjacent to the affected nerve root. The transforaminal approach enables precise drug delivery to the site of inflammation, thereby reducing nerve root edema, suppressing inflammatory mediators, and providing effective pain relief with improved functional recovery. Clinical outcomes are commonly assessed using validated instruments such as the Visual Analog Scale (VAS) for pain and the Oswestry Disability Index (ODI) for functional disability. [8-10] Despite widespread use of STNRB, variability exists regarding its long-term efficacy, particularly in the Indian population. Therefore, the present study was undertaken to evaluate the functional outcome of selective transforaminal nerve root block in patients with lumbar radiculopathy due to intervertebral disc prolapse.

Material & Methodology

This prospective interventional study was conducted in the Department of Orthopaedics, Government Medical College and Hospital (GMCH), over a period of 18 months from June 2024 to December 2025, after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants prior to enrolment.

The study included 40 consecutive patients aged ≥ 18 years with clinically and radiologically confirmed lumbar radiculopathy secondary to single-level prolapsed intervertebral disc (PIVD) who had persistent symptoms despite at least six weeks of conservative treatment, including analgesics, physiotherapy, and activity modification. Patients with previous lumbar spine surgery, cauda equina syndrome, progressive neurological deficits requiring emergency surgery, spinal infection, malignancy, traumatic spinal injury, uncontrolled diabetes mellitus, pregnancy, hypersensitivity to corticosteroids or local anaesthetics, opioid dependence, or other causes of lumbar radiculopathy were excluded. Baseline evaluation included a detailed clinical history, physical and neurological examination, routine

laboratory investigations, and magnetic resonance imaging (MRI) of the lumbosacral spine to confirm the diagnosis and identify the affected nerve root. All procedures were performed under strict aseptic precautions with the patient in the prone position under fluoroscopic guidance. Following infiltration of local anaesthesia, a 20-gauge spinal needle was advanced through the transforaminal approach into the affected neural foramen. Correct needle placement was confirmed using non-ionic contrast medium under anteroposterior, lateral, and oblique fluoroscopic views. A mixture of methylprednisolone (40 mg) and local anaesthetic (lidocaine or bupivacaine), with a total injectate volume of 2–3 mL, was then injected adjacent to the involved nerve root. Patients were observed for one hour after the procedure and discharged once clinically stable.

Pain intensity and functional outcome were assessed using the Visual Analog Scale (VAS) and the Oswestry Disability Index (ODI), respectively, before intervention and at post-procedure day 1, 1 month, 3 months, 6 months, and 1 year. Procedure-related complications, adverse events, and the requirement for additional interventions or surgery during the follow-up period were also recorded.

Statistical Analysis: Data were entered into Microsoft Excel and analysed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean $\pm$ standard deviation (SD), while categorical variables were presented as frequency and percentage. The normality of continuous data was assessed using the Shapiro–Wilk test. Changes in VAS and ODI scores over different follow-up intervals were analysed using repeated-measures analysis of variance (ANOVA) for normally distributed data, followed by Bonferroni post hoc analysis for pairwise comparisons. In cases where data were not normally distributed, the Friedman test with Wilcoxon signed-rank test for post hoc analysis was applied. Categorical variables were analysed using the Chi-square test or Fisher's exact test, as appropriate.

A two-tailed p-value < 0.05 was considered statistically significant. This statistical approach was adopted to evaluate changes in pain relief and functional improvement following selective transforaminal nerve root block over the study period.

Result

A total of 40 patients with lumbar radiculopathy secondary to intervertebral disc prolapse underwent selective transforaminal nerve root block (STNRB) and completed the follow-up. The mean age of the study population was 38.35 ± 9.64 years (range, 26–58 years), with the majority of patients

belonging to the 31–40 years age group (37.5%). There was a male predominance, with 25 (62.5%) males and 15 (37.5%) females. The most commonly affected disc level was L4–L5 (52.5%), followed by L5–S1 (32.5%) and L3–L4 (15%). Right-sided radiculopathy was observed in 62.5% of patients, while 72.5% presented within 2–5 months of symptom onset. Only 2 patients (5%) experienced transient post-procedural complications, and no major neurological or infective complications were encountered, indicating that STNRB is a safe intervention. Pain intensity, assessed using the Visual Analog Scale (VAS), demonstrated a significant and sustained reduction following STNRB. The mean VAS score decreased from 7.07 ± 1.12 before treatment to 3.77 ± 1.23 on post-procedure day 1 and progressively

improved to 1.85 ± 0.94 at the 12-month follow-up, representing a 73.8% reduction in pain. Repeated-measures analysis showed statistically significant improvement at every follow-up interval compared with baseline ($p < 0.001$). Similarly, functional disability assessed using the Oswestry Disability Index (ODI) improved significantly, with the mean score decreasing from 50.05 ± 9.07 before treatment to 21.60 ± 8.99 at 6 months, corresponding to a 56.8% improvement ($p < 0.001$). Overall, 77.5% of patients achieved good to excellent outcomes, while only one patient (2.5%) had a poor outcome, demonstrating the effectiveness of STNRB in improving pain and functional status in patients with lumbar radiculopathy due to intervertebral disc prolapse.

Table 1: Baseline characteristics of study participants.

S. No.	Variable	N=40
1	Age (Years)	38.35 ± 9.64
2	Age Range (Years)	26-58
3	Male/Female	25/15
4	Disc level L3-L4	6 (15.0 %)
5	Disc level L4-L5	21 (52.5 %)
6	Disc level L5-S1	13 (32.5 %)
7	Right sides Radiculopathy	25 (62.5%)
8	Left sided Radiculopathy	15 (37.5%)
9	Duration of symptoms 2-5 months	29 (72.5%)
10	Duration of symptoms 6-10 months	10 (25%)
11	Duration of symptoms >11 months	1 (2.5%)
12	Transient Complications	2 (5%)
13	No complications	38 (95%)

Table 2: Changes in pain (VAS) and functional disability (ODI) following STNRB.

S. No.	Follow up	VAS Score (Mean $\pm$ SD)	ODI Score (Mean $\pm$ SD)
1	Pre-treatment	7.07 ± 1.12	50.05 ± 9.07
2	Day 1	3.77 ± 1.23	31.20 ± 8.90
3	1 month	2.77 ± 1.23	26.20 ± 9.78
4	3 months	2.65 ± 1.33	23.65 ± 9.04
5	6 months	2.07 ± 1.01	21.60 ± 8.99
6	12 months	1.85 ± 0.94	--

Table 3: Clinical Outcome following selective transforaminal nerve root block

S. No.	Outcome	N (%)
1	Excellent	13 (32.5%)
2	Good	18 (45.0%)
3	Fair	8 (20 %)
4	Poor	1 (2.5%)

Discussion

The present study evaluated the functional outcome of selective transforaminal nerve root block (STNRB) in patients with lumbar radiculopathy secondary to intervertebral disc prolapse. The results demonstrated significant improvement in pain relief and functional status following the procedure, with a low complication rate, supporting

STNRB as an effective and safe minimally invasive treatment option for lumbar radiculopathy. The mean age of the study population was 38.35 ± 9.64 years, with the majority of patients belonging to the 31–40-year age group.

A male predominance (62.5%) was observed, and the L4–L5 level was the most frequently involved, followed by L5–S1. These findings are consistent

with previous epidemiological studies by Hoy et al. [11], Van Tulder et al. [12], and Koes et al. [13], who reported that lumbar radiculopathy predominantly affects individuals in the economically productive age group. Similarly, Vad et al. [14] and Pfirrmann et al. [15] reported that L4–L5 and L5–S1 are the most commonly affected disc levels owing to increased biomechanical stress and mobility at these segments.

A significant reduction in pain intensity was observed following STNRB. The mean Visual Analog Scale (VAS) score decreased from 7.07 ± 1.12 before the procedure to 1.85 ± 0.94 at the final follow-up, indicating sustained pain relief. These findings are comparable with those of Vad et al. [14], who demonstrated significant improvement in radicular pain following fluoroscopy-guided transforaminal epidural steroid injection. Similarly, Pfirrmann et al. [15] reported that selective nerve root blocks provided effective pain relief by accurately delivering corticosteroids to the affected nerve root. A recent evidence-based review by Viswanathan et al. [16] also concluded that transforaminal epidural injections offer excellent short- and intermediate-term pain relief in carefully selected patients. Furthermore, systematic reviews by Roberts et al. [17], Buenaventura et al. [18], and MacVicar et al. [19] demonstrated moderate-to-strong evidence supporting the efficacy of transforaminal epidural steroid injections in reducing radicular pain and improving clinical outcomes.

Functional improvement in the present study paralleled the reduction in pain. The mean Oswestry Disability Index (ODI) score improved from 50.05 ± 9.07 before intervention to 21.60 ± 8.99 at six months, indicating substantial recovery of daily functional activities.

These findings are in agreement with those reported by Dhandapani et al. [20], who observed significant improvement in both pain and disability scores following lumbar transforaminal epidural steroid injections. Likewise, Kennedy et al. [21] demonstrated that transforaminal injections provide superior functional improvement because of targeted delivery of corticosteroids into the ventral epidural space. Karppinen et al. [22] also reported significant functional recovery after periradicular steroid injections in patients with lumbar sciatica.

In the present study, only 5% of patients experienced transient post-procedural complications, while no major neurological deficits, infections, vascular injuries, or permanent adverse events were observed. This favorable safety profile is consistent with the findings of Viswanathan et al. [16], Kennedy et al. [21], and Buenaventura et al. [18], who concluded that fluoroscopy-guided transforaminal nerve root block

is a safe procedure when performed with appropriate technique and imaging guidance. The precise placement of medication around the affected nerve root minimizes systemic drug exposure while maximizing local anti-inflammatory effects.

Overall, 77.5% of patients achieved good-to-excellent clinical outcomes, demonstrating substantial pain relief and functional recovery. Similar success rates have been reported by Riew et al. [23], who found that selective nerve root injections significantly reduced the need for operative intervention in patients with lumbar radiculopathy. The prospective study by Dhandapani et al. [20] further identified STNRB as an effective treatment for improving pain, disability, and quality of life in patients with lumbar radiculopathy. Collectively, the findings of the present study, supported by previous randomized trials, systematic reviews, and recent evidence-based literature, reinforce the role of selective transforaminal nerve root block as a safe, effective, and minimally invasive treatment modality that provides sustained pain relief, improves functional outcomes, and may delay or obviate the need for surgical intervention in appropriately selected patients with lumbar radiculopathy secondary to intervertebral disc prolapse.

Conclusion

Selective transforaminal nerve root block (STNRB) is a safe and effective minimally invasive treatment for lumbar radiculopathy secondary to intervertebral disc prolapse.

It provides significant and sustained pain relief, improves functional outcomes as demonstrated by reduced VAS and ODI scores, and is associated with a low complication rate. STNRB may serve as an effective intermediate treatment option before surgical intervention in appropriately selected patients who fail to respond to conservative management.

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