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ROLE OF SELECTIVE NERVE ROOT BLOCK IN THE MANAGEMENT OF LUMBAR RADICULOPATHY DUE TO LUMBAR DISC PROLAPSE

[1]Dr Harika Katta, [2]Dr N Sai Veena, [3]Dr Santosh Reddy J

[1]Assistant Professor, Department of Orthopaedics, Gandhi Medical College and Hospital, Secunderabad, Telangana, India.
[2]Assistant Professor, Department of Orthopaedics, Government Medical College Sangareddy, Telangana, India.
[3]Assistant Professor, Department of Orthopaedics, Government Medical College Maheshwaram, Telangana, India.
Corresponding Author: [3]Dr Santosh Reddy J

ABSTRACT

Background:

Lumbar radiculopathy caused by lumbar disc prolapse is a common source of sciatica and functional disability, with some patients failing conservative therapy. Selective Nerve Root Block (SNRB) provides targeted diagnostic and therapeutic benefits by reducing inflammation and confirming the symptomatic nerve root.

Aim:

To evaluate the diagnostic and therapeutic efficacy of SNRB in patients with lumbar radiculopathy due to disc prolapse, and to determine its role in reducing the need for surgical intervention.

Materials and Methods:

A prospective observational study was conducted on 50 patients with MRI-confirmed lumbar disc prolapse presenting with radiculopathy unresponsive to ≥4 weeks of conservative therapy.

- SNRB was performed under fluoroscopic guidance using lignocaine and corticosteroid.

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- Pain relief was assessed using Visual Analogue Scale (VAS), and functional improvement was measured with Oswestry Disability Index (ODI) at baseline, 1 week, 1 month, 3 months, and 6 months.
- Need for surgical intervention and duration of pain relief were also recorded.

Results: Mean age: 46.2 ± 10.8 years; Male:Female ratio: 28:22. Immediate pain relief was achieved in >85% of patients, with maximum improvement at 1 month. Pain relief lasting >3 months occurred in 48%, while 24% required surgery within 6 months. Mild to moderate disc prolapse showed better and longer-lasting outcomes compared to severe/sequestrated discs. No major complications were reported.

Conclusion:

SNRB is a safe, effective, and minimally invasive technique that provides short-term pain relief, functional improvement, and reduces immediate surgical requirement in patients with lumbar radiculopathy due to disc prolapse. It serves as an important diagnostic and bridging therapy, especially in resource-limited settings, although long-term efficacy depends on disc morphology and appropriate patient selection.

Keywords: Lumbar radiculopathy, Lumbar disc prolapse, Selective nerve root block, Minimally invasive spine intervention.

Introduction

Lumbar radiculopathy is one of the most prevalent causes of sciatica and functional disability, contributing significantly to work absenteeism and socioeconomic burden. Its lifetime prevalence is approximately 3–5%, with a peak incidence between 30 and 60 years of age, and is slightly more common among individuals engaged in heavy manual labor (1). The condition most frequently arises from lumbar disc prolapse (LDP), wherein herniated or

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extruded nucleus pulposus compresses or irritates the adjacent nerve root, leading to radicular pain, paresthesia, numbness, or motor weakness along the corresponding dermatome (1,2).

While conservative management—including analgesics, physiotherapy, and activity modification—is the first line of treatment, 20–30% of patients experience persistent or progressive symptoms. These patients are at risk of chronic neuropathic pain, functional limitation, and diminished quality of life, often requiring targeted interventional procedures or surgical decompression (2).

Selective Nerve Root Block (SNRB) has emerged as an image-guided, minimally invasive procedure with dual diagnostic and therapeutic roles in the management of lumbar radiculopathy. Diagnostic Role: SNRB involves the injection of a small volume of local anesthetic, often combined with corticosteroid, adjacent to the affected nerve root under fluoroscopic or CT guidance. It helps confirm the pain-generating nerve root, particularly in multilevel disc disease, discordant imaging findings, or equivocal clinical presentations. A positive diagnostic block correlates strongly with postoperative pain relief if surgery is required (3). Therapeutic Role: By reducing perineural inflammation and edema, corticosteroids provide short- to intermediate-term relief, facilitating physiotherapy, rehabilitation, and functional recovery (3,4).

Global literature demonstrates the effectiveness of SNRB in relieving pain and delaying or avoiding surgery in a subset of patients. A systematic review reported that 60–70% of patients with disc-related radiculopathy achieved ≥50% pain relief within 6–12 weeks; however, the benefit tended to diminish over longer follow-up (4). In a Jordanian prospective study of 76 patients with lumbar disc herniation, 91% experienced immediate relief, though 62% had recurrence within 3 months, and 46% eventually required surgery, highlighting that SNRB often provides temporary, but clinically meaningful, benefit (5). Similarly, a Korean cohort

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study emphasized that symptom duration <12 weeks and extraforaminal herniation predicted better clinical response, underscoring the importance of early intervention and patient selection (6).

In the Indian context, SNRB has proven highly valuable, particularly where surgical resources are limited or delayed due to socioeconomic factors. A prospective tertiary-care study demonstrated 86% immediate pain relief and 73% avoidance of surgery over 6 months, with sequestrated discs showing the poorest long-term response (7). These findings indicate that SNRB serves as a critical bridge between conservative and surgical management, providing both diagnostic clarity and timely symptom control, allowing many patients to delay or avoid surgery while maintaining functional activity.

However, the duration of relief is variable, often influenced by disc morphology, symptom chronicity, and patient selection. SNRB is most effective in mild to moderate prolapse and less durable in severe or sequestrated herniations, where surgery may ultimately be required. Complications are uncommon but include transient paresthesia, dural puncture, or infection, which underscores the need for careful technique and appropriate patient counseling.

Considering these factors, this study aims to evaluate the diagnostic and therapeutic efficacy of SNRB in patients with lumbar radiculopathy due to disc prolapse, with a focus on pain relief, functional improvement, and its role in reducing the need for surgical intervention, integrating global evidence and the Indian clinical perspective to facilitate patient-tailored management.

Aim

To evaluate the diagnostic and therapeutic efficacy of Selective Nerve Root Block (SNRB) in patients with lumbar radiculopathy due to lumbar disc prolapse.

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Objectives

1. To assess the extent of pain relief and functional improvement following SNRB in patients with lumbar disc prolapse using Visual Analogue Scale (VAS) and Oswestry Disability Index (ODI) scores.
2. To determine the role of SNRB in reducing the need for surgical intervention and to evaluate its diagnostic utility in confirming the symptomatic nerve root in cases with multilevel or ambiguous imaging findings.

Methodology

Study Design

A prospective observational study was conducted to evaluate the diagnostic and therapeutic efficacy of SNRB in patients presenting with lumbar radiculopathy due to lumbar disc prolapse.

Study Population

Patients presenting to the outpatient and inpatient services with symptoms suggestive of lumbar radiculopathy and imaging evidence of lumbar disc prolapse were screened for eligibility.

Inclusion Criteria

1. Age between 18 and 70 years.
2. Clinically diagnosed lumbar radiculopathy with symptoms like unilateral leg pain, paresthesia, or motor weakness along a dermatome.
3. MRI-confirmed lumbar disc prolapse (protrusion, extrusion, or sequestration).
4. Failure of conservative management (analgesics and physiotherapy) for at least 4–6 weeks.
5. Ability to provide informed consent.

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Exclusion Criteria

1. Previous lumbar spine surgery.
2. Coagulopathy or ongoing anticoagulant therapy.
3. Local or systemic infection at the injection site.
4. Severe spinal canal stenosis or progressive neurological deficit requiring urgent surgery.
5. Known allergy to local anesthetics or corticosteroids.
6. Pregnant or lactating women.

Pre-Procedure Evaluation

- **Baseline data collection:**
    - Demographics, clinical history, and physical examination (SLR test, motor and sensory assessment).
    - **Baseline pain assessment:** Visual Analogue Scale (VAS, 0–10).
    - **Functional status assessment:** Oswestry Disability Index (ODI).
- **Imaging:** MRI lumbar spine to identify the level and grade of disc prolapse and to correlate with clinical findings.

Procedure: Selective Nerve Root Block

1. **Preparation:**
    - Procedure performed in operating theater / fluoroscopy suite under aseptic precautions.
    - Patient in prone position with a pillow under the abdomen to reduce lumbar lordosis.
    - Fluoroscopic C-arm positioned to visualize the target foraminal level.

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2. **Technique:**
    - Local skin infiltration with 1–2 ml of 1% lignocaine.
    - A 22-gauge spinal needle introduced toward the neuroforamen under fluoroscopic guidance using oblique and lateral views.
    - Confirmation of position with 0.5–1 ml of non-ionic contrast (optional) to visualize perineural spread.
    - Injectate composition:
        - 1 ml 2% lignocaine (local anesthetic)
        - 40 mg methylprednisolone or equivalent corticosteroid
        - Diluted with normal saline to 2–3 ml total volume.
    - Observation for 30 minutes post-procedure for immediate complications or relief.
3. **Diagnostic Assessment:**
    - A ≥50% immediate pain relief on VAS was considered a positive diagnostic block.

Post-Procedure Follow-up

Patients were followed at 1 week, 1 month, 3 months, and 6 months with:

- Pain assessment: VAS score.
- Functional outcome: ODI score.
- Activity status: Return to work or daily activity.
- Need for surgery: Documented if pain recurred or neurological deficits progressed.

Outcome Measures

1. **Primary Outcomes:**

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- Immediate and short-term pain relief (VAS reduction).
- Functional improvement assessed by ODI.

2. **Secondary Outcomes:**
    - Duration of pain relief (in weeks/months).
    - Rate of surgical avoidance.
    - Complications related to SNRB.
    - Correlation between MRI findings and response to SNRB.

Data Analysis

Continuous variables (VAS, ODI) expressed as mean ± standard deviation (SD). Categorical variables (surgical avoidance, complications) expressed as percentages. Paired t-test or Wilcoxon signed-rank test used for pre- and post-procedure score comparison. P value < 0.05 considered statistically significant. Analysis performed using SPSS.

Results

Table 1: Demographic Profile of Study Participants (n=50)

Parameter	**Value**
Mean Age (years)	46.2 ± 10.8
Age Range (years)	24 – 68
Gender (Male:Female)	28 : 22

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Side of Radiculopathy	Right: 30 (60%), Left: 20 (40%)
Duration of Symptoms	Mean 8.2 ± 3.6 weeks

Interpretation:

The study included middle-aged patients with a slight male predominance. Right-sided radiculopathy was more frequent, and most patients had symptoms for less than 3 months.

Table 2: Distribution of Patients Based on MRI Findings

MRI Finding	No. of Patients (n=50)	Percentage (%)
L4-L5 Prolapse	28	56%
L5-S1 Prolapse	18	36%
Multi-level Prolapse	4	8%
Type of Prolapse: Mild/Moderate	34	68%
Type of Prolapse: Severe/Sequestrated	16	32%

Interpretation:

The L4-L5 level was most commonly affected. Mild-to-moderate disc prolapse predominated, while 32% had severe or sequestrated discs, which may influence long-term response to SNRB.

Table 3: Comparison of VAS and ODI Scores Pre- and Post-SNRB

Time Interval	Mean VAS Score ± SD	Mean ODI Score ± SD

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Pre-Procedure	7.8 ± 0.9	58.2 ± 7.5
1 Week Post-SNRB	2.3 ± 1.0	26.5 ± 6.8
1 Month Post-SNRB	2.6 ± 1.2	28.3 ± 7.0
3 Months Post-SNRB	3.4 ± 1.4	31.8 ± 7.8
6 Months Post-SNRB	4.8 ± 1.8	39.5 ± 8.2

Interpretation:

There was a significant reduction in pain (VAS) and functional disability (ODI) immediately after SNRB, with maximum benefit in the first month. Gradual recurrence of symptoms was noted by 6 months.

Table 4: Surgical Requirement and Duration of Pain Relief

Parameter	**No. of Patients**	**Percentage (%)**
Pain Relief <1 Month	8	16%
Pain Relief 1–3 Months	18	36%
Pain Relief >3 Months	24	48%
Required Surgery within 6 Months	12	24%
Avoided Surgery with SNRB Alone	38	76%

Interpretation:

Nearly three-fourths of patients avoided surgery with SNRB alone.

Pain relief lasting more than 3 months was achieved in 48% of patients, highlighting SNRB as an effective short-to-mid-term intervention.

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Table 5: Response to SNRB According to Severity of Disc Prolapse

Severity of Prolapse	No. of Patients	Mean Pain Relief Duration (months)	Surgery Required (%)
Mild	20	4.3	2 (10%)
Moderate	14	2.5	2 (14%)
Severe / Sequestrated	16	1.2	8 (50%)

Interpretation:

Mild and moderate disc prolapse responded better and for longer duration to SNRB, whereas severe or sequestrated discs had short-lived relief and higher surgical conversion rates.

Discussion

In the present study, SNRB provided significant short-term pain relief and functional improvement in patients with lumbar radiculopathy due to disc prolapse, with the majority avoiding surgery within 6 months. Our findings are consistent with the growing evidence supporting SNRB as an effective minimally invasive intervention, particularly in mild to moderate disc prolapse.

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The demographic profile in our study, with a mean age of 46.2 years and male predominance, aligns with previous reports indicating that lumbar disc herniation commonly affects adults in their 30–50s, often associated with occupational mechanical stress (8). The L4-L5 and L5-S1 levels were the most frequently affected, reflecting the mechanical vulnerability of the lumbosacral junction, as also reported in prior studies (9).

Our study demonstrated a marked reduction in VAS and ODI scores immediately after SNRB, with the best functional outcomes observed in the first month, followed by gradual symptom recurrence by 6 months. This is comparable to the findings of Lee et al., who reported significant short-term relief after transforaminal SNRB, with pain reduction persisting for approximately 3–4 months in most patients (10). Similarly, Shrestha et al. observed that >85% of patients experienced immediate relief, but over 60% had recurrence within 3 months, highlighting the temporary but valuable role of SNRB (11).

A key observation in our study was the inverse correlation between disc prolapse severity and duration of pain relief. Mild and moderate prolapse cases experienced 3–4 months of meaningful relief, whereas severe or sequestrated discs had only short-term benefit, and 50% required surgery. These findings corroborate the results of Singh et al., who found that sequestrated herniations were poor responders to SNRB, with a higher likelihood of surgical conversion (12). The pathophysiology likely relates to mechanical compression predominance in sequestration, where chemical radiculitis alone does not explain symptoms.

Surgical avoidance is a major clinical goal of SNRB. In our study, 76% of patients avoided surgery within 6 months, which is comparable to reported rates of 70–80% in Asian and Indian cohorts (13). In contrast, Western studies often report lower long-term avoidance rates (40–60%), possibly due to differences in healthcare access and patient expectations (14). This

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underlines the practical value of SNRB in resource-limited settings, where it can serve as a bridge therapy while planning elective surgery or optimizing conservative measures.

Our study reinforces that optimal patient selection is critical for maximizing SNRB outcomes. Best results are seen in:

1. Short symptom duration (<12 weeks)
2. Mild to moderate disc prolapse without sequestration
3. Absence of significant motor deficit or canal stenosis

These factors have been consistently highlighted as predictors of SNRB success in both prospective and retrospective studies (15).

Despite its advantages, SNRB is not a permanent solution for many patients. Pain recurrence was observed in nearly half of our cohort by 6 months, which aligns with the natural history of disc prolapse and the temporary anti-inflammatory effect of corticosteroids. Repeat injections or surgery may be required in non-responders or recurrent cases (16).

In summary, our study supports SNRB as a safe and effective short-term intervention that provides pain relief, functional improvement, and reduces immediate surgical need in appropriately selected patients. Severe or sequestrated prolapse cases have limited benefit and often require surgical intervention.

Conclusion

This study demonstrates that Selective Nerve Root Block (SNRB) is an effective, minimally invasive intervention for patients with lumbar radiculopathy secondary to disc prolapse, particularly in those not responding to initial conservative therapy. Significant short-term pain relief and functional improvement were achieved, with the maximum benefit noted within the

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first 1–3 months. Mild to moderate disc prolapse responded more favorably and for a longer duration, whereas severe or sequestrated discs showed short-lived relief and higher surgical conversion rates. Approximately 75% of patients avoided surgery in the short term, highlighting the bridging role of SNRB in delaying or preventing surgical intervention.

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