

Distal Sodium Channel Block in Managing Lumbosacral Radicular Pain: A Prospective Single-Group Study

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ABSTRACT

Background: Lumbosacral radicular pain is a frequent cause of low-back-related disability and may substantially restrict walking, work, sleep and routine activities. Although most patients improve with conservative treatment, a subgroup experiences persistent or severe radicular symptoms requiring interventional pain management. Epidural and selective nerve-root procedures can provide short-term benefit, but their availability, technical requirements, cost and procedural risks may limit their use in some clinical settings. Distal sodium channel block (DSCB) represents a peripheral approach based on the concept that nerve-root irritation may produce distal neural hyperexcitability and increased sodium-channel activity along the affected neural pathway. **Objective:** To evaluate the effectiveness and short-term safety of DSCB in patients presenting with lumbosacral radicular pain involving the L4, L5 and/or S1 dermatomes. **Methods:** This open-label, non-randomised, single-group prospective study was conducted at Bangladesh Multicare Hospital, Rampura, Dhaka; Tropical Hospital and Diagnostic Centre, Demra, Dhaka and Holycare Hospital, Nawabganj, Dhaka, Bangladesh, from March 2020 to March 2024. A total of 200 patients with low back pain radiating to the L4/L5/S1 or all three dermatomes and baseline numerical rating scale (NRS) pain intensity $>4/10$ were included. Baseline NRS and straight leg raise (SLR) findings were recorded before treatment and reassessed at 30 minutes, 24 hours, 1 week and 4 weeks following DSCB. The injection consisted of 2 mL of 2% plain lignocaine, 1 mL triamcinolone 40 mg and 7 mL distilled water. A total volume of 2.5 mL was administered at each of the Beta 1, Beta 2, Beta 3 and tau 4 portals. Statistical analysis was performed using SPSS version 21.0. Paired comparisons between baseline and follow-up measurements were assessed, with statistical significance defined as $p \leq 0.05$. **Results:** Among the 200 participants, 114 (57.0%) were female and 86 (43.0%) were male. No serious procedural complications were recorded. Following DSCB, pain intensity decreased and SLR performance improved at 30 minutes, 24 hours, 1 week and 4 weeks. Comparisons between baseline and follow-up measurements demonstrated statistically significant improvement at every assessment point ($p < 0.001$). The persistence of improvement at 4 weeks suggests that the observed benefit was not limited to the immediate local anaesthetic period. **Conclusion:** DSCB was associated with significant improvement in pain intensity and SLR findings in patients with lumbosacral radicular pain. The technique is relatively simple, can be performed in an outpatient environment and may provide rapid symptomatic relief while allowing time for conservative pharmacological treatment and rehabilitation to take effect. Because this was an uncontrolled single-group study, controlled trials with longer follow-up and validated functional outcomes are required before DSCB can be considered an established alternative to conventional spinal interventions.

Keywords: Distal Sodium Channel Block; Lumbosacral Radicular Pain; Lumbar Radiculopathy; Sciatica; Lignocaine; Triamcinolone; Straight Leg Raise; Numerical Rating Scale; Peripheral Nerve Block; Pain Intervention.

INTRODUCTION

Low back pain is among the most important causes of disability worldwide and represents a major clinical and socioeconomic problem in both high-income and low- and middle-income countries. The global burden has increased substantially with population growth and ageing, while recurrence and persistence remain common even after apparently uncomplicated episodes.¹ Lumbosacral radicular pain constitutes a clinically important subgroup of low-back-related disorders in which pain extends into the lower limb along a neural distribution and may be accompanied by sensory, motor, or reflex abnormalities.²

Radicular pain differs from uncomplicated nonspecific low back pain because irritation of a spinal nerve root can produce a combination of nociceptive and neuropathic mechanisms. Disc herniation, foraminal narrowing, inflammatory mediators, mechanical compression, and changes in neural excitability may all contribute to symptom generation. Importantly, the pathological process at the nerve root is not necessarily confined to the proximal site of compression. Experimental work has demonstrated alterations in neural activity and sodium-channel expression following exposure of nerve roots to disc material, providing a biological rationale for interventions directed at neural excitability.³

Clinical assessment remains central to diagnosis. The distribution of pain, neurological examination, gait, and straight leg raise (SLR) testing are commonly used to identify clinically significant lumbosacral radicular involvement. Routine imaging is not required in every patient and is generally reserved for cases with neurological deficit, suspicion of serious pathology, persistent symptoms despite appropriate conservative management or situations in which invasive treatment is being considered.⁴

Management usually begins with education, maintaining appropriate activity, exercise or physical rehabilitation, and selected pharmacological treatment. When symptoms remain severe or disabling, interventional procedures may be considered. Epidural steroid injections are among the most commonly used interventions for lumbar radicular pain. Evidence suggests that they can provide short- to intermediate-term pain reduction in selected patients, although the magnitude and durability of benefit remain debated.⁵⁻⁷ Recent evidence syntheses have continued to demonstrate short-term benefit while highlighting uncertainty concerning long-term outcomes and the optimal injection approach.^{8,9}

The limitations of conventional spinal interventions have encouraged interest in less invasive peripheral approaches. Distal sodium channel block is based on the concept that irritation of a spinal nerve root can produce distal sensitisation and hyperexcitability of the corresponding peripheral neural pathway. Because voltage-gated sodium channels play an essential role in action-potential propagation, local anaesthetic

blockade at selected distal neural sites may interrupt abnormal nociceptive transmission and reduce pain.¹⁰

A 2023 pilot study of DSCB in lumbosacral radicular syndrome reported significant reductions in NRS pain and improvement in SLR after treatment, with benefit persisting through four weeks.¹⁰ More recently, a randomized placebo-controlled triple-blinded study found that distal peripheral nerve blockade using bupivacaine significantly improved both pain and SLR compared with saline in patients with unilateral lumbar radicular pain.¹¹ These findings provide emerging clinical support for the distal neural blockade concept. However, evidence concerning DSCB remains limited, particularly from South Asian outpatient populations and from larger prospective clinical series. The present study was therefore undertaken to evaluate the effectiveness and procedural safety of DSCB among patients with clinically diagnosed lumbosacral radicular pain involving the L5 and/or S1 dermatomes.

MATERIALS AND METHODS

Study Design

This was an open-label, non-randomised, single-group, prospective pilot study designed to evaluate the short-term effectiveness and safety of distal sodium channel block (DSCB) in patients with clinically diagnosed lumbosacral radicular pain. The study followed participants prospectively from baseline assessment through four weeks after the intervention. The primary clinical outcomes were changes in pain intensity measured by the numerical rating scale (NRS) and improvement in straight leg raise (SLR) findings.

Study Sites and Study Period

The study was conducted at three healthcare facilities in Dhaka, Bangladesh: Bangladesh Multicare Hospital, Rampura, Dhaka; Tropical Hospital and Diagnostic Centre, Demra, Dhaka and Holycare Hospital, Nawabganj, Dhaka. The study was carried out over a four-year period, from March 2020 to March 2024. The participating centres provided outpatient clinical services for patients presenting with musculoskeletal and pain-related conditions and facilitated clinical assessment, intervention, and scheduled follow-up.

Study Population

The study population comprised adult patients presenting with low back pain associated with radiation into the L4, L5 and/or S1 dermatomal distribution. Patients were considered clinically compatible with lumbosacral radicular pain when their presenting symptoms and physical examination findings suggested irritation or sensitisation of the corresponding lumbosacral nerve-root pathway. Patients were evaluated clinically before enrolment to determine their eligibility for DSCB.

Sample Size

A total of 200 eligible patients were included in the study. All participants who fulfilled the predefined eligibility criteria and consented to undergo DSCB during the study period were enrolled in the prospective study cohort. The sample was subsequently followed at predefined intervals to assess changes in pain intensity and SLR findings.

Inclusion Criteria

Patients were considered eligible if they had low back pain radiating to the L4, L5 and/or S1 dermatome, clinical features compatible with lumbosacral radicular pain, and a baseline NRS pain score greater than 4 out of 10. Participants were required to be willing to undergo the proposed distal sodium channel block and capable of completing the scheduled clinical follow-up assessments. These criteria were selected to ensure inclusion of patients with clinically significant symptomatic radicular pain rather than patients with mild or incidental radiating discomfort.

Exclusion Criteria

Patients were excluded when clinical assessment suggested serious spinal pathology or another condition that could make DSCB inappropriate or unsafe. Patients with major or progressive neurological deficits requiring urgent specialist or surgical assessment were excluded. Other exclusion criteria included active infection at or near the proposed injection sites, known clinically significant allergy or hypersensitivity to any component of the injection solution, clinically important bleeding or coagulation disorders, and inability to provide informed consent or participate reliably in the planned follow-up assessments. These criteria were applied to minimise procedural risk and avoid delaying treatment for patients requiring urgent alternative management.

Baseline Assessment

Before the intervention, each participant underwent a structured clinical assessment. Demographic characteristics and relevant clinical history were recorded, including the distribution of radiating pain and other clinically relevant symptoms. Pain intensity was assessed using the 11-point numerical rating scale, ranging from 0, representing no pain, to 10, representing the worst imaginable pain. Straight leg raise was also assessed clinically as a measure of neural mechanosensitivity associated with lumbosacral radicular symptoms. Baseline NRS and SLR findings were recorded before DSCB and subsequently used as reference measurements for evaluating treatment-related changes.

Distal Sodium Channel Block Procedure

DSCB was performed under appropriate aseptic precautions with the patient positioned supine. The injection preparation consisted of 2 mL of 2% plain lignocaine, 1 mL of triamcinolone containing 40 mg, and 7 mL of distilled water, producing a total volume

of 10 mL. The prepared solution was divided into four equal aliquots of 2.5 mL and administered at four predefined distal portals, designated Beta 1, Beta 2, Beta 3 and tau 4. The Beta 1 portal was located approximately 2 cm anterior and inferior border of the lateral malleolus, whereas the Beta 2 portal was positioned between the Achilles tendon and the posteroinferior aspect of the lateral malleolus. The Beta 3 portal was located posterior to the posteroinferior border of the medial malleolus, while the Tau 4 portal was located at the sacroiliac joint, on the either side of midline. These distal anatomical sites correspond to neural targets described in previous reports of DSCB for lumbosacral radicular syndrome.¹⁰ Following administration, participants were observed for immediate adverse events or procedural complications before discharge.

Follow-up and Outcome Assessment

Participants were followed prospectively for four weeks after DSCB. Pain intensity and SLR findings were recorded at baseline and reassessed at 30 minutes, 24 hours, 1 week and 4 weeks after the procedure. The primary clinical outcomes were changes in NRS pain intensity and SLR compared with baseline. The 30-minute assessment was intended to evaluate the early response to the intervention, while subsequent assessments at 24 hours, 1 week and 4 weeks were used to determine whether clinical improvement persisted beyond the immediate local anaesthetic effect. Any clinically apparent adverse events occurring during the follow-up period were also documented.

Statistical Analysis

All collected data were entered and analysed using the Statistical Package for the Social Sciences (SPSS), version 21.0. Categorical variables were expressed as frequencies and percentages, while continuous clinical variables were evaluated according to their baseline and post-intervention measurements. Changes in NRS and SLR were assessed by comparing baseline measurements with measurements obtained at each scheduled follow-up point. Because the same participants were evaluated repeatedly before and after the intervention, paired statistical comparisons were used to assess within-participant changes. A two-sided p value of ≤ 0.05 was considered statistically significant. The observed differences in NRS and SLR between baseline and each follow-up assessment were statistically significant, with the reported comparisons yielding $p < 0.001$.

Ethical Considerations

The study was conducted in accordance with accepted ethical principles governing research involving human participants. Before enrolment, participants were informed about the purpose of the study, the nature of the DSCB procedure, its potential benefits and risks,

alternative treatment options and their right to refuse participation or withdraw from the study without affecting their subsequent medical care. Written informed consent was obtained from participants before the intervention. Patient identity and clinical

information were kept confidential and were used only for the purposes of the study. Appropriate precautions were taken during the procedure to minimise the risk of infection, bleeding, drug-related reactions and other procedural complications.

RESULTS

A total of 200 patients who fulfilled the predefined eligibility criteria were included in the final analysis. The study population comprised 114 females (57.0%) and 86 males (43.0%), giving a female-to-male ratio of approximately 1.33:1. All participants had clinically compatible lumbosacral radicular pain with radiation to the L5 and/or S1 dermatomes and a baseline numerical rating scale (NRS) pain score greater than 4/10. Following distal sodium channel block (DSCB), participants were assessed at 30 minutes, 24 hours, 1 week and 4 weeks. A progressive and statistically significant reduction in NRS pain intensity and improvement in straight leg raise (SLR) findings were observed at every follow-up assessment compared with baseline. No serious procedural complications were reported during the intervention or four-week follow-up period.

Table 1. Distribution of study participants according to sex

Sex	Frequency (n)	Percentage (%)
Female	114	57.0
Male	86	43.0
Total	200	100.0

Table 1 demonstrates the sex distribution of the 200 study participants. Females constituted the majority of the study population, accounting for 114 participants (57.0%), whereas males accounted for 86 participants (43.0%). The female-to-male ratio was approximately 1.33:1. Thus, the study population showed a modest female predominance. However, because the study was designed as a single-group prospective pilot study and was not powered for sex-specific comparisons, the observed difference in sex distribution should not be interpreted as evidence of differential effectiveness of DSCB between males and females.

Table 2. Baseline clinical characteristics and eligibility profile of study participants

Variable	Study finding
Total sample	200
Low back pain with leg radiation	Present in all participants
Dermatomal distribution	L5, S1, or both
Baseline NRS pain score	>4/10
Intervention	Distal sodium channel block
Follow-up duration	4 weeks
Primary outcome	NRS pain intensity
Secondary clinical outcome	Straight leg raise
Study design	Prospective, open-label, single-group

Table 2 summarises the baseline clinical eligibility characteristics of the study population. All 200 participants presented with low back pain associated with radiation into the L4, L5 and/or S1 dermatomal distribution and had a baseline NRS pain score greater than 4/10. Therefore, the study population represented patients with clinically significant symptomatic lumbosacral radicular pain rather than individuals with mild or incidental radiating symptoms. All participants received DSCB and were prospectively followed for four weeks. Changes in NRS pain intensity were considered the principal outcome, while SLR findings served as an additional clinical measure of treatment response.

Table 3. Changes in numerical rating scale pain intensity following distal sodium channel block

Assessment time	NRS change compared with baseline	Statistical significance
Baseline	Reference measurement	—
30 minutes	Decreased	$p<0.001$
24 hours	Decreased	$p<0.001$
1 week	Decreased	$p<0.001$
4 weeks	Decreased	$p<0.001$

Table 3 presents the change in NRS pain intensity following DSCB. A significant reduction in pain was observed as early as 30 minutes after the intervention. The reduction remained statistically significant at 24 hours, 1 week, and 4 weeks when compared with the baseline assessment, with all reported comparisons demonstrating $p<0.001$. The early response indicates rapid symptomatic improvement following the intervention, while the persistence of reduced pain through four weeks suggests that the clinical benefit was not restricted to the immediate period of local anaesthetic action. However, because the supplied dataset does not contain the exact mean NRS values, standard deviations, mean

differences, or confidence intervals, these numerical statistics should be retrieved from the original database before submission of the manuscript.

Table 4. Changes in straight leg raise findings following distal sodium channel block

Assessment time	SLR finding compared with baseline	Statistical significance
Baseline	Reference measurement	—
30 minutes	Improved	$p<0.001$
24 hours	Improved	$p<0.001$
1 week	Improved	$p<0.001$
4 weeks	Improved	$p<0.001$

Table 4 demonstrates the changes in SLR findings following DSCB. Improvement in SLR was observed at all post-treatment assessments, beginning at 30 minutes and continuing through 24 hours, 1 week, and 4 weeks. Each comparison with baseline was statistically significant, with $p<0.001$. The simultaneous improvement in SLR and reduction in NRS pain suggests that the clinical response was accompanied by reduced neural mechanosensitivity. Nevertheless, SLR is influenced by pain tolerance, hamstring flexibility, patient cooperation and examiner technique; therefore, improvement in SLR should be interpreted as a supportive clinical outcome rather than as a definitive measure of neurological recovery.

Table 5. Procedural safety and adverse events during follow-up

Safety parameter	Finding
Total patients treated	200
Serious procedural complications	None reported
Immediate major adverse events	None reported
Follow-up duration	4 weeks
Overall reported tolerability	Favourable

Table 5 summarises the available safety findings. No serious procedural complications or immediate major adverse events were reported among the 200 patients who underwent DSCB. Participants were monitored following the procedure and followed for four weeks. The absence of serious complications in this cohort suggests that DSCB was generally well tolerated when performed in appropriately selected patients under aseptic precautions. However, the absence of observed serious complications should not be interpreted as proof that the procedure is completely risk-free. A sample of 200 participants is insufficient to reliably detect rare complications, and larger studies with standardized adverse-event reporting are required to establish the complete safety profile.

Table 6. Overall clinical response to distal sodium channel block

Outcome	Baseline-to-follow-up finding	Overall interpretation
NRS pain intensity	Decreased at all follow-up assessments	Significant improvement
SLR	Improved at all follow-up assessments	Significant clinical improvement
30-minute response	Improvement present	Rapid onset of benefit
24-hour response	Improvement maintained	Continued symptomatic benefit
1-week response	Improvement maintained	Sustained short-term benefit
4-week response	Improvement maintained	Benefit persisted through follow-up
Serious complications	None reported	Favourable observed short-term safety

Table 6 provides an overall summary of the clinical response following DSCB. Both principal outcome measures demonstrated a consistent improvement after treatment. NRS pain intensity decreased at every scheduled follow-up point, while SLR findings improved at each assessment. The response was already apparent at 30 minutes, indicating a rapid onset of symptomatic benefit and the improvement persisted through the four-week assessment. The sustained response beyond the immediate local anaesthetic period is noteworthy and may indicate an effect on the sensitised neural pathway, although the present study design cannot establish the underlying mechanism. No serious procedural complications were reported during the study period.

DISCUSSION

The present prospective study evaluated DSCB in 200 patients with clinically diagnosed lumbosacral radicular pain and demonstrated significant improvement in both pain intensity and SLR at 30 minutes, 24 hours, one week and four weeks. The principal finding was therefore not simply an immediate reduction in pain, but persistence of clinical improvement during the four-week observation period. No serious procedural complications were reported.

Lumbosacral radicular pain is clinically important because symptoms can extend beyond the lumbar region and interfere with mobility, employment, sleep, and quality of life. Contemporary clinical guidance emphasizes careful clinical examination, including SLR and assessment of symptom distribution, while discouraging routine imaging in uncomplicated cases.⁴ The current study used the same practical principle by identifying clinically symptomatic patients through

history and examination rather than making imaging a mandatory prerequisite for every participant.

The reduction in NRS pain at 30 minutes is consistent with the expected pharmacological action of local anaesthetic blockade. Lignocaine inhibits voltage-gated sodium channels and temporarily prevents propagation of action potentials in excitable neural tissue. However, the continued improvement at 24 hours, one week, and four weeks raises an important mechanistic question. A simple short-duration local anaesthetic effect would not ordinarily be expected to account for a sustained clinical response over several weeks. The DSCB hypothesis proposes that nerve-root inflammation and sensitisation may alter sodium-channel behaviour along the affected neural pathway, allowing distal blockade to interrupt abnormal afferent signalling. This mechanistic concept has experimental support from evidence demonstrating altered sodium-channel expression and neural excitability in response to disc material.³

The findings are particularly relevant when considered alongside the earlier 2023 pilot investigation of DSCB. Shafaat and colleagues evaluated 50 patients using a similar four-week follow-up strategy and reported significant reductions in NRS and improvements in SLR at all follow-up assessments.¹⁰ The present study involved a substantially larger sample of 200 patients and produced a similar direction of effect. Although the present study cannot establish superiority over conventional treatment, replication of the clinical signal in a larger cohort is encouraging.

More compelling evidence has subsequently emerged from a randomized placebo-controlled triple-blinded study. Jha and colleagues evaluated 100 patients with unilateral lumbar radicular pain and compared distal bupivacaine blockade with saline. The active-treatment group demonstrated a reduction in mean NRS from 8.06 ± 1.236 to 3.90 ± 2.013 at 30 minutes with 78% achieving the prespecified pain MCID. SLR improved from 40.90° to 60.90° and 54% crossed the predefined SLR MCID threshold. In contrast, the placebo group showed no significant improvement.¹¹ This study provides important external support for the concept underlying the present investigation because it used a randomized placebo-controlled design rather than a single-group observational approach.

The present results should also be interpreted in the context of epidural steroid injections, which remain a widely used interventional treatment for lumbar radicular pain. Recent meta-analyses suggest that epidural steroid injections can improve pain in the short and intermediate term, but the durability of benefit remains uncertain. Zhang et al., in a 2024 systematic review and meta-analysis of sciatica associated with lumbar disc herniation, reported significant short-term and medium-term pain relief but limited long-term benefit.⁸ Similarly, a 2024 synthesis of 72 randomized trials involving 7,701 patients concluded that epidural steroid injections can

outperform conservative approaches for sciatica but generally do not provide durable long-term results.⁹

The present study does not demonstrate that DSCB is superior to epidural steroid injection. Rather, it explores a potentially simpler peripheral alternative. This distinction is important. A systematic review and network meta-analysis published in 2024 found meaningful variation between epidural approaches, with transforaminal injections showing favourable results for some longer-term pain and disability outcomes.⁷ The choice of an invasive spinal procedure therefore depends on patient selection, imaging findings, neurological status, availability of expertise, cost and risk-benefit considerations. DSCB may have a role in settings where a less invasive outpatient approach is desirable.

Another important consideration is cost and accessibility. Advanced spinal interventions often require fluoroscopic or other image guidance, specialised facilities, trained personnel and additional procedural resources. DSCB can potentially be performed using simple anatomical landmarks and standard injection equipment. In resource-constrained healthcare systems, such as many settings in Bangladesh, a procedure that provides rapid symptomatic relief without requiring advanced imaging guidance could be clinically useful. Nevertheless, economic advantages should be formally demonstrated using health-economic studies rather than assumed.

The improvement in SLR is another noteworthy finding. SLR is commonly used as a clinical test for lumbosacral nerve-root irritation.⁴ An improvement in SLR following treatment may reflect reduced neural mechanosensitivity, reduced pain, or both. The parallel reduction in NRS and improvement in SLR suggests that the intervention was associated with improvement in more than one clinical dimension. However, SLR is not a pure neurological outcome measure, and future studies should incorporate validated disability instruments such as the Oswestry Disability Index, Roland-Morris Disability Questionnaire, walking capacity, analgesic consumption and patient-reported global improvement.

The absence of serious procedural complications is encouraging. The intervention involves superficial distal injection sites rather than entry into the spinal canal, which theoretically avoids some complications associated with neuraxial procedures. Nevertheless, local anaesthetic toxicity, vascular injection, infection, bleeding, steroid-related adverse effects, and nerve injury remain possible. Appropriate patient selection, aseptic technique, dose calculation, monitoring and emergency preparedness remain necessary.

The role of corticosteroid in the present injection mixture requires additional consideration. The intervention combines lignocaine with triamcinolone, so the observed clinical effect cannot be attributed exclusively to sodium-channel blockade. This is a major methodological limitation. A future factorial or

comparative trial should ideally include at least a local anaesthetic-only DSCB group and a saline-control group. Such a design would allow researchers to determine whether the prolonged benefit arises primarily from sodium-channel blockade, corticosteroid action the combination or nonspecific procedural effects.

The current study is also limited by its open-label single-group design. Without a control group, regression to the mean, natural recovery, placebo response, expectation effects, concurrent medications, and rehabilitation cannot be excluded as explanations for some or all of the observed improvement. This limitation is particularly relevant in radicular pain because spontaneous improvement occurs in a proportion of patients. Systematic reviews have also shown that the clinical relevance of some injection-based interventions can be smaller than their statistical significance suggests.^{5,13,14,15,16}

The four-week follow-up is another limitation. Although persistence of benefit for four weeks is encouraging, it cannot establish long-term effectiveness. Longer follow-up at three, six and twelve months would provide important information concerning recurrence, repeated intervention, functional recovery, medication use and eventual surgery.

The study also lacks detailed imaging correlation. This is not necessarily a weakness for routine clinical diagnosis because imaging is not required for every patient with radicular symptoms.^{4,17,18} However, future research should stratify patients according to disc herniation, foraminal stenosis, central stenosis and other structural causes. This would help determine whether DSCB works similarly across different anatomical causes of radicular pain.

Another limitation is the absence of a detailed neurological outcome assessment. Motor power, sensory deficits, reflex changes, walking distance, and validated disability scores would provide a more comprehensive assessment of treatment effectiveness. Pain reduction alone may not represent meaningful functional recovery.

The present study nonetheless has several strengths. It included a relatively large clinical sample for this emerging intervention, used prospective follow-up, assessed outcomes at multiple clinically meaningful intervals and included both subjective pain intensity and a physical examination measure. Conducting the study across three healthcare settings also provides some evidence that the procedure can be implemented in different outpatient environments.

The results are particularly timely because interest in distal peripheral nerve blockade for lumbar radicular pain is increasing. The present larger prospective series adds supportive observational evidence, although the two studies used different local anaesthetic agents and treatment protocols.

Current guideline-based management of lumbosacral radicular pain continues to emphasize education,

maintaining activity, exercise-based care, appropriate pharmacological treatment, and specialist referral when symptoms persist or neurological deficits develop.⁴⁻¹² DSCB should therefore not be considered a replacement for comprehensive conservative management. Instead, it may potentially serve as an adjunct or temporary bridge for patients with significant pain who require rapid relief to participate more effectively in rehabilitation.

The concept of DSCB as a “time-buying” intervention is clinically plausible. Severe radicular pain can interfere with sleep, mobility, exercise and adherence to rehabilitation. If a relatively simple intervention provides temporary pain reduction, the patient may be better able to engage with physiotherapy and other conservative measures while natural recovery occurs. However, this proposed role should be tested prospectively by measuring rehabilitation participation, analgesic requirements return to work and quality of life.

Finally, the present findings should be regarded as hypothesis-generating rather than definitive. The statistically significant *p* values indicate that the observed pre-post differences were unlikely to be attributable to random sampling variation under the statistical model used, but statistical significance does not establish clinical superiority or causality. Future multicentre randomized controlled trials should compare DSCB with sham injection, conventional conservative care, epidural injection and local anaesthetic-only protocols. They should use predefined minimal clinically important differences, blinded outcome assessment, validated functional scales, standardized injection techniques and at least six to twelve months of follow-up.

Limitations

- The study used an open-label, non-randomised, single-group design.
- There was no placebo or control group.
- The study was performed in clinical settings within Dhaka and may not represent all Bangladeshi patients.
- Follow-up was limited to four weeks.
- The injection contained both lignocaine and triamcinolone; therefore, the independent contribution of sodium-channel blockade cannot be established.
- Numerical mean and standard deviation values for NRS and SLR were not retained in the supplied study summary and should be recovered from the original dataset before publication.
- A validated disability instrument such as ODI or RMDQ was not reported.
- Detailed imaging findings and structural diagnoses were not incorporated into the supplied outcome data.
- The study was not powered for subgroup analyses by sex, dermatome, duration of symptoms, or underlying spinal pathology.
- Rare complications cannot be reliably excluded from a sample of 200 patients.

Recommendations

- Future studies should use a multicentre randomized controlled design with adequate sample size and blinded outcome assessment. DSCB should be compared with placebo/sham treatment and established interventions. A local anaesthetic-only group would be particularly valuable for determining the contribution of triamcinolone.
- Future research should also include:
 - Oswestry Disability Index;
 - Roland-Morris Disability Questionnaire;
 - quality-of-life assessment;
 - analgesic consumption;
 - return-to-work time;
 - duration of pain relief;
 - recurrence rates;
 - need for repeat intervention;
 - imaging-pathology correlation;
 - neurological examination;
 - three-, six- and twelve-month outcomes; and
 - formal cost-effectiveness analysis.
- A standardized procedural protocol should be established to reduce operator-dependent variation.

CONCLUSION

In this prospective single-group study of 200 patients with lumbosacral radicular pain, distal sodium channel block was associated with significant improvement in pain intensity and straight leg raise findings. Improvement was observed as early as 30 minutes after the procedure and remained statistically significant through four weeks of follow-up. No serious procedural complications were reported.

The findings support DSCB as a promising minimally invasive approach for selected patients with clinically significant lumbosacral radicular pain. Its potential advantages include rapid onset of symptomatic relief, outpatient feasibility, relatively simple anatomical targeting, and the possibility of providing temporary relief while conservative medication and rehabilitation take effect.

Nevertheless, the uncontrolled design prevents definitive attribution of the observed improvement to DSCB. The combined use of lignocaine and triamcinolone also makes it impossible to determine the independent contribution of sodium-channel blockade. Therefore, DSCB should presently be regarded as an emerging intervention rather than an established replacement for epidural or other evidence-based treatments.

The results, together with previous pilot evidence and the subsequent randomized placebo-controlled study of distal peripheral nerve blockade, provide sufficient justification for larger, well-designed randomized trials. Such studies should establish the magnitude of clinically meaningful benefit, identify appropriate patient subgroups, determine the durability of response, clarify the contribution of corticosteroid, and

assess the comparative cost-effectiveness and safety of DSCB.

DECLARATIONS

Consent for Publication

Not applicable. No individually identifiable patient information or identifiable images are presented in this manuscript.

Availability of Data and Materials

The datasets generated and/or analysed during the current study are not publicly available due to participant confidentiality and institutional considerations but may be made available from the corresponding author on reasonable request, subject to appropriate ethical and institutional approval.

Competing Interests

The authors declare that they have no competing interests.

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Authors' Contributions

All authors contributed to the conception and design of the study, patient assessment and/or data collection, interpretation of the findings, and critical revision of the manuscript. Dr. Md. Kamrul Islam contributed to study coordination and manuscript preparation. All authors reviewed and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

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Clinical Trial Registration

Not applicable. This was a prospective, non-randomised, single-group clinical study and was not registered as a clinical trial.

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