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Original Research Article

DIAGNOSTIC AND PROGNOSTIC VALUE OF DEGREE OF SLR IN THE TREATMENT OF MONORADICULAR SIACTICA

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ABSTRACT

Background: *Sciatica caused by lumbar disc herniation is a common cause of lower back and radicular leg pain. The Straight Leg Raise (SLR) test is widely used as a clinical tool for diagnosing lumbosacral radiculopathy, but its diagnostic accuracy remains debated compared with magnetic resonance imaging (MRI).* ***Objective:*** *To determine the diagnostic accuracy of the traditional Straight Leg Raise (SLR) test for monoradicular sciatica using MRI as the reference standard.* ***Study Design:*** *Diagnostic validation study.* ***Setting:*** *Department of Neurosurgery, Lady Reading Hospital, Peshawar, Pakistan.* ***Duration of Study:*** *From 10-June-2024 to 10-December-2024.* ***Methods:*** *A total of 100 patients presenting with lower back pain and radicular symptoms were enrolled. The SLR test was performed with the patient in the supine position and considered positive if it reproduced characteristic radicular pain at ≤80° of hip flexion. Pain intensity was quantified using a Visual Analogue Scale (VAS). All participants underwent lumbosacral MRI for confirmation of nerve root compression. Diagnostic parameters, including sensitivity, specificity, and overall accuracy, were calculated using a 2×2 contingency table with MRI findings as the gold standard.* ***Results:*** *The mean age of participants was 44.76 years, with a female predominance (54%). The S1 nerve root was the most frequently affected (36%). The SLR test demonstrated a sensitivity of 79.31%, specificity of 69.23%, and an overall diagnostic accuracy of 78.0%.* ***Conclusion:*** *The traditional Straight Leg Raise test remains a practical, simple, and reliable clinical tool for the diagnosis of monoradicular sciatica, demonstrating moderate sensitivity and specificity when compared with MRI.*

Keywords: Straight Leg Raise Test, Diagnostic Accuracy, Sciatica, Lumbar Disc Herniation, Magnetic Resonance Imaging, Sensitivity, Specificity

INTRODUCTION

Low back pain ranks as the second most prevalent reason for seeking medical care, with a projected lifetime incidence of 84% (1, 2). The usual symptoms for lumbar radiculopathy include radiating pain as well as paresthesia. An intervertebral disc herniation that compresses nerve roots from L1 to S1 can result in sciatica and back pain for the patient (3, 4). Monoradicular sciatica is a widespread and frequently incapacitating condition characterized by pain that extends along the pathway of a single spinal nerve root, usually including the lumbosacral nerve roots, primarily as a result of compression. This particular subtype of radiculopathy is an essential factor contributing to lower neck and leg pain worldwide, particularly among adults aged 30 to 60. The primary cause is intervertebral disc herniation, specifically posterolateral disc protrusion at L4-L5 or L5-S1 levels, which presses the traversing nerve root in the lumbar spine. The pathogenesis of monoradicular sciatica involves mechanical compression of the nerve root along with a multifaceted inflammatory response, which results in nerve root irritation as well as sensitization, which culminates in neuropathic pain (5-7).

The Straight Leg Raise (SLR) test is the most reliable, consistent, and accurate assessment for identifying nerve root strain. It has the highest sensitivity, which means discomfort associated with a disk herniation can be replicated throughout its performance. SLR tightens nerve roots and elicits symptoms of nerve irritation, particularly around L5 and S1, aiding in the differentiation of sciatica pain from pain associated with other illnesses. Throughout the SLR test, the patient remains supine, and the afflicted leg is raised with an outstretched knee unless pain is provoked. [8-10] The method anatomically displaces as well as alters L5 and S1 nerve roots at the foraminal level. Consequently, it primarily exerts tension on the L5-S1 nerve root region, with L4 being less affected, while upper levels are much less so. For the test to yield a positive outcome, the pain must manifest at an angle of less than 60 degrees (11, 12).

Monoradicular sciatica is most commonly caused by lumbar disc herniation, which is a prevalent neurological condition. The SLR test is a widely used clinical tool for diagnosing lumbar radiculopathy. However, the relationship between the degree of SLR limitation and both diagnostic accuracy and prognostic outcomes in monoradicular sciatica remains inadequately explored. Investigating the diagnostic and predictive value of the SLR degree could enhance clinical decision-making by providing a simple and non-invasive measure to stratify patients and tailor treatment strategies. This study aims to evaluate the diagnostic accuracy of SLR for monoradicular sciatica, taking MRI as a reference.

METHODOLOGY

This diagnostic validation study was conducted in the department of Neurosurgery of Lady Reading Hospital, after obtaining ethical approval from the hospital. The study was conducted from 10 June 2024 to 10 December 2024. One hundred patients aged 18 years or older presenting with a complaint of lower back pain accompanied by radiating pain into one lower limb following a dermatomal pattern suggestive of L3, L4, L5, and S1 nerve root involvement. The symptoms were required to have persisted for a minimum of three weeks in patients with previous lumbar spinal surgery and significant trauma to the spine or pelvis within the preceding year. A detailed history was taken from each patient, and a physical examination was conducted to record symptom characteristics and neurological status. The traditional straight leg raise test was performed with the patient in a supine position on a firm examination couch. The lower limb was passively raised, maintaining full knee extension until the patient

reported the onset of radicular pain or until the end of the available range of motion was reached. The angle of hip flexion at the onset of pain was noted, and the test was considered positive for Monoradicular sciatica if it reproduced the patient's typical radicular symptoms at an angle of ≤ 80 degrees. The severity of the pain during the test was evaluated using a Visual Analogue Scale. All the patients underwent a lumbosacral magnetic resonance imaging scan, which served as the reference standard.

The data gathered was then analyzed with SPSS 26. Age, BMI, and pain score were evaluated using mean and SD. Gender, along with other demographics and clinical variables, was presented using frequency and percentages. Diagnostic accuracy was calculated using a 2x2 contingency table.

RESULTS

Our cohort had a mean age of 44.76 ± 15.20 years. BMI was 25.79 ± 2.02 kg/m². Mean pain (VAS) during the SLR test was 6.63 ± 1.27. The demographic profile of the cohort showed that the majority of the patients were female 54, 54.0%), and 46 (46.0%) were males. Regarding the health status of the cohort, around 55 (55.0%) of the patients had no reported comorbidities (Table 1).

The diagnostic performance of the traditional SLR test was tested against magnetic resonance imaging (MRI) findings. Out of 100 patients, MRI confirmed Monoradicular sciatica in 87 (87.0%) cases. The SLR test was positive in 73 patients (73%). Analysis of the results demonstrated that the SLR test had a diagnostic accuracy of 78.0%, with a sensitivity of 79.31% and a specificity of 69.23%. (Table 2).

Table 1: Baseline profile

Baseline profile		n	%
Gender	Male	46	46.0%
	Female	54	54.0%
Residence	Urban	63	63.0%
	Rural	37	37.0%
Economic background	Low	19	19.0%
	Medium	69	69.0%
	High	12	12.0%
Education level	Higher	19	19.0%
	Higher Secondary	22	22.0%
	Illiterate	30	30.0%
	Primary	29	29.0%
Comorbidities	Diabetes	14	14.0%
	Hypertension	20	20.0%
	Diabetes & hypertension	11	11.0%
	No comorbidities	55	55.0%
Root nerve involved	L3	7	7.0%
	L4	27	27.0%
	L5	30	30.0%
	S1	36	36.0%

Table 2: Diagnostic accuracy of the traditional SLR test

		MRI findings		Total	Diagnostic accuracy
		Positive	Negative		
Traditional SLR	Positive	69	4	73	*Diagnostic accuracy: 78%* *Sensitivity: 79.31%* *Specificity: 69.23%* *PPV: 94.52%* *NPV: 33.33 %*
		79.3%	30.8%	73.0%	
	Negative	18	9	27	
		20.7%	69.2%	27.0%	
Total		87	13	100	
		100.0%	100.0%	100.0%	

DISCUSSION

The demographic profile of our study sample, with a mean age of 44.76 ± 15.20 years and a slight female predominance (54.0%), aligns well with the epidemiological profile of lumbar radiculopathy reported in other studies. The research by Montaner-Cuello et al. featured a similar mean age of 54.82 years and a female representation of 57.7% (13). This consistency reinforces that the condition commonly affects middle-aged adults without a strong gender bias. The distribution of affected nerve roots in our cohort, with the S1 root (36.0%) and L5 root (30.0%) being most frequently involved, is a classic presentation and is strongly supported by anatomical and clinical studies. This pattern is corroborated by Qazi et al., who also found the L5-S1 level to be the most common site of herniation (14). The high prevalence of pathology at these lower lumbar levels provides a physiological basis for the SLR test's mechanism, which primarily tensions the L5 S1 and, to a lesser extent, the L4 nerve roots.

We found that the diagnostic accuracy of SLR was 78.0%. Omar et al. reported a notably high accuracy of 84.9% while Bashir et al., using a seated SLR variant, found a lower accuracy of 51.2%.[15,16] Our result suggests that in a low-resource-income setting, the SLR test is a reliable tool. The sensitivity of our test was 79.31% showing that it had successfully identified approximately four out of every five actual cases of nerve root compression. This sensitivity is comparable to the 82.8% found by Omar et al. and 77.1% reported by Hussein et al.[1517] In contrast, the profoundly low sensitivity of 33.3% was reported by Qazi et al. in a patient population exclusively over 60 years of age (14). This discrepancy underscores a critical moderator of the SLR's utility, which is the age of the patient. The decline in sensitivity with advancing age, as highlighted by Qazi et al. and Tabesh et al., is often attributed to age-related changes in neural mobility and musculoskeletal flexibility, which can reduce the mechanosensitive response the test aims to provoke (14, 18). Our cohort's mean age of 44.76 years places it in a range where the test appears to retain reasonable sensitivity.

However, the specificity of our test was 69.23% which reveals a significant limitation. This means that nearly one-third of patients without radiculopathy were incorrectly flagged as positive by the SLR test. This finding is consistent with a well-documented trend in the literature where the SLR test often demonstrates higher sensitivity at the expense of specificity. Montaner-Cuello et al. observed this trade-off explicitly when they incorporated more criteria, such as asymmetry in range of motion or symptom location; their sensitivity rose to 89.02%. Still, specificity dropped to 25.00% (13). Our specificity is higher than this, but still indicates a substantial rate of false positives. This can be attributed to the fact that a positive SLR test indicates increased neural mechanosensitivity, which can have several reasons beyond a compressive radiculopathy, such as hamstring tightness, sacroiliac joint dysfunction, or even peripheral neuropathies. Hussein et al., who reported a higher specificity of 81.0% emphasized the use of standardized procedures, including structural differentiation with ankle dorsiflexion, which may help isolate the neural component from musculoskeletal pain (17).

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CONCLUSION

In conclusion, our findings demonstrated that the SLR test for the Diagnosis of monoradicular sciatica is a reliable and effective modality with a diagnostic accuracy of 78%. In low-resource settings, this test can be a reliable tool for the Diagnosis of monoradicular sciatica.

DECLARATIONS

Data Availability Statement
All data generated or analysed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department Concerned. (IRB)
Consent for publication
Approved
Funding
Not applicable

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTION

NAVEED KHAN (PGR)
Conception of Study, Development of Research Methodology Design, Study Design, Manuscript drafting, and Final approval of manuscript.
FAROOQ AZAM (Professor)
Critical guidance and Final approval of manuscript.
ZUBAIR KHAN (PGR)
Critical Input.
NAVEED AHMAD (PGR)
Review of Literature
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Review of Literature
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Review of Literature.

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