

Original Article

The diagnostic accuracy of straight leg raise test in patients more than 60 years of age suffering lumbar disk herniation with low back pain and sciatica

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ABSTRACT

Objective: To determine the diagnostic accuracy of the SLR test in elderly patients suffering from lumbar disk herniation with sciatica and low back pain, using magnetic resonance imaging (MRI) as the gold standard.

Materials and Methods: A cross-sectional study was conducted at Jinnah Postgraduate Medical Center and a total of 120 patients, above 60 years of age, with symptomatic lumbar disk herniation were enrolled. SLR test was performed and the results recorded. MRI of the lumbar spine was undertaken for confirmation of disk herniation.

Results: The sensitivity of the SLR test in patients 60 years and older is 33.3%. A decrease in the diagnostic accuracy of the SLR test with an increment in age was also noted.

Conclusion: It was found that with an increment in age, there is a steady decline in the diagnostic accuracy of SLR Test.

Keywords: Lumbar disk herniation, Straight leg raise test, Sciatica

INTRODUCTION

Low back pain is the second most common cause for seeking medical attention with an estimated lifetime prevalence of ~84%.^[1,2] In patients <45 years of age, it is also the most common cause of disability.^[3] However, only 1–3% will have a lumbar disk herniation.

Typical symptoms of lumbar radiculopathy are radiating pain, numbness, and paresthesia, with or without muscle weakness.^[4] When an intervertebral disk herniation compresses nerve roots anywhere from L1 to S1, the patient can experience sciatica along with backache.

The paraspinal musculature plays a key role in the movement and stability of the lumbosacral spine with musculoskeletal strain being the most common etiology of low back pain.^[5] History and physical examination can help in the identification of the cause.

SLR test is the most consistent, reliable, and valid test for the diagnosis of nerve root tension.^[6] It has the most sensitivity as during its performance the pain caused by disk herniation

could be reproduced.^[7,8] SLR tenses the nerve roots and reproduces the signs of nerve impingement, particularly at L5 and S1, helping in differentiating the pain of sciatica from the pain of other pathologies.

In the SLR test, the patient lies down supine, and then, the affected limb is raised with an extended knee until pain is elicited.^[9] This maneuver, anatomically, moves or deforms the L5 and S1 nerve roots at the level of the foramina ~2–6 mm.^[10] Thus, it primarily tenses the L5–S1 nerve root level, L4 is affected less, and the higher levels even less so.^[11] For the test to be positive, the pain should appear at an angle of <60°.

Nerve root compression produces a positive SLR test in ~83% of the cases and is more likely to be positive in patients <30 years of age.^[12,13] With an increment in age, the rate of positivity of the SLR test gradually and regularly declines with a chance of test positivity in patients above 60 years of age being 5 times less than in patients below 60 years.^[14]

This difference can be due to altering physiology and degeneration of the musculoskeletal elements as age progresses.

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In young patients, the hamstring muscles are strong, and during the test, they may resist motion facilitating the attainment of a more accurate result. Conversely, in the elderly population, these muscles tend to become lax and cannot provide significant resistance against flexion of the hip joint.^[14]

Different studies have shown a variation in the sensitivity (52–91%) and specificity (89–26%) of this test. In a systematic review, the SLR test was found to have low specificity which limits its diagnostic prowess; the pooled sensitivity and specificity of 91% and 26%, respectively.^[15] In another trial, the SLR test showed a wide variation in sensitivity and specificity and it was noted that taut hamstrings can give rise to a falsely high sensitivity.^[16]

In some studies, a marked difference was found in 16–25 and the 66–75 years age group with 77% sensitivity in the former and 25% in the latter.^[17] Another study showed that in younger patients (aged 16–45 years), a larger proportion had a positive response (58%) to the SLR test than the older patients (12%).^[17]

Increasing the age has a suppression effect on the positivity of the SLR test. With every 1-year increment, the SLR test becomes 0.27 times more likely to become negative meaning that in patients above 60 years of age, the sensitivity is likely to become 6% compared to 88% in patients <30 years of age.^[18]

Thus, the SLR test may be useful for detecting lumbar disk herniation in the young population, but it should not be considered conclusive in the older population.^[17]

MATERIALS AND METHODS

A cross-sectional study was conducted in the Outpatient Clinic at the Department of Neurosurgery, Jinnah Postgraduate Medical Center, Karachi. The study duration was 6 months from February 1, 2020, to July 31, 2020, with a sample size of 120 patients. Patients aged 60 years and above were included in the study of either gender having low back pain along with sciatica for more than 2 weeks with confirmed lumbar disk herniation on MRI, representing a focal displacement of <50% of disk material from the confines of the intervertebral disk and into the spinal canal. Patients with a history of spinal surgery, chronic musculoskeletal disorders, for example, rheumatoid arthritis, concomitant thoracic and/or cervical disk herniations, or previous history of trauma were excluded from the study. Demographic data were collected including age, gender, spinal level of the disk disease, and SLR test result.

Positive SLR test result was defined as the reproduction of low back or leg pain on raising the leg passively with the extended knee at an angle of <60°.

The data were analyzed through SPSS version 23. Measures of central tendencies were calculated for quantitative

variables, that is, age and symptom duration. Frequency and percentages of qualitative variables, that is, gender, affected lumbar spine levels, and SLR test result were also calculated. The sensitivity of the SLR test was calculated through a 2 × 2 table.

Effect modifiers were controlled through stratification and by applying the Chi-square test post-stratification to see the effect of these on the outcome. $P \leq 0.05$ was taken as significant.

RESULTS

Among the 120 patients, 67.5% (81) were male and 32.5% (39) were female, showing a higher male preponderance in this particular age group.

The most prevalent age group was 60–64 years (57.5%), followed by 65–69 years (34.2%), and then 70 and above (8.3%).

Among the patients, 35.8% experienced symptoms of low back pain and sciatica for a period of 6 months–1 year, 30% for more than a year, and 14.2% and 20% for a period of <6 weeks and between 6 weeks and 6 months, respectively.

In the sample, 3.3% had L1–L2 herniation, L2–L3 herniation in 1.7%, whereas, the incidence of L3–L4, L4–L5, and L5–S1 levels was 5%, 31.7%, and 35.8%. Multilevel lumbar disk disease was found in 22.5% of the patients. Therefore, L5–S1 disk herniation was the most common.

The rate of getting a true positive SLR in 60–64, 65–69, and 70–75 year age groups was 40.5%, 26.8%, and 10%, respectively, showing that with increasing age, the rate of positive results regularly declined [Table 1]. The chance of a true positive SLR in men with lumbar disk herniation is slightly more than in women in these age groups [Table 2]; however, it was found to be not significant.

A positive SLR test result was noted in 40 patients, demonstrating its sensitivity in ages above 60 years to be 33.3%.

DISCUSSION

The lifetime prevalence of low back pain ranges from 49% to 70% with one of the most common sources being intervertebral.^[19,20] In patients with a herniated lumbar disk, the SLR test brings about a movement of the nerves further exacerbating the impingement by the herniated disk and aiding in diagnosis.^[9] The sensitivity of SLR test, in a research carried out by Tabesh *et al.*, was determined to be 82%.^[17] In another trial by van der Windt *et al.*, it was noted that in surgical patients with a characteristic high prevalence of disk herniation (58–98%), the SLR showed high sensitivity (pooled estimate 0.92, 95% confidence interval: 0.87–0.95) with widely varying specificity.^[21] Both of these trials did not discriminate between age groups.

Table 1: Comparison of SLR test results in different age groups.

Age * SLR test cross-tabulation				
	SLR test		Total	P-value
	Positive	Negative		
Age				
60–64				
Count	28	41	69	0.088
% within SLR test	70.0%	51.3%	57.5%	
65–69				
Count	11	30	41	34.2%
% within SLR test	27.5%	37.5%	34.2%	
70 and above				
Count	1	9	10	8.3%
% within SLR test	2.5%	11.3%	8.3%	
Total				
Count	40	80	120	100.0%
% within SLR test	100.0%	100.0%	100.0%	

SLR: Straight leg raise

Table 2: Rate of positive SLR test in males and females.

Gender * SLR test cross-tabulation		Total	True positive percentage	P-value
Count				
	SLR test			
	Positive	Negative		
Gender				
Male	30	51	81	0.215
Female	10	29	39	
Total	57	63	120	

SLR: Straight leg raise

In our study, L5–S1 level of disk herniation was the most common (35.8%) similar to the one by Tabesh *et al.*, that is, L5–S1 (47%) and L4–L5 (42%).^[17]

In our study, when the SLR test was performed, 40 patients (33.3%) showed a positive result. In the remaining 80 patients (66.7%), the result was negative. When compared with the gender of the patients, it was found that the SLR test was positive in 37% of the males and 25.6% of the females, showing that the male gender has a slightly higher number of true positive rates in this age group. Tabesh *et al.* study also demonstrated a slight male preponderance, with the chance of positive SLR in men being 1.3 times that in women.^[17] However, this difference is not that significant.

The SLR test results were then compared to the level of disk herniation, and it was found that no positive SLR test was recorded in disk herniations of L1–L2, L2–L3, and L3–L4 levels. Patients with disk herniation at L4–L5 constituted 34.1% of the positive SLR test result, and disk herniation at

L5–S1 was 36.5%. This correlated with the hypothesis that the nerve stretch while performing SLR is the most at L5–S1 root level followed by L4–L5 level. Ko *et al.* suggested that the tension in nerve roots increased from L2 to S1 as the angle induced by the SLR test gradually increased indicating that the SLR test induced more movement and tension in distal segmental roots.^[22] Thus, SLR has a limitation when the level of disk disease is concerned. Other tests such as femoral stretch test are more suited to diagnose mid-lumbar disk disease, from L2 to L4.^[23,24] Suri *et al.* determined that positive results of femoral stretch tests and crossed femoral stretch tests increased the probability of having positive mid-lumbar radiculopathy, with femoral stretch test having a sensitivity of 43–60%.^[25] In studies conducted by Majlesi *et al.* and Ekedahl *et al.*, it was concluded that the slump test applies tension to nerves at all lumbar levels and has more sensitivity to disk herniations than the SLR.^[26,27]

When the results of the SLR test were compared among age groups, it was recorded that in the age group of 60–64 years, 40.5% of the patients had a positive SLR test. In the group of 65–69 years, 26.8% had a positive result, whereas, in the 70 years and above group, only 10% showed positivity. Tabesh *et al.* found that the chance of positive SLR in patients under 60 is 5.4 folds more than in patients above 60 years.^[17] Capra *et al.* also demonstrated that the discriminative power of the SLR seemed to decrease as age increased; thus, test results may be less conclusive in older patients.^[28] When SLR positivity was correlated with age and the level of spine disease, it was found that among the patients having L4–L5 disk disease and a positive SLR, 25 were in the 60–64 years age group, 12 in the 65–69 years group, and only one in 70 years and older group. Similarly, at L5–S1 level disk disease with positive SLR, 22, 14, and 7 were in the 60–64, 65–69, and 70 above age groups, respectively.

Our results correlated well with the results of other studies, proving that increasing age decreases the diagnostic accuracy of the SLR test. *P*-value, however, is 0.08 ($P = 0.005$) and is not statistically significant. The reason may be the small sample size and the lack of a control group, both in terms of younger age and those having low back pain without any herniations. Therefore, these issues must be addressed in future studies.

The sensitivity of the SLR test in the population of 60 years old and above is 33.3% with a false negative rate of 66.7%. As the non-diseased population was not included in this study, specificity could not be determined.

CONCLUSION

We concluded that as the age increases, the sensitivity of the SLR test gradually declines, signifying a much higher rate of false negatives. SLR, therefore, is not a good indicator of a herniated lumbar disk disease in patients above 60 years.

Declaration of patient consent

The Institutional Review Board (IRB) permission obtained for the study.

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Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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