

# The effect of age on result of straight leg raising test in patients suffering lumbar disc herniation and sciatica

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**Background:** Ninety percent of all people sometimes during their lives experience low back pain, and 30-40% develops radicular leg pain with the sciatica characteristics. Although for clinical diagnosis of lumbar disc herniation (LDH) straight leg raising (SLR) test in 85-90% of cases indicates LDH, but in our practice with LDH patients this test is frequently negative despite radicular leg pain due to LDH. Hence, we decided to evaluate this test in LDH in different age groups. **Materials and Methods:** All patients with leg pain referring to neurosurgery clinic were enrolled. Those with a history of pain other than sciatica excluded and SLR test and magnetic resonance imaging (MRI) of the lumbosacral spine performed. The patients with negative MRI findings excluded and finally 269 patients with true sciatica and positive MRI were included. SLR tests were performed for different age groups. **Results:** Of 269 patients, 167 were male. The age range was 16-80 years. The most involved levels were L5-S1 (47%) and L4-L5 (42%), respectively. The rate of positive SLR result, which was 100%, 87% and 82% for 10-19, 20-29 and 30-39 years age group respectively. With an increment of age, the rate of positive test regularly declined. The chance of positive SLR in men is 1.3 times the women (odds ratio [OR] 2.4; 95% confidence interval [CI] = 1.265-4.557;  $P = 0.007$ ). Increasing the age has suppression effect in positivity of SLR so that for each 1-year the chance of SLR become 0.27 times less to become positive and this is also statically meaningful (OR = 0.271; 95% CI = 0.188-0.391;  $P < 0.001$ ). The chance of positive SLR for patients under 60 is 5.4 folds more than patients above 60 years old (OR = 5.4; 95% CI = 4-8.3;  $P < 0.001$ ). **Conclusion:** Age, sex (male), and disk level had statistically the effect on SLR positive test.

**Key words:** Low back pain, lumbar disc herniation, sciatica, straight leg raising test

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## INTRODUCTION

Approximately, 90% of the population experience low back pain during their life and 30-40% of them develop leg pain because of lumbar spine degenerative process which is only 4-6% clinically significant. In fact, sciatica is the clinical description of the pain developed due to compression on lumbosacral nerve root, which is sensed in the course of the sciatic nerve.<sup>[1-6]</sup>

Historically sciatica the pain that originate in back and radiates to buttock and leg was first mentioned in an Egyptian manuscript dated 3000 BC and in Greek and Roman manuscript as well. In 1555 Vesalius described intervertebral disc. The degeneration of intervertebral disc observed by Luschka in 1858, the association between low back pain and sciatica recognized by Lase'gue in 1880, in 1929 Dandy explained two cases with cauda equine syndrome due to lumbar disc rupture, in 1934 Mixter and Burr described 34 patients

whose symptoms were due to lumbar disc herniation (LDH) and nowadays lumbar disc excision is a routine surgical intervention.<sup>[1,2,5,7]</sup>

The most common cause of sciatica is compression of the nerve root by herniation of lumbar disc but other conditions such as compression by an osteophyte, lumbar canal stenosis, spondylolisthesis, and tumors of spinal canal or pelvic cavity may be the etiology.<sup>[2,5]</sup> The factors that can cause lumbar disc bulging and herniation include age, gender, job, smoking, exposure to vibration but the role of other factors like genetic and height are less determined<sup>[3,5,6]</sup> even though other researches has confirmed the role of genetic, and driving as a cause of disc herniation.<sup>[4,8]</sup>

The most common levels for LDH are lower lumbar spaces (L5/S1 and L4/L5) because the most flexion-extension and movements of the lumbar spine occur in these levels.<sup>[4,7,9]</sup>

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Regarding high incidence and its physical and occupational disabilities and its concomitant economic and social consequences, the need for rapid and correct diagnosis of LDH is obvious. One of the most important physical examination tests for clinical diagnosis of LDH is straight leg raising (SLR) that plays a key role on diagnosis.<sup>[4,7]</sup> Normally people can tolerate 90° flexion of the hip joint in full knee extension without any pain except those with some stiffness in hamstrings.<sup>[3,7]</sup> At 30° hip flexion the nerve root begins to replace in its foramen and in the presence of compression on nerve root pain will be sensed in the distribution of sciatic nerve, which is called sciatica, in other words flexion of hip will reduplicate the sciatica. This reduplication of pain is considered positive SLR.<sup>[1,7]</sup> SLR has high sensitivity, but low specificity and when positive, it is a useful test, which in 85-90% of the cases indicates LDH. It had been claimed that SLR is the most sensitive test in the diagnosis of disc herniation.<sup>[7,9,10]</sup> SLR test not only is a useful test in diagnosing LDH,<sup>[4,11]</sup> but also in predicting the outcome of surgery play an important role. A negative test 3 months after surgery indicates a good outcome and vice versa.<sup>[10,12,13]</sup> In another study, it is shown that patients with positive magnetic resonance imaging (MRI) findings and positive SLR achieved better results than those with negative SLR.<sup>[14]</sup>

In our practice with LDH patients, the SLR test is frequently negative despite radicular leg pain due to LDH. Furthermore, it was our hypothesis that the age may have an effect on these negative results. Hence, we decided to evaluate the SLR test in different age groups in patients with LDH and positive MRI findings.

## MATERIALS AND METHODS

This is a cross-sectional study done in Alzahra Hospital, Isfahan, Iran during 2010-2012. The target population was patients suffering LDH and sciatica. All patients who referred to neurosurgery clinic due to leg pain were enrolled, and those with nonsciatalgia excluded. For all patients SLR test and MRI study of the lumbosacral spine performed. Those patients whom MRI findings had not detected for sciatica were excluded. Finally, 269 cases included. All steps of the study including history taking, physical examination, interpretation of MRI results, and records of data were done by a neurosurgeon. For analysis and interpretation of the data, the SPSS version 22 (SPSS Inc., Chicago, IL, USA) were used. Chi-square test, Fisher Exact test, and Mann-Whitney U-test were used for analysis.

## RESULTS

A total of 269 patients were studied. 102 (37.9%) were female and 167 (62.1%) were male. The mean age was  $41.6 \pm 5.6$

(range: 16.80). The SLR test in 182 patients (67.7%) was positive and in 87 (32.3%) was negative.

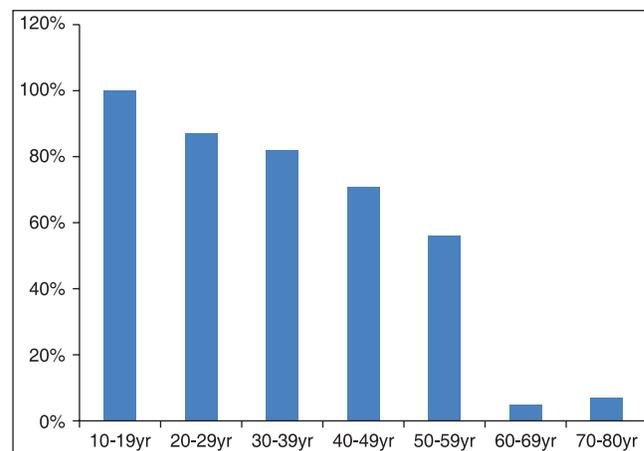
Frequency distribution of sex, age, disk level herniation and severity of LDH based on SLR was shown in Table 1. According to Chi-square test, the sex distribution between the two groups was statistically significant ( $P = 0.003$ ). Also, frequency distribution of age group and disk level herniation was shown in the table. The most common involved discs were L5/S1 and L4/L5. According to Fisher Exact test, distribution of the level between the two groups was statistically significant ( $P = 0.002$ ). Distribution of age between the two groups was also statistically significant ( $P < 0.001$ ). Finally, according to Mann-Whitney U-test, distribution of intensity between the two groups was statistically significant ( $P < 0.001$ ).

According to logistic regression, by backward of conditional method, showed that sex (male), age and disk level had statistically the effect on SLR positive ( $P < 0.05$ ).

Hence that the chance of positive SLR in men is 1.3 times the women (odds ratio [OR] 2.2; 95% confidence interval [CI] = 1.3-3.7;  $P = 0.003$ ). In contrast, increasing the age has suppression effect in positivity of SLR, so that for each 1-year the chance of SLR become 0.27 times less to become positive and this is also statically meaningful (OR = 0.27; 95% CI = 0.18-0.39 ;  $P, 0.0001$ ). The chance of positive SLR for patients under 60 is 5.4-fold more than patients above 60 years old (OR = 5.4; 95% CI = 4-8.3;  $P, 0.001$ ).

As shown in Figure 1, the most common decade for LDH is the fourth (34%) and as the distance from this decade increases the incidence of disc herniation declines so that in second and eighth decade the least affliction is encountered, 2% and 5% respectively.

32% of patients had negative SLR test, the overall sensitivity of this test was 68%. In all of the patients between 10 and



**Figure 1:** The percent of positive straight leg raising test among different age group in the patients with lumbar disc herniation

19 years old the SLR test was positive, but in the seventh decade only 7%. In the sixth decade 5% and in third and second decade 82 and 87% had a positive test results, respectively. With increasing the age the rate of positivity of SLR test in patients with LDH decreases in other words the sensitivity of the test in old patients (>60 year) is 6% and in young patients (<30 year) is 88%.

About 62% of patients were male. The male/female ratio is 1.6. In positive SLR group, the male/female ratio was 2.1.

The most involved levels were L5-S1 (47%) and L4-L5 (42%) respectively [Table 1].

Also, the patients classified according to the severity of their symptoms in three groups, mild (those who can continue their routine activity despite sciatic pain), moderate (those who can't continue their jobs) and severe, (those in whom any movement make so severe pain that they can't do any activity and are in complete bed rest) [Table 1].

## DISCUSSION

Considering the frequency of LDH among different levels, in our study 51% had L5/S1, 49% had L4/L5 and only 9% had L3/L4 herniation. In other studies, the most common level for LDH is L5/S1 (53%) and the second common level is L4/

L5 (41%) and for L3/L4 is 5%.<sup>[1,14]</sup> It is also mentioned that the most of flexion-extension of the lumbar spine occurs at L4/L5 and L5/S1 and consequently the most involved levels are lower lumbar, which is nearly the same as our results.<sup>[3,4,9]</sup>

In our study of 269 patients, 62% were male which is nearly the same with other studies.<sup>[1,7,8]</sup>

The age distribution of LDH in our study is the same as with other studies. In one study of 150 cases in Sweden the age range was from 21 to 81 (mean age 42).<sup>[1,3,5,13]</sup>

According to our data, the significant difference was the result of SLR test, which was meaningfully more negative in older patients, that is in seventh and sixth decades only 7% and 5% was positive, respectively.

The percent of positive SLR test among different age group in the patients with LDH which may be related to hamstring muscles. In young patients hamstring muscles are stronger and have thick fascia and during the test some portion of limitation of motion is due to the more resistance of the muscle fibers and its tendons, conversely in elderly these muscles become loose and its fascia has much more laxity as is true for all other muscles so that it can't provide a significant resistance against flexion of hip joint.

In other studies, the role of Hamstring muscles is indirectly pointed out. Completely healthy people should permit 90° hip flexion without sensing radicular pain, although some discomfort in hamstrings is expected and should not be considered positive SLR test.<sup>[2,7,12]</sup>

Another reason for negativity of SLR test in older ages may be the shortening of the height, which is due to shortening of the bones while the length of nerves including Sciatic is not decreased so some reduction of stretch on the nerve occurs, which leads to laxity of the nerve and consequently reduces resistance upon SLR test.

The most sensitive clinical test in diagnosing LDH is SLR test,<sup>[10]</sup> but in the study by Majlesi *et al.* the sensitivity and specificity of this test is reported 52% and 89% respectively.<sup>[15]</sup> And in another study sensitivity of 91% and specificity of 26% has been reported.<sup>[16]</sup> Considering these studies, it is necessary to re-evaluate the efficacy of this test in clinical diagnosis of LDH. Rebaïn *et al.* has also concluded suggested in his study that more research is needed to evaluate the clinical efficacy of SLR and the role of age in this test should be skated out.<sup>[12]</sup>

Although in the literature different sensitivities for SLR test are reported<sup>[9,15]</sup> but the role of age on these results had not been evaluated. In our study, we found that age may be a factor affecting on SLR test.

**Table 1: Frequency distribution of sex, age, disk level herniation and severity of LDH based on SLR**

SLR variables	Positive n (%)	Negative n (%)	P
Sex			
Male	124 (74.3)	43 (25.7)	0.003
Female	58 (56.9)	44 (43.1)	
Age group			
10-19	5 (100)	0 (0)	<0.001
20-29	40 (87)	6 (13)	
30-39	75 (81.5)	17 (18.5)	
40-49	41 (70.7)	17 (29.3)	
50-59	19 (55.9)	15 (44.1)	
60-69	1 (5)	19 (95)	
70 and +	1 (7.1)	13 (92.9)	
Disk level			
L5-S1	100 (79.4)	26 (20.6)	0.002
L4-L5	65 (57.5)	48 (42.5)	
L3-L4	6 (60)	4 (40)	
L5-S1 and L4-L5	7 (63.6)	4 (34.6)	
L3-L4 and L4-L5 and L5-S1	0 (0)	1 (100)	
L3-L4 and L4-L5	1 (50)	1 (50)	
Undetermined	3 (1.6)	3 (3.4)	
Severity of symptoms			
Mild	92 (69.7)	40 (30.3)	<0.001
Moderate	68 (66.7)	33 (33.3)	
Sever	22 (61)	14 (39)	

LDH = Lumbar disc herniation; SLR = Straight leg raising test

In our study, the severity of the sciatica had not any effect on the positivity of SLR test result.

## CONCLUSION

Age, sex (male), and disk level had statistically the effect on SLR positive test.

In elderly patients, the SLR test became positive only in a minority of the patients with sciatica. Hence, negative SLR test in elderly patients with sciatica should not deviate the clinicians from diagnosis of the LDH. On the other hand, positive test is more reliable than the negative test. The point is that usually in decision making to perform MRI of the spine, the result of SLR is determining criterion.<sup>[16]</sup> We also recommend in older patients with a history of sciatica imaging should be considered despite a negative SLR test. The question that must be answered by future researches is the reason of negative SLR test in elderly sciatica patients.

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## AUTHOR'S CONTRIBUTION

All authors have contributed in designing and conducting the study. All authors have assisted in preparation of the first draft of the manuscript or revising it critically for important intellectual content. All authors have read and approved the content of the manuscript and confirmed the accuracy or integrity of any part of the work.

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