

ACCURACY OF STRAIGHT LEG RAISE TEST IN PATIENTS WITH LUMBAR DISC HERNIATION KEEPING MAGNETIC RESONANCE IMAGING AS A REFERENCE STANDARD

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ABSTRACT

Objective: To determine the accuracy of straight leg raise (SLR) test in patients with lumbar disc herniation keeping magnetic resonance imaging (MRI) as a reference.

Study Design: Validation study.

Place and Duration of Study: Radiology department of Combined Military Hospital (CMH), Quetta, over a period of 16 months from 1st Dec 2012 to 31st May 2013

Material and Methods: Total 225 cases with lower back pain were included through non probability-consecutive sampling. Informed consent was taken. The patients were assessed for positive or negative SLR test. Then all patients underwent MRI of lumbosacral spine. Data was collected through a specially structured proforma. Data was analyzed by SPSS version 10.

Results: SLR test was found to be positive in 114 (50.7%) cases while negative in 111 (49.3%) cases. Lumbar disc herniation on MRI was found to be positive in 122 (54.2%) cases while negative in 103 (45.8%) cases. Sensitivity, specificity, positive and negative predictive values of SLR test were found to be 82.8%, 87.4%, 88.6% and 81.1% respectively. Accuracy of SLR test was found to be 84.9%

Conclusion: We concluded that SLR test is accurate enough to diagnose disc herniation with reference to MRI. Now we can advise SLR test for assessment of disc herniation where MRI is not available or unaffordable for the patients.

Keywords: Disc Herniation, Low back pain, Magnetic Resonance Imaging, Straight leg raise test.

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INTRODUCTION

Low back pain a major causes of morbidity throughout the world, is commonly due to lumbar disc herniation^{1,2}. The annual incidence of discogenic sciatica is 5 in 1000 in United States and almost 300,000 spinal surgeries are performed annually. Nearly 1.5 million disc surgeries are performed worldwide every year³⁻⁵. Ninety eight percent of disc herniation occur at the L4-5 and L5-S1 levels. Out of these 70% of disc prolapses occur at L5-S1 level. Only 2% of herniation occur at higher lumbar levels, and these lesions are usually seen in the older age group³. Disc herniation may cause sciatica by compressing the nerve roots. Diagnostic procedures such as magnetic resonance imaging (MRI) help to establish disc herniation as the anatomical basis for sciatica⁶. MRI is

94.28% sensitive, 60% specific and shows an accuracy of 90% for lumbar disc herniation⁷. The signs which are strongly associated with MRI are paresis, a finger-floor distance of more than 25 cm, absence of knee or ankle tendon reflex, and a positive straight leg raise (SLR) test⁶. The SLR test has been used as the primary test to diagnosis lumbar disc herniation and found to have high correlation with findings on operation since its sensitivity is high in only disc herniation leading to root compression that may eventually need operation⁸. The SLR also called Lasègue's sign, Lasègue test or Lazarević's sign is positive if pain in the sciatic distribution is reproduced by passive flexion of the straight leg ie the patient is lying down on his or her back on an examination table or exam floor, the examiner lifts the patient's leg while the knee is straight⁹. The traditional SLR test performed in supine position is more sensitive than the seated SLR test in patients with clinical features of lumbar radiculopathy¹⁰. In recent

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Received: 22 April 2014; revised received: 26 Dec 2014; accepted: 1 Jan 2015

studies, the sensitivity of the SLR test is 0.52 and its specificity is 0.89. The SLR is found to be a slightly more specific test (0.89) than the Slump test (0.83). Owing to its higher specificity, the SLR test may especially help identify patients who have herniation with root compression requiring surgery⁸.

SLR is a simple and quick examination technique. If a relationship can be established between SLR and disc prolapse on MRI, it will boost physicians' confidence in clinical management and help improve patient selection for MRI.

MATERIAL AND METHODS

This validation study was conducted in Radiology department of Combined Military Hospital (CMH) Quetta over a period of 6 months from 1 Dec 2012 to 31 May 2013. A total of 225 cases with lower back pain were included in the study by non probability-consecutive sampling. Patients with spinal pathologies such as tuberculosis, osteoporosis, malignancy, stenosis, spondylolesthesis or past history of surgery or trauma were excluded from the study to control confounders and prevent bias.

Informed consent was taken from all participants and each patient was given a serial number and their hospital registration number, age, gender and date of examination was recorded. Each patient was assessed by a medical officer in Radiology department CMH Quetta for positive or negative SLR test. They were then asked to lie down flat on an examination couch and the effected leg was raised passively by the medical officer keeping it straight at knee joint until the patient experienced pain. If the angle between the straight leg and the surface of examination couch is between 30 and 70 degrees, the patient exhibits a positive SLR test and if the patient experiences no pain, a negative SLR test was endorsed.

Then MRI of lumbosacral spine of all patients with positive SLR test was done. MRI was performed with Quantum gradient 1.5 Tesla Magnetom Symphony MRI scanner, first taking sagittal and transverse T1 weighted

sequences followed by sagittal and transverse T2 weighted sequences. All the patients with protrusion of disc material for more than 3 mm beyond margins of adjacent vertebral end plates involving less than 50% of disc circumference were endorsed as having lumbar disc herniation. Data will be collected through a specially structured proforma and confidentiality of the patients' record was maintained.

Data was entered and analyzed through Statistical Package for Social Sciences (SPSS version 10). Descriptive statistics were used to describe the results. Mean and standard deviation (SD) were calculated for numerical variables like age. Frequency and percentages was calculated for categorical variables like gender, straight leg test and MRI findings. Diagnostic measures were calculated for SLR test using MRI as gold standard.

RESULTS

In this study, total 225 cases with lower back pain were included with mean (SD) age of 36.71 ± 10.26 years. Subjects included 142 (63%) male cases and 83 (37%) females with male to female ratio of 1.7:1. SLR test was found to be positive in 114 (50.7%) cases while negative in 111 (49.3%) cases. Lumbar disc herniation was

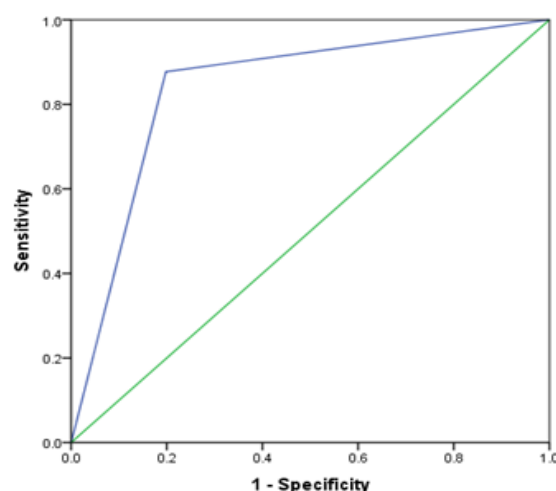


Figure-1: ROC curve of SLR test.

found to be positive in 122 (54.2%) cases while negative in 103 (45.8%) cases. There were 101 patients with positive SLR test who were found to have positive lumbar disc herniation on MRI as well (True Positive), whereas 90 patients

were negative for both SLR test and lumbar disc herniation on MRI (True Negative). Details are shown in table-1. SLR test was found to be 82.9% sensitive (true positive differentiation) and 87.4% specific (true negative differentiation). 88.6% of the tested positive on SLR test were actually positive (positive predictive value) and 81.1% of the tested negative were actually negative (negative predictive value). Detailed results are shown in table-2. Accuracy of SLR test was found to be 84.9%. Receiver operating characteristic (ROC) curve (fig) showed area under the curve (AUC) of 0.84 ($p < 0.0001$).

DISCUSSION

One of its most common causes of lower back pain is lumbar disc herniation which often compresses the nerve root resulting in pain that radiates down into the legs. MRI is the gold standard diagnostic procedure for lumbar disc herniation. However, MRI is not widely available in many developing countries, and where it is, the costs are highly prohibitive. The SLR test is a clinical diagnostic procedure used

Lumbar disc herniation is a disease that physical examination, symptoms, and findings on imaging technique do not always correlate with each other. SLR test has been used as the primary test to diagnosis lumbar disc herniation and found to have high correlation with findings on operation since its sensitivity is high in only disc herniations leading to root compression that may eventually need operation¹².

Patient selection for the less invasive, indirect techniques of lumbar discectomy and intradiscal therapies remains problematic. Both theoretically and clinically, inferior results with these techniques are noted when disc extrusion has occurred beyond the boundaries of the outer annulus and posterior longitudinal ligament¹³⁻¹⁵. Clinical symptoms and signs cited as suggestive of disc containment include increased pain with sitting but relief with recumbency and lack of pain during SLR raise of the uninvolved side (i.e., no crossover). While some surgeons use such clinical findings as indications for indirect discectomy

Table-1: Results of the SLR test vs MRI for Lumbar disc herniation.

SLR test	MRI test for lumbar disc herniation		Total
	Positive	Negative	
Positive	101(a)	13(b)	114
Negative	21(c)	90(d)	111
	122	103	n=225

a=True positives, b=False positive, c=False negative, d=True negative

Table-2 : Diagnostic analysis of SLR test.

Parameter	Value	95% Confidence interval
Sensitivity	82.9%	74.90 % to 89.01 %
Specificity	87.4%	79.38 % to 93.10 %
Positive predictive value	88.6%	81.29 % to 93.78 %
Negative predictive value	81.1%	72.54 % to 87.89 %

to detect lumbar disc herniation, but the literature is inconclusive regarding its accuracy¹¹.

An accurate and specific diagnosis prevents the recurrences of low back pain and chronic spinal pain. The physical examination is the most useful tool to diagnosis. The examiner must aim to determine the exact tissue that pain arises from to make the specific diagnosis.

techniques, most feel that MRI evidence of containment is crucial¹⁶.

We recruited total 225 cases with low back pain with mean age of 36.71±10.26 years. There were 142 (63%) male cases and 83 (37%) females. The male-to-female ratio was observed as 1.7:1. Males have a slightly higher incidence than females. Literature has also reported that almost 5% of males and 2.5% of females

experience sciatica or disc herniation in their life¹⁷.

Manipulative tests are used to help confirm the diagnosis of lower lumbar radiculopathy. The SLR test is among the tests commonly used¹⁸. In a recent literature review of the diagnostic accuracy of the SLR test, the test was shown to have a fairly high pooled sensitivity (91%) but low pooled specificity (26%) in detecting lumbar disc herniation. This high sensitivity rate suggests that, given a negative SLR, the diagnosis of acute lumbar radiculopathy may be ruled out with reasonable confidence¹⁹. In our study we found SLR test was found to be positive in 114 (50.7%) cases while SLR test was negative in 111 (49.3%) cases.

Our study calculated the accuracy of SLR test as 84.9%. One local study reported in earlier years that accuracy of SLR test was 74% in comparison to MRI²⁰. But results of one study indicated low accuracy of the SLR (52.8%) in diagnosis of lumbar disc herniation if compared with MRI results. The discriminative power of the SLR seemed to decrease as age increased; thus, positive and negative results may be less conclusive in older patients²¹.

CONCLUSION

According to this study, the accuracy of SLR test or agreement between SLR test and MRI was calculated as 84.9%. Thus it was concluded from the results of this study that SLR test is enough to diagnose disc herniation as MRI for the set-ups where MRI is not easily available. SLR test is a cost-effective method to diagnose disc herniation. So in future we can rely on this technique to diagnose disc herniation if MRI is unavailable or contra-indicated and plan management accordingly.

CONFLICT OF INTEREST

The authors of this study reported no conflict of interest.

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