



## Clinical History and Signs of Sciatica and their Relation to Localisation of Lumbar Disc Herniation

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### ABSTRACT

**INTRODUCTION:** We present a neurosurgical unit's experience with 6 adult patients who underwent surgical treatment for lumbar intervertebral disc herniation. The site of sciatic pain usually depends on the nerve root affected. Studies have shown that the clinical symptoms and the level of disc prolapse do not always correlate each other. The purpose of this study is to evaluate the reliability of clinical symptoms and signs in localizing the level of disc prolapse among patients having lumbar disc herniations. **MATERIALS AND METHODS:** Patients operated in our neurosurgery unit from 1st March 2017 to 30 April 2017 for sciatic pain was taken for the study. The clinical history and examination findings, radiological findings, and operative findings were noted. The pre-operative history and site of radicular pain and clinical examination findings were compared with the level and position of the disc prolapse during the surgery. **RESULTS:** Surgery was performed in all six patients with sciatic pain. The mean age of the patients with lumbar disc herniation was 41.1 years and 66.6 % were males. The levels of disc prolapse were L4-5 in 2 patients, L5-S1 in 2, and 1 each at the L1-2 and L3-4 levels. In four patients (83.3%) the site of radiation of the radicular pain had good correlation with the level of disc prolapse. Positive sign of extensor hallucis longus (EHL) weakness with pain projection or sensory disturbances was strong evidence of L5 root involvement. Sensory disturbances could not accurately localize the level of disc prolapsed. Achilles tendon reflex was a strong indicator of S1 root involvement due to L5-S1 disc prolapsed. **CONCLUSION:** Despite the routine use of MRI to evaluate the majority of cases with suspected lumbar degenerative disc disease, clinical evaluation remains of paramount importance in correlating clinical and radiological findings.

**Keywords:** Radicular pain, Level of disc prolapse, root compression, motor deficits, Achilles reflex

### INTRODUCTION

Lumbar disc herniation is the most common cause of sciatica. The site of sciatic pain usually depends on the nerve root affected. But studies had shown that the clinical symptoms and the level of disc prolapse do not always correlate each other. The purpose of this study is to evaluate the reliability of clinical symptoms and signs in localizing the level of disc prolapse among patients having lumbar disc herniations.

### MATERIALS AND METHODS

Patients operated in a neurosurgery unit from 1st March 2017 to 30 April 2017 for sciatic pain was taken for the study. The clinical history and examination findings, radiological findings, and operative findings were noted. The pre-operative history and site of radicular pain and clinical examination findings were compared with the level and position of the disc prolapse during the surgery. Analysis was done to find out if there is any correlation between the site of radicular pain and clinical examination with intra-operative findings.

We had six patients with sciatica and all underwent laminectomy and removal of the herniated disc. The surgery was done under general anesthesia and none of the patients had any new neurological deficits or complications after the surgery.

## RESULTS

Surgery was performed in all six patients with sciatic pain. The mean age of the patients with lumbar disc herniation was 41.1 years and 66.6% were males. None of the patients had any history of previous lumbar surgery. 2 patients had L4-5 disc prolapse and 2 patients had L5-S1 disc prolapse. The fifth patient had L1-2 disc prolapse and the sixth patient had L3-4 disc prolapse. The disc herniation was left sided in 4 cases (66.6%) and right side in 2 cases (33.3%). The projection of pain was localized to right lower limb in 3 cases (50 %) and left lower limb in 3 cases (50%). The segmental localization of pain was based on the dermatome charts of Foerster.(1) The radicular pain was usually located in the distribution of the 5th lumbar root in 66.6% cases, first sacral root in 16.6%, and second sacral root in 16.6%. L4-5 disc herniation was the cause of pain in 50 % of cases who had radicular pain in the fifth lumbar root distribution and remaining 50% of the cases had an L5-S1 disc herniation. The patient with L3-4 disc herniation had pain along the first sacral root distribution and another patient with L1-2 disc herniation had radicular pain distributed along the second sacral root. The straight leg raising test (SLR, Lasegue's sign) was positive in 33.3% cases and was negative in 66.6% cases. Neurological deficits involving the motor system (extensor hallucis weakness, extensor digitorum breviswasting, ankle dorsiflexion weakness) was found in 4 (83.3%) cases but the neurological deficits involving the sensory system was involved only in 3 (50%) of cases having disc herniations. Extensor hallucislongus (EHL) weakness was present in 4 (83.3%) - right side in one patient, left side in another, and bilateral in 2. In patients who had EHL weakness, 2 patients had disc herniation at the L4-5 level, 1 at the L5-S1 level, and another at L3-4 level. Extensor digitorum brevis weakness and wasting were found in 3 patients (50%), of which 2 had L4-5 disc herniation and a third had a disc herniation at L3-4 level with cauda equina syndrome. The level of disc prolapse and the distribution of the radicular pain along with neurological deficits are given in the Table 1.

**Table 1 showing Neurologic findings in patients with lumbar disc herniations excluding sensory deficit**

	Site and number of disc prolapse				
	L1-2	L3-4	L4-5	L5-S1	total
	1	1	2	2	6
<b>Signs</b>					
SLRT +			1	1	2
SLRT -	1	1	1	1	4
<b>Patellar reflex</b>					
present		1	2	2	5
absent	1				1
<b>Achilles reflex</b>					
present	1		1		2

	Site and number of disc prolapse				
	L1-2	L3-4	L4-5	L5-S1	total
unilaterally absent	0			2	2
bilaterally absent	0	1	1		2
<b>EHL weakness</b>					
unilateral			1	1	2
bilateral	0	1	1	0	2
<b>Bowel and Bladder involvement</b>	0	1	0	0	1

Sensory deficits were present in 50% cases. They were most common in the distribution of L5 nerve root and present in L4-5 and L1-2 disc prolapse. In these 3 patients, one had sensory disturbances along bilateral L5-S1 dermatome, another in bilateral S1-S5 dermatome and the third in right L2-L5 dermatome. The sensory deficits are shown in table 2.

**Table 2 showing sensory deficits in patients having lumbar disc prolapse**

Segment	Level of disc prolapse				Total
	L1-2	L3-4	L4-5	L5-S1	
L2	1				1
L3	1				1
L4	1				1
L5	1		1		2
S1			1		1
S2-5		1			1

Bowel and bladder disturbances were found in 2 patients (33.3%), in which one patient had L3-4 central disc prolapse with cauda equine syndrome and the second patient had L4-5 left paracentral disc prolapse.

The right patellar reflex was affected in one patient having L1-2 central and right paracentral disc prolapse. The ankle reflex was the most generally affected neurological sign (66.6%) and was absent in 4 patients (83.3) and was most common in L5-S1 disc herniation.

## DISCUSSION

Sciatica due to root compression is invariably caused by herniation of the intervertebral disc. The L4-5 intervertebral level is the most common site for disc herniations. The location of the disc herniation also plays an important role in the localization of the disc herniation. L4-5 lateral disc herniation can cause compression of the L5 nerve root destined to leave the canal at L5-S1neural

foramen level. The same disc herniation if presents as a far lateral disc prolapse will compress the L4 nerve root which leaves through the L4-5 intervertebral foramen. This disc can also compress the S1 nerve root, in the case of a paracentral disc prolapse. Central herniations can cause pain and neurological deficits in both lower limbs and more rarely bowel and bladder disturbances. Hence a thorough knowledge of intervertebral –nerve root relationship is very important to localize the nerve root syndromes accurately to appropriate sites of disc prolapse.

In a study done by Barbara M et al (2) it was found that anatomic position of disc prolapse has a significant effect on the post-operative outcomes after lumbar discectomies. In that study it was found that most of the disc herniations occurred at L4-5 level (58.7%) and those patients who had central and multiregional disc herniations had poor outcome than other types of disc prolapse in paracentral and lateral positions.

Lumbar canal stenosis due to disc herniation or ligamentum flavum hypertrophy can cause the syndrome of neurogenic pseudo claudication.(3) The stenosis may be due to congenital or acquired causes. In acquired aetiology, degenerative spondylolisthesis is a major cause. The patient may develop unilateral or bilateral buttock, thigh or leg pain. This pain is caused by cauda equina ischemia brought on by increased blood flow demand due to exercise and is relieved by rest, flexion at the waist and sitting. Lumbar canal stenosis may also cause unprovoked erections. (4)

In clinical practice anatomical localization of lesion plays an important component. In lesions at different levels of spinal root nerve compression can cause varying signs and symptoms. In L1 root compression sensory signs and symptoms usually occur in the inguinal region along with lower abdominal muscle paresis - in clinical practice, it is difficult to demonstrate the same.(5) Lumbar disc herniations at L1-2 can cause compression of the L2 nerve root and can cause signs and symptoms like weakness of the pectineus which causes thigh adduction and flexion, ilio-psoas which assists in thigh flexion and quadriceps which help in knee extension.(5) Pain usually occurs in the anterior thigh region in case of L2 nerve root compression or irritation. In lesions causing L3 nerve root compression the above signs and symptoms may be present and the pain will be more on the medial part of the thigh and knee. The patellar reflex (L2-L4) is depressed or absent in these cases.

L4 nerve root compression is usually caused by disc herniations at the L3-4 level or far lateral disc herniations at L4-5 level. The pain radiating to the anterolateral part of the thigh and the medial leg region is the characteristic features of L4 nerve root compression. The weakness of the quadriceps and sartorius (thigh flexion) and tibialis anterior (ankle dorsiflexion) may be caused by L4 nerve root compressions. (5)

L5 root involvement a cause pain along the lower back, lateral thigh and anterolateral calf region. Weakness occurs in gluteus medius, tensor fasciae latae (adduction of the thigh), semimembranosus and semitendinosus (knee flexion).

S1 root involvement causes radiating pain along the back, posterior thigh and heel region. S1 root involvement causes weakness in the gastrocnemius and flexor digitorum longus muscle and short flexor muscles of the toes. The absence of ankle jerk is the characteristic feature of S1 radiculopathy. (5)

S2-S5 root involvement usually causes sensory disturbances on the calf, posterior thigh, and perianal region. (5) Bowel and bladder control can be impaired. The external anal sphincter may fail to contract on external stimulus (absent anal wink). L5-S1 central disc prolapse is the most common cause of involvement of these roots.

#### **SITE OF RADIATING PAIN AND THE LEVEL OF DISC PROLAPSE**

In our series 4 patients had radicular pain along the L5 root distribution. Two of these had disc prolapse at the L4-5 level and remaining two patients had disc prolapse at L5-S1 level. In patients having L4-5 level disc prolapse, the possible explanation of L5 radicular pain was that there will be impingement of the traversing L5 nerve root by the prolapsed disc. In both patients, the disc prolapse was at a paracentral location which is the commonest area where the traversing root will be involved. In other two patients who had disc prolapsed at the L5-S1 level the radicular pain along the L5 root could not be explained, because in those patients the disc prolapse was at the paracentral and central location. If a far lateral disc prolapsed occurs at L5-S1 level, the disc material can cause compression of the L5 exiting nerve root. It may be possible that some of the L5 root fibres were anatomically running in the S1 root in these patients.

In the fourth patient who had disc prolapse at the L3-4 level, the radicular pain was along the S1 root distribution which may be due to impingement of the traversing S1 nerve root by the disc material.

In the sixth patient who had disc prolapse at the L1-2 level, the radicular pain was along the S2 dermatome as explained by the above mechanism. Thus in our series of 4 patients (83.3%), the type of radiation of the radicular pain had good correlation with the level of disc prolapse. In our series 2 cases who had disc prolapse at L3-4 and L1-2 level had pain projected to the first sacral nerve root thus decreasing the level of diagnostic reliability of pain projected to the S1 nerve root region.

#### **MOTOR DEFICIT AND THE LEVEL OF DISC PROLAPSE**

In our series, 4 patients had motor deficit such as weakness of the EHL, extensor digitorum brevis weakness, and wasting. In all these patients the weakness of the extensor hallucis longus was the predominant motor deficit.

Two among four patients who had weakness of the EHL had disc prolapsed at the L4-5 level and other two had disc prolapse at L5-S1 and L3-4 level respectively. The positive sign of EHL weakness with pain projection or sensory disturbances was strong evidence of L5 root involvement, even if signs of other nerve root involvement was present.

#### **SENSORY DISTURBANCE AND LEVEL OF DISC PROLAPSE**

The present results from our study showed that sensory disturbances had a variable distribution. The patient who had disc prolapse at L4-5 level had sensory disturbance in bilateral L5 dermatome. The second patient with L3-4 disc prolapse, had sensory disturbance in bilateral S1-S5 region. The third patient with disc prolapse at L1-L2 level had sensory disturbance at right L2 to L5 region. The findings show that sensory disturbances cannot accurately localize the level of disc prolapse. A disc prolapse can cause sensory disturbances below it due to compression of multiple roots by the disc.

#### **ACHILLES REFLEX AND LEVEL OF DISC HERNIATION**

Achilles reflex or the ankle jerk is of multiple root origin. In our study, the ankle jerk was absent in four patients (83.3%) and in these patients, 50% had disc herniation at L5-S1 level. The other two patients had disc prolapse at L3-4 and L4-5 level respectively. Thus in our study, the absence of Achilles tendon reflex was a strong indicator of S1 root involvement due to L5-S1 disc prolapse.

#### **CONCLUSION**

Segmentally localized pain projection is very important in the clinical level diagnosis of lumbar disc herniations. In cases with signs of single root involvement, additional factors like motor, sensory and reflex involvement increases the accuracy of clinical localization of the level of disc prolapse in lumbar disc herniation. The difference in the diagnostic reliability is due to two or multiple root compression caused by central or paracentral disc prolapse. Despite the routine use of MRI to evaluate the majority of cases with suspected lumbar degenerative disc disease, clinical evaluation remains of paramount importance in correlating clinical and radiological findings.

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