

Correlation between Clinical Features and Magnetic Resonance Imaging Findings in Lumbar Disc Prolapse

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ABSTRACT

Background: Magnetic resonance imaging is routinely done for diagnosis of lumbar disc prolapse. Many abnormalities of disc are observed even in asymptomatic patient. This study was conducted to correlate these abnormalities observed on Magnetic resonance imaging and clinical features of lumbar disc prolapse.

Methods: A This prospective analytical study includes 57 cases of lumbar disc prolapse presenting to Department of Orthopedics, Tribhuvan University Teaching Hospital from March 2011 to August 2012. All patients had Magnetic resonance imaging of lumbar spine and the findings regarding type, level and position of lumbar disc prolapse, any neural canal or foraminal compromise was recorded. These imaging findings were then correlated with clinical signs and symptoms. Chi-square test was used to find out p-value for correlation between clinical features and Magnetic resonance imaging findings using SPSS 17.0.

Results: This study included 57 patients, with mean age 36.8 years. Of them 41 (71.9%) patients had radicular leg pain along specific dermatome. Magnetic resonance imaging showed 104 lumbar disc prolapse level. Disc prolapse at L4-L5 and L5-S1 level constituted 85.5%. Magnetic resonance imaging findings of neural foramina compromise and nerve root compression were fairly correlated with clinical findings of radicular pain and neurological deficit.

Conclusions: Clinical features and Magnetic resonance imaging findings of lumbar disc prolapse had fair correlation, but all imaging abnormalities do not have a clinical significance.

Keywords: Correlation; lumbar disc prolapse; magnetic resonance imaging.

INTRODUCTION

Low back pain (LBP) is a common problem among adults.¹ Most of these symptoms are short-lived and 80% to 90% resolves within 6 weeks regardless of the type of treatment.^{2,3} Lumbar disc prolapse (LDP) is one of the commonest causes of low back pain in the working population.³ The Magnetic resonance imaging (MRI) is gold standard noninvasive investigation for viewing lumbar anatomy in great detail.³ LDP occurs at L4-L5 and L5-S1 region in 95% cases.⁴ MRI scans should be interpreted with caution as almost 30% of asymptomatic individuals without history of LBP had disc abnormalities.⁵ MRI has

85% accuracy in predicting the types of LDP.⁶ There is controversy regarding which MRI findings are clinically relevant, and have diagnostic as well as prognostic value. This study was conducted to determine correlation between clinical features and MRI findings in LDP.

METHODS

This prospective analytical study was conducted between March 2011 to August 2012 at Department of Orthopedics and Trauma Surgery, Spine unit, Tribhuvan University Teaching Hospital, Nepal. Ethical approval was taken as per the requirements of Institutional

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Review Board of Institute of medicine. All patient aged 20-50 yrs presenting with clinical features of LBP with lower limb radiculopathy not improving with 3 weeks of rest and analgesic were screened for inclusion in the study. The clinical criteria used for the diagnosis of LDP were: a) low backache with radiation to the lower limb, b) radicular pain along a specific dermatome, c) nerve root tension signs like Pelvic list, Straight Leg Raising Test (SLRT), Femoral stretch test, d) presence of neurological symptoms and signs.⁶ Three of four criteria had to be fulfilled for the diagnosis of LDP.⁶ Patients with two positive criteria, when other causes were ruled out and MRI showed disc prolapse, were also included in the study. 57 cases fulfilled the inclusion criteria. After getting an informed consent, details of patients regarding the duration of symptoms, dermatome level of pain distribution, neurological signs and symptoms were recorded in standard patient Performa.

These patients the underwent a complete MRI evaluation of lumbosacral spine in 0.3 tesla MR system (Aris Vento, Hitachi, Japan-Permanent Magnet). The MRI findings on standard sagittal and axial T1W and T2W sequences, 5mm slice, was reported by a radiologist regarding level, type and position of disc prolapse, any neural foramen or nerve root compression and findings related to chronicity (facet joint arthritis, ligamentum flavum hypertrophy, canal stenosis, spondylolisthesis) While correlating clinical and MRI levels of lesion, if multiple level disc prolapse were present, the nerve root compression visible in MRI was used as the MRI level. When only neural foramen compression was seen, the conventional wisdom that L1-L2 level produces L2 dermatomal level symptoms, and so on was used. However, if only one-level neural foramen compression or neural compression was visible in MRI, the same was taken as the MRI level. Chi-square test was used to find out p-value for correlation between clinical features and MRI findings using SPSS 17.0.

RESULTS

This study included 57 patients of low back pain with radiation to lower limb, of them 37 (64.9%) were males and 20 (35.1%) were females, with mean age of 36.82 years \pm 8.573. Out of these 57 patients 41 (71.9%) had radicular pain along a specific dermatome. There were 74 different dermatomal levels distribution of radicular pain (in 41 patients), of them 28 patients had more than one dermatome level distribution of pain 23(82.1%) patients had L5 and S1 level distribution of pain and 5(17.9%) patients had L4 L5 and S1 level distribution of pain). Straight leg raising test (SLRT) was positive in 50 patients (87.7%) and 42 patients (73.7%) had neurological

deficits, of them 25 patients (59.5%) had both motor and sensory deficit, 12 patients (28.6%) had only sensory deficit and 5 patients (11.9%) had only motor deficit. Out of 42 patients 12 (28.6%) had neurological deficit of L5 level and 9 patients (21.4%) had a neurological deficit of S1 level, while 12 patients (28.6%) had both L5 and S1 level and 9 patients (21.4%) had L4, L5 and S1 level neurological deficits.

Table 1. Correlation of type of LDP in MRI and neurological deficit.

Type of prolapse	Neurological deficit			p-value
	Present	Absent		
Bulge	Present	19	6	0.762
	Absent	23	9	
Protrusion	Present	39	14	0.951
	Absent	3	1	
Extrusion	Present	4	1	0.737
	Absent	38	14	

There were 104 disc prolapse levels (in 57 patients). Disc bulge, protrusion, extrusion was noticed in 31 levels (in 25 patients), 68 levels (in 53 patients) and 5 levels (in 5 patients) respectively (Table 1). LDP was most commonly seen at L4-L5 level (49.0%) and L5-S1 level (36.5%), the constituted 85.5% of total LDP. Regarding the position of disc prolapse 47 (65.3%) were centro-lateral, 25 (33.3%) were central and 1 (1.4%) was far-lateral (1 protrusion), of them 27 centro-lateral and 12 central disc prolapse caused neural foramen compromise.

There were 36 patients with neural foramen compromise due to 41 different disc prolapse levels of them 21 patients had neural foramen compromise at L4-L5 levels 10 patients had neural foramen compromise at L5-S1 levels and 5 patients had neural foramen compromise at L4-L5 and L5-S1 levels (Table 2).

Table 2. Correlation of neural foramen compromise in MRI and clinical findings.

Clinical observation	Neural foramen compromise		p-value
	Present	Absent	
Radicular pain	Present	31	0.002
	Absent	5	

Neurological deficit	Present	30	12	0.030
	Absent	6	9	

There were 37 patients with nerve root compression due to 42 different disc herniations level of them 19 patient had nerve root compression at L5 and 13 had nerve root compression at S1 level, 4 patient had nerve root compression at L5 and S1 levels and 1 patient had nerve root compression at L4 and L5 levels (Table 3).

Table 3. Correlation of nerve root compression in MRI and clinical findings.

Clinical Observation		Nerve root compression		p-value
		Present	Absent	
SLRT	Positive	35	15	0.031
	Negative	2	5	
Radicular pain	Present	30	11	0.030
	Absent	7	9	
Neurological deficit	Present	31	11	0.030
	Absent	6	9	

There were total 61 MRI levels of the 57 patients- 1 as L2 level, 38 as L5 level and 22 as S1 level. There were 4 patients with two levels in MRI i.e. L5 and S1 (Table 4).

Table 4. Correlation between MRI level L5 with clinical level L5 and MRI level S1 with Clinical Level S1.

Clinical level L5		MRI Level L5		p-value
		Present	Absent	
Clinical level L5	Positive	26	7	0.023
	Absent	12	12	
Clinical Level S1		MRI Level S1		p-value
		Present	Absent	
Clinical Level S1	Present	16	14	0.016
	Absent	6	21	

DISCUSSION

Lumbar disc herniation is one of the common causes of sciatica and low back pain.³ Mechanical compression and inflammation of the nerve root by herniated disc is responsible for radicular pain. MRI is done routinely for patients with suspected lumbar disc prolapse, but one is not sure which of the MRI findings are clinically relevant,

and have diagnostic as well as prognostic value.⁶ There are very few studies conducted to determine correlation between patients clinical features including pain distribution neurological signs, and symptoms in lumbar disc prolapse and abnormalities visible in MRI.

In this study 41 (71.9%) cases had radicular pain in 74 different dermatomal distribution. Of them 35 levels were L5, 34 levels were S1 and 5 levels were L4. Thus L5 and S1 were the most common dermatome levels distribution of pain, which correlates well with the MRI findings of 85.5% disc prolapse occurring in L5 and S1 level. Similar findings were reported by other authors.⁶⁻⁸

In this study out of 104 levels of disc prolapse 85.5% occurred at L4-L5 and L5-S1 level. Kamal et al⁷ found 82.5% and Akbar et al¹⁰ found 86% disc prolapse at L4-L5 and L5-S1. This is because L4-L5 level is the transition point for coupled axis of rotation and bending, it experiences higher stress than other lumbar level.

In this study; out of 25 patients with disc bulge 19 had neurological deficit (p value 0.762), out of 53 patients with protrusion 39 had neurological deficit (p-value = 0.951) and out of 5 patients with extrusion 4 had neurological deficit (p-value 0.737). Thus clinical findings of neurological deficit had no statistically significant correlation with MRI findings regarding types of disc prolapse. This is similar to the study done by Janardhana et al⁶ who concluded that type of disc herniation (bulge, protrusion, or extrusion) correlates poorly with clinical signs and symptoms.

In this study neural foramen compromise in MRI and clinical findings of radicular pain and neurological deficit were fairly correlated (p value 0.002 and 0.003 respectively). Similarly the MRI findings of nerve root compression had fair correlation with radicular pain and neurological deficit (p value 0.036 and 0.019 respectively). In similar study done by Janardhana et al⁶ there was significant association between evidence of neural foramen compromise seen in MRI and clinical symptoms (Odds ratio 6.03, p<0.001) as well as between evidence of root compression seen in MRI and clinical symptoms (p<0.001). Siddique et al¹¹ found that presence of ipsilateral severe nerve compression in MRI and distal extremity pain had strong correlation (p-value of 0.001).

SLRT was positive in 87.7% (50) of patients among them 35 had nerve root compression in MRI which was statistically significant (p value=0.031). Which is similar to study done by other authors.⁷⁻⁹ Thus a positive SLRT is indicative of nerve root compression.

In this study MRI level L5 and S1 correlates fairly with Clinical level L5 and S1 (p value= 0.023 and 0.016 respectively) .In a similar study by Janardhana et al ⁶,they found strong correlation between clinical level and MRI level; the kappa value for the statistical significance between them was 0.8. Rehman et al ⁸ also had similar findings in case of L4-L5 and L5-S1 level disc herniation,with sensitivity of all clinical features (p value of 0.000 and 0.000 respectively).

CONCLUSIONS

The presence disc protrusions with gross neural foramen compromise or nerve root compression were fairly correlated with clinical signs and symptoms, but the type of disc prolapse had no correlation with clinical signs and symptoms.

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