

To Study the Association Between Clinical Features and MRI Findings in Patients of Lumbar Disc Prolapse: A Prospective Study

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Abstract

Background: Lumbar disc prolapse (LDP) is a leading cause of low back pain and disability worldwide. Magnetic Resonance Imaging (MRI) is considered the gold standard for evaluating disc pathology; however, the correlation between MRI findings and clinical presentation remains inconsistent. This study aimed to evaluate the association between clinical features and MRI findings in patients with lumbar disc prolapse.

Methods: A prospective cross-sectional study was conducted on 60 patients presenting with clinical features suggestive of lumbar disc prolapse at a tertiary care center. Clinical evaluation included assessment of pain severity using the Visual Analogue Scale (VAS), presence of radiculopathy, neurological deficits, and Straight Leg Raising (SLR) test. MRI findings were analyzed for type and level of disc herniation, neural canal compromise, and disc degeneration graded according to the Pfirrmann classification. Statistical analysis was performed using the Chi-square test.

Results: The majority of patients were aged 51–60 years, with a slight male predominance (55%). Disc bulge was the most common type of herniation (56.67%), followed by protrusion (33.33%) and extrusion (10%). The most frequently affected levels were L5–S1 (80%) and L4–L5 (70%). Radiculopathy was present in 90% of patients, and SLR test was positive in 80%. A significant association was found between disc degeneration and sensory ($p = 0.001$) and motor deficits ($p = 0.013$), while no association was observed with pain severity.

Conclusion: MRI findings correlate better with neurological deficits than with pain severity; hence, clinical evaluation remains essential for accurate diagnosis and management of lumbar disc prolapse.

Keywords: Lumbar disc prolapse, Clinical features, MRI findings, Low back pain, Radiculopathy

Introduction

Low back pain is one of the most prevalent musculoskeletal disorders worldwide and represents a major cause of disability and healthcare burden. It is estimated that nearly 60–80% of adults experience at least one episode of low back pain during their lifetime. Among the various causes, lumbar disc prolapse is one of the most common structural pathologies, particularly in individuals engaged in physically demanding activities.

Lumbar disc prolapse occurs due to degeneration of the intervertebral disc, leading to displacement of nucleus pulposus material through the annulus fibrosus. This can result in

compression or irritation of adjacent nerve roots, producing symptoms such as low back pain, radiculopathy, sensory disturbances, and motor weakness.

Magnetic Resonance Imaging (MRI) has revolutionized the diagnosis of lumbar disc disease. It provides excellent visualization of intervertebral discs, neural structures, and surrounding soft tissues without radiation exposure. MRI can accurately detect disc degeneration, herniation, nerve root compression, and spinal canal compromise. Because of these advantages, MRI is considered the gold standard imaging modality for lumbar disc pathology.

However, despite its high sensitivity, MRI findings do not always correlate with clinical symptoms. Several studies have demonstrated that asymptomatic individuals may exhibit significant disc abnormalities on MRI, while some patients with severe symptoms may show minimal radiological changes. This discrepancy highlights the complexity of low back pain, which is influenced not only by structural factors but also by

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inflammatory, neurological, and psychosocial components. Pain in lumbar disc prolapse is multifactorial. Mechanical compression of nerve roots is only one aspect; inflammatory mediators released from degenerated discs can also contribute to pain. Additionally, muscle spasm, facet joint pathology, and central sensitization may influence symptom severity. Therefore, relying solely on MRI findings for clinical decision-making may lead to overdiagnosis or inappropriate management.

Given these considerations, it is essential to evaluate the relationship between clinical presentation and MRI findings in patients with lumbar disc prolapse. Understanding this association can help clinicians differentiate clinically significant abnormalities from incidental findings and guide appropriate treatment strategies.

The present study was undertaken to assess the association between clinical features—including pain severity, neurological deficits, and radiculopathy—and MRI findings in patients with lumbar disc prolapse, with the aim of improving diagnostic accuracy and patient management.

Materials And Methods

This prospective cross-sectional study was conducted in the Department of Orthopaedics at SGRDIMSAR, Amritsar, over a period from July 2024 to December 2025. A total of 60 patients presenting with symptoms suggestive of lumbar disc prolapse were included in the study.

Inclusion Criteria

Patients were included based on the presence of clinical features indicative of lumbar disc prolapse, including:

- Radicular pain radiating along a dermatomal distribution
- Positive Straight Leg Raising (SLR) test
- Presence of neurological deficits such as sensory impairment, motor weakness, or reflex changes

Exclusion Criteria

Patients with the following conditions were excluded:

- Spinal infections
- Neoplastic lesions of the spine
- Metastatic disease
- Previous spinal surgery
- Contraindications to MRI

Clinical Evaluation

A detailed history was obtained from all patients, including duration of symptoms, previous episodes, and occupational history. Pain severity was assessed using the Visual Analogue Scale (VAS). A thorough clinical examination was performed, including:

- Assessment of radiculopathy

- Straight Leg Raising test
- Evaluation of sensory deficits
- Motor power assessment
- Deep tendon reflexes

Radiological Evaluation

All patients underwent MRI of the lumbar spine using a 1.5 Tesla scanner. The MRI protocol included T1-weighted and T2-weighted images in axial and sagittal planes.

The following parameters were evaluated:

- Type of disc herniation (bulge, protrusion, extrusion)
- Level of disc involvement
- Neural canal compromise
- Disc degeneration graded according to Pfirrmann classification



Figure 1: Sagittal MRI of lumbosacral spine showing degenerative disc disease with posterior disc protrusion at L4–L5/L5–S1 causing thecal sac compression suggestive of lumbar disc prolapse.

Disc Degeneration	Sensory Deficit Present	Absent	Total	χ^2	df	p-value
Grade 1	7	12	19			
Grade 2	7	18	25			
Grade 3	14	2	16			
Total	28	32	60	14.95	2	0.001 (HS)

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 23.0. Categorical variables were expressed as frequencies and percentages. The Chi-square test was used to assess associations between variables. A p-value < 0.05 was considered statistically significant.

Results

A total of 60 patients were included in the study. The majority of patients (30%) belonged to the 51–60 years age group, indicating that lumbar disc prolapse is more common in middle-aged individuals. There was a slight male predominance, with males accounting for 55% of cases.

Occupational distribution revealed that farmers (40%) and housewives (31.67%) constituted the majority of patients, suggesting a strong association between physical activity and lumbar disc pathology.

Most patients (53.33%) had symptoms for a duration of 7–12 months, while 70% reported previous episodes of pain, indicating a recurrent nature of the disease.

Clinical Findings

Radiculopathy was present in 90% of patients, making it the most common clinical feature. The Straight Leg Raising test was positive in 80% of cases, indicating nerve root irritation.

Sensory deficits were observed in 46.67% of patients, while motor deficits were present in an equal proportion (46.67%). Deep tendon reflex abnormalities were less frequent, with ankle reflex involvement being more common than knee reflex changes.

MRI Findings

Disc bulge was the most common type of herniation (56.67%), followed by protrusion (33.33%) and extrusion (10%). The most commonly affected levels were L5–S1 (80%) and L4–L5 (70%), reflecting the increased mechanical stress at these levels. Disc degeneration was most commonly Grade 2 (41.67%), followed by Grade 1 (31.67%) and Grade 3 (26.67%). Neural canal compromise was predominantly Grade 2 (43.33%).

Association Between Clinical and MRI Findings

A statistically significant association was found between disc degeneration and sensory deficit ($p = 0.001$), indicating that

higher grades of degeneration are associated with increased likelihood of sensory involvement. (Table 1)

Description:

Significant association present. Higher grades show increased sensory deficit.

Similarly, a significant association was observed between disc degeneration and motor deficit ($p = 0.013$), suggesting that advanced degenerative changes are more likely to produce motor weakness. (Table 2)

Description:

Significant association observed. Motor deficit varies with degeneration grade.

However, no significant association was found between disc degeneration and pain severity (VAS score) ($p = 0.609$), indicating that MRI findings do not reliably predict the intensity of pain. (Table 3)

Description:

No significant association between disc degeneration and pain severity. Most patients had moderate pain (VAS 6–7).

Discussion

Lumbar disc prolapse is a common cause of low back pain and radiculopathy, particularly in the working population. The present study aimed to evaluate the association between clinical features and MRI findings, highlighting the strengths and limitations of imaging in clinical practice.

The age distribution observed in this study, with a peak in the fifth and sixth decades, is consistent with the degenerative nature of disc disease. Intervertebral disc degeneration begins early in adulthood and progresses with age due to dehydration and structural weakening of the disc.

The slight male predominance observed in this study is likely related to increased exposure to physical labor and occupational stress. The high proportion of farmers and housewives further supports the role of repetitive mechanical strain in the development of lumbar disc pathology.

Radiculopathy was the most common clinical feature, present in 90% of patients. This high prevalence reflects the tertiary care setting, where patients often present with advanced or persistent symptoms. The high rate of positive SLR test (80%)

Disc Degeneration	Motor Deficit Present	Absent	Total	χ^2	df	p-value
Grade 1	13	6	19			
Grade 2	12	13	25			
Grade 3	3	13	16			
Total	28	32	60	8.72	2	0.013 (S)

Table 3 : Association Between Disc Degeneration and Pain Severity (VAS)

Disc Degeneration	VAS 4–5	VAS 6–7	VAS 8–9	Total	χ^2	df	p-value
Grade 1	5	10	4	19			
Grade 2	6	15	4	25			
Grade 3	3	7	6	16			
Total	14	32	14	60	2.7	4	0.609 (NS)

further emphasizes the importance of clinical examination in diagnosing nerve root involvement.

One of the key findings of this study is the lack of significant association between MRI findings and pain severity. This observation supports previous studies that have demonstrated poor correlation between structural abnormalities and subjective pain. Pain perception is influenced by multiple factors, including inflammation, nerve sensitization, and psychological components.

In contrast, a strong association was found between MRI findings and neurological deficits, particularly sensory and motor deficits. This suggests that MRI is more reliable in detecting clinically significant nerve compression than in assessing pain severity.

The predominance of L4–L5 and L5–S1 involvement observed in this study is consistent with established biomechanical principles. These segments bear the maximum load and are more susceptible to degenerative changes and herniation.

The finding that disc bulge is the most common type of herniation indicates that many patients present in the early or moderate stages of disease. More severe forms, such as extrusion, were less common but more likely to be associated

with neurological deficits.

Overall, the findings of this study highlight the importance of correlating MRI findings with clinical features. While MRI is an invaluable diagnostic tool, it should not be used in isolation. Clinical examination remains essential for accurate diagnosis and appropriate management.

Conclusion

Magnetic Resonance Imaging (MRI) is a highly sensitive modality for detecting lumbar disc pathology; however, its findings do not always correlate with the severity of pain. Clinical symptoms, particularly pain intensity, may be influenced by multiple factors and do not reliably reflect the extent of radiological abnormalities.

In contrast, neurological deficits, especially sensory and motor involvement, demonstrate a stronger and more consistent association with MRI findings. Among radiological features, neural foraminal compromise plays a crucial role in determining clinical manifestations, as it directly affects exiting nerve roots.

Furthermore, the morphological type of disc herniation—whether bulge, protrusion, or extrusion—shows poor correlation with clinical signs and symptoms. Patients with multilevel disc involvement accompanied by neural foraminal compromise are more likely to present with objective neurological deficits.

Therefore, a combined clinical and radiological approach is essential for accurate diagnosis, appropriate correlation, and effective management of lumbar disc prolapse.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the Journal. The patient understands that his name and initials will not be published, and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

Conflict of Interest: NIL; **Source of Support:** NIL

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