



ORIGINAL ARTICLE

Clinical correlation of Magnetic Resonance Imaging (MRI) with symptom complex in prolapsed intervertebral disc disease in the patients of Tertiary Care Hospital, Kharian.

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ABSTRACT... Objective: To assess the clinical correlation of MRI with the symptoms of prolapsed intervertebral disc disease in the patients of Tertiary Care Hospital, Kharian. **Study Design:** Cross Sectional study. **Setting:** Tertiary Care Hospital, Kharian. **Period:** February 2022 to August 2022. **Methods:** The patients with age range 18 to 50 years, visiting hospital with complaint of low back pain and radicular pain were included in this study. Physical and neurological examination was conducted followed by MRI. The symptoms were correlated with MRI findings through correlation analysis with $p < 0.05$ as significant. **Results:** The mean age was 38.09 ± 8.4 years with majority (54.6%) of patients in age range 41 to 50 years. The male patients (69.3%) and hard labor workers (59.3%) were more effected. Protrusion was the most prevalent type (60%). SLR was significantly associated with disc bulge and protrusion ($p < 0.001$). The loss of power (56.6%) had significant correlation with disc protrusion ($p < 0.001$). Majority (55.3%) of the cases comprised of nerve root compression with more (47.3%) and significant prevalence in protrusion ($p < 0.001$). The multiple nerve root involvement had significant association with disc extrusion ($p < 0.001$). **Conclusion:** MRI is a good means of indicating disease level in prolapsed intervertebral disc disease. However, some of the clinical symptoms show high association with the radiological findings, whereas, some are not good indicators.

Key words: Intervertebral Disc Disease, Magnetic Resonance Imaging, Prolapsed Intervertebral Disc Disease.

INTRODUCTION

Low back pain (LBP) is one of the most common symptoms dealt by medical professionals. According to an estimate at least 80% of the population witness it during their life.¹ There are several causes of low back ache including trauma, spinal cord stenosis, age related degeneration of spine, lumbosacral disc prolapse, infection, tumor and arthritic issues. One of the major reasons of low back pain is lumbar disc herniation.² The presentation of lumbar disc herniation may vary from being asymptomatic to involving spinal nerve root.³

The diagnosis of disc herniation has remained challenging for the practitioners as the identification of exact structures causing pain

and disability in patient is perplexing. Magnetic Resonance Imaging (MRI) has remained the modality of choice for diagnosis of disc herniation.⁴ However, in order to investigate lumbosacral disc disease, the relevant symptoms need to be associated. The literature indicates a provocative link of MRI imaging findings with clinical history and final outcomes of the patient. Consequently, MRI is used to investigate the changes in tissue characteristics of lumbosacral disc, which requires detailed examination in clinical terms.⁵

Only a moderate relationship has been indicated between MRI and clinical symptoms of disc herniation, by the previous research works.⁶ Research indicates that disc herniation remains prognostic among young adolescents and major

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complaints and progress in witnessed among the adults.⁷ This results in absenteeism from school and work, disability, chances of medical intervention. Thus, there are high costs of intervertebral disc disease. Therefore, there is a dire need to assess relationship between clinical characteristics of disc prolapse and MRI in order to know the applicability of MRI in this regard.⁸ The present study affirms to evaluate correlation between clinical features of disc prolapse and MRI.

METHODS

The present cross sectional research work was performed at Tertiary Care Hospital, Kharian after approval from ethics committee (Ref 15: 15-9-22). For this purpose, the patients with any gender and age range 18 to 50 years, visiting to have MRI with complaint of low back pain and radicular pain were included in this study. The study was conducted from February 2022 to August 2022. The patients with previous history of tumor, infection, spinal trauma, lumbar canal stenosis, cauda equine syndrome, spondylolisthesis, metabolic spinal disease, myelopathy, spinal surgeries and radiological multiple level of disc involvement were excluded from the study. The patients with pacemakers and metal prosthesis were also not considered for the present study. In total, 150 patients were included. The patients were explained about the purpose of the study and the informed consents were collected from the willing ones. The participants were made assured about the privacy and confidentiality of their personal information.

The patients underwent physical assessment to rule out hip joint issues and abdominal wall hernia. The participants were also assessed neurologically and all the related symptoms were recorded. MRI was performed by 1.5 tesla machine. The types of disc herniation, modic changes, nerve root compression and disc morphologies were noted. The MRI examinations were also recorded. The symptoms were correlated with MRI findings through correlation analysis by considering p value of 0.05 as significant.

RESULTS

The majority (n = 82; 54.6%) of the cases were present in age range 41 to 50 years. The mean age was found to be 38.09 ± 8.4 years. On the other hand, male population (n = 104; 69.3%) was found to be more affected as compared to female individuals. It was observed that individuals affiliated with hard labor work (n = 89; 59.3%) were more effected as compared to the ones with sedentary life style.

The Table-I shows types of herniation found for the patients of present study. The most prevalent type noted was protrusion (n = 90; 60%). This was followed by disc bulge (n = 40; 26.6%) and disc extrusion (n = 20; 13.3%). In 15 (37.5%) cases of disc bulge, root involvement was noted. SLR was positive for 31 (77.5%) patients of disc bulge with highly significant association ($p < 0.001$).

In cases of protrusion, high significant association ($p < 0.001$) was found with SLR positivity (n = 54; 60%). The loss of power (n = 51; 56.6%) also had significant correlation with disc protrusion ($p < 0.001$).

Types of Disc Herniation	Frequency n (Percentage %)
Disc herniation	
Bulge	40 (26.6%)
Protrusion	90 (60%)
Extrusion	20 (13.3%)
Bulge and symptoms	
Root involvement	15 (37.5%)
Straight leg raise test (SLR)	31 (77.5%)
Protrusion and symptoms	
Straight leg raise test (SLR)	54 (60%)
Power - LL	51 (56.6%)
Deep tendon reflexes (DTR)	34 (37.7%)
Sensory level	90 (100%)

Table-I. Types of disc herniation

The Table-II shows occurrence of nerve root compression with respect to the type of disc herniation. Majority (n = 83; 55.3%) of the cases comprised of nerve root compression. It was more commonly present in association with disc protrusion (71; 47.3%). This association was found to be significantly associated ($p < 0.001$). Most common involvement was found for S1 root and L5 root. Few cases (n = 24; 16%) showed

poly radicular involvement.

The Table-III shows association of protrusion with clinical symptoms of lumbar disc disease. The protrusion and clinical symptoms of lumbar disc disease were highly linked.

The Table-IV shows association of disc extrusion and multiple nerve root involvement. The multiple nerve root involvement showed significant association with disc extrusion ($p < 0.001$).

DISCUSSION

Low back pain is the fifth most common cause for visit to the doctor. It may affect 7.6% to 37% of patients. Long lasting pain and difficulty in movement is eminent in 10% of the patients.⁹ In present research work, mean age was 38.09 ± 8.4 years with majority ($n = 82$; 54.6%) of the cases present in age range 41 to 50 years. On the basis of gender, male population ($n = 104$; 69.3%) was found to be more affected as compared to female individuals. It was also observed that individuals affiliated with hard labor work ($n = 89$; 59.3%) were more effected as compared to the ones with sedentary life style. Literature indicates that initial stage of the intervertebral disease may start in adolescence with 20% of youth showing mild signs. However, the incidence and symptoms may increase with aging. At the age of 50, about 10% of the male population gets effected, whereas, 50% of the population gets affected till the age of 70 years.¹⁰

Lumbar intervertebral disc herniation mainly involves the breach of annulus fibrosus with the movement of nucleus pulposus towards back of the breached annulus. This can occur due to numerous reasons including lumbar degeneration and prolonged stress. The spinal nerve root and cauda equine stimulates the lower back pain.¹¹ This is followed by radiating pain and impassiveness in lower limbs. Sometimes the symptoms include fecal dysfunction and reduced muscle strength of lower limb. Owing to prolonged duration, prevalent recurrence and associated complications, the disease highly impacts the quality of life of patients.¹²

The literature supports use of MRI in diagnosis of prolapsed intervertebral disc disease. Several studies have explored MRI and its advantages.¹³ The major benefit of MRI is that images can be acquired by horizontal, sagittal, three-dimensional scanning and various sequences without the need of repositioning of the patient. This is beneficial as the quality of the image remains the same. It enables direct and close view of spinal cord, vertebral body, subarachnoid space and intervertebral discs. Moreover, the differentiation between various anatomical structures with in vertebral column including bone marrow, nerve roots, supporting ligamentous structures, spinal cord parenchyma, synovial joints, epidural fat and cerebrospinal fluid.¹⁴

Root Compression	Disc Bulge	Disc Protrusion	Disc Extrusion	Total
Present	0	71 (47.3%)	10 (6.6%)	83 (55.3%)
Absent	40 (26.6%)	19 (12.6%)	10 (6.6%)	67 (44.6%)
Total	40 (26.6%)	90 (60%)	20 (13.3%)	150 (100%)

Table-II. Occurrence of nerve root compression with respect to types of disc herniation

Disc Herniation-Protrusion	L3	L4	L5	S1	L3L4L5	L4L5	L5S1
Present	0	3 (3.3%)	52 (34.6%)	52 (34.6%)	4 (4.4%)	4 (4.4%)	10 (11.1%)
Absent	2 (2.2%)	0	6 (6.6%)	8 (8.8%)	0	2 (2.2%)	2 (2.2%)

Table-III. Relation of protrusion with clinical symptoms of disc herniation

Extrusion	Single Root	Multiple Root	Total
Present	6 (4%)	14 (9.3%)	20 (13.3%)
Absent	121 (80.6%)	9 (6%)	130 (86.6%)
Total	127 (84.6%)	23 (15.3%)	150

Table-IV. Relation of disc extrusion and multiple nerve root involvement

Previous research works explain that MRI helps in defining intervertebral disc disease in terms of signal level.¹⁵ It is considered as a gold standard for diagnosis of intervertebral disc disease in humans as well as veterinary patients. The position, shape, size and direction of nerve roots and nucleus pulposus helps in understanding intervertebral disc herniation. The other modalities such as myelography are found to be less sensitive than MRI in diagnosis of lumbar disc disease. It is also considered better than computed tomography (CT) owing to more imaging parameters, more flexibility, extensivity, multiple tissue variable functions, absence of radiation, better diagnostic accuracy and safety in terms of use.¹⁶ However, the disadvantage of longer examination as compared to CT has been affiliated with MRI due to more planes used during examination. In addition to this, CT is sometimes used with myelography for better diagnosis of intervertebral disc disease but MRI does not have this requirement due to the quality of changing tissue contrast through application of various acquisition sequences. This helps in reducing the risks related to myelography. An important finding in previous research works is that disc herniation can remain undetected on CT or myelography but probability of false negative on MRI is negligible.⁴

The present study was oriented towards relating the clinical findings of intervertebral disease with the radiological outcomes. Literature indicates that motor weakness is highly linked with the radiological findings of MRI, whereas, sensory deficiency may not be associated at radiological level.¹⁷ The same was found in present study, as loss of power was found to have highly significant correlation with disc protrusion ($p < 0.001$). A similar relation is indicated for loss of deep tendon reflex, which is not able to predict radiological outcomes but still has better association as compared to loss of sensation. This is owing to the fact that loss of sensation occurs for all the selected cases ($n=90$; 100%).

Previous research works indicate that SLR is not a good indicator of diagnosis of disc involvement in the disease¹⁸, although it is found to be positive

for majority of the cases (77.5% in bulge and 60% in protrusion). Despite this fact, some of the research works document SLR as a highly sensitive and specific test for localization of lumbar disc disease.⁷ However, it is observed that femoral stretch test is more highly correlated with the disc involvement.

When considering clinical findings, the factor of nerve root involvement is found to be correlated with the MRI findings of disc involvement as documented by previous research works.⁹ The same was true for present research work. The nerve root involvement is a better characteristic to be explored on MRI as compared to nerve root compression as the latter is mostly not visible. However, the presence of nerve root compression is believed to be associated with low back pain, sciatica and radiculopathy among patients of disc herniation. SLR was a common finding as compared to nerve root involvement.³

The highest prevalence of nerve root involvement was found to occur in patients of disc protrusion ($n = 71$; 47.3%). This relation was also statistically significant ($p < 0.001$). Although SLR, loss of power and DTR are all associated with disc protrusion but previous research works indicate that loss of motor power has highest predicting potential regarding the level of disc disease.⁵

The present research work related disc extrusion with radiculopathy. The previous research work has indicated that disc extrusion can have more clinical symptoms and higher disability.¹¹ Moreover, it is also notable that extrusion is more symptomatic as compared to disc bulge and disc protrusion. The factor of pain is highly prominent in disc extrusion cases. However, the clinical features may not be able to predict the level of disc involvement in disc extrusion cases. This can be attributed to the fact that multiple nerve root involvement is related with disc extrusion.¹⁵ In 70% of extrusion cases, multiple nerve root involvement was indicated. This association was found to be statistically significant ($p < 0.001$). The previous researches emphasize that extrusion patients should be prioritized as such patients are not only asymptomatic and suffering from

multiple nerve root involvement but they have high probability of facing failure for conservative treatment.¹⁷

CONCLUSION

It can be concluded that root nerve involvement is highly indicative of disc disease level. Among various factors, loss of motor power is the most eminent in indicating disc disease level. Radiculopathy is not mostly associated with disc bulge cases, but in case of its presence, the surgical decision may get influenced. Multiple root involvement is the indicative feature of disc extrusion.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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

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