Available online freely at www.isisn.org

Bioscience Research

Print ISSN: 1811-9506 Online ISSN: 2218-3973

Journal by Innovative Scientific Information & Services Network

RESEARCH ARTICLE BIOSCIENCE RESEARCH, 2025 22(4): 205-209. **OPEN ACCESS**

Low Back Pain Patients: a Correlation between MRI findings in current and future Disc Herniation Grade 1 and 3

Qurain Turki Alshammari[1*], Mona Ahmed Alshardi[2] , Amal Hathal Alshammari[3], Abdullah Helaeil Alenezi[4], Rahaf Awad Alshammari[5], Fatimah Hussein Alshardy[2], Ala' Mansour Qazaq[6], Meshari Turki Alshammari [1]

[1]Diagnostic Radiology Department, College of Applied Medical Sciences, University of Hail, Saudi Arabia
[2]Diagnostic Radiology Department, South Qunfudah General Hospital, Makkah, Saudi Arabia
[3] Diagnostic Radiology Department, King Abdullah Specialized Hospital, Qassim, Saudi Arabia
[4] Diagnostic Radiology Department, Security medical services Hospital, Riyadh, Saudi Arabia
[5] Diagnostic Radiology Department, College of Dentistry, University of hail, Saudi Arabia
[6] Department of Radiology and nuclear Medicines, Jordan University Hospital, Amman, Jordan
DOI: https://doi.org/10.65970/br.2026.134

***Correspondence:** g.algrain@uoh.edu.sa **Received: September 05, 2025, Revised: Oct., 14, 2025, Accepted: Oct. 16, 2026 e-Published: Oct., 20, 2025**

Magnetic resonance imaging (MRI) is a procedure used to assess the effects of a herniated disc. There is a hypothesis that there might be a correlation between MRI findings at baseline and follow-up to determine whether there is an ability to predict future progress in LBP among LBP patients with mild and sever disc prolapse (grade 1 and 3-disc herniation) with the help of MRI findings. This study consisted of a total of 50 patients, all of whom gave their informed consent to participate in the study. Using the Visual Analogue Scale (VAS), patients were asked to rate how intensely the back pain. For all patients, the spine was assessed by MRI scan. Within 1.5 years of baseline MRI scan, 50 volunteers were repeat MRI scan for LBP patients.In this study, we found that age, VAS, and disc herniation were weakly correlated. In addition, Our longitudinal study found that most of the MRI findings did not seem to be linked to future LBP - severity, whether the participant experienced LBP in the past or not (r= 0.07, p=0.8).it was discovered that MRI scans in both ongoing and forthcoming studies do not exhibit a statistically noteworthy association with the magnitude and position of lumbar disc herniation, pain.

Keywords: Low back pain, Disability, Disc Prolapse, MRI, MSU

INTRODUCTION

Chronic low back pain (LBP) affects nearly 80% of people at some point in their lives, altering the structure of the intervertebral discs and remaining a leading cause of disability (Clark et al. 2018). Magnetic resonance imaging (MRI) is among the most dependable imaging methods for diagnosing and evaluating intervertebral disc conditions, including degeneration, disc herniation, and endplate inflammation (Alshammari QT et al. 2024, Jarvik JJ et al. 2001). It also effectively visualizes the relationship between discs and surrounding soft tissues and nerves, as well as assessing the spinal canal and spinal cord. MRI is particularly valuable for measuring the shape, size, extent, and location of disc herniations (Hancock MJ et al. 2017, Alshammari QT et al. 2024). However, in some instances, MRI results may not pinpoint the exact origin of low back pain (Clark et al. 2018, Alshammari QT et al. 2024, Jarvik JJ et al. 2001, Hancock MJ et al. 2017, Alshammari QT et al. 2024).

Magnetic resonance imaging (MRI) is indicated for sciatica patients with severe, persistent symptoms unresponsive to conservative management after six to eight weeks (Alshammari QT et al. 2024). The scan evaluates lumbar disc prolapse and its effect on nerve roots to inform surgical planning. The correlation between MRI results and clinical symptoms remains controversial, given that disc herniations are often found in asymptomatic individuals. Positive findings on MRI, however, frequently prompt invasive interventions such as epidural injections or surgical procedures (Hancock et al. 2017, Boden et al. 1990).

Few studies has been estimated the impact of pain intensity and long-term LPB using follow-up MRI techniques. MRI results at baseline and follow up will be compared in this study to estimate the progress of LBP in patients with mild and sever - prolapsed discs (grade 1

and 3 -disc herniation).

MATERIALS AND METHODS

The investigation was carried out at the Radiology Department of King Khalid Hospital in Hail, Saudi Arabia. A total of 50 subjects suffering from sciatica were included in the research. These individuals were classified into grade-1 and grade-3 based on the dimensions and location of the herniated disc in the spinal canal. Only those patients showing a dermatomal pain distribution pattern qualified for the MRI analysis. Over a period of 1. 5 years following the initial MRI scan, all 50 subjects underwent a follow-up MRI examination aimed at patients with low back pain.

The participants in the study were males and females aged 20 to 60 years, who willingly took part and had no signs of cognitive issues. Those with particular origins of lower back pain, such as tumors, injuries, spinal deformities (including scoliosis, kyphosis, spondylolisthesis), trauma, vascular conditions, rheumatoid arthritis, fractures, infections, pregnancy, congenital issues, ankylosing spondylitis, hernias, visceral complications, fibromyalgia, myofascial pain, and individuals using corticosteroids, were excluded from participating in the research. Furthermore, subjects diagnosed with cauda equina syndrome and those needing emergency surgical procedures were also omitted from the study.

Data collected from the participants included age, sex, place of residence, lifestyle choices, education level, smoking habits, and dietary practices. A comprehensive assessment was conducted regarding the duration, location, radiating nature, triggers, and relief factors associated with sciatic pain. In addition, thorough medical and neurological examinations were performed.

Procedure

Pain Severity Assessment: The intensity of pain was measured using a visual analog scale, where participants indicated their current level of pain on a scale that ranged from "no pain" to "unbearable pain."

Spinal MRI Procedure: All patients underwent spinal MRI imaging while lying in a supine position. A 1.5 T MRI machine equipped with a 24-element body spine surface coil was used for the procedure. T1-weighted axial images and T2-weighted sagittal images were captured both before and after the administration of gadolinium diethyl enetriaminepenta-acetic acid (Gd-DTPA). The MRI findings from L1 to S1 were evaluated and interpreted by two experienced musculoskeletal radiologists. The classification system used to assess lumbar disc herniation on the MRI was the Michigan State University (MSU) Classification, which takes into account the size and location of the herniation based on a single measurement of the intra-facet line. Additionally, guidelines from the North American Spine Society, the American Society of Spine Radiology, and the American Society of Neuroradiology were followed for the classification of lumbar disc pathology.

Correlation Analysis: A Pearson correlation coefficient was computed using SPSS 26.0 to investigate the potential association between the location or size of the herniated disc and
the levels of pain and disability.

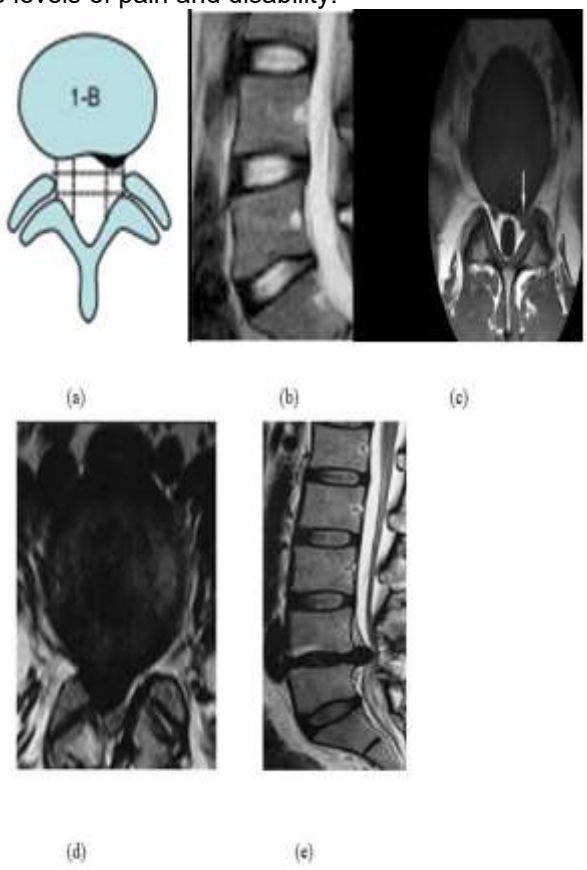

Figure 1: (a) Grade 1 disc herniation with minimal impact on nerve compression, (b) MRI axial T_2 weighted image and (c) sagittal T_1 shows L4-L5 lumbar disc herniation. (d) MRI axial T_2 weighted image and (e) sagittal T_1 shows L4-L5 lumbar disc herniation.

RESULTS

This study aimed to explore the relationship between initial and subsequent MRI findings in predicting the progression of lower back pain (LBP) in patients with mild and severe disc prolapse (grade 1 and 3 disc herniation). The research involved 50 patients with an average age of 33 ± 6.3 years. The participants had an average height of 172.6 centimeters and an average weight of 78.1 kilograms. In the follow-up evaluation, the mean VAS score was 6.9 ± 1.4 The correlation coefficient (r) between the initial and subsequent VAS scores was 0.07, with a p-value of less than 0.8.

The mean VAS score indicated the pain intensity in patients with disc herniation at the L4-L5 and L5-S1 levels

as 6.6 ± 1.3 and 7.5 ± 1.5, respectively. Patient distribution based on characteristics such as age, gender, body mass index, symptom duration, pain radiation, and disc herniation is presented in Table 1. Patients were divided into three groups based on the size and location of the herniated disc [Table 2].

Pain intensity (VAS) did not exhibit a relationship with patient age (r = 0.07; P = 0.90) or the duration of their lower back pain (r = 0.012; P = 0.80). There was no association between the degree of disc herniation and pain (r = 0.22; P = 0.01).

This cross-sectional study employed Pearson's correlation coefficient to determine the relationship between disc herniation and its clinical manifestations, specifically pain and disability, in patients with LBP. A weak correlation was noted during the initial assessment between grade 1- and 3-disc herniation and both pain intensity at baseline and follow up (Table 3).

Table 1: Distribution of the subjects with their characteristics.

Characteristics	Variables	N = 50 n [(n/N) %]
Age	20 – 29 years	18 [36]
	30 – 39 years	23 [46%]
	40 – 49 years	7 [14]
	50 – 59 years	2 [04]
Gender	Male	27 [54%]
	Female	23 [46%]
Radiation of Pain into legs	Yes	50 [100%]
	No	0 [0]
Body Mass Index [BMI]	Normal	35[70%]
	Overweight	15 [30%]
	Obese	0 [0.0%]
Disc Herniation	L4 – L5	31 [61%]
	L5 – S1	19 [39%]

* MSU – Michigan State University Classification.

Table 2: Distribution of the patients based on their size and level of disc herniation.

Characteristics	Variables	N = 50
MSU [Grade – 1]	A	26
	B	14
	AB	10
	Total	50

Table 3: Correlation between pain, disability and level of disc prolapse.

Parameters	'r' Value with p value	Interpretation
MSU – Grade 1 and 3		
Baseline Exam		
Pain & MSU grade 1	r = 0.11; P = 0.01	Weak Correlation
Pain & MSU grade 3	r = 0.04; P = 0.01	Weak Correlation
Follow up exam		
Pain & MSU grade 1	r = 0.27; P = 0.01	Weak Correlation
Pain & MSU grade 3	r = 0.14; P = 0.01	Weak Correlation

DISCUSSION

In this study, it was found that MRI images from both current and future research do not show a significant correlation with the degree and location of lumbar disc herniation, along with pain levels. The studies investigating the connection between MRI findings of degeneration and lower back pain vary greatly in their design, participant demographics, follow-up time frames, and methods of pain evaluation, making direct comparisons with earlier research challenging. Further MRI results were observed in older individuals who had symptoms as well as in those who did not, which is consistent with earlier findings (Alshammari QT et al. 2023, Boden SD et al. 1990, Alshammari et al. 2023). In our research, every participant indicated they felt discomfort extending into their legs, while Boden and colleagues discovered that issues such as disc herniation, spinal canal narrowing, disc deterioration, and bulging discs were detected in a notable number of asymptomatic people between the ages of 20 and 80 (Boden SD et al. 1990).

In research examining youthful and physically active persons presenting with symptomatic disc degeneration, increased instances of disc degeneration, Modic change, and disc herniation were noted. Nevertheless, no relationships were discovered. The difference in results may stem from several elements, such as the structure of the research, characteristics of the sample, and the criteria used to define low back discomfort. Earlier longitudinal research with small sample groups and participants experiencing ongoing pain could not determine a meaningful connection between particular MRI results and low back pain over the course of the follow-up (Boos et al. 2000, Borenstein et al. 2001, McNee et al. 2011, Suri et al. 2014, Udby et al. 2021, Simo et al. 2020).

One investigation involving adults who are not currently experiencing low back pain indicated that there is a connection between spondylolisthesis and disc degeneration and a heightened likelihood of developing future low back pain incidents. Additionally, Borenstein and colleagues identified that conditions such as disc herniation, narrowing of the spinal canal, bulging discs,

and disc degeneration are correlated with the emergence of low back pain in those who had no prior history of pain (Borenstein et al. 2001). Our results align with earlier studies indicating that there is no link between MRI results and lower back pain (LBP). There have been few investigations into the association between MRI observations and subsequent pain, with only a small number looking at the link between the quantity of MRI findings and later occurrences of LBP. Research conducted by Hancock et al. (Hancock et al. 2017) revealed that patients presenting three or more MRI findings were more likely to suffer from recurrent LBP than those who did not report any initial pain. On the other hand, McNee et al. found no correlation between the amount of MRI findings and lumbar pain after a span of 18 months in patients who had a history of lumbar spine problems (McNee P et al. 2011).

CONCLUSIONS

MRI examinations in current and future research do not show a statistically significant correlation with the severity and location of lumbar disc herniation and discomfort. The findings from MRI concerning degeneration and lower back pain vary greatly regarding their composition, origin of the samples, length of follow-up, and evaluation of pain, which makes it challenging to directly relate them to earlier studies.

Supplementary materials

Not applicable

Author contributions

Conceptualization, Q.T.A. and M.A.A.; methodology, Q.T.A and M.T.A.; formal analysis, A.M.Q.; investigation, M.T.A.; writing-original draft preparation, Q.T.A., A.H.A, and F.H.A; writing-review and editing, Q.T.A, R.A.A and A.H.A.; supervision, Q.T.A. All authors have read and agreed to the published version of the manuscript.

Funding statement

This study was not supported or funding

Institutional Review Board Statement

The study was approved by the Bioethical Committee of the King Khaled Hospital

Informed Consent Statement

Not applicable.

Data Availability Statement

All of the data is included in the article/ Supplementary Material.

Acknowledgments

We take this opportunity to thank all the participants of this study, and the MRI technician and nurse who assisted in taking the MRIs.

Conflict of interest

There is no funding agency/research support / potential conflict of interest relevant to this article was reported.

REFERENCES

Alshammari QT, Alghamdi RM, Alshammari OH, Alkayyadi ZT, AlAqeel FH , Albakri BS , AlqarniMS, Ali S Alyami7, Alshammari AT. An MRI longitudinal study in Low back Pain Patients: Assessment of Disc Herniation Grade 2. Journal of Positive Psychology & Wellbeing. 2024, Vol. 8, No.3, 67 – 72

Alshammari QT, Alqarni M, Alshammari SF, Abo Thaman BA, Alghamdi AA, Alsubaie MM, A Correlation between MRI findings in current and future Disc Herniation Grade 1- Amongst Low Back Pain Patients. Journal of Positive Psychology &Wellbeing. 2024, Vol. 8, No. 2, 196-202

Jarvik JJ, Hollingworth W, Heagerty P, Haynor DR, Deyo RA. The Longitudinal Assessment of Imaging and Disability of the Back (LAIDBack) Study: baseline data. Spine. 2001;26: 1158–1166.

Alshammari QT, Alsubaie AN, Alkayyat AA, Qazaq AM, Alnukhali AA, Alrefaei MGh, et al. Magnetic Resonance Imaging of Chronic Low Back Pain: Correlation between Pain, Disability, and Disc Herniation. Pharmacophore. 2023;14(3):41-6.

Alshammari QT 1*, Althobaiti AM 2, Alnazhan FH 2, Almesned RM 2, Alharbi MF 2, AlDukain MM 2, Alqahtani HS 3, Hendi FM4 and Alqarni M. An MRI

longitudinal study in low back pain patients:assessment of Disc Herniation Grade 3. Bioscience research. 2024, 21 (4): 721-725.

Alshammari QT 1*, Eman Alshammari1,2 , Wed Almutairi1,2, , Ohood Alrashidi1, MeshariT Alshammari1,3, Shashi Kumar CG4, Saleh Abdulkareem AlRumyan5, Musaed Alie Almalki5,Nagwan Elhussein1, Ibtisam Abdallah Fadulemulla1, Rasha M Aljohan. The Efficiency of MRI in Determining the Lower Back Pain associated with lumbar disc pathology. Bioscience research. 2023, 20(1): 77-82.

Boden SD, Davis DO, Dina TS, et al. Abnormal magnetic resonance scans of the lumbar spine in asymptomatic subjects. A prospective investigation. J Bone Joint Surg Am 1990; 72:403–8.

Borenstein DG, O'Mara Jr JW, Boden SD, et al. The value of magnetic resonance imaging of the lumbar spine to predict low back pain in asymptomatic subjects: a seven-year follow-up study. J Bone Joint Surg Am 2001; 83:1306–11.

Boos N, Semmer N, Elfering A, et al. Natural history of individuals with asymptomatic disc abnormalities in magnetic resonance imaging: predictors of low back pain-related medical consultation and work incapacity. Spine (Phila Pa 1976) 2000; 25:1484–92.

Clark, S.; Horton, R. Low Back Pain: A Major Global Challenge. Lancet 2018, 391, 2302

Hancock MJ, Kjaer P, Kent P, et al. Is the number of different mri findings more strongly associated with low back pain than single MRI findings? Spine (Phila Pa 1976) 2017; 42:1283–1288.

McNee P, Shambrook J, Harris EC, et al. Predictors of long-term pain and disability in patients with low back pain investigated by magnetic resonance imaging: a longitudinal study. BMC Musculoskeletal Disorder 2011; 12:234.

Suri P, Boyko EJ, Goldberg J, et al. Longitudinal associations between incident lumbar spine MRI findings and chronic low back pain or radicular symptoms: retrospective analysis of data from the longitudinal assessment of imaging and disability of the back (LAIDBACK). BMC Musculoskeletal Disorder 2014; 15:152.

Simo S, Kerttula L, Luoma K, et al. Disc degeneration of young low back pain patients: a prospective 30-year follow-up MRI study. Spine (Phila Pa 1976) 2020;45:1341–7.

Udby PM, Ohrt-Nissen S, Bendix T, et al. The association of MRI findings and long-term disability in patients with chronic low back pain. Global Spine J 2021; 11:633–9.