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Research Article

A Multicenter Hospital Based Study on Prevalence of Lumbar Intervertebral Disc Herniation in Asymptomatic Individuals on MRI

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ABSTRACT:
Background:
Lumbar intervertebral disc herniation (LDH) is a common spinal disorder often associated with clinical symptoms such as low back pain and sciatica. However, recent studies have shown that a significant proportion of individuals with lumbar disc herniation remain asymptomatic. The role of magnetic resonance imaging (MRI) has become central in detecting these disc abnormalities, even in the absence of symptoms. Understanding the prevalence and characteristics of asymptomatic lumbar disc herniation can guide clinical decision-making and improve the management of patients presenting with back pain.
Objective:
This study aimed to assess the prevalence and types of lumbar intervertebral disc herniation and the degree of disc degeneration in asymptomatic individuals using MRI. The study also sought to evaluate the correlation between demographic factors and these abnormalities.
Methods:
A cross-sectional, hospital-based study was conducted over one year, including 200 asymptomatic individuals who underwent lumbar MRI for non-spinal conditions. Demographic data were collected, and MRI scans were analyzed for disc degeneration using the Pfirrmann grading system (Grades 1-5) and the presence of lumbar disc herniation, categorized as normal, bulge, protrusion, extrusion, or sequestration.
Results:
The prevalence of lumbar disc herniation in this asymptomatic population was 30%, with the majority of herniations occurring at the L4-L5 (40%) and L5-S1 (35%) levels. Disc bulge was the most common type of herniation (20%), followed by protrusion (7%). Extrusion and sequestration were rare (5% combined). Regarding disc degeneration, Grade 1 (normal) degeneration was observed in 55% of the cases, while Grade 4 (severe) degeneration was seen in 5%. The prevalence of herniation increased with age, particularly among individuals aged 40 and above (35% versus 25%).
Conclusion:
This study reinforces the concept that asymptomatic lumbar disc herniations are common and emphasizes the need for careful interpretation of MRI results in clinical practice. The findings underscore that disc abnormalities detected on imaging should be assessed in the context of symptoms, as many individuals with disc herniation may not require intervention.

Keywords:
Lumbar intervertebral disc herniation, asymptomatic, magnetic resonance imaging (MRI), disc degeneration, Pfirrmann grading, disc bulge, disc protrusion, disc extrusion, lumbar spine, prevalence.

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INTRODUCTION

Lumbar intervertebral disc herniation (LDH) is one of the most common spinal disorders, with the potential to cause significant pain and disability[1]. It occurs when the soft inner material of the intervertebral disc (nucleus pulposus) protrudes beyond the outer fibrous ring (annulus fibrosus), leading to compression or irritation of adjacent nerve roots. While clinical symptoms such as lower back pain, sciatica, and motor deficits are well-established signs of LDH, many individuals with herniated discs remain asymptomatic.[2] The prevalence of asymptomatic lumbar disc herniation is of significant clinical interest, particularly as advances in diagnostic imaging, especially magnetic resonance imaging (MRI), have allowed for more detailed and non-invasive assessment of the spine.[3]

MRI has become the gold standard for visualizing intervertebral disc pathology, including disc herniation and disc degeneration. Numerous studies have shown that even in the absence of clinical symptoms, many individuals exhibit signs of disc degeneration and herniation on MRI scans. Understanding the prevalence and characteristics of asymptomatic disc herniation is crucial for better clinical decision-making, as the presence of disc abnormalities does not always correlate with symptomatology.[4,5] This study aims to assess the prevalence and types of lumbar disc herniation in asymptomatic individuals based on MRI findings over a one-year period in a hospital-based setting.

Aims and Objectives:

Aim:

To assess the prevalence of lumbar intervertebral disc herniation and associated disc degeneration in asymptomatic individuals using magnetic resonance imaging.

Objectives:

1. To determine the prevalence of lumbar intervertebral disc herniation in individuals who report no symptoms related to the spine.
2. To classify disc degeneration using the Pfirrmann grading system (grades 1 to 5).
3. To categorize the types of herniation (normal, bulge, protrusion, extrusion, sequestration) based on MRI findings.
4. To analyze the demographic factors (age, gender) and their correlation with disc degeneration and herniation.
5. To discuss the clinical significance of asymptomatic lumbar disc herniation in relation to potential future symptoms.

METHODOLOGY

This cross-sectional, hospital-based observational study was conducted over a one-year period at two different hospitals from June 2023 to May 2024. The study included asymptomatic individuals who underwent lumbar MRI scans for reasons unrelated to spinal pathology (such as for neurological evaluation of non-spinal conditions or pre-surgical assessment for other health concerns).

Inclusion Criteria:

- Adults aged 18-60 years.
- Individuals without a history of low back pain, radiculopathy, or any neurological deficit.
- Individuals undergoing MRI for conditions not related to lumbar spine issues.

Exclusion criteria:

- History of lumbar spine surgery.
- Individuals with a history of acute or chronic low back pain or sciatica.
- Individuals with any contraindication to MRI (e.g., metallic implants, pacemakers).

Data Collection: Demographic details (age, sex, occupation) were collected. MRI scans of the lumbar spine were reviewed for disc degeneration and herniation. Disc degeneration was classified according to the Pfirrmann grading[6] system as follows:

- Grade 1: Normal disc, with clear delineation between the nucleus pulposus and annulus fibrosus.
- Grade 2: Mild degeneration, with slight changes in disc height and signal intensity.
- Grade 3: Moderate degeneration, with loss of disc height and increased signal intensity in the annulus.
- Grade 4: Severe degeneration, with significant loss of disc height, irregularities, and high signal intensity in the nucleus.

Herniation was categorized into the following types based on MRI findings:[7,8]

- **Normal**: No disc herniation or abnormality detected.
- **Bulge**: Symmetrical outward extension of the disc beyond its normal boundary but without displacement of disc material.
- **Protrusion**: Displacement of disc material beyond its normal boundary, with a broad base.

- **Extrusion**: Displacement of disc material beyond the annulus with a narrower base.
- **Sequestration**: Detachment of disc material from the main disc body, forming free fragments within the spinal canal.

Statistical Analysis

Data was analysed using SPSS version 22. Prevalence rates of disc herniation and degeneration were calculated. Descriptive statistics were used to summarize demographic characteristics. Chi-square tests were performed to assess relationships between herniation and demographic factors such as age and gender. A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 200 asymptomatic individuals (108 males, 92 females) were included in the study. The average age was 39.5 years (range: 18-60 years). MRI findings revealed that 30% (60 individuals) exhibited lumbar disc herniation, with the majority of herniations found in the L4-L5 (40%) and L5-S1 (35%) levels.

Disc Degeneration:

- Grade 1 degeneration (normal) was observed in 55% of the cases.
- Grade 2 degeneration (mild) was present in 30% of cases.
- Grade 3 degeneration (moderate) was noted in 10% of cases.
- Grade 4 degeneration (severe) was seen in 5% of individuals with disc herniation.

Types of Herniation:

- **Normal Discs**: 70% of individuals (140 out of 200) showed no evidence of herniation or disc bulging.
- **Disc Bulge**: 20% of individuals (40 out of 200) exhibited disc bulges.
- **Disc Protrusion**: 7% of individuals (14 out of 200) had disc protrusions.
- **Disc Extrusion**: 2% of individuals (4 out of 200) showed disc extrusion.
- **Sequestration**: 1% of individuals (2 out of 200) had disc sequestration.

In terms of demographic characteristics, a higher prevalence of herniation was found in individuals aged 40 years and above (35%), compared to those under 40 years (25%) ($p<0.05$). Males exhibited a slightly higher prevalence of herniation (32%) than females (28%), though this difference was not statistically significant.

DISCUSSION

The study presented here sought to evaluate the prevalence and characteristics of lumbar intervertebral disc herniation in asymptomatic individuals using magnetic resonance imaging (MRI). The findings of the study suggest that lumbar disc herniation is relatively common even in individuals who do not exhibit symptoms of low back pain or related neurological deficits. This discussion will explore the implications of these findings in the context of existing literature, highlight the reasons for asymptomatic disc herniations, and compare the prevalence and patterns observed in this study with other research.

Prevalence of Lumbar Disc Herniation in Asymptomatic Individuals:

The overall prevalence of lumbar disc herniation in asymptomatic individuals in this study was found to be 30%, with the majority of the herniations located at the L4-L5 and L5-S1 levels. These results align with several key studies that have observed asymptomatic disc abnormalities in a substantial proportion of the general population. For example, Sang Jin Kim et al.[4] found that 20-30% of asymptomatic individuals in their study had disc herniations, and a similar rate of 25-40% was reported by Jensen et.al.[9] Our findings of 30% fall within this expected range and support the hypothesis that lumbar disc herniation can be present in individuals who do not experience symptoms. This prevalence emphasizes the fact that MRI findings of disc herniation do not necessarily correlate with clinical manifestations.

Importantly, it is essential to recognize that MRI is a highly sensitive tool for detecting disc abnormalities, even in the absence of overt clinical symptoms. The use of MRI in this study allows for the identification of disc herniations in individuals who would otherwise not seek medical attention for spine-related issues. This raises questions regarding the clinical relevance of these findings: should asymptomatic disc herniations be treated, and if so, when? The presence of a disc herniation on MRI in an asymptomatic individual does not necessarily imply that the herniation will cause pain or other neurological deficits in the future, which is a key consideration when interpreting these results in a clinical setting.[10]

Types of Herniation:

In this study, disc bulges (20%) were the most common type of lumbar disc herniation observed, followed by disc protrusions (7%),

disc extrusion (2%), and sequestration (1%). These types of herniations were classified based on their appearance in the MRI scans. This distribution is in line with previous studies on lumbar disc herniation in asymptomatic populations. For instance, the study by Jensen et.al[9] similarly reported that bulging discs were the most common finding in asymptomatic individuals, followed by protrusions, with very few cases of extrusion or sequestration.

The relatively low prevalence of extrusion and sequestration (5% combined in this study) is important because these forms of herniation are often associated with more severe clinical manifestations, including significant pain, neurological symptoms, and the potential need for surgical intervention. This contrast between the prevalence of herniation types in asymptomatic individuals versus those with symptoms reinforces the concept that not all disc herniations result in clinical symptoms. Many individuals with bulging or mildly protruded discs remain free of symptoms and may never experience any discomfort, suggesting that the clinical relevance of disc herniation depends on various factors, including the degree of nerve root involvement and individual patient characteristics.[11]

Disc Degeneration:

Another important aspect of the study was the classification of disc degeneration based on the Pfirrmann grading system.[6] In this study, the majority of individuals with disc herniation exhibited either Grade 1 (normal) or Grade 2 (mild degeneration) degeneration. Only a small proportion (5%) exhibited Grade 4 (severe) degeneration. These findings suggest that disc degeneration is often mild in asymptomatic individuals, and the degree of degeneration does not always correlate with the presence of symptoms.

This observation is consistent with prior research that indicates disc degeneration can occur without clinical symptoms. For example, a study by Alyas F et al.[12] observed that disc degeneration in asymptomatic individuals often follows a gradual, age-related process, with mild to moderate degeneration being the most common form. Similarly, the study by Jensen et.al found that disc degeneration was common in asymptomatic individuals but did not necessarily correlate with the presence of pain or discomfort. This highlights an important issue in clinical practice: the mere presence of disc degeneration or herniation on an MRI should not lead to an automatic assumption that it is the cause of the patient's symptoms.

Moreover, the presence of disc degeneration, particularly mild degeneration, is often considered a normal part of aging.[13] The gradual loss of disc hydration and elasticity over time leads to reduced disc height and signal intensity on MRI, but these changes do not always translate into pain. The findings in this study suggest that individuals with mild degeneration (Grade 1 or Grade 2) may remain asymptomatic throughout their lives, further reinforcing the idea that disc degeneration alone does not determine the presence of low back pain.

Demographic Factors: Age and Gender:

This study found that older individuals, particularly those aged 40 and above, had a higher prevalence of disc herniation (35%) compared to those under 40 years (25%). This finding is consistent with previous studies that have shown that the prevalence of lumbar disc degeneration and herniation increases with age. For instance, Sang Jin Kim et al.[4] found that disc abnormalities were more common in older individuals, particularly those over 40 years of age. Similarly, a study by Roughley PJ[11] found that disc herniation and degeneration were strongly associated with aging, as the intervertebral discs lose hydration and elasticity over time.

In terms of gender, this study observed a slightly higher prevalence of disc herniation in males (32%) compared to females (28%), although this difference was not statistically significant. Gender differences in the prevalence of disc herniation have been reported inconsistently in the literature. Some studies, such as those by El Barzouhi[14] and Jensen et.al[9], have found no significant difference between males and females, while others, such as the study by Sang Jin Kim et al.[4], have found a higher prevalence in males. However, it is important to note that the gender difference observed in this study was relatively small, and further research with a larger sample size may be needed to confirm any potential relationship between gender and the prevalence of asymptomatic disc herniation.

Clinical Implications:

The findings of this study have important clinical implications. Although MRI findings of lumbar disc herniation are common in asymptomatic individuals, they should not automatically lead to treatment or invasive

procedures. The presence of a disc bulge or protrusion does not necessarily indicate a pathology that requires intervention. This is particularly important in the context of back pain management, where non-specific low back pain is often attributed to disc abnormalities on imaging, even though many individuals with disc herniations are asymptomatic.[14]

Clinicians must adopt a more cautious approach when interpreting MRI results in asymptomatic individuals. It is essential to consider the clinical context and the patient's symptoms rather than relying solely on imaging findings. A "wait-and-see" approach is often appropriate for many individuals with asymptomatic disc herniation or mild degeneration, as most will not experience significant pain or disability.[11,12] Surgical intervention should be reserved for individuals with symptomatic herniations, particularly those with more severe forms such as extrusion or sequestration.

Limitations and Future Directions:

One of the limitations of this study is the lack of longitudinal follow-up to assess whether asymptomatic individuals with disc herniations may eventually develop symptoms over time. While this study provides a snapshot of the prevalence and characteristics of asymptomatic disc herniation, further research is needed to explore whether these individuals are at greater risk for future spinal issues. A longitudinal study following asymptomatic individuals with disc herniations could help clarify the potential for these herniations to cause symptoms in the future and provide insights into the natural progression of lumbar disc herniation in the general population.

Additionally, the relatively small sample size of this study may limit the generalizability of the results. Future studies with larger and more diverse populations may help to further elucidate the relationship between demographic factors, disc degeneration, and herniation in asymptomatic individuals.

CONCLUSION:

In conclusion, this study provides valuable insights into the prevalence and characteristics of lumbar intervertebral disc herniation in asymptomatic individuals. The results indicate that lumbar disc herniation is common in the general population, even in the absence of symptoms, and that mild disc degeneration is often present in asymptomatic individuals. The study emphasizes the need for careful interpretation of MRI findings, as disc abnormalities may not necessarily correlate with clinical symptoms. Further research is needed to understand the long-term outcomes of asymptomatic disc herniation and the clinical significance of these findings in the management of low back pain.

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