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Role of MRI in detection of lumber spine pathologies using 1.5 tesla (MRI)

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Abstract

Background: This study investigates the diagnostic accuracy of MRI in detecting various lumbar spine pathologies in patients with lower back pain. Lower back pain (LBP) is a prevalent issue affecting 80%–85% of the population during their lifetime, contributing significantly to global disability. LBP is nonspecific in 95% of cases but can stem from underlying pathologies such as disc herniation, spinal stenosis, infection, inflammation, tumours, or fractures.

Objective: To emphasize the importance of magnetic resonance imaging (MRI) in patients suspected of lumbar spinal examinations.

Methods and material: The research focused on adult patients with radicular syndrome, spinal stenosis, spinal tumours, spinal fractures, spinal infection/inflammation, disc herniation, spondylolisthesis, spondylolysis, ankylosing spondylitis, disc displacement, osteoporotic fractures, and other degenerative disc diseases. Utilizing a 1.5 Tesla MRI machine, the descriptive, cross-sectional observational study spanned one year and included 150 patients.

Results: revealed that diffuse disc bulge (87.33%) and disc protrusion (87.33%) were the most common pathologies, followed by partial desiccation (34.67%), neural foramina stenosis (16.00%), spondylosis (1.33%), osteoporosis (12.00%), spinal haemorrhage (2.00%), osteophyte spurs (29.33%), and sclerotic changes (3.33%).

Discussion and Conclusion: The study's discussion highlighted notable findings, including a higher prevalence of lumbar spine abnormalities in females (51.33%) and a substantial association with a history of lower back pain (40.00%). The conclusion underscores the significance of MRI in diagnosing lumbar spine pathologies, with specific attention to the prevalence of disc bulge and protrusion in the studied population.

Keywords: LBP; Diffuse Disc Bulge; Lumbar Spine; Tumour

1. Introduction

Lower back pain (LBP) affects up to 80%–85% of the population during their lifetime.[1] low backpain (LBP), which is defined as pain in the lumbar spinal area with or without sciatica, is a frequentcause of disability worldwide. LBP is nonspecific in around 95% of instances, but it can also be brought on by major underlying pathologies such disc herniation, spinal stenosis, infection, inflammation, tumors, or fractures.[2] The benefit of employing ionizing radiation free MRI is that it has strong visualizing capabilities, particularly for soft tissues. As a result, it is considered the most effective technique for identifying disc abnormalities, spinal metastases, infections, and nerve root problems. However, there is ongoing debate over the use of MRI in the diagnosis of lumbar spinal disease.[3] The search strategy was created to find studies evaluating the diagnostic efficacy of MRI in the identification of lumbar spinal pathology in adult patients with radicular syndrome, spinal stenosis, spinal tumors, spinal fractures, spinal infection/inflammation, disc herniation,

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spondylolisthesis, spondylolysis, ankylosing spondylitis, disc displacement, osteoporotic fractures, and other degenerative disc diseases.[4]

The preferred imaging technique for identifying spine disorders is MRI. Numerous studies have found that between 26% and 44% of lumbar MRIs do not adhere to the recommendations, which call for conservative therapy as the new-onset LBP approach without warning signs.[5] Because there isn't usually a clear association between image findings and patient complaints, ordering unneeded MRIs has little effect on clinical decision-making and doesn't enhance outcomes. Additionally, it is thought to cost $300 million annually in the United States. Another tragic outcome of imaging that might have a long-term impact on people is labelling them as having certain illnesses.[6]

Aim & Objective

To emphasize the importance of magnetic resonance imaging (MRI) in patients suspected of lumbar spinal examinations.

2. Material and Method

This is descriptive, cross-sectional observational study spanned one year and included 150 patients. The research focused on adult patients with radicular syndrome, spinal stenosis, spinal tumours, spinal fractures, spinal infection/inflammation, disc herniation, spondylolisthesis, spondylolysis, ankylosing spondylitis, disc displacement, osteoporotic fractures, and other degenerative disc diseases.

2.1. Study area

(Phillips 1.5 tesla) magnetic resonance imaging (MRI), Department ofradiodiagnosis and imaging, NIMS hospital, Jaipur Rajasthan. In this study all patients who were referred for MRI lumber spine study were taken for dataanalysis. MRI Surface body coil were used.

2.2. Inclusion criteria

OPD (outpatient department) patients, Patients of different age groups between 10-90, Conscious & cooperative patients with their consent., Patients complaining about lumber spine abnormalities.

2.3. Exclusion criteria

IPD (In patients department) patients, Uncooperative patients, Claustrophobic patients, Trauma patients.

3. Results

The information was presented through numerical values, percentages, mean, and standard deviation. Additionally, a Chi-square test was conducted. The primary aim of this investigation was to identify abnormalities in the lumbar spine. The analysis delved into various aspects, including diffuse disc bulge, disc protrusion, partial desiccation, neural foramina stenosis, spondylosis, osteoporosis, spinal haemorrhage, osteophyte spurs, and sclerotic changes. Gender and age distribution were also assessed in 150 patients at NIMS Hospital in Jaipur, Rajasthan. The study employed the MRI Spine protocol Sequences on a 1.5 Tesla MRI machine, encompassing T1-weighted images, T2-weighted images, fluid-sensitive images, STIR or fat-suppressed images, T2-weighted gradient-echo images, and post-gadolinium T1-weighted images.

A total of 150 patients were taken, of which 131 (87.33%) are suffering from diffuse disc bulge, 131 (87.33%) are suffering from disc protrusion, 52 (34.67%) are suffering from partial desiccation, and 24 (16.00%) are suffering from neural foramina. And 2 (1.33%) are suffering from spondylosis, 18 (12.00%) are suffering from osteoporosis, 3 (2.00%) are suffering from spinal haemorrhage, 44 (29.33%) are suffering from osteophyte spurs, and 5 (3.33%) are suffering from sclerotic changes. Diffuse disc bulge and disc protrusion are mostly seen (87.33%).

In these 150, the distribution of patients is according to age, starting from ≤ 20 years old with 4 patients having (2.67%), then 20-30 years old (30 patients having (20.00%), then 30-40 years old 49 patients having (32.67%), then 40-50 years old 31 patients having (20.67%), then 50-60 years old 19 patients having (12.67%), then 60-70 years old 9 patients having (6.00%), then 70-80 years old 5 patients having (3.33%), and 80-90 years old 3 patients having (2.00%). Most patients' ages start at 30–40 years old, with 49 patients with a percentage of 32.67% **(Table-1).**

Table 1 Frequency distribution of age of patients

Age Interval	n = 150	Percentage%
≤ 20	4	2.67%
20 – 30	30	20.00%
30 – 40	49	32.67%
40 – 50	31	20.67%
50 – 60	19	12.67%
60 – 70	9	6.00%
70 – 80	5	3.33%
80 – 90	3	2.00%

In these 150 patients' distributions, it is according to gender (male or female). We have 150 patients, of whom 73 (48.67%) are males and 77 (51.33%) are females. We have a greater number of females than males, as shown in **fig-1.**

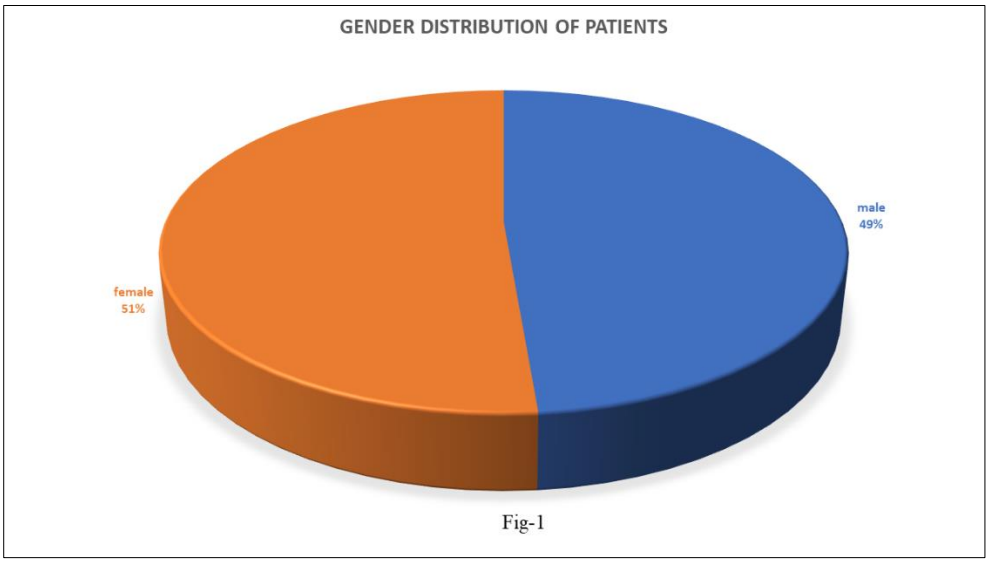

Figure 1 Gender Distribution of Patients

In these 150 patients, the distribution of patients was according to the patient's complaints and histories. The total number of patients is 150, of which 59 (40.00%) are suffering from lower back pain, 47 (31.0%) are suffering from numbness of the limbs, and 44 (29.00%) are suffering from PIVD. Most people have a complaint of lower back pain **(Table-2).**

Table 2 Frequency distribution of patient history

Patients History	n = 150	Percentage%
Lower back pain	59	40.00%
Numbness of limbs	47	31.00%
PIVD	44	29.00%

In these 150 patients, the distribution of diffuse disc bulges was on different portions. In 150 patients, central disc bulge is seen in 50 (33.3%) patients, posterior disc bulge is seen in 90 (60.00%) patients, and is seen in 10 (6.7%) patients. A posterior disc bulge is mostly seen **(Table-3).**

Table 3 Distribution of pattern based on disc bulge

Disc bulge	n = 150	Percentage%
Central disc bulge	50	33.3%
Posterior disc bulge	90	60.0%
Anterior disc bulge	10	6.7%

In these 150 patients, the distribution of diffuse disc bulges was at different levels of the lumber spine region. In this, we find that 30 (20.00%) patients with diffuse disc bulges are seen at the L3-L4 level. We find that 42 (28.00%) patients with diffuse disc bulge are seen at level L4-L5, and we find that 34 (22.77%) patients with diffuse disc bulge are seen at level L5-S1. Most patients have diffuse disc bulges seen at levels L4–L5.

In these 150 patients, the distribution of disc protrusion was at different levels of the lumber spine region. We find that 51 (34.0%) patients with disc protrusion are seen at levels L4–L5. We find that 52 (34.67%) patients with disc protrusion are seen on level L5-S1. We find that 13 (8.67%) patients with disc protrusion are seen on both levels L4-L5 and L5-S1. Most disc protrusion is seen at the level of L5-S1.

In these 150 patients, the distribution of partial dissection was at different levels of the lumber spine. We find that 32 (21.33%) patients with partial desiccation are seen at levels L1–L5. We find that 11 (7.33%) patients with partial dissection are seen at levels L4–L5. We find that 4 (2.67%) patients having partial desiccation are seen at the level of L5-S1. Most patients have partial dissection seen at levels L1–L5.

In these 150 patients, the distribution of neural foramina stenosis was at different levels of the lumber spine. We find that 9 (6.00%) patients have neural foramina stenosis seen at the level of L5-S1. We find that 4 (2.67%) patients have neural foramina stenosis seen at the levels of L4-L5. We find that 3 (2.00%) patients have neural foramina stenosis seen at the levels of L1-L2. Most patients with neural foramina stenosis are seen at level L5-S1.

In these 150 patients, the distribution of spondylosis was at different levels of the lumber spine. We find that 2 (1.33%) patients with spondylosis have a level of L5-S1.

4. Discussion

In our research, we conducted 14 evaluations, revealing notable findings in a sample of patients. Among the 49 individuals (32.67%) aged between 30 and 40, there was a prevalence of lumbar spine abnormalities. Further analysis demonstrated that 77 (51.33%) female patients also exhibited lumbar spine abnormalities. Notably, 59 (40.00%) patients shared a common history of lower back pain. The majority, comprising 131 patients (87.33%), suffered from diffuse disc bulge and disc protrusion.

Additionally, 52 patients (34.67%) experienced partial desiccation, while 24 individuals (16.00%) faced neural foramina stenosis. Spondylosis affected 2 patients (1.33%), osteoporosis affected 18 patients (12.00%), and spinal haemorrhage affected 3 patients (2.00%). Osteophyte spurs were present in 44 cases (29.33%), and sclerotic changes were identified in 5 patients (3.33%). These findings collectively contribute to a comprehensive understanding of the diverse spinal conditions observed in our study population.

In the cohort of 150 patients under study, osteoporosis exhibited varied distribution across different levels of the lumbar spine. Notably, 5.33% of individuals with osteoporosis manifested this condition at levels L1–L5, constituting 8 patients. Similarly, spinal hemorrhage presented diversely among the same set of patients, with 1.33% (2 patients) exhibiting this condition at level 1, and a solitary case (0.67%) observed at level L4. The distribution of osteophyte spurs in the lumbar spine also demonstrated variability, with 19.33% (29 patients) of individuals presenting these spurs at levels L1–L5. Moreover, sclerotic changes were discerned at different levels of the lumbar spine, specifically at levels L4-L5, accounting for 1.33% (2 patients) of the cohort.

This analysis underscores the heterogeneity in the presentation of osteoporosis, spinal hemorrhage, osteophyte spurs, and sclerotic changes within the examined patient population. The distribution across distinct lumbar spine levels

highlights the importance of comprehensive assessment and diagnosis, considering the varied anatomical involvement in these spinal conditions.

5. Conclusion

Lower back pain (LBP) is a prevalent issue affecting 80%-85% of the population, often causing disability. While nonspecific in 95% of cases, LBP can result from various pathologies. Ionizing radiation-free MRI is crucial for visualizing soft tissues and identifying disorders like disc abnormalities, spinal metastases, and infections. Despite MRI being the preferred imaging technique for spine disorders, studies reveal overuse, costing $300 million annually in the US, with limited impact on clinical decisions. This study at NIMS hospital in Jaipur aims to assess the diagnostic accuracy of MRI in identifying lumbar spine pathologies in 150 patients with LBP, incorporating diverse criteria and excluding inpatients, uncooperative or claustrophobic individuals, and trauma patients.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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