

Clinical Importance of MRI Lumbar Spine in Lower Backache

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ABSTRACT

Aim: To examine the effectiveness and clinical significance of lumbar spine MRI in chronic lower-back ache patients and its relevant radiculopathies.

Study design: Cross-sectional descriptive study

Place and duration of study: Department of Radiology, Sir Syed College of Medical Sciences for Girls Karachi from 1st June 2020 to 30th November 2020.

Methodology: Ninety patients of both males and females, between the ages of 20-75 years with a history of bilateral or unilateral lower limbs radiculopathy, lower back numbness and pain were included. The patients with a history of vascular malformation, metastasis, tumour, infection, and trauma were excluded. Lumbar spine MRI was performed by MRI scanner. At the following levels, the scan was taken: L5-S1, L4-L5, L3-L4, L2- L3.

Results: The mean age was 44.64±15.67 years. Eighty percent of patients showed osteophytes formation and disc desiccation signs, 53.5% of patients showed signs of numbness, and 36.7% of patients has bilateral lower-limbs radiculopathies complaints, whereas 91.1% had shown signs of diffuse disc bulge on spinal level of L5-S1. In 100 percent of patients, neural foramina were compromised at level L4-L5 to which in 98.9% of patients there was a “nerve root compression” at this level. Mostly it has been seen that level L2-L3 is spared. At level, L2-L3 hundred percent of patients did not reveal any important ligamentum flavum hypertrophy and 98.9 percent of people have no “facet joint hypertrophy”.

Conclusion: The lower back pain frequency is higher in males as well as in females. In a patient who has lower back pain, the Disc desiccation was frequent. Because of spinal canal stenosis, foraminal canal and nerve root compressions the most general targeted sites were L5-S1 and L4-L5.

Keywords: Lumbar spine, Magnetic resonance imaging, Lower backache

INTRODUCTION

For the human body, the spine works as a pillar and in identifying its pathology any ignorance could be devastating. Globally “lower backache (LBP)” is a general issue and could cause disability. It was predicted, according to the “Global Burden of Disease Study” that pain in the lower back ranked on the topmost level in disability terms and worldwide the LBP prevalence is 9.4%¹. Back pain usually is categorized into 2 classes that are: chronic which endures for twelve weeks or longer and acute, which lasts for some weeks or days. It was seen that 20% of acute pain cases could form chronic low back pain². There are several back pain causes including age-related changes, postural imbalance, obesity, and occupational hazards. 1/3rd of nurses in Pakistan have jobs linked to lower back disorder and also ninety-four percent of them prefer bed rest to improve their condition because ignoring back pain could lead to permanent health issues³.

Moreover, other professionals, for example, doctors between the ages of twenty-six to forty years with ten to fifteen years of experience also suffer from musculoskeletal disorders generally low back pain. Also, the symptoms of LBP have been observed in radiologists, physiotherapists, psychiatrists, and dermatologists⁴. In the intervertebral disc, the degeneration leads to facet joint degeneration⁵. Usually, the ageing disc wears off and most might not have symptoms that could cause severe LBP later⁵.

But spine-related anatomical defects like herniation and endplate fracture are detected easily. These types of issues are irreversible due to the cause that adult persons have limited capability of healing and it progresses because of biological and physical function⁵. Because of lumbosacral disc herniation, radiculopathy is an intervertebral disc displacement beyond the disc space boundaries and that could cause needles and pins sensation, paresis throughout the dermatomal or myotomal levels or severe pain⁶. Usually, structural abnormalities are shown by “magnetic resonance imaging (MRI)” and it helps in the planning of surgery, whereas studies of nerve conduction could identify the nerve root damage severity and helps in postoperative follow-up^{6,7}.

There are different options for LBP investigations for example MRI, discography, and Computed Tomography. All these methods have been used by doctors for comparing the signs and clinical symptoms of “chronic low back pain (CLBA)”⁸. But MRI of the lumbar spine show bulges of the disk without extrusions in person without complaining of back pain so such MRI findings in low backache patients can be coincidental.⁹ Soft-tissue structures can be seen by MRI for instance, muscles, nerves and discs that are the probable LBP causes however, it might not identify the LBP source in some cases¹⁰.

From baseline findings of MRI, it is hard to make any guess on future LBP¹¹. But the MRI or CT are believed to be the most reliable procedures for spinal disease diagnosis however, it is appropriate to do more than one MRI sequence like T2-weighted and T1-weighted scans¹². In the neurological examination, the positive findings could be used for predicting compression of a nerve root in MRI. However, such physical examination findings do not forecast studies of abnormal nerve conduction¹³.

Research supported that MRI has better or equal sensitivity as compared to other technologies and also it reveals super contrast and it is more explanatory as compared to CT however, also reveals clinically unknown pathologies¹⁴. Non-steroidal anti-inflammatory drugs, in un-specific lower back pain, are effective for symptomatic treatment¹⁵. Moreover, it is better to follow non-pharmacologic treatment like spinal manipulation, acupuncture, and thermotherapy, however, if the medicine is needed then choose muscle relaxant or NSAIDs.¹⁶ Issues linked to the back pain, including radiculopathy, disc degeneration, and lower back pain are not noted commonly when economic assessments are discussed that is why it is hard to assess the symptomatic disc herniation's economic effect. However, less productivity, absent time at work, and the healthcare price bring a massive economic burden¹⁷.

Frequently MRI is done for evaluating radiculopathies and chronic lower backache, but in the developing states its significance has not been assessed yet thus this research was performed to evaluate the effectiveness and clinical significance of lumbar spine MRI in chronic lower-back ache patients and its relevant radiculopathies.

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MATERIALS AND METHODS

This cross-sectional descriptive study was conducted at Department of Radiology, Sir Syed College of Medical Sciences for Girls Karachi from 1st June 2020 to 30th November 2020. Patients were selected for lumbar spine MRI at the diagnostic centre that is in collaboration with Sir Syed Hospital's Orthopaedic Department, located in Karachi, Pakistan. With a 90 patients sample size, the data was collected with the help of Performa after taking informed consent and ethical approval. Patients included both males and females, between the ages of twenty and seventy-five years with a history of bilateral or unilateral lower limbs radiculopathy, lower back numbness and pain were included in this research, whereas the exclusion criteria were patients with a history of vascular malformation, metastasis, tumour, infection, and trauma. Symptoms duration varied from years, months, weeks, and days or without any particular known period. Lumbar spine MRI was performed by "Hitachi Airis Elite 3 tesla MRI scanner". In both T2 and T1 sequences, the sagittal images were taken. In the T2 sequence, axial images were established parallel to the "intervertebral disc", however, with 0.3mm inter-slice distance at 4mm slice thickness sagittal images were acquired. At the following levels, the scan was taken: L5-S1, L4-L5, L3-L4, L2- L3. It has revealed findings of lateral recess and neural foraminal narrowing, facet hypertrophy, ligamentum flavum hypertrophy, and stenosis at the above-mentioned spine levels. Statistical assessment was done by using SPSS-21.

RESULTS

The patient's mean age was 44.64±15.67 years in which 37(41.1%) were females and 63(58.9%) were males. Thirty-three out of ninety patients (36.7%) complained of lower limb bilateral radiculopathy. But in the right lower limb radiating pain as compared to the left lower limb is common with 23.3% which is around twenty-one patients from ninety patients; however, the pain duration is unknown usually in 49(54.4%) people. After a few months around 22(24.4%) patients were having pain. 48(53.5%) of patients were having lower back numbness. It has been seen after getting MRI reports that all sampling patients were having "abnormal findings", in 18 patients (20%) reveal signs of

complexes of multi-level disc osteophyte whereas 72(8%) had osteophytes formation and disc desiccation signs as shown in table 1. Patients, according to the data analysis at spinal L5-S1 level were having diffuse bulge of the disc. At the L4-L5 level in ninety patients (hundred percent) neural foramina were compromised because of which at this level there was a compression of the nerve root. It has been seen that level L2-L3 is spared mostly from nerve root compression and neural foramina compromise in 86 (95.6%) and there were no findings of spinal canal stenosis. At level, L2-L3 hundred percent of patients did not reveal any important ligamentumflavum hypertrophy and 89 (98.9%) of patients have no "facet joint hypertrophy". At L5- S1 and L4-L5 levels with 85 (94.4%) patients, 73 (81.1%) patients respectively, mild to average "spinal canal stenosis" was present. The most influenced level with facet joint hypertrophy and ligamentum flavum hypertrophy was L5- S1 with 59 (65.6%) and 20 (22.2%) respectively (Table 2).

Table 1: Frequency of symptoms, gender, age and MRI finding of osteophytes complex or disc desiccation

Variable	Mean±SD/n (%)
Age (years)	44.64±15.67
Gender	
Female	37 (41.1%)
Male	53 (58.9%)
Pain radiation	
Absent	22 (24.4%)
Both legs	33 (36.7%)
Left leg	14 (15.6%)
Right Leg	21 (23.3%)
Numbness	
Yes	48 (53.5%)
No	42 (46.7%)
Duration of pain	
Days	9 (10.0%)
Weeks	1 (1.1%)
Months	22 (24.4%)
Years	9 (10.0%)
Unknown	49 (54.4%)
Disc desiccation/disc osteophyte complexes	
Yes	72(80.0%)
Multi-level disc osteophyte complexes	18(20.0%)

Table 2: Distribution of MRI findings at different spinal levels

Variable		Spinal Level			
		L2-L3	L3-L4	L4-L5	L5-S1
Disc bulging	Diffuse disc bulge	2(2.2%)	20(22.2%)	83(92.2%)	82(91.1%)
	Mild disc bulge	2(2.2%)	37(41.1%)	7(7.8%)	2(2.2%)
	Absent	86(95.6%)	33(36.7%)	-	6(6.7%)
Neural foramina compromise	Yes	4(4.4%)	57(63.3%)	90(100.0%)	84(93.3%)
	No	86(95.6%)	33(36.7%)	-	6(6.7%)
Nerve root compression	Yes	4(4.4%)	34(37.8%)	89(98.9%)	84(93.3%)
	No	86(95.6%)	56(62.2%)	1(1.1%)	6(6.7%)
Spinal canal stenosis	Mild	3(3.3%)	39(43.3%)	16(17.8%)	3(3.3%)
	Mild to moderate	-	11(12.2%)	73(81.1%)	85(94.4%)
	Moderate to Severe	-	-	1(1.1%)	1(1.1%)
	Significant	1(1.1%)	1(1.1%)	-	-
	Nil	86(95.6%)	39(43.3%)	-	1(1.1%)
Ligamentum flavum hypertrophy	Yes	-	3(3.3%)	21(23.3%)	20(22.2%)
	No	90(100.0%)	87(96.7%)	69(76.7%)	70(77.8%)
Facet Joint Hypertrophy	Yes	1(1.1%)	7(7.8%)	52(57.8%)	59(65.6%)
	No	89(98.9%)	83(92.2%)	38(42.2%)	31(34.4%)

DISCUSSION

In the present study, the most evident finding of MRI was the compressed nerve root and compromised neural foramina presence with the percentage of 98.9% and 100% respectively at the spinal level of L4-L5 in lower backache patients whereas the most secured part was L2-L3. L3-L4 level showed disc bulge signs and mild and average level canal stenosis, however, L5-S1 was believed to be a highly influenced area because of the compressed nerve root, disc bulge, and compromised neural foramina, mild to average spinal canal stenosis also was witnessed in 94.4%

patients. It was suggested by Kim's¹⁸ study that acute axial severe lower back pain patients have eighty-seven percent disc herniation chances however; endplate changes, annular tear and lumbar disc degeneration had been observed also. Seventy five percent of patients according to Kohat's study were facing facet joint arthropathy and 72.2% of patients had gas compression of the nerve root and at the L4-L5 level, these findings were most common in "chronic low backache".⁸It was supported by another study that the obvious disc herniation MRI findings were at levels L5-S1 and L4-L5¹⁹. Another study's outcomes are consistent with this study that showed the smallest spinal canal evidence at the

L5-S1 level widest at L1-L2 level.²⁰ The patient's average age with lower back pain complaints was found in this study to be approximately forty-five years (44.64 years mean age), research done by Kohat⁸ showed 41 years of the average age of chronic lower backache patients and also Brinjikji²¹ proved the changes of MRI more prevalent at age of 50 years or younger. In this study we have revealed that disc Osteophyte Complexes or disc desiccation were the common pathologies and also Kohat⁸ showed that disc desiccation is the common issue of disc whereas another research²² evident the disc extrusion existence as the common finding. In our study, the amazing observation was that L5-S1 and L4-L5 had a great connection with problems in the lower back. Also, this type of relationship had been discussed in research published in 2015 by "American Journal of Neuroradiology".²¹

One of the main LBP causes had appeared as lumbar spine radiculopathy however, pathologies of the lumbosacral spine could also mimic frequently the clinical symptoms and signs of radiating lower limbs pain.²³ However magnetic resonance neurography are a helpful tool for the assessment.²⁴ In neurological assessment, the positive results could be utilized to forecast compression of a nerve root in MRI. However, findings of such physical examination do not forecast abnormal "nerve conduction studies".¹³

Likewise, there was research that attempt to evaluate the correlation between findings of MRI with the low back pain intensity or degree of disability²⁵ however, in 2012 the study conducted concluded that MRI doesn't improve results in patients candidates for "epidural steroid injections".²⁶ Thus it is not possible that MRI may have less influence on the outcomes of treatment. Our study's advantage was that it evaluated the most common cause, most affected site and highly reported signs of lower back pain. It also showed the MRI lumbar spine significance in chronic lower backache patients and their clinical radiculopathy evidence with "localized low backache".

CONCLUSION

The lower back pain frequency is higher in males as well as in females, 41.1% females and 58.9% males and the common sign was "bilateral lumbar radiculopathy". Inpatient who has lower back pain the disc desiccation was frequent. Because of spinal canal stenosis, foraminal canal and nerve root compressions the most general targeted sites were L5-S1 and L4-L5.

Conflict of interest: Nil

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