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Magnetic Resonance Imaging (MRI) Lumbosacral Spine Findings in Patients With Low Backache: A Clinico-Radiological Relation

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ABSTRACT

Objective: To correspond clinical findings of patients with lower backache to those demonstrated at Magnetic Resonance Imaging of the Lumbosacral spine.

Study Design: Cross-sectional study.

Place and Duration of Study: Department of Diagnostic Radiology, Pakistan Institute of Medical Sciences Hospital, Islamabad Pakistan, from Oct 2019 to Jan 2020.

Methodology: All consecutive adult patients with lower backaches of more than one month duration were enrolled in the study. Detailed clinical history and examination were obtained. Pain scoring was done by visual analogue score, and a straight leg raise test was performed. Patients then underwent magnetic resonance imaging in the hospital, and findings were reported.

Results: Mean age of the patients was 30.2±13.53 with male preponderance. The mean duration of symptoms was 2.3±2.34 years. According to the visual analogue score, most patients had a moderate pain scale. Seventy-six percent of patients had no sensory deficit; upon clinical examination, twenty-one had a loss of power. Upon Lasegue Test, the majority (43,48.9%), had pain between 30-70 of hip flexion.

Conclusion: History and detailed clinical examination play an emphasising role in the treatment regimen of patients with lower backache, with special concern on the correlation of findings with Magnetic Resonance Imaging of the lumbosacral spine, thus alleviating morbidity of patients.

Keywords: Backache, Degenerative changes, Spinal canal stenosis.

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INTRODUCTION

Lower backache is one of the most prevalent, morbid and debilitating diseases affecting adults of all age groups, equally affecting all socioeconomic classes and occupations.[1,2] More than 80% of the population worldwide encounter it at least once in their life time.[3] It is one of the important causes for the limitation of daily activities, absence from the workplace and every-day increase in hospital expenditure due to outpatient visits.[4] In Asia, it is largely due to the degenerative disease process.[4] Most people suffering from lower backache belong to the middle age group, specifically between 40-50 years.[5]

Radiological imaging plays a vital role in characterising the etiological factor and aids in the treatment regimen. Most patients are thus routinely advised radiological evaluation through radiography and Magnetic Resonance Imaging (MRI).[6] However, during the past few decades, MRI has emerged as a prime investigation for evaluating low backache as it poses no hazardous radiation risk and is widely accepted. It is costly but provides the treating clinician with a clue to diagnose the cause of pain and aid in the treatment strategy.[7]

Various entities signifying the cause of backache are evaluated accordingly in the MRI of such patients. For example, degenerative disc disease hallmarks disc desiccation, loss of disc height, Modic changes, annular tears, herniation of the disc, and osteophytosis.[8] Besides, spinal canal stenosis and spondylolisthesis are also established causes of backache in patients.[9,10]

Very few studies are focused on the correlation of symptomology with positive findings on MRI lumbosacral spine in patients with lower backache, thus categorising the aetiology. This article intends to estimate the diagnostic correlation of symptomology spectrum and clinical findings with MRI lumbosacral spine findings in patients with lower backaches.

METHODOLOGY

The cross-sectional validation study was conducted at the Department of Diagnostic Radiology,

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PIMS hospital, in consortium with other departments of the hospital, especially Neurosurgery, Orthopaedics and Gynecology, from October 2019 to January 2020. Approval from the Ethical Review Committee was taken (letter No.F.1-1/2019/Radiology/PIMS). Non-probability consecutive sampling technique was used. The sample size was calculated by keeping the estimated proportion of 99.6%.[10]

Inclusion Criteria: The healthy patients with lower backaches of more than one month duration were included in the study.

Exclusion Criteria: All patients with known severe claustrophobia, metastatic or metabolic disease, history of spinal surgery or trauma were excluded from the study.

A total of 88 patients fulfilling the inclusion criteria were enrolled in the study. In our study, patients who complained of backache, which was causing limitations of daily activities, were referred to the Radiology department for MRI. Before MRI, All those patients were asked for professional history and duration of the symptomology. Their pain severity was scored by using the Visual Analog score. They were examined in the department with the Straight leg raise test/Lasegue Test, sensory and motor deficits. MR procedure and protocol were clearly explained to the patients. The procedure was performed on a 1.5T superconducting magnet (Philips) MR scanner using a body coil by a chief MR technician in the PIMS radiology department. The slice thickness was kept at 3mm.

Standard MR imaging protocol, including T1, and T2 images, were obtained in axial and sagittal planes. Axial sections were taken at the disc level and the superior and inferior endplate of the corresponding vertebral levels. Images were interpreted on an MR console by a consultant radiologist with at least ten years of experience in spinal MR imaging. The images were evaluated for degenerative changes, spinal canal stenosis, spondylolisthesis and recess or foraminal narrowing heralding nerve root compressions.

All the record maintenance and data analysis were carried out using Statistical Package for The Social Sciences (SPSS) version 25:00. Mean±SD was calculated for continuous variables. Frequency and percentage were calculated for categorical variables. The chi-square test was used with the *p*-value of ≤0.05 considered as significant.

RESULTS

Amongst 88 patients, the mean age was 30.2±13.53, with male preponderance 52(59.1%). The mean duration of symptoms was 2.3±2.34 years. According to the visual analogue score, most patients had a moderate 39(44.3%) pain scale. A majority, 71(89.7%), experienced radiation of pain to either of the limb or both lower limbs. Thirty-one percent of the patient felt prolonged sitting to be the most aggravating factor, followed by strenuous work and prolonged standing. Upon clinical examination, only four percent had muscle wasting, sixteen per cent had a loss of reflexes, and twenty-one had a loss of power. Upon Lasegue Test, the majority, 43(48.9%), had pain between 30-70° of hip flexion.

MRI findings showed straightening of the spine in 49(55.7%) patients, reversal of lumbar curvature in 10(11.4%), exaggeration of lordosis in 5(5.7%) and normal curvature in 24(27.3%) patients 21(23.8) patients had osteophyte formation. Disc desiccation was present in 52(65%) patients. About 40(45.5%) patients did not have Modic changes.The annular tear was present in 35(41.8%) patients, with the majority of twenty-nine having tears only at one level. Ligamentum flavum hypertrophy was present in 31(45%), facet arthrosis in 30(34.1%), recess compression in 46(53.2%), foraminal narrowing in 39(31.9%) and spondylolisthesis in 11(12.6%) patients.

We compared the Lasegue Test with the Visual analogue pain score for disc desiccation. Laseguetest was found to be more associated (*p*=0.001). Most

Table-I: Lasegue Test Positivity Correlation in Patients with Foraminal Narrowing on MRI (n=88)

Interpretation of Lasegue Test	Severity of Foraminal narrowing on MRI images.				
	No Foraminal Narrowing	Mild Foraminal Narrowing	Moderate Foraminal Narrowing	Severe Foraminal Narrowing	*p*-value
No pain on hip flexion	10(76.5%)	2(15.5%)	1(8%)	0	0.001
Pain between 30-70 degrees of hip flexion	22(51.3%)	13(30.3%)	7(16.2%)	1(2.2%)	
Pain at less than 30 degrees of hip flexion	14(48.2%)	9(31%)	5(17.3%)	1(3.5%)	
Pain at greater than 70 degrees of hip flexion	3(100%)	0	0	0	

positive patients had pain below 30° or between 30° & 70° of hip flexion. Most patients with foraminal narrowing were also positive for Lasegue Test (Table-I). Patients who were negative for pain did not have spinal canal stenosis, as shown in Table-II.

Table-II: Lasegue Test Findings in Patients with Spinal Canal Stenosis (n=88)

Interpretation of Lasegue Test	Spinal Canal Stenosis		
	No Stenosis	Present at One Itervertebral Disc Level	Present at More Than One Intervertebral Disc Level
No pain on hip flexion	13(100%)	-	-

DISCUSSION

The correlation of the symptomology of a patient with radiological findings at imaging plays a vital role in the management of lower backache, causing alleviation of socioeconomic health care burden.[11]

Impairment of the sensory system and elicitation of pain may or may not be a cardinal feature of lumbar disc degenerative disease.[12] Clinical examination of most patients in our study showed that motor examination was impaired more than sensory impairment. There was muscle weakness with loss of power either in unilateral or bilateral limbs. Lee *et al*. also found that there is a significant correlation between muscle weakness and lumbar spinal canal stenosis on MRI.[13]

Straight leg raising test, also known as the Lasegue test, is an effective bedside method and worthwhile tool for assessing and predicting lumbar spinal canal stenosis as an etiological factor of lower backache.[3,14] It is a valid prognostic indicator of spinal canal stenosis. However, it may not accurately predict radiculopathy due to possible nerve root compression at the intervertebral disc due to herniation or resultant neural canal stenosis.[15] On the contrary, our study showed that patients had positive straight leg raising tests with foraminal and lateral recess narrowing, which contains nerve roots and thus helped evaluate the involved intervertebral disc level. Straightening of the spinal curvature related to the postural adaptation to the pain is experienced by a majority of patients. Habibi states that loss of normal lumbar lordotic curve manifested as straightening of curvature may be a valid indicator of intervertebral disc disease.[16] Majority of the patients of our study cohort were found to have this on MRI.

Degeneration of the intervertebral disc is demonstrated as dehydration with loss of high T2 signals within it on MRI, as Modic changes at the opposing endplates, or as an annular tear.[8,9,12] Dehydration of the intervertebral disc occurs due to age-related wear and tear.[8] A study in the United Kingdom reveals that Modic changes seem to hold a specific but insensitive relationship to an irritating degenerated lumbar disc.[17] The most common Modicchange in our patients was documented to be of Type II, which is consistence with the Modic *et al*. study.[18]

A tear of the annulus fibrosis of the intervertebral disc returns a bright signal on T2-weighted images in an MRI of the lumbosacral spine. It is categorised as central, paracentral, foraminal or extraforaminal based on location. In many patients, it is a salient cause of pain in the lower back, with or without radiation to either of the lower limb. Similarly, facet arthropathy and hypertrophy of ligamentumflavum are important cause too of lower backache.[19] Similarly, one of the manifestations of disc degeneration is its herniation and extension beyond its confines to cause compression of the central spinal canal, thecal sac, lateral recess and foramina, depending upon its extent and morphology. Most commonly, it affects L4-L5 intervertebral disc level. This is in accordance with the two locally published studies.[20,21]

CONCLUSION

Lower backache is one of the commonest morbid ailments of the present society, with a great socioeconomic and healthcare burden enticing adequate clinical examination and history. MRI is an effective and advanced tool for the corroboration of findings and for the classification of etiological factors causing lower backache, entailing the treating physician to select an appropriate treatment strategy.

Conflict of Interest: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

JE & AIM: Data acquisition, critical review, approval of the final version to be published.

MEH & RR: Conception, study design, drafting the manuscript, approval of the final version to be published.

ME: Critical review, data analysis, data interpretation, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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