

Degenerative Lumbar Spine findings on MRI in Young Adults presenting with Low Back Pain

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Abstract

Aim: The purpose of this study was to determine the MRI findings in young adult patients presenting with low back pain suggestive of degenerative lumbar spine disease.

Methods: The study was conducted in the Department of Radio-Diagnosis of Pacific Medical College and Hospital, Udaipur, Rajasthan. Participants who fulfilled the inclusion criteria were included in the study and written informed consent were obtained before the start of the procedure. Bio-data, Clinical detail and level of physical activity were obtained and recorded.

Results: Of the 100 patients (52 males and 48 females; age range 18 to 39 years, median [IQR] 33 [14-23]) who were evaluated, 80 (80%) [42 males and 38 females] were found to have lumbar spine diseases. Fifty-six (56%) patients had gradual onset of pain whereas 44 (44%) had sudden onset; 82 (82%) patients had severe pain and most of which were burning in nature (n = 74, 74%). Majority of the patients had radiating pains (n = 62, 62%) that was frequently aggravated by bending down (n = 43, 43%) and alleviated by lying down (n = 90, 90%). The median duration of pain was 4 weeks, with a minimum duration of 1 week and maximum of 14 weeks.

Conclusion: Pain lasting more than 10 weeks is the most common clinical presentation among patients with LBP. Disc protrusion and disc desiccation are the most common findings in patients who present with severe LBP of acute onset in this study. LBP which is radiating in nature is the most common finding in patients with disc protrusion in this study.

Keywords: lower back pain, Magnetic resonance imaging, degenerative lumbar spine

Introduction

Low back pain (LBP) is one of the common indications for MRI in our clinical practice. It is estimated that 70-80% of adults experience low backache at some time during their lives ^[1]. The causes of low back pain include degenerative changes, spinal stenosis, neoplasm, infection, trauma, and inflammatory or arthritic processes. Among these, lumbar disc degeneration is the most commonly diagnosed abnormalities associated with low back pain ^[2]. There are varieties of factors that contribute to this condition. Aging, axial loading of disc,

vascular in growth, and abnormalities in collagen and proteoglycan all contribute to disc degeneration. Disc herniation with radiculopathy and chronic discogenic low back pain are the result of this degenerative process^[3].

MRI is non-invasive imaging technique with excellent spatial and contrast resolution. Hence, it has become the investigation of choice in evaluation of patients with low back pain or radicular pain. It has also emerged as an investigation of choice over the other investigations for a herniated disc and become a gold standard to diagnose herniated disc^[4]. MRI is also useful in planning surgical management of patients with sciatica attributable to lumbar disc herniation^[5].

Magnetic resonance imaging (MRI) has played a significant role in evaluating lumbar-sacral spine as it is able to show clearly any anomaly of the vertebrae, intervertebral disks, spinal cord, the neuroforamina, ligamentum flavum, facet joints and the longitudinal ligaments. The clinicians now prefer MRI to radiographic evaluations because of its high spatial resolution ability providing images that will offer diagnosis of a disease, monitoring treatment response and follow up of patients since it provides conclusive results. It is also used to determine extent of a disease and in follow up of patients. MRI is indicated in most conditions such as severe progressive neurologic deficit, persistent low back pain with features of radiculopathy, spinal stenosis, or when a patient is to undergo surgery where plain X-ray would provide inconclusive results^[6].

Certain lifetime occupation and activities have influenced the development of lumbar spine degeneration diseases^[7], such activities include heavy weight lifting or any work that requires over bending of waist^[8]. A study conducted by Takatala *et al.* (2011) among Finnish young adults with low back pain using MRI found that disc degeneration (Modic changes, Schmorl's nodes), disc bulge, radial tears, spondylosis and sacroiliac joint abnormality were common among sportsmen. The degenerative disc findings are commonly found at L5-S1 level, followed by L4-L5 level^[9].

The purpose of this study was to determine the MRI findings in young adult patients presenting with low back pain suggestive of degenerative lumbar spine disease.

Methods

The study was conducted in the Department of Radio-Diagnosis of Pacific Medical College and Hospital, Udaipur, Rajasthan. Participants who fulfilled the inclusion criteria were included in the study and written informed consent were obtained before the start of the procedure. Bio-data, Clinical detail and level of physical activity were obtained and recorded. 100 patients were included in the study.

Consecutive sampling of young adults aged between 18 to 39-years old who are to undergo MRI Lumbosacral spine evaluation after referral to the department.

Informed consent and ethical approval

Institutional approval for the study was sought from, and granted by Institutional Ethics Committee of Pacific Medical College and Hospital, Udaipur. All patients were briefed about the study; background, aim, risks, benefits and expectations for participation before being consented to participate. Written informed consent (in English or Hindi) were sought from each of the prospective participants in the study prior to enrolment and data collection.

Data collection

Participants were recruited at the MRI room reception station and written informed consent were obtained. Bio-data, Clinical detail and level of physical activity were obtained and recorded.

The MRI scan of the lumbar spine was performed with a 1.5 Tesla MRI machine (Siemens

Medical Systems, Magnetom Essenza with Tim + Dot technology) using a dedicated receive—only spine coil, and a standard protocol specification for young adult in sagittal T1W, T2W, T2W STIR, T2W myelo, sequences. Coronal/axial reformats at levels T12-S1 were obtained.

The MRI images were viewed at the picture archiving and communication system (PACS) workstations. The corresponding radiological reports were made by the principal investigator and supervised by two consultant radiologists with substantial experience in neuroradiology imaging. Any difference in opinion was settled by consensus.

Data was captured for every image using a data collection form that was de-identified to exclude any unique identifier that would reveal the identity of the image. All study data forms were checked for accuracy, completeness and consistency regularly and any identified errors were corrected on the spot. All forms with completed data were sorted, and coded with unique study identifiers.

Results

Table 1: Sociodemographic profiles of the patients

Variable	N%
Sex	
Male	52 (52%)
Female	48 (48%)
Age, median (IQR)	
18-22	8 (8%)
23-27	16 (16%)
28-32	26 (26%)
33-37	24 (24%)
38-42	26 (26%)
Occupation	
Housewife	8 (8%)
Students	16 (16%)
Business	24 (24%)
Professional (formally employed)	50 (50%)

Of the 100 patients (52 males and 48 females; age range 18 to 39 years, median [IQR] 33 [14-23]) who were evaluated, 80 (80%) [42 males and 38 females] were found to have lumbar spine diseases.

Table 2: Pain characterization of the patients

Variable	N%
Duration of pain	
≤ 6 weeks	50 (50%)
> 6-11 weeks	16 (16%)
> 12 weeks	34 (34%)
Onset of pain	
Gradual	56 (56%)
Sudden	44 (44%)
Side of the back affected	
Left	10 (10%)
Right	20 (20%)
Both	70 (70%)
Quality of pain	
Aching	26 (26%)

Burning	74 (74%)
Severity of pain	
Mild	0
Moderate	18 (18%)
Severe	82 (82%)
Aggravating factors	
Bending	43 (43%)
Sitting	40 (40%)
Standing	17 (17%)
Alleviating factors	
Walking	5 (5%)
Sitting	5 (5%)
Lying down	90 (90%)
Distribution	
Localised	38 (38%)
Radiating	62 (62%)

Fifty-six (56%) patients had gradual onset of pain whereas 44 (44%) had sudden onset; 82 (82%) patients had severe pain and most of which were burning in nature (n = 74, 74%). Majority of the patients had radiating pains (n = 62, 62%) that was frequently aggravated by bending down (n = 43, 43%) and alleviated by lying down (n = 90, 90%). The median duration of pain was 4 weeks, with a minimum duration of 1 week and maximum of 14 weeks.

Table 3: Grades of nerve root compression at different level

Compressed nerve	Grade 1	Grade 2	Grade 3
L2	0	0	3
L3	2	3	4
L4	2	5	8
L5	2	10	25
S1	5	10	21

Nerve root compression was observed in 55% of the total cases. Nerve root compromise was also noted most frequently at L4-L5 level (28% of cases), followed by L5-S1 (25%) and L3-L4 (8%) levels in decreasing order of frequency. Grade 3 nerve root compression was the most common and was observed in 61% (61) of cases with nerve root compression.

Discussion

Acute lower back pain is one of the most common reasons for hospital visits. Approximately 33% of adults experience lower back pain in their life, ^[10] and the lifetime prevalence of lower back pain is reported to be 70-85% ^[11]. Despite this high prevalence rate, the cause of lower back pain is difficult to accurately diagnose, and its treatment is costly and results in considerable work day loss. In most cases, the cause of lower back pain, if without any red-flag signs, is a self-controllable disease, and is known to be a benign disease. Red-flag signs include serious neurological defects or organic diseases as tumors, infections, paralytic syndrome, or fractures that require immediate assessment and treatment ^[12]. Diagnostic imaging may have a critical impact on the proper diagnosis of lower back pain and on the treatment decision by providing accurate anatomical information from a therapeutic viewpoint. Magnetic resonance imaging (MRI) enables the visualization of abnormal vertebral findings that could not have previously been revealed ^[13, 14].

Our observation is consistent with observations made in other studies conducted in other regions of the world on similar age groups ^[15]. Most patients in this study had multiple level

disease with the highest prevalence (46%) at the 2 lowest lumbar levels (L4/L5 and L5/S1), which is consistent with observations made by others [15-17]. In a study from Finland on a group aged 20-22 years, Takatalo *et al.* found a 47% prevalence of degeneration diseases of lumbar spine [16]. Osama Al-Saeed *et al.* [15] from Kuwait also compared MRI features between the cases and control groups (16-29 years), they found that 64% had disc degeneration.

There are reports that show that low physical activity (being sedentary) is also associated with increased occurrence of disc degeneration¹⁸ and higher prevalence of LBP in the young adult population [19]. There are also studies which reports that high activities such as competitive sports correlates with increased occurrence of MRI findings of disc abnormality in young adults [20]. Heavy works have also been found to be a risk factor for disc degeneration [22]. In the present study, 75% of the patients reported to be doing moderate to severe (intense) activities, and majority of whom were men. There are studies which reports that high environmental temperatures especially in the tropics is associated with development of disc desiccation [21].

Statistical analysis confirms that age, pain distribution and duration of pain as the independent factors which associated with abnormal MRI findings in our study. This is supported by a large population-based study from Norway [21], Middle East [15] and China [23] which revealed a high prevalence of MRI findings associating with history of chronic pain in the lumbar- sacral region. Literature shows that chronic clinical features of LBP are associated with most features on MRI. This fact is also supported by the current study where patients with history of chronic back pain were found to have MRI features of disc degeneration disease.

In this study, nerve root compression was observed in 55% of the total cases. Among them, central canal stenosis was observed in 70% (79), neural foraminal narrowing in 35.4% (40). Yong *et al.*, [24] conducted study in 56 Japanese patients where they observed spinal stenosis in 34 (59.6%) and foramina narrowing in 17 (29.8%) patients. Findings of disc degeneration are often interpreted as causes of back pain, triggering both medical and surgical interventions, which are sometimes unsuccessful in alleviating the patient's symptoms [25].

Conclusion

Pain lasting more than 10 weeks is the most common clinical presentation among patients with LBP. Disc contour irregularity and disc desiccation are the most common findings in patients who present with severe LBP of acute onset in this study. LBP which is radiating in nature is the most common finding in patients with disc protrusion in this study. This study shows spectrum of MRI findings in patients with low back ache. Disc generation is most common at L4-L5 level.

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