



MRI IMAGE FEATURES WITH AN EVIDENT RELATION TO LOW BACK PAIN

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Abstract

Introduction: Several diagnostic modalities are being used for evaluation of low back pain (LBP) such as conventional radiography, computed tomography scan, bone scan, and ultrasonography. Magnetic resonance imaging (MRI) can give different and improved information about structures in the body. Through MRI, an attempt was made to identify the structural abnormalities at the lumbosacral region.

Objectives: To demonstrate the usefulness of MRI in early detection of various pathologies leading to LBP in the adult age group.

Introduction

Most LBP follows injury or trauma to the back, but pain may also be caused by degenerative conditions, osteoporosis or other bone diseases, infections, or congenital abnormalities in the spine. Obesity, smoking, weight gain stress, inappropriate posture etc. **Magnetic resonance imaging (MRI) is usually used for treatment decision to evaluate causes relating to low back pain (LBP).** MRI is the established diagnostic modality of choice for specific diagnosis in patients with potentially severe underlying conditions (The Red Flags) which including malignancy, vertebral infection, severe/progressive neurological deficits and other serious conditions as recommended in Guidelines, 2007 American College of Physicians and the American Pain Society, Diagnosis and Treatment of LBP (Chou R. et al. 2007)¹, (Last and Hulbert 2009)², (Maus 2010)³, (Sheehan 2010)⁴. Measures will be taken to establish diagnostic criteria based on the MRI findings in different subsets of low back pain. **Several studies have highlighted the sensitivity and specificity of MRI in detecting different spine conditions spondyloarthropathies and disc degeneration.** MRI is also highly sensitive in diagnosing complications of degenerative disc disease as stenosis and nerve root compression.

Key words: Low Back Pain; Magnetic Resonance Imaging; Disc Degeneration

MATERIALS AND METHOD

STUDY TYPE :

This study was a hospital-based cross-sectional study

STUDY PERIOD

This study was carried out at a Tertiary care institute in Eastern India, Kolkata, West Bengal after taking proper ethical clearance, conducted from May 2014 to April 2015

STUDY POPULATION:

The Study population included all patients above 18 years of age or above with LBP with/without radiculopathy referred for lumbar spine MRI to the Department of Radio- Diagnosis, from May 2014 to April 2015.

Inclusion criteria

Patients referred for low back pain in adult age group of both sexes with or without radiculopathy as the primary and only diagnosis or in association with other pre-existing conditions referred for MRI.

EXCLUSION CRITERIA:

1. Patients with MR unsafe devices such as cochlear implants and pacemakers, with ferromagnetic foreign bodies such as surgical prosthesis and aneurysmal clips
2. Patients having claustrophobia.

3. STUDY TOOLS:

4. 1. Questionnaire form/ case record form
5. 2. Written informed consent and counselling
6. 3. MRI Scanner SIEMENS MAGNETOM-C 0.35 Tesla.
7. Sample size-150

8. SAMPLING AND SAMPLE SIZE:

9. All consented patients with LBP with/without radiculopathy referred for lumbar MRI were consecutively included in the study.

10. A total of 158 individuals had lumbar MRI scan from May 2014 to April 2015, but only 154 whom fulfilled the study criterion were considered for the study.

11. The sample size was calculated from the formula $n = Z^2 P(1-P)/E^2$ where

12. n = sample size, Z value at 95% confidence level = (1.96), P = prevalence = 11%, E = error margin (5%).

13. The prevalence of degenerative spinal canal stenosis among patient with LBP is 11%⁷⁸.

14. Therefore $n = (1.96)^2 \times 0.11 (1 - 0.11) / (0.05)^2$

$$n = 150$$

15. Therefore, the sample size required for the study is 150.

Data Collection:

Data was collected by purposive sampling using a proforma.

A standardized data collection form with lists of imaging findings at the lumbo-sacral region including trauma, infective, neoplastic, degenerative changes including Disk degeneration, Modic change, Disk bulge, Disk herniation, Central canal stenosis and Nerve root compression etc.

Age of the patients ranged from 18-82 years; most patients were in the age group between 40 and 59 years. The participants' ($n=154$) had a mean age of 45.3 years and median age of 46 years. Data related to the population are presented in

Percentage distribution of participants by sex

Age	18-39 years	40-59 years	60-82 years
female	19(12.3)	49(31.8)	8(5.1)
male	34(22)	31(20.1)	13(8.4)

Distribution of patients with degenerative imaging findings by age

Findings	18-39yrs $n = 53$	40-59yrs $n = 80$	60yrs above	& Total $n = 154$	p value
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			n = 21		
Disc Degeneration	32(60.3)	60(75.0)	21 (100.0)	113(73.3)	0.002120828
Modic changes	0(0.0)	24(30.0)	2(9.5)	26(16.8)	2.27172E-05
Type I		5			
Type II		19			
Type III			2		
Disc bulge	28(52.8)	63(78.7)	16(76.1)	107(69.4)	0.004950181
Disc herniation	15(28.3)	38(47.5)	6(28.5)	59(38.3)	0.051105837
Spinal canal stenosis	20(37.7)	34(42.5)	9(42.8)	63(40.9)	0.844720666
Nerve root compression/neural foraminal/ lateral recess narrowing	25(47.1)	60(75.0)	18(85.7)	103(66.8)	0.000541994
Facet joint arthropathy				5(3.6%)	
Ligamentum flavum hypertrophy				5(3.6%)	

Results: Majority (86.4%) of patients of LBP were aged below 60 years. Majority (88.3%) of the patients had lumbar spine degenerative disease, which was the most common pattern. Among lumbar degenerative findings, disc degeneration being the most frequent finding seen in 113 (83%) patients, followed by disc bulge 107 (78.6%), nerve root compression 103 (75.7%), disc herniation 59 (43.3%), and central canal stenosis 63 (46.3%). Odds ratio for disc degeneration was 2.6 (95% confidence interval: 1.2-5.5) times in age ≥ 40 years in comparison to age

Discussion

The main objective of the current study was to identify the different MRI patterns of LBP in patients referred to the MRI department of Tertiary care institute for Low Back Pain. Results have shown that MRI is a useful tool in establishing different radiological diagnosis in patients with LBP. In this discussion the final findings of this study in relation to other similar studies carried out in the past will be done so as to be able to come up with a relevant conclusion..

Low back pain and age.

In this study, the mean age of the participants' was 43.5 years and the median was 46 years,. The results of my study corroborates with previous reports from Kenya and Ethiopia showing mean age group affected with low back pain as 40.9 ± 13.2 and 42.4 ± 13.22 respectively. Other studies also report that in USA, Britain and many other countries, LBP is a common occupational disorder; especially in adults of working age , further support to these findings was obtained from study conducted by Quinet et al⁵, who concluded irrespective of etiology, 85-99% of adults show DDD at autopsy by the age of 50 years.

Low back pain and gender

Results show a slightly higher incidence of LBP in males (56.5%) versus females (43.5%). However several previous studies have reported higher incidence of low back pain in females , the difference in the findings can be attributed to number and the type of population sampled. studies have shown that in developed countries functional in capacitance due to LBP as a sequelae of disc degeneration is reported equally in both sexes

Incidence of radiculopathy in patients reporting with low back pain.

In the present study, I report a higher incidence of radiculopathy (56.4%) in patients with low back pain than those without radiculopathy (43.5%). Similar findings have also reported by Biluts et al whose study showed, 92.5% pain, 63.7% numbness and 30.5% neurologic claudication as the three most common presenting symptoms Biluts et al⁶

Lumbar degenerative disc disease in patients with low back pain

Disk degeneration was the most frequent finding observed in 113(83%) patients in this study. The prevalence was observed to increase with age (The incidence in the various range of age groups were 60 to 82 years of age 100%, between 40 to 59 years and in the range 18 to 39 years was 75% and 60% respectively). The difference observed between the age groups was significant (p-value <0.05) and compares well to the findings of other previous studies. The difference in prevalence among young and aged individual could be contributed by aging process. integrity during the normal process of aging and as the disc deteriorate Disc degeneration was slightly more frequent among females (78.9%) as compared to males(67.9%), and the variation observed was statistically significant, similar outcome was also reported by [Teraguchi et al](#) ⁷.

Proportion of degenerated disks (reduction in disk signal intensity) progressively increases with the lower the spine level, and that most common spine levels identified in this study was between L4/L5, which corroborates with previous studies. The possible explanation of this finding can be attributed to the fact that mechanical characteristics of the discs are greater in those that are close to fused lumbar vertebrae therefore favours degeneration and with increased aging there is loss of proteoglycans from the lumbar disc that may culminate into disc degeneration.

The observation that in some cases disk degeneration was not associated with LBP, is similar to the findings from previous report by [Sivas et al](#) (2009) ⁸.

The prevalence of Modic changes (19%), was lower compared to 43% and 23% reported in previous studies, the most common location were L3-L4, L4/L5 and L5/S1. is with previous Recent studies indicate modic changes as a heritable factor associated with disc degeneration ([Juhani et al](#) 2014)⁹.

Conclusion : The study revealed lumbar spine degenerative disease (83%), specifically lumbar disc degeneration at L4/L5 position as the major finding associated with low back pain. The most affected age group was the middle aged mean age (43.5 years) working class and this study showed women showed a slightly more propensity for lumbar degenerative changes. A significant finding in this study was the severity of degeneration associated with the duration of low back pain, , therefore early identification of degenerative changes in patients with low back pain can help in taking appropriate measure for prevention and further aggravation of changes.

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