, Dr Indrani Hazra

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Expert Opinion Article

MRI Predictors of Low back pain:An imaging Based analysis

Dr Debajyoti Konar[1], Dr Indrani Hazra[2*],

[1]Visiting physician HCG EKO Hospital, New Town Kolkata
[2]ESIC PGIMSR and ESIC Medical College,Joka
Correspondence Dr Indrani Hazra ,ihazra@rediffmail.com

Abstract
Introduction: A number of diagnostic techniques, including computed tomography, ultrasonography, bone scans, and traditional radiography, are used to assess low back pain (LBP). Different and better information on the body's structures can be obtained by magnetic resonance imaging (MRI). An attempt was made to determine the structural anomalies at the lumbosacral area using MRI.
Objectives: To assess usefulness of MRI images as a predictor in early detection of various pathologies leading to LBP in the adult age group.

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

Introduction

The majority of LBP is the result of a back injury or trauma, however degenerative disorders, osteoporosis or other bone diseases, infections, or congenital anomalies of the spine can also cause pain. Smoking, weight gain, stress, poor posture, obesity, etc. When making treatment decisions, magnetic resonance imaging (MRI) is typically utilised to assess the reasons of low back pain (LBP).

According to 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), MRI is the recognised diagnostic modality of choice for specific diagnosis in patients with potentially severe underlying conditions (The Red Flags), such as cancer, vertebral infection, severe/progressive neurological deficits, and other serious conditions.

, (Sheehan 2010)4. In various subsets of low back pain, steps will be taken to develop diagnostic criteria based on MRI findings.The sensitivity and specificity of MRI in identifying various spine disorders, such as disc degeneration and spondyloarthropathies, have been demonstrated in a number of investigations.Additionally, MRI is quite sensitive in identifying degenerative disc disease consequences such nerve root compression and stenosis.

MATERIALS AND METHOD

STUDY TYPE :

This study was a hospital-based cross-sectional study

STUDY PERIOD

Following appropriate ethical approval, this study was undertaken from May 2014 to April 2015 in a tertiary care facility in Kolkata, West Bengal, Eastern India.

STUDY POPULATION:

From May 2014 to April 2015, all patients over the age of eighteen who had LBP with or without radiculopathy and were referred to the Department of Radiodiagnosis for lumbar spine MRI were included in the study population.

Inclusion criteria

Patients in the adult age group of both sexes who are referred for an MRI due to low back pain may have radiculopathy as their primary diagnosis or in conjunction with other pre-existing disorders.

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
1. 2.Patients having claustrophobia.
2. **STUDY TOOLS:**
3. 1. Questionnaire form/ case record form
4. 2. Written informed consent and counselling
5. 3. MRI Scanner SIEMENS MAGNETOM-C 0.35 Tesla.
6. Sample size-150
7. **SAMPLING AND SAMPLE SIZE**:
8. All consented patients with LBP with/without radiculopathy referred for lumbar MRI were consecutively included in the study.
9. 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.
10. The sample size was calculated from the formula $n=Z^2P(1-P)/E^2$ where
11. n= sample size, Z value at 95% confidence level = (1.96), P = prevalence = 11%, E = error margin (5%).

12. The prevalence of degenerative spinal canal stenosis among patient with LBP is 11% [78].
13. 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:
Purposive sampling was used to gather data using a proforma.

Lists of imaging findings at the lumbo-sacral region, such as trauma, infectious, neoplastic, and degenerative changes, such as disc degeneration, modic change, disc bulge, disc herniation, central canal stenosis, and nerve root compression, are included in a standardised data collection form.

The patients' ages ranged from 18 to 82, with the majority falling within the 40–59 age range. The median age of the 154 (n=154) participants was 46 years, while the mean age was 45.3 years. Population-related data are displayed 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 n = 21	Total n =154	p value
Disc Degeneration	32(60.3)	60(75.0)	21 (100.0)	113(73.3)	0.002120828
Modic changes Type I Type II Type III	0(0.0)	24(30.0) 5 19	2(9.5) 2	26(16.8)	2.27172E-05
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
Finding the various MRI patterns of low back pain in patients referred to the tertiary care institute's MRI department was the primary goal of the current investigation. According to the findings, MRI is a helpful technique for determining various radiological diagnoses in LBP patients. In order to reach a pertinent conclusion, the final results of this study will be discussed in comparison to other comparable studies that have been conducted in the past.

Low back pain and age.
The participants in this study had a median age of 46 years and a mean age of 43.5 years. My study's findings are consistent with other research from Ethiopia and Kenya, which found that the mean age group affected by low back pain was 42.4 ± 13.22 and 40.9 ± 13.2, respectively. According to other studies, LBP is a common occupational disorder in the USA, Britain, and many other countries, particularly in working-age adults. Quinet et al.5 found that 85–99% of adults had DDD at autopsy by the age of 50, regardless of the cause.

Low back pain and gender
The incidence of LBP is slightly higher in men (56.5%) than in women (43.5%), according to the results. Nonetheless, a number of earlier studies have found that low back pain is more common in women; the discrepancy in the results can be

explained by the size and kind of population that was sampled. Research has demonstrated that functional capacitance caused by LBP as a result of disc degeneration is equally observed in both sexes in developed nations.

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Incidence of radiculopathy in patients reporting with low back pain.

According to the current study, patients with low back pain had a higher incidence of radiculopathy (56.4%) than those without it (43.5%). Similar results were also reported by Biluts et al., who found that the three most prevalent presenting symptoms were 92.5% pain, 63.7% numbness, and 30.5% neurologic claudication.

Lumbar degenerative disc disease in patients with low back pain

In this study, disc degeneration was the most common finding in 113 patients (83%). The incidence was found to rise with age (it was 100% in the age range of 60 to 82 years, 75% in the age range of 40 to 59 years, and 60% in the age range of 18 to 39. There was a significant difference (p-value <0.05) between the age groups, and the results align well with those of other earlier research. The ageing process may be a factor in the disparity in prevalence between young and old people. integrity during the normal ageing process and when the disc deteriorates. Disc degradation was slightly more common in females (78.9%) than in males (67.9%), and the difference was statistically significant. Teraguchi et al. 7 also reported a similar result.

The most common spine levels found in this study were between L4 and L5, which is consistent with earlier research. The proportion of deteriorated discs (a decrease in disc signal intensity) gradually increases with the lower the spine level. This finding may be explained by the fact that discs near fused lumbar vertebrae have stronger mechanical properties, which encourages degeneration. Additionally, as people age, the lumbar disc loses proteoglycans, which may lead to disc degeneration.

The finding that disc degeneration was not always linked to LBP is consistent with earlier research by Sivas et al. (2009) 8.

The most common locations were L3-L4, L4/L5, and L5/S1; the prevalence of Modic alterations (19%) was lower than the 43% and 23% described in earlier research. According to recent research, modic alterations are a heritable feature linked to disc degeneration (Juhani et al., 2014).

Conclusion :The main finding linked to low back pain was lumbar spine degenerative disease (83%), notably lumbar disc degeneration at the L4/L5 location. The middle-aged working-class mean age (43.5 years) was the most affected age group, and this study revealed that women had a marginally higher susceptibility for lumbar degenerative alterations. The intensity of degeneration linked to the length of low back pain was a noteworthy discovery in this study. As a result, early detection of degenerative changes in individuals with low back pain can aid in taking appropriate action to prevent further aggravation of changes.

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