



## The role of MRI in the evaluation of low backache in adults

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### Abstract

Low back pain is a commonly reported musculoskeletal condition in day to day life. The direct and indirect effects of low back pain are enormous in terms of quality of life, productivity and employee absenteeism making a common complaint as a cause of musculoskeletal system (MSK) related disability. <sup>[1]</sup>

Thus, in the absence of more objective diagnostic criteria, most epidemiological studies of low back pain have defined cases simply on the basis of reported symptoms. With this approach, various risk factors have been established, including physical activities that stress the spine. <sup>[2]</sup>

Magnetic resonance imaging (MRI) has opened up new possibilities for refined diagnostic classification of low back pain in epidemiological research. Various abnormalities can be identified on spinal MRI, including disc herniation, nerve root impingement, disc degeneration and annular tear. However, before any of these abnormalities is used in case definition, evidence is needed that it can be measured repeatably and that it is importantly related to the pathogenesis of symptoms and not simply an incidental finding. <sup>[2]</sup>

However, the available literature has shown a widespread inconsistency over the physical, pathological and psychological aspects of low back pain. Hence this study was taken up to determine the sensitivity and probability of MRI in patients with low back pain, as the investigation would also evaluate spinal canal without contrast, multiplanar capabilities, non-invasiveness and high sensitivity with or without enhancement.

**Source of Data:** Patients visiting the department of radio-diagnosis of Sri Siddhartha Medical College for MRI with chronic back pain.

**Method of Collection of Data:** The study is based on number of patients, who are visiting Department of Radio Diagnosis for magnetic resonance imaging from the period of November 2018 to October 2020. Consent will be taken for each case.

**Result:** Out of 85 patients studied 52 (61%) were males and 33 (39%) were females. The age range was from 20-80 years. Low backache with radicular pain was the commonest clinical presentation. The commonest cause of low back ache was degenerative disc disease, most common level being L4-L5

**Interpretation:** In this study we present our experience in the utilization of MRI as a diagnostic tool in the evaluation of low back pain in the adults and its correlation with clinical scenarios.

**Keywords:** MRI, Low backache, adult

### Introduction

Low backache is a remarkably common disability. Hirsch stated that 65% of population is affected by low back pain at some time during their working lives. <sup>[3]</sup>

Low backache is defined as pain occurring between costal margins and gluteal folds. <sup>[4]</sup>

The etiology of low backache is multifactorial and can be broadly classified as spondylogenic, neurogenic, vascular and psychogenic. <sup>[5]</sup>

In spondylogenic it can be subclassified as due to congenital, inflammatory, infectious, traumatic and neoplastic causes <sup>[6]</sup>. Spondylogenic back pain is defined as pain derived from spinal column and its associated structures. The pain may be derived from the lesions involving the bony components of spinal column, changes in the sacroiliac joints or most commonly changes occurring in the soft tissue.

Since these lesions contribute to the most common cause of low back pain seen in clinical practice, the lumbar spine is evaluated in detail. <sup>[5]</sup>

While current diagnostic imaging technology enables a remarkably detailed anatomic assessment, there is also a potential for identification of incidental findings. These incidental findings fall into two main groups: The first is group consisting of morphologically abnormal findings which are not responsible for the symptoms and group consisting of findings that are abnormal and possibly related to symptoms but not relevant to clinical decision making and outcome.

The role of diagnostic imaging in patients with back pain is an important one in today's health care environment. Previous studies have demonstrated a high prevalence of morphologic abnormalities in both symptomatic and asymptomatic individuals. <sup>[7]</sup>

The importance of these findings, the relevance of their changes over time, and their relationship to symptoms is not fully understood. In view of the frequency and substantial effect of this disorder, we sought to prospectively determine the type of magnetic resonance imaging (MRI) findings in patients with chronic low back pain (LBP) with or without

### lower limb radiculopathy

Studies have shown that LBP often begins in childhood and during the early teenage years.<sup>[8]</sup>

The causes of LBP in adolescents and adults are often not known. Magnetic resonance imaging (MRI) studies are useful sources of information regarding lumbar spinal anatomy. The purpose of the study was to describe the prevalence of certain MRI findings in the lumbar spine and to evaluate any possible associations between LBP/care seeking and the MRI findings. Therefore, a prospective study was designed to evaluate the role of MRI in the evaluation of low back pain in adults. However, because almost all lumbar structures can elicit pain.<sup>[9]</sup> It is reasonable to assume that morphologic changes of the lumbar spine also play a role in LBP.

Many imaging modalities are available for the evaluation of chronic low back pain namely Plain radiography, CT, MRI, scintigraphy, discography etc. each of which have their set of advantages and limitations in the identification of the cause of pain.

**Radiography:** Lumbar radiographs may be sufficient for the initial evaluation of low back pain in the setting of recent significant trauma (at any age), osteoporosis and age more than 70 years<sup>[10]</sup>

### Image of radiograph



**Fig 1:** Plain radiograph of the lumbosacral spine. Lateral and Anteroposterior projections.

**Isotope bone scans:** Bone scan is a moderately sensitive test for detecting the presence of tumor, infection, or occult fractures of the vertebrae but not for specifying the diagnosis. The yield is very low in the presence of normal radiographs and laboratory studies and is highest for patients with known malignancy. The test is contraindicated in pregnancy.<sup>[11]</sup>

**Myelography/CT “Plain” myelography** was the mainstay of lumbar herniated disc diagnosis for decades. It is now usually combined with post myelography CT. The combined study is complementary to plain CT or MRI and occasionally more accurate in diagnosing disc herniation, but suffers the disadvantage of requiring lumbar puncture and contrast injection. It may also be useful in surgical planning.<sup>[12, 13]</sup>

**Computed Tomography** CT scans provide superior bone detail but are not quite as useful in depicting disc protrusions when compared with multiplanar MRI. With the added value associated with high quality reformatted sagittal and coronal plane images, CT is useful for depiction of spondylolysis, pseudoarthrosis, Scoliosis and for

postsurgical evaluation of bone graft integrity, surgical fusion and instrumentation.<sup>[14]</sup>

Magnetic Resonance Imaging of the lumbar spine has become the initial imaging technique of choice in complicated LBP, displacing myelography and CT in recent years. MRI with contrast is useful for suspected infection and neoplasia.<sup>[15]</sup>



**Fig 2:** MRI lumbosacral spine

### Aims and Objectives

The aims and objectives of this study were:

- To study the prevalence and MR imaging findings in non-traumatic young adults (20- 80 years) with low back pain.
- To distinguish various causes of low back pain with level of spinal involvement.
- To assess the various marrow signal intensity changes by MRI in lumbosacral region.

### Methodology

To study the prevalence and MRI findings in non-traumatic adults (20- 80 years) with low back pain.

### Source of Data

Patients visiting the department of radio-diagnosis of Sri Siddhartha Medical College for MRI with complaints of chronic back pain to determine the extent of pathological process.

### Inclusion Criteria

- All patients with complaints of low back pain who were referred to the department of radiology for lumbosacral

spine MRI.

- Adults aged between 30 to 80 years.
- Prospectus of surgery.
- Positive signs on x ray.

**Exclusion Criteria**

- Trauma cases
- History of recent surgery
- Pregnant women

**Method of Collection of Data**

The study is based number of patients, who are visiting Department of Radio Diagnosis for magnetic resonance imaging from the period of November 2018 to November 2020. Consent will be taken for each case.

Selection of patient will be based on low back pain on clinical presentation and referral to MRI to detect pathology will be chosen for the study.

SIEMENS MAGNETOM ESSENZA 1.5 Tesla compact superconducting active shielded magnet channel with direct digital sampling.

**Use of surface coils**

Motion suppression technique such as anterior radio frequency saturation bands, gradient moment nulling are critical to reduce motion artefacts.

**Technique**

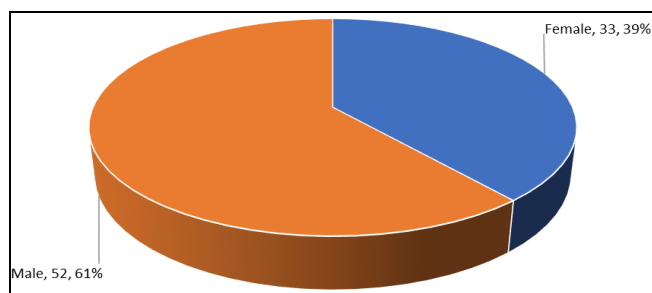
Fast Spin Echo (FSE), T1weighted, T2 weighted, Short Time Inversion Recovery (STIR)

**Planes**

Coronal, Axial, Sagittal

**Results and Observations**

MRI of the lumbosacral spine was performed on 85 patients in the age range of 20-80 years. There were 52 males and 33 females.



**Fig 3:** Gender distribution of study population

**Table 1:** Sex distribution of study population

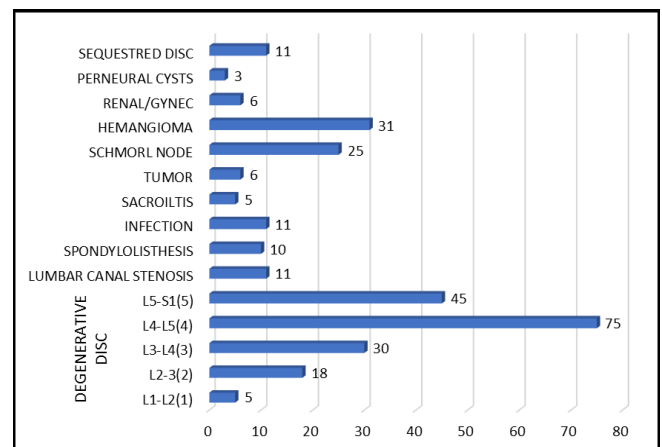
Gender	Frequency	Percent
Female	33	38.8
Male	52	61.2
Total	85	100.0

The following are the various abnormalities found in the MRI scans performed in our study.

**Table 2:** Various MRI abnormalities

Abnormality	Responses	
	Frequency	Percent
Degenerative DISC		
L1-L2(1)	5	1.7%
L2-3(2)	18	6.2%
L3-L4(3)	30	10.3%
L4-L5(4)	75	25.7%
L5-S1(5)	45	15.4%
Lumbar Canal Stenosis	11	3.8%
Spondylolisthesis	10	3.4%
Infection	11	3.8%
SACROILTIS	5	1.7%
Tumor	6	2.1%
SCHMORL Node	25	8.6%
Hemangioma	31	10.6%
Renal/GYNEC	6	2.1%
PERNEURAL Cysts	3	1.0%
SEQUESTRED DISC	11	3.8%
Total	292	100.0%

\*Dichotomy group tabulated at value 1.

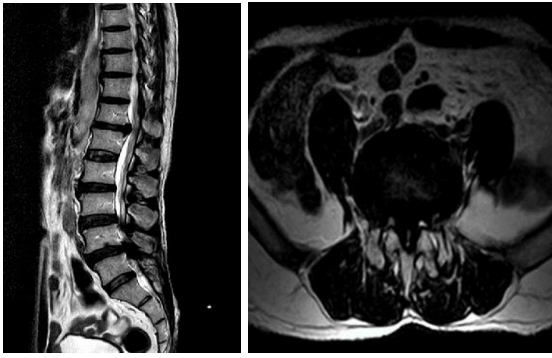


**Fig 4:** Various M.R.I abnormalities

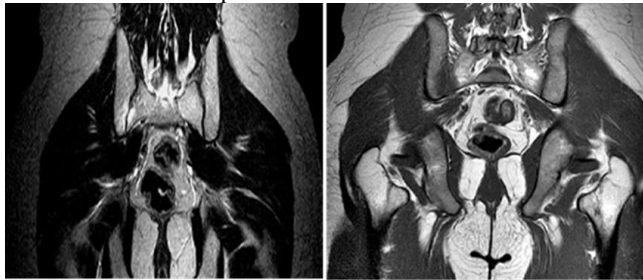


**Fig 5:** Disc desiccation at L5-S1. Diffuse disc bulge with broad based posterior disc bulge and inferior migration of disc, at L5-S1 causing severe compression of bilateral traversing nerve roots (R>L) with severe foraminal and spinal canal stenosis





**Fig 6:** Disc desiccation at all levels with schmorl's nodes. L4-5: Diffuse disc bulge with disc extrusion into bilateral lateral recesses and neural foramina causing complete stenosis of spinal canal causing severe compression of bilateral L5 nerve roots and mild compression of L4 nerve roots



**Fig 7:** Altered signal changes on right side of sacroiliac joint in inferior aspect – Sacroilitis.

### Discussion

All symptomatic patients who came to department of Radiology in the year 2018-2020 were studied. The number of cases studied were 85.

Lumbar disc degeneration is the most common cause of low back pain around the world and the majority is due to disc herniation. Due to development of MRI, non-invasive and excellent imaging of spine is possible.

In our study there were more male (61%) patients compared to female (39%) patients.

Men are more commonly affected to the disc degeneration than women. It is most likely due to the increased mechanical stress and injury<sup>[16]</sup>. The findings of our study were consistent with other studies.

Females (40%) had higher prevalence of low back pain compared to males (Schneider *et al.* 2006 total sample of 5315 persons; Wijnhoven *et al.* 2006).<sup>[17, 18]</sup> It has been associated with hormonal changes, irregular or prolonged menstrual cycle, different pain perception and recall of symptoms (Wedderkopp *et al.* 2005; Wijnhoven *et al.* 2006).<sup>[18, 19]</sup>

### Conclusion

- From the present study it was concluded that MRI is one of the most comprehensive, non-invasive and safe imaging modality for early diagnosis of low backache.
- In our study the frequency of MRI changes in the spine in the symptomatic patients appears to be higher when compared to other reports in the literature and these changes were more frequent in the (51 to 60 years) age group.
- The most common cause of low back ache was degenerative disc disease involving L4-L5 the most.
- Apart from degenerative diseases, other causes of low backache were also diagnosed.

- Finally MRI provides the best global assessment of diseases of bone marrow, disc, posterior vertebral elements, spinal cord and nerve roots.

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