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Critical analysis and MRI evaluation of patients presenting to orthopaedic department with chronic low back pain- A study of 40 cases

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Abstract

Background: More than 60 percent of common people suffer from low back pain (LBP) once in a lifetime. Plain radiography of spine is of little use in determining the cause of LBP. A thorough clinical examination along with magnetic resonance imaging (MRI) evaluation of lumbosacral spine can determine the exact pathology.

Material and methods: A cross-sectional study was carried over 40 patients presenting to orthopaedic department with complaints of chronic low back pain. MRI of lumbosacral spine was done by 1.5 superconductive scanners and clinical correlation was done with MRI findings.

Results: This study included 20 males and 20 females. Average age of patients was 45.7 years. Maximum number of patients belonged to more than 50 years age group. Disc herniation was seen at multiple levels, maximum at L5-S1. MRI showed 10 cases of annular tear, 19 spinal stenosis, 29 nerve root compression, 18 facet arthropathy, 3 cord compression, 13 ligamentum flavum hypertrophy and 2 lumbar vertebral fractures.

Conclusion: MRI, being an expensive investigation should be used judiciously. MRI may be valuable in making an early diagnosis of any serious pathology like infection or malignancy presenting with LBA. We should obtain a detailed history of LBP cases, do a thorough clinical examination, make a provisional diagnosis and then correlate these with MRI to make a final diagnosis.

Keywords: low back pain, magnetic resonance imaging, disc herniation, facet arthropathy

Introduction

Low back pain (LBP) is one of the commonest complaints of patients presenting to orthopaedic departments. Although back pain is reported by adolescents and adults of all ages, yet the peak prevalence is seen in 45 to 60 years age group ^[1]. In most of the cases, it is difficult to make a definite diagnosis of underlying pathology (idiopathic LBP).

LBP may have varied aetiologies

- 1. Primary mechanical derangements:** Like ligamentous strain, muscle spasm, facet joint degeneration, intervertebral disc degeneration or herniation, vertebral compression fracture, vertebral end-plate micro fractures, spondylolisthesis, spinal stenosis, diffuse idiopathic skeletal hyperostosis, Scheuermann's disease.
- 2. Infections:** Like epidural abscess, septic discitis, vertebral osteomyelitis, tuberculosis, bacterial endocarditis, influenza and nonspecific manifestation of any systemic illness.
- 3. Neoplasias:** Like multiple myeloma, lymphoma, primary epidural or intradural tumours, and epidural/vertebral carcinomatous metastases.
- 4. Metabolic diseases:** Like osteoporosis, osteomalacia, ochronosis and hemochromatosis.
- 5. Inflammatory rheumatologic disorders:** Ankylosing spondylitis, reactive spondyloarthropathies (including Reiter's syndrome), psoriatic arthropathy and polymyalgia rheumatica. Other than these it may be referred from retroperitoneal structures, herpes zoster or primary fibromyalgia.

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Magnetic resonance imaging (MRI) of spine is a costly but valuable tool in diagnosing cases of LBP due to spinal stenosis, disc degeneration or herniation, infection, neoplasias, metabolic diseases etc., though computed tomography may be more helpful in some cases of LBP due to fractures. MRI is a non-invasive technique with no known harmful effects. Images may be produced in any plane, in various sequences and exhibit excellent soft tissue contrast. Any lesion identified can be further evaluated with contrast material [2]. Significant association has been observed between MRI of lumbosacral spine findings and clinical findings by Rai GS *et al.* [3], in chronic low back pain. With its high contrast, spatial resolutions and lack of ionizing radiations, MRI may be imaging technique of choice for investigation of LBP.

Although MRI findings are common in asymptomatic people and the association between single MRI findings and LBP is often weak. Sub groups of multiple and severe lumbar MRI findings have a stronger association with LBP than those with milder degrees of degeneration [4].

Aims and objectives

This study was conducted to critically analyse various cases of low back pain to make a clinical diagnosis, to investigate the role of MRI in evaluation of LBP and to establish a differential diagnosis based on MRI

Material and methods

A hospital based cross sectional study was carried out over 40 patients with chief complaint of chronic LBP. After a detailed history and thorough clinical examination, MRI of lumbosacral spine was done in all cases on SIEMENS 1.5 TESLA MRI superconducting magnet.

Inclusion criteria

1. Patients of 20 to 65 years age group with chief complaint of LBP.
2. Radicular LBP radiating to one or both lower limbs.
3. LBP with infective, neoplastic or traumatic history.
4. LBP with associated neurological deficit including bowel and bladder disturbance.

Exclusion criteria

1. Patients having severe claustrophobia.
2. Patients having cardiac pacemakers or any electromagnetic device.

Non contrast T1 weighted, T2 weighted and short tau inversion recovery (STIR) sequences in axial, coronal and sagittal planes were of the involved spine were taken in all cases with use of post contrast images in selected cases.

Observations

Present study included 40 patients who presented to Department of Orthopaedics Government medical college and

hospital, Patiala with chief complaint of chronic LBP and were evaluated with MRI of lumbosacral spine in the department of Radio diagnosis. Mean age of cases was 45.7 years, (20 males and 20 females) with maximum number of cases belonging to more than 50 years age.

Table 1: Age distribution

Age group	Number of patients	Percentage
20-30	8	20.0
30-40	8	20.0
40-50	9	22.5
>50	15	37.5
Total	40	100.0

Table 2: Gender distribution

Sex	Number of patients	Percentage
Females	20	50
Males	20	50
Total	40	100

74% of cases had abnormal lumbar curvature, 15% spondylolisthesis and 15% had transitional vertebra. Osteophytes were observed in 72.5% cases, modic changes in 20% and Schmorl nodes in 17.5%. In 27 cases, discs were desiccated with frequency of disc desiccation increasing downwards being maximum number at L5-S1 level.

Table 3: Spinal canal stenosis

	Number of patients	Percentage
Yes	19	52.5
No	21	47.5

19 (47.5%) cases had spinal canal stenosis. 37 cases showed various types of disc bulge and herniation. Maximum number (67.5%) of cases had asymmetric disc bulge. Among various types of herniation, posterocentral herniation was seen in maximum cases (62.5%).

Table 4: Distribution of disc herniation

Disc level	Number of patients	Percentage
L1-L2	6	15
L2-L3	8	20
L3-L4	12	30
L4-L5	18	45
L5-S1	22	55

Disc herniation was seen at various levels of lumbar spine in MRI evaluation with many patients having multiple level involvements. L5-S1 level was involved in most of the cases. 10 patients had annular tear, 19 had spinal stenosis, 29 nerve root compression and 18 facet arthropathy. Out of 40 cases, 3 had cord compression, 13 ligamentum flavum hypertrophy while 2 had lumbar vertebral fracture.



Fig 1: T2 SAG image showing sequestered disc at the level of L5 vertebral body and schmorl's nodes at inferior end plates of L1 and L4 vertebrae

Table 5: MRI diagnosis distribution of cases

	Number of cases	Percentage
Degenerative disc disease	27	67.5
Diastematomyelia	1	2.5
Filar lipoma	1	2.5
Metastasis	2	5.0
Multiple myeloma	1	2.5
Post op case paraganglioma	1	2.5
Infection	4	10.0
Spinal dysraphism with lipomyelocele	1	2.5
Trauma	2	5.0
Total	40	100

Most of the patients who had some provisional clinical diagnosis for their low back pain and also showed a correlating MRI finding belonged to above 50 years age

group, while age group of 20 to 30 years patients had minimum MRI findings.



Fig 2: T2 AXIAL image showing spinal dysraphism with lipomyelocele at S1 vertebral level.

Table 6: Age and sex distribution of lesions

Lesions	Age 20-30 years	Age 30-40 years	Age 40-50 years	Age >50 years	Males	Females
Spondylolisthesis	0	2	1	3	3	3
Osteophytes	4	6	7	12	13	16
Schmorl nodes	1	2	2	2	5	2
Disc desiccation	8	8	8	14	18	20
Bulge with herniation	6	8	9	14	18	19
Annular tear	1	3	3	3	4	6
Spinal canal stenosis	2	4	5	8	9	10
Nerve root compression	4	6	6	13	15	14
Cord involvement	1	2	1	4	6	2
Modic changes	0	2	2	4	5	3
Facetal arthropathy	1	5	4	8	8	10
Ligamentum flavum hypertrophy	2	1	2	8	8	5

Discussion

While evaluating any case of LBP clinically or by MRI, it is important to rule out psychogenic pain or malingering. A good history combined with physical examination including informal observation (pain behaviour, posture and gait), general examination, neurologic examination and back examination may be sufficient in most of the cases to make an initial treatment plan. Non relieving LBP may need further radiography and in certain cases MRI evaluation to rule out any serious pathology or need of surgical intervention

Most of acute LBP cases have spinal muscle strain or sprain. These patients are generally young; if there are no red flag features then MRI should not be performed within 4 to 6 weeks of symptoms. Many patients have back symptoms that suggest neither nerve root compromise nor any serious underlying conditions^[5].

MRI is the method of choice for the evaluation of disc morphology due to its high specificity (43-97%) and sensitivity (60-100%) for disc herniation (both protrusion and extrusion)^[6]. Imaging does not distinguish symptomatic from asymptomatic radiologic findings particularly in cases of prolapsed intervertebral disc^[7]. Lower specificity of MRI can be attributed to the high prevalence of degeneration (46-93%) and protrusion (20-80%) in asymptomatic adults^[8]. MRI has highest sensitivity and specificity in cases of infections of spine. It is important to distinguish infection from neoplasm. Diffusion weighted imaging with ADC (apparent diffusion coefficient) mapping has shown promise in distinguishing these two entities^[9].

Degenerative disc disease of lumbar spine was seen in majority of cases (84.3%) in a study by Singh R *et al.*^[10] on MRI of 154 cases of LBP. Other findings were trauma 3.5%, infections 5.2%, neoplasm 2.3% and other causes 5.7%. In present study of 40 cases MRI of lumbosacral spine for LBP showed degenerative disc disease in 27 cases, infections in 4 cases, trauma with fracture in 2 cases, metastasis in 2 cases and other causes in 5 cases.

In a cross sectional double blind analysis of 75 cases of prolapsed intervertebral disc disease, Bajpai *et al.*^[11] concluded that there was correlation between clinical findings and MRI. In a study by Shrinivasan *et al.*^[12] most common aetiology of back pain was disc disease and herniation. The age of patients ranged from 21 to 68 years with an average of 41.3 years. Back pain was commonly observed in third to fifth decade. In present study of 40 cases of LBP majority 24 (60%) belonged to third to fifth decade with average age of 45.7 years. Annular tear on MRI was seen in 26.3% cases of LBP by Kim SY^[13] *et al.*, in 14.4% cases by Thapa N *et al.*^[14] and in 25% cases in current study with frequency increasing downwards (maximum at L5-S1)

In a study of MRI for chronic LBP (excluding infection, trauma, malignancy and autoimmune disease cases) in 72 patients, Kohat *et al.*^[15], MRI was abnormal in all cases. The most common finding was disc desiccation (90.3%) followed by facet joint arthropathy (FJA, cases 75%) and nerve root compression (NRC, 72.2%). End plate changes and high intensity zone were noted in 58% and 50% patients respectively. One-third of FJA cases were below 30 years of age. NRC seen on MRI had 61.3% sensitivity and 10% specificity with clinical radiculopathy. FJA had 60.7% sensitivity and 15.9% specificity with localized chronic LBP. None of the MRI abnormality correlated with the severity of pain or disability. In present study NRC was seen in 72.5% and FJA was seen in 45% cases on MRI. Maximum number of cases of NRC (7) and FJA (12) belonged to more than 50

years age group and minimum number of NRC (3) and FJA (1) in 20 to 30 years age group.

Conclusion

MRI, being an expensive investigation should be used judiciously. In cases with unremitting chronic LBP, radiculopathy/worsening neurological symptoms, MRI may be helpful in delineating further treatment plan and need of any surgical intervention. MRI may be valuable in making an early diagnosis of any serious pathology like infection or malignancy presenting with LBP. We should obtain a detailed history of LBP cases, do a thorough clinical examination, make a provisional diagnosis and then correlate these with MRI to make a final diagnosis. Limitation of this study is small sample size.

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