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Original Article

Radiology Section

Application of MRI in the Evaluation of Low Backache

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ABSTRACT

Introduction: Low Backache (LBA) is one of the commonest presenting complaint of patients and it is important to evaluate it. Since degenerative changes and neoplastic lesion present initially with LBA, it is important to differentiate the lesions as degenerative, benign or malignant. Once the lesion is differentiated the patient can be managed appropriately.

Aim: The aim of the study is application of MRI in the evaluation of lower backache.

Materials and Methods: In this cross-sectional study male and female patients with LBA, between the age group 30 years to 70 years were included. Exclusion criteria were history of trauma, surgery, metallic implants. Study was conducted in the Department of Radio-diagnosis of Sree Mookambika Institute of Medical Sciences for a period of 1 year. In patients who had back pain associated with radiculopathy, spinal stenosis, or another specific spinal cause, Magnetic Resonance Imaging (MRI) proved to be essential.

Results: This study shows various conditions which causes LBA and the most common cause of LBA was degenerative disc disease, and the most common position of herniation was posterolateral. Most of the disc herniation was seen at L4-L5 level.

Conclusion: MRI is an important tool in diagnosing the pathology causing LBA and in guiding the clinician in further management of the patient.

Keywords: Disc bulge, Disc herniation, Ligament, Metastasis, Posterolateral

INTRODUCTION

LBA is one of the commonest complaints in patients [1]. It is important to evaluate the cause of the low backache and rule out the causes. In the present scenario MRI plays an important role in evaluation of LBA to identify the pathology [2]. MRI has good soft tissue resolution, disc material can be well visualised, any bony pathology can be identified and pathology in the spinal canal can be found and evaluated. Various sequences are used in MRI study. If any lesion is identified it can be further evaluated with contrast material based on the features in plain MRI [3].

Acute LBA is a common presenting symptom in primary health care. Two thirds of the adult population suffers from LBA at some point of time in their lives [4]. The prevalence of low back pain is as high as 70- 85% [5]. It is often self limiting in majority of the patients. The etiology cannot be ascertained in 95% of the patients, where the patient may have suffered a muscular or ligamentous injury [6,7]. Extensive work up is warranted in cases where there is an association of acute backache with neurological symptoms to look for spinal stenosis, herniated intervertebral disc or cauda equina syndrome which accounts of a minority of the cases (5%). LBA can be categorized as: (i) non specific low back pain, (ii) LBA associated with radiculopathy, (iii) LBA with specific spinal cause which includes patients with neurological deficits or with serious underlying conditions like infections, tumours and patients not responding to therapy as in cases of ankylosing spondylosis or vertebral compression fractures [8].

MATERIALS AND METHODS

It was a cross-sectional institutional based study. This study was conducted in the Department of Radio-diagnosis at Sree Mookambika Institute of Medical Sciences, Kulasekharam, Tamil Nadu, India, for a period of 1 year (July 2015 to July 2016). The sample size was calculated from the prevalence of earlier studies by using R software [9]. The study was approved by Institutional Research Committee and Institutional Human Ethics Committee.

Inclusion Criteria

- Male and female patients with LBA, between the age group 30 years to 70 years.

Exclusion Criteria

- Patients having claustrophobia
- Patients with cardiac pacemaker
- Cochlear implant
- Patients with h/o trauma and surgery
- Other metallic implant

A total of 104 patients were selected for the study. Based on inclusion and exclusion criteria 100 patients were included in the study. (Two patients had previous history of trauma and two patients had previous history of surgery a total of four patients were excluded from the study). The study procedure was explained in detail and informed consent was taken from individual patient. In the study population 54 were females and 46 were males. All were educated and residing in urban and rural areas of Kulasekharam.

Procedure

Patients who complaint of LBA were selected and subjected to MRI (Siemens Essenza, 1.5 tesla). Patients were taken into the MRI room and positioned in supine position on the MRI table and imaging was performed in various sequences. The sequences used in our setting are T1 W.I, T2 W.I, STIR, myelogram and T1 FS. For better diagnosis contrast (Magnavist, Bayer, Germany) was used wherever necessary. Images were acquired in axial, coronal and sagittal planes. Slice thickness of 3 mm.

STATISTICAL ANALYSIS

The data was expressed in number and percentage.

RESULTS

A total of 100 patients were studied for the evaluation of LBA. In this study 46% were males and 54% were females. Based on the aetiology the lesions were categorised as degenerative disc disease, infective, congenital, neoplastic and non traumatic spondylolisthesis. Degenerative disc diseases comprised of annular disc bulge, disc herniation and annular fissures which comprised maximum percentage (74%) in the study population. Congenital causes of low back pain were sacralisation, lumbarisation and perineural cysts. Thirteen (13%) of patients had low backache due to congenital cause. In the congenital causes maximum cases had sacralisation. Three of patients showed infection (tuberculosis) as a cause for LBA. Neoplastic causes were detected in our study was very minimal percentage (2%).These two patients had metastatic lesions. Eight of patients showed non-traumatic spondylolisthesis as the aetiology for LBA [Table/Fig-1].

Etiology	Number	Percentage (%)
Degenerative	74	74
Infective	3	3
Congenital	13	13
Neoplastic	2	2
Non-Traumatic Spondylolisthesis	8	8
Total	100	100

[Table/Fig-1]: Distribution of patients based on the etiology.

In the study a total of 500 discs were observed. Maximum number was posterolateral (right central and left central) (224) followed by central (88) and foraminal (58). It shows the location of herniation in a degenerative disc disease of this, posterolateral disc bulge was most common location seen. Other locations of disc bulge were central and foraminal [Table/Fig-2]. The types of herniation and the intervertebral levels at which these disc bulges were identified. Herniation was mostly seen in L4-L5 intervertebral disc (163) level and the most common type of disc herniation was annular disc bulge (93). Other conditions seen in the study were disc protrusion, disc extrusion and disc sequestration. Least detected type of herniation in the study was disc sequestration [Table/Fig-3]. T2 weighted sagittal showing Grade II anterolisthesis of L4 over L5 vertebra. Intervertebral disc at L4-L5 level shows diffuse annular bulge causing indentation of anterior thecal sac and narrowing of bilateral neural foramina, with

Position of Herniated Disc	Postero-lateral	Central	Foraminal	Total
Number	224	88	58	370
Percentage (%)	60.54	23.78	15.68	100

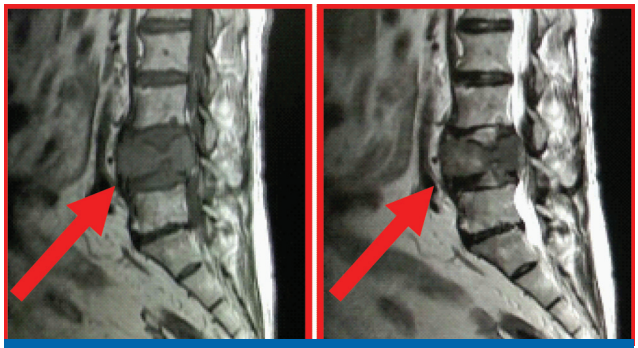
[Table/Fig-2]: Distribution of patients based on the position of herniated disc.

Herniation Types	L1- L2	L2-L3	L3-L4	L4-L5	L5-S1	Number	Percentage (%)
Annular Disc Bulge	9	15	50	93	42	209	56.49
Disc Protrusion	6	5	32	46	21	110	29.73
Disc Extrusion	0	4	8	14	8	34	9.19
Disc Sequestration	0	1	6	10	0	17	4.59
Total	15	25	96	163	71	370	100
Percentage (%)	4.05	6.76	25.95	44.05	19.19	100	

[Table/Fig-3]: Distribution of patients based on disc herniation types.

impingment of bilateral exiting nerve roots [Table/Fig-4]. T1 and T2 weighted images showing metastatic lesion in the L4 vertebral body [Table/Fig-5]. T1 FS post contrast axial image showing enhancing lesion in the body and pedicle of the vertebra [Table/Fig-6]. Spondylisthesis was seen at L4 and L5 [Table/Fig-7] and Disc bulge was observed at L5-S1 position [Table/Fig-8].

[Table/Fig-4]: T2 weighted sagittal showing non-traumatic spondyolisthesis of L4 over L5 vertebra.



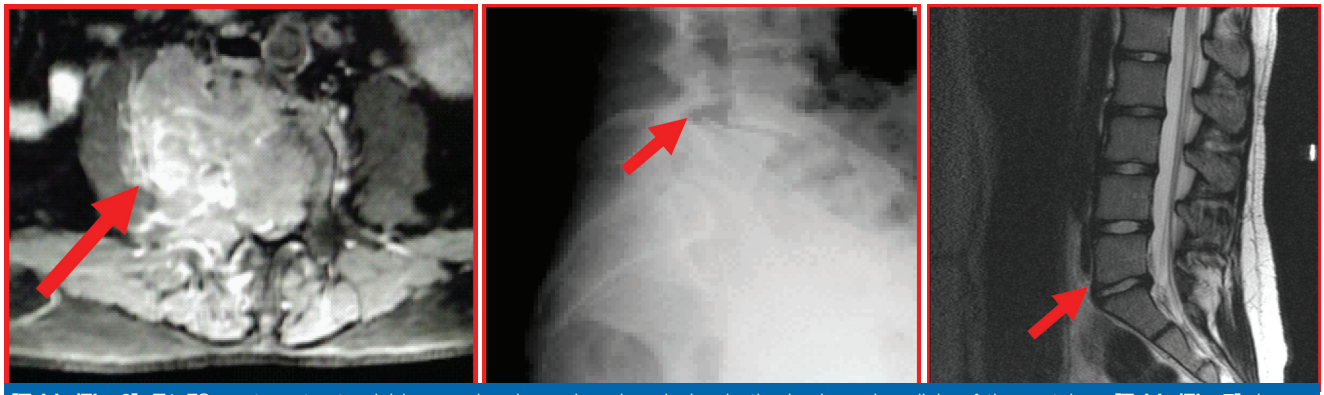
[Table/Fig-5]: T1 and T2 weighted images showing metastatic lesion in the L4 vertebral body.

DISCUSSION

Most common cause of LBA is degenerative disc disease. Other causes of LBA were infective, traumatic, congenital and neoplastic. Degenerative disc disease can be classified as disc bulge or herniation. When the disc material is displaced beyond the edges of the apophysis then it is called disc herniation. Disc herniation can be sub classified as disc protrusion, extrusion and sequestration based on the shape of the material which is herniated. When the distance between the edges of the disc herniation is less than the distance between edges of the base it is called disc protrusion. Migration is the displacement of disc material from the site of extrusion. Migrated disc when it losses continuity with the parent disc is called sequestration. Munter M et al., described annular tear as focal area of T2 hyperintensity which is in annulus fibrosis posteriorly and separate from nucleus pulposis. On contrast posterior annular tear shows enhancement [3]. Jung HS et al., in his study evaluated lumbar spine by MRI to discriminate between metastatic and osteoporotic collapse of vertebra [9]. Abnormal signal intensity in posterior elements or in the pedicle, paraspinal mass, epidural mass or convex post border of vertebral body are the imaging features of metastatic compression fracture on MRI [9-14].

Vertebral end plates and intervertebral discs can be visualized on sagittal and axial T1 and T2 weighted images. On T2WI there is good contrast between the inner, outer parts of annulus, the latter being more fibrous (low signal) and nucleus pulposus in which there is a higher water content (high signal intensity). In a study conducted by Flynn WT et al., the prevalence rate of compression fracture secondary to cancer was 4%, metastasis was seen in 9% of the patients [10].

Battie MC et al., in his study found that 76% of cause for low back ache was degenerative disc disease [11]. Similarly, in our study also we identified that 74% of cause for LBA was degenerative disc disease [15-17]. Knop-Jerges BM et al., in his study stated that most common position of disc herniation



[Table/Fig-6]: T1 FS post contrast axial image showing enhancing lesion in the body and pedicle of the vertebra. **[Table/Fig-7]:** Image showing spondylisthesis of L4 on L5. **[Table/Fig-8]:** Image showing disc bulge at L5-S1.

was postrolateral, which was about 60% [18]. Similarly, in our study also 60% patients had disc herniation in posterolateral position.

LIMITATIONS

Post contrast study was not performed in patients with only degenerative disc disease. All annular tears were not evaluated on post contrast. Follow-up of all patients were not obtained.

CONCLUSION

MRI is very useful imaging modality in detecting the causes of low backache to aid in the appropriate treatment. By using MRI neoplastic lesions are diagnosed and the extent and involvement of the adjacent structures can be evaluated. The operability of the lesion can be assessed.

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