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Role of Magnetic Resonance Imaging in Evaluation of Low Back Pain of Non-Traumatic Causes.

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ABSTRACT

Background: Low back pain (LBP) is a commonly encountered complaint in clinical practice with a significant economic burden to the society. The objective of study was to evaluate the changes seen on MRI in patients with low back pain due to various non-traumatic causes and to distinguish various causes of low back pain with level of spinal involvement. **Methods:** This descriptive observational study was carried from October 2015 to October 2017 in 106 patients with low back pain who underwent MRI of the lower spine at Department of Radio-Diagnosis, Chalmeda AnandRao institute of Medical sciences. Patients who met the inclusion/exclusion criteria were included in the study. **Results:** More than 40% of patients (n=43; 40.57%) were in the age group of 41 to 60 years (Figure 24). There were 29 patients in the age group of 21 to 40 years (27.36%), followed by age group of > 60 years (n =21; 19.8%) and least patients were in the age group of <20 years (n =13; 12.26%. **Conclusions:** We concluded that 106 patients, degenerative changes were the commonest cause for low back pain followed by infective and neoplastic etiologies. The ability of MRI to detect morphological abnormalities, extent of lesion and nerve root compression all help in complete evaluation of low back pain.

Keywords: Low back pain, MRI imaging, degenerative changes, non-traumatic causes.

1

INTRODUCTION

Low back pain (LBP) is a commonly encountered complaint in clinical practice with a significant economic burden to the society. Globally, LBP has been shown to cause more years lived with disability (YLD) that any other condition and is considered as one of the leading causes of disability adjusted life years (DALYs) among the general population.[1]

In India, a high incidence of LBP has been found in individuals who are involved in jobs that require handling heavy loads, constant sitting/standing position or working at improper body position and prolonged working hours. In fact, the causative factors for LBP are very wide and ranges from body habits, work atmosphere, age and gender.[5] However, the commonest cause for LBP is attributed to mechanical disorders, which contribute about 9 out of 10 cases.[4] MRI is the modality of choice for evaluation of spinal cord tumors as it can provide diagnosis or differential diagnoses in majority of cases.[6,7] On magnetic resonance imaging (MRI) studies degenerative changes with intervertebral disc space pathologies are a common cause for low back pain.[8] Other causes include involvement of spinal elements and paraspinal structures, degenerative changes in facet joints, joint effusion, synovitis, sacroilitis, spondylolysis, degenerative and inflammatory processes of the spinal ligaments and pathologies of paraspinal muscles.[9] The aim of study was to evaluate the changes seen on MRI in patients with low back pain due to various non-traumatic causes and to distinguish various causes of low back pain with level of spinal involvement.

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MATERIALS & METHODS

Study Design

This descriptive observational study was carried from October 2015 to October 2017 in 106 patients with low back pain who underwent MRI of the lower spine at Department of Radio-Diagnosis,

Chalmeda AnandRao institute of Medical sciences. Patients who met the inclusion/exclusion criteria were included in the study.

Inclusion Criteria:

- Patients with low-back ache of non-traumatic etiology who underwent MRI of lower spine and had positive findings on MRI.

Exclusion Criteria:

- Patients with previous history of spinal surgery.
- Patients with previous history of spinal trauma.

The study was conducted in patients who underwent MRI for evaluation of low back pain and agreed to participate in the study. An informed consent was taken from the patient before including them in the study. The study was performed on 1.5 T MRI Ge Signa HDxt.

The following sequences of the lower spine were performed: T2 weighted imaging (T2 WI) sagittal spine,

1. T1 weighted imaging (T1 WI) sagittal spine
2. T1 WI axial images of relevant segments of spine
3. T2 WI axial images of relevant segments of spine
4. Coronal short τ wave inversion recovery (STIR) sequence of region of interest,
5. T1 fat saturation (FS) sagittal spine
6. T1 FS axial images of relevant segments of spine

Baseline demographic data was recorded, which included the patient's age, gender, radiculopathy symptoms and clinical diagnosis. The MRI findings were analyzed with regard to location and extent of abnormality, which included degenerative changes, discal abnormality, vertebral end plate changes, ligamental and facetal changes, presence of lesion(s) and its characteristics (such as infective or neoplastic lesions), spinal canal stenosis, congenital abnormalities/conditions and incidental findings, if any. In patients who underwent surgery, MRI findings were correlated with surgical and pathology findings. A total of 50 patients underwent surgery and surgical findings were correlated.

Statistical Analysis

Descriptive statistics was used for data analysis. Microsoft Excel® was used for data analysis.

RESULTS

Table 1: Distribution of Patients Based on Age and Sex Group

Age (in years)	No of patients	Percentage
0-20	13	12.26%
21-40	29	27.36%
41-60	43	40-57%
>60	21	19.81%
Total	106	100 %
Gender		
Males	62	58.49%
Females	44	41.51%
Total	106	100%

The study included a total of 106 patients [Table 4]. More than 40% of patients (n = 43; 40.57%) were in the age group of 41 to 60 years (Figure 24). There were 29 patients in the age group of 21 to 40 years (27.36%), followed by age group of > 60 years (n = 21; 19.8%) and least patients were in the age group of <20 years (n = 13; 12.26%.

Gender-wise distribution of patients There was slight male preponderance in the study with 58% of patients being males (n=62).

Table 2: MRI Diagnosis of various causes of Low Back Pain

MRI Diagnosis	No of Patients	Percentage
Degenerative changes	87	82.08
Infective	20	18.87
Inflammatory	4	3.77
Neoplastic	11	10.38
Congenital	4	3.77
Arachnoid cyst	2	1.89

On MRI, degenerative changes were the commonest findings in more than 50% of patients (n = 87; 82.08%) followed by infective (n = 20; 18.87%) and neoplastic (n = 11; 10.38 %) etiologies. Four patients each had inflammatory and congenital etiologies (3.77%). Arachnoid cyst was seen in two patients (1.89%) [Table 2].

A total of 65 patients had degenerative changes only and was therefore considered to be cause for low back pain. Remaining 22 patients had additional diagnosis of tuberculosis of spine (n= 7), metastases (n=6), sacroilitis (n=4), arachnoid cyst(n=2), arteriovenous malformation, multiple myeloma and sacral chordoma(n=1each). In these patients degenerative changes were not considered as the primary cause for low back pain.

Table 3: Type of Degenerative changes

Degenerative changes	No of Patients	Percentage
Disc changes	76	71.7%
End plate changes	63	59.4%
Vertebral changes	58	54.7%
Joint and ligament changes	44	41.5%
Radiculopathy		
Right	20	18.87%
Left	12	11.32%
Bilateral	52	49.06%

Nearly half of the patients (n=52, 49.02%) had bilateral radiculopathy followed by radiculopathy on right side (n=20, 18.87%) and lastly left sided radiculopathy in (n=12, 11.32%) [Table 3].

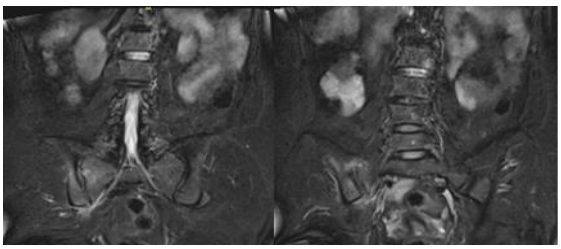

Figure 1: Sacroilitis- MRI Showing Marrow Edema Adjacent to right sacroiliac joint associated with irregularity of articular Margins.

Figure 2: Intradural extramedullary tumour- intradural extramedullary lesion at T11-T12 vertebral level on right side abutting right exiting nerve root with foraminal extension and widening.

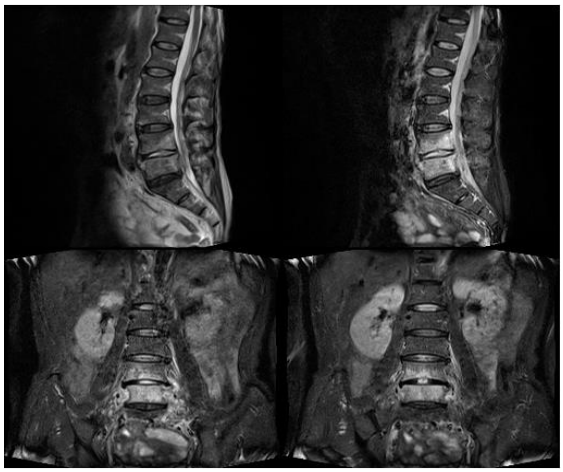

Figure 3: Tubercular Spondylodiscits -MRI showing marrow edema with irregularity of articular margins, paravertebral collection and altered signal intensities at L4-L5 IV disc level.

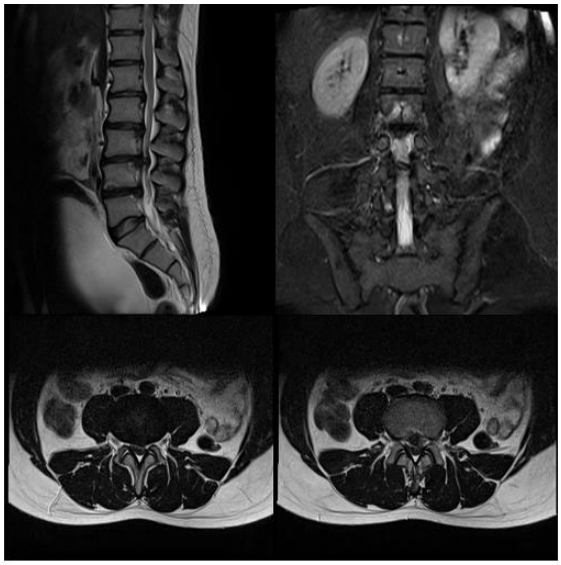

Figure 4: Degenerative Disc disease- MRI showing multi level disc degeneration in the form of disc extrusion, protrusions with endplate modic changes

DISCUSSION

The aim of the study was to evaluate the changes seen on MRI in patients with low backache due to various non-traumatic causes, to distinguish various causes of low back pain with level of spinal involvement.

In our study, there were four cases of sacroilitis (bilateral in three patients and unilateral in one patient on left side). Bone marrow edema along the sacroiliac joints 120 was the most common feature and was seen in three patients. Subchondral edema and erosions were seen in two patients and sclerosis was seen in one patient. MRI changes are considered as the earliest signs for sacroilitis.

Degenerative changes were observed in 87 patients in our study. Among degenerative changes, degenerative disc changes were the most common abnormality seen in >70% of patients (71.7%) followed by endplate changes (59.4%), vertebral changes (54.7%) joint and ligament changes (41.5%). Among disc changes, disc bulges were most commonly seen in 43.7%, followed by disc protrusion (22.52%), annular fissure/tears (13.25%), disc extrusion (12.25%) and disc sequestration (25 discs; 8.28%).

The most commonly affected discs were L4-5 followed by L5-S1 and L3-4. L1-2 and L2-3 were least commonly affected discs. L4-5 was the commonest location for disc bulge (40.15%), disc protrusion (45.59%), disc extrusion (56.76%), disc sequestration (64%) and annular fissure/tears (42.5%) followed by L5-S1 and L3-4 levels.

Our results are in contrast to the gender distribution observed by other studies. The difference in gender distribution in our study is probably due to the fact that we have included patients who underwent MRI for low back pain. Not all patients with low back

pain undergo MRI, and this may have resulted in more males in our study.

Nearly half of the patients (49.02 %) in our study had bilateral radiculopathy, radiculopathy on right side (18.87%) and lastly left sided radiculopathy in (11.32%). Radiculopathy was seen in 55 of 87 patients with degenerative changes (63.2%).

Similarly radiculopathy was seen in more than 2/3rd of patients with Pott's spine (11 of 16 patients; 68.75%) and 7 of 8 patients with metastasis (87.5%). All the patients with radiculopathy had nerve root impingement/compression on MRI.

In present study, central disc protrusions were seen in >40% of involved discs (41.18%) followed by right paracentral disc protrusion (36.76%) and lastly left paracentral disc protrusion (22.06%). Taken together paracentral disc herniations were the commonest type of disc herniation seen in our study (58.8% of disc protrusions). Our results are similar to study by Gopalakrishnan et al. They observed that paracentral disc herniation was commonest type of disc herniation seen in about 65% of patients followed by central disc herniation (30%) and foraminal disc herniation (5%).[7]

The current study showed that vertebral end plate changes were seen in the form of Schmorl's nodes in 48 patients and Modic endplate changes seen in 51 patients. Type II Modic end plate changes were commonest and seen in 37 patients (72.55%) followed by type I (15.69%) and type III Modic end plate changes (11.76%). Yu et al in their study of end plate changes found type II changes to be commonest followed by type I and lastly type III, which was very rare and was seen in only one patient.[9]

Out of this 37 patients were 40 years or older (72.55%). Our study findings were similar to findings reported by O'Neill et al who conducted a population based survey in 1180 individuals to determine the frequency and distribution of osteophytes. They found that vertebral osteophytes were seen in about 84% of men and 74% of women and showed increasing frequency with advancing age.[10]

MRI is considered to be highly sensitive for diagnosis of degenerative changes of spine in patients with low back pain. However, specificity of MRI is low, as degenerative changes of the spine are also seen in many asymptomatic individuals. However, current evidence suggests that disc bulges and protrusions have poor correlation to symptoms. Disc extrusions are almost always associated with symptoms and therefore may be considered as predictors of response to treatment.[8]

CONCLUSION

We concluded that 106 patients, degenerative changes were the commonest cause for low back pain followed by infective and neoplastic etiologies. MRI provides most precise visualization of all spinal elements and paraspinal soft tissues. Additionally, the ability of MRI to detect disc and vertebral signal changes has made it an investigation of choice for evaluation of low back pain. Our study underscores the importance of MRI in evaluation of low back pain. The ability of MRI to detect morphological abnormalities, extent of lesion and nerve root compression all help in complete evaluation of low back pain.

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