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MRI Evaluation of Modic Changes and Schmorl's Nodes in Patients with Low Back Pain

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Abstract: ***Background: The prevalence of LBP in Indian population has been found to vary between 6.2% (in general population) to 92% (in construction workers). Many structural components of spine are responsible for low backpain of degenerative etiology including the intervertebral disc, vertebral periosteum, facet joints and spinal ligaments. Aims: The aim of this study was to assess the role of MRI in the evaluation of Modic changes and Schmorl's nodes in patients with low backpain. Material and Methods: This cross-sectional study was conducted on forty patients with chief complaint of low back pain. Results: Of the 40 patients evaluated with MRI lumbosacral spine for low backpain, Modic changes were seen in 8 patients (20.0%) and Schmorl's nodes were seen in 7 patients (17.5%). Conclusion: It was concluded that MRI is a useful and safe modality for the evaluation of lumbar vertebral pathologies like Modic changes and Schmorl's nodes in patients with LBP.***

Keywords: low backpain, Modic changes, Schmorl's nodes, MRI

1. Introduction

The prevalence of LBP in Indian population has been found to vary between 6.2% (in general population) to 92% (in construction workers).

Many structural components of spine are responsible for low backpain of degenerative etiology including the intervertebral disc, vertebral periosteum, facet joints and spinal ligaments.

Modic et al described three types of endplate changes referred to as **Modic changes**. Type 1 is low signal on T1-weighted images and high signal on T2-weighted images and likely represents endplate edema. Type 2 is high signal on T1-weighted images and on T2 fast spin-echo images but is dark on fat-suppressed sequences and likely represents fat. Type 3 is low signal on both T1- and T2-weighted sequences and represents endplate sclerosis. These endplate changes are commonly referred to as "Modic" changes. [1]

Schmorl's nodes (SN) correspond to herniation of the intervertebral disc nuclear material of variable sizes (typically>2mm) through the cartilaginous and bony endplate into the body of the adjacent vertebra. They are commonly asymptomatic and incidentally found in 38% to 76% of the population, with a male predominance.[2] They classically affect the thoracic and lumbar vertebrae, especially in the T7-L1 regions, and the inferior middle part of the vertebral body. Their etiology still remains unclear and debated. The common hypothesis suspected in SN formation is a cartilaginous end plate weakness of the vertebrae related to several mechanisms including vascular, traumatic or degenerative causes, due to Scheuermann's disease [3], bone fragility [4], or immunologic factors.

2. Materials and Methods

This cross-sectional study was carried out on 40 patients with chief complaint of low back pain in Department of Radio diagnosis, Government Medical College, Rajindra Hospital, Patiala which were referred to our department for MRI from the outpatient department and emergency from the Department of orthopedics. A detailed history along with complete clinical examination was done before the MRI examination.

Patient Preparation
Before evaluating a patient by MRI imaging informed consent was obtained from the patient or guardian and the procedure was briefly explained to the patient or guardian.

Inclusion criteria
1) Patients of age (20-65 years) with chief complaint of low back pain who were referred for MRI to Department of Radiology, Government medical college and Rajindra hospital Patiala.
2) Radicular low back pain radiating to one or both lower limbs.
3) LBP Associated with neurological deficits including bowel and bladder disturbances.
4) LBP with some infective, neoplastic or truamatic history.

Exclusion criteria
1) Patients having cardiac pacemakers and electromagnetic implants.
2) Non manageable severe claustrophobia.
3) Age (less than 20 years and more than 65 years)
4) Patient who refused to give consent.

Study equipment
SIEMENS 1.5 TESLA MRI superconducting magnet. Standard surface coils and body coils for lumbar spine for acquisition of images.

Sequences
Conventional spin echo sequences T1WI, T2WI, STIR sag, T1WI axial, T2WI axial and post contrast T1 axial, sag and coronal.

Technique
MRI LUMBOSACRAL SPINE was done in all cases on SIEMENS 1.5 TESLA MRI superconducting magnet. Initially non contrast T1 weighted (T1W), T2 weighted (T2W) and short tau inversion recovery (STIR) sequences in axial, sagittal and coronal planes of the involved spine will be taken. Then post-contrast T1 sequence will be obtained by using intravenous administration of gadodiamide (GdDTPA-BMA) of 0.2 mmol/kg doses, in axial, coronal and sagittal planes in selected cases. Several parameters that were noted on MRI are described in performa.

3. Study Analysis

A total of 40 patients were included in this study. Informed consent was taken from all the subjects before starting the study. After fulfillment of all the inclusion and exclusion criteria, MR imaging of LUMBOSACRAL SPINE was done by various MR techniques by 1.5-T superconductive scanner (Siemens 1.5T Magnetom aera MRI machine).

4. Results

Table 1: Distribution of Modic changes

Modic changes	Number of patients	Percentage
No	32	80
Yes	8	20
Total	40	100

Of the 40 patients evaluated with MRI lumbosacral spine for low backpain, Modic changes were seen in 8 patients (20.0%).

Distribution of Modic changes

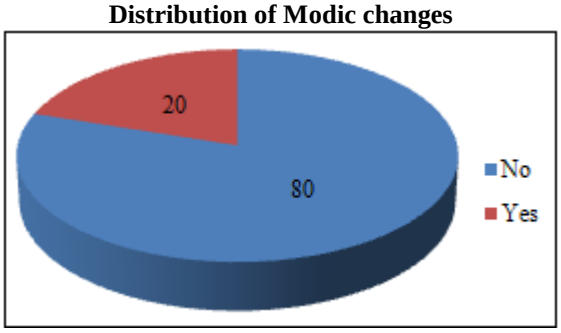
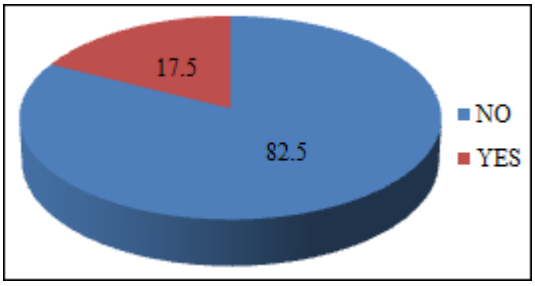


Table 2: Distribution of Schmorl's nodes

Number of patients	Number of patients	Percentage
No	33	82.5
Yes	7	17.5
Total	40	100

Of the 40 patients evaluated with MRI lumbosacral spine for low backpain, Schmorl's nodes were seen in 7 patients (17.5%).

Distribution of Schmorl's nodes



5. Discussion

In the present study, Modic changes were seen in 8 patients (20.0%). This is in concordance with the study of Kohat et al[5] (2017) who reported Modic changes in 20% of 474 patients referred for lumbar MRI. In another similar study conducted by Noha Mohammed Osman et al[6] (2017), Modic changes were seen in 24.3% of patients. In the study conducted by Rohini et al[7] (2017) on 158 patients with low back pain to assess the role of MRI, Modic changes were seen in 19.1% of patients.

In the present study, Schmorl's nodes were seen in 7 out of 40 patients (17.5%). This is in concordance with the study of Kohat et al[5] (2017) who reported Schmorl's nodes in 12.5% of patients referred for lumbar MRI. In another study conducted by Williams et al[8] (2007) on 516 patients, Schmorl's nodes were found in 30% of patients and there was seen a positive association between SN and lumbar disc disease.

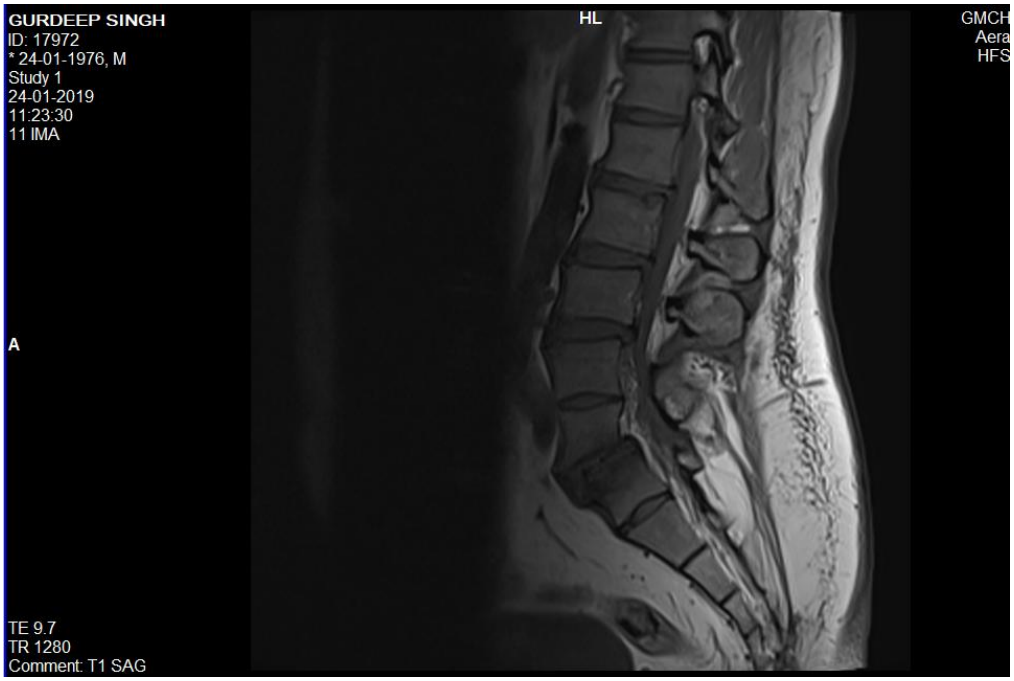


Figure (A): T1 SAG Image showing Modic type III changes at superior end plate of S1 vertebra.

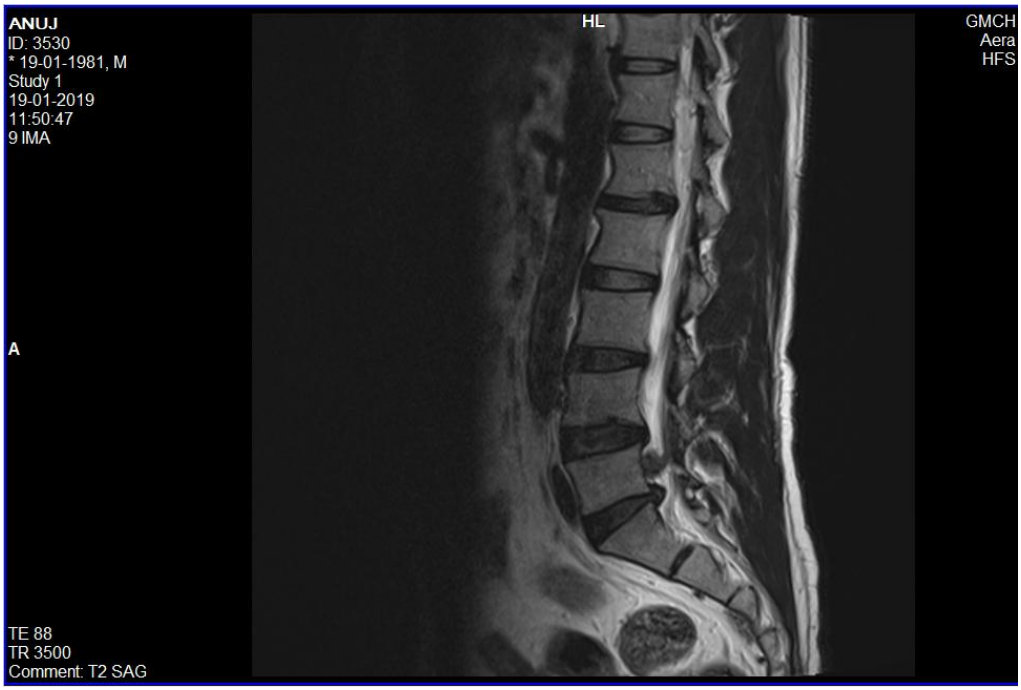


Figure (B): T2 SAG Image showing sequestered disc at the level of L5 vertebral body and schmorl's nodes at inferior end plates of L1 and L4 vertebrae

6. Conclusion

Based on the results of our study the following conclusions can be made:

1) Of the 40 patients evaluated with MRI lumbosacral spine for low backpain, Modic changes were seen in 8 patients (20.0%).
2) Of the 40 patients evaluated with MRI lumbosacral spine for low backpain, Schmorl's nodes were seen in 7 patients (17.5%).

Thus MRI is a useful and safe modality for the evaluation of lumbar vertebral pathologies like Modic changes and Schmorl's nodes in patients with LBP.

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