

# Magnetic Resonance Imaging (MRI) Findings in Spinal Tuberculosis

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## ABSTRACT

**Aim:** To determine the MRI findings in spinal tuberculosis

**Methods:** The descriptive study was conducted at the Department of Radiology, Children Hospital, Institute of Child Health, Lahore from 7-01-2013 to 6-10-2013. A total number of 109 known cases of tuberculosis of both the sexes were included in this study. It was descriptive study. Patients were selected by non-probability convenience sampling. Patients were diagnosed on the basis of clinical examination, history and following investigations: Sputum cytology, CBC, and ESR. Chest X-ray also performed for the diagnosis of pulmonary tuberculosis. Gold standard of the diagnosis of inflammatory lesion of spine was histopathological biopsies. All features of MRI observed in biopsy proven cases were carefully evaluated.

**Results:** Age of the patients ranged between 5-50 year. Mean age of the patients was 34.91±7.33. Out of 109 cases of tuberculous spine 62 (56.9%) were male and 47 (43.1%) were female. Most common clinical features of spinal tuberculosis were low grade fever 84.4% and backache 65.1%. MRI findings of spinal tuberculosis were found as follows: reduced inter- vertebral disc space 95 (87.2%), wedge collapse of body 35 (32.1%), complete destruction of body 42 (39.5%), paraspinal abscess, calcification 34 (31.2%) and cord compression 28 (25.7%)

**Conclusion:** MRI is a great diagnostic modality for spinal TB as well as being more sensitive than plain radiography. It offers the diagnosis of spinal TB earlier than conventional methods offering the advantages of earlier diagnosis and treatment.

**Keywords:** Spinal tuberculosis, MRI findings, Gadolinium

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## INTRODUCTION

Spinal tuberculosis is one kind of older diseases known to human-beings and has been found in Egyptian mummies dating back to 3400 BC.<sup>1</sup> In 1778 Percival Pott first identified spine tuberculosis classically. Spine tuberculosis is the frequent type of skeletal tuberculosis along with 50 percent of all cases of tuberculosis of bones and joints.<sup>2</sup>

Tuberculosis, as a result of Mycobacterium tuberculosis, continues to be a main public health issue, especially in developing nations around the world where poverty, malnutrition, as well as existence of drug-resistant strains have merged to aid the spread of the disease.<sup>3</sup>

Spinal tuberculosis is a devastating type of tuberculosis. It accounts for about fifty percent of all cases of musculoskeletal tuberculosis. Spinal tuberculosis is a bit more frequent in children and adolescents. The prevalence of spinal tuberculosis is elevating in developed nations around the world. Inherited susceptibility to spinal tuberculosis has recently been proven.<sup>4</sup>

The exact incidence and prevalence of spinal tuberculosis in most parts of the world are not known. In countries with a high burden of pulmonary tuberculosis, the incidence is expected to be proportionately high.<sup>5</sup>

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Neurologic issues are the most awful complication of spinal tuberculosis. The patients having paraplegia develop in the active phase of tuberculosis of the spine need active remedy for spinal tuberculosis as well as have a better prognosis as compared to the patients which have paraplegia develop a number of years after the early disease has healed.<sup>6</sup>

The dismal outcome of tuberculosis of the spine in the pre-antibiotic era has improved significantly as a consequence of the usage of potent antituberculous drugs, contemporary diagnostic aids and developments in surgical treatment. MRI enables the diagnosis of a tuberculous lesion, with a sensitivity of 100% and specificity of 88%, well before deformity occurs.<sup>7</sup>

In the technique of coping with spinal diseases, clinicians have faced the problem of diagnosis despite advanced imaging research, subjecting patients to invasive procedures for final diagnosis. Tuberculosis of the spine is one of the commonest vertebral lesion experienced on a daily basis in the neurosurgical practice in an endemic country similar to India which includes an extremely high incidence of pulmonary tuberculosis as well as around 1.7% of patients with pulmonary tuberculosis have spinal tuberculosis.<sup>8</sup> MRI Imaging of spinal infections needs the usage of a combination of T1 weighted and T2-weighted or STIR sequences. MRI scans usually demonstrate loss of cortical definition of the affected vertebral segments.<sup>9</sup>

MRI is an ideal modality for detecting Spinal Tuberculosis early, assessing the extent of disease and identifying complications such as cord compression, vertebral deformity, paravertebral and epidural abscess. The use of gadolinium is promising in detecting the disease earlier as it invariably results in bone enhancement and may assist in making the diagnosis when the rim enhancing pattern of soft tissue mass is demonstrated.<sup>10</sup> In a study carried out by Bajwa<sup>11</sup> demonstrated that MRI findings of tuberculosis spine were as follows: reduced intervertebral disc space (95%) cases, wedge collapse of body 18(30%), complete destruction of body 12(20%), paraspinal abscess 24(40%). Calcification in 18(30%) and cord compression 16 cases (26.6%).

## METHODOLOGY

The study was carried out at the Department of Radiology, Children Hospital, Institute of Child Health, Lahore from 7-01-2013 to 6-10-2013. One hundred and nine known patients of tuberculosis fulfilling inclusion criteria were selected in this study. Study design was descriptive and patients were selected by non-probability convenience sampling. Calculated sample size was 109 patients by taking 95% confidence interval, 7.5% margin of error and 20% expected frequency of complete destruction of body.<sup>11</sup> Patients were diagnosed on the basis of clinical examination, history and following investigations: Sputum cytology, CBC, and ESR. Chest X-ray also performed for the diagnosis of pulmonary tuberculosis. Gold standard of the diagnosis of inflammatory lesion of spine was histopathological biopsies. All features of MRI observed in biopsy proven cases were carefully evaluated. Clinical features included low grade fever, backache, paraparesis, bowel bladder involvement, scoliotic deformity, kyphotic deformity, history of contact with TB patients. Exclusion criteria were those who presented having backache associated with neurological symptoms due to metastatic disease, trauma and discogenic problems. Histological findings for diagnosis were numbers of granulomas, epithelioid cells and Langhans type giant cells. MRI findings of spinal tuberculosis were as follows: reduced intervertebral disc space cases, wedge collapse of body, complete destruction of body, paraspinal abscess, calcification and cord compression.

Patient's criteria were; increased vertebral intensity in T2-weighted images and low intensity signal in T1-weighted images. Erosion of vertebral end plates and reduced intervertebral disc space, paravertebral mass, epidural collection, deformity of vertebrae and cord compression. MRI was performed with superconducting system operating at 1.5T (MR Gyro Scan Philips) T1

and T2 weighted sagittal and axial images were obtained with spinal sequences with TR/TE of 500/60, 2040 and 1800-2000, 60-90 respectively. In selected cases T2 coronal and T1 coronal specially after contrast were performed. Post contrast images were repeated in T1 sagittal and axial planes using Gd-DTPA in a dose of 0.1 mmol/kg body weight. Mostly slice thickness was 4mm in sagittal plane and 3.5mm in coronal plane with 1 mm interslice gap.

## RESULTS

Age of the patients ranged between 5-50 year. Mean age of the patients was 34.91±7.33 years (Table 1). Out of 109 cases of tuberculous spine 62(56.9%) were male and 47(43.1%) were female (Table 2). Thoracolumbar region was most common in the study 52(47.7%), followed by thoracic spine 24 (22.0%), lumbar spine 21 (19.3%), cervical spine 9 (8.3%) and diffuse involvement 3(2.7%) (Table 3). Most common clinical features of spinal tuberculosis were low grade fever 84.4% and backache 65.1% (Table 4). MRI findings of spinal tuberculosis were found as follows: reduced inter-vertebral disc space 95 (87.2%), wedge collapse of body 35 (32.1%), complete destruction of body 42(39.5%), paraspinal abscess, calcification 34(31.2%) and cord compression 28(25.7%) (Table 5).

Table 1: Distribution of age (n = 109)

Age (Year)	n	%
5-20	27	24.8
21-30	13	11.9
31-40	42	38.5
41-50	27	24.8
<b>Mean±SD</b>	<b>34.91±7.33</b>	

Table 2: Distribution of gender (n = 109)

Gender	n	%
Male	62	56.9
Female	47	43.1

Table 3: Distribution of spinal tuberculosis according to region (n = 109)

Region	n	%
Cervical spine	9	08.3
Thoracic spine	24	22.0
Thoracolumbar	52	47.7
Lumbar spine	21	19.3
Diffuse involvement	03	02.7

Table 4: Clinical features of spinal tuberculosis (n=109)

Region	n	%
Backache	71	65.1
Low grade fever	92	84.4
Kyphotic deformity	63	57.8
History of contact with TB patients	58	53.2
Scoliotic deformity	30	27.5
Paraparesis	47	43.1
Bowel bladder involvement	56	51.4

Table-5: MRI findings of spinal tuberculosis (n=109)

MRI Findings	n.	%
Reduced inter - vertebral disc space	95	87.2
Wedge collapse of body	35	32.1
Complete destruction of body	42	39.5
Paraspinal abscess, calcification	34	31.2
Cord compression.	28	25.7

## DISCUSSION

Tuberculous spondylitis can occur in almost any age. Middle aged people are the characteristically suffering with tuberculous spinal infection.<sup>12</sup> In present study, the most frequent age group with tuberculous spinal infection was 31-40 years (38.5%), In European as well as other developed countries, tuberculosis is a delayed presentation simply because only risk factor which play crucial role for the progression of this condition is immunocompromised states such as diabetes, old age and more recently AIDS.

The presenting complaints depend on the stage of the disease and the level of cord involvement. Because of multiplier capability of MRI, imaging of large area of spine can be done in the sagittal, coronal and axial planes. There is no exposure to radiation as compared to other imaging modalities. MRI has been of great value in early detection of soft tissue masses and extent of vertebral destruction along with involvement of intervening disc, which are not easily identified in routine radiograph.<sup>13</sup>

In our study all cases demonstrated disk hypointensity on T1-weighted images, disk hyperintensity on T2-weighted images. Affected vertebral bodies were hypointense on T1-weighted images and hyperintense on T2-weighted images, with signal intensity increase on contrast enhanced images. This also augmented the findings of Yilmaz et al had demonstrated the same findings.<sup>14</sup>

Male preponderance was reported by Chuo et al<sup>15</sup>, as it was evident in my study while in another study carried out by Mulleman et al,<sup>16</sup> female preponderance was reported.

In present study, low grade fever in 84.4%, backache was noted in 65.1%, bowel-bladder involvement in 51.4% and paraparesis in 43.1% patients. Comparable results have been demonstrated by Jain et al, Javtic and Alothman et al in their study.<sup>17-19</sup>

Our study reveals spinal tuberculosis according to region as follows: cervical spine 8.3%, Thoracic spine 22.0%, Thoracolumbar 47.7%, lumbar spine 19.3%, diffuse involvement in 2.7% of cases. Similar results were observed in a study by Bajwa at District Headquarter Teaching Hospital Sargodha.

Despite that MRI is more expensive investigation nevertheless it provides more information in relation to soft tissue involvement as well as degree of spinal cord or root compression than plain X-Ray, CT scan.<sup>20</sup> It

provides information regarding details of disease and consequently gives information to treatment. It really is useful in monitoring response to treatment by serial MRI scans.

## CONCLUSION

MRI is a great diagnostic modality for spinal TB as well as being more sensitive than plain radiography. It offers the diagnosis of spinal TB earlier than conventional methods offering the advantages of earlier diagnosis and treatment. In spinal tuberculosis, the superior contrast resolution of MR imaging is useful for showing contiguous vertebral involvement, skip lesions and paraspinal collections. MR imaging provides critical information about the vertebrae, disc space, spinal canal and paraspinal anatomy. Familiarity with the spectrum of MR findings in tuberculous spondylitis, especially in a high risk patient population, can prevent a delay in diagnosis and may limit the morbidity that can be caused by this aggressive but curable infectious disease. The use of gadolinium is promising in detecting disease earlier, as it invariably results in bone enhancement and may assist in making the diagnosis when the rim enhancing pattern of the soft tissue mass is demonstrated.

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