



International Journal of Medical and All Body Health Research

Retrospective Evaluation of Spectrum of Pott's Spine by Magnetic Resonance Imaging

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Article Info

ISSN (online): 2582-8940

Volume: 05

Issue: 04

October-December 2024

Received: 06-10-2024

Accepted: 11-11-2024

Page No: 155-159

Abstract

Skeletal tuberculosis represents about 2% of all tuberculosis (TB) cases. Magnetic resonance imaging (MRI), with its excellent soft tissue contrast, is a highly effective diagnostic tool for detecting this condition and assessing its spread and associated deformities. This study aims to examine MRI findings in patients diagnosed with spinal tuberculosis.

Methods: This study was conducted at Department of Radiodiagnosis of Saraswathi Institute of Medical Sciences, Hapur, UP. It included MRI scans of the spine from patients diagnosed with spinal tuberculosis during the study period. Patients without microbiological or pathological confirmation of spinal tuberculosis were excluded.

Results: Thirty-five patients participated in the study, with a mean age of 47.2 ± 16.5 years. All patients displayed a spondylodiscitis pattern of involvement. In 71.4% of cases, a single intervertebral disc and the adjacent vertebrae were affected, while 28.5% had involvement of multiple contiguous vertebrae and intervertebral discs. Gibbus deformity was observed in 77.1% of cases. Pre/paravertebral and epidural collections were found in 51.4% and 45.7% of patients, respectively, and psoas abscesses were seen in 25.7% of patients. Cord compression with myelopathy occurred in 8.5% of cases, and posterior element involvement was noted in 25.7% of patients.

Conclusion: MRI is a highly effective tool for evaluating the extent of spinal tuberculosis, as well as identifying deformities and abscesses. Most patients present at advanced stages with significant collections and deformities.

Keywords: Epidural Collection, Magnetic Resonance imaging, Tuberculosis, Spinal

Introduction

Tuberculosis (TB) remains one of the leading infectious causes of death globally ^[1]. Skeletal TB accounts for approximately 2% of all TB cases, with spinal tuberculosis, or Pott's disease, comprising less than 1% of all TB cases ^[2]. Two primary forms of spinal TB are recognized: the classic form, known as spondylodiscitis (SPD), and a more common atypical form, characterized by spondylitis without disc involvement (SPwD). Early diagnosis of spinal TB is challenging, as symptoms often do not manifest until kyphotic deformity or neurological deficits occur. The infection can also involve soft tissues, leading to abscess formation, and in severe cases, may cause gibbus deformity and neurological complications ^[3]. These neurological symptoms can include radicular pain, severe cauda equina syndrome, and spinal cord compression, which may result from factors such as edema, vascular engorgement, vertebral collapse, retropulsion of debris, meningomyelitis, or subarachnoid collections ^[4]. Additionally, the progression of spinal tuberculosis can lead to significant morbidity, including permanent disability, if not diagnosed and treated promptly. MRI has become a vital tool in diagnosing and assessing the extent of spinal TB, as it helps in visualizing both bone and soft tissue involvement, including abscesses, deformities, and compression of neural structures. The aim of this study

was to examine the patterns of spinal involvement, as well as associated collections, deformities, and complications in spinal tuberculosis using MRI.

Methods

This retrospective study was conducted at Department of Radiodiagnosis of Saraswathi Institute of Medical Sciences, Hapur, UP. Ethical approval for the study was obtained from the institutional ethical committee. The study included all patients diagnosed with Pott's spine (spinal tuberculosis) who underwent MRI scans between May 2022 and May 2024. Demographic data and MRI findings for each patient were collected and recorded using a pre-designed data collection sheet. All relevant data were compiled and analyzed using IBM SPSS 25.0. Patients who did not have a pathological or microbiological diagnosis of spinal tuberculosis were excluded from the study. Only MRI scans obtained at the time of initial presentation were included; repeat or follow-up scans were excluded. MRI examinations were performed on a 1.5T Siemens MRI machine, following the protocol outlined in Table 1. The study aimed to assess the MRI characteristics and patterns of spinal tuberculosis, including the extent of disease involvement, deformities, abscesses, and neurological complications.

Results

A total of 35 patients participated in the study, with 23 (65.7%) being male and 12 (34.2%) female, resulting in a male-to-female ratio of 1.9:1. The ages of the patients ranged from 14 to 86 years, with a mean age of 47.2 ± 16.5 years. The majority of patients were in the 20-50 age group, while the least affected group was of those under 20 years (5.7%) (Figure 1).

None of the patients showed cervical involvement, while 22.8% had only thoracic involvement. 14.2% had thoracolumbar vertebral involvement, 57.1% had lumbar vertebral involvement, and 5.7% had lumbosacral vertebral involvement (Figure 2).

All patients had the classic form of spondylodiscitis, and there were no cases of single vertebral body involvement (spondylitis). In 71.4% of the cases, a single intervertebral disc and its adjacent vertebra were involved, while 28.5% had involvement of multiple intervertebral discs and more than two vertebrae, all of which were contiguous. No skip lesions were observed in the study.

Alteration of curvature with gibbus deformity was present in 77.1% of cases. Pre/paravertebral collections were seen in 51.4% of cases, while epidural collections were found in 45.7% of patients. Psoas abscess was observed in 25.7% of patients, and cord compression with myelopathy was seen in 8.5% of cases (Figures 3, 4). Involvement of the posterior elements occurred in 25.7% of the patients (Table 2 and 3).

Plane Sequences

Discussion

Pott's spine is the most common manifestation of musculoskeletal tuberculosis, accounting for approximately 40-50% of all cases. Osborn observed that in developing

countries, it primarily affects the younger age group, while in the western world, it is more commonly found in middle-aged individuals (mean age 40-45 years) [5]. Our study also showed that most patients were in the productive age group (20-50 years), which has a significant economic impact. This suggests that spinal tuberculosis continues to affect economic productivity in developing nations like India, often leading to disability at a young age.

Consistent with many previous studies, our findings showed that spinal tuberculosis was more common in males than females [6-8]. The most commonly affected vertebrae in our study were the lumbar vertebrae, followed by the dorsal vertebrae, which aligns with the findings of Sinan *et al* [6]. However, several studies have reported that the dorsolumbar spine is the most common site of involvement [6, 8, 9]. An atypical finding in spinal tuberculosis is the infection of a single intervertebral disc or multiple non-adjacent vertebrae (skip lesions). The incidence of skip lesions associated with spinal tuberculosis varies widely in the literature, ranging from 1.1% to 71.4% [10, 11]. In our study, no skip lesions were found. To reduce the patient's costs, post-contrast enhancement was performed only in selected cases, as it did not significantly impact management.

In all our cases, both vertebral endplates and the intervertebral disc were involved, indicating a delayed presentation. This is likely due to the predominantly rural population presenting to our hospital, where lower socioeconomic strata are common. The delayed seeking of healthcare in such populations is often attributed to the out-of-pocket healthcare expenditure system.

Osborn noted that pre/paravertebral abscesses were present in 55-95% of spinal tuberculosis cases [5]. In our study, pre/paravertebral collections were found in 51.4% of cases, similar to the findings of Maurya *et al*. [12] Interestingly, while many studies report rare involvement of posterior elements, our study showed that 25.7% of cases involved the posterior elements. However, isolated posterior element involvement was not seen. Gibbus deformity, which occurs late in the disease due to vertebral collapse (usually in the dorsal and upper lumbar vertebrae), was observed in 77.1% of cases in our study, which is much higher than the 27.5% reported by Maurya *et al*. [12] Gibbus deformity is more common in regions with delayed healthcare seeking practices, as seen in our local area.

Epidural collections, which can lead to severe compression of the thecal sac and spinal cord, were observed in 45.7% of cases in our study. Gehlot *et al*. reported psoas abscesses in 37.1% of cases, whereas in our study, they were seen in 25.7% of cases [13].

Our study has certain limitations, including a small sample size and the lack of clinical correlation or assessment of clinical recovery. Despite these limitations, we conclude that MRI is the most valuable diagnostic tool for evaluating suspected spinal tuberculosis. It provides detailed information about the extent of soft tissue and bone involvement, assisting in surgical planning by highlighting vertebral destruction, disc involvement, skip lesions, abscess formation, and canal compromise, among other features.

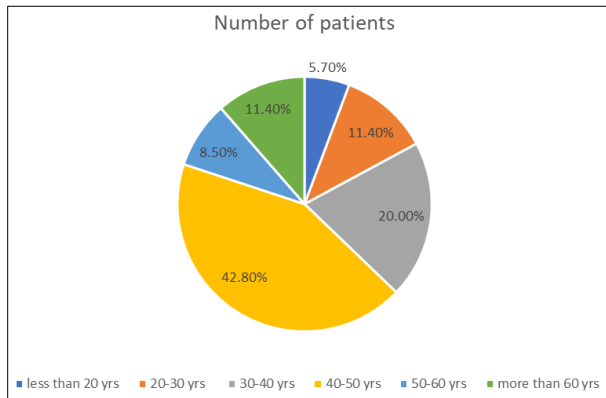
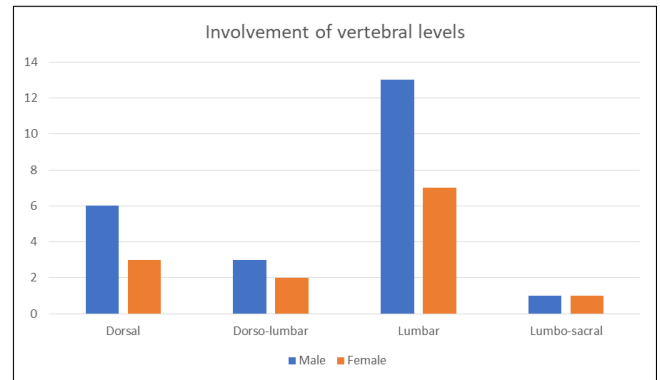
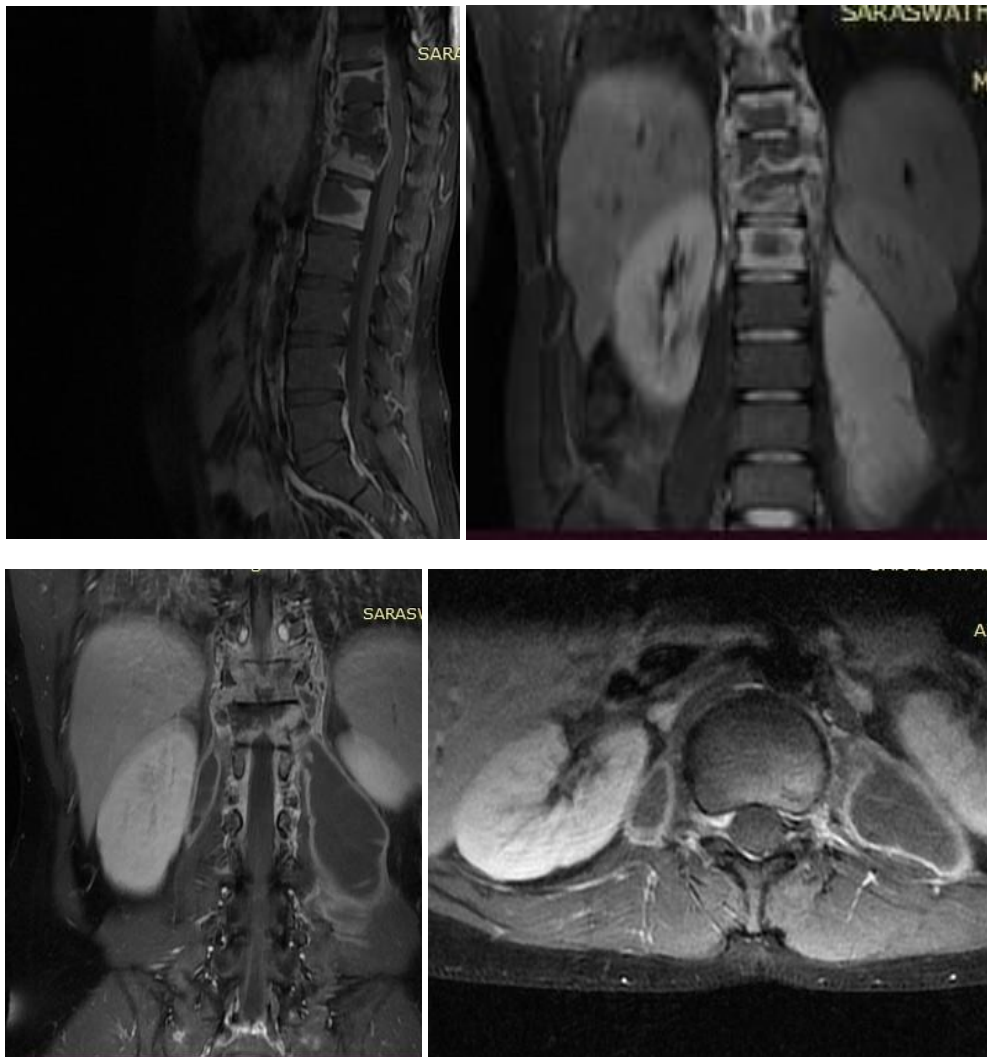
**Fig 1:** Age distribution**Fig 2:** Involvement of various vertebral body levels

Fig 3: Sagittal STIR, Coronal STIR, Axial T1+C and Coronal T1+ C images showing marked reduction in the anterior heights of T10 and T12 vertebral bodies showing abnormal outline, irregular opposing end plates, and near total obliteration of the intervening disc space with resultant kyphosis. Extensive signal abnormality noted involving the D10 to L1 vertebral bodies. Evidence of multiloculated pre and paravertebral collections bilaterally. Bilateral psoas muscle abscesses, on the left side it is extending up to the iliacus muscle.



Fig 4: Sagittal T2, Axial T1 and Axial T1 FS+ C images showing evidence of kyphotic deformity due to destruction of D8-D9 intervertebral disc and adjacent D8 and D9 vertebral bodies (end plates) causing reduced vertebral heights with retropulsion and thecal sac indentation leading to spinal canal narrowing with cord compression. Also there is evidence of destruction of posterior D12-L1 intervertebral disc and adjacent vertebral bodies D12 and L1. There is evidence of enhancing pre and para vertebral collection extending from D8-D9 vertebral bodies.

Table 1: MRI protocol for Pott's spine in our Institute

Plane	Sequences
Sagittal	T2W (screening of whole spine) T1W, T2W, STIR, Pre contrast Fat suppressed (Affected parts)
Axial	T1W, T2W
Coronal	STIR
Multiplanar	Post contrast Fat suppressed in selected cases

Table 2: MRI findings according to gender

	Male (n= 23)	Female (n=12)
Number of Vertebra		
2	17 (48.5%)	8 (22.8%)
> 2	6 (17.1%)	4 (11.4%)
Vertebral Level		
Dorsal	6 (17.1%)	2 (5.7%)
Dorso-lumbar	3 (8.5%)	2 (5.7%)
Lumbar	13 (37.1%)	7 (20%)
Lumbo-sacral	1 (2.8%)	1 (2.8%)
Alteration in curvature	19 (54.2%)	8 (22.8%)
Paravertebral collection	12 (34.2%)	6 (17.1%)
Epidural collection 30	6 (17.1%)	10 (28.5%)
Psoas abscess	5 (14.2%)	4 (11.4%)
Myelopathy	2 (5.7%)	1 (2.8%)
Posterior elements	5 (14.2%)	4 (11.4%)

Table 3: MRI findings according to involved vertebral bodies

	Dorsal (n= 8)	Dorso-lumbar (n=5)	Lumbar (n= 20)	Lumbo-sacral (n=2)
Number of vertebra				
2	6 (17.1%)	4 (11.4%)	14 (40%)	2 (5.7%)
> 2	2 (5.7%)	1 (2.8%)	6 (17.1%)	0 (0.0%)
Alteration in curvature	3 (8.5%)	7 (20%)	16 (45.7%)	1 (2.8%)
Paravertebral collection	4 (11.4%)	4 (11.4%)	10 (28.5%)	0 (0.0%)
Epidural collection	2 (5.7%)	5 (14.2%)	8 (22.8%)	1 (2.8%)
Psoas abscess	1 (2.8%)	3 (8.5%)	5 (14.2%)	0 (0.0%)
Myelopathy	0 (0.0%)	1 (2.8%)	2 (5.7%)	0 (0.0%)
Posterior elements	0 (0.0%)	3 (8.5%)	6 (17.1%)	0 (0.0%)

Conclusion

MRI is an excellent tool for evaluating the extent, deformities, and abscesses associated with spinal tuberculosis. Most patients with spinal tuberculosis present late, with significant collections and deformities.

Conflict of Interest

None

Sources of Funding

None

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