

MRI Evaluation of Spinal TB: A Cross-Sectional Study.

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Abstract

Background: Tuberculosis of spine is one of the commonest musculoskeletal TB. It not only causes back pain but also causes functional disability.

Methodology: A cross-sectional study was conducted in the department of Radiology and Imaging, JNIMS, Imphal East in collaboration with the Departments of Orthopedics and Microbiology, JNIMS from March 2017 to June 2021. Fifty patients appeared as tuberculosis spondylitis on clinical and X-ray findings were included in the study. MRI (3 Tesla, Phillips), microbiological tests and preoperative biopsy were done from each patient and 45 of them were confirmed as the patients of spine TB by these procedures. Maximum of the patients were from the age group 31-40 years with a mean age of 36.25 ± 6.33 years. Males were predominant.

Results: Multiple and continuous vertebral involvement was seen more common.

Conclusions: MRI should be considered to be the imaging modality of choice for patients with suspected TB spondylitis, because of its high specificity, sensitivity and accuracy as it provides necessary information to the surgeon for proper management by providing vertebral intra-osseous abscess, vertebral disc collapse, skip lesions, dural and intradural diseases and involvement of posterior elements more precisely.

Keywords: Spinal TB, MRI, Vertebral involvement.

Introduction

Tuberculosis is still a major cause of morbidity and mortality in India¹. India had an estimated incidence of 2.64 million cases according to World Health Organisation (WHO) TB statistics for India for 2019. This accounts to a rate of 193 per 100,000 population.² Musculoskeletal involvement in TB accounts to approximately 10% and among these, half of them had spinal involvement.³ Although it can involve any part of spine, the commonest part seems to be thoracolumbar junction.⁴ Involvement of neurological function varies from 10% to 43%.⁵ Recently, the development of multidrug resistant TB, frequency of infection in immunodeficient individuals, more accurate imaging modalities, and advances in spinal reconstruction techniques have all changed the management of Pott's disease.⁶ Advanced

imaging techniques such as magnetic resonance imaging (MRI) make the early diagnosis of spinal TB easier and a considerable number of patients with spinal TB are diagnosed earlier and treated more effectively before significant neurological deficits develop.⁷ MR is regarded as modality of choice for the detection, staging, and differential diagnosis of inflammatory disorders of the spine. It allows the correct diagnosis to be made in all cases, demonstrating the pathological involvement of the Para vertebral structures and into spinal canal earlier and more accurately than CT and plain radiography.⁸ MRI Imaging of spinal infections requires the use of a combination of T1- weighted and T2-weighted or STIR sequences. MRI scans invariably show loss of cortical definition of the affected vertebrae. However, affected vertebrae are often at least partially maintained in pyogenic spondylitis. T1WI often shows infection spread beneath the longitudinal ligaments to involve adjacent vertebral bodies. The discs are sometimes relatively spared, particularly in relationship to the degree of bone destruction. Contrast enhancement is useful and helps to define Para spinal and epidural disease.⁷ However, patients can still present late with considerable spine deformity. Since the advanced imaging modalities and different diagnostics protocols are developed during these years, new reviews are always required to assess these modern diagnostic modalities.

Materials and methods:

This cross-sectional study was conducted in the department of Radiology and Imaging, JNIMS, Imphal East in collaboration with the Departments of Orthopedics and Microbiology, JNIMS from March 2017 to June 2021. Fifty patients appeared as tuberculosis spondylitis on clinical and X-ray findings were included in the study. MRI (3 Tesla, Phillips), microbiological tests and preoperative biopsy were done from each patient and 45 of them were confirmed as the patients of spine TB by these procedures. A history of tuberculosis, a positive skin test, and an elevated erythrocyte sedimentation rate (ESR) were for screening of spinal tuberculosis. Biopsy and PCR was used to confirm the diagnosis. Some patients were sent for culture of the organism. MRI examination of spine was routinely performed in the sagittal and axial planes. Sagittal images are obtained with T1 and T2 weighted images by using spin-echo and fast spin-echo technique. Axial images were obtained with T1 weighted spin echo sequence and proton density weighted. Comparison of T1 and T2 weighted images was one of the fundamental principles of image interpretation. Intravenous gadolinium DTPA MR contrast injection improves MR sensitivity for intramedullary, intra-dural and extra medullary neoplasm and inflammatory process. Ethical approval was taken from the Institutional Ethics Committee and confidentiality was maintained throughout the study. Data was collected using a pre-designed performa. Data were analyzed using IBM SPSS 16.

Results:

All 45 patients were analyzed. Minimum age was 9 years and maximum 65 years. Mean age was 36.25 ± 6.33 years. Maximum of the patients were from the age group 31-40 years (47.9%), followed by age group 41-50 years (21.3%) (Figure 1). Males were predominant accounting for 73% while the females were 27% (Figure 2)

Most of the patients were presented with back ache in 82% of cases. Nearly half of them had fever (47.2%) and deformity was present in 12%. Functional disability was present in majority of cases (91%). None was experienced radiculopathy. MRI shows regional vertebral involvement. 11% had cervical involvement, cervicodorsal in 5%, dorsal in 39% and lumber in 30%. Double vertebral involvement was common in nearly half of the cases followed by three, >three and single. Most of the involvement was continuous. Destruction and collapse were common. In soft tissue, it was found that epidural was 52%, paraspinal (Figure 3 & 4) including Psoas abscess involvement 79%, subligamentous 79%, calcification 1%, Myelitis

11% and cord compression 23%. In disc, it was observed that thinning was 75%, destruction 68%, endplate changes 75% and single changes 73%.

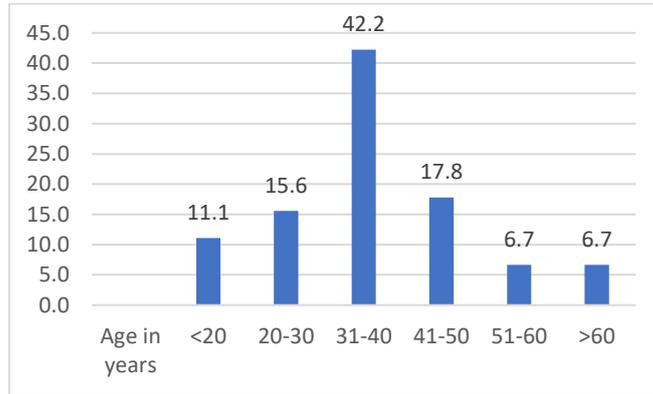


Figure 1: Bar diagram showing age distribution of the respondents

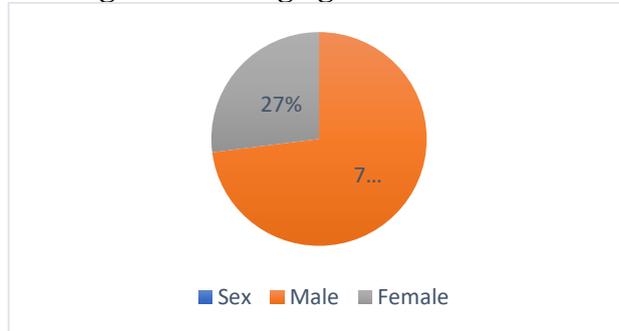


Figure 2: Pie chart showing distribution of the respondents by sex

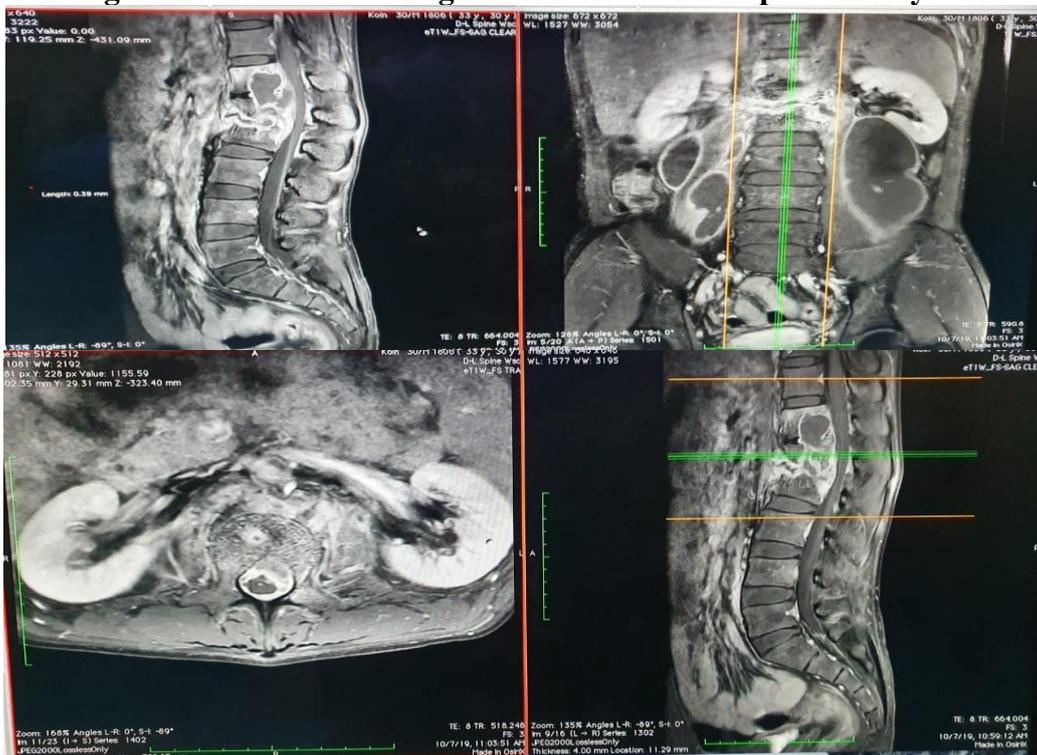


Figure 3: Koch spine involving D12, L1, L2 vertebral bodies causing spinal deformity with associated pre and para vertebral rim enhancing soft tissue collection (Cold abscess) extending into epidural space bilateral Psoas muscles causing compressive myelopathy.



Figure 4: Koch spine involving D9 and D10 vertebral bodies with destruction of adjacent end plates and associated minimal pre and para vertebral rim enhancing soft tissue collection (Cold abscess).

Discussion:

Spinal tuberculosis was common in middle age group⁹. In this study, the most common age presenting with Potts spine is between 31 to 40 years. This finding was almost similar to the finding by Khalequzzaman et¹⁰ where commonest age group was 30-40 years in 42.2%.¹⁰ Male predominance was seen in this study regarding spinal TB. Khalequzzaman et¹⁰ study had almost similar finding. In this study, more than 50% of cases involve lumbar vertebra, which is not differed from the observation by Khalequzzaman et¹⁰ & TK Loke¹¹. In same series, single vertebral body involvement found only 6% of cases. The result of this study is near to that result (5%)¹¹. However, Lolge showed fewer cases (1.69%) of solitary vertebral body involvement.

Involvement of three or more vertebral bodies was found in 49% of my cases, more frequent than in other series (14-22%) carried out by Smith¹². The multiplicity of vertebral body involvement may cause confusion with metastatic disease. Skip lesions located at the cervical spine have been reported in as many as 12% of cases. There may be a need to exclude non contiguous lesions in the lower spine in those patients with cervical spondylitis, especially when low back symptoms are present.

Conclusion:

Spinal tuberculosis is still a major cause of morbidity where tuberculosis is prevalent specially developing countries. Spinal TB is common among males and among middle age group. Multiple and continuous vertebral involvement was common. MRI should be considered to be the imaging modality of choice for patients with suspected TB spondylitis, because of its high specificity, sensitivity and accuracy as it provides necessary information to the surgeon for proper management by providing vertebral intra-osseous abscess, vertebral disc collapse, skip lesions, dural and intradural diseases, involvement of posterior elements and pre and paraspinal involvement including psoas muscles more precisely.

References:

1. Dhamnetiya D, Patel P, Jha RP, Neha S, Singh M, Bhattacharyya K. Trends in incidence and mortality of tuberculosis in India over past three decades: a joinpoint and age-period-cohort analysis. *BMC Pulm Med*. 2021;21:375. (<https://doi.org/10.1186/s12890-021->

- 01740-y.
2. TBFACTS.ORG. TBFacts - TB Statistics, India. Available at [http://: TBFacts - TB Statistics, India](http://TBFacts - TB Statistics, India). Accessed 5 January 2022.
 3. Gautam MP, Karki P, Rijal S, Singh R. Pott's spine and Pott's paraplegia. *J Nep Med Assoc* 2005;44(159):106–15.
 4. Moorthy S, Prabhu NK. Spectrum of MR imaging findings in spinal tuberculosis. *AJR Am J Roentgenol* 2002;179:979-83.
 5. Sai Kiran NA, Vaishya S, Kale SS, Sharma BS, Mahapatra AK. Surgical results in patients with tuberculosis of the spine and severe lower-extremity motor deficits: a retrospective study of 48 patients. *J Neurosurg Spine* 2007;6:320-6.
 6. Rezaei AR, Lee M, Cooper PR, Errico TJ, Koslow M. Modern management of spinal tuberculosis. *Neurosurgery* 1995;36:87-97.
 7. Tuberculosis of Spine Magnetic Resonance Imaging (MRI) Evaluation of 42 Cases
 8. Stäbler A, Reiser MF. Imaging of spinal infection. *Radiol Clin North Am.* 2001 Jan;39(1):115-35.
 9. Sharif HS. Role of MR imaging in the management of the spinal infections, *AJR* 1992;158:1333-1345.
 10. Khalequzzaman, Hoque. Tuberculosis of Spine Magnetic Resonance Imaging (MRI) Evaluation of 42 Cases. *Medicine Today* 2012;24(2):59-62.
 11. Loke TK., Ma HTG., Chan CS. Magnetic Resonance Imaging of the tuberculous spinal infection, *Australas Radiol* 1997;4:7-12.
 12. Smith AS, Weinstein MA, Mizushima A, Coughlin B, Hayden SP et al. MR imaging characteristics of tuberculous spondylitis vs vertebral osteomyelitis, *AJR* 1989;153:399-405.