



ORIGINAL RESEARCH PAPER

Radiodiagnosis

ROLE OF MRI IN THE EVALUATION OF SPINAL TUBERCULOSIS

KEY WORDS:

Dr Sonia N Misquitta

Department of Radiodiagnosis, MGM Institute of Health Sciences, Navi Mumbai.

Dr Saijyot Raut*

Department of Orthopaedics, MGM Institute of Health Sciences, Navi Mumbai
*Corresponding Author

Dr Ashutosh Chitnis

Department of Radiodiagnosis, MGM Institute of Health Sciences, Navi Mumbai.

ABSTRACT

Background:

MRI is now the preferred imaging modality and technique to define the activity and extent of disease in patients suspected with spinal tuberculosis.

The objective of the study was to describe various radiological features on MRI of spinal tuberculosis and to assess its role in evaluation of extent of disease.

Methods:

A study of 50 patients with proven spinal tuberculosis were retrospectively analysed to determine the pattern of occurrence of various pathological lesions and extent of soft tissue involvement, was carried out in the Department of Radio-Diagnosis, MGM Institute of Health Sciences. Post-operative and Follow-Up cases were excluded from this study.

Results:

Of the 50 cases examined, MRI scan showed the most affected level of the spine was lumbar spine with lumbar vertebra being the most commonly affected vertebra seen in 30% of the cases followed by thoracolumbar vertebra (26%) and thoracic vertebra (24%).

Intervertebral disc involvement was seen in 88% of cases with an epidural component occurring in 32% of the cases. Wedge collapse of vertebral body accounted for 56%, pre and para vertebral involvement was noted in 36% and complete destruction of vertebra was observed in 12% of the cases.

Conclusion:

It has been noted that MRI is a valuable tool in the evaluation of spinal tuberculosis. It is very sensitive for the detection of different pathological processes, pattern of occurrence, depiction of soft tissue involvement, cord involvement and nerve root integrity. It aids in diagnosing spinal tuberculosis in early stages and hence prompt treatment prevents spinal deformity and neurological deficit.

INTRODUCTION:

Tuberculosis, caused by mycobacterium tuberculosis, remains a major public health hazard in our country due to poverty, malnutrition and presence of drug resistant strains. Tuberculosis of the spine accounts for more than 50% of musculoskeletal tuberculosis[1]. In developing countries, the disease commonly affects children and young adults and tends to be more aggressive in nature with abscess formation. Consequently, neurological complications and spinal deformities are frequently observed[2].

Magnetic Resonance Imaging(MRI) has emerged as the modality of choice for patients with suspected spinal tuberculosis. It helps in early detection of the disease and is the technique of choice to define the activity and extent of the infection. It shows not only bony involvement but also the edema and soft tissue swelling[3].

In most cases, TB of spine is caused primarily by hematogenous spread of pulmonary infection. The infection typically begins from the anterior part of vertebral body, spreads to the disc and causes bone destruction and formation of abscess[4]. Spread of infection can occur beneath the longitudinal ligaments involving the adjacent vertebral bodies[5].

The intervertebral disc is typically involved and disc space narrowing occurs secondarily and therefore is limited relative to the degree of bone destruction. As the vertebral bodies collapse, a sharp angulation (or kyphos) develops.

Caseation and cold abscess formation may show extension into the neighboring vertebra or escape into the paravertebral soft tissue. Cord compression and edema is noted due to the pressure by the abscess or displaced bone or due to involvement of spinal artery thus resulting in neurological deficits.

AIMS AND OBJECTIVES

- To describe the various radiological features of spinal tuberculosis
- To evaluate the role of MRI in assessing the extent of disease progression.

MATERIALS AND METHODS

MRI case records of 50 patients with proven spinal tuberculosis were retrospectively reviewed and relevant clinical history was noted over a period of 1 year in the Department of Radio-Diagnosis, MGM Institute of Health Sciences.

INCLUSION CRITERIA:

- Patients with an age range of 21-60 years
- Both genders were included in the study

EXCLUSION CRITERIA:

- Patients less than 21 years of age
- Patients above 60 years of age
- Patients with history of trauma
- Post-Operative and Follow-Up patients

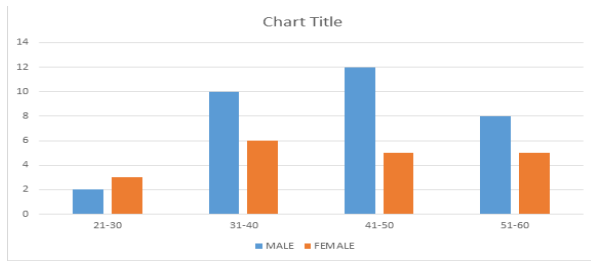
The MRI Scan was performed in 1.5T Toshiba MRI Scanner. The following MRI sequences were studied Sagittal T2, T1 and STIR weighted, Coronal STIR weighted, Axial T2 and STIR weighted sequences.

The following features were assessed by MRI:

1. Compartment of spine involved: Epidural/ Intradural/ Intramedullary/Multiple
2. Compression/Wedging
3. Disc Involvement
4. Subligamentous Extension
5. Extent of Abscess: Epidural/Paravertebral/Psoas

6. Spinal Cord Changes

TABLE 1- AGE AND SEX DISTRIBUTION



In our study as per the chart displayed in table 1, spinal tuberculosis showed more predominance in males and was more common in the age range of 41-50 years

TABLE 2- REGIONAL DISTRIBUTION OF TB SPINE

REGION	NO OF CASES	PERCENTAGE %
LUMBAR	15	30
THORACOLUMBAR	13	26
THORACIC	12	24
CERVICAL	04	08
MULTIPLE LEVELS	06	06

In our study, the MRI scan showed that the most affected level of the spine was the lumbar spine with the lumbar vertebrae being the most affected vertebrae seen in 30% of the cases (table 2) followed by the thoracolumbar and thoracic vertebrae. Intervertebral disc involvement was seen in 88% of cases with a pre and para vertebral collection observed in 36% of cases (table 3) Wedge collapse of vertebral body was observed in 56% of cases with an epidural collection noted in 32% cases.

TABLE 3-EXTENT OF TUBERCULOSIS SPINE IN VARIOUS COMPARTMENT

FEATURES	NO OF CASES	PERCENTAGE %
INTERVERTEBRAL DISC INVOLVEMENT	44	88
WEDGE COLLAPSE BODY	28	56
COMPLETE DESTRUCTION OF VERTEBRAE	06	12
PRE AND PARA VERTEBRAL COLLECTION	18	36
EPIDURAL COLLECTION	16	32

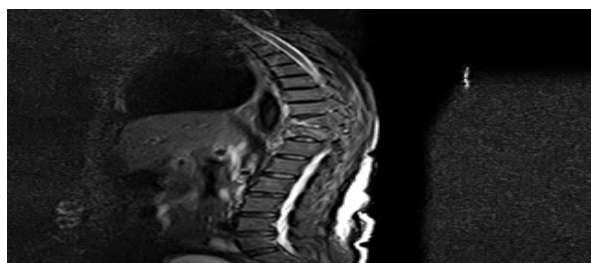


Fig.1- T2 weighted image shows significant erosion and destruction involving D10 and D11 vertebral bodies. Wedging of D10 vertebral body with destruction of the intervening disc is noted. Also, the involved disc shows increased T2 signal suggestive of caseating abscess

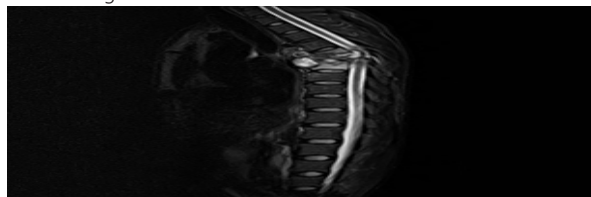


Fig.2- T2 weighted STIR sagittal images show Collapse of D7 vertebral body with significant marrow oedema of D7 and D8 vertebral bodies.

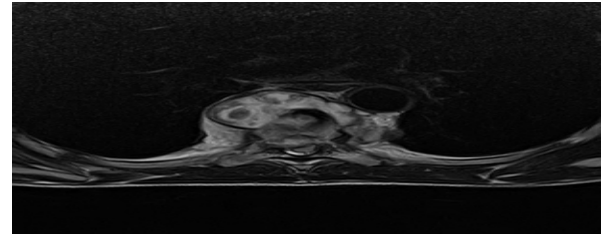


Fig.3- T2 weighted axial image shows multi-loculated thin walled subligamentous pre and para vertebral abscesses with anterior epidural component causing indentation over the spinal cord resulting in narrowing.



Fig.4 - T2 weighted sagittal image shows destruction of L4 superior end-plate and L3-L4 disc. T2 hyperintense epidural abscess indenting the thecal sac anteriorly is noted at the level of L3-L4 disc. There is also pre vertebral T2 hyperintense abscess noted below the anterior longitudinal ligament.

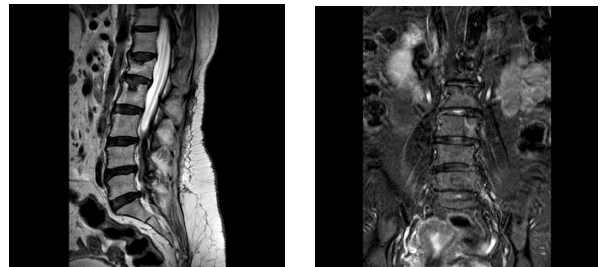


Fig.5- Sagittal T2 weighted images show hyperintensity involving L2 and L3 vertebral body with evidence of destruction of the inferior and superior end plates of L2 and L3 with involvement of intervertebral disc space.

Fig.6- In the same case, Coronal STIR weighted image shows hyperintense abscess in bilateral psoas muscle.

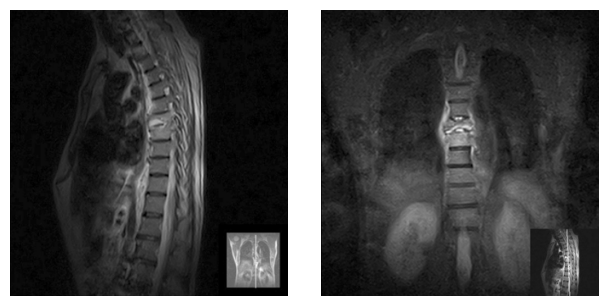


Fig.7- T2 weighted sagittal image shows collapse of D7 and destruction of D7 and D8 vertebral body. Intervening disc shows destruction and high signal suggestive of caseating abscess.

Fig.8- Coronal STIR weighted image of the same patient shows bilateral paravertebral hyperintense abscesses.

DISCUSSION:

In tuberculous spondylitis, more than one vertebrae is usually

involved and affects the anterior/inferior/superior aspect of the vertebral body adjacent to the subchondral plate. From there it spreads to involve adjacent intervertebral discs. In our study, Irregularity of both the end plates and anterior aspect of vertebral bodies with bone marrow oedema was noted. T1- weighted images usually show hypointense signal within the affected vertebral bone marrow.

On T2-weighted images a relative hyperintensity was noted within the diseased tissues[6]. The paraspinal collections were typically well-circumscribed.

Further with involvement of bone, wedge collapse and vertebral destruction occurs which results in kyphosis. Epidural abscess formation results in narrowing of the spinal canal diameter with resultant cord compression and neurological deficits[7].

It is also important to differentiate tuberculous spondylitis and pyogenic spondylitis. A well-defined paraspinal abnormal signal, a thin and smooth abscess wall, subligamentous spread to three or more vertebral levels, and multiple vertebral or entire body involvement are more suggestive of tuberculous spondylitis than pyogenic spondylitis[5].

CONCLUSION:

The MRI scan due to its multi-planer, multi-sequential and excellent soft tissue resolution is highly sensitive in the detection of various pathological processes of spinal tuberculosis and their pattern of occurrence. The superior contrast resolution also provides excellent depiction of soft tissue involvement, cord involvement and nerve root integrity. It aids in diagnosing spinal TB in early stages and hence prompt treatment minimizes spinal deformity and permanent neurological deficits. MRI is accurate for differentiation of tuberculous spondylitis from pyogenic spondylitis. Serial MRI scans can also be used to assess the disease response to treatment.

REFERENCES:

1. Hodgson AR, Skinsnes OK, Leong CY. The pathogenesis of Potts paraplegia. *J Bone Joint Surg Am.* 1967;49:1147-56
2. Ho EKW, Leong JCY. The pediatric spine: principles and practice. In: Weinstein SL, ed. *Tuberculosis of the spine*, 3rd ed. New York: Raven, 1994:837-49
3. Bajwa GR. Evaluation of the role of MRI in spinal Tuberculosis: A study of 60 cases. *Pak J Med Sci.* 2009;25(6):944-7
4. Shashikumar MR et al. Role of MRI in the evaluation of spinal tuberculosis. *Int J Res Med Sci.* 2015 Aug;3(8):1839-1843
5. Alison S. Smithy et al. MR Imaging Characteristics of Tuberculous Spondylitis vs Vertebral Osteomyelitis. *AJR* 153:399-405, August 1989
6. Sharif HS, Clark DC, Aabed MY, Haddad MC, Al Deeb SM, et al. Granulomatous Spinal Infections: MR Imaging. *Radiology.* 1990;177:101-7.
7. Sharif HS, Clark DC, Aabed MY, Haddad MC, Al Deeb SM, et al. Granulomatous Spinal Infections: MR Imaging. *Radiology.* 1990;177:101-7.