

SIGNIFICANCE OF MAGNETIC RESONANCE IMAGING FINDINGS IN POTT'S DISEASE. A DESCRIPTIVE CASE SERIES

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ABSTRACT

Objective: To describe characteristic Magnetic Resonance Imaging features and assess the significance of this imaging in spinal tuberculosis (Pott's disease).

Study Design: Descriptive study.

Place & Duration of study: Combined Military Hospital, Rawalpindi, from Jun 2017 to Jul 2018.

Methodology: This study was carried out at the Department of Orthopedic Surgery at Combined Military Hospital, Rawalpindi from Jun, 2017 to Jul, 2018. A total of 120 consenting adults who were diagnosed cases of Pott's disease were selected for the study. There were 60 males (50%) and 60 females (50%). Age range was 20-60 years. Mean age was 40 years. Diagnosed cases of spinal tuberculosis based on clinical, pathological and radiological findings were included in the study. Cases of pyogenic spondylitis, pyogenic psoas abscess, spinal trauma and vertebral column tumors were excluded.

Results: Magnetic Resonance Imaging scan showed that lower thoracolumbar (49.1%) was the most common involved level. Only involvement of thoracic spine was found in 25 cases (20.8%). Lumbar spine was involved in 23 cases (19.1%). Cervical spine was involved in 9 cases (7.5%). Diffuse involvement of spine was found in only 4 cases (3.3%). Magnetic Resonance Imaging features and their incidences were: disc space narrowing/destruction in 105 (87.5%) cases, complete body destruction in 25 cases (20.8%), wedge collapse of body in 28 cases (23.3%), paraspinal abscess in 67 cases (55.8%), compression of spinal cord in 30 cases (25%) and calcification in 22 cases (18.33%).

Conclusion: The significance of Magnetic Resonance Imaging is enormous in patients with spinal tuberculosis. It provides accurate information about the involvement of vertebrae, spinal cord and paraspinal soft tissues. This imaging proved to be very advantageous from clinical as well as management point of view as serial scans describe the progression or regression of disease with great precision.

Keywords: Calcification, Magnetic resonance imaging, Pott's disease, Paraspinal abscess, Spinal cord compression, Wedge collapse.

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INTRODUCTION

Tuberculosis (TB) is a bacterial infection caused by *Mycobacterium tuberculosis* or other bacterium in the M. Tuberculosis complex. They are acid fast, aerobic, non-motile, non-encapsulated obligate parasites. In liquid cultures, they form a mold like pellicle, hence the name mycobacterium (fungus like bacterium). It generally affects the lungs, however other parts of the

body can be affected i.e. it can be pulmonary or extrapulmonary. Pulmonary TB can be primary (infection of an individual who has not previously been infected or immunized) or secondary (infection of an individual who has previously been infected or immunized), it can be post primary or reinfection. Extrapulmonary TB can present as TB of skin, kidney, intestine, liver, bone, spinal cord, eyes, male genital tract, female genital tract and meningitis of brain. TB in this type can spread from lungs to other organs through hematogenous route or millets, hence also known as miliary TB.

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Vertebral column involvement presents with significant morbidity and if left untreated may cause permanent disability. Spinal TB is named Pott's disease after Percival Pott who described it in 1779. It spreads hematogenously and has grave clinical consequences if left untreated. Involvement of the spine is an important extra-pulmonary manifestation of TB¹. Spinal TB is associated with significant morbidity and mortality in the developing countries². Lower thoracic and upper lumbar vertebrae are the areas of spine that are most commonly affected by TB. It is arthritis of intervertebral joint and infection can spread from adjacent vertebra into intervertebral disc. It can be associated with significant neurological deficits due to compression of adjacent neurological structures.

Magnetic Resonance Imaging (MRI) is considered the mainstay imaging investigation in patients suspected of Pott's disease. MRI uses body's natural magnetic properties to produce detailed images from any part of body. The hydrogen atom spins on an axis of its own, in this respect, it acts as a small magnet. When body is placed in the strong magnetic field of MRI scanner, the axes of hydrogen atoms line up in one direction. This uniform alignment creates a magnetic vector oriented along the axis of the MRI scanner. MRI scanners come in different strengths. The strength of the magnetic field can be altered electronically from head to toe using a series of gradient electric coils. Thus different slices of body can be made to resonate as different frequencies are applied. When the radiofrequency source is switched off, the magnetic vector returns to its resting state and this causes a radiowave signal to be emitted. This signal is used to create MR image. Multiple transmitted radiofrequency pulses can be used in sequence to emphasize particular tissues of the body. Thus a series of pulse sequences are generated. The intensities of the received signals are plotted on grey scale and cross sectional images are built. MRI uses radiation in radiofrequency range which is found all around us, so there are no significant biological hazards of MR imaging.

Pacemakers, metal clips, metal valves and foreign bodies are contraindicated because of their potential movement within the strong magnetic field created by MR scanner.

Both imaging and clinical findings determine the final decision of management. Efforts have been made to strengthen the co-ordination between clinicians and radiologists so that the incidence of morbidity and mortality associated with either pulmonary or extrapulmonary TB can be decreased, control the spread of different forms of the disease ultimately eliminate TB across the globe by early detection of disease process and its complications. However, this would require more aggressive approach³. Spinal TB is the commonest manifestation of skeletal involvement by TB and about 50 percent of all cases of musculoskeletal TB presents with spinal involvement⁴. TB of spine is caused primarily by hematogenous spread of pulmonary infection in most of the cases. The infection begins at the anterior aspect of the vertebral body, involves the disc and ultimately destroys the bone with formation of abscess. Subligamentous extension of the abscess along the anterior longitudinal ligament and the intervertebral disc involvement causes loss of the intervertebral disc height with subsequent collapse of the vertebral body causing a sharp posterior angulation of the vertebral column known as kyphosis. The abscess may extend into the prevertebral and paravertebral soft tissues. Culture and sensitivity are positive in approximately 80% cases⁵. Spinal cord compression and edema are either due to pressure by the abscess, bone displacement or spinal artery thrombosis with consequent radiculopathy. Pott's disease is among most common causes of non-traumatic paraplegia⁴. Differentiation between tuberculous and pyogenic spondylitis, although not always possible, but important as different treatment options have to be explored by the clinicians. Involvement of intervertebral discs is an early feature of pyogenic spondylitis while it seen during later course of tuberculous spondylitis and calcification strongly points towards tuberculous etiology⁵. Another important diffe-

rential diagnosis to consider is metastasis, although imaging alone can not always reliably differentiate between these two differentials⁶⁻¹⁰. The presence of an abscess and bone fragments differentiate spinal TB from neoplastic etiology, however in suspicious cases biopsy and histopathology are needed for tissue specific diagnosis. A history of tuberculosis, positive skin test and elevated erythrocyte sedimentation rate (ESR) are helpful clues to the diagnosis. The use of DNA amplification techniques (such as polymerase chain reaction) may help in rapid and accurate diagnosis of the disease¹¹⁻¹⁵.

The emergence of multidrug resistant TB,

Table-I: Spinal Levels Involvement in TB spine (n=120).

Spinal Level	No. of Cases	Percentage
Cervical	9	7.5
Thoracic	25	20.8
Thoraco Lumbar	59	49.1
Lumbar	23	19.1
Diffuse Involvement	4	3.3

Table-II: MRI Findings Percentage (n=120).

MRI Findings	Percentage
Narrowing / destruction of disc space	87.5
Wedge shaped vertebral body collapse	23.3
Complete destruction of body	20.8
Paraspinal abscess	55.8
Calcification	18.3
Cord compression	25

increased incidence in immuno compromised patients and advances in imaging modalities have changed the management of spinal TB over the years. In adults, the involvement of intervertebral disc is caused by spread from the adjacent vertebral body. In children, it is mainly due to highly vascularized nature of the intervertebral disc. The main lesion in spinal TB is a combination of osteomyelitis and arthritis, involving more than one vertebra. Spinal TB can cause bone destruction leading to vertebral body collapse, spinal canal narrowing, cold abscess formation or granulation tissue formation resulting in spinal canal stenosis and neurological deficits^{16,17}.

MRI is a non-invasive modality for assessment of spinal pathologies. It describes bone, spinal cord and soft tissue extent in great detail. Modic *et al*, described that MRI had a sensitivity of 96%, and specificity of 92%, and an accuracy of 94% as far as spinal pathology is concerned. The bony, soft tissue and spinal cord involvement are assessed on conventional T1WS, T2WS and STIR (fat suppressed images), however contrast enhanced study can be performed for better visualization of spondylodiscitis, abscess formation and extent of pre-spinal and paraspinal soft tissue involvement¹².

To determine the role of MRI in evaluating the radiological features and the extent of vertebral column as well as paraspinal soft tissue involvement in Pott's disease. The results will significantly add to the existing knowledge of clinicians and will also greatly benefit the patients from the management point of view.

METHODOLOGY

The study was done in the department of Orthopedic Surgery at Combined Military Hospital, Rawalpindi from June 2017 to November 2018. It included a total of 120 patients. The method of inclusion was patients of both gender, age range was 20-60 years, and the previously diagnosed cases of Potts disease were included in the study. Patients of pyogenic spondylitis, pyogenic psoas abscess, spinal trauma and vertebral column tumors were excluded. A protocol was printed and followed for the study. Diagnosis was based on clinical features and investigations. X-Ray whole spine was carried out in all cases as an initial radiological investigation. Pathological investigations included were CBC, ESR and sputum cytology. This study was done with T1 weighted images, T2 weighted images, Short Tau Inversion Recovery (STIR or fat suppressed) images and contrast-enhanced MR images of whole spine for visualization of bone, intervertebral disc and soft tissue extent. MR images of whole spine were acquired in sagittal, axial and coronal planes.

RESULTS

Total 120 patients were included in this study. There were 60 Male (50%) and 60 Female (50%) patients. Age group included was in the range of 20-60 years. Mean age was 40 years. Lower backache was the most common symptom and local tenderness was the most common sign. MRI scan showed that lower thoracolumbar spine (49.1%) was the most common involved level. Only involvement of thoracic spine was found in 25 cases (20.8%). Lumbar spine was involved in 23 cases (19.1%). Cervical spine was involved in 9 cases (7.5%). Diffuse involvement of spine was found in only 4 cases (3.3%). Table-I shows this regional distribution.

MRI features and their incidences were: disc space narrowing/destruction in 105 (87.5%) cases, complete body destruction in 25 cases (20.8%), wedge collapse of body in 28 cases (23.3%), paraspinal abscess in 67 cases (55.8%), compression of spinal cord in 30 cases (25%) and calcification in 22 cases (18.33%).

DISCUSSION

This study was done to explore the significance of MRI findings in Pott's disease. Tuberculous spondylitis has a higher incidence in the developing countries due to risk factors like high percentage of pulmonary tuberculosis, low nutrition, overcrowding, poor hygienic condition and low budget for health¹⁷. In developed countries, the most important risk factor is immunocompromised status. Male predominance was observed by Jalleh²⁴. Our study showed lower thoracolumbar spine to be the most commonly involved level, Ram *et al*¹⁸ and Tulsi also showed the same¹⁹. MRI is superior to all other imaging modalities in assessing Pott's disease and delineates the characteristic features as well as extent of the disease in great detail. It describes the involvement of vertebrae, paravertebral soft tissues, severity of cord compression, nerve root compression and vertebral canal size with greater details²⁰⁻²⁴. These features can be used to monitor the response of the disease to therapeutic agents by comparing successive scans with the previous

ones²⁵. MRI can thus significantly alter the patient's management.

CONCLUSION

MRI delineates the level and features of Pott's disease in a great detail. It can accurately describe the extent of the bones, intervertebral discs and paraspinal soft tissues very early during the course of the disease. These features can be used to monitor the response of the disease to therapeutic agents by comparing successive scans with the previous ones.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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