SPECTRUM OF MRI FINDINGS IN SPINAL TUBERCULOSIS

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ABSTRACT

Objective: Tuberculosis caused by mycobacterium tuberculosis is among the commonest diseases around the world especially in third world countries and tuberculosis of the spine is the commonest extra pulmonary manifestation of the disease. MR imaging is usually performed to evaluate symptomatic patients. The purpose of this article is to evaluate the typical and atypical findings of spinal tuberculosis on MR imaging.

Material and Methods: The study is a cross sectional study. The study was conducted in Peshawar Institute of Medical Sciences from 1st January 2015 to 1st November 2015 during which 58 cases of patients with tuberculous spine were evaluated with MRI and the different imaging features were analyzed.

Results: Spinal tuberculosis is a very common disease presenting usually with typical imaging findings but at times the presentation can be quiet atypical. The important findings of spinal TB on MRI are endplate disruption (found in 56 out of 58 patients in our study), paravertebral soft tissue abscess (48 patients) and the presence of increased signal intensity of intervertebral disc on T2WI (53 patients). In addition, MRI will identify other abscesses including extension into the psoas muscle (40 patients) and epidural space (33 patients), posterior element involvement (2 patients) and spinal cord compression (17 patients). MRI is also able to identify any resultant spinal deformity like gibbus formation (5 patients), vertebra plana (5 patients) etc. Atypically more than two contiguous vertebrae can be involved (3 patients).

Conclusion: MRI is the best diagnostic modality for spinal TB and is more sensitive than other modalities. It provides the diagnosis earlier than conventional methods, offering the benefits of earlier detection and treatment. MRI allows for rapid determination of the mechanism for neurologic compression and can distinguish between bone and soft tissue lesion. MRI with contrast is helpful in differentiating from noninfectious causes and delineating the extent of disease. MRI can identify the typical and atypical presentations of the disease.

Key Words: Tuberculosis, Potts spine, Magnetic resonance imaging.

INTRODUCTION

Percival Pott was the first person to present the classic description of spinal tuberculosis (TB) in 1779; hence, spinal TB was called 'Pott's Disease'. TB of the spine is one of the oldest demonstrated diseases of mankind and is the common extrapulmonary form of TB. The morbidity and mortality rate due to spinal TB is higher than other infections in developing countries with dense population. Since the advent of antituberculous drugs and improved public health measures, spinal TB has become uncommon in industrialized countries, although it is still a significant cause of disease in developing countries. Spinal TB has the potential for serious morbidity, including permanent neurologic deficits and severe deformity[1]. The diagnosis of spinal TB is challenging with non-specific constitutional symptoms and late presentation. Imaging plays an important role in the diagnosis and treatment decisions in these patients. Plain radiography remains the cornerstone of diagnosis in spinal tuberculosis; however, computerized tomography (CT) and magnetic resonance imaging (MRI) have gained popularity as special investigation methods. The MRI has become the gold standard for diagnosis and preoperative planning in spinal TB[2]. Osteoarticular TB is a paucibacillary, slow-growing disease, hence, the chances of diagnosing the disease clinicoradiologically, before it produces significant destruction, are remote, although magnetic resonance imaging (MRI) has certainly improved the diagnostics[3]. Accurate interpretation of imaging requires experience and understanding of spinal anatomy and pathophysiology. The sources of spinal infection can be hematogenous spread through arterial vessels, postoperative infection, direct puncture or trauma and also spread from a contiguous focus[4]. The MR features of infection confidently exclude tumor, degeneration, and so forth as the underlying process; differentiate pyogenic from granulomatous infections in most cases; and can suggest the rarer specific infective organisms[5]. Evidence on MR of involvement of two consecutive vertebrae and the intervening disk is virtually diagnostic of infective spondylitis. Rim enhancement around abscess, loculations within the vertebral bodies and/or paraspinal soft tissues is strongly suggestive of tuberculous spondylitis[6]. In

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this study we described the various typical and atypical presentations of spinal tuberculosis in order to help in early diagnosis and treatment of such patients before gross deformities occur.

MATERIAL AND METHODS

This study is a cross sectional study.It was conducted in radiology department of Peshawar institute of medical sciences from 1st January 2015 to 1st November 2015. During this duration 58 cases of spinal tuberculosis were reported using MRI.All newly diagnosed and old cases were included in the study .The different presentations of the disease were identified. In this study we also assessed the importance of contrast agents in such patients in order to diagnose the full extent of the disease.

RESULTS

MRI is the best diagnostic modality for spinal TB and is more sensitive than other modalities. In our study we evaluated 58 patients with tuberculous spine using MRI, out of these 36 patients were male and 22 females. Majority of the patients were middle age. The important findings of spinal TB on MRI are endplate disruption(present in 57 out of 58 patients in our study)(fig 1,3), paravertebral soft tissue abscess(48 patients)(fig 2,6) and the presence of increased signal intensity of intervertebral disc on T2WI(53 patients(fig 1)). In addition, MRI will identify other abscesses including extension into the psoas muscle(40 patients)(fig 7) and epidural space(44 patients), posterior element involvement(2 patients) and spinal cord compression(17 patients). MRI is also able to identify any resultant spinal deformity like gibbus formation(5 patients)(fig 5),vertebra plana(5 patients)(fig 5) etc and shows the extent of the lesion and the precise level of cord compression responsible for any neurological deficit and helps in deciding on the surgical approach in cases that need decompression. Post contrast MRI can be helpful in showing the total extent of the disease process (fig 4). Commonly there is involvement of two contiguous vertebrae but at times more than two vertebrae can be involved (3 patients) (fig 1). Serial MRI can be used to assess the response to treatment and regression of the disease.

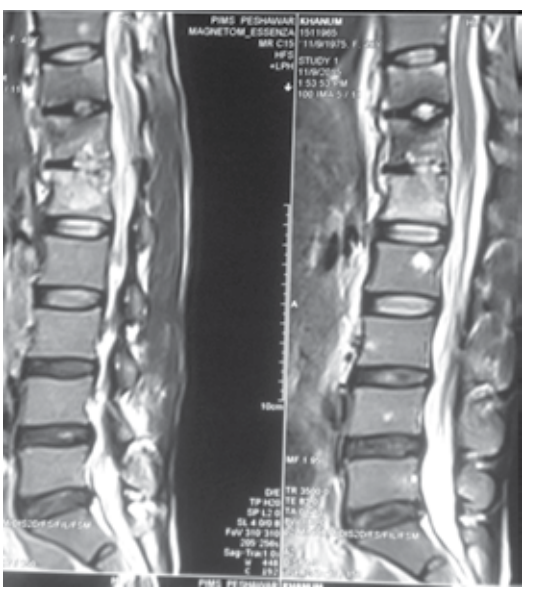

Figure 1. T2Weighted sagittal MRI image of lumbosacral spine shows altered signals in D11,D12 and L1 vertebrae and the intervening disc spaces.

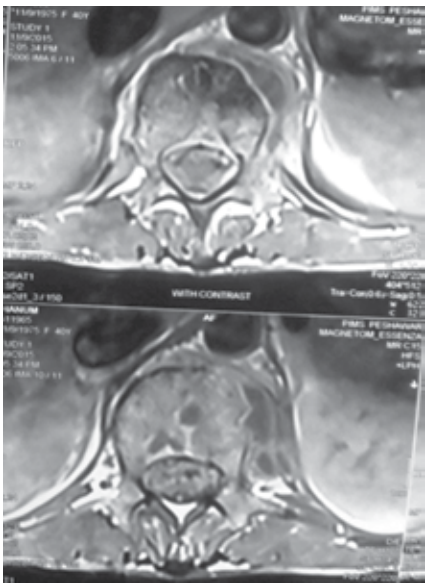

Figure 2: Post contrast axial MRI image of lumbar spine shows enhancement of the involved vertebrae along with minimal pre and left side para vertebral collection.

Figure 3: Sagittal T1Weighted MRI image of lumbosacral spine reveals altered signals in L2 and L3 vertebrae and the intervening disc space .

Figure 4: Axial and sagittal Post contrast MRI image of lumbar spine reveals irregular enhancement of the involved vertebrae.

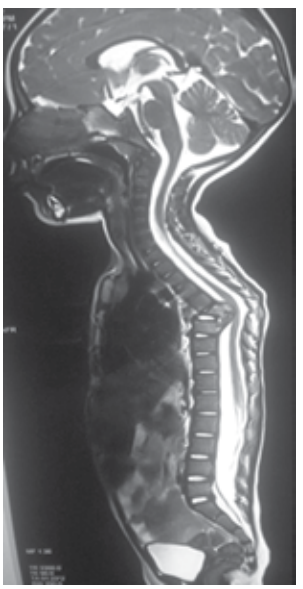

Figure 5: Sagittal T2Weighted MRI image of whole spine in a child reveals almost complete compression collapse of D7 and D8 vertebrae with resultant gibbus formation.

DISCUSSION

The incidence of typical acute vertebral osteomyelitis has decreased because of the more wide-spread use of antibiotics. However, tuberculous spondylitis is still a frequent cause of infectious spondylitis in endemic regions[7]. MR imaging is sensitive for detecting vertebral osteomyelitis and is therefore the imaging technique of choice in spinal infection[8]. MRI scan has a reported sensitivity and specificity of 100% and

Figure 6: Post contrast axial MRI image of a dorsal vertebra reveals enhancement of the vertebra along with pre and para vertebral collections.

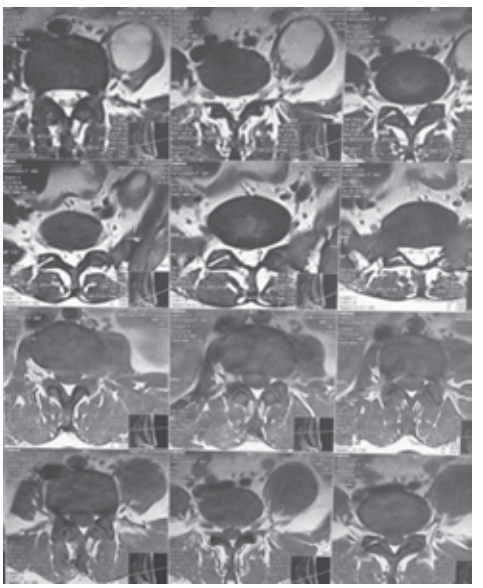

Figure 7: Axial T1 and T2Weighted images of lumbosacral spine reveals collection in left psoas muscle .

88.2% respectively for the diagnosis of spinal TB[9]. The major advantages of MRI are the earlier detection of spinal TB as suggested by an increased intensity of the bone marrow and allowing for overview of the whole vertebral column to diagnose non-contiguous lesions[10]. Three important findings of spinal TB on MRI are endplate disruption, paravertebral soft tissue abscess and the presence of increased signal intensity of intervertebral disc on T2WI. In addition, MRI will identify other abscesses including extension into the psoas muscle and epidural space, posterior element involvement and spinal cord compression[2]. The use

of MRI in preoperative planning has been described before (Bell et al 1990). The method best shows the extent of the lesion and the precise level of cord compression responsible for any neurological deficit and helps in deciding on the surgical approach in cases that need decompression[11]. Contrast enhanced MRI with the use of Gadolinium chelates, improves the delineation of the abscesses which appear as an enhancing periphery and a necrotic core. A smooth enhancement of the wall and a discrete paraspinal enhancement suggests a tubercular infection, with the thick irregular enhancement being generally due to pyogenic infections. An enhancement along the nerve roots is suggestive of early arachnoiditis[12]. Awareness of the atypical imaging patterns of spinal infection is important in the appropriate clinical context to avoid a delay in diagnosis. Atypical patterns include involvement of only one vertebral body, one vertebral body and one disk, and two vertebral bodies without the intervening disk. Although it is uncommon, involvement of an isolated vertebral body without the adjacent disks or involvement of one vertebral body and one disk may be seen on MR images. Infection of an isolated vertebral body is thought to represent an early manifestation of a spinal infection. When two vertebral bodies are involved but not the disk, it may be difficult to differentiate infectious spondylitis from neoplastic conditions[13]. Therefore an awareness of atypical MR imaging findings of early infectious spondylitis is important to avoid diagnostic delay and unnecessary diagnostic procedures.

CONCLUSION

MRI is the best diagnostic modality for spinal TB and is more sensitive than other modalities. It provides the diagnosis earlier than conventional methods, offering the benefits of earlier detection and treatment. MRI allows for rapid determination of the mechanism for neurologic compression and can distinguish between bone and soft tissue lesion. MRI with contrast is helpful in differentiating from noninfectious causes and delineating the extent of disease. Serial MRI can be used to assess the response to treatment and regression of the disease.

REFERENCES

1. Ansari S, Amanullah F, Ahmad K, Rauniyar RK. Pott's Spine: Diagnostic Imaging Modalities and Technology Advancements. N Am J Med Sci. 2013 Jul; 5(7): 404-411.
2. Anley CM, Brandt AD, Dunn R. Magnetic resonance imaging findings in spinal tuberculosis: Comparison of HIV positive and negative patients. Indian J Orthop. 2012 Mar-Apr; 46(2): 186-190.
3. Jain AK,Rajasekaran. Tuberculosis of the spine. Indian J Orthop. 2012 Mar-Apr; 46(2): 127-129.
4. Garcia AR, Estrada SS, Odin CT, Gomila LC, Franquet E. Imaging findings of Pott's disease. Eur Spine J. 2013 Jun; 22(Suppl 4): 567-578.
5. Tins BJ, Pullicino VNC. MR Imaging of Spinal Infection. Semin Musculoskelet Radiol. 2004; 8(3): 215-229.
6. Sharif HS. Role of MR imaging in the management of spinal infections. AJR. 1992 June; 158(6): 1333-45.
7. Jung NY, Jee WH, Ha KY, Park CK, Byun JY. Discrimination of Tuberculous Spondylitis from Pyogenic Spondylitis on MRI. AJR. 2004 June; 182(6): 1405-1410.
8. Moore SL, Rafii M. Imaging of musculoskeletal and spinal tuberculosis. Radiol Clin North Am. 2001; 39: 329-342.
9. Danchaivijitr N, Temram S, Thepmongkhol K, Chiewvit P. Diagnostic accuracy of MR imaging in tuberculous spondylitis. J Med Assoc Thai. 2007 Aug; 90(8): 1581-9.
10. Polley P, Dunn R. Noncontiguous spinal tuberculosis: incidence and management. Eur Spine J. 2009 Aug; 18(8): 1096-101.
11. Desai SS. Early diagnosis of spinal tuberculosis by MRI. J Bone Joint Surg Br. 1994 Nov; 76(6): 863-9.
12. Gehlot PS, Chaturvedi S, Kashyap R, Singh V. Pott's Spine: Retrospective Analysis of MRI Scans of 70 Cases. J Clin Diagn Res. 2012 Nov; 6(9): 1534-1538.
13. Hong SH, Choi JY, Lee JW, Kim NR, Choi JA, Kang HS. MR Imaging Assessment of the Spine: Infection or an Imitation? Radiographics. 2009 Mar; 29(2): 599-612.