Role of Magnetic Resonance Imaging in Caries Spine

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A B S T R A C T

Objective: To evaluate the usefulness of Magnetic Resonance Imaging (MRI) in Caries spine, avoiding invasive procedures for the diagnosis of the spinal tuberculosis.

Patients and Methods: This cross-sectional study was conducted at Department of Orthopedic and Spine surgery, Ghurki |Trust Teaching Hospital Lahore, from January 2012 to May 2016. Patients who underwent surgery for cervical, thoracic and lumbar spinal tuberculosis were inducted in the study. Their MRI were reviewed and eight parameters namely T1 hypo intensity, T2 hyper intensity, epiphyseal involvement, disc involvement, pedicle involvement, anterior subligamentous extension, paraspinal extension and no spinous process involvements were noted. Each of the variables were given 1 point when present and zero when absent. Score of ≥ 6 favored a tuberculous pathology whereas ≤4 were suggestive of non-tuberculous etiology.

Results: We evaluated 243 patients of histopathologically proven cases of caries spine. Among these, 129 (53.08%) were females and 114 (46.91%) were males. Mean age of patients was 39.04 years ranging from 8 years to 71 years. Dorsal spine was mainly involved in 105 (43.21%) patients followed by lumbar spine in 91(37.45%) and cervical spine in 47 (19%) patients. Number of vertebrae involved were two or more in each case. Data showed that 238 (97.94%) patients had score ≥ 6 which favored a tuberculous spine whereas 5 (2.06%) patients had scores 5 which suggest anti-tuberculous cause.

Conclusion: Our study revealed that objectively outlined eight-point MRI criteria of vertebral lesions is expected to diagnose caries spine with confidence in majority of cases. The proposed scoring system will mitigate the dependency on histopathological diagnosis or invasive method, so that early initiation of anti-tuberculous therapy may be possible.

Keywords: Caries spine, Magnetic Resonance Imaging, Scoring system.

Introduction

Spinal tuberculosis is an ancient disease and the causative agent, Mycobacterium Tuberculosis is still detectable in the bones of Egyptian mummies.[1] The first description of spinal tuberculosis was given by Sir Percival Pott in 1779.[2] Today Spinal tuberculosis constitutes 50% of skeletal tuberculosis, 50-60% of extra Pulmonary tuberculosis and 1-5% of all tuberculosis cases. It continues to be a fatal disease in developed and under developed countries.[3] Although the thoracolumbar junction seems to be the most common site of the spinal

column involvement in Caries spine, any part of the spine can be affected.[4] Furthermore, the incidence of neurologic complications in Caries spine varies from 10% to 43%.[5] The diagnosis of spinal tuberculosis is not easy and in almost all cases, the illness manifests in advanced stages.[6] Conventional radiological imaging is noninvasive but it takes nearly three to four months for spinal tuberculous lesion to be evident on plain radiographs and unfortunately, more than 50% of the vertebra are destroyed before the formation of the lesions to be seen on a plain radiograph.[7,8,9]

The advent of magnetic resonance imaging (MRI), with reported sensitivity and specificity of 100% and 88.2% respectively, for Caries spine has revolutionized the diagnosis of the condition.[10] It can identify the pathological lesions in the early stages of the disease, correctly demonstrate the extent of the disease involvement and can monitor the response to treatment. However, the usefulness of MRI in diagnosis depends on accurate interpretations of the findings seen. Although the literature outlined the broad-spectrum features of MRI in spinal TB,[11] but what exactly defined the tubercular lesion on a spinal MRI is still not mutually agreed.[11] Hence, this study was conducted to outline, various pathological changes seen on MRI in established cases of Caries spine and to evaluate its diagnostic accuracy.

Patients and Methods

This cross-sectional study was conducted at Department of Orthopedic and spine surgery, Ghurki Trust Teaching Hospital Lahore, Pakistan, from January 2012 to May 2016.The research protocols were approved from Ethical Review Board (ERB) of the hospital. MRIs of all the patients who underwent surgery for cervical thoracic and lumbar spinal tuberculosis during this period, were reviewed and the MRI assessment was broadly divided into eight parameters (Table 1).[12] A score of ≥ 6 favored a tuberculous pathology whereas ≤4 were suggestive of non-tuberculous etiology. The cases included were those with a definitive diagnosis of Caries spine on histopathological examination of tissue obtained at the time of definitive surgery or biopsy. The patients with an inconclusive or doubtful diagnosis of spinal TB and those with infection due to nontuberculous mycobacteria were excluded from the study. Surgical procedures (anterior strut grafting, anterior instrumentation and posterior instrumentation) changed according to the progression of the disease. Posterior instrumentations and fusion was done in same session with anterior surgery or after 10–15 days in sever khyphosis (sagittal index more than 20 degrees) All the patients eligible for the study had a pre-treatment MRI done at the time of diagnosis. A retrospective assessment of the Pre-treatment MRI of the eligible patients was done and the findings were noted. Data entered into SPSS Version 15. Frequency and percentages were calculated for qualitative variables.

Results

A total of 243 patients of histopathologically proven caries spine were evaluated in our study. Among these, 129 (53.08%) were females and 114 (47%) were males. Their mean age was 39.04 years, ranging from 08 years to 71 years. The patients in the study group presented with backache, deformity and neurological deficit. Dorsal spine was mainly involved, in 105 (43.21%) patients followed by lumbar spine 91(37.45%) and cervical spine (n=47, 19%). Number of vertebrae involved were two or more in each case. In total cases, 238 (97.94%) patients had MRI scores ≥ 6 which favored a Tuberculous whereas 5 (2.06%) had score 5 which is a grey zone in this scoring system but all of our patients were histopathologically proven caries spine. The MRI characteristic findings are shown in table 2.

Table 1. Scoring system for MRI characteristic findings in spine tuberculosis		
MRI Characteristic involvement	Score when present	Score when absent
T1 hyposensitivity	1	0
T2 hypersensitivity	1	0
Epiphyseal involvement	1	0
Disc involvement	1	0
Pedicle involvement	1	0
Anterior subligamentous extension	1	0
Paraspinal extension	1	0
no spinous process Involvements	1	0

Table 2: MRI characteristic findings		
MRI Characteristic Findings	Number of patients	Percentage
T1 hyposensitivity	243	100
T2 hypersensitivity	243	100
Epiphyseal involvement	243	100
Disc involvement	238	98.3
Pedicle involvement	238	98.3
Anterior subligamentous extension	243	100
Paraspinal extension	242	99.5
Spinous process Involvements	06	2.4

Discussion

Early diagnosis is the keystone in the management of Caries spine. Delay in diagnosis leads to extensive bony destruction, progressive deformity and permanent neurological deficit. Spinal MRI show early bone involvement of TB than plain x-ray.[9] Several studies recommend the use of MRI for the early diagnosis of Caries spine [9,13] but lack of guidance on the appropriate interpretation could complicate the diagnosis and pose a great problem for the accurate diagnosis.[6] In our study, dorsal spine was most common site (43.21%) of involvement of TB spine, followed by lumbar spine(37.45%).Similar pattern of tuberculous involvement was reported in previous studies.[14,17] With a mean patient age of 39.04 years in our study, the finding outlines the predominant prevalence of TB in the younger, active & outgoing population group, having a higher incident exposure to the airborne tubercle bacilli. The number of vertebrae involved were two or more in each case in our study. Average vertebral involvement in spinal TB is reported to be between 2.5 to 3.8.[14] Pedicle was involved in 238 (97.9%) patients while six (2.46%) patients had involvement of the spinous process or the facet. Accurate diagnosis of isolated posterior element TB is essential, since similar picture is seen in spinal tumors and treatment strategy would encompass a laminectomy in addition to chemotherapy.[18] Disc involvement was reported in large majority (98%) of our patients. Based on the involvement of disc interval, Pertuiset et al identified two patterns of spinal TB, namely tuberculous spondylodiscitis (SPD) or classic Potts disease, and tuberculous spondylitis without disc involvement (SPwD).[19] Involvement of the disc space was a common finding observed in our study which varied from pure signal intensity changes, suggesting inflammatory edema (SPwD), to partial reduction of disc height, to complete destruction by granulation tissue. Demographically, since TB affects the younger population more frequently, disc involvement is seen frequently in spinal TB because it is more vascularized at the younger age.[20]

Regarding the eight point MRI criteria of the vertebral lesions we found that majority (n=237, 97.53%) of our patients had MRI scores ≥ 6 which favored tuberculous pathology whereas 5 (2.06%) had score 5 and 1 (0.41%) patient had a score ≤4 suggestive of non-tuberculous pathology, but all of our patients were histopathologically proven caries spine. Similar to our study Chandrasekhar evaluated the eight parameters in 45 spinal MRI and noted that scores ≥ 6 favored a tuberculous pathology whereas ≤4 were suggestive of non-tuberculous etiology.[12] He concluded that the eight-point MRI criteria of the vertebral lesions are very useful and reliable in diagnosing spinal TB thereby reducing the utility of invasive biopsy.

Conclusion

MRI is an indispensable modality of primary investigation in suspected patients of spinal TB, which aids in early, rapid, noninvasive and accurate confirmation of the diagnosis of spinal TB. By objectively outlining the eight point MRI criteria of the vertebral lesions, caries spine can be diagnosed with confidence in majority of cases. The proposed scoring system is expected to mitigate costs of surgery (when indicated) and dependency on histopathological diagnosis or invasive procedure. Moreover, early initiation of anti-tuberculous therapy will be beneficial for the patients. Amidst the multitude findings seen on MRI, the constellation of these eight pathological findings on a spinal MRI in the form of a scoring system would serve as a clinician's tool for rapid and confident diagnosis of spinal TB

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