Retrospective Study of Magnetic Resonance Imaging (MRI) Findings in Pott’s Spine

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ABSTRACT

Tuberculosis is the very communal infection found globally and can nearly all parts of the human body can be affected by it, mostly affect the chest. Among the tuberculosis of the skeletal system: 50% of cases affect the spinal cord. Tuberculosis infection of the spinal cord results in Gibbus deformity, edema, involvement of intervertebral discs, epidural abscess, paravertebral abscess and edema with bone destruction and vertebrae collapse in the soft tissue planes. The most valuable diagnostic tool is MRI as it can clearly show all of the above results in the spine tuberculosis affected patients.

Aim: The objective of this research was to know the pattern of incidence and to analyzed the several Pott's spine pathological processes by means of the MRI scan.

Study Design: A Retrospective study.

Place and Duration: In the Radiology Department of HMC Peshawar and Orthopedic Department of BKMC Swabi from August 2021 to January 2022.

Methods: This study analyzed MRI scans of 90 identified patients of spinal tuberculosis performed at the Radiology Department to govern the pattern of the several pathological lesions.

Results: This study institute Pott’s spine to be more common in the 21-50 age group, mostly among men. The lumbar and dorsal vertebrae are often affected and several vertebrae are affected frequently, with the most common affected is the L3 vertebra. The involvement of Intervertebral disc and para and pre-vertebral collections were communal, with epidural collection happening in > 75 of patients. 13.3% of the patients have cord oedema.

Conclusions: MRI is very sensitive in detecting various Pott’s spine pathological processes, and the occurrence patterns of these findings were assessed in this research. As the prevalence and incidence of tuberculosis depends on several sensitive epidemiologically parameters, this research could deliver a standard conclusion against which further results could be compared in future studies.

Keywords: Tuberculous spondylitis, lumbar abscess, Gibbus

INTRODUCTION

Tuberculous spine infection, Pott’s disease or tuberculous spondylitis was initially defined in 1779 by Percival Pott and was identified in mummies of ancient era from Peru and Egypt1-3. It is instigated by the bacterium Mycobacterium tuberculosis, spread often by the blood-borne infection through the Batson venous plexus4-3. Conferring to the WHO, about 20 million individuals, or approximately 1/3 of the global populace, suffered from TB in 2006, and 6 million of them fell ill each year, and 200,000 died from the disease universally5. It remains to be the leading infection causing augmented mortality and morbidity among under-developing states in compactly populated area5. The tuberculosis incidence has decreased in the Western states, but has revealed a renaissance among these non-endemic inhabitants in recent years. Its global incidence has also increased, predominantly in patients who are immunocompromised, at a frequency of 1.1% approximately in a year6-8. The drug addiction, malnutrition, human immunodeficiency virus (HIV) epidemic, the emergence of drug-resistant tuberculosis strains, alcoholism, and ineffective control programs of tuberculosis appear to be the main causes of the rise in TB incidence worldwide9-10. Approximately 11.2 million persons globally are infected with tuberculosis and HIV11. Therefore, tuberculosis is related closely to epidemiologically parameters which are sensitive, and may change the incidence of several pathological processes of tuberculosis. The process of infection in the vertebral body generally begins in the vertebral body at its cancellous bone part, which is beneath the periosteum anteriorly, and then spreads to the other vertebral parts and intervertebral disc12-13. The presenting Pott’s spine symptoms comprise fever of low-grade with rise in the evening, weakness, lethargy, loss of appetite, night sweats, and loss of weight which are typical of any tuberculous contamination14. The characteristic Pott’s spine symptoms are limited range of motion, local tenderness and severe spinal deformity (acute kyphotic flexion) in advanced stages of the disease15. The grave spinal tuberculosis complications are quadriplegia or paraplegia, monoplegia or hemiplegia, with a paraparesis frequency of 28%-47%. The utmost communal reason of non-traumatic paraplegia is tuberculosis in many parts of the world. The tuberculosis presentation on MRI exhibits many additional pathological progressions and can be classified as neoplastic or infectious lesions16. The main D/Ds comprise low-grade infections such as brucella, fungal infections, atypical mycobacteria and tumours such as multiple myelomas, metastases and lymphomas. The intervertebral discs are usually involved in these infections preserving them in tumors17. The objective of this research was to know the pattern of incidence and to analyzed the several Pott’s spine pathological processes by means of the MRI scan.

METHODS

This study was held at the Radiology Department of HMC Peshawar and Orthopedic Department of BKMC Swabi from August 2021 to January 2022. The MRI of all proven Pott's spine cases was assessed retrospectively by two consultant radiologists, and the disagreements were resolved later by harmony. This research comprised 90 tuberculosis cases detected histopathologically and suspicion of Pott's spine proven before or after MRI. Both genders and patients of all age-group were enrolled in the analysis, and patients done with repeated scans of the same subjects were not included. T1W and T2W sequences and the fat suppressed inversion recovery (STIR) sequence in the sagittal and axial planes were taken. The structures of bone were recognised and any collapse or deterioration was noted and considered in the T2W sequence as hyperintensity and hypointense in the T1W sequence [Table / Fig. one].

Edema of the spinal cord was manifested by a weak signal in the sequence of T1W and a hyperintensity in the sequence of STIR. The vertebral bodies posterior margins were carefully

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observed for bone fragments or posterior displacement in the epidural space [Table / Fig. 2].

The posterior component of the bone was carefully assessed for bone marrow destruction or edema [Table / Figure 3C]. Spinal edema was definite in the sequence of T2W as a hyperintensity [Table / Figure 3A and B].

The cerebrospinal fluid column was monitored for any accumulation in the epidural space that manifested as hypointense with heterogeneity in the sequence of T1W, signifying the existence of granulation tissue and necrotic material causing the subarachnoid space invasion and dura mater elevation. The level of this accumulation was recorded and > 75% decrease in the CSF column thickness was measured as important and caused compression of nerve. A comparable collection in the psoas muscles and Para/ pravertebral planes proposed to be an abscess, and an examination of the entire spine was performed to recognise skip lesions [Table / Figure 3A and B].

The posterior component of the bone was carefully assessed for bone marrow destruction or edema [Table / Figure 3C]. Spinal edema was definite in the sequence of T2W as a hyperintensity and the curvature alteration was recorded [Table / Figure 2]. Tuberculosis is usually related with a local periosteal reaction or no or little reactive sclerosis, which aids to distinguish it from spinal pyogenic infections. The collection aspiration under the control of CT or USG of pathological or paraspinal bone tissue was collected and culture-sensitivity was done. The histopathological examination of the sample for caseating granulomas, detecting acid-fast mycobacteria by Ziehl Neelsen staining.

In most cases, more than one vertebra was involved, in most cases 2 vertebrae (55.1%) were involved, then 3-4 vertebrae (36.7%), in two cases, a single vertebra was involved.

<table>
<thead>
<tr>
<th>Number of Vertebra involvement</th>
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<tr>
<td>2 Vertebra involvement</td>
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<tr>
<td>3-4 Vertebra involvement</td>
</tr>
<tr>
<td>Single Vertebra involvement</td>
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<tr>
<th>AGE</th>
<th>&lt;10</th>
<th>11-20</th>
<th>21-30</th>
<th>31-40</th>
<th>41-50</th>
<th>51-60</th>
<th>61-70</th>
<th>71+</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>Male</td>
<td>4</td>
<td>5</td>
<td>11</td>
<td>8</td>
<td>4</td>
<td>10</td>
<td>2</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>Female</td>
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<td>9</td>
<td>8</td>
<td>2</td>
<td>-</td>
<td>2</td>
<td>38</td>
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| Total | 4    | 8     | 25    | 17    | 6     | 16    | 10    | 4   | 90    |

The dorsal spine was affected in 44 (48.9%) cases, and the lumbar spine vertebra in 46 (51.9%) cases. Of these, 14 had lumbar and dorsal involvement of vertebrae.
Two dorsal vertebral involvement in cases were related to the cervical vertebrae, and one case was related to the sacrum of the lumbar vertebra. The involvement of cervical spine vertebrae includes 5 total cases, 4 were<30 years of age, 3 (3.3%) cases had Skip lesions. In most cases, the vertebral body involved is L3 (42.6%). In 21 (23.3%) cases a change in curvature was observed, mainly in the gibbus, caused by the collapse of the vertebrae.

<table>
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<th>Table-3: Complications of the spine</th>
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<tr>
<td>Collection in the epidural space</td>
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<tr>
<td>Thecal sac indentation</td>
</tr>
<tr>
<td>Neuron damage due to posterior dislocation or gibbus deformation</td>
</tr>
<tr>
<td>Altered Nervous state</td>
</tr>
<tr>
<td>Cord oedema</td>
</tr>
<tr>
<td>Lumbar abscess</td>
</tr>
</tbody>
</table>

The involvement of the intervertebral disc was a common symptom in 78 (86.7%) patients. A paravertebral and prevertebral collection was observed in all but 1 case, while collection in the epidural space was found in 69 (76.7%) patients. The collection in epidural space caused the thecal sac indentation in 53 cases, while cord compromise due to deformation of the gibbus or posterior dislocation of bone fragments was reported in 19 patients. The grouping of the epidural collections and gibbus damaged neurons in 16 patients. The size of the canal has been reduced by 75.5% which is considered serious. Worsening of the nervous state was observed in 18 (20%) cases. 12 (13.3%) of the patients have cord oedema. 29 (32.2%) cases had Lumbar abscess with bilaterally contribution in 12 cases. Of the 17 patients with psoas abscess on unilateral side, 8 had left sided and 9 had right sided. In 13 (17.8%) cases, 12 of which had pedicle involvement, destructive process or cord edema extending to the posterior bone components.

DISCUSSION

Skeletal tuberculosis accounts for 1-5% of tuberculosis cases, 50% of which affect the spine. Osborn stated that it is common at an early age in developing countries, while in the Western world it is middle-aged (40-45 on average). Sinan et al. institute 44% of patients in the 30-49 years of age group in their study24. In our study, the majority of cases were 21-50 years of age (mean 37.9 ± 18.2), which was comparable to the Misaedai et al findings, whose mean age was 39 ± 16 years. Although Osborn does not suggest a gender preference, most of the previously published series have found that spinal tuberculosis is more common in men than in women25. Although Pott's spine is generally more common in men, we have seen a predominance of women (81.5%) between the ages of 21-50, where Pott's spine is more common. 36.8% of patients in the 21-30 age group were women, 36.7 ± 15.1 years was the mean age of women, and of men 40.5 ± 21.1 years. This recommended that during the female's productive spell, women most commonly have Pott's spine26. The upper lumbar and lower thoracic regions have been supposed to be the maximum affected region in most studies22. Similar to the findings of Sinan et al in our study, it most often concerned the lumbar vertebrae, followed by the thoracic vertebrae. In a study by Sinan et al., he found involvement of intervertebral disc in 74% of cases, and in our study, there was 86.7% of them23. Gibbus, which transpires mainly in the dorsal spine, was seen in 28.2% of the patients testified in only 1/3 of the patients in the African study25. Gibbus' late appearance in the sequence of the disease in several numbers of patients is because delay in referral from inadequate health care systems in rural and urban areas. As in discicor region26, 80% of the patients have epidural involvement, which is a result comparable to this analysis (76.7%). Misaedai et al. detected a lumbar abscess in 14.3% of cases, and in our study, they found a lumbar abscess in 32.2% of patients27. MRI with Contrast and gadolinium chelates improves the identification of abscesses that appear as developed peripheral and necrotic nuclei28. Tuberculosis was positive in the Ziehl Neelsen staining of the cases included in this study or in the culture of pathological tissue aspirates. However, the results of these studies were negative in some cases of tuberculosis, and therefore some cases of spinal tuberculosis were excluded from this study29.

CONCLUSION

MRI is the significant way of early detection of disease and the method of choice for identifying the extent and activity of infection. It can additionally serve as a surgical treatment guide for tuberculosis of the spine. As the prevalence and incidence of tuberculosis depends on several sensitive epidemiologically parameters, this research could deliver a standard conclusion against which further results could be compared in future studies.

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