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Case Report

Pott's paraplegia and role of neuroimaging in resource limited setting: A case report and brief review of the literatures

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ABSTRACT

Background: Tuberculosis (TB) is the leading cause of morbidity and mortality in low and middle income countries (LMIC). Approximately 50% of cases of skeletal TB involve the spine. Failure to identify and treat these areas of involvement at an early stage may lead to serious complications such as vertebral collapse, spinal compression, and spinal deformity. The clinical and radiologic features of Pott's disease may mimic other spine diseases such as, metastatic lesions and other infectious etiologies, this is especially imperative in older patients.
Case report: We report a 60-year-old right handed male patient presented with back pain, paraparesis, and sensory symptoms 2 weeks duration. He has history of dry cough, fatigue, and reduced appetite, but no history of weight loss, fever, night sweat, and bowel/bladder incontinence. No contact history with TB patients. He has a borderline hypertension and diabetes mellitus. Serology for HIV was negative. Thoraco-lumbar magnetic resonance image (MRI) showed destruction of L2 and L3 vertebral body and the inter-vertebral disc; with T2 hyper and T1 hypointensity of the affected vertebral bodies. Probable tuberculous spondylitis with paraparesis was considered and the patient was initiated on antituberculous regimen and short course steroid therapy. After five months treatment, the patient showed significant clinical and radiological improvement.
Conclusion: In summary, the present case describes, a patient with Pott's paraplegia due to probable spine tuberculosis and showed significant clinical and radiological improvement following initiation of antituberculous drugs and short course of steroid; indicating the crucial role of imaging in the diagnosis of TB, especially in resource limited settings.

1. Introduction

Tuberculosis (TB) is the leading cause of infectious disease-related death worldwide [1,2]. In Ethiopia, TB is endemic and still a major public health problem; the country is still among the 22 high TB burden countries with high number of missed and infectious TB cases in the community [3]. Spinal tuberculosis (also called Pott's disease) was discovered by Sir Pott in 1776. TB bacilli reaches the spine either by hematogenous route from the primary pulmonary and abdominal focuses or from the adjacent paravertebral or para aortic lymph nodes [4–8].

Common clinical manifestations of Pott's TB includes: radiating back pain, spinal tenderness, paraplegia, and if not diagnosed and treated early the patient may present with spinal deformities [9]. Neurological deficit is common and reported between 23% and 76% of the cases. Spine MRI is the most sensitive and specific imaging modality in diagnosing and following spinal TB patients. Compared to plain X ray, MRI has the following advantage: it allows visualization of cord compression by pus and debris, intrinsic cord signal, bone marrow changes and disc destruction [4,8–10].

Abbreviations: **TB**, Tuberculosis; **MRI**, magnetic resonance image; **SSA**, sub Saharan Africa; **L2**, Lumbar level 2; **L3**, Lumbar level 3.

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Antituberculous treatment (ATT) and adjuvant steroid remains the cornerstone of treatment of patients with Pott's disease [11–14]. In microbiologically/ or molecularly confirmed cases Pott's disease, the role of surgery in is limited to the following indications: progressive acute neurologic deficit, progressive increase of spinal deformity (more than 40° of segmental kyphosis, anteroposterior or lateral translation), unsatisfactory medical treatments, and severe pain due to abscess or spinal instability [21–23]. With early diagnosis and treatment, prognosis of Pott's disease has good prognosis [1,5,8–10,15,16]. The present case describes a patient with paraparesis secondary to probable spine tuberculosis (Pott's disease) completely responsive to antituberculous and adjuvant steroid alone without surgical intervention.

2. Case report

We report a 60-year-old right handed male patient presented with back pain of 4 weeks and progressive lower limb weakness of 2 weeks duration; in which he becomes wheel chair bound since then. He was told to raised blood pressure and borderline diabetes, but no medications were initiated. He reported numbness and tingling sensation in bilateral legs. He has history of dry cough, fatigue, and reduced appetite; but no history of weight loss, fever, night sweat, and bowel/bladder incontinence. No history of similar illness, stroke, HIV infection, smoking, alcohol use, and trauma. On examination he is obese and well coherent. Blood pressure 140/90 mmHg; pulse rate 79 beat per minute; temperature 36.1 degree centigrade; and oxygen saturation of 92% room air. The patient was fully conscious and alert and cranial nerves were normal. Examination of the lower limb shows: reduced tone and deep tendon reflexes. The muscle strength in the lower extremities Medical Research Council Scale (MRCS) was 3/5 bilaterally. Sensory examination shows, reduced pain and temperature sense in L2 –L5 dermatomal distribution. Plantar reflexes were equivocal bilaterally. Hematological and biochemical investigations were unremarkable, except mild elevation of fasting blood sugar, ESR, and hemoglobin A1C (Table 1). Abdominal ultrasound showed fatty liver; echocardiography and electrocardiography examinations were unremarkable. Chest X ray was unremarkable.

Plain X ray of thoracolumbar region showed mild vertebral body height reduction, otherwise unremarkable. Thoraco-lumbar MRI showed destruction of L2 and L3 vertebral body and the corresponding inter-vertebral disc; the L2 and L3 vertebral bodies' shows T2 and STIR hyper and T1 hypointense and destruction of vertebral bones and the corresponding intervertebral disc (Fig. 1).

The patient had no sputum production at the time of presentation. Thus, no AFB or Gene Xpert analysis was done from the sputum. Considering the presence of active infectious process in the lower lumbar region, we deferred to do CSF analysis in this patient. However, to avoid delaying initiation of the anti-tuberculous drugs in this patient; considering the clinical presentation, typical imaging findings, and epidemiology of TB in Ethiopia; we decided to initiate the patient on anti-TB treatment empirically with the diagnosis of paraparesis due to a probable tuberculous spondylitis (Pott's paraparesis) and immediately initiated on antituberculous regimen (Isoniazid; Rifampin; Ethambutol; Pyrazinamide) and dexamethasone 8 mg IV two times per day for 7 days and followed by oral prednisolone 60 mg daily dose. In addition, he received physical therapy for ten days. The patient was re-evaluated after five months of anti-TB treatment; and showed significant clinical and radiological improvement. The paraparesis and the sensory impairments were fully recovered with power of 5/5 in both proximal and distal lower limb muscles bilaterally. Follow up lumbo-sacral MRI shows healed spine tuberculous lesion and mild T2 hyperintensity of the L2 and L3 vertebral bodies (Fig. 2). The patient was advised to continue his antituberculous medications for additional seven months.

Table 1
Patient's laboratory investigations with normal reference value.

	Results	Normal reference values
White blood cells (WBC)	10, 000 (N 61%, L 32.2%)	5000 – 11,000 cells/mL
Hemoglobin (Hgb)	16 g/dL	14–16 g/dL
Mean corpuscular volume (MCV)	87.5 fL	80–99 fL
Platelets	206,000 cells/mL	150,000–350,000 cells/mL
Fasting glucose	149 mg/dL	70–140 mg/dL
Hemoglobin A1C	6.27%	<5.97%
Creatinine	0.89 mg/dL	0.5–1.2 mg/dL
Blood urea nitrogen	11 mg/dL	5–18 mg/dL
ALT	25 IU/L	10–59 U/L
AST	33 IU/L	10–40 U/L
Alkaline phosphatase	107 IU/L	20–140 U/L
Erythrocyte sedimentation rate (ESR)	24 mm/hr	0 and 20 mm/hr
HIV serology	Negative	
Cholesterol	186 mg/dL	Up to 200 mg/dL
High density lipoprotein (HDL)	41	greater than50
Low density lipoprotein (LDL)	117	Up to 150 mg/dL
Triglyceride	140 mg/dL	Up to 150 mg/dL
Potassium	3.79	3.35–5.1
Sodium	138	136–145
Chloride	102.3	101–109

3. Discussion and conclusion

The present case describes a 60 year old patient with probable Pott's paraparesis managed conservatively after he presented with radiating back pain and lower extremities weakness. In developing countries like Ethiopia, spinal tuberculosis is a frequently encountered extra pulmonary form of the disease particularly in younger age group [11,12,17,18]. However, for patients with advanced age like the present case, who presented with progressive back pain and paraparesis, metastatic lesions are the common suspect, even in the resource limited settings [19]. Therefore, in resource limited countries, TB spondylitis should be one of the differential diagnoses for patients of any age who presented with radiating back pain and progressive paraparesis.

In Ethiopia, considering the endemic nature of TB infection, it is vital for practicing clinicians to have a high index of suspicion toward spine TB in a patient who presents with radiating back pain and paraparesis [20]. In the present case, the following risk factors were identified: advanced age, living in endemic region, and comorbid diabetes. Furthermore, clinical suspicion of spine TB should be augmented by

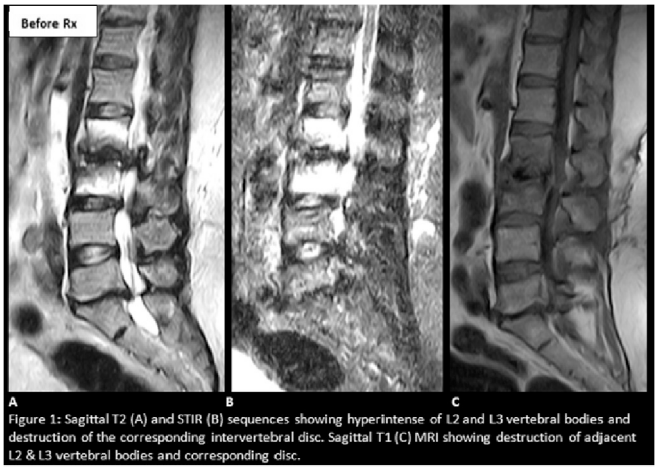

Fig. 1. (A) Thoraco-lumbar sagittal T2 (A) and STIR (B) MRI showing destructive hyperintense lesion of L2 and L3 vertebral bodies with hypointense corresponding intervertebral disc (red arrow); (C) T1 MRI sequence showing hypointense L2 and L3 vertebral bodies with the corresponding disc (red arrow).

Fig. 2. (A) Thoraco-lumbar sagittal T2 (A) and STIR (B) MRI showing mild hyperintense lesion of L2 and L3 vertebral bodies with hypointense corresponding intervertebral space (red arrow); (C) T1 MRI sequence showing isointense L2 and L3 vertebral bodies with the corresponding disc (red arrow).

imaging of the spine, which will further strengthen the clinical diagnoses of Pott's disease. In resource limited countries such as Ethiopia, where access to the microbiological and Gene Xpert analysis for TB diagnosis is limited, it is important to improve patient's accessibility to advanced imaging modalities such as MRI.

The recommended total duration of antituberculous treatment (ATT) for patients with spinal TB varies from guideline to guideline. World Health Organization (WHO) recommends a minimum of 9 months, while the American Thoracic Society recommends 6 to 12 months, and the British Thoracic Society recommends six months therapy [11,18,21]. However, many experts still prefer a durations of 12–24 months or until radiological or pathological evidence of regression of disease occurs [11,13,14]. Similarly, considering the severe disability and mortality associated with CNS tuberculosis, use of an adjuvant steroid is recommended, especially in those patients with tuberculous arachdinitis [11,18,21]. In the present case, the ATT was continued for 12 months and the oral steroid was discontinued after 8 weeks. Prolonged ATT is important to make sure the patient is cleared of mycobacterium tuberculous bacilli, in order to reduce the risk of multi drug resistant (MDR) tuberculous infection. In Pott's disease complete clearance of TB bacilli can be followed by serial of spine MRI and absence of post gadolinium enhancement on a follow up imaging would suggest absence of an active disease and would guide the clinician decision to stop the ATT. In microbiologically/ or molecularly confirmed cases Pott's disease, the role of surgery in is limited to the following indications: progressive acute neurologic deficit, progressive increase of spinal deformity (more than 40º of segmental kyphosis, anteroposterior or lateral translation), unsatisfactory medical treatments, and severe pain due to abscess or spinal instability [21–23].

According to recently published review report on non-traumatic myelopathy from the sub Saharan Africa (SSA) [24], Pott's disease is the commonest cause of compressive myelopathy in the SSA. The authors found infectious causes of paraplegia (eg. tuberculosis, HIV, and syphilis) more common in younger age group compared to those ages above 50. Furthermore, they recommend considering degenerative diseases and neoplasm in older patients with progressive paraplegia [24]. Contrary to these findings, the present case describes a probable Pott's paraplegia in an older age patient with no known risk factors such as HIV infection, except mild hypertension and borderline diabetes. Hence, clinicians in the resource limited settings should effectually utilize clinical, imaging, and epidemiological data to guide their management plan, even in older patients.

4. Role of neuroimaging in Pott's disease, particularly in resource limited settings.

Confirmatory diagnosis of tuberculous infection requires detecting mycobacterium tuberculous (MTB) bacilli in biological samples such as sputum, tissue, and cerebrospinal fluid (CSF). Ironically, in most of the SSA countries, where TB infection is endemic, the availability and accessibility of the microbiological and genetic diagnostic tests were limited. However, evidences from the ancillary tests such elevated ESR, CRP, and plain X ray of the chest and vertebral region would significantly support the presence of TB infection [12,14,18,25,26]. Thus, it's important for the treating physicians to guide their management primarily based on clinico-radiological evidences of tuberculosis particularly for CNS infections such as, spinal TB, so that delay in the treatment would be avoided. Certain anatomical and pathophysiological aspects involved in producing a typical tuberculous lesion serve as a guide-wire in dissecting the various etiologies which mimic spinal tuberculosis. In spinal TB, the lower thoracic and upper lumbar vertebral regions are the commonest region to be affected; furthermore, paradiscal lesions, anterior segment (body) involvement, and destruction of the intervertebral disc are highly suggestive of Pott's spine [26–28].

The differential diagnosis for spine tuberculosis in older patients includes: metastatic disease, pyogenic infection (eg, brucellosis), and degenerative disorders; all of which have similar imaging characteristics. Nevertheless, there are some clinical and radiologic features that may help differentiate these mimickers from Pott's disease [7,29–31]. Mycobacterium tuberculosis is a species of pathogenic bacteria in the family mycobacteriaceae and the causative agent of tuberculous infection and the bacilli gets an access to the spine structures via the venous plexuses [26,32–35]. In older individuals such as the patient case, the top culprits were degenerative vertebral diseases and metastatic lesions to the spine [1,2,6,8,26]. Even the country is located in the SSA, in the past few decades in Ethiopia, the number of advanced imaging modalities such as magnetic resonance image and CT scans has significantly increased. However, the availabilities of these imaging modalities were primarily in the urban cities. This fact needs to be corrected urgently. Because, the present case showed us the positive role of neuroimaging modalities in early diagnosis of spine tuberculosis, even in the absence of confirmatory microbiological/ or Gene Xpert analysis.

In a setting where confirmatory diagnosis of spinal TB is challenging, the diagnosis of TB could be supported by: history of contact with TB patients elevated ESR, C-reactive protein (CRP), lymphocyte predominant leukocyte count, and chest X ray abnormalities [1–3,7,9]. In the present case, the ESR showed borderline elevation, normal chest X ray, and the patient denied contact with patient with active TB infection. However, CRP was not determined because of financial constrain. However, even in a resource limited settings whenever possible it's important to support TB diagnosis with microbiological or molecular tests, as these tests help the clinician to select more potent and sensitive ATT and further contribute to the global effort to reduce the burden of MDR TB.

Compared to plain X ray, magnetic resonance imaging (MRI) of the spine is the preferred imaging modality in the diagnosis and follows up of patients with spinal TB. Because MRI can detect spinal canal narrowing, cord compression / cord oedema and can also pick up clinically/ X-ray occult cases as well as multilevel involvement, without the risk of ionizing radiation, and have a better sensitivity for the soft-tissue abnormalities [26–28,36,37]. The lower thoracic and upper lumbar levels are most commonly affected spinal sections [7,9,26,32,34,35,38]. In the present case, the upper lumbar region at L2 and L3 vertebral level was involved including the intervertebral disc, which is in line with the literatures [19,39–42]. The age of the present case makes us to be cautious and to rule out metastatic disease to the spine. However, the negative results of the modest cancers work up (normal abdomino-pelvic ultrasound and chest x-ray); relatively short disease duration and involvement of the intervertebral disc on the MRI speak against possibility of

malignancy as a culprit of paraplegia in our patient.

Sinan et al. 2004 [43], reviewed spinal imaging of 30 patients with confirmed TB; the lumbar spine was the commonest affected site followed by the thoracic spine. Furthermore, intervertebral disc destruction was observed in two-third of the patients. Of the 11 patients who had an MRI, contiguous vertebral disease with disc destruction was seen in 10 cases. A fragmentary type of bone destruction was the most frequent CT feature of the disease (48.2%) followed by the lytic type (24.1%) [43]. In this case, the adjacent L2 & L3 lumbar vertebral bodies were destructed along with the corresponding intervertebral disc (Fig. 1). Similarly, a review done in Pakistan on 60 patients with spinal tuberculosis showed, MRI findings of tuberculosis spine were reduced intervertebral disc space in 95% cases; wedge collapse of body was observed in 30%; complete destruction of vertebral body was seen in 20%; paraspinal abscess and cord compression were observed in 40% and 26.6% respectively [44] (Table 2).

Tuberculosis has a unique predilection for the anterior vertebral bodies and rarely affects the posterior vertebral elements such as the pedicles; this is in contrast to metastatic disease, which primarily affect the posterior vertebral structures [19]. Rarely, tuberculosis of the spine may also affect the posterior vertebral structures such as pedicle, transverse & spinous processes and lamina [19]. Sivalingam et al. 2015 [19] reviewed 59 Patients diagnosed as tuberculous spondylitis with atypical MRI features. Accordingly, all the 59 cases of spinal TB show no involvement of intervertebral disc and posterior appendage involvement was observed in more than half of the patients. Contrary to this, in the present case the posterior vertebral structures were not affected. Similarly, a review done by Dunn et al. 2011 [40], supported the rare involvement of the posterior vertebral appendage in Pott's disease. Nonetheless, the damage of the intervertebral disc will be uncommon in case of a metastatic lesion of the spine. This is because, most metastasis occurs hematogenous and intervertebral discs are avascular structures [26,31–35]. Furthermore, adjacent surrounding inflammatory collections are usually uncommon in tumour infiltration [26,31–35] (Table 2).

In the present case, the most important differential diagnosis includes; metastatic spinal lesion, pyogenic spine infection, and degenerative diseases [26,31–35]. The predominant involvement of the anterior vertebral body of two adjacent spinal bones and the corresponding intervertebral discs supports the diagnosis of Pott's disease [32,35,38,39,45,46]. These is contrary to the neuroimaging hallmarks of metastatic carcinomas which preferably involves the posterior vertebral components and often spares the intervertebral discs [19,33,38,43,44,47,48]. Similarly, pyogenic spinal infections often present with more acute and short duration of toxic symptoms such as fever, elevated ESR, severe spine tenderness, and history of intravenous (IV) drug abuse [30,33,34]. Contrary to these, the present case symptoms were started over a period of two weeks, absence of toxic symptoms, and no history of IV drug abuse. In the present case, the diagnosis of degenerative vertebral diseases is less likely; because osteoporotic vertebral involvement is more common in thoracic regions and also the degenerative vertebral lesions do not involve the pedicle or have contour abnormalities [7].

In summary, the present case describes, a patient with Pott's paraplegia due to probable spine tuberculosis and showed significant clinical and radiological improvement following initiation of antituberculous drugs and short course of steroid; indicating the crucial role of imaging in diagnosis of TB where microbiological and genetic tests are inaccessible. This case also highlights on the benign prognosis associated with early diagnosed and treatment.

5. Declaration

Consent to publication: Written informed consent was obtained from the patient family for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Table 2
A review of neuroimaging features patients with Pott's disease.

#	Author et al.	Country	# of patients	Neuroimaging Findings
1	Sinan et al. 2004 [39]	Kuwait	30	Lumbar spine is commonly involved (43.3%) Fragmentary type of bone destruction (48.2%) Intervertebral disc destruction (72%) Paravertebral mass/abscess (65.5%)
2	Misra et al. 2020 [38]	India	36	Spondylodiscitis (92%) Epidural abscess (81%) Spinal cord edema (47%) Paravertebral abscess (81%), Vertebral body collapse (33.3%)
3	Bajwa et al. 2009 [25]	Pakistan	60	Spinal cord compression (26.6%) Thoracolumbar commonly affected (45%) Intervertebral disc space (95%) Wedge collapse of body (30%) Complete destruction of body (20%), Paraspinal abscess (40%). Calcification (30%)
4	Page et al. 2006 [26]	France	19	Paravertebral abscess (15%) Spinal cord edema (25%) Spinal cord compression (47%) Radicular compression (42%)

Availability of data and materials: All data sets on which the conclusions of the case report based, to be available as a medical record document and available from the corresponding author on reasonable request from the editors.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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