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Case Report

Transverse myelitis in a 26-year-old male with tuberculosis☆

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ABSTRACT

Acute transverse myelitis is an inflammatory condition covering the entire cross section of the spinal cord, spreading on two or more vertebral segments, without evidence of a compressive lesion. This shows clinically as an acute or subacute onset of paraparesis, lower limb paresthesia, sensory deficits, and impaired sphincter function. Mycobacterium tuberculosis is exceedingly rare cause of this inflammation, with a mechanism still not fully understood. The main etiologies are thought to be an abnormal activation of the immune system against the neuronal cells of the medulla, direct inoculation of the bacillus, and the toxic effect of the antitubercular medications on the spinal cord.

We present the case of a 26-year-old male patient with acute symptoms of transverse myelitis and presence of miliary tuberculosis of the lungs. The purpose of this case report

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Keywords:

Acute transverse myelitis
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Paraesthesia
Paraparesis
Impaired sphincter function
Magnetic resonance
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is to put the emphasis on the importance of distinguishing the characteristics of tubercular lesions on imaging modalities, especially on magnetic resonance imaging, in the differential diagnosis of tuberculosis as a rare but profoundly serious cause of acute transverse myelitis.

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Introduction

Acute transverse myelitis (ATM) is a neurologic syndrome derived from the inflammation of one or more segments of the spinal cord. The word transverse is used to show that the inflammatory process involves the entire cross-section of the spinal cord, including the posterior columns, spinothalamic tracts, and pyramidal tracts, but without clinical or laboratory findings of spinal cord compression. This presents clinically with an acute onset of bilateral sensory and motor deficits and impaired sphincter function [1].

ATM is typically classified as either idiopathic or disease-associated transverse myelitis. Disease-associated transverse myelitis occurs in the context of systemic inflammatory diseases, infection, and central nervous system (CNS) multifocal diseases [2].

There are many bacterial or viral causes of ATM such as influenza virus, herpes virus, human immunodeficiency virus (HIV), cytomegalovirus, Epstein Barr virus, poliomyelitis, syphilis, Lyme disease, and mycoplasma. *Mycobacterium tuberculosis*, an acid-fast pathogenic bacterium that primarily involves the lungs and is the causative agent of tuberculosis, is an exceedingly rare cause of transverse myelitis. Despite the availability of effective treatments, central nervous system manifestations of TB (CNS-TB) are the most serious complications, resulting in elevated levels of morbidity and mortality. The likelihood of developing CNS tuberculosis was 1.0% among 82,764 tuberculosis cases in an important prospective epidemiological study performed in Canada between 1970 and 2001 [3]. The meninges are the most frequent site of CNS allocation, resulting from hematogenous spread, while spinal cord involvement manifests like intramedullary tuberculoma, leptomeningitis, extradural TB, and exceptionally as transverse myelitis [4].

The symptoms of ATM usually progress over hours to few weeks, with 45% of patients worsening within 24 hours. The most common symptoms include lower limb paraesthesia (80%–95%), partial inability to move legs (paraparesis 50%), sensory level (80%), and bladder symptoms (almost 100%) [5]. The history, including past medical, family, and detailed social, may reveal systemic symptoms. Our patient presented with typical constellation of symptoms and signs of acute transverse myelitis associated with pulmonary symptoms of a long productive cough as well systemic symptoms of fatigue and anorexia, with a family history of a past tuberculous infection on the father's side.

The diagnosis is made using a combination of clinical symptoms with cerebrospinal fluid (CSF) analysis and magnetic resonance imaging (MRI) of the spinal cord. The typical

findings of the CSF are an increased level of proteins and pleocytosis, with normal levels of glucose and negative oligoclonal bands [6].

MRI is essential to rule out compressive causes of these neurologic manifestations, such as tumor, epidural abscess, herniated disc, stenosis of the medullary canal or hematoma. It is also used to show the extension of the lesion and for follow-up progress of these lesions after treatment [7].

Imaging modalities such as MRI as well as computerized tomography (CT) are of great significance for proving correct diagnosis and clinical management. Magnetic resonance imaging is considered the imaging modality of choice for the study of patients with suspected CNS tuberculosis coupled with thoracic CT scan to decide the extension of the pulmonary involvement.

The recommended management of this clinical entity is the treatment of tuberculosis and the use of high doses of systemic corticosteroids. [8] Despite longer treatment periods, CNS-TB carried a greater risk of death than pulmonary tuberculosis and it has a lower likelihood of being cured or receiving complete anti-tuberculosis therapeutic regimens. [9]

Case presentation

A previously asymptomatic, 26-year-old male presented to the Neurology Department with acute onset and progressive bilateral lower extremity weakness, paresthesia and urinary retention. He reported voiding difficulties had initially developed 3 weeks prior to admission, followed by bilateral lower limb hypoesthesia associated with progressively worsening walking difficulties. Four months prior the hospitalization, the patient reported fatigue, anorexia, and productive cough. He denied any pre-existing comorbidities and his previous medical history was unremarkable. His family medical history was significant for pulmonary tuberculosis on his father's side, for which he had received treatment 30 years ago. On physical examination, the patient was alert, oriented to person, place and time. Aside from urinary retention that needed indwelling catheter placement, the rest of the clinical examination of the genitourinary, respiratory, cardiovascular, and musculoskeletal systems was otherwise unremarkable. The abdomen was soft, non-tender and non-distended, with no presence of rebound or guarding. A thorough neurological assessment revealed bilateral motor and sensory deficits affecting the lower extremities. Bilateral spastic hypertonia and hyperreflexia were noted, as well as decreased muscle strength 3/5. Babinski's reflexes were present bilaterally, with no signs of meningeal irritation. No visual disturbances were clear. Ex-



Fig. 1 – Chest CT- Lung window presents multiple bilateral cavary and nodular lesions (a, b, c red arrows) as well as areas of parenchymal consolidation (a, black arrow) The findings impose on Tuberculosis.

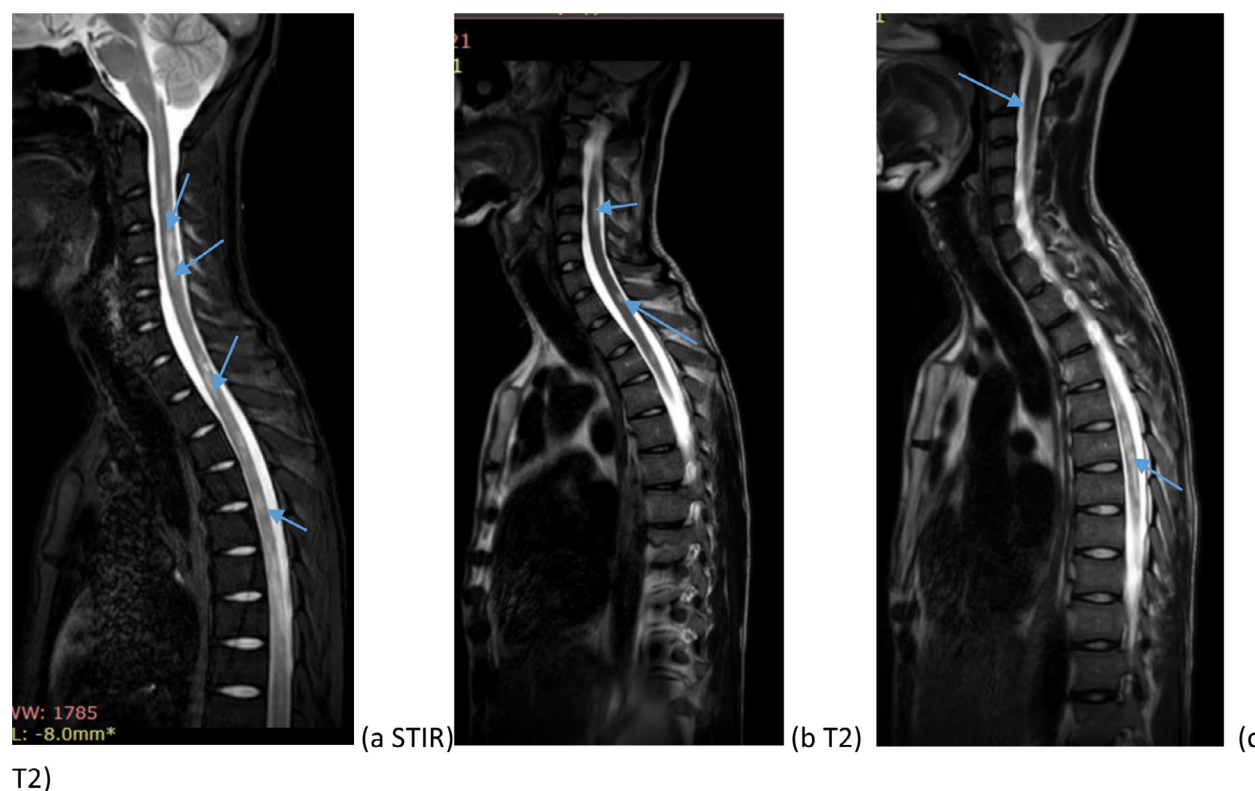


Fig. 2 – Spinal Cord MRI, both in the cervical and thoracic segment, presents multifocal lesions with T2-weighted image and STIR hypersignal (Blue arrows, a, b, c and g). Lesions have diffusion-weighted magnetic resonance imaging (DWI) (red arrows, cervical lesion d and e). There is moderate contrast reinforcement (blue arrowhead, f). The pulmonary changes that suggests Tuberculosis (white arrow, g) are also evident.

amination of the cranial nerves, cerebellum, cortical function, and upper extremities was within normal limits. Routine laboratory studies including a complete blood count, comprehensive metabolic panel, electrolyte panel and arterial blood gas test were ordered. They showed mild anemia RBC - 4.7×10^{12} /L, Hgb - 10.8 g/dL (RBC normal range - $4.3 - 5.9 \times 10^{12}$ /L, Hgb normal range - 13.5 - 17.5 g/dL), leucocytosis WBC - 19.0×10^9 /L (normal range $4.5 - 11.0 \times 10^9$ /L), elevated erythrocyte sedimentation rate, ESR - 89 mm/hr (normal range 0-22 mm/hr) and C- reactive protein levels, CRP - 50.1 mg/L (normal range 8-10 mg/L), elevated AST - 44 U/L (normal range 5-40 U/L), ALT - 79 U/L (normal range 7 - 55 U/L), total bilirubin - 6.7 mg/dL

(normal range 0.1-1.2 mg/dL), and LDH - 475 U/L (normal range 140-280 U/L) levels, as well as hypocalcaemia Ca - 1.12 mmol/L (normal range 2.13-2.55 mmol/L). Testing for HIV and Syphilis using the ELISA and VDRL tests, respectively were both negative, along with a COVID-19 rapid test.

Two blood samples were collected for interferon- gamma release assay testing, which eventually showed current mycobacterium tuberculosis infection. Thoracic CT scan and sputum samples were used to confirm diagnosis of acute tuberculosis (Fig. 1).

In addition, MRI revealed hyperintense lesions along the spinal cord, in the cervical and thoracic spine, as well as

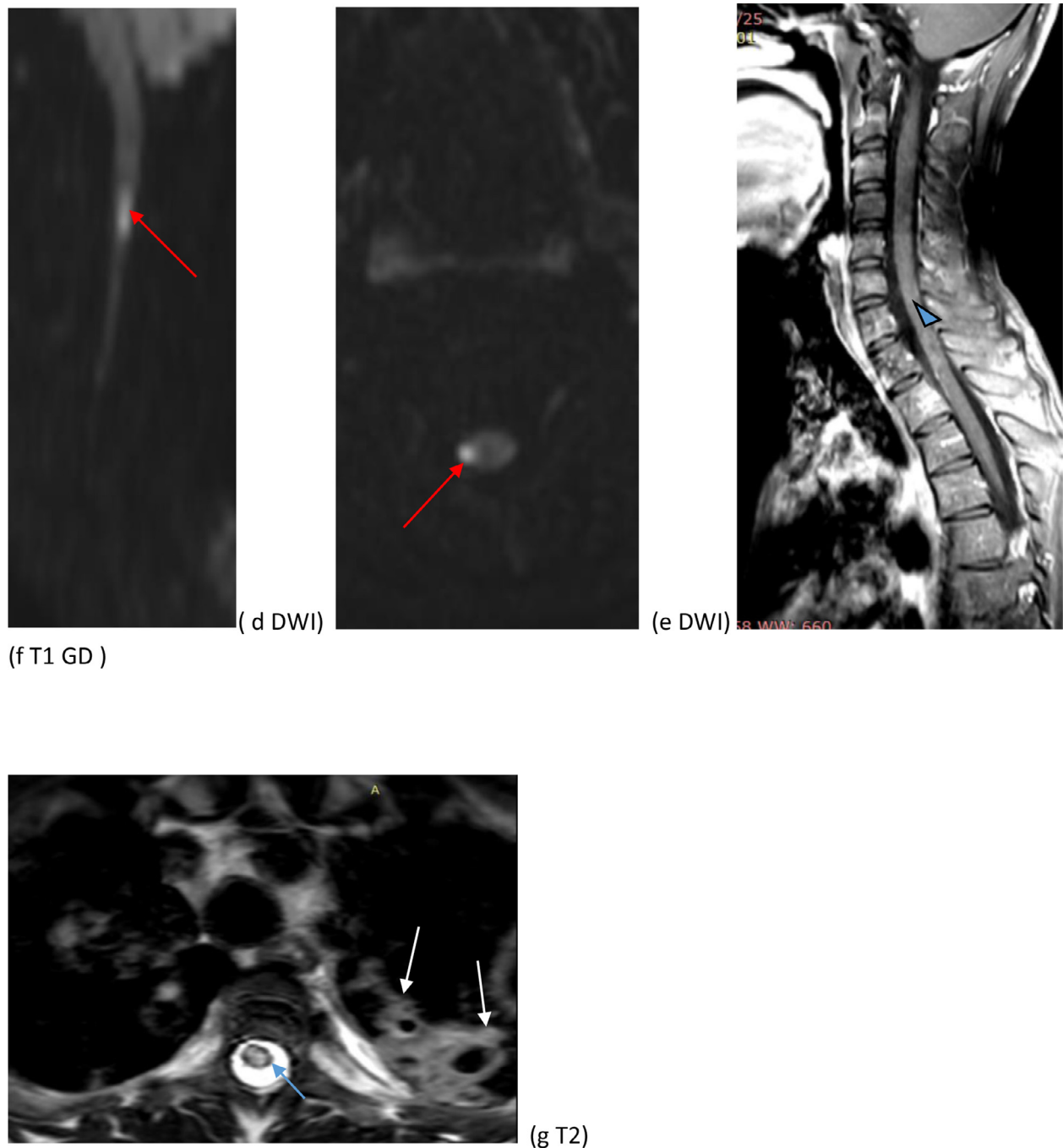


Fig. 2 – Continued

the brainstem, including the right side of the midbrain and the pons suggesting a demyelinating process (Fig. 2). The lesions showed discrete post-contrast enhancement following Gadolinium administration.

Following the imaging testing, lumbar puncture was performed, and a CSF sample was collected. CSF analysis showed a slightly elevated white blood cell (WBC) count - 10/mm³ (normal range 0-8/mm³), elevated protein levels - 1.02 mg/mL (normal range 0.15-0.6 mg/mL) and normal glucose levels - 3.07 mmol/L (normal range 2.5-4.4 mmol/L). Such results, along with the MRI findings, supported the hypothesis of transverse myelitis diagnosis. Xpert MTB/RIF assay and

oligoclonal bands were both negative. Electrophysiological studies (ENG/EMG) were notable for M-wave latency and reduction of the activity of the right gastrocnemius and extensor digitorum brevis muscles, potentially secondary to spinal cord injury.

Discussion

ATM is a focal inflammation across the spinal cord along one or more levels, in the absence of a compressive lesion.

Infectious myelitis is found in about 12% of patients and can be due to viral, bacterial, fungal, and/or parasitic infections [10]. Despite being a rare etiology of transverse myelitis, infection needs to be considered among the top differential diagnosis, given the importance of prompt recognition and initiation of therapy.

Mycobacterium tuberculosis is a rare causative agent of ATM, triggering an inflammation through a mechanism that is still not known for certain.

The main etiologic mechanism is thought to be an abnormal activation of the immune system against the spinal cord. This is thought to be a result of molecular mimicry phenomenon due to a similar subtype of ganglions that can be found in the cell wall of the human nervous tissue and on the cell wall of *mycobacterium tuberculosis*. The immune cells activated to fight off the infection, mistakenly also attack the neuronal cells, causing inflammation in the spinal cord. This inflammation leads to demyelination and neuronal injury of various degrees [11,12]. Another immune mediated mechanism is thought to be due to the superantigens that *Mycobacterium tuberculosis* has, which stimulate the activation of T-cells to attack myelin proteins [13].

Other suspected mechanisms are the direct invasion by the bacillus. The disease begins with the development of small tuberculous foci (Rich foci) in the brain, spinal cord, or meninges. They can have a compressive effect on the spinal cord or can be present as intramedullary lesions. The location of these foci and the ability to control them ultimately determine which form of CNS tuberculosis occurs [14]. Transverse myelitis may also be due to vascular thrombosis or mechanisms related to the toxic effect of antituberculosis drugs [15].

Spinal cord MRI and cerebrospinal fluid analysis are necessary for the transverse myelitis diagnosis. MRI findings reveal high signal intensity on T2 weighted images extending over 3 to 4 segments and occupying more than two thirds of the cord cross-sectional area [16]. This imaging characteristics help in the differential diagnosis with multiple sclerosis, in which the spine MRI show multiple small focal lesions affection less than 2 vertebral segments and less than half of the cross section of the medulla.

The brain MRI is the final diagnostic method used in differentiating transverse myelitis as an isolated condition or as the beginning of multiple sclerosis, with demyelinating brain lesions present on the latter condition [17].

Conclusion

Through this case report, we hope to draw attention to Tuberculosis as an uncommon cause of acute transversal myelitis and emphasize the importance of considering it in the differential diagnosis of noncompressive myelopathies, particularly in the presence of pulmonary lesions and clinical symptoms suggestive of TB. It is important that physicians and radiologists understand the characteristic patterns, distribution, and imaging manifestations of TB in the central nervous system. Magnetic resonance imaging is considered the imaging modality of choice for these cases.

Patient consent statement

Informed Consent Statement: Written informed consent has been obtained from the parent of the patient to publish this paper.

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