

Case Report

Mycoplasma pneumoniae and *Schistosoma mansoni* co-infection in a young patient with extensive longitudinal acute transverse myelitis

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Abstract

Introduction: Acute transverse myelitis (ATM) is an uncommon inflammatory, intramedullary, disorder of the spinal cord. Spastic paraplegia, impaired sphincter functions, and sensory loss, with sensory level, are the clinical manifestations of this devastating disorder. The utilization of magnetic resonant imaging (MRI) contributes to the surge in the diagnosis of more ATM cases. Although the causes of ATM are numerous, both *Mycoplasma pneumoniae* and *Schistosoma mansoni* are uncommon causes and their co-existence in the same patient has not been reported before in Saudi Arabia.

Case Summary: We report a 25-year-old ATM male patient presented with a history of sudden onset severe low back pain. Within four hours from the onset of the back pain, he became completely paraplegic with impaired functions of the bowel and urinary bladder sphincter. Furthermore, he lost all modalities of sensory functions in the lower limbs. His examination revealed spastic complete paraplegia with sensory level at T6. Clinical neurological examination revealed normal upper limbs and brain functions. The MRI of the cervico-dorsal spine showed extensive longitudinal hyperintense lesion extending from the upper cervical segments to the lower dorsal segments (extensive longitudinal transverse myelitis). A post-infectious immune-mediated predisposition was highly suspected due to the very high titers of anti-*Mycoplasma pneumoniae* IgM and IgG that were detected. The immunosuppressant therapy did not improve his paraplegia. A spinal cord biopsy revealed the presence of several *Schistosoma mansoni* ova surrounded by chronic inflammatory reactions and reactive gliosis.

Conclusions: Both *Mycoplasma pneumoniae* and *Schistosoma mansoni* should be investigated in cases with extensive longitudinal ATM.

Key words: Intramedullary lesion; longitudinal myelitis; *Mycoplasma pneumoniae*; neuroschistosomiasis; spinal cord; transverse myelitis.

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Introduction

Mycoplasma pneumoniae and *Schistosoma mansoni* are common pathogens causing community-acquired atypical pneumonia and human schistosomiasis, respectively [1,2]. Many studies reported the multiple systemic involvements of *Mycoplasma pneumoniae* in the pediatric literature [3-8].

Acute transverse myelitis (ATM) is an uncommon inflammatory, intramedullary, disorder of the spinal

cord and it is idiopathic in more than 50% of the cases [9]. The etiology of this clinical syndrome can be classified into three main categories. The first is inflammatory demyelinating ATM which can be due to multiple sclerosis and neuromyelitis optima and their wide-spectrum disorders. The second is ATM due to infectious causes such as viral, bacterial, and parasitic infections. The third is ATM due to noninfectious causes such as congenital spinal cord malformation, ischemic spinal cord stroke, vasculitis, intramedullary

tumors, and paraneoplastic syndrome [10]. The severity of transverse myelitis is variable from complete paralysis of lower limbs to mild rapidly improving paraparesis [11]. Recently, neuro-immunological mediated cases of autoimmune neuromyelitis optica were reported and paved the way for its specific effective antibody-mediated immunotherapy [12].

Although the causes of ATM are numerous, both *Mycoplasma pneumoniae* and *Schistosoma mansoni* are uncommon causes and their co-existence in the same patient has not been reported before. We report a 25-year-old man presented with rapid onset ATM. MRI of the cervico-dorsal spine revealed extensive longitudinal transverse myelitis. Anti-*Mycoplasma pneumoniae* IgM and IgG titers were critically elevated in the serum. A spinal cord biopsy confirmed the diagnosis of *Schistosoma mansoni* infection.

Case presentation

A previously healthy 25-year-old Saudi man working in agriculture presented with a three days history of upper respiratory tract infection in form of runny nose, sore throat, sneezing, cough, and sweating. A week after the onset of the respiratory symptoms he developed mild low back pain that progressed gradually and reached the maximum severity on the fourth day. On the fifth day, he started to complain of weakness in the lower limbs and an unsteady gait that progressed rapidly over four hours to complete paraplegia. It was associated with progressive lower limbs numbness up to the level of the lower abdomen, and urinary retention. There were no histories of trauma to the back, visual symptoms, upper limbs involvement, or previous neurological relapses, and there was no history suggestive of connective tissue diseases, recent vaccination, or travel.

The patient was living in Najran, Saudi Arabia. Najran is a province in southwestern Saudi Arabia and is famous for agriculture. The Najran Valley Dam is one of the largest dams in the Arabian Peninsula. The patient visited a local hospital on the day of the lower limbs weakness. His MRI confirmed extensive longitudinal signal changes involving the cervical and thoracic spinal cord with an enhancing lesion at the mid-thoracic area, and normal brain images. CSF analysis showed inflammatory changes, high WBC count at 50, with lymphocyte predominance and high protein. He was treated for transverse myelitis with intravenous pulse steroids. He showed transient improvement of the lower limbs' weakness within days and was able to walk using the walker. After two weeks, his lower limbs' weakness worsened as he developed

symmetric progressive weakness to complete paraplegia in four days associated with loss of sensation in the legs. Repeated spinal cord MRI in the local hospital showed the same previous finding. Treatment of the presented case at the local hospital failed to improve his clinical condition.

Two months after the initial presentation, he was referred to our hospital at King Abdulaziz Medical City. On examination, the patient had a temperature of 36.9 °C, pulse 114 beats per minute, sinus rhythm, respiratory rate of 18 breaths per minute, 102/59 mmHg blood pressure, and 99% oxygen saturation while breathing ambient air. His higher mental function, cranial nerves, and upper limbs on neurological examination were normal. The examination of his lower limbs showed symmetrical normal muscle bulk, the tone was spastic bilaterally, and his power was 0/5 on the MRC scale (where 0 no movement at all and 5 normal strength), this weakness involved all joints of the lower limbs in a symmetrical form. Deep tendon reflexes were pathologically exaggerated, which bilateral sustained ankle clonus, and bilaterally extensor toes. Sensory examination revealed impaired sensation for pain, temperature, and touch, with sensory level at T6. The sensation of proprioceptive functions was impaired up to the mid-thigh on both sides for both vibration and position sense. General physical examination was unremarkable, in particular, there was no lymphadenopathy, ankle pitting edema, or jaundice. Cardiovascular examination revealed normal first and second heart sounds with no murmurs or pericardial rubs. His respiratory system examination was unremarked. Abdominal examination was unremarkable except for hepatosplenomegaly.

Basic laboratory studies showed normal CBC, renal, and liver profiles. CRP was high at 38 mg/L, but ESR was normal. Urine analysis showed evidence of urinary tract infection and the culture revealed *Pseudomonas aeruginosa* which responded to the antibiotic course and repeated cultures were negative. Autoimmune markers were negative for ANA, anti-DNA, RF, anti-SS-A, anti-SS-B, C-ANCA, P-ANCA, anticardiolipin, and neuromyelitis optica antibodies. Vitamin B12 serum level was low at 132 pmol/L (138-652), and methylmalonic acid was high at 38 micro/L (8.6-32.0). The infectious screen showed positive antibodies to mycoplasma IgG > 200, IgM > 27, (> 10 is positive), high titer for *Schistosoma* antibodies 1:64 (> 1:16 is positive), positive IgG HSV1 and IgG varicella-zoster but not IgM. Results were negative for HSV2, CMV, EBV, enteroviruses, HIV, brucella, tuberculosis, VDRL, toxoplasmosis, and amoeba.

The neurological workup revealed the following results; CSF analysis showed inflammatory changes with high protein 1.08 g/L (0.15-0.40), cell count WBC 12, Lymphocytes 73%, Monocytes 19%, Segments 1%, Eosinophils 7%, RBC 28, glucose 3.5 mmol/L, serum glucose 6.7 mmol/L. CSF was positive for oligoclonal bands, CSF IgG was high 260 mg/L, (reference range 0-34). CSF angiotensin-converting enzyme (ACE) level was high 2.9 µ/L (normal < 2.0 µ/L). CSF cytology showed scattered lymphocytic cells and no malignant cells. CSF flow cytometry was not indicated as 96% of the cells were morphologically normal.

The MRI of the whole spine with and without Gadolinium contrast media administration showed a diffuse expanding intramedullary hyperintense lesion on T2 weighted image, extending from the mid-cervical up to the lower thoracic spinal cord segments. From T6 to T9 segments this lesion was heterogeneously enhanced (Figure 1). Brain MRI was normal. CT scans for the chest, abdomen, and pelvis, were all unremarkable. Whole-body positron emission tomography (PET) scan showed increased uptake localized to the spinal cord from the level of T5 through T8 (Figure 2). A spinal cord biopsy was declined by the patient and his family at this time.

The presented case was considered as an extensive longitudinal transverse myelitis patient. He received a course of intravenous pulse steroids, followed by

Figure 1. MRI weighted image of the spinal cord. (A) T2 MRI weighted image in an axial view confirmed the hyperintense lesion, which occupied almost the whole diameter of the spinal cord (single white arrow). (B) T1 MRI weighted image in a sagittal view of the cervical-dorsal spine with gadolinium contrast showed a patchy heterogeneously enhanced lesion in the lower dorsal segments (white arrows). (C) T2 MRI weighted image in a sagittal section of cervical –dorsal spine showing extensive longitudinal hyperintense lesion occupying almost the whole, spinal cord from C4 to T8 (white arrows).

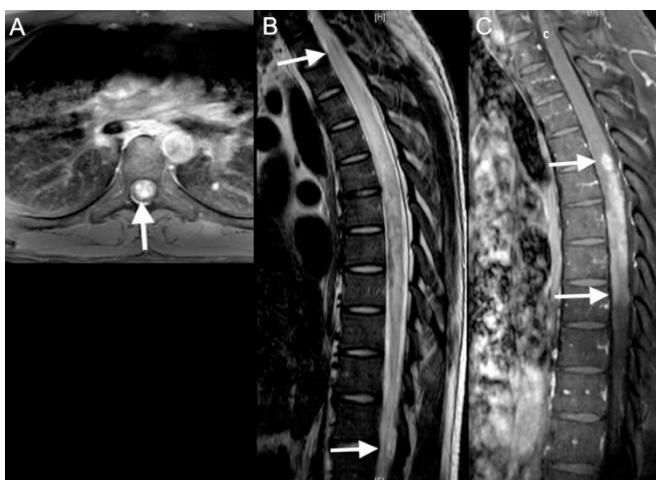
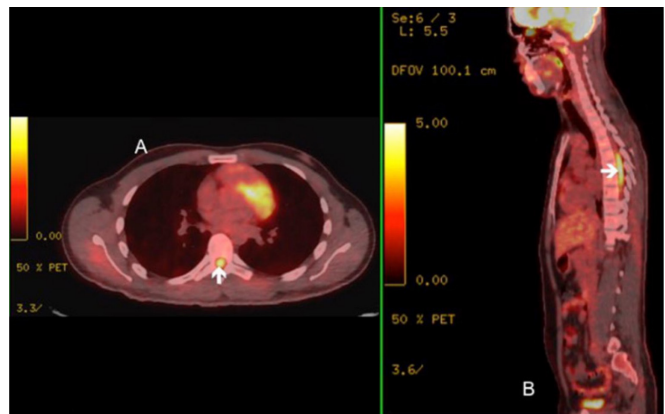


Figure 2. Positron Emission Tomography (PET) scan of the whole body. The PET scan shows a strong spinal cord uptake indicating a fulminant spinal cord infectious process (white arrows). (A) Axial view, (B) Sagittal view.



therapeutic plasma exchanges of seven sessions on alternative days. He also received parenteral vitamin B12 replacement. The patient showed no improvement. Repeated CSF analysis showed similar results to the previous one. However, the titers of anti-*Mycoplasma pneumoniae* IgG and IgM were critically elevated.

At this stage, *Mycoplasma pneumoniae* and *Schistosoma mansoni* infection were highly suspected to be the cause of the presented case depending on the infectious screen results. The case was treated with a moxifloxacin course under the supervision of the hospital’s infectious disease team; however, he did not show any improvement, thus, a spinal cord biopsy was considered at this time. Intraoperatively frozen section biopsies revealed only gliosis and chronic inflammation involving the spinal cord parenchyma. Permanent sections prepared from the unfrozen additional biopsy revealed the presence of several *Schistosoma mansoni* ova surrounded by chronic inflammation and reactive gliosis (Figure 3). The patient was treated with praziquantel and a high dose of steroids and his clinical condition was partially improved.

Discussion

We are presenting an unusual case suffering from acute longitudinal extensive transverse myelitis (LETM), *Mycoplasma pneumoniae*, and *Schistosoma mansoni* infections. The radiological appearance of the spinal cord lesion (Figure 1) was suggestive of intramedullary astrocytoma or ependymoma [13-15], while in fact, it was a pseudotumor. This case report is unusual for the following reasons. First, the symptoms of ATM were not preceded by symptoms indicating schistosomiasis infection. Second, the disease reached its maximum effects in hours (the patient became

completely paraplegic after only four hours from the onset of symptoms) instead of the usual course taking weeks or even months of progression, however, similar cases have been reported [16-18]. Third, the spinal cord lesion is expanding and ascending to the upper cervical segments (Figure 1). Fourth, the serum titers of both anti-*Mycoplasma pneumoniae* IgG and IgM were above the ability of the radioimmunoassay to detect, indicating that it was critically high. Fifth acute schistosomiasis is usually accompanied by fever and peripheral blood eosinophilia [17] which is not found in this patient. The term LETM is self-explanatory, indicating severe continuous multiple spinal cord segments involvement (three or more vertebral segments), similar to the case under discussion.

In the presented case, the weight of *Mycoplasma pneumoniae* in the pathogenesis of the disease is not fully clear. We believe that the process of ATM associated with *Mycoplasma pneumoniae* is a post-infectious immune-mediated process, rather than a direct invasion by the organism. *Mycoplasma pneumoniae* most likely initiated an autoimmunity process involved in the pathogenesis of the spinal cord

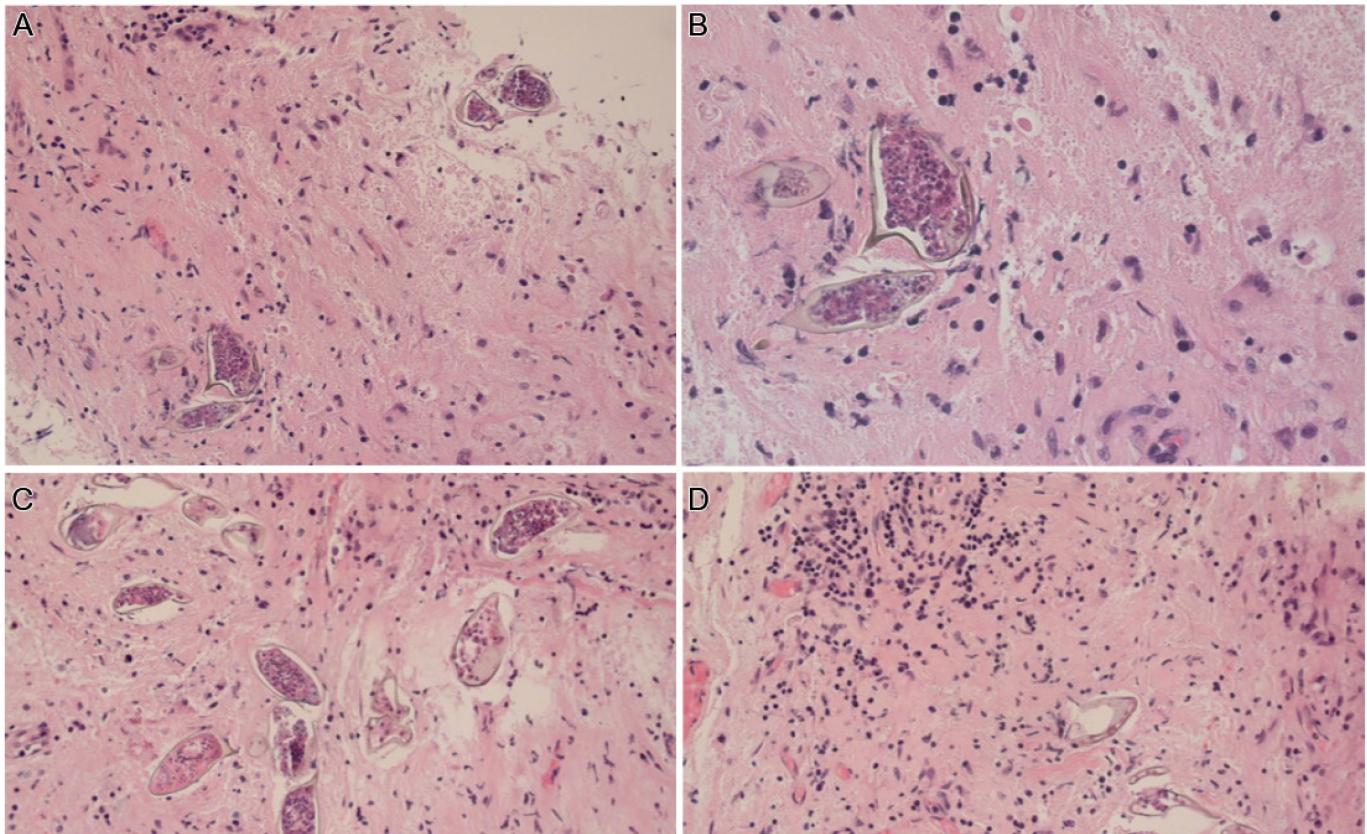
lesion. Case reports of acute autoimmune transverse myelitis were described in the literature such as following COVID-19 vaccination [19].

On the other hand, *Schistosoma mansoni* is involved in the pathogenesis of the presented case by direct spinal cord invasion with acute and chronic inflammatory reactions due to ova deposition, with subsequent granuloma formation. The patient declined spinal cord biopsy at presentation, however, after the failure of steroids and plasma phoresis therapies to improve his weakness, he was convinced to do the spinal cord biopsy which revealed the *Schistosoma mansoni* infection (Figure 3).

Last but not the least, the serum vitamin B-12 was significantly low in this patient, the cause of this deficiency is not clear. A role for *Schistosoma mansoni* is suspected, however, chronic schistosomiasis of the gastrointestinal tract causes malabsorption and iron deficiency anemia [20,21].

The differential diagnosis of ATM differs in tropical regions in contrast to temperate countries [22]. In tropical countries, infectious causes of ATM are important considerations and most of them are treatable

Figure 3. Thoracic cord Schistosomiasis. (A) Intermediate power view of the hematoxylin and eosin-stained section of the spinal cord biopsy showing deposition of several *Schistosoma* ova surrounded by gliosis and chronic inflammation. (B) High power view depicting the lateral spine of the *Schistosoma* ovum characteristic of the *Schistosoma mansoni* species. (C and D) Other fields with more deposition of *Schistosoma* ova.



with complete recovery if diagnosed and treated at the onset of the disease including neuroshistosomias [17-18], tuberculosis [23], and brucellosis [24-25]. Parasite infections are endemic in tropical regions, such as neurocysticercosis [26], neuro-leishmaniasis, and toxoplasmosis [27]. HTLV-1 is a well-recognized cause of tropical spastic paraplegia [28]. However, *Mycoplasma pneumoniae* related ATM is rare [3,5]. Noninfectious causes include spinal cord trauma (common in underdeveloped countries due to motor vehicle accidents), vasculitis such as SLE and Jorgen's syndrome predominate spinal cord vasculitis-related transverse myelitis, however other vasculopathies disorders are reported in association with longitudinal transverse myelitis. Tumors, congenital AV-malformation, and ischemic spinal cord stroke are among the causes of acute transverse myelitis in both regions [29].

Conclusions and Recommendations

Both *Schistosoma mansoni* and *Mycoplasma pneumoniae* are recognized causes of ATM, however, the co-existence of both infections in the same patient presented by acute LETM has not been reported before in Saudi Arabia. We recommend that both *Mycoplasma pneumoniae* and *Schistosoma mansoni* should be investigated in cases presented with acute LETM.

Authors' Contribution

All authors have contributed equally to this work and share the first authorship.

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