

# Acute paraplegia caused by *Schistosoma mansoni*

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## ABSTRACT

أن مرض البلهارسيا يصيب أكثر من 200 مليون شخص في جميع أنحاء العالم. إن إصابة الجهاز العصبي المركزي بهذا المرض هو أمر نادر الحدوث. نحن هنا نقوم بدراسة حالتين من الذكور الشباب الذين أصيبوا ببلهارسيا الحبل الشوكي والذين حضروا سريريا على هيئة شلل سفلي حاد مع سلس بولي. في كلتا الحالتين، التصوير بالرنين المغناطيسي للحبل الشوكي أظهر وجود تغيرات وارتشاح في المخروط النخاعي. لقد أظهرت الفحوصات المخبرية وجود زيادة في عدد الخلايا الحمضية وتغيرات مرضية غير محددة في السائل الشوكي النخاعي. في إحدى الحالتين، تم اعتماد التشخيص بناء على زيادة معدل مستضدات البلهارسيا مع وجود تغيرات ايجابية في خزعة المستقيم. في الحالة الأخرى، تم أخذ عينة من الحبل الشوكي والتي أظهرت وجود ورم حبيبي. كلا المريضين تم علاجهما بعقار برازيكوانتيل والكرتيزون القشري وتم تحسن الحالتين بشكل واضح. يقوم المؤلفون في هذا التقرير بعرض حالتين عن بلهارسيا الحبل الشوكي وبالتشديد على أهمية وجود حدس سريري عالي عند معاينة مثل هذه الحالات وخصوصا إذا ما حدثت هذه الحالات في مناطق موبوءة بهذا المرض.

Schistosomiasis affects over 200 million people worldwide. Involvement of the CNS is a rare occurrence. We report 2 young males who presented with rapidly progressing paraparesis associated with urinary incontinence. In both cases, MRI of the spine demonstrated a diffusely enhancing mass at the conus medullaris with extensive spinal cord edema. Laboratory investigations revealed mild peripheral eosinophilia and abnormal, but non-specific, CSF analysis. In one patient, the diagnosis was made based on a rising schistosomal titer with a positive rectal biopsy. In the other patient, spinal cord biopsy revealed a granuloma. Both cases were caused by *Schistosoma mansoni* and patients were treated with praziquantel and steroid therapy. They both made a remarkable neurological recovery. We emphasize that a high index of suspicion should be raised in the differential diagnosis of transverse myelitis in endemic areas.

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Schistosomiasis may present as an acute or chronic Trematodal infection, and affects more than 200 million people worldwide, 120 million of them are symptomatic, and 20 million are severely affected.<sup>1</sup> Although infection of the CNS with schistosomiasis is rare, the involvement of the spinal cord accounts for approximately 6% of non-traumatic myelopathy in endemic areas.<sup>2</sup> The literature review revealed more than 500 cases of spinal cord involvement by schistosomiasis; with only a few cases reported in Saudi Arabia. Our objective in presenting these particular cases is to report on spinal schistosomiasis, and to emphasize that a high index of suspicion should be raised in the differential diagnosis of transverse myelitis in endemic areas.

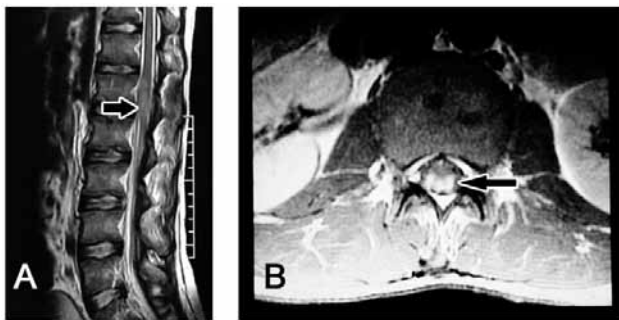
**Case Reports. Patient 1.** This 19-year-old previously healthy male developed cramps in his left thigh 3 weeks prior to admission. This was followed, 3 days later, by numbness, tingling, and hypersensitivity to touch in his left lower leg. He also had severe back pain radiating into the legs that worsened with movement, coughing, or sneezing. The course then progressed rapidly and within a week, he became paraplegic with an inability to control his urine and stool. He had no history of recent vaccinations, trauma, or any medical

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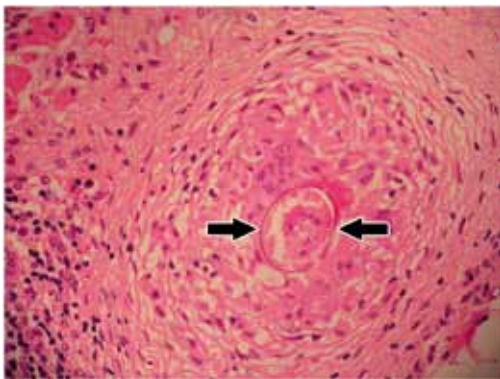
illness. He is a farmer living in Al-Baha, Saudi Arabia. He was admitted to King Abdulaziz Medical City Hospital with a normal general examination, including vital signs. Musculoskeletal system examination demonstrated localized percussion tenderness over the lower thoracic and upper lumbar spine with no swelling or deformity. Neurological examination revealed normal higher mental functions and cranial nerves examination. Motor examination of the upper extremities was unremarkable. Lower extremity examination showed symmetrical hypotonia, paraplegia, and areflexia. There was a sensory level to light touch and pin prick sensation at the eighth thoracic dermatome (T8) with a combination of paresthesia, hyperesthesia, and allodynia in a patchy pattern in both legs and buttocks. The rectal tone and anal wink reflexes were absent. Laboratory investigations revealed a normal complete blood count (CBC) with eosinophilia at 1000 cells/mm (100-700) on differential. Erythrocyte sedimentation rate (ESR) was within normal range, but C reactive proteins (CRP) were high at 69 (normal<5). Liver

function tests showed high alanine transaminase (ALT) of 108 units/Litre (normal range 10-55), and aspartate transaminase (AST) of 295 units/Litre (normal range 10-40), but were otherwise normal. The rest of his biochemical profile was unrevealing. An MRI of the spine demonstrated diffuse edema of the spinal cord extending from the conus medullaris up to the middle thoracic segment (Figure 1A). The conus medullaris has a gadolinium-enhanced intramedullary nodular lesion (Figure 1B). An MRI of the brain and cervicothoracic spine were normal. The connective tissue screen and serology for HIV, Hepatitis B and C, syphilis, brucella, toxoplasmosis, leishmaniasis, *Entamoeba histolytica*, hydatid, and cytomegalovirus (CMV) were negative. Schistosoma serology on 2 different occasions, 2 weeks apart, showed a rising titer of 128 and 2048 (normal titer less than 20). The CSF study showed pleocytosis (white blood cells 417, 90% mononuclear cells and 10% polymorphonuclear leukocyte cells), and 5 red blood cells with a mildly elevated protein and normal glucose. It was negative for oligoclonal bands. A rectal snip showed epithelioid granuloma with *Schistosoma mansoni* ova (Figure 2). He was treated with praziquantel, steroids (20mg/kg body weight 3 times a day on a one day treatment), and analgesia with intensive physiotherapy. At 3 months follow up, he was walking unsupported with full control of his sphincters and a follow up MRI scan showed marked improvement of the edema.

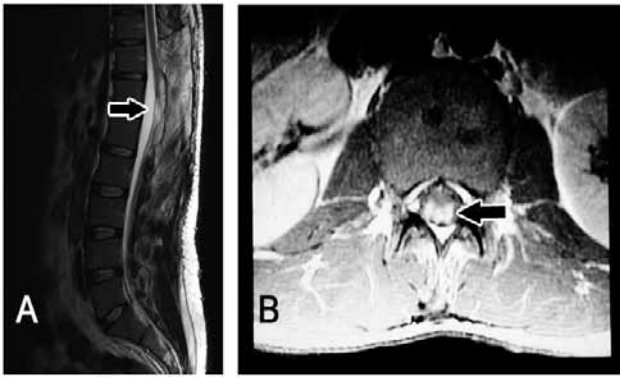
**Patient 2.** A previously healthy 36-year-old male presented with 8 days history of progressive weakness and numbness in his lower extremities. He was admitted to a local private hospital for 3 weeks where he became wheelchair-bound and unable to stand on his own. He also developed urinary retention. He denied any headache, nausea or vomiting, fevers, chills, cough, diarrhea, or any recent contact with febrile patients. He is a schoolteacher originally from Jazan, but lived in Jeddah for the last 9 years. Routine laboratory investigations at that time, including CBC, differential, and renal profile were within normal range. An MRI scan of the spine revealed diffuse cord edema and a 10x7x6 mm intramedullary conus medullaris enhancing lesion, which was initially reported as glioma (Figures 3A & 3B). An MRI of the brain and cervicothoracic spine was normal. He underwent emergency lumbar laminectomy and spinal cord biopsy. The histopathological diagnosis was a granuloma. He was transferred to King Abdulaziz University Hospital, Jeddah, for further treatment. On general physical examination, he appeared to be well nourished with normal vital signs. Local wound examination did not reveal any signs of infection. On neurological examination, he was awake, alert, and



**Figure 1** - Sagittal T2-weighted MRI sequences (A) and axial (B) demonstrating extensive hyperintense spinal cord signal extending from the conus to the middle thoracic level cord consistent with edema.



**Figure 2** - Light micrograph of a *Schistosoma mansoni* egg with surrounding granuloma.



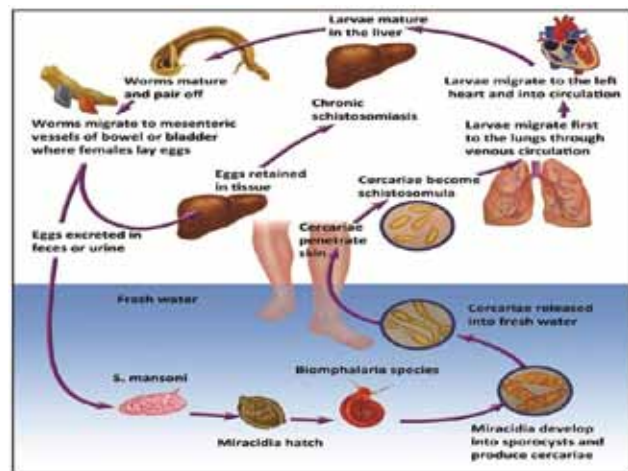
**Figure 3** - Sagittal (A) and axial (B) T1-weighted MRI sequences with gadolinium revealing expanded conus with a heterogeneous enhancing intramedullary lesion and surrounding cord edema.

oriented, and his cranial nerves were intact. His upper extremities had full strength and normal reflexes and sensory examination. However, his lower extremities had 2 out of 5 weaknesses throughout all muscle groups bilaterally. He had a sensory level at the twelfth thoracic dermatome (T12) for pain, temperature, and vibration but joint position sensation was intact. Deep tendon reflexes were absent at the knees and ankles bilaterally. He exhibited bilateral Babinski signs. Repeat laboratory investigation revealed a normal CBC with eosinophilia 850 cells/mm (100-700) on the differential. Screening serological tests and chest x-rays were negative. The liver function tests showed a mild increase in transaminases (ALT 78 units/L, and AST 98 units/L). A lumbar puncture was performed, and CSF analysis demonstrated elevated protein levels (67 mg/dl), normal glucose level, and increased white cell count of 195 with the following differential count: 30% neutrophils, 55% lymphocytes, 10% monocytes, and 5% eosinophils. The CSF culture was negative. Rectal biopsy and stool specimens were negative for schistosomal ova. The CSF enzyme-linked immunosorbent assay and immunoblot analyses detected the presence of immunoglobulin G antibodies against *S. mansoni*. He was treated with antiparasitic (praziquantel) and steroid therapy. He made a remarkable recovery apart from mild numbness of his feet. The MRI scans on follow up confirmed complete resolution of the intramedullary conus lesion (within 3 months).

**Discussion.** Schistosomiasis is considered one of the more important and serious parasitic infections of humans. As such it has been especially targeted for control by the Special Program for Research and Training in Tropical Diseases of the United Nations

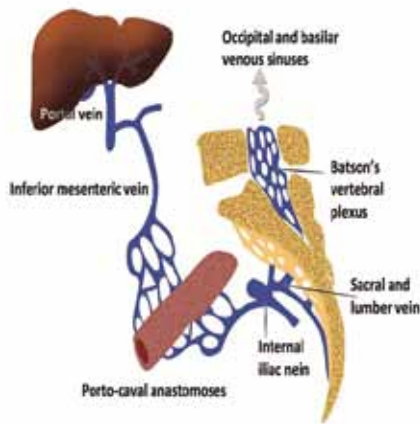
Development Program, the World Bank, and the World Health Organization.<sup>3</sup> It affects more than 200 million people in 74 countries, the majority with symptoms, and 20 million being severely ill.<sup>1</sup> Of the 16 species of schistosomes known to infect human or animals, 5 are responsible for most human infections: *Schistosoma haematobium*, *japonicum*, *mansoni*, *intercalatum*, and *mekongi*.<sup>4</sup> Schistosomes alternate generations between definitive hosts (mammals and birds) and intermediate hosts (snails) (Figure 4). Humans acquire *S. mansoni* infection through direct penetration of intact skin by the characteristically forked-tail cercariae. Once inside the human body, the cercariae lose their tails and differentiate into larval forms, called schistosomulae. The schistosomulae migrate and first reach the lungs to remain for 3-8 days. At the next station, the liver, the worms mature into adults and pair up. Male and female worms migrate to the mesenteric plexus of veins around the large intestine and rectum and start egg deposition. The human's cell mediated immune response, against egg-secreted antigens, represents the trigger of all pathology and the subsequent clinical picture. Most eggs do not pass in the stool. They either become entrapped in the intestinal wall or get carried away by the blood stream to lodge mainly in the liver or in any other organ of the body.<sup>5</sup>

Because they are small and rounded, eggs of *S. japonicum* may reach the brain. Those of *S. mansoni* and *S. haematobium* usually stay in the spinal cord. In spinal schistosomiasis, the infection is thought to occur because of migration of the ova into the spinal cord via the valveless perivertebral venous plexus of Batson, connecting both deep iliac veins and inferior vena cava to the veins of the spinal cord<sup>6</sup> (Figure 5). As the pressure



**Figure 4** - The life cycle of *Schistosoma mansoni*.





**Figure 5** - The mechanism of spread of *Schistosoma mansoni* into the spinal cord.

is usually around zero in this venous plexus, retrograde egg transport to the spinal cord is possible. The CNS schistosomiasis can rarely occur through anomalous migration of adult schistosomes into vertebral vessels, to start egg deposition. The epidural vertebral venous plexus, an “internal” part of the Batson’s plexus, communicates also with the occipital and basilar venous sinuses, affording a route for *Schistosoma* to reach the brain.

Spinal cord schistosomiasis due to *S. mansoni* may present as myelopathy, radiculopathy (or both) and rarely as a syndrome of anterior spinal artery occlusion. Until the clinical presentation with spinal cord symptoms, most patients have neither suggestive history nor a clinical sign of hepatosplenic schistosomiasis. The onset of the symptoms of spinal cord dysfunction is not predictable. It may take days to years from the time of *Schistosoma* infection. The lower thoracic region is most frequently affected, probably due to higher systemic-vertebral anastomosis.<sup>7</sup> Schistosomal myelopathy affects male patients in more than 80% of cases. Although different epidemiological studies have shown variable results, the mean age of presentation is 28 years for myelopathy caused by *S. mansoni*, while cases caused by *S. haematobium* present at a lower age (mean of 19 years).

Examination of CSF typically shows a mild pleocytosis, usually with a mononuclear predominance, raised protein, and normal or mildly reduced glucose. The CSF is always devoid of *S. mansoni* or *S. haematobium* eggs, which have never been detected. Serum immunological tests for schistosomiasis, while easy, have limited specificity in endemic areas.<sup>2</sup> The CSF schistosomal enzyme-linked immunosorbent assay

(ELISA) was found to be positive in 75% of patients with biopsy-proven schistosomal myelopathy (total samples were 17).<sup>8</sup> In the same study, 7% of patients with myelopathy due to other causes also had a positive test. Therefore, the CSF ELISA test could be indicative in areas with highly endemicity where a more specific investigative maneuver is needed.<sup>8</sup> The recovery of *S. mansoni* ova from stool or rectal biopsy is especially important in patients with neurological symptoms who have been in an endemic area.<sup>9</sup> A CT myelogram may show expansion of the conus medullaris in the granulomatous form with complete block at the level of the lesion; however, it is completely normal in the myelitic form. The MRI scan has a higher sensitivity in detecting spinal schistosomiasis. It demonstrates an enlarged conus medullaris on T1 weighted images; increased signal intensity in T2 weighted images, and a heterogeneous pattern of enhancement with contrast as seen in our case.<sup>10,11</sup> Although a definitive diagnosis can be made by laminectomy and spinal cord biopsy, this is rarely carried out.

Praziquantel is a broad-spectrum schistosomacidal drug with parasitological cure in 70-90% of patients, and is considered the drug of choice for all forms of schistosomal myelopathy. Improvement in motor, sensory, and sphincter function usually occur within 6 weeks following praziquantel treatment.<sup>2</sup> Although controversial, corticosteroids could have a role in patients with severe pathology to mitigate inflammatory responses participating in granuloma formation. A multidisciplinary team care and rehabilitation are necessary especially in severely disabled patients. Wheelchair devices, bladder intermittent catheterization, management of intestinal and sexual dysfunction, prevention of venous thrombosis and pressure sores, and treatment of urinary tract infections, spasticity, and pain may be needed.<sup>2</sup>

With regards to our cases, the diagnosis was made based on clinical presentation, a rising schistosoma antibody titer, consistent neuroimaging studies, identification of *S. mansoni* on a rectal biopsy or spinal cord biopsy showing granuloma. Both patients were treated empirically with our initial suspicion of the diagnosis, and they made a good recovery despite late presentation and resultant delay in initiating treatment.

In conclusion, spinal cord schistosomiasis is rare, but an important, and potentially treatable cause of myelopathy. It should be considered in any patient who lives in endemic areas especially if peripheral eosinophilia is present and ova are identified in stool, urine, or rectal biopsy.

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## References

1. Gryseels B, Polman K, Clerinx J, Kestens L. Human schistosomiasis. *Lancet* 2006; 368: 1106-1118.
2. Carod Artal FJ, Vargas AP, Horan TA, Marinho PB, Coelho-Costa PH. Schistosoma mansoni myelopathy: clinical and pathologic findings. *Neurology* 2005; 63: 388-391.
3. Morel CM. Reaching maturity - 25 years of the TDR. *Parasitol Today* 2000; 16: 522-528.
4. Davis A. Schistosomiasis. In: Cook GC, editor. *Manson's Tropical Diseases*. 20th ed. London (UK): WB Saunders Company Ltd. 1996. p. 1413-1456.
5. Coon DR. Schistosomiasis: Overview of the history, biology, clinicopathology, and laboratory diagnosis. *Clin Microbiol Newsletter* 2005; 27: 163-168.
6. Carod-Artal FJ. Neurological complications of Schistosoma infections. *Trans R Soc Trop Med Hyg* 2008; 102: 107-116.
7. Araújo KC, Silva Cda R, Santos AG, Barbosa CS, Ferrari TC. Clinical-epidemiologic profile of the schistosomal myeloradiculopathy in Pernambuco, Brazil. *Mem Inst Oswaldo Cruz* 2010; 105: 454-459.
8. Haribhai HC, Bhigjee AI, Bill PL, Pammenter MD, Modi G, Hoffmann M, et al. Spinal cord schistosomiasis. A clinical laboratory and radiological study, with a note on therapeutic aspects. *Brain* 1991; 114: 709-726.
9. Nascimento-Carvalho CM, Moreno-Carvalho OA. Neuroschistosomiasis due to Schistosoma mansoni: a review of pathogenesis, clinical syndromes and diagnostic approaches. *Rev Inst Med Trop Sao Paulo* 2005; 47: 179-184.
10. Lucato LT. The role of magnetic resonance imaging in the management of schistosomal myeloradiculopathy. *Arg Neuropsiquiatr* 2012; 70: 167-168.
11. Saleem S, Belal AI, El-Ghandour NM. Spinal cord schistosomiasis: MR imaging appearance with surgical and pathologic correlation. *AJNR Am J Neuroradiol* 2005; 26: 1646-1654.

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