Spinal Schistosomiasis: Differential Diagnosis for Acute Paraparesis in a US Resident

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Abstract

Background: Spinal schistosomiasis is a severe presentation of *Schistosoma mansoni* infection, which is endemic in South America, the Middle East, and sub-Saharan Africa. With increasing international travel, a disease can spread from an endemic area to another part of the world easily.

Objective: To present a case of a US resident who developed acute paraparesis due to spinal schistosomiasis after traveling to sub-Saharan Africa.

Participant: A 45-year-old woman presented with abdominal pain radiating into the bilateral lower extremities. She was diagnosed with a pelvic mass and underwent an urgent hysterectomy with right salpingo-oophorectomy. Postoperatively, she developed progressive weakness with worsening pain in her bilateral lower extremities and neurogenic bladder. Magnetic resonance imaging showed an abnormal T2 hyperintense signal in the entire spinal cord below the T3 level with abnormal contrast enhancement from T9 through the conus medullaris. Spinal fluid analysis showed lymphocytic pleocytosis and elevated protein. The patient was diagnosed with transverse myelitis. Subsequently, a detailed history revealed a visit to Ethiopia 2 years earlier. Tests for *S mansoni* were positive. After treatment with praziquantel and prednisone, her neurologic function began to improve.

Conclusions: An increasing incidence of international travel is increasing the likelihood of US physicians' encountering this treatable condition. Travelers with spinal schistosomiasis may not have symptoms of systemic infection. Therefore, it is important to include spinal schistosomiasis in the differential diagnosis of acute inflammatory myelopathy, particularly with a history of travel to endemic areas.

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INTRODUCTION

Schistosomiasis is one of the world's most widespread parasitic diseases, and it is caused by the trematode *Schistosoma*. It has affected 200 million people worldwide (1). *Schistosoma mansoni*, 1 of the 3 main species, is endemic to South America, the Middle East, and sub-Saharan Africa (2). *S mansoni* uses a human as a definitive host and a freshwater snail (*Biomphalaria* species) as an intermediate host. Infection ensues upon direct contact with fresh water that harbors cercariae, a larval form of

schistosome released from snails. Upon exposure, cercariae penetrate the skin of humans and enter the blood and lymphatic circulation en route to the lungs. After several days, cercariae migrate to the portal venous plexus and sexually mature if they meet the opposite sex. Then the adult pairs travel to the venous plexus surrounding the intestines, where they begin egg production. Eggs pass through the intestinal mucosa and are shed in the stool. Once excreted, they hatch in fresh water and release the fresh-living motile form, miracidia, which, in turn, infect specific freshwater snails. The life cycle is completed when cercariae are released from the snails into water (2,3).

Acute schistosomiasis secondary to *S mansoni* infection presents with fever, headache, myalgia, diarrhea, and abdominal pain. Acute respiratory symptoms are reported in up to 70% of individuals. In the chronic phase, it commonly involves hepatic and gastrointestinal

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Figure 1. T2-weighted magnetic resonance image of the cervical (A) and thoracic (B) spine demonstrates hyperintense signal in the lower thoracic spine.

systems causing diarrhea, constipation, intestinal bleeding, intestinal obstruction, hepatomegaly, or portal hypertension (2). When *S. mansoni* infects the central nervous system, it commonly causes spinal cord disease known as spinal schistosomiasis. The central nervous system becomes infected either by migration of pairs of adult worms or by embolization of eggs through retrograde venous flow into the Batson venous plexus, a valveless paravertebral venous system from the mesenteric venous system (4). Clinical presentation of spinal schistosomiasis ranges from radicular pain to myelopathy causing flaccid paraplegia, bladder incontinence, and dysesthesia.

In times of increasing international travel, a disease can spread easily from an endemic area to another part of the world (2). The H1N1 virus outbreak is a recent example. We present a case of a US resident who developed acute paraparesis due to spinal schistosomiasis secondary to traveling to an endemic area, sub-Saharan Africa.

CASE DESCRIPTION

A previously healthy 45-year-old white woman presented with acute abdominal pain radiating into her bilateral lower extremities. Workup at that time revealed a 7-cm pelvic mass, and she underwent an urgent hysterectomy with right salpingo-oophorectomy. Pathology results indicated no malignancy. Postoperatively, she developed progressive bilateral lower extremity weakness, areflexia, sensory impairment, and bladder incontinence with worsening pain in the bilateral lower extremities. Magnetic resonance imaging (MRI) showed an abnormal T2 hyperintense signal in the entire spinal cord below the T3 level with abnormal contrast enhancement from T9

through the conus medullaris (Figures 1 and 2). The brain MRI was normal. Cerebrospinal fluid (CSF) was remarkable for pleocytosis, with 92% lymphocytes and an elevated protein level of 240 mg/dL. The CSF glucose

Figure 2. Gadolinium-enhanced sagittal T1-weighted magnetic resonance image of the thoracolumbar junction shows patchy enhancement with scattered focal nodular enhancement of the expanded distal spinal cord and conus.

Table 1. Results of Laboratory Workup

Blood	Test	Normal Value	Test Result
	ANA	Negative	Negative
	Anti-double-stranded DNA	Negative	Negative
	Antiphospholipid IgG/IgM	Negative	Negative
	West Nile antibody	Negative	Negative
	TSH	0.2–5.5 mU/L	3.6 mU/L
	Vitamin B12	200–900 pg/mL	1,050 pg/mL
	Lyme antibody	Negative	Negative
	RPR	Negative	Negative
	VDRL	Negative	Negative
	NMO-IgG	Negative	Negative
	HIV ELISA	Negative	Negative
CSF	Test	Normal Value	Test Result
	Total WBC	0–5/mm ³	94/mm ³
	Differential WBC	—	Lymphocytes 92%
	Protein	15–45 mg/dL	240 mg/dL
	Glucose	5–80 mg/dL	62 mg/dL
	Gram stain	Negative	Negative
	Bacterial/viral/fungal culture	Negative	Negative
	West Nile IgG/IgM	Negative	Negative
	Cryptococcal antigen	Negative	Negative
	HSV PCR	Negative	Negative
	EBV PCR	Negative	Negative
	CMV PCR	Negative	Negative
	Enterovirus PCR	Negative	Negative
	Oligoclonal bands	Negative	Negative
	Myelin basic protein	Negative	Positive
	HTLV 1 and 2	Negative	Negative
	AFB PCR	Negative	Negative

ANA, antinuclear antibody; Ig, immunoglobulin; TSH, thyroid-stimulating hormone; RPR, rapid plasma reagin; VDRL, Venereal Disease Research Laboratory; NMO, neuromyelitis optica; HIV ELISA, human immunodeficiency virus enzyme-linked immunosorbent assay; CSF, cerebrospinal fluid; WBC, white blood cell count; HSV PCR, herpes simplex virus polymerase chain reaction; EBV, Epstein-Barr virus; CMV, cytomegalovirus; HTLV, human T-cell lymphotropic virus; and AFB, acid-fast bacillus.

level was within the normal range at 62 mg/dL. There were no oligoclonal bands. Exhaustive CSF workup for viral, bacterial, mycobacterial, and fungal infections was negative. Laboratory workup for connective tissue disorder, neuromyelitis optica, and human immunodeficiency virus was negative as well (Table 1). The patient was diagnosed with transverse myelitis and treated with a course of methylprednisolone 1 g/d followed by a 5-day course of intravenous immunoglobulin 400 mg/kg/d.

Although detailed serology results were inconclusive for the cause, she progressively worsened to flaccid paraplegia. Further history taking revealed her visit to Ethiopia 2 years earlier as a river guide. Examination of stool and urine for schistosomal ova was negative; however, the titer for schistosomal immunoglobulin G antibody was markedly elevated to 3.3 median fluorescence intensity (FOCUS Diagnostics, Cypress, CA). Her

serum sample was sent to the Centers for Disease Control and Prevention (CDC) for a *S mansoni* antibody Falcon assay screening and enzyme-linked immunosorbent assay test. This test is 99% sensitive and specific for *S mansoni* infection (5). Test results showed an elevated titer of 48 units/μL and confirmed the diagnosis of spinal schistosomiasis secondary to *S mansoni* infection. She was treated with praziquantel, an antihelminthic, for 5 days and prednisone for 14 days followed by a 4-week steroid taper. On neurologic examination at discharge, she was classified as T10 ASIA impairment scale A. She was wheelchair dependent for mobility.

She did not receive any rehabilitation intervention for 1 year. Follow-up MRI at 9 months showed an improving T2 hyperintense signal in the thoracolumbar spinal cord (Figure 3). Neurologic examination showed improvement to T10 ASIA impairment scale C with a lower extremity motor score of 8/50, normal deep anal

Figure 3. T2-weighted magnetic resonance images of the cervical (A), thoracic (B), and lumbar (C) spine demonstrate a decrease in hyperintense signal within the lower thoracic spinal cord after 9 months.

sensation, and weak voluntary anal contraction. She was able to walk with braces and continued to manage her neurogenic bladder by intermittent catheterization and bowel by colostomy.

DISCUSSION

Acute inflammatory myeloradiculopathy, also known as spinal schistosomiasis, is the most common neurologic complication secondary to *S. mansoni* infection. It commonly affects the conus medullaris and cauda equina. Radicular symptoms are caused by multiple granulomas deposited on the spinal roots with congestion and edema. Myelopathy is secondary to necrosis, vacuolization, and further atrophy of the spinal cord tissue (3,4). In sub-Saharan Africa, 1% to 5% of nontraumatic spinal cord injuries are attributed to spinal schistosomiasis (6). Spinal schistosomiasis is infrequently reported in the USA, except in immigrants from endemic areas or in individuals who were stationed in the endemic area (7–9).

Although a high CSF titer clearly indicates the presence of *S. mansoni*, the diagnosis of spinal schistosomiasis is often made based on the combination of strong clinical, epidemiologic, radiologic, and laboratory evidence (10,11). Our patient presented with radicular pain in the lower extremities and progressed to paraparesis, hypotonia, areflexia, and neurogenic bladder and bowel. This combination of symptoms is the most common clinical presentation of spinal schistosomiasis. The patient also had a travel history to the endemic area, with exposure to fresh water. Her CSF showed an increase in protein concentration. It also revealed a normal glucose level and elevated mononuclear cells. Other potential differential diagnoses

for myelopathy were ruled out, including infectious, inflammatory, or connective tissue disorders. The enzyme-linked immunosorbent assay test provided by the CDC is particularly sensitive to *S. mansoni* infection and showed an elevated titer of 48 units/ μ L. Spinal MRI is valuable in the diagnosis of schistosomal myeloradiculopathy. In this case, spinal MRI showed hyperintense areas on T2-weighted sequences and abnormal contrast enhancement in the conus medullaris (12,13). This patient responded well to praziquantel and steroid therapy.

Schistosomiasis affects approximately 25% of the population of sub-Saharan Africa and accounts for 93% of the global case burden (14). This patient most likely became infected while traveling in Ethiopia (15). Exposure to schistosome cercariae carried in snails during swimming or river rafting in the fresh water of the river increased the risk of infection. Incidence of travel-associated schistosomiasis is affected by the type of traveling. Business travelers are less likely to be infected than tourists (16). Travelers to the endemic area who develop spinal schistosomiasis present an unusual clinical scenario. They often do not have clinical evidence of systemic schistosomiasis (10,16). The low parasite burden may be responsible for the large number of negative results of parasitologic examinations. Spinal cord disease usually occurs within weeks to months after the infection. In rare cases, it has been reported after a few years (17), as seen in this case.

Most of the time, the diagnosis of spinal schistosomiasis is associated with positive retrospective travel history to the endemic area (18). A high index of suspicion is needed to diagnose spinal schistosomiasis

in travelers for the following reasons: (a) Patients often do not have systemic involvement. (b) Routine tests for detection of ova and parasites in urine and stool are often negative. (c) Onset of myelopathy may be delayed by months or even years in some patients. (d) Whereas histopathologic detection of schistosomal ova and inflammatory granulomas in the spinal cord provides a definitive diagnosis, such invasive surgery is not always a feasible option. (e) Full neurologic recovery is observed in 30% of all patients affected by spinal schistosomiasis (3).

Although uncommon in North America, an increasing incidence of international travel increases the possibility of an encounter of this treatable condition by US physicians. Therefore, it is prudent to include schistosomiasis in the differential diagnosis of acute inflammatory myelopathy, particularly in patients with a history of travel to endemic areas, especially in individuals who were exposed to fresh water. It is also recommended that these travelers be screened (16,19). The CDC also urges physicians to become familiar with the clinical manifestations, diagnostic criteria, and appropriate treatment for schistosomiasis (20).

CONCLUSION

Every year millions of Americans travel internationally for business and recreational activities. Travel to endemic areas can expose them to infection by *S mansoni*. Spinal schistosomiasis is a serious but curable condition, and it should be considered in the differential diagnosis of acute inflammatory myelopathy. Screening of all potentially exposed travelers should be encouraged.

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