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Case Report

Cerebral Schistosomiasis Caused by *Schistosoma mansoni*: a Case Report with Clinical Analysis

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Abstract

Central nervous system involvement arising from schistosomiasis is uncommon. It may be produced most frequently by *Schistosoma japonicum* infection, but reports of *S. mansoni* presenting as an intracerebral mass lesion are particularly rare. The authors describe the case of a 35-year-old woman with a 3-month history of partial epileptic seizures and headaches. She immigrated to Egypt 4 years ago and had worked in Iraq for 2 years after the immigration. The patient's general physical and neurological examinations were unremarkable. Magnetic resonance (MR) imaging revealed an enhancing lesion with surrounding edema and mild mass effect in the left frontal lobe. A stereotactic brain biopsy demonstrated intraparenchymal granulomas surrounding *S. mansoni* eggs. *S. mansoni* was identified by stool examination. Prednisone (1 mg/kg per day for 1 week, with gradual withdrawal during the following 3 weeks) and praziquantel (2 doses at 20 mg/kg per day) therapy was initiated. The patient's symptoms resolved following medical treatment and the follow-up MR imaging yielded normal findings. This case is the rare imported case of cerebral schistosomiasis in China and the neuroschistosomiasis should be considered as the patient lived in a region in which this disease is endemic.

Keywords: *Cerebral schistosomiasis, Magnetic resonance imaging,* Schistosoma mansoni

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Introduction

Schistosomiasis is one of the most widespread parasitic infections in the world. Schistosomiasis is transmitted to human by skin contact with infested water. Three major *Schistosoma* species known to infect humans are *Schistosoma haematobium* (endemic in Africa and the eastern Mediterranean), *S. mansoni* (endemic in Africa, the Middle East, the Caribbean, and South America), and *S. japonicum* (endemic mainly in China, Japan, and the Philippines). More than 200 million people are infected with schistosomiasis worldwide (1). It is estimated that more than 1000000 humans in China are presently infected with *S. japonicum* (1-3).

Humans are the definitive host, although certain aquatic snails act as the intermediate host. The adult parasite is a flat, elongated fluke that lives in the mesenteric (*S. mansoni* and *S. japonicum*) or pelvic *(S. haematobium)* veins. Females of this genus lay hundreds to thousands of eggs per day, which are excreted in human urine or feces. Intestinal or urinary symptoms are most common; they develop when eggs remain in the wall of the bowel or bladder and incite a localized inflammatory response. Although gastrointestinal system involvement with appears to be common, cerebral schistosomiasis is rare. Cerebral lesions most frequently occur in cases of *S. japonicum*, whereas *S. mansoni* and urinary or bladder schistosomiasis may involve the spinal cord.

The authors describe an unusual imported case with partial seizures caused by *S. mansoni* (4, 5).

Case report

This 35-year-old woman grew up in China and worked as an engineer in a company major in petrochemical processing before immigrating to Egypt 4 years ago (2004). After the immigration, she worked in Iraq for another two years. Three months before hospital admission, she presented with a first simple partial seizure episode described as a burning sensation in the right lower limb that spread to the ipsilateral aspect of the upper limb, followed by colonic movements of the right leg and upper part of the arm. The next day, she had three more episodes with the same symptoms without confusion. However, there was no evidence of tonic-colonic movements (secondary generalization). Phenytoin therapy (200 mg/d) was initiated, with good seizure control for the first week. Eight days later, her seizure relapsed more frequently with a brief period of confusion. Accompanying the seizure, she developed left-sided, frontotemporal headaches. The headaches were throbbing in nature and radiated posteriorly. There was no association with position or movement and no nausea or vomiting. After the new seizures and headaches, she was referred to our department. The dosage of phenytoin was increased to 400 mg/d, and the patient was admitted for evaluation.

The patient appeared to be a healthy woman in no distress. Her blood pressure, heart rate and temperature were normal. A general physical examination proved to be unremarkable. The patient exhibited no hepatomegaly or splenomegaly. The neurological examination was normal, with no visual defect identified by confrontation and no papilledema. The EEG tracing showed diffuse high voltage of 3–4 Hz wave mixed with 7–8 Hz with asymmetrical slow waves on the left frontal areas.

Routine laboratory tests were performed. Renal and liver function tests were normal. Leukocyte count was 1.21×10^9/L with peripheral eosinophilia of 16%. Fresh cerebrospinal fluid (CSF), stool and urine were obtained. CSF examination showed 50mg/dl of protein, 65mg/dl of sugar, 21×10^6/L of red blood cells and 3×10^6/L of white blood cells. The stool revealed a few brown colored eggs, each of which measured 150×50μm, and had a lateral spine, content with *S. mansoni* (Fig. 1). Urine was negative for egg. ELISA for schistosomiasis infec-

tion was performed with serum and CSF, which showed significant high titers for *S. mansoni*. MR imaging examination of the brain and spinal cord revealed a heterogeneously enhancing lesion with mass effect and a hyperintense signal on T2 sequences in the left frontal lobe with some surrounding edema (Fig. 2- 4). The clinical impression was that of an intrinsic brain tumor and a stereotactic biopsy was performed to avoid missed diagnosis. Histological examination revealed multiple relatively well-defined granulomas in gray matter and gray-white matter junction. Each granuloma consisted of epithelioid cells and foreign body giant cells with infiltration of eosinphils. Some of the foreign body giant cells contained refractile egg shell in their cytoplasm. There was surrounding infiltration of lymphocytes, eosinphils and reactive gliosis. When the Ziehl–Neelsen technique was used for staining, the shells of the eggs were found to be acid fast (Fig. 5). The diagnosis of cerebral *S. mansoni* infection was confirmed.

The patient was treated with prednisone (1 mg/kg per day for 1 week, with gradual withdrawal during the following 3 weeks) and praziquantel (2 doses at 20 mg/kg per day) therapy accompany with previous anti-epileptic drug. When she returned for follow-up examination 3 months later, she was free of symptoms. Six months later, the phenytoin therapy was gradually discontinued. Repeated MR imaging performed at 12 months yielded normal results.

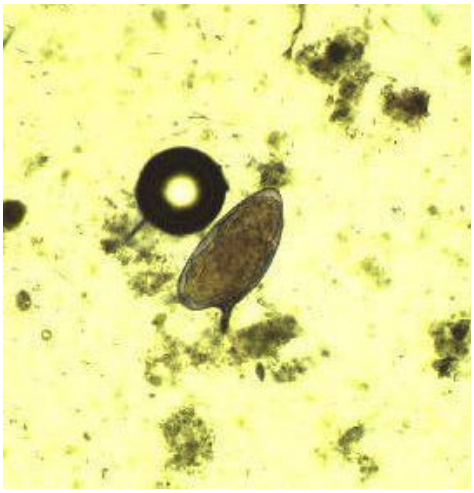

Fig. 1: The egg of *Schistosoma mansoni* measures 150×50µm, is light brown, and has a lateral spine (wet smear of stool, ×150)

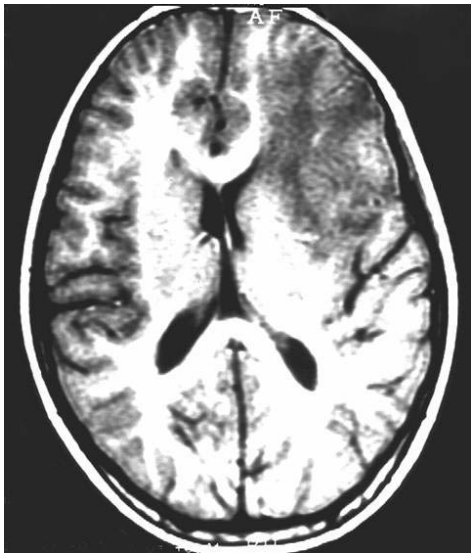

Fig. 2: Axial T1-weighted MRI of the brain showed hypo-intense signal in left frontal lobe

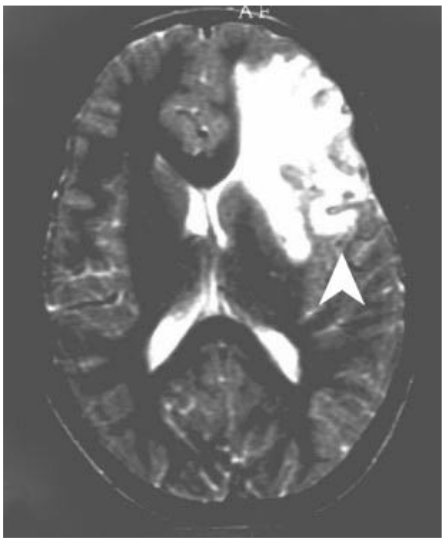

Fig. 3: Axial T2-weighted MRI of the brain showed hyper-intense signal in left frontal lobe (arrow)

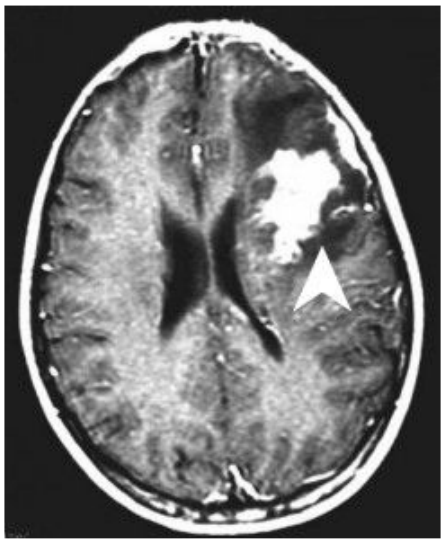

Fig. 4: Axial T1-weighted MRI after gadolinium injection showing intensely enhancing nodules in left frontal lobe (arrow)

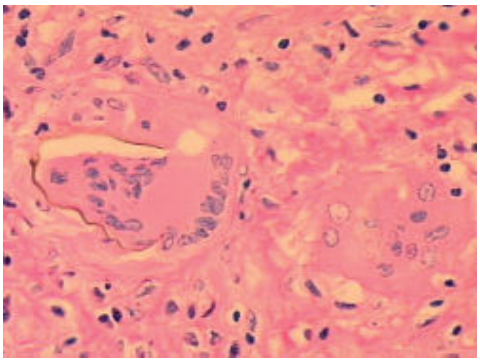

Fig. 5: The granuloma consists of multinucleated giant cells, phagocytizing parasitic egg shells, and inflammatory cells including eosinphils (H-E stain, ×300)

Discussion

Humans can acquire *Schistosoma* infection through contact with fresh water populated with cercariae infected snails. *S. mansoni* larvae enter the human circulation by penetrating the skin. After several days, pairs of worms migrate to the inferior mesenteric veins. Egg production begins 4 to 6 weeks after infection and continues for the life of the worm, usually 3 to 5 years. The eggs pass through the blood vessel lumina and the intestinal mucosa. They are finally shed in the feces. The life cycle is complete when the eggs hatch, releasing miracidia that infect specific freshwater snails (*Biomphalaria* species). Miracidia will then develop into sporocysts and produce cercariae (6).

Central nervous system (CNS) involvement is a rare ectopic manifestation of schistosomiasis. CNS manifestations are more commonly seen in *S. japonicum* infections. However, *S. mansoni* very rarely invades the brain as shown by only 14 documented cases reported in the literature (7, 8). A re-

cent review outlined the 11 cases published between 1984 and 1995, following which only two additional case reports have been noted (9,10).

The pathogenesis of cerebral schistosomiasis is not completely understood. The clinical findings are attributable to an inflammatory response from the host to the eggs in the brain. It is likely that the eggs enter the brain by embolization through venous shunts as a result of hepatic and pulmonary hypertension. Aberrant migration of the worms is another possibility. Some authors believe that the cerebral form is caused by aberrant migration of the worms to the vertebral venous plexus (Batson plexus). In the absence of valves, the worms migrate and produce eggs directly in the brain.

Confirmation of the diagnosis is difficult, as clinical findings are nonspecific and laboratory changes such as eosinophilia and evidence of *Schistosoma* ova in stool or urine may or may not be present. Neuroimaging usually shows a tumor-like lesion with mass effect and heterogeneous contrast enhancement mainly at the temporoparietal, occipital, and frontal regions. Antibody detection in samples of blood or cerebrospinal fluid is useful in only a few specific circumstances. Eosinophilia is not a constant finding in cerebrospinal fluid analysis. Wet smear stool examination, which is the most practical laboratory examination for the investigation of cerebral schistosomiasis, can determine the presence of eggs in feces. Positive results constitute supportive evidence for the diagnosis.

Patients who were treated with complete surgical resection or biopsy and antihelmintic medication (praziquantel or oxamniquine) tended to have a good outcome. Our patient treated with prednisone and praziquantel therapy is currently asymptomatic, despite minimal surgical intervention.

The use of either oxamniquine or praziquantel seems logical. Both drugs cause death of the adult worm, resulting in cessation of oviposition and thus a reduction in the inflammatory response. Their use in non CNS *S. mansoni* infection is well documented (11, 12). Corticosteroids are expected to diminish granulomatous inflammation and edema, thereby preventing further tissue damage. In addition, there is some evidence that corticosteroids reduce ova deposition by adult worms and concomitant administration of an antiparasitic agent can further enhance this effect (13).

The therapeutic decision in patients with new onset seizures should be made based on the type of seizures and on the epilepsy syndrome. For partial seizures, carbamazepine and phenytoin have a similar profile and are considered first-line drugs.

As an extremely rare complication, *S. mansoni* should be considered in the differential diagnosis when an individual from an endemic region presents with a mass lesion in the brain. In most reported cases, the clinical history and preoperative laboratory investigations failed to suggest the diagnosis. It was only recognized after biopsy. However, the history of exposure to *Schistosoma* infected water was important for diagnosis and the prognosis of schistosomiasis depends on early diagnosis and good treatment.

Acknowledgements

The authors declare that they there is no conflict of interests.

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