

Case Report: A Severe Eosinophilic Meningoencephalitis Caused by Infection of *Angiostrongylus cantonensis*

Hua Li, Feng Xu, Jin-Bao Gu, and Xiao-Guang Chen*

Department of Parasitology, School of Public Health and Tropical Medicine, Southern Medical University, Guangzhou, China;
Department of Neurological Internal Medicine, Wuyi Traditional Chinese Medical Hospital, Jiangmen, China

Abstract. This paper reports a severe case of eosinophilic meningoencephalitis after infection with *Angiostrongylus cantonensis*.

INTRODUCTION

Angiostrongylus cantonensis is prevalent in the Pacific islands and Southeast Asia and the most common cause of eosinophilic meningitis/meningoencephalitis in humans living in endemic regions.¹ Snails and slugs are the major intermediate hosts in which first-stage larvae develop to infective third-stage larvae. Humans become infected through the consumption of raw snails, fresh water or vegetables contaminated with intermediate or carrier hosts. Third-stage larvae are transported to the central nervous system, where they incite eosinophilic meningitis/meningoencephalitis with symptoms including headache, fever, and neck stiffness. We present here a severe case of eosinophilic meningoencephalitis after infection with *A. cantonensis*.

CASE REPORT

A 23-year-old man presented to our hospital on August 5, 2006, after the onset of severe abdominal pain, nausea, vomiting, and weakness for 3 days and lower limb pain and paresthesia for 1 day before admission. On admission, he was conscious and oriented. The findings of a physical examination were unremarkable. No obvious focal neurologic signs were detected. Laboratory tests showed a blood leukocyte count of 15,700/mm³, with 81.7% neutrophils. Results of urine and stool tests were normal.

On Hospital Day 2, the patient developed an irregular low-grade fever and was administered anti-inflammatory and symptomatic treatment. After treatment, the patient experienced a decrease in abdominal distention and pain but a gradual elevation in temperature.

On Hospital Day 9, the patient's condition suddenly worsened. He had a severe headache with cognitive impairment and slowed reactions. Body temperature reached 39.5°C. Blood test showed hyponatremia and hypochloremia. A cerebral spinal fluid (CSF) lumbar puncture test showed an opening pressure of 32 cm H₂O, 290 white blood cells (WBCs) (30% neutrophils and 70% lymphocytes), protein 262 mg/dL, glucose 2.23 mmol/L, and chlorine 104.4 mmol/L. No space-occupying lesions or other abnormalities were found by computer-assisted tomography of the brain.

On Hospital Day 13, a bone marrow test showed eosinophilia. A second CSF test showed an opening pressure of 38 cm H₂O, 199 WBCs (48% neutrophils, 22% lymphocytes, 30% eosinophils), 4 red blood cells (RBCs), and protein 398 mg/dL. CSF was clear, and culture for bacteria yielded no growth. A peripheral blood smear suggested eosinophilic granulocytes ≤ 12%. Given the presence of an eosinophilic pleocytosis in the CSF, bone marrow and peripheral blood, parasitic infection of the central nervous system was suspected, but the etiology was not clear.

On Hospital Day 14, the patient's condition worsened. He became unconscious and developed hyperpyrexia and neck rigidity. The patient history showed that on August 1, according to a folk prescription, the patient ate two raw golden apple snails (*A. canaliculatus*) to treat his insomnia. An ELISA showed that both his serum and CSF were positive for antibodies (IgG and IgM) against *A. cantonensis*, as well as parasite-circulating antigen. *A. cantonensis* larvae also were detected in snails collected from the same region where the patient had consumed uncooked snails (Figure 1). Based on the history, clinical manifestations, and laboratory tests, angiostrongyliasis was suspected, and albendazole was used for anti-parasite treatment.

On Hospital Day 19, the patient exhibited symmetric and ascending weakness, quadriparesis, areflexia, and type I respiratory failure. Muscle atrophy was observed in the limbs and most obviously in the hands. A third CSF analysis showed 350 WBCs (23% neutrophils, 55% lymphocytes, 22% eosinophils), 2 RBCs, and a protein level of 905 mg/dL. Magnetic resonance imaging (MRI) of the pars encephalica showed many inflammatory foci in the ambi-temporal lobes and left cerebellum (Figure 2); however, abnormalities in spinal cord and nerve roots were not observed. The patient's history, characteristic symptoms and signs of meningoencephalitis, presence of eosinophilic pleocytosis, and detection of specific antibodies and antigens of *A. cantonensis* resulted in a diagnosis of a severe eosinophilic meningoencephalitis after infection of *A. cantonensis*.

The patient was transferred to the intensive care unit (ICU), and a combined therapy was applied that included a respiratory machine to assist breathing, a high dose of dexamethasone as an anti-inflammatory (20 mg, four times a day), γ -globulin to increase the patient's immunity (0.5 g/kg), 20% mannitol to decrease the intracranial pressure, and Chinese herbs (Xing Nao Wan) to recover the function of nerve cells. The patient's condition improved quickly with this treatment and he became conscious 2 days later. After 4 months of treatment, the patient recovered and was discharged from the hospital with mild memory loss.

* Address correspondence to Xiao-Guang Chen, Department of Parasitology, School of Public Health and Tropical Medicine, Southern Medical University, Guangzhou GD 510515, China. E-mail: xgchen@fimmu.com

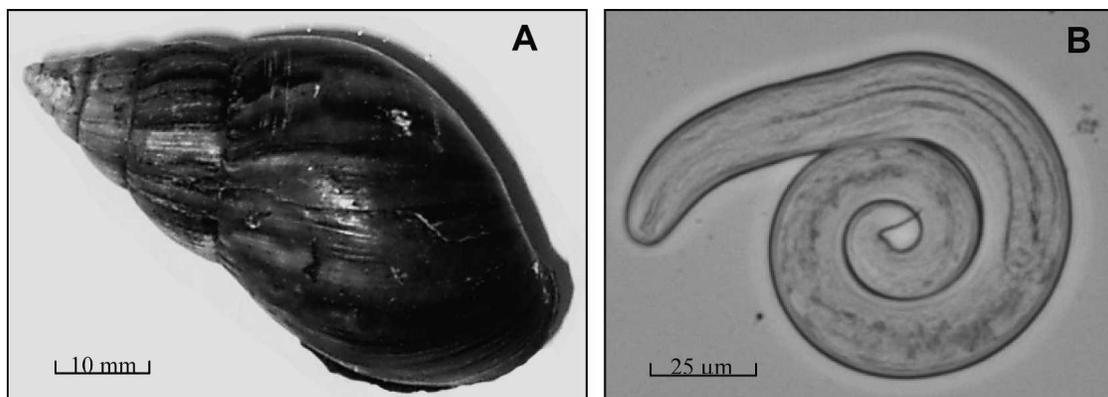


FIGURE 1. **A**, An *A. canaliculatus* (golden apple snail) collected from the place where the patient found the consumed snail. **B**, A third-stage larva of *A. cantonensis* separated from an infected *A. canaliculatus*.

DISCUSSION

Angiostrongyliasis is an emerging food-borne infectious disease. The recent increase in angiostrongyliasis cases in China is thought to result from a geographic extension of the natural focus of *A. cantonensis* and changes in human dietary patterns. In this case, the patient was most likely infected with *A. cantonensis* by ingestion of raw, parasitized snails (*A. canaliculatus*). Epidemiologic studies have implicated the African giant land snail, *Achatina fulica*,² as the main snail vector for angiostrongyliasis in China. However, golden apple snails (*A. canaliculatus*) also play an important role because most cases of angiostrongyliasis documented in the province of Guangdong are transmitted by this species.³ This phenomenon could be explained by the fact that the local Cantonese seldom consume *A. fulica*. Furthermore, three of four *A. canaliculatus* collected from the same location where the patient had obtained the snails he consumed were infected with *A. cantonensis*, and the parasite load was high. More than 6,000 *A. cantonensis* larvae were detected in a single infective snail, and >1,000 larvae were found in the other two snails.

The detection rate for *A. cantonensis* is low because infection occurs in the human central nervous system (CNS),

which is more difficult to sample for diagnosis, and the parasitic larvae are small in size and often adhere to the meninges or nerve root, causing missed diagnosis. Larvae of *A. cantonensis* were found in only 1.9% (56/3000) of patients with angiostrongyliasis.⁴ Therefore, the most commonly used techniques for diagnosing angiostrongyliasis are immunologic methods, including immunofluorescent antibody test,⁵ immunoenzyme staining test,⁶ and enzyme linked immunosorbent assay.⁷ The antigens used in these methods are usually prepared from whole worm lysate. Although these tests are sensitive, they are not highly specific. Some researchers reported serological cross-reactivity between trichinosis and angiostrongyliasis.⁸ However, a 32-kd protein purified from young female worms of *A. cantonensis* is useful for detecting *A. cantonensis* infection with high sensitivity and specificity.^{9,10} The specific antigen and antibody of *A. cantonensis* in this patient was identified by a method based on the 32-kd diagnostic molecule.

Patients with angiostrongyliasis often show brain abnormalities. Tsai and others¹¹ reported that most MRI findings in CNS infection with *A. cantonensis* are non-specific. Clinical characteristics can range from normal to having leptomeningeal enhancement, ventriculomegaly, abnormal enhancement of punctate area, and hyperintense signal lesions on T2-

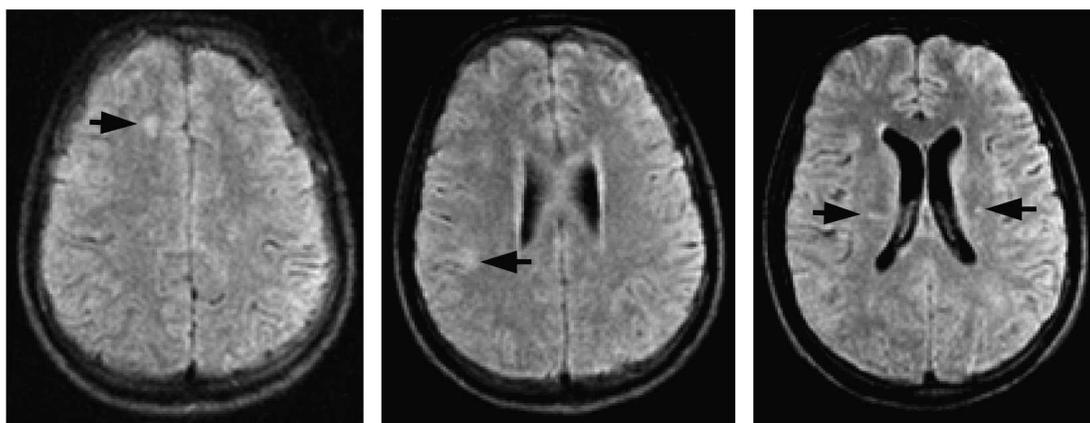


FIGURE 2. Fluid attenuated inversion recovery T2-weighted imaging of the brain. The arrows direct the high signal intensity that implies multiple inflammatory foci in different areas.

weighted images. There seems to be a special predilection for involvement of the globus pallidus and cerebral peduncle in some patients, and this correlates with the presence of worms in the CSF, severity of headache, CSF pleocytosis, and eosinophilia, as well as peripheral eosinophilia. The linear enhancement of the spinal cord surface by contrast-enhanced T1WI spinal MRI also appears in cases of eosinophilic meningoencephalitis caused by infection of *A. cantonensis*.¹² In this case, spot or patching enhancements on contrast-enhanced T2WI were observed in different areas of the brain.

There are different opinions of the proper treatment of *A. cantonensis* infection. Some clinicians show that anthelmintics, such as albendazole, ivermectin, mebendazole, and pyrantel, do not provide clinical benefit, and many patients have worsened while being treated with these therapies because of the inflammatory reaction to antigens released by dying worms.¹³ However, many studies in mainland China have shown that anthelmintics can relieve symptoms and shorten the course of disease. For example, Wang and others¹⁴ reported that albendazole could relieve the symptoms of angiostrongyliasis and suggested that it can be used to treat the disease. Lin and others¹⁵ also reported that, in eight patients who were treated with 20 mg/kg albendazole for 9 days, symptoms of acute angiostrongyliasis were rapidly relieved 3–6 days after treatment. All of these patients recovered by 10 days after treatment, and no side effects were observed. In this case, the symptoms caused by the infection of *A. cantonensis* were improved measurably after the treatment of albendazole (20 mg/kg/d, for 7 days). Therefore, based on the documented reports and our experience, the use of anti-helminthics is recommended for the treatment of angiostrongyliasis, especially when infection is severe.

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Authors' addresses: Hua Li, Jin-Bao Gu, and Xiao-Guang Chen, Department of Parasitology, School of Public Health and Tropical Medicine, Southern Medical University, Guangzhou GD 510515, China.

Feng Xu, Department of Neurological Internal Medicine, Wuyi Traditional Chinese Medical Hospital, Jiangmen, GD 529030, China.

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