Case report

EOSINOPHILIC MENINGITIS DUE TO *ANGIOSTRONGYLUS CANTONENSIS* IN CHILDREN

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ABSTRACT

Meningoencephalitis is not a rare disease in children. However, eosinophilic meningitis due to Angiostrongylus cantonensis is unusual in pediatric population. We describe the case of a 12-year-old girl from central zone of Vietnam with eosinophilic meningitis. The patient lived in a rural area, where farming is widespread, and presented with fever and headache. Laboratory results showed peripheral eosinophilia, cerebrospinal fluid white blood cell count 730/mm^3 with many of eosinophils, cerebrospinal fluid ELISA positive for Angiostrongylus cantonensis, and blood ELISA positive for A. cantonensis. The presentation was consistent with a diagnosis of A. cantonensis eosinophilic meningitis. The patient recovered fully after administering albendazole (800 mg/day for 2 weeks), and intravenous dexamethasone (0.6 mg/kg/day every 8 hours) and mannitol (1.5 g/kg/day every 8 hours) for the first 3 days, followed by 5 days of oral prednisolone (2 mg/kg/day).

Keywords: *Angiostrongylus cantonensis, eosinophilic meningitis, children*

I. INTRODUCTION

Angiostrongylus cantonensis (or "rat lung worm") is responsible for most infectious cases of eosinophilic meningitis (EM) worldwide. *A. cantonensis* is endemic to Southeast Asiaand the Pacific islands, but in recent years human cases have been reported from increasingly diverse locations [1-3]. Most patients are adults and are infected by eating raw or undercooked freshwater snails or other paratenic hosts such as freshwater shrimps, frogs, or monitor lizards [4]. The diagnosis is mostly made clinically by the evidence of eosinophils in cerebrospinal fluid (CSF) constituting more than 10% of total CSF white blood cells [4,5]. A typical presenting symptom of EM is acute severe headache without neurological deficits [6,7]. The diagnosis may be missed because meningism signs including fever and neck stiffness are found infrequently [8]. EM in children is rarely reported in the literature. However, clinical manifestations in children may be different from those of adult patients. We hereby report a case of eosinophilic meningitis due to *Angiostrongylus cantonensis*, which as far as we know is the first one to be diagnosed in our hospital.

II. CASE REPORT

A previously healthy 12-year-old girl presented toour hospital with a headache of three days duration on March 23, 2018. The patient like eating roasted seafood. Three days before hospitalization,

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the patient had a fever (38-39ºC), and a continuous headache with nausea but no vomiting. She had no myotoniaor convulsion. She was referred to the Pediatric Neurology Unit with a headache of unknown cause and was examined by routine tests (as shown in **Table 1**). Her WBC count was 5450 cells/ μL with 5.1% eosinophils. Chest radiograph findings were normal and computed tomographyand magnetic resonance imaging of the brain were unremarkable. A lumbar puncture was was done and revealed 468 WBCs (65% neutrophils, 35% lymphocytes), a CSF protein level of 0.63 g/L. The patient was treated for bacterial meningitis with antibiotics such as Vancomycine 60mg/kg/day (March 26 - April 4), Ceftriaxon 100mg/kg/day (March 26 - April 2) and Meropenem 100mg/kg/day (April 3 - April 4). The patient's headache persisted, and a second lumbar puncture performed 7 days later demonstrated 750 WBCs (10% neutrophils, 90% lymphocytes), a CSF glucose level of 2.2 mmol/L, and a CSF protein level of 0.75 mg/dL. CSF culture for bacteria yielded no growth. The serum findings of an evaluation for. Trichinella spiralis, helicobacter pylori were normal, and the were negative. Repeat lumbar puncture revealed 730 WBCs (10% lymphocytes, 5% neutrophils, and a lot of eosinophils).

Given the presence of an eosinophilic pleocytosis in her spinal, infection with *A. cantonensis* was suspectedand confirmation of *A. cantonensis* infection by immunodiagnosis was sought. Serumand CSF samples were sent The Hospital for Tropical Diseases in Ho Chi Minh City (Vietnam), where Western blot analyses were done against *A. cantonensis* antigens. The both serum and CSF ELISA tests showed strongly reaction to *A. cantonensis,* confirming the diagnosis of angiostrongyliasis. The patient received treatment with albendazole (800 mg/day for 2 weeks), and intravenous dexamethasone (0.6 mg/kg/day every 8 hours) and mannitol (1.5 g/kg/day every 8 hours) for the first 3 days, followed by 5 days of oral prednisolone (2 mg/ kg/day). After one week of treatment, the patient's headache was relieved and body tem-perature was normal. The last lumbar puncture showed normal biochemical and ctylogic results.

Table 1: Biochemical and ctylogic analysis of the patient's CSF and Hematological analysis.

Date	Biochemical and ctylogic analysis of CSF						Hematological analysis			
	WBC (0-8)	Ly (%) (0)	NE (%) (0)	EO (%) (0)	Pro (g/L) (0.15-0.45)	Glu (mmol/L) (2.5-4.5)	WBC ($\times 10^9$/L) (4-10)	NE (%) (50-70)	Ly (%) (10-50)	EO (%) (0.5-5)
3/23/2018	468	35	65		0.63		5.45	55.5	29.6	5.1
4/3/2018	750	90	10		0.75	2.2	8.84	34.6	42.9	8.5
4/5/2018	739	10	5	Many	0.73					
4/9/2018	361		62	15						
5/8/2018	5	60	40	0						

III. DISCUSSION

Clinical manifestations and outcomes of EM in children were different from those in adults. According toSawanyawisuth, children with EM revealed more systemic responses, as were apparent from the high proportion of patients with fever (78.9% vs 10%) and nausea/vomiting (63.2% vs 38.8%) [6]. Compared to adult patients [8], a higher proportion of children showed cranial nerve

abnormalities (both cranial nerve VI and VII), neck stiffness (68.4% vs 47.5%), and papilledema (31.6% vs 2.5%). Clinical signs of meningism (fever, headache, and neck stiffness) were much more frequent in child patients compared with adults (68.4% vs 9.0%). In contrast, hyperesthesia, the specific sign for angiostrongyliasis in adults, was not found in children [6]. Consistent with the clinical features described in previous reports, our patient presented with an extended prodrome of headache, fever, and vomiting [9].

Regarding laboratory results, all variables were quite comparable between children and adults except for thrombocytosis and high CSF opening pressure [6]. These clinical features recall a report from Taiwan that showed high proportion of fever (91.5%) in children with EOM [10]. The explanation may be due to systemic responses and high intracranial pressure, evidenced by higher CSF opening pressures in children than in adults [6].

Identification of *A. cantonensis* larvae occurs in only 1.9% of patients with angiostrongyliasis [11]. Therefore, immunological assays are used as tools to confirm a presumptive diagnosis, including the Immunofluorescent antibody test (IFA), Immunoenzyme staining test (IEST) and ELISA. With regard to imaging tests, computed tomography cannot distinguish *A. cantonensis* eosinophilic meningitis from that caused by other parasites such as gnathostomiasis or neurocysticercosis [12]. On the other hand, the use of magnetic resonance imaging to investigate *A. cantonensis* eosinophilic meningitis shows a diffuse increase in the hyperintense signal of the subcortical white matter of bilateral cerebral and cerebellar hemispheres on T2-weighted images, probably due to the presence of granulomaas a response to the antigens released by the death of the parasite [13,14].

The standard treatment for eosinophilic meningitis caused by *A. cantonensis* infection has been controversial [15]. Angiostrongyliasis is usually treated with albendazole. An adrenal cortical hormone combined with dehydration and neurotrophic therapy can also be used. Combined therapy with albendazole and dexamethasone has also been shown to be effective [16]. Sometimes there was no difference in the duration or severity of illness in patients treated with analgesics alone, analgesics and glucocorticosteroids, or analgesics and antibiotics [4]. Most patients in the Hospital for Tropical Diseases (Ho Chi Minh city, Vietnam) were treated with a combination of albendazole and corticosteroids, but there is no definitive evidence for the use of anti-helminthic agents. Chotmongkol et al found noadditional benefit of 14 days albendazole plus prednisolone as compared to prednisolone alone in reducing the duration of headache in EM; however, this study did not reach the planned sample size [5]. Adequately powered randomized controlled trials are needed to guide the optimal management of EM.

Regarding treatment outcomes, the duration of headache in children seemed to be shorter but a higher proportion required repeated lumbar puncture. This may imply that children with EM may resolve more quickly than adults despite having more severe systemic responses as discussed earlier. Children with EM, however, needed more frequent reduction of intracranial pressure by repeated lumbar puncture compared with adult patients.Our patient was completely recovered after one week of treatment.

Having a history of eating raw freshwater snails is an important risk factor for angiostrongyliasis, yet was found in only 68.4% of child patients compared toalmost 100% in adult patients [17]. Other than eating, direct contact with snails and slugs may be another risk factor for EM in children. A report from Taiwan showed that having snails as a pet was another route of infection [6].

IV. CONCLUSION

Clinical features and outcomes of EM caused by *A. cantonensis* in children were different from those in adult patients. We were able to diagnose and successfully treated a patient with eosinophilic meningitis caused by *A. cantonensis*, based on clinical signs and his eating habits. The management of the patient was effective.

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