

Transient Cerebral Vasculopathy: A Rare Complication Associated with Cerebral Gnathostomiasis

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Abstract

Keywords

- gnathostomiasis
- transient cerebral vasculopathy
- cerebral gnathostomiasis
- intracerebral hemorrhage
- meningitis
- neuroimaging

Gnathostomiasis is a common parasitic infection in Southeast Asia, involving many organs in infected human hosts. Common neurological manifestations of *Gnathostoma* infection include radiculomyelitis, eosinophilic meningitis, and nontraumatic subarachnoid hemorrhage, leading to a high mortality and morbidity. This study first reported transient cerebral vasculopathy, an atypical neurological manifestation, in an 11-year-old Thai girl. The patient was diagnosed with intracerebral and intraventricular hemorrhage, and meningitis with atypical cerebrospinal fluid (CSF) profile. The imaging study of the brain revealed the abnormal white matter lesion and transient cerebral vasculopathy with the cerebral hemorrhage showing a track-like appearance (at the level of the corpus callosum). The serological testing in CSF and serum using the enzyme-linked immunosorbent assay (ELISA) technique was positive for *Gnathostoma spinigerum*. The patient spontaneously recovered within 3 months without albendazole or corticosteroid treatments.

Introduction

Gnathostomiasis is a parasitic infection caused by *Gnathostoma* spp., which is endemic in Southeast Asia, especially in Thailand, Japan, and Latin America.^{1–6} Of the five *Gnathostoma* species that cause human disease, the most common is *Gnathostoma spinigerum*, whose definitive hosts are vertebrates such as dogs and cats.^{7,8} Human can be infected with *Gnathostoma* by consuming raw or undercooked fish, snake, and frog. Gnathostoma infection can manifest as a cutaneous form and/or in visceral organs. The most serious manifestation of gnathostomiasis involves the central nervous system (CNS). Radiculomyelitis, radiculomyeloencephalitis, eosinophilic meningitis, and subarachnoid hemorrhage are common in afflicted individuals with CNS involvement, resulting in a high mortality rate (8–25%) and severe morbidity (30%).¹ This study reports for the first time a transient cerebral vasculopathy associated with meningitis and intracerebral hemorrhage in a patient with cerebral gnathostomiasis.

Case

An 11-year-old girl living in Nakhon Ratchasima Province, Northeast of Thailand, presented with acute severe headache with high-grade fever for 5 days. She experienced nausea and vomiting. She had no alteration of consciousness, weakness, or seizure. She denied history of trauma or consumption of raw fish, freshwater shrimp, snails, frog, and snake, and had no underlying diseases.

Physical examination showed normal and stable vital signs except for the high body temperature (39°C). Neurological examinations revealed normal cranial nerve examination, no papilledema, no muscle weakness, normal muscle tone, and normal sensory examination. Deep tendon reflexes were graded 2+ in all extremities. Babinski's sign was absent bilaterally, but stiffness of the neck was positive. Other systemic examinations were unremarkable.

The complete blood count showed no eosinophilia (hematocrit 40.9%, platelet 873,000/μL, white blood cell 9,000/μL;

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neutrophil 79.6%, lymphocyte 17.5%, and monocyte 2.9%). The cerebrospinal fluid (CSF) appeared xanthochromic, and open/close pressures were 60/33 cm H₂O. The biochemical analysis revealed 20,500 cells/mm³ of red blood cell, 47 cells/mm³ of white blood cells (100% polymorphonuclear), 163 mg/dL of protein, and 23 mg/dL of glucose. No bacterial growth in hemoculture and CSF culture was detected. Although there was no evidence of eosinophilia, the serological testing in the CSF and serum using the enzyme-linked immunosorbent assay (ELISA) technique was positive for *G. spinigerum* (immunoblot test, 24 kDa of molecular test for *G. spinigerum*). The test for *Angiostrongylus cantonensis* and repeated CSF analysis were not evaluated in this patient.

A computed tomography (CT) of the brain with contrast was performed and showed acute hematoma at the splenium of corpus callosum (track-like appearance) and the adjacent right parietal lobe with intraventricular hemorrhage, no mass effect was observed on CT, and no demonstrable abnormal enhancing portion or obvious vascular malformation as shown in ►Fig. 1. A magnetic resonance imaging (MRI) and magnetic resonance angiogram (MRA) of the brain were done 2 weeks after the clinical onset and demonstrated late subacute hematoma at the splenium of corpus callosum and the adjacent right parietal lobe with subacute intraventricular hematoma. Additionally, the imaging studies showed multiple T2/fluid-attenuated inversion recovery (FLAIR) hyperintensity foci at the subcortical white matter of the bilateral frontal and parietal lobes. Mild irregular narrowing of the bilateral supraclinoid internal carotid arteries (ICAs), ICAs bifurcation, and proximal bilateral M1 and A1 segments of the middle cerebral arteries (MCAs) and anterior cerebral arteries (ACAs), respectively, as well as left P2 segment of the posterior cerebral artery (PCA) were also observed as shown in ►Fig. 2. The follow-up MRA at 3 months after the onset showed a normal vascular structure; however, the abnormal white matter lesion remained unchanged as shown in ►Fig. 3.

Since the serological testing for *Gnathostoma* was reported 4 weeks after admission, the patient only received supportive treatment without corticosteroid or albendazole. She had spontaneous recovery within 3 months after the onset of symptoms without neurological deficits.

Discussion

Our study first reported an atypical neurological manifestation of gnathostomiasis, a transient cerebral vasculopathy, which spontaneously resolved at 3 months' follow-up. This patient showed atypical CSF profiles and complete blood count as there was no eosinophilia. The clue for diagnosis of gnathostomiasis in this case was according to the CT brain showing nontraumatic intracerebral hemorrhagic lesions which were suspected hemorrhagic tracks from *Gnathostoma*. The definitive diagnosis was confirmed by the positive result of *Gnathostoma* titer in the CSF and serum. From previous studies, there was no report of cerebral vasculopathy as the complication of *Gnathostoma* infection. However, the common neurological manifestations in both adult and pediatric patients are nontraumatic subarachnoid hemorrhage, intracerebral hemorrhage, subdural hemorrhage, and intraventricular hemorrhage.^{1-6,9} The typical finding from CT brain is multiple intracerebral hemorrhages with a track-like appearance at uncommon sites for hypertensive hemorrhage such as the frontal lobe, unexplained subarachnoid hemorrhages, and nontraumatic subdural hemorrhage.¹⁰⁻¹² The MRI of brain in gnathostomiasis showed white matter lesions as subcortical enhancement and high signal intensity on T2-weighted image involved in the periventricular area.¹³ These results were correlated with our patient's neuroimaging study showing hemorrhagic tracks at the corpus callosum with abnormal white matter lesions. The pathogenesis of abnormal neuroimaging studies could be explained by the migration of parasite through the brain parenchyma causing multiple hemorrhagic and track-like

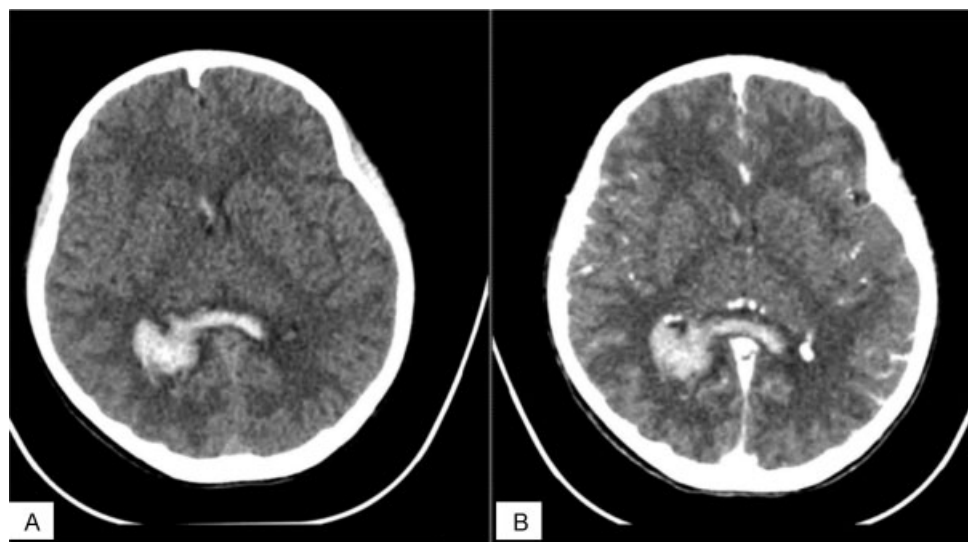


Fig. 1 (A) Noncontrast CT of brain showed acute hematoma at the splenium of corpus callosum (track-like lesions) and the adjacent right parietal lobe with intraventricular hemorrhage. (B) Postcontrast image showed no demonstrable abnormal enhancing portions or obvious vascular malformations. CT, computed tomography.

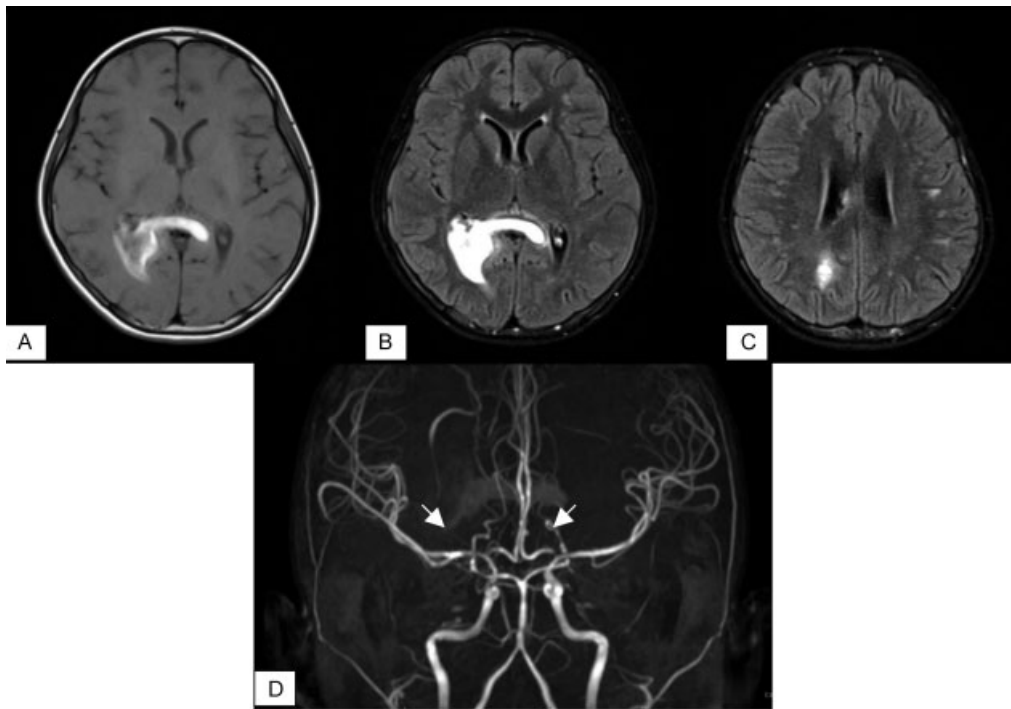


Fig. 2 Magnetic resonance imaging and MRA of the brain. (A) Axial T1WI and (B) axial T2WI/FLAIR showed late subacute hematoma at the splenium of the corpus callosum and the adjacent right parietal lobe with subacute intraventricular hematoma. (C) Axial T2WI/FLAIR demonstrated multiple T2/FLAIR hyperintensity foci at the subcortical white matter of bilateral frontal and parietal lobes. (D) 3D-TOF MRA of the brain showed mild irregular narrowing of the bilateral supraclinoid ICAs, ICAs bifurcation, and proximal bilateral M1 and A1 segments of MCAs and ACAs, respectively, as well as left P2 segment of PCA (as the arrows). 3D-TOF, three-dimensional time-of-flight; ACAs, anterior cerebral arteries; ICAs, internal carotid arteries; FLAIR, fluid-attenuated inversion recovery; MCAs, middle cerebral arteries; MRA, magnetic resonance angiogram; MRI, magnetic resonance imaging; PCA, posterior cerebral artery; WI, weighted image.

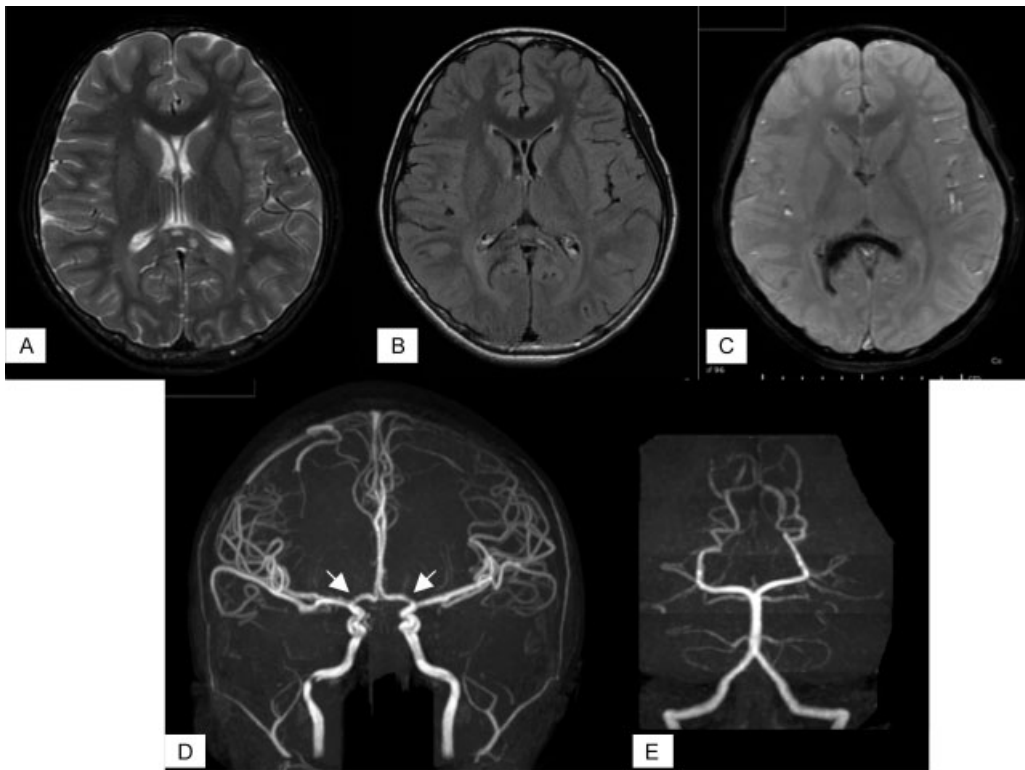


Fig. 3 Follow-up MRI and MRA of the brain. (A) Axial T2WI and (B) axial T2WI/FLAIR. (C) T2WI/GRE showed complete resolution of the hematoma with cystic encephalomalacic change and hemosiderin deposit at the splenium of the corpus callosum. (D, E) 3D-TOF MRA of the brain showed complete resolution of the prior mild irregular narrowing of the intracranial vessels (as the arrows). 3D-TOF, three-dimensional time-of-flight; FLAIR, fluid-attenuated inversion recovery; GRE, gradient recalled echo; MRA, magnetic resonance angiogram; WI, weighted image.

lesions with the inflammatory or demyelinating process, which ultimately lead to abnormal white matter lesions. Since the larvae enter the spinal cord along the nerve roots and then ascend to the brain, penetrating the meninges at the base of the skull, and reaching the subarachnoid space, the transient cerebral vasculopathy could be explained by the proximity of the larvae to the great vessels of the base during its migration, causing vasospasm or arteritis, as described in subarachnoid neurocysticercosis.^{14,15} Although other CNS manifestations such as eosinophilic meningitis and radiculomyelitis are typical in gnathostomiasis, CSF eosinophilia and symptoms of radicular pain or signs of spinal cord involvement were not observed in this patient. The explanation of no motor weakness in this patient was due to the abnormal lesion on CT or MRI brain had no mass effect. The absence of eosinophilia could be attributed to the absence of cutaneous and visceral manifestations.

Conclusion

Gnathostomiasis should be in a differential diagnosis in children presenting with nontraumatic intracerebral hemorrhage, especially in endemic areas for *Gnathostoma spp.* Transient cerebral vasculopathy is one of the rare CNS manifestations of gnathostomiasis.

Conflict of Interest

None.

Funding

None.

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