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A case report of disseminated cysticercosis in Guangxi Zhuang Autonomous Region, Southwest China

Wu-xiao Wei[1†], Yan Qin[1†], Hong-qiao Chen[1], Lian Meng[1*] and Zhao-yin Su[2]

Abstract

Background Cysticercosis is a zoonotic parasitic disease that poses a serious threat to public health. It is widely distributed and has a high incidence rate in China. Reports of disseminated cysticercosis worldwide are rare. This article presents a case of disseminated cysticercosis in the Guangxi Zhuang Autonomous Region of southwestern China.

Case presentation The patient, a 46-year-old male belonging to the Miao ethnic group, hailed from a region in Guangxi Zhuang Autonomous Region known for its high incidence of cysticercosis. He had a habit of consuming raw pork and beef. With a history of recurrent consciousness disturbances and limb convulsions for five years, he presented with headaches and dizziness nine days prior. Comprehensive examinations were conducted on the patient. Ultimately, based on epidemiological history, imaging findings, pathogen testing, and pathological results, he was diagnosed with disseminated cysticercosis. Following anthelmintic treatment, the patient was discharged with clear consciousness, free from headaches, dizziness, nausea, vomiting, and seizures. The patient is currently under follow-up care.

Conclusion It is crucial to enhance public awareness, promote health education, and cultivate good hygiene habits, as these are essential measures in reducing the incidence of cysticercosis.

Keywords Neurocysticercosis, Disseminated cysticercosis, Epilepsy, Altered consciousness, Control

Introduction

Taenia solium cysticercosis is a tissue disease caused by the pork tapeworm, first discovered and described in the mid-16th century [1]. It is an endemic condition in China, primarily transmitted through the ingestion of food and water contaminated with eggs of the pork tapeworm. Following ingestion, the egg hatches into an oncosphere that burrows through the intestinal wall into the bloodstream and spreads to many parts of the body leading to clinical manifestations in the brain, muscles, and subcutaneous tissues [2, 3]. Neurocysticercosis (NCC) is the most common parasitic infection of the central nervous system. In the Guangxi Zhuang

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Autonomous Region of China, more than 10 counties and cities have reported outbreaks of NCC, particularly in certain ethnic minority areas where the consumption of raw meat is prevalent, exacerbating the transmission of the infection [4]. NCC can manifest a spectrum of nonspecific symptoms such as seizures, headaches, dizziness, and focal neurological deficits, posing challenges to diagnosis [5]. Consequently, many cases of NCC have been misdiagnosed as brain metastases, cystic gliomas, craniopharyngiomas, and arachnoid cysts [6, 7]. Disseminated cysticercosis represents a rare manifestation of this disease, with fewer than 120 cases reported worldwide [3]. In this case, initially, based on the findings of head Computed Tomography (CT) imaging, we considered the possibility of brain metastases in the patient. However, through comprehensive examination, it was ultimately confirmed as a rare case of disseminated cysticercosis. This article presents a review of relevant literature to introduce a case of disseminated cysticercosis, aiming to enhance public awareness of this condition and advocate for the adoption of healthy dietary habits.

Case presentation

The patient is a 46-year-old male of Miao ethnicity. Five years prior, the patient began experiencing recurrent episodes of consciousness disorders without an apparent trigger, characterized by upward eye movements, foaming at the mouth, stiff limb convulsions, and unresponsiveness, lasting approximately 1–2 min each time, with subsequent spontaneous recovery of consciousness but inability to recall the events. There were no episodes of urinary or fecal incontinence, nausea, vomiting, visual disturbances, water choking, or swallowing difficulties. The patient sought medical attention at a local hospital, where unspecified medications were prescribed, but the episodes persisted, often occurring during cold weather or colds, with intervals ranging from months to years. On February 6, 2024, the patient experienced another episode of consciousness disorder and limb convulsions, with subsequent headaches and dizziness 9 days prior to admission, prompting consultation at our hospital, where outpatient evaluation suggested "epilepsy," leading to admission to our department. Since the onset of symptoms, the patient has had poor mental status, with normal sleep and diet, regular bowel and bladder habits, and no significant weight changes. He has had a history of residing long-term in Rongshui Miao Autonomous County, Guangxi Zhuang Autonomous Region, denying any history of trauma, surgery, or blood transfusion, as well as infectious diseases such as hepatitis and tuberculosis, no known food or drug allergies, no smoking or alcohol abuse history, and regular consumption of raw pork, beef, and chicken. There is no significant medical history in the family.

Symptoms and Physical Examination: The patient presented with a temperature of 37.0 °C, heart rate of 80 beats per minute, respiratory rate of 20 breaths per minute, and blood pressure of 146/93 mmHg (1 mmHg = 0.133 kPa). There were no palpable enlargements of superficial lymph nodes. Neurological examination revealed clear consciousness, right-handedness, fluent speech in the Miao language, with partial translation assistance required for Mandarin Chinese communication. Memory, calculation, orientation, and comprehension were generally normal. There was no impairment in olfaction, and gross examination of vision and visual fields was normal. Bilateral palpebral fissures were symmetrical, without ptosis. Pupils were equal, round, and reactive to light, with a diameter of approximately 3.0 mm. Extraocular movements were intact, without nystagmus. Corneal reflexes were sensitive bilaterally. Mastication was strong, and there was no deviation of the mandible. Facial wrinkles and nasolabial grooves were symmetrical. Cheeks could be puffed without air leakage. Taste sensation on the anterior two-thirds of the tongue was normal. Gross examination of hearing was normal. The uvula was midline, and the gag reflex was present. The neck was supple, with no resistance. Shoulder heights were symmetrical, and neck movements and shoulder shrugs were strong. Tongue protrusion was midline, without atrophy or fasciculations. Muscle tone in all limbs was normal, with grade 5 muscle strength. Finger-to-nose, alternate motion, and heel-to-shin tests were normal. There were no abnormalities in deep or superficial sensations, and deep tendon reflexes were brisk (++). There were no clonus or pathological reflexes elicited. Neck was supple without resistance, and meningeal signs were negative. There was tenderness bilaterally over the calf muscles.

Laboratory Investigations: Fresh fecal samples were collected from the patient and processed using a saturated salt flotation method, which involves mixing the fecal sample with a saturated salt solution to create a dense environment where heavier parasite eggs or cysts float to the surface while lighter substances sink. The processed samples were examined under a microscope, revealing 1 *roundworm* egg and 1 *taenia solium* egg/high-power field while no common *hookworm* eggs, *whipworm* eggs, *amoebae*, *Giardia lamblia*, *Entamoeba histolytica*, or *Ascaris lumbricoides* eggs were detected. Lumbar puncture was performed to collect the cerebrospinal fluid (CSF), which appeared clear and transparent with a pressure of 150 mmH2O (1 mm H2O = 9.81×10^3 kPa, normal range: 70–200 mmH2O). Samples of CSF and blood were sent to the Guangxi Jinyu Medical Laboratory for

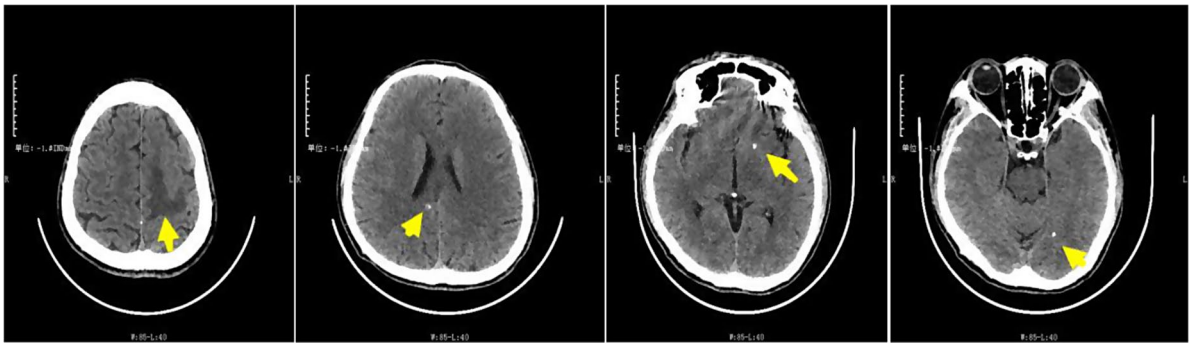

Fig. 1 Head CT scan. The head CT scan revealed locally uneven density with slightly increased density in the left parietal lobe, unclear borders, and an irregular low-density edema zone around it. Multiple patchy calcifications with clear edges were observed in the left frontal lobe, right parietal lobe, and left occipital lobe

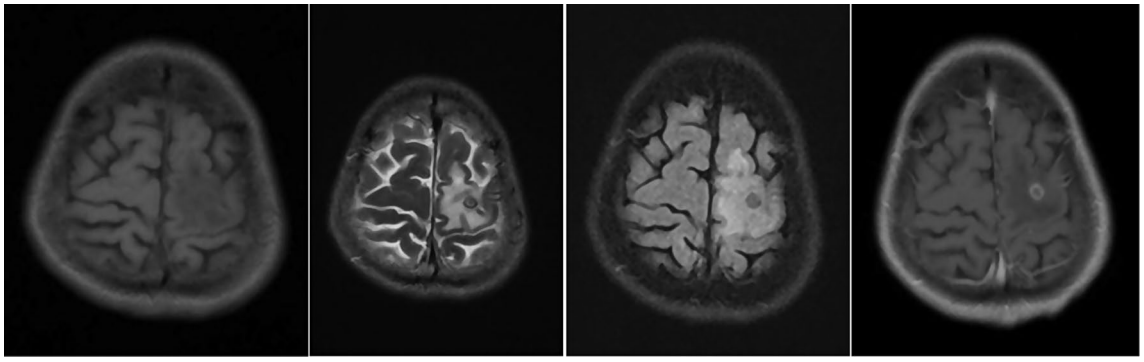

Fig. 2 Head MRI scan. The head MRI revealed a nodular abnormal signal in the left frontal lobe, with slightly high signal on T2-weighted images and slightly low signal on FLAIR images, surrounded by patchy edema. The lesion in the left extraocular muscle area exhibited a low signal

testing. ELISA testing results indicated negative IgG antibodies for pig cysticercosis, lung fluke, echinococcus, and schistosomiasis in both CSF and serum samples. Serological testing for hydatid disease antibodies by ELISA also returned negative results. All other laboratory parameters were within normal limits.

Imaging Findings: Head CT scan demonstrated locally heterogeneous density with slightly increased density patches in the left parietal lobe, with indistinct borders and surrounding irregular large low-density edema zones. Multiple patchy calcifications were observed in the left frontal lobe, right parietal lobe, and left occipital lobe, with relatively clear margins (Fig. 1). Head Magnetic Resonance Imaging (MRI) revealed a nodular abnormal signal in the left frontal lobe, exhibiting low signal on T1-weighted images, slightly high signal on T2-weighted images, and slightly low signal on FLAIR, with patchy edema around it. The lesion in the left extraorbital muscle region appeared as a low signal (Fig. 2). On contrast-enhanced head MRI T1-weighted images, circular enhancement was visible around lesions in the left frontal lobe and left hippocampus, with patchy edema around the lesion in the left frontal lobe (Fig. 3). Magnetic Resonance Spectroscopy (MRS) revealed reduced N-acetylaspartate (NAA) (6.88) and slightly decreased Creatine (Cr) peak (10.42), with no significant change in Choline (Cho) peak (16.26) in the lesion of the left frontal lobe. The NAA/Cr ratio was approximately 0.66, Cho/NAA ratio was approximately 2.36, and Cho/Cr ratio was approximately 1.56. In the corresponding right frontal lobe, NAA peak (17.54), Cr peak (14.12), and Cho peak (15.10) were observed, with an NAA/Cr ratio of approximately 1.24, Cho/NAA ratio of approximately 0.86, and Cho/Cr ratio of approximately 1.07 (Fig. 4). Whole-body X-ray revealed multiple elliptical and elongated high-density lesions within soft tissues throughout the body, consistent with clinical suspicion of cysticercosis (Fig. 5). CT scans of the neck, chest, and abdomen showed multiple high-density calcifications in soft tissues in the neck, chest, back, abdominal wall, and liver margin (Fig. 6).

Ophthalmology consultation revealed no evidence of subretinal parasites during fundoscopic examination. Subsequently, on February 21, 2024, under local infiltration anesthesia, a biopsy was performed on the left thigh midsection under ultrasound guidance. Intraoperatively, oval-shaped white lesions, approximately 0.5 cm × 0.2 cm in size, with a firm consistency and adhesion to surrounding muscle tissue, were observed

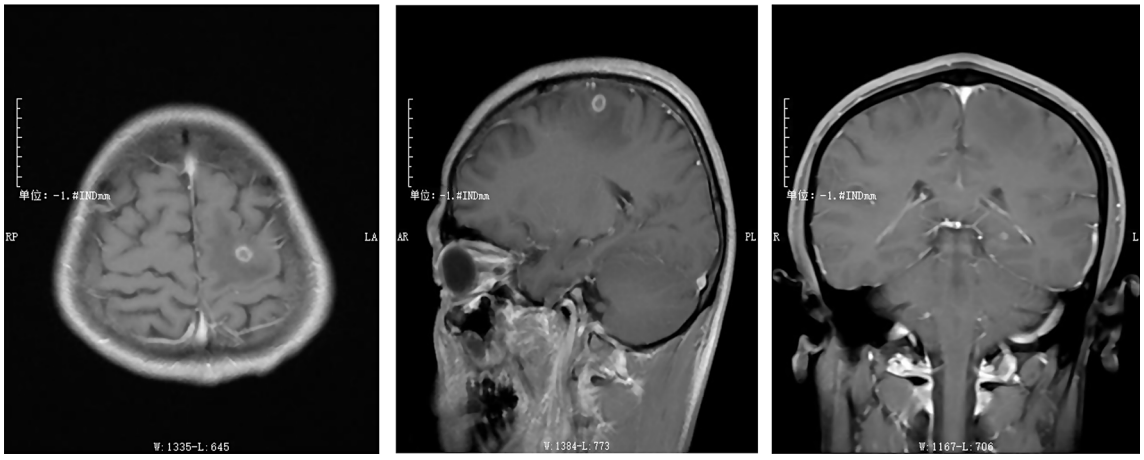

Fig. 3 Head MRI T1-weighted images. On the head MRI T1-weighted imaging with contrast enhancement, a ring-enhancing lesion is observed in the left frontal lobe and left hippocampus. Patchy edema is visible surrounding the lesion in the left frontal lobe

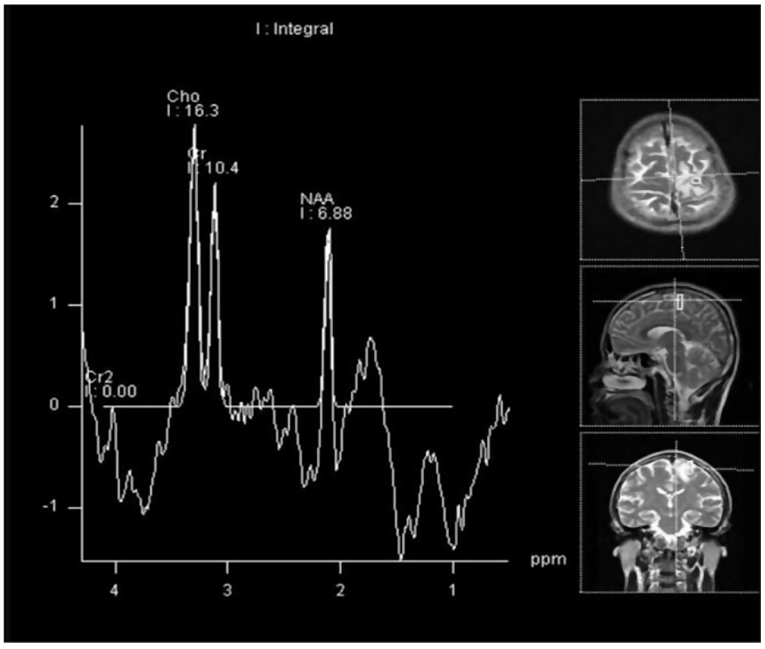

Fig. 4 MRS. MRS reveals a decrease in NAA within the lesion in the left frontal lobe, a slight decrease in Cr peak, and no significant change in Cho peak

and completely excised. The histopathological examination of excised tissue revealed fibrous, fatty, and muscular tissue with partial degenerative necrosis and calcifications. Irregularly shaped oval calcifications were observed within the calcifiedmaterial, suggestive of calcified parasite larva (Fig. 7). Based on the comprehensive epidemiological history, imaging findings, pathogen testing, and pathological results, the patient was finally diagnosed with cysticercosis (involving the intracranial, ocular muscles, trunk, and visceral soft tissues).

Treatment and Prognosis: The patient received anti-cysticercosis treatment based on hospital guidelines. On February 23, 2024, the patient underwent treatment with albendazole (1.2 g, divided into 3 doses) for 3 cycles (12 days/cycle, with a 3-month interval between cycles), dexamethasone (10 mg/day for 7 days); intravenous mannitol 125 ml infused daily for 7 days; and oral sodium valproate 200 mg thrice daily for antiepileptic therapy. A follow-up head MRI on March 2, 2024, revealed a significant reduction in perilesional edema around the left frontal lobe lesion compared to the previous assessment (Fig. 8). Due to economic reasons, the patient requested discharge on March 3, 2024, and was discharged with clear consciousness, absence of headache, dizziness, nausea, vomiting, or seizure symptoms. Following discharge, on March 7, 2024, the patient started treatment with

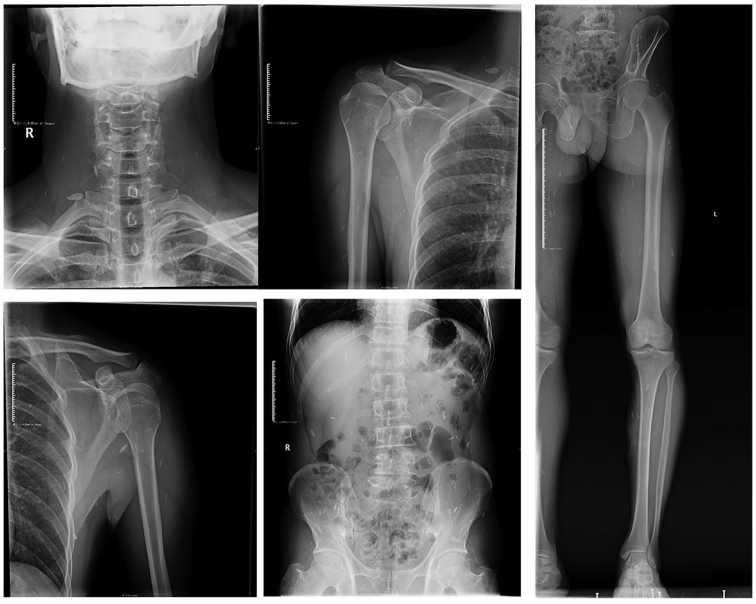

Fig. 5 Whole-body X-ray slices. Whole-body X-ray reveals multiple elliptical and elongated high-density lesions within the soft tissues throughout the body, consistent with clinical suspicion of cysticercosis

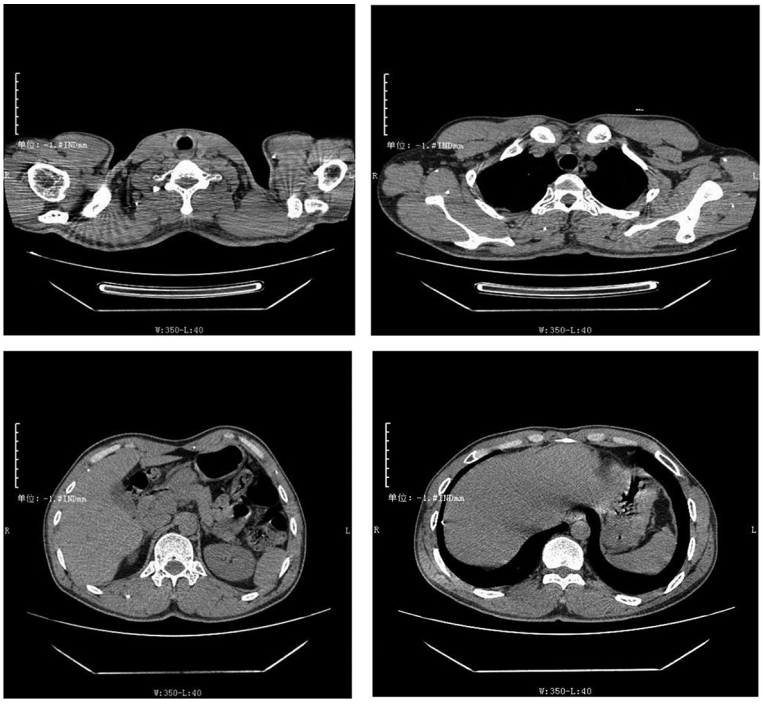

Fig. 6 CT of the neck and chest and abdomen. Neck, chest, and abdominal CT scans reveal multiple high-density calcifications within the soft tissues of the neck, chest, back, abdominal wall, and along the liver margin

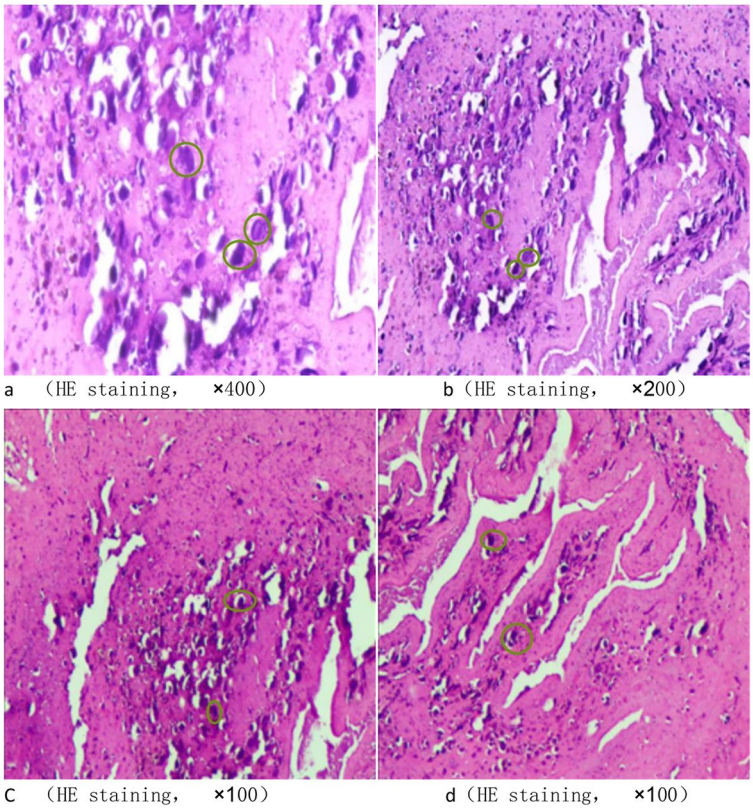

Fig. 7 Pathological section. The pathological examination reveals partial degeneration, necrosis, and calcification in fibrous, fatty, and muscular tissues, indicating calcification of parasitic larva

praziquantel (400 mg every 8 h) for 3 cycles (12 days/cycle, with a 3-month interval between cycles). The patient is currently under regular follow-up.

Discussion

NCC is the most common parasitic infection of the central nervous system. Based on the location of the lesions, NCC is categorized into parenchymal, subarachnoid, ventricular, and spinal cord types. Parenchymal NCC is the most prevalent form, typically presenting with seizures, altered consciousness, and headaches [5, 8–10]. It is considered a serious condition requiring prompt and aggressive intervention. Literature reports show that cysticercosis is endemic in several regions worldwide, being one of the most neglected tropical diseases. It is prevalent in most parts of Latin America, sub-Saharan Africa, Southeast Asia, India, and China, with approximately 200 million people infected with *Taenia solium* resulting in seizures [11–13]. Despite numerous revisions to diagnostic criteria in recent years, the preoperative definitive diagnosis of NCC has remained challenging due to impractical histopathological examination, atypical clinical and radiological findings, and poor sensitivity or specificity of immunological tests. The latest revised diagnostic criteria for NCC emphasize the crucial role of neuroimaging, while clinical manifestations and exposure criteria serve as indirect evidence. According to Del Brutto's revised diagnostic criteria (2017), our patient meets one absolute neuroimaging criterion (identifiable vesicular lesions) and two major neuroimaging criteria (ring-enhancing lesions and typical calcifications), as well as minor clinical/exposure criteria (individual from or residing in a cysticercosis-endemic area) [13].

In this case, a middle-aged male with a chronic course presented initially with episodic altered consciousness and limb convulsions. Following comprehensive evaluation including head CT scan, initial clinical suspicion leaned towards brain metastases. Subsequently, extensive clinical and radiological investigations were conducted to ascertain the cause of seizures. A specific lesion was identified on his brain MRI, raising concerns about NCC, given the patient's residency in an endemic area and dietary habits involving the consumption of raw pork, beef, and chicken, increasing the likelihood of *Taenia solium* infection. Lumbar puncture revealed non-specific inflammatory changes, prompting a full panel of CSF and blood tests for brain parasites, which returned negative. It is noted that serological and CSF testing may

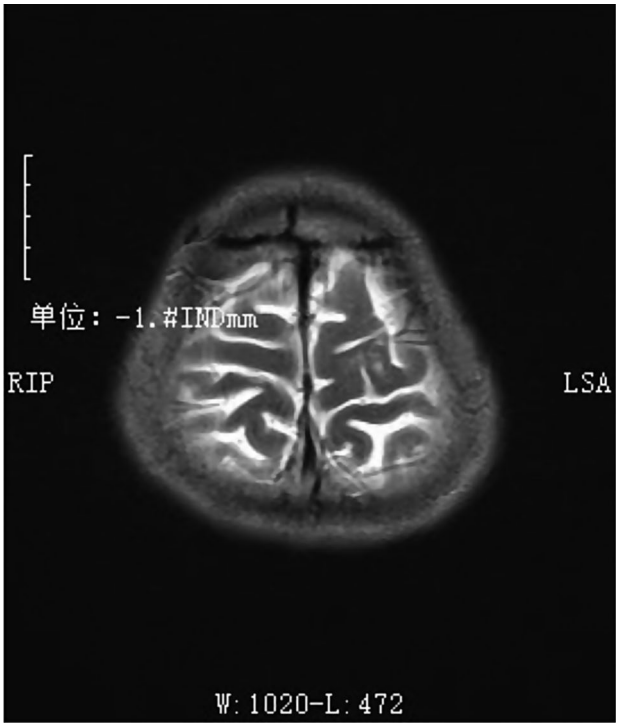

Fig. 8 Head MRI after treatments. Head MRI shows a significant reduction in edema surrounding the lesion in the left frontal lobe compared to before

have limited sensitivity in patients with solitary lesions or calcifications, and negative results do not rule out infection, especially in cases with solitary lesions or calcifications, where false negatives are more likely [14]. Stool examination detected roundworm eggs, suggesting possible infection through various routes such as ingestion of contaminated food. Although intestinal roundworm infection was not considered in this case, coexistence with NCC was contemplated. Next-generation Sequencing (NGS) of CSF holds significance in challenging cases of NCC [15], however, this test was not performed in this patient.

Treatment for NCC includes anthelmintic therapy, surgical intervention, and symptomatic management with cortico steroids and antiepileptic drugs. Anthelmintic drugs aid in more rapid reduction of parasites, although parasites may ultimately die off without drug intervention [16]. Praziquantel (50 mg/kg/day for 10–14 days) and albendazole (15 mg/kg/day for 10–14 days) are recommended anthelmintic agents. The current evidence has demonstrated that the combination of praziquantel and albendazole has a more effective cysticidal effect on live cysts of NCC compared to monotherapy [17]. However, prior to drafting this paper and reviewing relevant literature, physicians at our institution were unaware of this information, leading to the omission of combination therapy during treatment. The writing of this study has also been a learning experience for our team, and in future treatments of cysticercosis patients, we may consider incorporating this treatment approach. Moreover, it is noteworthy that the use of antiparasitic drugs may trigger subsequent inflammatory reactions in degenerating cysts, particularly in patients with multiple cystic lesions, potentially worsening clinical conditions, especially if lesions are located in critical areas such as the spinal cord, brainstem, or eyes [18]. Hence, consideration of excluding these lesions is often necessary in cases of disseminated cysticercosis when contemplating anthelmintic therapy.

With prompt initiation of treatment, NCC generally carries a favorable overall prognosis. Early detection and timely intervention are crucial in preventing complications associated with this potentially fatal condition and improving long-term outcomes. Strengthening public awareness, promoting health education, and fostering good hygiene practices are vital measures in reducing the incidence of cysticercosis [19].

Abbreviations

NCC	Neurocysticercosis
CT	Computed Tomography
MRI	Magnetic Resonance Imaging
MRS	Magnetic Resonance Spectroscopy
CSF	Cerebrospinal Fluid
NAA	N-Acetylaspartate
Cr	Creatine
Cho	Choline
NGS	Next-generation Sequencing
HE	Hematoxylin-Eosin

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Author contributions

WXW and YQ designed the study and revised the manuscript. WXW and ZYS wroted the draft of the manuscript. WXW and HQC examined and treatment patients. YQ, LM and ZYS critically revised the article for the important intellectual content. All authors read and approved the final manuscript.

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Data availability

The data supporting the conclusions of this article are include within the article. Mr. Wu-xiao Wei is the contact person for Availability of data and materials.

Declarations

Ethics approval and consent to participate

The authors confirm that the approval of an institutional review board was not required for this work. Written informed consent was obtained from the patient. The authors confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this work is consistent with those guidelines.

Consent for publication
Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent isd available for review by the Editor of this journal.

Competing interests
The authors declare no competing interests.

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References

1. Chand S, Mishra M, Singh G, Singh A, Tandon S. Orofacial cysticercosis: report of a rare case with review of literature. Natl J Maxillofac Surg. 2016;7(2):209–12.
2. Gonzales I, Rivera JT, Garcia HH. Pathogenesis of Taenia solium taeniasis and cysticercosis. Parasite Immunol. 2016;38(3):136–46.
3. Zang XZ, Li HZ, Qian MB, Chen YD, Zhou CH, Liu HK, Liu YH, Li SZ. Extensive disseminated cysticercosis: a case report in Yunnan province, China. BMC Infect Dis. 2019;19(1):535.
4. Li XM, Ouyang Y, Yang YC, Lin R, Xu HB, Xie ZY, Li SL, Shang SM. [Distribution of food-borne parasitic diseases and dietary habits in human population in Guangxi]. Zhongguo Ji Sheng Chong Xue Yu Ji Sheng Chong Bing Za Zhi. 2009;27(2):151–5.
5. Garcia HH, Nash TE, Del BO. Clinical symptoms, diagnosis, and treatment of neurocysticercosis. Lancet Neurol. 2014;13(12):1202–15.
6. Rehman AF, Lazo-Vasquez AF, Bhatt PK, Quiroz T, Joseph JA, Gultekin S, Montreuil N, Sternberg CA, Ayoade F. Neurocysticercosis mimicking craniopharyngioma: a case report. Clin case rep. 2023;11(12):e8166.
7. Li HJ, Han HX, Feng DF. Rapid increase in cystic volume of an anaplastic astrocytoma misdiagnosed as neurocysticercosis: a case report. Oncol lett. 2016;12(4):2825–7.
8. Carabin H, Ndimubanzi PC, Budke CM, Nguyen H, Qian Y, Cowan LD, Stoner JA, Rainwater E, Dickey M. Clinical manifestations associated with neurocysticercosis: a systematic review. Plos Negl Trop D. 2011;5(5):e1152.
9. Nash TE, Garcia HH. Diagnosis and treatment of neurocysticercosis. Nat Rev Neurol. 2011;7(10):584–94.
10. Carpio A, Fleury A, Romo ML, Abraham R. Neurocysticercosis: the good, the bad, and the missing. Expert Rev Neurother. 2018;18(4):289–301.
11. Sethi NK. Evidence-based guideline: treatment of parenchymal neurocysticercosis: report of the Guideline Development Subcommittee of the American Academy of Neurology. NeurologyY. 2013;81(16):1475–6.
12. Molyneux DH, Savioli L, Engels D. Neglected tropical diseases: progress towards addressing the chronic pandemic. Lancet. 2017;389(10066):312–25.
13. Del BO, Nash TE, White AJ, Rajshekhar V, Wilkins PP, Singh G, Vasquez CM, Salgado P, Gilman RH, Garcia HH. Revised diagnostic criteria for neurocysticercosis. J Neurol Sci. 2017;372:202–10.
14. Elliott EJ, Landaker EJ. Worsening migraine due to neurocysticercosis. Clev Clin J Med. 2017;84(3):196–8.
15. Chen B, Chen Z, Yang YS, Cai GL, Xu XJ, Guan HZ, Ren HT, Tuo HZ. Next-generation sequencing combined with serological tests based pathogen analysis for a neurocysticercosis patient with a 20-year history:a case report. BMC Neurol. 2021;21(1):236.
16. Rajshekhar V. Neurocysticercosis: diagnostic problems & current therapeutic strategies. Iindian J Med Res. 2016;144(3):319–26.
17. Garcia HH, Lescano AG, Gonzales I, Bustos JA, Pretell EJ, Horton J, Saavedra H, Gonzalez AE, Gilman RH. Cysticidal Efficacy of Combined Treatment with Praziquantel and Albendazole for Parenchymal Brain Cysticercosis. Clin Infect Dis. 2016;62(11):1375–9.
18. White AJ, Coyle CM, Rajshekhar V, Singh G, Hauser WA, Mohanty A, Garcia HH, Nash TE. Diagnosis and treatment of neurocysticercosis: 2017 clinical practice guidelines by the Infectious Diseases Society of America (IDSA) and the American Society of Tropical Medicine and Hygiene (ASTMH). Clin Infect Dis. 2018;66(8):1159–63.
19. Rodríguez-Morales AJ, Yepes-Echeverri MC, Acevedo-Mendoza WF, Marín-Rincón HA, Culquichicón C, Parra-Valencia E, Cardona-Ospina JA, Flisser A. Mapping the residual incidence of taeniasis and cysticercosis in Colombia, 2009–2013, using geographical information systems: implications for public health and travel medicine. Travel Med Infect Dl. 2018;22:51–7.

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