A Case of Acute Ischemic Stroke Associated with Hookworm Anemia.

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Short report

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Abstract

Background: Hookworm disease discovered in a patient presenting with cerebral infarction due to severe iron-deficiency anemia and confirmed by gastroduodenoscopy has not been reported especially with negative stool routine.

Case presentation: We report a male patient who presented himself to us with acute cerebral stroke verified as hookworm disease. Routine laboratory tests revealed low Hemoglobin (Hb) concentration but stool routine and occult blood test were normal. Brain magnetic resonance imaging (MRI) showed left-sided parietal-occipital lobe and centrum semiovale ("watershed") infarction verified the diagnosis of acute ischemic stroke. Bone marrow aspiration showed proliferative bone marrow image with obvious red system hyperplasia. Gastroduodenoscopy discovered adult hematophagic hookworms in the bulb and descending part of duodenum of the patient. A series of conservative drug treatment was initiated and the patient was subsequently treated with albendazole after the gastroduodenoscopy. Twenty-five days later, the patient's physical function improved gradually and he was discharged without neurological deficit.

Conclusion: Hookworm disease could be manifest in acute ischemic stroke. It was concluded that patients with severe iron-deficiency anemia should also be examined for rare intestinal parasitic diseases. Screening for these intestinal parasitic diseases in patients presenting with cerebral infarction and anemia could effectively avoid misdiagnosis and make increase the efficacy of treatment.

Background

Hookworm infection is a common public health problem in the underdeveloped countries and is characterized by iron-deficiency anemia. Additionally, certain large and higher-income countries, such as China and Brazil, still face considerable hookworm burden [1]. Chronic blood loss from hookworm infection has the greatest impact worldwide and blood loss is one of the major causes of iron-deficiency anemia, which is not generally recognized as a risk factor for ischemic stroke. Generally, the diagnosis is based on the identification of characteristic ova in the stool [2]. There are very few documented cases reporting hookworm infestation of the stomach. In this case report, we present an endoscopic demonstration of hookworm infestation of the bulb and descending part of duodenum in a man who presented with acute ischemic stroke.

Here, we reported a rare case of Hookworm disease discovered by gastroduodenoscopy with negative stool examination in a patient presenting with acute cerebral infarction associated with severe iron-deficiency anemia.

Case Presentation

A 79-year-old right-handed man presented with 4 months of exercise-associated chest tightness and was admitted to the department of the Cardiology. Vital signs showed normal. Routine laboratory tests

revealed Hb $4.9\text{g}\cdot\text{dL}^{-1}$, red blood cell (RBC) $3.05\times 10^{12}\cdot\text{L}^{-1}$, hematocrit (HCT) 0.18, mean corpuscular volume (MCV) 57.2fl, mean corpuscular hemoglobin (MCH)16.1pg, mean corpuscular hemoglobin concentration (MCHC) 282g/L. Serum myocardial enzymes, cholesterol, coagulation times, renal and liver function tests, electrolytes, stool routine and occult blood test were normal. On the next day, cerebral infarction had been developed as demonstrated by right limb side paralysis (upper muscle strength grade 4/5, lower muscle strength 0/5) accompanied by transient coma and normal brain computed tomography (CT) scan. We advised that the patient receive thrombolytic therapy within 3 hours for the stroke, but the family refused this treatment. The patient was then transferred to neurology department for further treatment. In the sixth day, a brain MRI showed [Fig. 1A,1B,1C,1D,1E] left-sided parietal-occipital lobe and centrum semiovale (“watershed”) infarction, verifying the diagnosis of acute ischemic stroke attack. Bone marrow aspiration showed proliferative bone marrow image with obvious red system hyperplasia. Gastroduodenoscopy discovered [Fig. 2A,2B,2C,2D] adult hematophagic hookworms in the bulb and descending part of duodenum of the patient, though the stool occult blood test showed negative result and no hookworm eggs were found in the patient’s stool.

A series of conservative drug treatment that included iron supplementation and antiplatelet aggregation (e.g. Aspirin) drugs, to improve cerebral circulation, was initiated. After the gastroduodenoscopy, the patient was subsequently treated with albendazole to eradicate the parasite along with iron therapy, achieving clinical cure. The concentration of serum Hb reached 10.2 g/L twenty-five days after the therapy, and the patient's physical function improved gradually; he was discharged and without neurological deficit. At the 4 month follow-up, his anemia was corrected. The patient underwent a second gastroduodenoscopy showing that the hookworms had disappeared.

Discussion And Conclusions

Although an association between acute cerebral infarction and anemia has been reported [3], iron-deficiency anemia is still not generally recognized as a potential risk factor of the ischemic stroke. Approximately 10% of the patients infected by hookworms experienced anemia [4], which is most strongly associated with moderate to severe hookworm infection in both adults and children. Adult hookworms inhabit the small intestine, ingest red blood and intestinal epithelial cells, causing iron-deficiency anemia. In the present study, we reported a rare case of ischemic stroke in an elderly man that considered to be associated with iron-deficiency anemia secondary to hookworm disease.

In this case, we initially attributed the cerebral infarction to atherosclerosis given the patient's history of hypertension and carotid artery doppler ultrasound findings of carotid artery plaque (left: $5.7\times 1.5\text{mm}$, right: $6.4\times 1.6\text{mm}$). However, the patient’s right lower extremity muscle strength was resolved the next day. Cranial MRI scan in the sixth day confirmed left-sided parietal-occipital lobe and centrum semiovale (“watershed”) infarction, also known as “borderzone infarction” (BI). Acute anemia may decrease oxygen-carrying capacity, producing cerebral blood flow insufficiency and resulting in distal-field tissue ischemic injury, particularly when Hb levels decrease below a critical level especially in patients with intracranial stenosis.

Additionally, anemia is negatively associated with outcome (in-hospital mortality or discharge to hospice) in patients with less severe ischemic stroke [5]. The causes of anemia are multifactorial and include diet, infection and genetics. This is significant because early recognition and treatment of the underlying etiology of anemia are crucial to the patients' recovery and prognosis. This case also highlights that hookworm disease, while globally significant, often goes unrecognized as the cause of this type of progressive, insidious, and often severe anemia.

Hookworm disease, can be confirmed by gastroduodenoscopy, especially in negative results of the stool. In this patient, further gastroduodenoscopy showed numerous actively feeding hookworms, which confirmed the diagnosis.

Albendazole is an effective anthelmintic of the treatment used to treat ancylostomiasis (hookworm disease) clinically, for the drug binds to the β -tubulin of nematodes, thus inhibiting the microtubule polymerisation of these parasites. Anemic symptoms of the patient were significantly clinically improved after iron supplementation and expelling the parasites, indicating that ancylostomiasis was the etiology of anemia in this patient.

Anemia appeared to have a significant impact on the functional improvement and discharge outcomes, increasing the complication rate and affecting the efficiency of rehabilitation for patients following ischemic stroke. As previously reported, anemia is the risk factor for cerebrovascular events [3], we should also be aware of that one etiology of anemia is hookworm disease.

In conclusion, we report a case of acute ischemic stroke associated with hookworm anemia. It concluded that patients with severe iron-deficiency anemia be examined for rare intestinal parasitic diseases. Screening for these intestinal parasitic diseases in patients presenting with cerebral infarction and anemia could effectively avoid misdiagnosis and make increase the efficacy of treatment.

Abbreviations

Hb: Hemoglobin; MRI: Magnetic resonance imaging; RBC: Red blood cell; HCT: hematocrit; MCV: Mean corpuscular volume; MCH: Mean corpuscular hemoglobin; MCHC: Mean corpuscular hemoglobin concentration; CT: Computed tomography

Declarations

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Author's contribution

All authors have read and approved the manuscript of this case report.

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Availability of data and materials

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Ethics approval and consent to participate

Not applicable.

Consent for publication

The written informed consent was obtained from the patient before and after all procedures, and for the publication of this case report.

Competing interests

Authors have no conflict of interest in relation to this research and its publication.

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Figures

Figure 1

The brain MRI scan. Brain MRI 5 days after the neurological symptoms. DWI imaging, showing hyperintense signal, indicated left-sided parietal-occipital lobe and centrum semiovale infarction (cerebral watershed infarction).

Figure 2

Biologic behavior of hookworms on a close-up gastrointestinal endoscopic view. Full gut with a red line extending along the whole hookworm (arrows) is seen.

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