Heart Failure Caused by Hookworm Infection Possibly Associated with Organic Food Consumption

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Abstract

An 87-year-old man with heart failure caused by severe anemia was referred to our hospital. Gastroenteroscopy revealed the existence of several parasites in the duodenum. Examination of the stool by a formalin-ethyl acetate concentration technique detected hookworm eggs. After a single dose of pyrantel pamoate, his symptoms including dyspnea on exertion and edema diminished. And also hemoglobin and B-type natriuretic peptide (BNP) had improved dramatically. Hookworm infection is an extremely rare cause of heart failure, and furthermore this parasitic infection is not common in advanced countries. We suggest the possible relationship between parasite infection and organic foods.

Key words: hookworm, heart failure, organic food, anemia

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Introduction

There are many underlying diseases which are known to cause heart failure, such as ischemic heart disease, valvular disease, anemia, and thyrotoxicosis. In general, we do not think of parasite infection as a cause of heart failure. Hookworm infection causes severe anemia, which might eventually result in heart failure. This infection does not seem to be a leading cause of heart failure in advanced countries because proper sanitation is established. Recently, we encountered a patient, who ate organic foods, with congestive heart failure associated with hookworm infection. This report is compelling for internists because the present case suggests an unusual cause of heart failure. It is advisable for us to consider parasitic infections as a cause of heart failure, even in advanced countries.

Case Report

In November 2004, an 87-year-old Japanese man living in Kagoshima who had a 30-year history of eating organic foods was admitted for evaluation of severe anemia. Despite outpatient treatment with sodium ferrous citrate (50 mg/day) for 3 months, anemia was worsening. He had a history of hospitalization for congestive heart failure in 2003. He gave no history of allergy, overseas travel, or trauma.

Findings on admission included facial and pretibial edema, dyspnea on exertion, and koilonychia. He had no respiratory symptoms such as cough and wheezing. The remainder of the physical examination was unremarkable. A chest radiograph obtained on admission showed cardiac enlargement (cardiothoracic ratio, 0.60) and mild pulmonary congestion without any abnormal shadow in both lung fields. Laboratory results included a red blood cell count of 178×10^4/μL; hemoglobin, 5.1 g/dl; mean corpuscular volume (MCV), 99.4 μm^3; mean corpuscular hemoglobin (MCH), 28.5 pg; mean corpuscular hemoglobin concentration (MCHC), 28.7%; white blood cell count, 3,700 /μl; platelet count, 19.9×10^4/μL; serum iron, 19 μg/dl; ferritin, 70.2 ng/ml; total iron-binding capacity (TIBC), 316 μg/dl; and B-type natriuretic peptide (BNP), 632.5 pg/ml (normal range, <18.0). In investigating the possible causes of anemia, we suspected gastrointestinal bleeding because the fecal occult blood test was positive. Gastroenteroscopy disclosed several parasites in the duodenum (Fig. 1). The surface of intestinal mucous membrane was red and edematous. Examination of the stool by a formalin-ethyl acetate concentra-
Figure 1. Hookworms were seen in the patient’s duodenum via endoscopy.

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Hookworms were seen in the patient’s duodenum via endoscopy. We administered a single dose of pyrantel pamoate (500 mg) and increased the dose of sodium ferrous citrate (100 mg/day). Ten days later, the red blood cell count had improved to 335×10⁴/μl, and hemoglobin to 10.9 g/dl. Two months later the red blood cell count had risen to 411×10⁴/μl, and hemoglobin to 13.2 g/dl. Edema and dyspnea no longer were present and BNP had decreased to 63.8 pg/ml. Examination of the stool no longer disclosed hookworm eggs. Echocardiographic findings were normal, including normal left ventricular wall motion.

Discussion

Hookworm remains a common cause of iron-deficiency anemia in developing countries (1). The major hookworm-related injury in humans occurs when the adult parasites cause intestinal blood loss. Iron-deficiency anemia occurs when blood loss exceeds the intake and reserves of host iron (2). Fifteen cases of heart failure associated with hookworm infection were reported in Uganda in 1959 (3). However, heart failure caused by hookworm has not been reported in advanced countries. In 1999, one case was reported in Japan in which a patient’s hemoglobin decreased to 4.6 g/dl by hookworm infection (4). However, this patient did not have heart failure. Generally, proper sanitation and footwear are important for control of hookworm, since the parasite usually is transmitted through contact with contaminated soil (5). The highest rates of hookworm infection occur in the world’s coastal regions, typically in poverty-stricken areas (1). Importantly, however, two species of hookworm exist: Necator americanus and Ancylostoma duodenale. Ancylostoma duodenale infects humans both by the oral route and through the skin (5). Ancylostoma duodenale sometimes cause Wakana disease, which is characterized by pharyngeal irritation, cough and wheezing (5). However, the present patient did not have such respiratory symptoms.

The present patient always wore shoes outdoors and lived inland. In fact, since he had difficulty walking, he did not go out often. Furthermore, hookworm infection is not common in Japan (1). In Japanese houses the floor is above ground, and people remove their shoes when they enter the house. Accordingly, no soil is brought indoors. Since transcutaneous transmission was highly unlikely in our patient, we suspected oral transmission. Organic foods have become popular in advanced countries with good hygiene, and increasing numbers of people purchase foods grown without pesticides. We suspect that our patient may have become infected by eating organic food imported from endemic areas of hookworm infection.

Heart failure is seen commonly in routine outpatient and hospital practice. Anemia is an independent prognostic factor in patients with heart failure (6). Among the many causes of anemia in advanced countries, hookworm is highly unusual. Yet organic foods grown without pesticides may carry old-fashioned diseases. The World Health Organization (WHO) has urged monitoring of organic food for this reason (7).

We have reported a patient with congestive heart failure and severe anemia. We concluded the anemia was attributed to the hookworm infection. Hookworm infection might not have directly resulted in the heart failure, but it is clearly one of several contributing factors. This parasitic infection was probably caused by eating organic foods over a long period. There are some benefits of eating organic foods (8), however, it is strongly suggested that we wash or heat organic foods well after purchase. An important lesson from our case is that hookworm infection still may occur not only in developing countries but also in advanced countries.
References


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