

Microcytic Anemia in the Setting of Helminth Infection

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Abstract

Parasitic infections are endemic to developing countries due to poverty, poor water hygiene, and inadequate sanitation systems; however, the incidence is increasing in the United States. Parasitic infections can cause anemia, malnutrition, growth impairment, developmental and physical delays. Here, we present the case of a 27-year-old male who presented with profound iron deficiency anemia due to presumed *Ascaris lumbricoides* infection in the colon and Hookworm infection in the duodenum. He was treated with a one-time dose of Albendazole 400 mg. To help combat the prevalence and morbidity associated with helminth infections, mass drug administration (MDA) programs and clean water initiatives have been developed. There is still a significant need for ongoing assistance programs and research to look for interventions to help eradicate helminth infections. Our case helps highlight to providers the importance of evaluation for parasitic infections in non-endemic regions as a potential source of anemia.

Key Words: Hookworm, Roundworm, microcytic anemia, Albendazole therapy, Helminth infection

Introduction

Anemia is characterized by an inappropriately low hemoglobin level, which in turn decreases the oxygen carrying capacity of red blood cells¹. Anemia can cause a constellation of symptoms, including shortness of breath, lightheadedness, fatigue, leg cramps, and hemodynamic compromise if severe. Iron deficiency anemia is the most common cause of anemia, whether from poor oral intake of iron, or chronic blood loss. There are many other causes of anemia ranging from chronic inflammation, kidney disease, and various nutrient deficiencies. Parasitic infections can also be an unusual, but devastating cause of anemia. Parasitic infections are most commonly contracted from the soil and are estimated to affect approximately 24% of the world's population². Parasitic infections are endemic to developing countries and are associated with poverty and poor environmental hygiene¹. The highest prevalence of these infections is reported in sub-Saharan Africa, China, South America and Asia². These infections are transmitted via eggs, present in human feces, that contaminate the soil in areas with poor sanitation structure. The eggs may then be consumed on poorly washed vegetables or ingested by children playing in the infected soil. Adult worms then hatch and inhabit the intestine where thousands of parasitic eggs are produced daily; those eggs are then shed in feces². The main species of helminths that infect people include: the roundworm (*Ascaris lumbricoides*), the whipworm (*Trichuris trichiura*) and hookworms (*Necator americanus* and *Ancylostoma duodenale*)². According to the Centers for Disease Control (CDC), there are still many parasites that are endemic within small pockets of the United States—most commonly in areas of poverty and poor sanitation³. Parasitic infections are a serious cause of morbidity in those affected. The helminths feed on the host's tissues leading to chronic blood loss, protein loss, malabsorption of nutrients and chronic malnutrition². In severe cases, some experience impaired growth, developmental and physical delay.

Case Presentation

The patient is a 27-year-old male with no pertinent past medical or surgical history that initially presented to the emergency department with severe anemia. He was evaluated by his primary care provider after five months of frontal headache and fatigue. Laboratory evaluation obtained by his primary care provider revealed significant anemia requiring prompt evaluation by the emergency department.

Upon arrival, the patient was afebrile, normotensive, and in no acute distress. He denied any history of anemia or previous blood transfusions, melena, hematochezia, or hematemesis. He reported taking ibuprofen up to three times daily since symptom onset. Laboratory evaluation was significant for hemoglobin 4.5, mean corpuscular volume 64.2, platelets 741, and white blood cells 3.9. Hemocult was negative and two units of packed red blood cells were transfused. Computed tomography (CT) of the head without contrast was negative for acute intracranial processes.

Additional laboratory studies were significant for ferritin 2, iron level 13, and elevated reticulocytes with normal LDH and haptoglobin levels, confirming severe iron deficiency anemia (IDA) causing reactive thrombocytosis. Further history was obtained and revealed moderate alcohol consumption (7 drinks weekly) and recent emigration from Guatemala. With additional risk factors for gastrointestinal cause of severe IDA, oral Protonix was initiated, anticoagulation was not given for thrombocytopenia and gastroenterology was consulted for endoscopy.

Esophagogastroduodenoscopy (EGD) revealed LA grade B reflux esophagitis, mild non-reactive gastritis, and multiple live hookworms within the duodenal bulb, first and second portions of the duodenum (Figure 1 and 2).

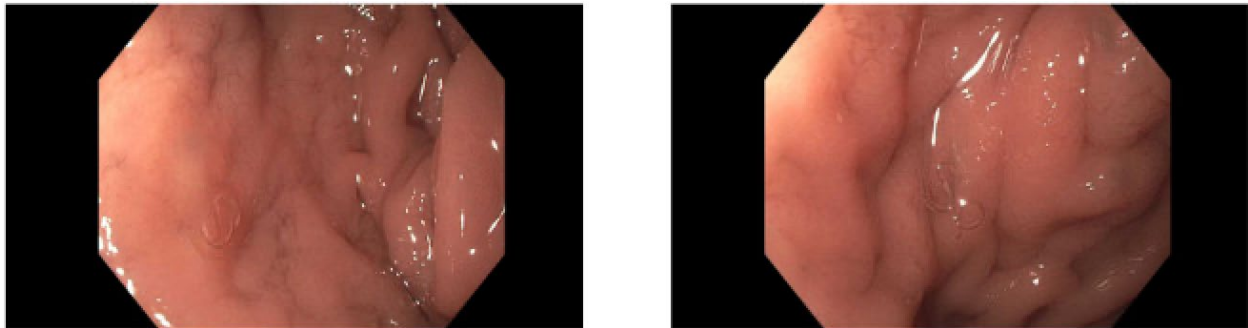


Figure 1&2. Endoscopic evaluation revealing live hookworms within the second portion of the duodenum.

Colonoscopy was significant for live roundworms (presumed *Ascaris lumbricoides*) within the cecum. (Figure 3). A specimen was biopsied via suction and sent to pathology for evaluation. The patient was treated with Albendazole 400mg.

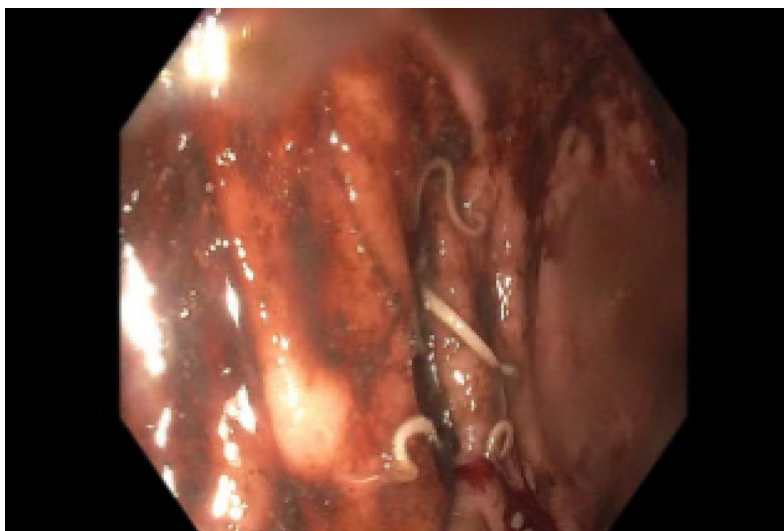


Figure 3. Endoscopic evaluation of the cecum revealing multiple roundworms.

After transfusion of two units of packed red blood cells and several days of intravenous iron replacement, the patient's hemoglobin levels remained stable. He was given an additional dose of Albendazole 200 mg upon discharge and was instructed to follow up with his primary care physician to ensure infection eradication.

Discussion

This case describes a young patient with profound iron deficiency anemia due to a helminth infection. It should be noted that it is unknown when this patient emigrated to the United States and therefore difficult to ascertain how long he had been infected. This raises the question of how long a patient must be infected to start exhibiting signs of anemia. According to the Centers for Disease Control (CDC), most immigrants with parasitic infections are not diagnosed for greater than 5 years after emigration to the United States⁴. However, there is more research to be done to be able to ascertain the time frame when parasitic infection should be higher on the differential as a source of anemia in patients who emigrated from endemic countries. The patient was ultimately treated with a single dose of Albendazole 400 mg for presumed *Ascaris lumbricoides* infection in the colon and Hookworm infection in the duodenum. Albendazole's active metabolite, albendazole sulfate, works to impair glucose metabolism in intestinal helminths, ultimately depleting their ATP production and causing energy depletion, immobilization, and death⁵. Currently, efforts to decrease the burden of intestinal helminth infections include mass drug administration (MDA) of anti-helminth medications to children living in endemic areas, as well as improving water hygiene and sanitation⁶. The three most common types of soil-transmitted helminths– the roundworm (*Ascaris lumbricoides*), the whipworm (*Trichuris trichiura*) and hookworms (*Necator americanus* and *Ancylostoma duodenale*), are susceptible (in varying degrees) to the benzimidazole drug class, making albendazole and mebendazole the most commonly used medications in MDA programs⁶. Although MDA programs have shown benefit in reducing prevalence of helminthic infections, they must be paired alongside clean water initiatives and improvement in sanitation. There is still much work to be done to decrease the burden and overall morbidity associated with these

parasitic infections. Future research could be aimed at possible vaccinations or other medications to assist in helminth eradication.

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