
Hookworm disease as a cause of iron deficiency anemia in the prison population

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ABSTRACT

We report a case of hookworm parasitosis in a Spanish patient who before imprisonment had lived in Brazil. The diagnosis was established from a progressive manifestation of asthenia, together with significant weight loss. Laboratory tests showed

hypochromic microcytic anemia and eosinophilia. Consequently, the patient was admitted to hospital in order to complete the study, where several hookworm eggs were later found in feces. The patient was subsequently treated with Albendazole and iron, achieving clinical cure, normalization of biochemical parameters and eventual eradication of the parasite.

We believe it is important for the prison doctor to bear this and other parasitosis in mind when facing the case of inmates who are originally from tropical countries, where these parasites are endemic. In addition, it might be appropriate to implement parasite screening programs in the immigrant population headed by the Prison Health Service, even when said population is asymptomatic.

Keywords: Hookworm; Anemia, Iron-Deficiency; Prisons; Asthenia; Emigration and Immigration; Infection; Parasites; Neglected Diseases; Spain.

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INTRODUCTION

Hookworm infection is an intestinal helminthiasis caused by two different species of hookworm: *Ancylostoma duodenale* and *Necator americanus*. It is included in the group of Neglected Tropical Diseases (NTD). Most cases are described in tropical and subtropical countries, where it entails a relevant public health issue. It has been estimated that there are around 740 million ¹ people infected by hookworm worldwide, most of whom live in Latin America and the Caribbean, and a population at risk of about 514 million people in this region ². Its main clinical manifestation is iron deficiency anemia, since these helminthes feed on blood. In Spain hookworm infection

is an imported disease derived from migrations and the increase of international travelling ³⁻⁴. Prison authorities are aware of the increase of such imported diseases due to the high number of inmates who come from developing countries, where hookworm is endemic ⁵.

CLINICAL CASE

We hereby report the case of a Spanish 28 year old male imprisoned since December 2009 and with no significant medical history except for bronchial asthma on inhaled bronchodilator therapy. Before imprisonment he had lived in the Northeastern region

of Brazil (State of Cereá) from March 2008 to August 2009, in suburbs (*favelas* or slums). During his stay in Brazil he refers to have taken tap water, fresh salads and to have walked barefoot on muddy grounds. He also reports an episode of self-limited diarrhea of unclear origin. Twelve months after entering prison he initiates a general syndrome of progressive asthenia and weight loss of 10kg, together with dizziness, occasional headache and dyspepsia. He had two episodes of liquid diarrhea with midepigastric pain and with no pathological products. The physical examination revealed pallor of skin and mucous membranes. Complete blood count presented the following results: Hemoglobin 9.4 g/dl; hematocrit 29.3%; mean corpuscular volume 65 fL; Leukocyte count 10900/mm³ (2800/mm³ eosinophils), 431000/mm³ platelets; Serological tests for HIV, Hepatitis B and C were negative. The patient was derived and admitted to his reference hospital where complete biochemical testing, including liver function tests, and chest X-rays revealed no further alteration. Parasite detection in 3 consecutive samples of stool was carried out by means of the formol-ether concentration technique, thereby detecting the presence of hookworm eggs. Serological testing for *Strongyloides stercoralis* was positive by means of the ELISA technique with a result of 0.6 optical density (OD) units. Treatment was initiated with albendazole 400mg/12 hours and ivermectin 200 micrograms/kg/day for two consecutive days together with oral iron supplements (ferric sulfate) for three months.

Three months later all hematological parameters had come back to normal and both the parasite fecal exam and the serological determination of *Strongyloides stercoralis* had become negative.

DISCUSSION

Hookworm infection is a public health issue worldwide. The main risk factors identified with this infection are: living in rural, tropical and subtropical areas, social and economic factors, and poor hygiene, impaired management of biological waste and walking barefoot, which enables the penetration of the parasite into the skin. Although sometimes the time between the penetration into the skin and the appearance of eggs in feces is of about 5 to 6 weeks, usually this happens years after leaving the country where the infection was contracted, since adult hookworms are extremely long lasting (average life span from 3 to 5 years) and because of latent forms of *ancylostomatidae* as in our patient.

Hookworms live in the small intestine, their eggs are eliminated through human stool and in the appropriate conditions they hatch in the soil to release larvae that mature into infective filariform larvae (or L3). Infection is transmitted by larval penetration into human skin, from where larvae migrate into the blood vessels and are carried to the lungs and ultimately to the pharynx, where they are swollen and thereby complete their life cycle in the intestine^{2,6}. Adult worms attach to the mucous wall of the small intestine where they are able of softening the wall of intestinal villi and breaking blood capillaries, mainly feeding on blood and tissue fragments⁷.

Lesions depend mostly on the number of larvae producing the infection, the number of migratory larvae and the number of adult parasites ultimately developed. When there are over 500 parasites the infection is considered to be severe. During the acute phase there can be itching at the site of larval penetration; during transpulmonary passage the infection can actually simulate Loeffler's syndrome or less frequently pneumonitis; due to the migration of larvae to the esophagus, retrosternal pain may occur; and when reaching the small intestine, abdominal pain or diarrhea⁸. Chronic infection is asymptomatic or symptoms and signs resulting from iron-deficiency anemia³ can be found, since duodenal ulcers may result from the infection and worms feed on hemoglobin. This results in iron-deficiency anemia being one of the most frequently found manifestations of the disease in its chronic phase, just as in our patient³. It has been estimated that one worm can take up to 0.1 to 0.2 ml blood per day. The diagnosis is established by egg identification in stool examination, so that at least three samples obtained in different days are necessary⁹. Since hookworms belong to the order *Strongyloidea* there may be serological crossed-reaction with *S. stercoralis*. Our patient also presented positive serology for *S. stercoralis*.

Nevertheless, since microscopy has a low sensitivity in the detection of larvae from *S. stercoralis* in stool, it is sometimes difficult to diagnose the coinfection. *S. stercoralis* is a predominantly intestinal helminth, although in immunoincompetent patients multiplication may become uncontrolled when non infective larvae mature into invasive filariform larvae, therefore producing hyperinfection, or less frequently multiple organ dysfunction¹⁰ which entails mortality rates of up to 70% and requires combined treatment of both parasites, as in the case which is herewith presented¹¹⁻¹². These features are most commonly found in patients under corticoid therapy, suffering from malignancies, transplanted patients, or patients infected with HTLV-1 virus. Anthelmintic treatment of

hookworm infection consists of mebendazole or albendazole, which needs to be repeated one week later. The preferred anthelmintic therapy for *Strongyloides stercoralis* is ivermectin, although, since hookworms are resistant to this drug, the two treatments had to be implemented. In case of anemia, iron supplements need to be administered. It is compulsory to check on the negativisation of stool samples between 4 and 6 weeks after the therapy is completed.

CONCLUSIONS

Since Spanish prisons host a high number of immigrant inmates, the incidence of hookworm infection as well as of other parasitic diseases is expected to increase. In our facility there are currently 62 inmates belonging to such areas, which represents 4% of the total population. This fact can be extrapolated to other prisons in the country and entails the need of a high awareness and diagnostic suspicion of such diseases, as well as the implementation of screening programs of intestinal parasitosis in immigrant imprisoned population, even when asymptomatic, alike in the general immigrant population^{3,9}.

To conclude, we must consider that hookworm infection must be suspected before the presence of iron-deficiency anemia and eosinophilia in patients from tropical countries until proven otherwise. Therefore, before considering invasive tests such as digestive endoscopy, fecal examination for parasite identification must be the first test undertaken.

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