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Adult female of *Strongyloides stercoralis* in respiratory secretions

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PEER REVIEW

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Comments

Strongyloidosis is an intestinal parasitism caused by the threadworm, *S. stercoralis*. This can cause pulmonary or cerebro-spinal strongyloidosis as well as fulminant intestinal parasitism. The real challenge is screening patients prior to and during immunosuppressive therapy. This manuscript is very well written. Importantly, the authors describe an unusual finding as is the adult parasites detected in lung samples. The article is a significant contribution to the diagnosis of this parasite.

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ABSTRACT

Objective: To communicate the presence of adult females, rhabditoid larvae and eggs of *Strongyloides stercoralis* (*S. stercoralis*) in the respiratory secretions obtained by tracheal aspirate from a HIV-negative patient who was suffering from polymyositis, and treated with corticoids and amethopterin and assisted by pneumonia. **Methods:** The respiratory secretions submitted to the Parasitology Laboratory of the Muñiz Hospital were made more concentrated by centrifugation (1500 r/min for 15 seconds). Wet mount microscopy was performed with the pellet. **Results:** It revealed adult females, rhabditoid larvae and eggs of *S. stercoralis*. Further parasitological studies performed after the start of the treatment with ivermectin on fresh fecal samples, gastric lavages and tracheal aspirates showed scanty mobile filariform and rhabditoid larvae of the same parasite. **Conclusions:** The presence of adult female *S. stercoralis* which has never been observed before in the clinical samples submitted to our Laboratory for investigation can be considered as an indirect marker of the severe immunosuppression of the patient.

KEYWORDS

Strongyloidiasis, *Strongyloides stercoralis*, Hyperinfection, Parasitological diagnosis, Adult female

1. Introduction

Strongyloides stercoralis (*S. stercoralis*) is a parasite that causes about 300 million of human infections in the whole world, mainly in tropical and subtropical regions. This geohelminthiasis is endemic in regions that are humid, warm and with muddy soil in the Southwestern Asia, Africa, Brazil, Northern Argentina and Argentine Mesopotamia and neighboring countries^[1].

In immunocompetent hosts, *Strongyloides* causes mild or even asymptomatic infections, which are restricted to the gastrointestinal tract and/or to the lungs. In the case of immunocompromised hosts those who are treated with corticosteroids, antineoplastic drugs or patients with AIDS, *Strongyloides* may have a spread form (some may appear outside the intestine), known as hyperinfection, which endangers patients' lives^[2]. The diagnosis of parasitosis is established, generally, by the visualization of rhabditoid larvae

in the feces of the patient or in the respiratory secretions when it is found in the lungs^[3]. The presence of eggs (in general absent in the feces samples) and adult females of *S. stercoralis* (found in the soil of endemic regions) in the clinical materials represent an exceptional finding (even more in respiratory secretions), which will be informed in the present paper.

2. Materials and methods

In the Laboratory of Parasitology, the sample of respiratory secretions was collected into a screwed-cap plastic conical tube by tracheal aspirate from a 53 year-old HIV-negative patient. The Tucuman patient was suffered from polymyositis, treated with high doses of corticosteroids and methotrexate. At the same time, he was diagnosed to have pneumonia with consolidation in the left lower field.

The sample was immediately centrifuged at 1500 r/min. The

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concentrate was obtained, then a drop of the concentrate was placed between the slide and coverslip and observed under a microscope with a 100× and 400× magnification. The results were immediately sent to the corresponding room.

According to the results of the parasitological study and the seriousness of the general condition of the patient, an antiparasitic treatment with ivermectin (400 µg/day for 10 d) was started in the following days. After the treatment, the patient's samples of feces, gastric lavage and respiratory secretions were obtained, which were equally concentrated and microscopically observed. Due to the persistence of mobile larvae in the subsequent parasitological studies, albendazole, was then added at the rate of 800 mg/day.

3. Results

The microscopy of the first respiratory secretion revealed abundant rhabditoid larvae, eggs and adult females of *S. stercoralis*, as it is shown in Figures 1 and 2.



Figure 1. Adult female and several rhabditoid larvae of *S. stercoralis*, which are present in a concentrate of respiratory secretions obtained by tracheal aspiration (microscopy in fresh material, 400×).



Figure 2. *S. stercoralis* embryonated eggs, which are present in respiratory secretions obtained by tracheal aspirate (microscopy in fresh material, 400×).

The feces (single fresh-collected samples) as well as gastric lavage, which were investigated after the start of the

antiparasitic treatment, revealed the presence of filariform and rhabditoid larvae with low mobility of *S. stercoralis*. Respiratory secretions obtained after the start of the treatment were also positive for larvae rhabditoides, barely mobile.

4. Discussion

The prevalence of *S. stercoralis* among samples submitted to the Laboratory of Parasitology of the Muñiz Hospital has been approximately of 1% during the last 10 years. In our experience, it is more frequent than other roundworms (*Ascaris lumbricoides* and *Uncinarias*), although it should be noted that these data include all types of stool parasitological studies, such as controls after the therapy^[4].

Generally, patients referred from an outpatient clinic and different wards of the Muñiz Hospital are HIV positive, suffering from a syndrome of hyperinfection, and we observed in their stools a large number of rhabditoid and filariform larvae of *S. stercoralis*. Occasionally, in these patients whose parasitosis was found in the lungs, these stages of the parasite (preferably the former) are found in respiratory secretions obtained by sputum or bronchoalveolar lavage. Exceptionally, the microscopy of the respiratory secretions has revealed *S. stercoralis* eggs in respiratory secretions of an AIDS patient^[5].

Even though the Muñiz Hospital is not located in an endemic region of this parasitosis, a lot of patients came from there and, as it is in the case herein described, they acquire the disease during the early ages of their lives, and they have clinical manifestations a lot of time later. The infection can remain in a latent state during several years, fulfilling cycles of self-reinfestation over a period that may exceed 30 years^[6].

The reported case is the first finding in our laboratory of *S. stercoralis* adult females (together with eggs) in a clinical material, which has been previously mentioned by other authors, although in fecal samples^[7].

In the usual biological cycle of *S. stercoralis*, adult forms evolve in the environment, where they develop a free life and cause the infectious forms of the parasite (filariform larvae) that infect humans through the skin. It is called endogenous self-reinfestation the mechanism by which the larvae of *S. stercoralis* filariform, which are present in the patient's digestive tract, penetrate the intestinal mucosa and repeat the cycle, without going outside. This latter mechanism is probably the one that was present in the patient described herein, as well as in other situations in which the patient has an immunological compromise^[8].

Regarding the strongyloidiasis diagnosis, in immunocompromised patients, this diagnosis is facilitated by the large number of parasites that are present in the materials, in which the large number of different microscopy parasitic forms is usually observed in the microscopy^[2]. However, the use of a single sample may give a wrong diagnosis in more than half of these cases, which obliges, in case of a strong suspicion of parasitosis, to study several samples in order to improve the sensitivity of the method.

The concentration techniques of Baermann and the formalin-ethyl acetate, applied to fecal samples, improve the sensitivity of parasitological studies. The method of Harada-Mori (culture in filter paper) does not seem to be so successful, whereas the blood agar culture is preferred to the above-mentioned due to its high sensitivity and easy implementation in low complexity laboratories^[8]. The duodenal sampling can be useful, although it is an invasive and less tolerable procedure.

The determination of antibodies is available and, even though it is sensitive, it has cross reactions with filarial infections or *Ascaris lumbricoides*. The sensitivity of these tests often decreases in HIV positive patients and in those with hematologic diseases.

A single serum sample is unable to differentiate current from past infections, although the persistence in the tissues of *S. stercoralis* and the possibility that the antiparasitic treatment does not completely eradicate the parasite force to an empirical treatment due to a positive test accompanied by a compatible clinical history^[9].

In recent years, some techniques based on PCR and coproantigen detection has been developed for detection of intestinal parasites in feces^[10,11]. Evaluation and standardization of such techniques are necessary to overcome the limitations of the current diagnostic methods. As regards the causes that favor the hyperinfection, the patient described herein had received, due to his underlying disease, prolonged courses of corticosteroids and methotrexate, referred to in the literature as such^[12]. The presence of adult females of *S. stercoralis* in respiratory secretions, as far the authors were able to investigate, has not been previously published, and it is possibly an exceptional finding.

Conflict of interest statement

We declare that we have no conflict of interest.

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Comments

Background

S. stercoralis is an endemic nematode in tropical and subtropical countries. Cases have also been described in Spain, major mainly in the Mediterranean coast. *S. stercoralis* infection is usually asymptomatic or causes mild gastrointestinal symptoms. Spillover infection can cause widespread disseminated strongyloidiasis associated to severe systemic bacterial infections which may lead to multiorgan failure and death. The most important risk factors that may convert an infection that is basically intestinal and often asymptomatic, to severe entity, are immunocompromised conditions and corticosteroids therapy, due to their effect on the eosinophil function.

Research frontiers

Immunocompromised hosts may require hospitalization and intensive care in disseminated infection. Consider contact isolation in these patients, because sputum, stool, vomitus, and other bodily excreta may contain infective (filariform) larvae. Patients with hyperinfection syndrome often have complications of sepsis, shock, and acute respiratory distress syndrome. Any patient suspected of disseminated disease should receive care in a facility properly equipped for intensive management.

Related reports

The growing importance of human strongyloidosis depends upon the unique ability of *S. stercoralis* to replicate within its host and to behave as a potentially fatal opportunistic pathogen in immunocompromised hosts, particularly in those receiving corticosteroids.

Innovations and breakthroughs

Control of human strongyloidosis has been achieved in

kennels by strategic use of anthelmintics. Given the lack of epidemiological information community-based programs to control human strongyloidosis have not been attempted.

Applications

S. stercoralis is unique among intestinal nematodes in its ability to complete its life cycle within the host through an asexual autoinfective cycle, allowing the infection to persist in the host indefinitely. Under some conditions associated with immunocompromise, this autoinfective cycle can become amplified into a potentially fatal hyperinfection syndrome, characterized by increased numbers of infective filariform larvae in stool and sputum and clinical manifestations of the increased parasite burden and migration, such as gastrointestinal bleeding and respiratory distress.

Peer review

Strongyloidosis is an intestinal parasitism caused by the threadworm, *Strongyloides stercoralis*. This can cause pulmonary or cerebro-spinal strongyloidosis as well as fulminant intestinal parasitism. The real challenge is screening patients prior to and during immunosuppressive therapy. This manuscript is very well written. Importantly, the authors describe an unusual finding as is the adult parasites detected in lung samples. The article is a significant contribution to the diagnosis of this parasite.

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