# Duodenal strongyloidiasis and hyperinfection syndrome: case report and literature review

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*Strongyloides stercoralis* is an intestinal nematode that commonly causes chronic or asymptomatic infection, but in some situations, especially in immunosuppressed patients, infection by this parasite can manifest with extreme severity and high mortality. Hyperinfection syndrome and disseminated strongyloidiasis are two serious, life-threatening presentations associated with immunosuppression. This paper aims to report a case of duodenal strongyloidiasis that was associated with malabsorption syndrome and evolved to hyperinfection.

## CASE REPORT

A 69 year-old Caucasian male, agronomist, sought the emergency department complaining of diffuse abdominal pain, intermittent watery diarrhea, and fever. At admission he remained with diffuse abdominal pain, now associated with nausea, vomiting, and loss of appetite. Review of systems revealed a cough that started 2 months prior to hospital admission.

Clinical examination showed pale mucous membranes and lower-extremity edema. Vesicular murmur was decreased at the right hemithorax, and abdominal exam revealed diffuse pain to palpation, with no other signs of peritoneal irritation.

In regard to laboratory screening, eosinophilia (29%), increased C-reactive protein (258.7 mg/dL), hypoalbuminemia (1.7 g/dL), and decreased total and HDL-cholesterol (65 and 8 mg/dL, respectively) were observed. Hemogram showed normocytic anemia with hemoglobin 8.5 g/dL (normal 11.5-16 g/dL).

Stool analysis did not find eggs, cysts or larvae. Serology for human T-cell lymphotropic virus (HTLV) was negative. Chest radiograph showed an opacity with irregular borders in the lower third of the right lung. Other radiograph of esophagus, esophageal hiatus, stomach, duodenum and of transit and morphology of the small intestine had no significant alterations.

Upper gastrointestinal endoscopy (figure 1) revealed that the first and second duodenal portion of the mucosa presented with edema, areas of redness, whitish plates possibly corresponding to lymphangiectasia, important friability, and discreet duodenal stasis. Biopsies were performed. The histopathological report was consistent with ulcerative duodenitis due to strongyloidiasis (figure 2), showing the presence of larvae in several lymph and intraglandular crypts. After histological diagnosis was established, treatment with albendazole and ivermectin was given for 14 days, with significant improvement in symptoms.

During hospital stay, the patient remained febrile, and a positive hemoculture was detected for Klebsiella sp. Additional treatment with imipenem was provided for 14 days, with satisfactory recovery.

## DISCUSSION

Strongyloidiasis is an infection caused by two species of the strongyloides nematode, the human pathogen of major clinical importance being the *Strongyloides stercoralis*[1-3]. This parasitic disease affects 30 to 100 million
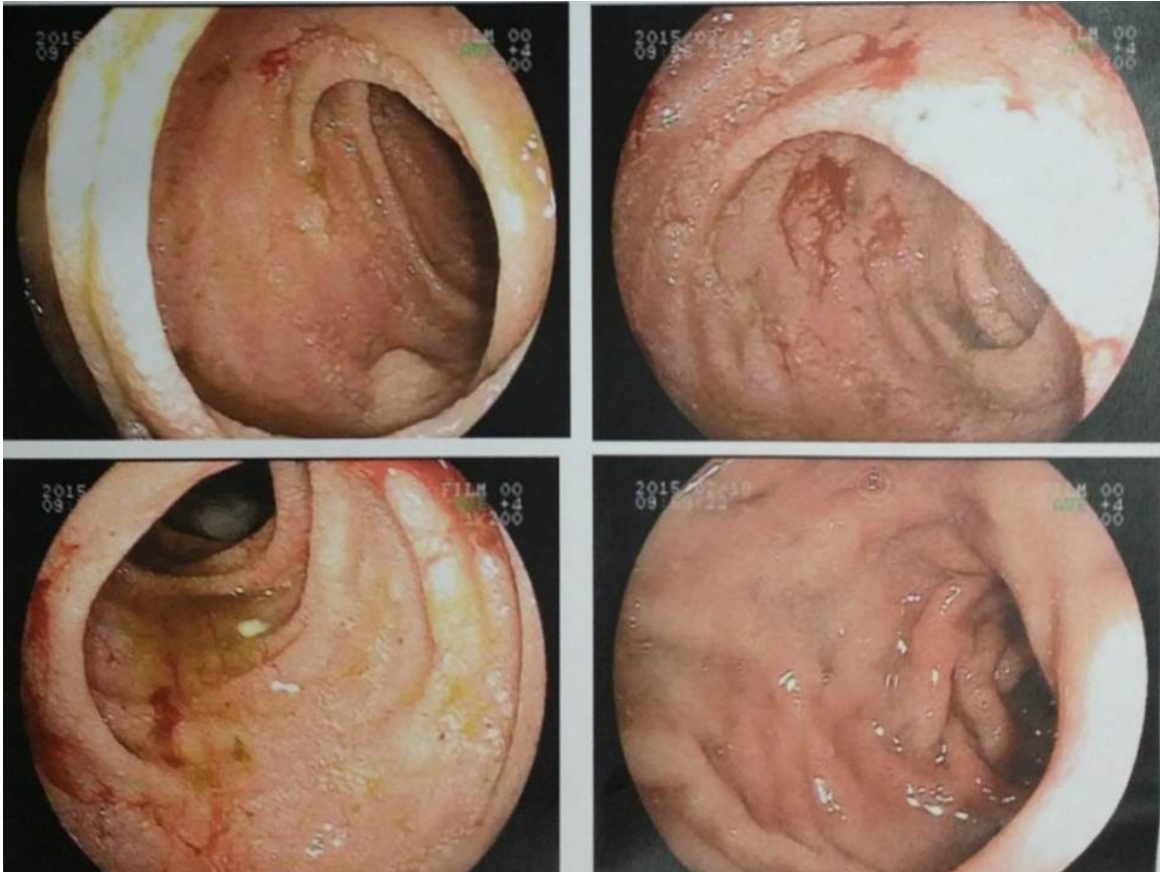
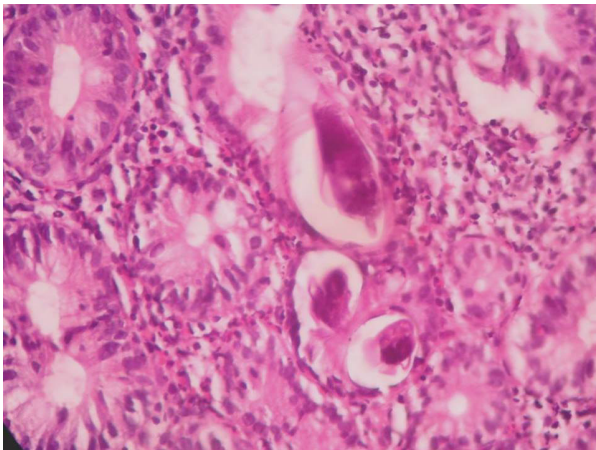Figure 1: Upper gastrointestinal endoscopy associated with duodenal biopsy.



Figure 2: Histopathological upper endoscopy with duodenal biopsy.

people worldwide and is most prevalent in tropical and subtropical areas[1-3]. The hyperinfection stage is associated with high mortality rates, reaching approximately 100% mortality if not treated[1,4].

Potential to develop severe forms of the disease is observed in high-risk individuals, such immunosuppressed patients or those on chronic corticosteroid therapy; patients with lymphoma, conditions associated with HIV infections, or leukemia; and travelers to endemic areas[1,5]. Recently, an association of severe and recurrent forms of infection by this parasite with HTLV type 1 (HTLV-1) has been demonstrated[5]. Studies have found positive HTLV-1 results in 47.8% of patients with strongyloidiasis. Animal trials suggest that immune response to strongyloides infection may be mediated by T and B-cells[5].

In situations where T-helper cells are decreased, there are higher chances of hyperinfection and disseminated disease[6]. This relation seems to be bidirectional: not only strongyloides infection has an effect on the development of HTLV-1-associated malignant diseases, but HTLV-1 inhibits cell response to strongyloides infection[5]. There is evidence that type 2 T-helper cell (Th2) response, mediated by interleukin (IL)-4 and IL5, and consequent production of immunoglobulin E, eosinophilia and mastocytosis, might be involved in the destruction of the parasite.

Since HTLV-1 has a predilection for T-cells, the consequences of the interaction between virus and immune system, altering the immunological response

of the host, are innumerous. It is known that this virus benefits from T-cell activation, favoring a permanent infection. In HTLV-1 infection there is a deviation of the immune response to type 1 T-helper cells, with increase of interferon-gamma and decrease of cytokines such as IL-5, IL-4 and IL-3, directly linked to Th2 response[7].

Researches have demonstrated that human infection caused by *S. stercoralis* seem to be controlled by Th2 response, as was observed in patients with HTLV-1 coinfection[8]. Since the immune response to helminths is associated Th2 response, T-cell suppression constitutes the immunological basis to the increased frequency of strongyloidiasis in patients infected by HTLV-1, as well as the pathogenesis of severe and disseminated strongyloidiasis[7]. In clinical practice, screening for HTLV-1 is commonly used in cases of strongyloidiasis[5].

Strongyloides infection begins by contact of human skin with infective larvae found in soil contaminated by feces[1]. The larvae penetrate the skin and by hematogenous spread, migrate to lungs where they infiltrate alveolar sacs[1]. They can ascend the bronchial tree and be swallowed, triggering helminth life cycle[1]. In autoinfection, the larvae reach the digestive tract, penetrate the intestinal mucous membrane and subsequently migrate to definite places in the intestine or in extraluminal regions[1].

Strongyloidiasis usually presents itself as an asymptomatic infection. In immunosuppressed patients this parasitic infection can assume severe and disseminated presentations, causing what is known as hyperinfection syndrome, with pulmonary, gastrointestinal, cutaneous, cerebral, hepatic manifestations, as well as gram-negative sepsis[1,5-7,9]. Digestive symptoms include diarrhea, abdominal discomfort, nausea and anorexia, and other symptoms include hydroelectrolytic disorders, hypoalbuminemia, wheezing, hoarseness, palpitations, atrial fibrillation, dyspnea, or rarely massive hemoptysis[1,9,10].

The term hyperinfection describes a syndrome accelerated by the increase in larvae migration triggered by an altered immunological state[4]. The major consequence of this syndrome is the exacerbation of gastrointestinal and pulmonary symptoms and the increase in the detection of larvae[4]. Predisposition to paralytic ileus and protein-losing enteropathy originates hypoalbuminemia and peripheral edema, conditions commonly observed in patients with the syndrome[4].

Disseminated infection happens when the larvae migrate to extrapulmonary or gastrointestinal sites and get installed in other organs[4]. Dissemination of strongyloides leads to large-scale penetration of larvae through the intestinal mucous membrane, which may be associated with bacterial translocation to the blood stream[4]. Most commonly detected bacteria include *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Pseudomonas*, *Enterococcus faecalis*, *Staphylococcus spp.*, and *Streptococcus pneumoniae*[4]. Complications like bacterial infections – especially by gram-negative germs – potentially leading to septicemia and meningitis are related to high mortality and hyperinfection syndrome[7].

Manifestations of infection can range from asymptomatic eosinophilia in immunocompetent hosts and septic shock in disseminated disease[9]. Radiological presentation shows lung infiltrates consisting of hemorrhagic sites and parenchymal infiltration[1,9]. Rarely, adult parasites can be found in the bronchial tree causing wheezing and cough, often accompanied by hyperinfection[1,9].

Strongyloidiasis is difficult to diagnose due to the low load of parasite and irregular disposition of its larvae, and because methods of laboratory detection of the larval stage fail in 70% of cases[1]. Strongyloidiasis should be suspected in the presence of signs and symptoms, eosinophilia, or suggestive serologic findings[1]. Eosinophilia is often the only indication of the presence of infection by *S. stercoralis*, although it is only found in 15% of cases and is not a specific finding[1]. Studies report that the examination of duodenal aspirate is very sensitive, because the parasite is found in the duodenal fluid in 67% of patients[1]. In cases of hyperinfection, detection of strongyloides larvae is more easily obtained, being identified in sputum analysis, bronchoalveolar lavage, lung biopsy, and pleural fluid test[1].

Hyperinfection by *S. stercoralis* has proven to be a difficult condition to manage, with increase in the number of patients who die despite specific treatment with antiparasitic drugs[3,6,7]. There are no characteristic signs or symptoms suggesting the infection, and stool analysis is the primary method for detecting the infection[1]. Strongyloidiasis is difficult to treat, wherein only the complete eradication of the parasite eliminates the potential danger of the disease[1]. Thiabendazole is the drug of choice for treatment, although ivermectin – in association or not with albendazole – has been considered by the World Health Organization as a drug with better efficacy in the treatment of disseminated infection by *S. stercoralis*[1-3,9-11].

## Conflicts of interest

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