

Strongyloides stercoralis as an Unusual Cause of COPD Exacerbation

María del Mar Ortiz Romero,^a María Dolores León Martínez,^b María de los Ángeles Muñoz Pérez,^b Antonio Altuna Cuesta,^a Alfredo Cano Sánchez,^b and José Hernández Martínez^c

^aSección de Microbiología, Hospital General Reina Sofía, Murcia, Spain

^bServicio de Medicina Interna, Hospital General Reina Sofía, Murcia, Spain

^cSección de Neumología, Hospital General Reina Sofía, Murcia, Spain

The nematode of the genus *Strongyloides* can persist in the body for long periods with asymptomatic eosinophilia as its only manifestation. If patients with chronic obstructive pulmonary disease (COPD) are also infected by this organism, altered cellular immunity or therapy with corticosteroids, which are commonly used to treat COPD exacerbations, could lead to hyperinfection and dissemination of the larvae from the gastrointestinal tract to the bloodstream. Thus, the unexpected presence of enteric bacteria in the context of a nonsevere COPD exacerbation with unexplained chronic eosinophilia should lead us to search for rhabditiform larvae in stool.

Key words: *Strongyloides stercoralis*. COPD. Enteric bacteria. Exacerbation.

Strongyloides stercoralis: una peculiar forma de exacerbación en la EPOC

Strongyloides es un nematodo que puede persistir en el organismo durante largos períodos y tener como única manifestación eosinofilia asintomática. La enfermedad pulmonar obstructiva crónica (EPOC) puede ser una afección asociada a esta infección. La presencia de una alteración en la inmunidad celular o el uso de esteroides, frecuentes en el tratamiento de la exacerbación de la EPOC, podría provocar una hiperinfección de la larva, arrastrando en su paso al torrente sanguíneo bacterias entéricas. Así pues, la presencia no esperada de bacterias entéricas en la exacerbación de un caso de EPOC no grave con eosinofilia crónica sin filiar debería orientarnos a la búsqueda activa de larvas rhabditiformes en las heces.

Palabras clave: *Strongyloides stercoralis*. EPOC. Bacterias entéricas. Exacerbación.

Introduction

Strongyloides stercoralis is an intestinal nematode that affects millions of people throughout the world. It is endemic in Southeast Asia, Latin America, sub-Saharan Africa, and some areas in the southeast of the United States.¹⁻³ This parasite has a complex life cycle and, although autoinfection is limited by the immune response in the immunocompetent host, even a low-grade autoinfection can enable the organism to persist for decades,^{1,2,4} leading to chronic infection and clinical manifestations some time after the initial infection.^{1,2,4} The manifestations range from asymptomatic eosinophilia in the immunocompetent host to disseminated disease with septic shock in immunocompromised patients.^{5,6} We report the case of an 85-year-old man with chronic eosinophilia

who attended our hospital with an exacerbation of chronic obstructive pulmonary disease (COPD) resulting from a hyperinfection syndrome due to *S. stercoralis*.

Case Description

An 85-year-old Spanish man came to our hospital with dyspnea. His medical history included an 8-year history of chronic eosinophilia, a stomach ulcer diagnosed 2 years earlier, and COPD (class II according to the Global Initiative for Obstructive Lung Disease), with a forced expiratory volume in 1 second (FEV₁) of 1300 mL (50% of predicted) and a Tiffeneau index (FEV₁/vital capacity) of 61.3%. He had not been admitted to hospital recently and came to the emergency room because of cough, whitish expectoration, and dyspnea that was worse than usual. There were no pulmonary infiltrates, only peripheral eosinophilia (2900/μL, 40.8%). The patient was diagnosed with an exacerbation of his COPD brought about by a respiratory infection. Before being discharged, he was prescribed moxifloxacin for 7 days, in addition to bronchodilators and oral corticosteroids. After 9 days with persistent dyspnea and expectoration, he returned to the emergency room. Treatment with bronchodilators and oral corticosteroids was maintained and he was prescribed clarithromycin. Twenty days later he was admitted to hospital because his condition had deteriorated. On admission, the peripheral eosinophil count was 3100/μL. Two

Correspondence: Dr M.M. Ortiz Romero
Sección de Microbiología, Hospital General Reina Sofía
Avda. Intendente Jorge Palacios, 1
30003 Murcia, Spain
E-mail: mmar.ortiz2@carm.es

Manuscript received May 31, 2007. Accepted for publication June 12, 2007.



Figure 1. Computed tomography scan of the thorax. Note the right pleural effusion and right basal atelectasis.



Figure 2. *Strongyloides stercoralis* larvae in the bronchial aspirate.

stool samples were taken for detection of parasites and sputum samples were taken for culture. No parasites were detected and sputum culture yielded *Pseudomonas aeruginosa* and *Serratia marcescens*. Antibiotic therapy was started with amikacin and meropenem. After 2 weeks, the patient's condition had not improved. Computed tomography of the thorax revealed right pleural effusion and right basal atelectasis (Figure 1). Bronchoscopy revealed a purulent secretion in the lower right lobar bronchus, and a bronchial aspirate was taken. Gram staining of the bronchial aspirate showed a considerable number of *S stercoralis* larvae (Figure 2); culture of the aspirate did not reveal bacterial growth. The patient was treated with albendazole, his clinical symptoms, analytical parameters, and chest radiograph improved, and he was discharged.

Discussion

Chronic infection by *S stercoralis* may not be clinically apparent until the patient presents gastrointestinal, cutaneous, or pulmonary symptoms, and it can even lead to hyperinfection syndrome or disseminated infection.^{1-3,5,7} In chronic infection, cough, dyspnea, and whitish sputum⁸ are common pulmonary symptoms, and are accompanied by eosinophilia of 350/ μ L to 450/ μ L.^{1-3,8} In the case we report, the patient had presented eosinophilia since 1998, in addition to mild gastrointestinal symptoms. In 2005, an ulcer in the pyloric canal was diagnosed by endoscopy. Several parasitologic studies were carried out, although they all proved negative. A negative finding is normal in uncomplicated strongyloidiasis, however, since the larval load is low and the sensitivity of stool examination is also low (only increasing when many samples—up to 7—are taken for analysis,^{3,6,7,9} and this was not done in the case we report). The cycle of autoinfection that persists in chronic infection can lead to hyperinfection syndrome caused by an increase in the number of parasites and by massive dissemination to other organs such as the lungs, liver, central nervous system, and endocrine glands, where it induces inflammation leading to dysfunction, and can even cause septic shock.⁵⁻⁷ A series of risk factors are involved in the development of hyperinfection syndrome, including diminished cellular immunity (especially in patients undergoing treatment with corticosteroids), malignant neoplasm, malnutrition, and COPD.⁵⁻⁷ Our patient had COPD and, upon admission, he had been receiving oral corticosteroids for 1 month to treat exacerbated COPD. The outcome of hyperinfection syndrome is, first, a direct result of the invasion of the organ by filariform larvae and, second, a consequence of the bacteremia, meningitis, and pneumonia caused by gram-negative microorganisms (such as *Escherichia coli*, *Proteus mirabilis*, *Klebsiella pneumoniae*, and *P aeruginosa*) that are transported by larvae from the intestine. The patient's condition deteriorates and the outcome is often fatal.^{8,10-12} Many patients who develop hyperinfection syndrome are receiving corticosteroids for their COPD, and pulmonary strongyloidiasis can also mimic a COPD exacerbation.^{3,12,13} Corticosteroids are the immunosuppressive agents most commonly associated with the transformation of chronic infection by *S stercoralis* into hyperinfection.⁵ What is striking in our case is the isolation of *P aeruginosa* in sputum. Our patient did not present risk factors, such as a recent hospital stay, treatment with antibiotics during the last 3 months, previous isolation or colonization by *P aeruginosa*, or severely impaired respiratory function ($FEV_1 < 30\%$).^{14,15} The first microbiological diagnosis revealed *P aeruginosa* and *S marcescens*, however. The isolation of these microorganisms is not consistent with reports in the literature, and this finding together with the presence of chronic eosinophilia should have led us to search for *S stercoralis* larvae in case the patient was chronically infected by this parasite but had only mild digestive symptoms. Such an infection, combined with reactivation of the COPD and treatment with corticosteroids, would have led to a syndrome of hyperinfection by *S stercoralis*.

The presence of *P. aeruginosa* and *S. marcescens* in the respiratory secretions could have been a consequence of their transport in larvae when crossing the intestine, since the patient's history, as described above, included no predisposing factors for infection by these pathogens. Despite being treated with appropriate antibiotic therapy in accordance with the antibiogram, the patient's condition did not improve. The onset of segmental atelectasis accompanied by effusion subsequently prompted inspection by bronchoscopy, which revealed no endobronchial abnormalities that could account for the radiographic images. It was the standard Gram stain of the aspirate, however, that led to the discovery of *S. stercoralis* larvae, since large quantities of larvae are characteristic of hyperinfection and they may reach the lung.^{5,7} Some authors report that Gram staining is a good tool for the detection of these parasites^{6,12,16} and the diagnosis of pulmonary strongyloidiasis. In the case of patients from areas where the parasites are endemic who present eosinophilia and COPD exacerbation, strongyloidiasis should be suspected.¹³ However, our patient was from Spain, where there is no endemic infestation, and he did not carry out any work or activity that could be a risk factor for contagion. Therefore, we never suspected pulmonary strongyloidiasis and its discovery was purely by chance. The gram-negative pathogens isolated at the outset no longer grew in a culture of the aspirate. Specific treatment with albendazole improved the patient's symptoms and gradually reduced his eosinophilia.

In conclusion, the unexpected presence of enteric bacteria in the respiratory secretions of patients with lower respiratory tract infection and unexplained chronic eosinophilia should lead us to search for rhabditiform larvae in stool.

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