tropical lung disease

Pulmonary Hyperinfection Syndrome with Strongyloides stercoralis*

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A 65-year-old man with steroid-dependent chronic airflow obstruction presented with progressive dyspnea and weight loss. Travel history included a military tour in southeast Asia. A chest roentgenogram revealed hyperexpanded lung fields with diffusely increased interstitial markings. The Papanicolaou stain of expectorated sputum demonstrated the rhabditiform larvae of Strongyloides stercoralis. Endemic areas of infection include the southeastern United States, Puerto Rico, Central America, the Pacific basin, and central Africa. In recent immigrant groups and veterans of the Vietnam conflict, rates of infection are as high as 6 percent. The hyperinfection syndrome occurs in immunocompromised hosts and is associated with glucocorticoid steroid therapy. This allows massive proliferation of larval forms. Clinical clues include an appropriate travel history (even in the remote past), gastrointestinal symptoms, cutaneous symptoms, eosinophilia, or thrombocytosis. Our patient demonstrated a classic presentation of the hyperinfection syndrome, and the condition responded well to thiabendazole. (Chest 1990; 97:1475-77)

We present the findings in a case of pulmonary hyperinfection syndrome with Strongyloides stercoralis.

CASE REPORT

A 65-year-old man presented to Letterman Army Medical Center with three months of progressive weakness, dyspnea, anorexia, and a weight loss of 6.8 kg (15 lb). The medical history was remarkable for steroid-dependent chronic airflow obstruction and an 80-pack-year smoking history. The patient has worked as a records clerk and is aware of no significant occupational exposures. He presently resides in northern California. Travel history included a tour of southeast Asia while in the military. Medications on admission included theophylline, terfenadine, aspirin (acetylsalicylic acid), dipyridamole, and prednisone (20 mg once daily). On review of systems, the patient denied fevers, chills, change in his chronic nonproductive cough, diarrhea, or constipation.

Physical examination at admission revealed a cachectic white man in mild respiratory distress with a temperature of 37.1°C (98.8°F) a pulse of 100 beats per minute while supine, and a respiratory rate of 20 breaths per minute. The blood pressure was 106/60 mm Hg. Results of examination of the ears, nose, and throat were normal. No accessible lymphadenopathy was detected. The chest examination showed an increased anteroposterior diameter and a prolonged expiratory phase with diffuse wheezes. Abdominal examination revealed mild midepigastic tenderness with a percusion showing a hepatic span of 10 cm at the right midepigastic line. The patient had no splenomegaly or abdominal masses. The stool was guaiac-positive.

Laboratory evaluation revealed a hematocrit reading of 26.3 percent, a white blood cell count of 5.2 x 10^9/L, (79 percent segmented neutrophils, 1 percent bands forms, 14 percent lymphocytes, 4 percent monocytes, and 2 percent eosinophils). The platelet count was 805 x 10^9/L. Arterial blood gas analysis demonstrated a pH of 7.5, PaCO_2_ of 4.4 kPa (33 mm Hg), and a PaO_2_ of 8.0 kPa (61

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FIGURE 1. Anteroposterior chest roentgenogram shows hyperinflation and diffuse interstitial markings.
FIGURE 2. Expectorated sputum shows rhabditiform larvae of *S. stercoralis* in proximity to squamous epithelial cells (Papanicolaou stain, original magnification × 40).

mm Hg) on room air. Pulmonary function studies showed a FVC of 2.22 L and a FEV₁ of 0.76 L. A chest roentgenogram was obtained on admission and revealed hyperexpanded lung fields and diffusely increased interstitial markings (Fig 1). The patient was admitted and begun on a regimen of intravenous steroids, theophylline, inhaled β-adrenergic agonists, and anticholinergic agents for an exacerbation of his chronic obstructive pulmonary disease. He experienced progressive cough and worsening dyspnea. The Papanicolaou stain of expectorated sputum demonstrated the rhabditiform larvae of *S. stercoralis* (Fig 2).

**DISCUSSION**

**Strongyloides stercoralis**, the “threadworm,” is a member of the superfamily, Rhabdiasoidea, and is the etiologic agent of strongyloidiasis. It is usually a benign gastrointestinal infection. Endemic areas of infection include the southeastern United States, Puerto Rico, and many areas in Central America, the Pacific basin, and central Africa. Rates of infection up to 4 percent were noted in one screened endemic area.¹ Institutional groups, such as prison inmates and hospitalized or chronic-care patients may have a rate of infection reaching 6 percent.² In select recent immigrant groups and US veterans of the Vietnam conflict, rates of infection may be much higher.³,⁴

Acquisition of the infective-stage filariform larvae of *S. stercoralis* occurs by contact with human skin or by the fecal-oral route. The spectrum of disease ranges from an asymptomatic or self-limited infection to the fatal syndrome of hyperinfection. Larval forms may persist for up to 40 years after acquisition.⁵,⁶ Chronic strongyloidiasis is gaining increasing importance as a clinical entity in patients with chronic illness and immune-compromised conditions.

Respiratory symptoms may occur by three mechanisms. During the primary migratory phase, with initial infection or with autoinfection, filariform larvae invade from the intestinal mucosa or cutaneous capillaries and disseminate hematogenously to pulmonary capillaries. There, they migrate across alveolar-septal walls where varying degrees of inflammatory response produce cough, dyspnea, and bronchospasm.⁶ A second mechanism occurs in the setting of antecedent pulmonary disease, bronchial inflammation, or mucous plugging. Because of derangements of airway mechanics, larvae mature in the pulmonary parenchyma, and symptoms manifest as chronic bronchitis, a bronchospastic syndrome, or as disseminated chest disease. Rhabditiform larvae are present in the bronchial tree and may be identified by examination of sputum. Clinically, disseminated chest disease may present as moderate to severe exacerbations of underlying pulmonary disease, bronchopneumonia, hemorrhagic pulmonary infarction, and respiratory failure.⁷ Lastly, the hyperinfection syndrome occurs in immunocompromised hosts and is commonly associated with chronic glucocorticoid steroid therapy.⁸ Steroid therapy and subsequent compromise of cell-mediated immunity allows massive proliferation of larval forms. Widespread dissemination of larvae subsequently occurs.

Roentgenographically, this syndrome may present as diffuse or segmental alveolar infiltrates with or without cavitation, diffuse interstitial infiltrates, nodular infiltrates, and rarely as a lung abscess.⁹,¹¹ Notably, steroids and intercurrent bacterial infection may suppress eosinophilia, a well-known clue of parasitic infection.

Common gastrointestinal symptoms include an enteropathy with malabsorption of fat and vitamin B₁₂ in the hyperinfection syndrome or during autoinfection. Invasion by adult Strongyloides organisms may cause gastritis or enteritis with ulceration and may be associated with chronic occult gastrointestinal blood loss.

Involvement of the central nervous system, liver, adrenal glands, thyroid, parathyroid, kidneys, adrenals, prostate, ovary, peritoneum, and heart may be seen with widespread dissemination of filariform larvae.¹² Cutaneous symptoms include pruritus ani and a creeping eruption, similar to that of cutaneous larva...
migrants, called larva currens.\textsuperscript{13} Gram-negative bacte-
remia associated with parasitic infiltration of the bowel
is also well described.

Antemortem diagnosis is difficult because the clinical
presentation may vary from asymptomatic to respiratory failure, and roentgenographic findings are
equally variable. High clinical suspicion in the patient
at risk with persistent or worsened symptoms is
necessary. Clinical clues include an appropriate travel
history (even in the remote past), gastrointestinal
symptoms, cutaneous symptoms, eosinophilia, or
thrombocytosis. In one review of recipients of renal
transplants, systemic Strongyloides infection was as-
associated with a mortality of over 50 percent.\textsuperscript{14}

Strongyloidiasis requires treatment even if asym-
ptomatic. Thiabendazole (25 mg/kg twice daily for three
days) or mebendazole (100 mg twice daily for one
week) is adequate, but with hyperinfection, two to
four weeks may be required. (Note that thiabendazole
interferes with theophylline excretion, and theophyll-
line levels should be monitored closely during therapy.)

Our patient demonstrated a classic presentation of
the hyperinfection syndrome. He had \textit{S stercoralis}
recovered from sputum, urine, and stool. His condi-
tion responded well to thiabendazole (25 mg/kg)
administered twice daily for two weeks. At one year
of therapy, after receiving a three-day course of thei-
bendazole (25 mg/kg) every month, his pulmonary
function studies showed a 23 percent increase in the
FVC, and an 18 percent increase in the FEV\textsubscript{1}, with
resolution of his symptoms.

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