CLINICAL VIGNETTE

A 55-year-old male immigrant with lymphoma and Gram-negative sepsis

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CASE PRESENTATION
A 55-year-old male immigrant from Iraq presented with progressive shortness of breath and hypotension. The illness started with diarrhea and headache, and began three weeks after the first cycle of chemotherapy (cyclophosphamide, doxorubicin, vincristine and prednisone) was administered for the patient’s newly diagnosed lymphoma. On presentation, he was in septic shock and respiratory failure requiring mechanical ventilation. The patient had altered sensorium and neck rigidity. He had no rashes and no lymphadenopathy. His white blood cell count was 16.9×10⁹ cells/L with 8% eosinophilia. Chemistry tests showed acute kidney injury with a creatinine level of 168.2 μmol/L. Chest x-ray showed multifocal pneumonia. His blood and sputum cultures grew Escherichia coli. Lumbar puncture performed 24 h after presentation showed pleocytosis and elevated protein level; however, the culture was negative. A diagnostic test was performed.

What is your diagnosis?

DIAGNOSIS
A stool wet mount was performed and revealed Strongyloides larvae (Figure 1). He was diagnosed with E coli septic shock incited by Strongyloides hyperinfection and dissemination. Chemotherapy, particularly steroids, was the trigger behind this syndrome. Despite aggressive supportive measures including ivermectin, the patient succumbed to multiorgan failure in the second week of his illness.

DISCUSSION
There are >50 species of Strongyloides, with Strongyloides stercoralis (threadworm) being the most common in humans (1). These helminths affect millions of individuals worldwide and are most endemic in tropical and subtropical regions of the globe (2). The majority of reported infections in North America occur in immigrant populations; however, sporadic cases have been reported in the southeastern regions of the United States (3).

Infection begins when the filariform larva penetrates the skin (4). This event usually goes unnoticed although, on occasion, the patient may report localized, pruritic, erythematous, papular rash soon after larval penetration (larva currens). The larvae hematogenously spread to the lungs, where they migrate to the tracheobronchial tree, are coughed up and swallowed. Invasion of the lungs can cause asthma-like symptoms and pneumonitis. In the small intestine, the larvae burrow in the mucosa and molt twice to become adult worms. Through parthenogenesis, the adult female worm produces eggs that hatch into rhabditiform larvae, subsequently migrate to the colon and are mostly excreted in feces (4). Infection of the gastrointestinal (GI) tract is asymptomatic, although some patients may report nonspecific symptoms such as nausea and chronic diarrhea. A small percentage of the larvae mature into infective filariform larvae, which penetrate the colonic mucosa or perianal skin and reinfect the host. Larva currens is more likely to occur at the time of reinfection as opposed to the time of original infection. This cycle of maturation and autoinfection within the host leads to the persistence of this infection and may last for decades (4). It is worth mentioning that Strongyloides is the only clinically important helminthic parasite that can complete its entire life cycle within the human host (4).

Chronic S stercoralis infection is often asymptomatic and rarely presents with the nonspecific dermatological, GI or pulmonary symptoms described above (5). It carries low mortality unless the host’s immunity wanes and, subsequently, the parasitic infestation progresses to more serious forms of infection (hyperinfection syndrome and/or disseminated disease) (5). The above two entities can be distinguished as follows.

In hyperinfection, the parasite burden increases and the cycle of autoinfection accelerates; however, the Strongyloides larva continues to be confined to the organs normally involved in the autoinfection cycle (ie, GI tract and lungs). Severe GI symptoms, including abdominal pain, intestinal obstruction and ileus, may occur, and severe bronchospasm and acute respiratory failure requiring mechanical ventilation have been reported (6-9).

On the other hand, disseminated disease results from the migration of Strongyloides larvae to organs beyond the GI tract and lungs such as the brain, liver, kidneys and skin. Dissemination carries a formidable risk for morbidity and mortality (5). As the worm burrows through the intestinal mucosa, it carries with it colonic commensal organisms, mainly Gram-negative bacteria and, rarely, Gram-positive bacteria, such as Streptococcus bovis, and Candida (10). This causes bacteremia, meningitis and other secondary infections and, consequently, contributes to organ damage.

Risk factors that are known to promote the evolution of strongyloidiasis to hyperinfection syndrome and/or disseminated disease include immunosuppressive therapy and the use of steroids in particular; hematological malignancies, especially lymphoma, bone marrow and renal transplantation; human T cell lymphotropic virus type 1 infection; HIV infection; hypogammaglobulinemia; and malnutrition (11,12).

Strongyloidiasis is largely unrecognized due to the low level of clinical suspicion and the low sensitivity of diagnostic tools (6). Eosinophilia is common in asymptomatic and symptomatic cases but is nonspecific (7). The diagnostic sensitivity of examining three stool samples for S stercoralis is approximately 50% (13). Strongyloides serology testing is available, with a reported sensitivity of 80% to 97% (14). Unfortunately, it cannot differentiate between previous, active or treated infections, although assessing trends in titres may be useful. Furthermore, it can be falsely negative in immunocompromised patients and falsely positive in the presence of other helminthic infections (15). In addition to the abovementioned tests, filariform larvae multiply exponentially in hyperinfection syndrome, and respiratory
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