



## Case report

# Polymicrobial bacteremia and Strongyloides hyperinfection syndrome: Vigilance in patients on corticosteroids

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## ABSTRACT

Strongyloidiasis is a worldwide parasitic infection. Many who develop infection remain asymptomatic. Due to Strongyloides autoinfection cycle it can result in chronic infection over decades. Immunosuppression particularly with corticosteroids has been associated with a rapid acceleration of the autoinfection cycle known as Strongyloides hyperinfection syndrome. The hyperinfection syndrome has severe complications and is associated with significant patient mortality. Here we report a case of hyperinfection complicated by polymicrobial bacteremia and intestinal ileus and review the literature regarding the hyperinfection syndrome.

## Introduction

Strongyloides stercoralis is a nematode endemic worldwide in tropical and subtropical regions as well as the Southeastern United States [1]. Human infection occurs by filariform larvae penetrating the skin and migrate to pulmonary circulation where they penetrate the alveoli and are eventually swallowed into the GI tract where they mature into adults. Strongyloides has the ability to replicate within the human host, termed autoinfection, allowing for chronic infection [2]. Chronic disease may occur with minimal or no symptoms present. Patients who are receiving immunosuppressive therapy, such as high dose steroids, are at risk for developing hyperinfection syndrome and disseminated disease [3]. These severe complications can carry high mortality rates up to 86% [3]. Here we present a case of polymicrobial bacteremia secondary to Strongyloides hyperinfection in the setting of high dose steroid use for giant cell arteritis (GCA).

## Case Report

An 80-year-old female from Liberia with a history of hypertension initially presented to the emergency department with vision loss in her right eye with associated right sided headache and right jaw pain. She was found to have an elevated erythrocyte sedimentation rate of 78 millimeters/hour (mm/hr) [reference range 0–30 mm/hr]. After an evaluation by Ophthalmology, she was started on high dose steroids for presumed GCA and was discharge from the hospital. Three weeks later, she presented to the Emergency Department with right sided chest pain

and was admitted to rule out aortitis in the setting of GCA. Cardiac workup was negative and computed tomographic (CT) angiography of the chest showed normal aortic dimensions without inflammatory changes, aneurysm or dissection. She remained hospitalized for further Rheumatologic workup due to lack of improvement in vision. On hospital day 12 she developed abdominal pain and a fever of 101.7°F. Lab studies were notable for a white blood cell count of 15.7 billion/liter (B/L) [reference range 4.0–11.0 B/L] with no eosinophilia, an aspartate aminotransferase level of 40 international units/liter (IU/L) [reference range 7–35 IU/L], an alanine aminotransferase level of 75 IU/L [reference range 0–30 IU/L]. Her blood culture resulted positive for gram positive cocci in chains. Enterococcus faecium was immediately identified by multiplex polymerase chain reaction (PCR). She was started on vancomycin 1000 mg every 12 h. The next day she developed a fever of 102.7°F. Blood cultures were repeated and grew gram negative rods identified as Klebsiella pneumoniae by multiplex PCR. Cefepime 2 g every 8 h was added to the vancomycin. A CT of the chest, abdomen and pelvis demonstrated distended fluid filled loops of small bowel compatible with ileus, multiple foci of air in gallbladder favored to represent air containing gallstones or emphysematous cholecystitis and consolidation at the left lung base compatible with atelectasis versus aspiration. She underwent percutaneous cholecystostomy tube placement with return of thick, black fluid. Aerobic and anaerobic cultures of fluid demonstrated no growth. She developed respiratory failure and shock requiring intubation and vasopressor support. The Klebsiella pneumoniae isolate was found to be multi-drug resistant, and cefepime was discontinued, while ertapenem 1 g daily was initiated. Given the left

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lung base consolidation seen on CT, a sputum culture was collected. The culture ultimately demonstrated no growth on routine culture. However, parasites were seen on gram stain. She was started on ivermectin daily. A *Strongyloides* immunoglobulin G assay was sent and ultimately returned positive. She was diagnosed with *Strongyloides* hyperinfection syndrome in the setting of high dose steroid use for GCA. Despite therapy the patient died several days later. Fig. 1.

### Discussion and review of literature

*Strongyloides* hyperinfection syndrome is a rare complication of *Strongyloidiasis* typically occurring in patients who have subclinical infection and are receiving high dose steroids [3]. In the cycle of *Strongyloides* autoinfection, filariform larvae penetrate the gastrointestinal tract mucosa, enter the circulatory system and are transported to the lungs where they penetrate alveolar spaces [4]. Hyperinfection is an acceleration of autoinfection in which larvae disseminate to organs outside of the typical autoinfection cycle [4]. The penetration of larvae through gut mucosa often leads to the translocation of enteric bacteria and bacteremia [5]. Link et al. [6] reviewed 38 cases of severe bacterial infection in the setting of hyperinfection and found 73% had bacteremia. The development of severe bacterial infections with *Strongyloides* hyperinfection carries a significant mortality up to 86% [3].

Multiple risk factors have been implicated in predisposing patients to hyperinfection including corticosteroids, chemotherapy, hematologic malignancy and viral infections such as human T-cell lymphotropic virus type 1 and human immunodeficiency virus [7]. Of these immunocompromising factors, corticosteroids have been the most associated with hyperinfection [5]. Smith et al. [8] reported four cases of confirmed hyperinfection in patients with chronic obstructive pulmonary disease receiving corticosteroids. A case series of bacterial infections associated with *Strongyloides* found 55% of these patients were taking corticosteroids when hyperinfection developed [6]. Several theories have been proposed for the mechanism behind steroids inducing hyperinfection. Corticosteroids have been shown to suppress eosinophils and lymphocyte activation resulting in suppressed host immunity. Furthermore, corticosteroids may interact directly with the parasites inducing a rapid proliferation from rhabditiform larvae to invasive filariform larvae [8].

A high degree of suspicion is necessary to screen and diagnosis patients. The Center for Disease Control recommends screening patients with epidemiologic risk factors who are about to be taking corticosteroids or other immunosuppressants, are being considered for organ transplant, or have hematologic malignancies. Some experts have suggested prophylactic treatment in these patient populations who have positive serologic screening to prevent future complications [5]. Hyperinfection, once suspected, is typically a straightforward diagnosis given the large numbers of larvae present in the stool and sputum [4]. However, this diagnosis can be missed if not clinically suspected. The presence of enteric bacteremia, particularly if polymicrobial, should raise the suspicion for hyperinfection [5,6]. Serologic testing for serum IgG has been shown to be sensitive though may not distinguish between active versus prior infection [10].

Oral ivermectin is the drug of choice for treatment of *Strongyloidiasis* including hyperinfection and disseminated disease [11]. In acute and chronic infection, a two day dose is given which has been shown to be effective in eradicating infection. In the setting of hyperinfection syndrome or disseminated disease, the Centers for Disease Control recommend to continue oral daily treatment until stool and/or sputum samples are negative for two weeks. Case series have shown subcutaneous ivermectin to successfully eradicate infection in those with malabsorptive complications such as paralytic ileus [12]. Treatment of concomitant bacterial infections should be guided by antimicrobial susceptibility data.

Our case highlights severity of *Strongyloides* hyperinfection and the complications that can arise with this syndrome. It is important to consider chronic infection in all patients who will be corticosteroid



Fig. 1. Sputum gram stain demonstrating parasite consistent with *Strongyloides stercoralis* filariform larva.

therapy and screen appropriately prior to initiating steroids if strong epidemiological risk factors.

### CRediT authorship contribution statement

Evan Boyle – writing, Dagan Coppock - writing.

### Consent

Patient is deceased therefore unable to consent for themselves. Next of kin lives in Africa and we were unable to contact to obtain consent. There are no identifying factors mentioned in the case report to identify the patient.

### Conflict of interest

None.

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