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Case report

Disseminated Cryptococcus in an immunocompetent patient due to prison yard pigeon exposure

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ABSTRACT

Opportunistic infection by Cryptococcus is one of the most common occurrences in patients with Human Immunodeficiency Virus (HIV) disease or Acquired Immunodeficiency Syndrome (AIDS); however, it is a very rare discovery in the immunocompetent. This encapsulated, aerobic fungus can be found in bird droppings, the soil, or on trees, and breathing the spores can lead to pneumonia, meningitis, sepsis, skin lesions, or disseminate throughout the body. We discuss the unique presentation of an immunocompetent former inmate who was admitted to the hospital due to symptoms of dyspnea and fever. After a thorough history, physical exam, and diagnostic testing, the patient was diagnosed with disseminated cryptococcosis. The patient has since made a complete recovery and was discharged home after receiving careful medical management.

Introduction

The prison system is a breeding ground for the contraction and transmission of a variety of infectious diseases, and these diseases often times remain with the prisoner even after they've completed their sentence. According to statistics by the United States Department of Justice, the prevalence of infectious disease within the jail and prison population was 14–21% [1]. Although prisoners make up 0.7% of the entire United States population, once released from prison, former inmates make up a significant portion of patients suffering from infectious diseases. Former inmates account for approximately 35% of tuberculosis cases, 29% of hepatitis C cases, 24% of sexually transmitted infection cases, and 17% of AIDS cases [2]. With limited access to sanitation supplies, hand washing stations, and protective equipment, inmates may contract and spread blood-borne diseases by sharing needles for drug use or tattooing, airborne diseases through close-quartered indoor environment, and sexually transmitted diseases through the practice of unprotected sex [3]. Opportunities may even exist during outdoor recreational time for inmates to contract infectious diseases that are rarely seen. We review the rare presentation of an immunocompetent former inmate who was exposed to pigeon droppings during daily recreation time in the prison yard, resulting in disseminated infection by *Cryptococcus neoformans*.

Case report

This case reviews the medical management of a 55-year-old gentleman who presented to the emergency room with symptoms of nausea, vomiting, and headache lasting three months in duration. His daily, recurrent, tension-like headaches had progressively worsened over that time period. Physical exam revealed a well-developed Caucasian male that appeared comfortable and in no acute distress. The patient's physical exam was grossly benign with no pain on neck flexion and a non-tender, non-distended abdomen. No rashes were seen on physical examination.

The patient was admitted to the hospital for additional workup and medical management. Upon admission, the hospital medicine team conducted a thorough history and physical exam which revealed that the patient was recently an inmate and exposed to pigeons at the recreational area of the prison. When questioned, the patient admitted seeing pigeons lining the fences of the outdoor area where the prisoners exercised on a daily basis.

Differential diagnoses were very broad as the patient's symptoms were very non-specific. Imaging studies included chest X-ray with

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bilateral lobar infiltrates. Bronchoalveolar lavage with visualization of encapsulated yeast forms were noticed. Head CT was negative for mass affect or hydrocephalus. Lumbar puncture revealed a small amount of clear fluid, with an opening pressure that was too low to measure. The low volume and pressure was suspected to be due to the formation of synechiae in the spinal column, due to inflammation from cryptococcosis, interfering with the flow of cerebrospinal fluid. Cerebrospinal fluid (CSF) analysis revealed a protein level of 123.3 mg/dL (15–45 mg/dL), CSF Glucose of 38.0 mg/dL (40–70 mg/dL), CSF white blood cell count of 43 leukocytes/mm (0–5 leukocytes/mm), and CSF lymphocytes of 90% (60% ± 20%). Specialized CSF analysis revealed a positive cryptococcal antigen titer of 1:20, however India ink staining was not conducted at that time. Final blood culture was positive for Cryptococcus neoformans var. grubii.

The patient was deemed immunocompetent based upon his history. He denied chronic steroid use, history of immunodeficiency, or chronic lung infections. Furthermore, immunoglobulins and complement levels were drawn and found to be within normal limits. Finally, the patient had an HIV test performed that was negative.

Over his 21-day hospital stay, the patient's condition stabilized with treatment consisting of amphotericin B and flucytosine. The patient was diagnosed with disseminated cryptococcus due to inhalation of fungal spores from pigeon droppings at the prison recreational area. The patient was discharged on a 6-week course of amphotericin B and flucytosine with complete resolution of symptoms.

Discussion

Although *Cryptococcus neoformans* is behind *Candida* and *Aspergillus* in infection rate, this encapsulated aerobic fungus still infects over 1 million vulnerable patients worldwide annually [4]. Cryptococcosis, the disease caused by the *Cryptococcus* species, results in over 600,000 annual deaths worldwide and is one of the most prevalent opportunistic infections amongst the population of individuals living with HIV [5]. Due to its relatively high mortality rate, the WHO recommends that HIV patients receive cryptococcal antigen screening if their CD4 count drops below 100/μL [6]. Studies of the cryptococcal antigen assay in the serum or CSF of HIV-negative patients discovered a 70% specificity when the titer threshold was set to 1:5, a 100% specificity when the threshold was set to 1:10, and a titer above 1:1280 was linked to higher mortality in the population of people living with HIV [7]. Within the United States, the prevalence of cryptococcal antigen positivity among patients with HIV and AIDS is approximately 3%, with antiretroviral therapy helping to reduce the morbidity and mortality associated with cryptococcosis [5]. The Infectious Disease Society of America (IDSA) does not routinely recommend prophylactically treating HIV-infected individuals in the US or Europe against cryptococcosis due to the widespread use of antiretroviral therapy, and recommends routine antigen testing and prophylaxis in areas with limited antiretroviral therapy use or high levels of resistance [8].

Treatment of cryptococcosis is stratified into three groups by the IDSA; HIV-infected individuals, organ transplant recipients, and patients without HIV or transplants [8]. The IDSA recommends a standard primary therapy for HIV-infected individuals of a 2-week regimen of amphotericin B followed by fluconazole for at least 8 weeks. Transplant recipients should undergo 2-weeks of amphotericin B with flucytosine, followed by fluconazole for up to 1-year. Immunocompetent patients receive a primary therapy of amphotericin B with flucytosine for up to 6-weeks based on symptom severity. Patients receiving flucytosine in their treatment regimen were found to have a lower overall mortality rate [9]. In this case, our patient was started on fluconazole after the bronchoalveolar lavage revealed yeast, but was transitioned to amphotericin B and flucytosine once the titers returned positive for Cryptococcus.

This opportunistic fungal infection has a devastating impact on the immunocompromised population, but disseminated cryptococcal infection amongst the immunocompetent is very rarely documented in medical literature. Immunocompetent patients most often display the manifestation of cryptococcal infection with skin lesions or pulmonary infections [10]. The criteria for disseminated cryptococcosis is the discovery of positive blood cultures or positive cultures from two bodily locations such as skin, lungs, or cerebral spinal fluid [11]. In this case, the patient satisfied the criteria with a positive blood culture, bronchoalveolar lavage with encapsulated yeast, along with CSF analysis that featured a positive cryptococcal antigen titer of 1:20.

Initially, the index of suspicion for cryptococcal infection in our patient was very low due to his immunocompetence, but the suspicion began to grow while conducting a thorough bedside history. Reviewing his activities while incarcerated illustrated his enhanced exposure to pigeons in the prison yard during recreational time. He noted seeing the pigeons line the fences and droppings cover the walking surfaces and seating areas. Confinement in this pigeon dropping infested area most likely lead to infection via inhalation as the inmates' recreational activities stirred up the droppings and introduced the particles into the air.

Prison systems may consider measures such as reflective tape or owl decoys to limit birds in the recreational area. Furthermore, with a significant percentage of inmates being immunocompromised, frequent cleaning of the bird droppings could significantly reduce the potential for cryptococcal infection within this vulnerable population. Primary care providers may consider adding the cryptococcal antigen test to their list of screening tests administered to patients with a history of incarceration. Through early detection of cryptococcal infection, effective and timely treatment can help to stop this fungus from becoming disseminated throughout the body and reduce morbidity and mortality.

Conclusion

The prison system has limited resources to control communicable diseases. This results in the spread of well-known diseases such as Hepatitis and Tuberculosis amongst inmates and the general public when former prisoners are released from custody. The prison system may also expose inmates to rare infectious pathogens that might ordinarily be overlooked. A broad differential diagnosis list and a thorough bedside history are important in these patients so clinicians won't overlook infections that could lengthen the time to correct diagnosis and treatment.

Conflict of Interest

The authors declare that they have no conflict of interest and financial disclosure.

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