



Case report

A case of *Bacillus cereus* bacteremia in a COVID-19 patient treated with steroids



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ABSTRACT

This report describes a case of *Bacillus cereus* bacteremia in a COVID-19 patient with prior inhalational steroid use and inpatient steroid treatment for COVID-19 pulmonary symptoms. The case herein is intended to illustrate an uncommon presentation of *B. cereus* bacteremia and highlight the increased likelihood for the occurrence of this bacteremia in patients with COVID-19 and concomitant steroid use. © 2020 Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Bacillus cereus and related species are gram positive, aerobic to facultative spore forming rods often considered contaminants when isolated from blood culture [4]. These organisms are also known to cause gastrointestinal and non-gastrointestinal infections that can be local or systemic including bacteremia [1,2]. Known risk factors for *B. cereus* bacteremia include prior antimicrobial use, central venous catheters, injection drug use, pacemakers, prosthetic heart valves, immunosuppression, and malignancy [3,4]. Cases of bacteremia in general have been reported in patients with COVID-19 and history of steroid use [5–7]. However, no relevant reports have as yet been published directly related to steroid use and *B. cereus* bacteremia, including among patients with COVID-19. Herein, we report a case of a patient with COVID-19, history of inhalation steroid use and inpatient steroid treatment who developed *Bacillus cereus* bacteremia in the absence of other known risk factors.

Case report

A 66-year-old female with medical history of chronic obstructive pulmonary disease (COPD) on chronic fluticasone/salmeterol and hypothyroidism presented to the emergency room for shortness of breath, lightheadedness, and a fall. In the emergency department, the patient's temperature was 99.3 F, pulse 104 beats per minute, respiratory rate 22 breaths per minute, and the oxygen saturation on room air 86 % and 98 % on 5 liters(L) nasal cannula oxygen. Chest radiograph showed multifocal patchy bilateral airspace opacities suggesting multifocal pneumonia. Computer

tomography (CT) of the head showed no acute territorial infarction, hemorrhage, or mass effect. Coagulation profile revealed d-dimer of 271 ng/mL (0–243). A reverse-transcriptase-polymerase-chain-reaction assay detected the presence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) RNA in a nasopharyngeal swab. The patient was admitted for acute hypoxic respiratory failure.

On hospital day 4, patient required supplemental oxygen therapy via a non-rebreather mask at 15 L to maintain oxygen saturation at 95 %. There was also progressive elevation of d-dimer, lactate dehydrogenase, C-reactive protein. A CT angiogram of the chest was negative for pulmonary embolism and the patient was started on intravenous methylprednisolone. Patient still required oxygen therapy via Venturi mask at 50 % fractionated inspired oxygen (FiO₂) to maintain oxygen at 95 %.

On hospital day 18, while still requiring a significant amount of oxygen but with improvement with corticosteroids, patient developed a fever of 102.7 F. Blood culture grew gram positive rods in both sets of aerobic and anaerobic bottles, patient was started on trimethoprim/sulfamethoxazole anticipating possibility for *Listeria*. The organism was identified as *Bacillus cereus/thuringiensis* using matrix-assisted laser desorption/ionization time-of-flight (MALDI-TOF) mass spectrometry, sensitive to vancomycin, clindamycin, and trimethoprim-sulfamethoxazole and resistant to penicillin. Patient was subsequently placed on vancomycin. *Bacillus* bacteremia persisted for 8 days in both aerobic and anaerobic bottles and eventually cleared by day 25 of admission.

Investigation for possible course of infection included a CT abdomen and pelvis with no significant findings and, a whole-body positron emission tomography scan (PET) – CT scan without significant findings to explain source of bacteremia. A 12-day course of antimicrobial treatment with vancomycin was

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complicated by acute renal failure requiring completion of therapy with daptomycin. The patient showed clinical improvement with resolution of fever, gradual decrease in oxygen requirement. Patient was eventually discharged home on 3 L nasal cannula oxygen.

Discussion

This case report presents a patient who developed *Bacillus cereus* bacteremia amidst a COVID-19 infection while receiving corticosteroids. *B. cereus* bacteremia typically presents in patients with prior antimicrobial use, central venous catheters, prosthetic devices, or injection drug use. In the present case, the patient had none of the aforementioned risk factors, however other significant risk factors for bacteremia including exposure to inhaled and systemic corticosteroids use as part of treatment for COVID-19 infection were present.

Use of steroids result in immunosuppression and has been reported as a risk factor for *B. cereus* infection [4]. Long-term use of inhaled steroids specifically fluticasone/salmeterol has been associated with higher risk of bacteremia [7]. Of note, in the present case report, the patient had a history of COPD with long term use of fluticasone/salmeterol.

Bacteremia has been described as a complication of COVID-19 infection. One study also reported nosocomial infection rate of 7.1 % among patient COVID-19 patient with bacteremia accounting for 24.6 % [5]. Another study found bacteremia to be a complication in 7.7 % of COVID-19 patients [6]. Although this organism does not commonly lead to systemic infections, in this patient it did. This case illustrates that a patient with COVID-19 treated with steroids

can develop *Bacillus cereus* bacteremia and can be successfully managed.

Declaration of Competing Interest

The author has no conflict of interest to declare.

Author statement

This work was solely done and submitted by Nonso Osakwe, MD, MPH.

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