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Case Report

A case report of bloodstream infection by *Prototheca zopfii*: An emerging opportunistic pathogen

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ABSTRACT

This case report describes the presentation, investigation, and diagnosis of algaemia (*Prototheca* algaemia) in an immunocompromised patient with hematological malignancy. A patient of acute lymphoblastic leukemia was admitted with febrile neutropenia after a few weeks of induction chemotherapy. During hospital stay, the patient developed severe body pain, loss of appetite and persistent fever after a week of recovery. Upon thorough investigation, the patient was found to have central line related bloodstream infection with an emerging opportunistic environmental pathogen of genus *Prototheca* species *zopfii*, sensitive to Amphotericin B, Fluconazole, Voriconazole, Micafungin and Caspofungin. Liposomal Amphotericin B, an antifungal treatment was prescribed, post-treatment blood cultures were negative.

1. Introduction

Bloodstream infection (BSI) is defined by positive blood cultures in a patient with systemic signs of infection and maybe either secondary to a documented source or primary (without identified origin).[1,2] BSIs are among the important causes of morbidity and mortality across the age groups. However, immunocompromised patients are at greater risk, especially subset of patients with hematological malignancies (HM). Treatment for HM mainly includes radiotherapy, chemotherapy and hematopoietic stem cell transplantation (HSCT). Chemotherapy and HSCT are known to cause mucosal damage, depressed immune system, and neutropenia which all together contribute to the risk of development of BSI.[3,4] The incidence of BSI in patients with HM ranges from 7.2% to 14.5%.[5] Wide spectrum of microorganisms both pathogenic and opportunistic pose threat of BSI in HM patients. This case report brings into notice a rare opportunistic pathogen *Prototheca zopfii* causing BSI in Acute lymphoblastic leukemia (ALL) patient, sensitive to Amphotericin B, Fluconazole, Voriconazole, Micafungin and Caspofungin. The first documented human infection with genus *Prototheca* was described by Davies and colleagues in 1964.[6] The effects of immunosuppression and corticosteroid therapy produce a marked increase in the incidence of *Prototheca* infections; 67% of patients with one or both risk factors were diagnosed with Protothecosis, whereas the incidence for those who were neither immunocompromised nor receiving corticosteroid therapy was 33%.[1,2] Protothecosis can also be reported in immunocompetent where infection generally occurs by direct traumatic inoculation.[1]

2. Case Report

A 14-year-old boy, known case of ALL, was re-admitted after 25 days of induction phase of chemotherapy due to Febrile Neutropenia (FN) (day-0). However, the patient's

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condition improved over the next few days but on day-8, patient complained of generalized body ache, loss of appetite and persistent low-grade fever with sudden spikes of high-grade fever (documented high-grade fever was 103^0 F) with profuse sweating without any apparent focus of infection. Empirical antibiotic treatment was started after collecting blood samples for microbiological investigations.

2.1. Investigations

Given the repeated spikes of fever and absence of localized signs, an array of investigations was carried out to identify the potential source of infection. Erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), serum pro-calcitonin were measured to evaluate the presence of inflammation due to bacterial infection. Complete blood picture (CBP) was carried out to assess hematological parameters (Table 1). Blood cultures were also sent to rule out the suspicion of BSI, the most common complication in patients with FN.

Table 1: Laboratory parameters of the patient

Investigation	Results
Hemoglobin	100 g/dl
Hematocrit	31.6 %
Reticulocyte count	$0.84x10^4/\mu l$
White blood cell count	$241x10^2/\mu l$
c-reactive protein	142.8 g/l
Blood urea nitrogen	3.26mmol/L
Erythrocyte sedimentation rate	29 mm/hr.
Procalcitonin	1 μg/L

Two sets Blood culture bottles (BCB)(two FA plus for each set) (Biomerieux, Marcy-l Etoile, France) were received by the Department of Microbiology, BCBs were incubated in BacT/ALERT. BCBs flagged positive in less than 12 hours, Gram smear was prepared from positive BCB and was subsequently sub-cultured onto the 5% sheep blood agar plate (BAP) (COS-Biomerieux) and chrome agar plate (CAP) (CPS-Biomerieux). The gram-smear was showing ovoid, globose, and spherical cells, resembling yeast but slightly bigger in diameter without budding (Figure 1a). The colonies grown on BAP were small, non-hemolytic, smooth, raised creamy to white color and colonies on CAP were white to cream, smooth resembling yeast (Figure 1b). Plate gram -smear revealed similar globose yeast like cells, colonies were subsequently subjected to identification and antimicrobial susceptibility (AST) testing by VITEK 2 system. (Biomerieux, Marcy-l Etoile, France) using YST Panel and Y-S08 respectively.

The Organism was identified as *Prototheca zopfii* with 98% identification probability. Sensitive to Amphotericin B (MIC 1mg/L), Fluconazole (MIC 0.05 mg/L), Voriconazole (0.12mg/L), Micafungin (0.06mg/L) and Caspofungin (0.012mg/L). Multiple blood cultures were repeated along with the paired sample from the central line (chemo-port).

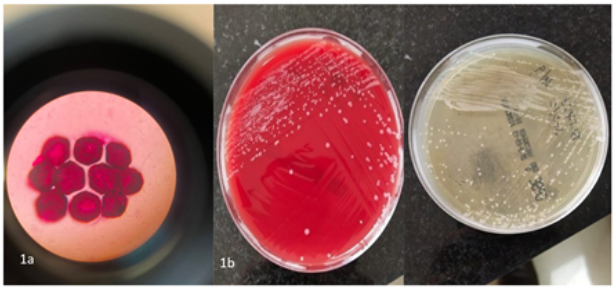

Figure 1: a: Showing ovoid, globose non budding cells; **b:** Colony morphology of *P.zopfii* on BAP and CAP

Lactophenol Cotton Blue (LPCB) mount was prepared from direct blood sample. Structures having morula like appearance containing endospores i.e., sporangia with sporangiospores were appreciated. (Ovoid to globose non budding hyaline cell, varying in size from 3 to 30 micrometer, with relatively thick and refractile wall) Figure.2.

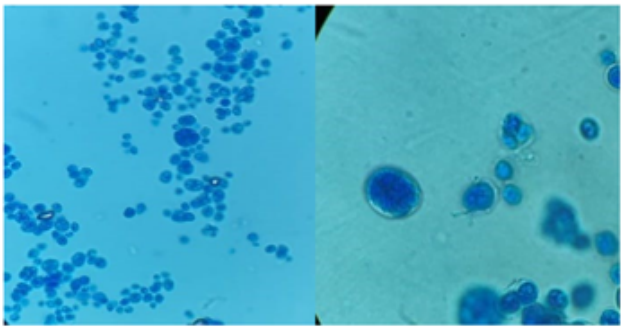

Figure 2: LPCB mount of direct blood showing hyaline morula like endospores with thick cell wall.

The paired blood culture was positive for differential time of positivity, same organism was isolated and identified in all the cultures collected. Hence, the case of central related bloodstream infection (CR-BSI) infection was established, chemo port was subsequently removed. The treatment with liposomal amphotericin B and vancomycin was started. Post treatment cultures were negative for algaemia. However, patient died due to septicemia.

3. Discussion

Prototheca infection in humans is very rare . Generally, not suspected as pathogen due to its ubiquitous presence in the environment and largely unknown pathogenesis. A similar case of BSI with *Prototheca zopfii* was reported in 2019 by Fernández and colleagues.[1] *Prototheca zopfii* is known to cause bovine mastitis across the globe.[7]

4. Conclusion

Diagnosis of algaemia in humans with suppressed immune system poses great challenge due to lack of suspicion of causative agents and limited resources for identification of the pathogen. Isolating algae from patients of HM needs thorough investigation to rule out possible contamination of the sample due to its ubiquitous nature. Hence *Prototheca* spp, should be considered as emerging pathogen, in the backdrop of immunosuppression.

5. Patient Consent

The patient guardian has given consent for images and other clinical information to be reported. The patient guardian has been assured that the patient's name will not be published, and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

6. Conflict of Interest

No conflict of interest.

7. Source of Funding

None.

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