Indian Journal of Microbiology Research 2022;9(4):304–307

Content available at: https://www.ipinnovative.com/open-access-journals

Indian Journal of Microbiology Research

Journal homepage: https://www.ijmronline.org/

Case Report

Bacillus cereus causing brain abscess in an immunocompetent patient with craniotomy

Sweta Shah[1,*], Pooja Thakkar[1], Tanu Singhal[1], Abhishek Srivastava[1], Akshat Kayal[1], Urvi Patel[1]

[1] *Kokilaben Dhirubhai Ambani Hospital and Research Institute, Mumbai, Maharashtra, India*

ARTICLE INFO

Article history:
Received 17-12-2022
Accepted 17-01-2023
Available online 23-01-2023

Keywords:
Bacillus cereus
Immunocompetent
Brain abscess
Craniotomy

ABSTRACT

A 44 years old, immunocompetent, male patient was admitted to the hospital with fever and left hemiparesis. Patient had undergone decompressive craniotomy with partial clot evacuation at another institute for right Prieto-occipital intracranial haemorrhage (ICH) and subarachnoid haemorrhage (SAH) four weeks back. CT scan on the day of admission, showed peripherally enhancing brain abscess in right parietal lobe with surrounding oedema which was at the surgical site. Pus evacuated from abscess grew *Bacillus cereus*. Patient was treated with intravenous vancomycin for two weeks with a favourable outcome. Non-gastrointestinal infections due to *B.cereus* are emerging.

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1. Introduction

Bacillus cereus is a motile, aerobic or facultative anaerobic, sporulating, Gram-positive bacilli. As a human pathogen, it usually causes self-limited foodborne acute gastroenteritis. It can cause opportunistic infections such as bacteraemia, pneumonia, ophthalmitis, osteomyelitis, cutaneous-soft tissue infections and meningitis among neonates, immunocompromised and sometimes immunocompetent hosts with high risk or implants.[1–3] The route of transmission is usually via indwelling catheters or foreign bodies. The occurrence of *B.cereus* in hematological malignancies ranges from 0.07% to 2%.[4,5] Mortality can be as high as 42%[6] to 52%.[7]

2. Case Report

A 44 years old, immunocompetent male patient was admitted to the hospital with fever and left hemiparesis in March 22. He had history of right parieto-occipital intracranial haemorrhage (ICH) and subarachnoid haemorrhage (SAH) one month back. On examination pupil reacted to light, but he couldn't obey commands to open the eyes. The rest of the findings were as expected.

In Feb '22, he was admitted with left sided giddiness, slurring of speech and headache at another hospital. MRI brain showed right parieto-occipital intracranial haemorrhage with midline shift and uncal herniation. He underwent decompressive craniotomy and partial clot evacuation for the same. One week later arteriovenous embolization was done. The patient was brought to our institute 4 weeks after the craniotomy.

CT scan was done on the day of admission, showed peripherally enhancing brain abscess in right parietal lobe with surrounding oedema. This was at the surgical site. Patient was started with treatment for management of SAH and ICH along with meropenem and vancomycin. Patient was put on ventilator. Laboratory investigations were done as appropriate which included blood culture and urine culture.

* *Corresponding author*.
E-mail address: shahsweta.microbiology@gmail.com (S. Shah).

https://doi.org/10.18231/j.ijmr.2022.051
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Table 1: Summary of reported cases of Brain abscess

Journal	Author	Clinical Condition	Predisposing Factor	Treatment
Pedia Infect Dis J 1989;8:795–8	Jensen HB et al.[8]	Multiple Brain Abscess (Appx 12)	Induction Chemotherapy for Acute lymphoblastic leukemia	Medical Treatment
Intern Med 2001;40:654-7	Sakai et al[9]	Multiple brain and liver abscess after B.*cereus* bacteremia	Neytropenic Patient with Acute Lymphoblastic Leukemia	Medical plus Surgical Intervention
J Pedia Hematol Oncol 2002;24:569–71.	Leonard et al.[10]	Brain abscesses Coinfection with Aspergillus like molds	Alveolar rhabdomyosarcoma of the thigh with mutile CLBSI	Medical treatment
Med Wieku Rozwoj 2009;13:40-4	Pawlik et al.[11]	Late-onset sepsis due to B. cereus Disease course complicated by development of brain abscesses Premature,	Low birth weight	Medical treatment
Intern Med 2009;48:1175-1177	Close T et al.[12]	Brain Abscess with Polyneuropathy	ALL on chemotheray	Medical treatment
Pediatr Neurosurg 2010;46:466-71	Drazin et al.[13]	B. cereus bacteremia and subsequent intracranial abscesses	Premature infant	Aggressive medical therapy, surgical drainage was performed via a left frontal mini-craniotomy
J Pediatr Hematol Oncol 2014;36:e197-201	Hansford et al.[6]	Multifocal B. cereus cerebral abscesses	During acute lymphoblastic leukemia induction therapy	
Leuk Lymphoma 2014;55:2947-9	Ugai and Matsue[14]	Blood culture of 22 patients with hematological malignancy All patients were catheterized and were having hematological malignancy	Neutropenia was predisposing factor for brain abscess	Medical Treatment
J Neuropathol Exp Neurol 2015;74:1000-11	Vodopivec et al.[15]	Cluster of B. cereus infections among five patients with AML and chemotherapy-induced neutropenia	Possible route of infection was hematogenous dissemination via GI mucosal breaches (GI symptoms occurred in three of five cases, and postmortem GI ulceration was found in three of four cases)	B. cereus causing brain abscess was identified after autopsy of brain tissue
J Pediatr Hematol Oncol 2015;37:568-9	Dabscheck et al.[16]	Blood cultures grew B. cereus and neuroimaging studies demonstrated a cerebral abscess	B-cell acute lymphoblastic anemia developed fever during induction chemotherapy	Antibiotic therapy with removal of catheter
Indian J Pathol Microbiol 2016;59:554-6.	K Saigal et al.[1]	Intramural Brain Abscess	i.v. Steroid in immunocompetent individual	Surgical Excision Medical treatment
Access Microbiology 2020;2 DOI 10.1099/acmi.0.000080	Samarasekara H et al.[17]	Brain abscess following bacteremia	Neonate	Surgical Drain, Medical treatment
BMC Infectious Diseases (2020) 20:15	Koizumi et al.[18]	Bacteremia, Meningitis and brain abscess	Acute myelogenous leukemia: During Consolidation of Chemotherapy	Medical Treatment

Exploration and evacuation of abscess was done on 2^{nd} day of admission. Pus collected during surgery showed gram positive bacilli on smear examination and further grew *Bacillus cereus* on 5% Sheep blood agar which was identified by Vitek MS (MALDIToF, Biomerieux, France). Antimicrobial susceptibility was done on Vitek2 and breakpoint of *Bacillus sp*. By EUCAST (The European Committee on Antimicrobial Susceptibility Testing) were followed.[19] It was sensitive to vancomycin (MIC1), linezolid (MIC1), clindamycin (MIC0.5). Penicillin and levofloxacin were found to be resistant. Antimicrobial therapy was deescalated to only vancomycin once the reports were available. Blood culture on admission grew *Candida tropicalis* which was fluconazole resistant. Caspofungin was added to antimicrobial treatment for candidemia. Urine culture grew *Candida auris* which was considered as coloniser as patient's symptoms were attributed mostly to the brain abscess. Vacomycin and caspofungin each were continued for 14 days. His clinical condition improved. Blood culture did not grow *Candida tropicalis* after seven days of caspofungin. The patient remained in the hospital for approximately six months for rehabilitation therapy and then was discharged.

3. Discussion

Brain abscess due to *B.cereus* are reported from India[1] and other countries[6,8,16,17,20] but brain abscess at surgical site in immunocompetent patient is not reported. The reported cases of brain abscess are summarised in Table 1.

Conventionally, the detection of *Bacillus spp*. in clinical specimens is considered as contaminant due to its ubiquitous presence in environment.[3] Evaluating the clinical settings and predisposing factors[3] of the patient is crucial to identify it as pathogen and reduce the turnaround time to report. Repeated isolations are useful but it takes up the additional time. In our case, pus specimen collected during surgery grew *B.cereus* hence it was considered as a pathogen.

Surgical drainage is significant in the treatment of individuals with brain abscesses by *B.cereus* along with antimicrobial therapy for improved outcome.[1,5]

Often *B.cereus* is found to be resistant to penicillin.[5,8,17] Antimicrobial susceptibility reporting for *B.cereus* is done as per EUCAST Guidelines[19] of *Bacillus sp*. or sometimes, breakpoints for staphylococcus are extrapolated for *B.cereus*.[17,21] Hence, appropriate standardisation for susceptibility is imperative.

Patient was a middle-aged healthy person before SAH. It was crucial to make an attempt to give him his previous pre-morbid life back. Hence, aggressive surgical drainage to relieve symptoms and bacterial load along with vancomycin was used for our patient.

Patient also had candidemia at the time of admission to our hospital and was treated as per susceptibility pattern. It is important to mention that since our patient had candidemia at the time of admission and if he was treated presuming *Candida tropicalis* also as brain abscess pathogen without draining or culturing the pus or if *B.cereus* was considered as contaminant, the patient's outcome could have been compromised.

Candida auris in urine was considered to be a coloniser as described. Contact isolation however, was maintained.

Patient was further provided extensive rehabilitation therapy to improve his mobility and was discharged from the hospital after about six months.

4. Conclusion

Brain abscess is one of the important non-gastrointestinal manifestation of *B.cereus*. It is imperative to achieve a microbiologic diagnosis of *B.cereus* quickly. Antimicrobial susceptibility needs standardisation. Clinico-Microbiological correlation to ensure that it is not a contaminant along with appropriate surgical and antimicrobial treatment improves patient outcome.

5. Conflicts of Interest

None.

6. Ethics Approval

Patient's informed and written consent was taken. Study is approved by Institutional Review Board.

Acknowledgments

Imaging Department, Team of Rehabilitation Department.

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Author biography

Sweta Shah, Lead Consultant https://orcid.org/0000-0002-0644-9031

Pooja Thakkar, Lead Consultant

Tanu Singhal, Lead Consultant

Abhishek Srivastava, Director

Akshat Kayal, Consultant

Urvi Patel, Technical Officer

Cite this article: Shah S, Thakkar P, Singhal T, Srivastava A, Kayal A, Patel U. *Bacillus cereus* causing brain abscess in an immunocompetent patient with craniotomy. *Indian J Microbiol Res* 2022;9(4):304-307.