

Case Report

Bloodstream Infection due to *Bacillus Cereus* in a Preterm Neonate Associated with Necrotizing Enterocolitis: A Case Report

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ABSTRACT

A case of nosocomial bloodstream infection caused by *Bacillus cereus* (*B. cereus*) in a 33-day old preterm neonate in a teaching hospital in Kuwait who developed necrotizing

enterocolitis (NEC) is described. The possible role of *B. cereus* in NEC is discussed.

KEY WORDS: *Bacillus cereus*, bloodstream infection, necrotizing enterocolitis

INTRODUCTION

Bacillus cereus is an emerging pathogen that causes invasive disease in immunocompromised hosts^[1]. It is a motile, aerobic or facultative anaerobic, spore-forming, gram-positive or gram-variable bacterium of the family *Bacillaceae* that is found worldwide in dust, air, and water. As a human pathogen, the organism is perhaps best known for its role as a mediator of self-limited foodborne illness^[2]. Although considered a ubiquitous bacterium, the incidence of neonatal infections is very low with only a few cases of *B. cereus* infections in neonates reported in the literature^[3]. Incidents of nosocomial bloodstream infection in neonates that are caused by this organism have been published mostly as case reports. Some of these reports documented the primary source or the reservoir for infection while others did not^[4]. To the best of our knowledge, this is the first case encountered of bloodstream infection due to *B. cereus* in a preterm neonate in Kuwait.

CASE REPORT

The patient was a 28-week preterm female neonate born to a 24-year-old Para 0 + 0 mother who underwent cesarean section. The patient had a birth weight of 840g and an Apgar score of six and eight at one and five minutes respectively. She was ventilated due to respiratory distress and given one dose of exogenous surfactant. She was extubated on day three and placed on Nasal Continuous Positive

Airway Pressure. On day six, she was re-ventilated due to a Patent Ductus Arteriosus (PDA) associated with pulmonary hemorrhage. Umbilical catheters were removed on day 16 and the PDA was ligated on day 17. On day 30, there was a right upper lung lobe collapse on plain radiographs which resolved within three days. Endotracheal secretions showed normal flora.

Breast milk was given on the third hospital day for three days and then resumed on day 15 through day 33 when the patient had repeated vomiting, abdominal distension with discoloration and pneumoperitoneum on plain radiograph (Fig. 1). The WBC count was 14,000, hemoglobin 10.3 g/dl, platelet count 73,000 and C reactive protein was 66 mg/l. Blood cultures were ordered for possible sepsis.

Cultures grew *B. cereus* which was treated with amikacin and cefotaxime. Two pediatric aerobic blood culture bottles were positive for gram positive bacilli 24 hours following incubation using the Bactec System (Becton Dickenson, USA). The isolate showed small beta hemolytic colonies and was a facultative anaerobe, growing well in air at 37 °C. Smears from the culture plates showed gram positive bacilli with infrequent spores which did not swell the bacillary body. The isolate was catalase positive, motile, showed no gas with glucose, non-fermentative with other sugars, and was citrate positive. The isolate showed lecithinase

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Fig. 1: Plain radiograph of the abdomen P-A view showing air under the diaphragm in a preterm neonate with *B. cereus* bloodstream infection who developed necrotizing enterocolitis and jejunal perforation.

positivity on egg-yolk agar and was penicillin resistant but sensitive to clindamycin, gentamycin and vancomycin.

A laparotomy revealed jejunal perforation which was repaired followed by a 17-day course of piperacillin-tazobactam and amikacin. Stool and peritoneal fluid culture after surgery were negative. The patient had zone two stage two retinopathy with no other ocular complications. On day 84, the patient developed *Klebsiella pneumoniae* sepsis and expired the next day. Head ultrasound revealed cystic periventricular leukomalacia.

DISCUSSION

Due to the widespread distribution of this microorganism, the hospital environment can contain spores of *B. cereus*^[5]. Drobniowski^[6] previously reviewed *Bacillus cereus* and related species. He highlighted the role of *B. cereus* as a causative agent of gastrointestinal disease mostly food poisoning and a non-gastrointestinal disease in the form of local infection, ocular infection or systemic disease like bacteremia and septicemia, bacterial endocarditis, central nervous system infection and respiratory infections.

Assessment of the origin of infections may not yield an obvious source. Nonetheless, a few epidemiologic investigations of outbreaks provide some insights on likely vehicles for infections with *B. cereus* in neonatal units. Such vehicles include ventilation equipments^[7], IV catheters^[8], resuscitation devices, drugs^[9] or hands of caregivers^[7,9]. Since our laboratory reported *B. cereus* as the causative agent of bloodstream infection in this preterm neonate, epidemiologic investigation was carried out to identify a potential source of this infection in the NICU. Nonetheless, the source was not identified.

Infection plays an important role in necrotizing enterocolitis (NEC). Frequently NEC is complicated by bacteremia or peritonitis. Putative organisms include *E. coli*, *Klebsiella*, *Salmonella* and *Clostridium spp.* Review of peritoneal cultures from infants undergoing surgery for NEC revealed predominance of *Klebsiella* and *Enterobacter spp* (63%), *E. coli* (21%), coagulase negative *Staphylococci* (30%), anaerobes (6%) and *candida* isolates (10%)^[10]. There is one case-report where *B. cereus* was isolated from the peritoneal fluid of a preterm infant who had NEC with perforation^[2]. It is speculated that the several enterotoxins secreted by the organism may play a role in NEC beside their systemic effects such as septic shock, epidermal necrolysis and alopecia capitis^[11]. Despite the fact that *B. cereus* bacteremia can be severe with poor prognosis, our patient survived the episode, and stayed alive 52 days thereafter.

CONCLUSION

Our case report adds new evidence to link *B. cereus* bacteremia to NEC. We speculate that the complications of *B. cereus* bloodstream infection are at least partly related to the effect of *B. cereus*-associated enterotoxins.

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