Severe peritonitis caused by *Citrobacter freundii* and successful treatment with double antibiotic coverage

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ABSTRACT

Serratia, *Pseudomonas*/*Providencia*, indole-positive *Proteus*/*Acinetobacter*/*Morganella*, *Citrobacter*, *Enterobacter* and *Hafnia* group of organisms cause peritoneal dialysis (PD)-related peritonitis with high morbidity and mortality. Peritonitis caused by *Citrobacter freundii* is uncommon, and it may lead to catheter removal despite antimicrobial treatment. We describe a case of PD-related peritonitis caused by *C. freundii*, which was successfully treated with double antibiotic coverage.

Key words: Antimicrobials, *Citrobacter freundii*, gram-negative organism, peritoneal dialysis, peritonitis

Introduction

Recently, *Serratia*, *Pseudomonas/Providencia,* indole-positive *Proteus/Acinetobacter/Morganella, Citrobacter, Enterobacter* and *Hafnia* group of organisms (SPICE) were described to cause peritoneal dialysis (PD)-related peritonitis with a particularly high morbidity and mortality.[1] Peritonitis caused by *Citrobacter* is relatively uncommon[2] and *Citrobacter freundii* is the most common species involved. We report a case of PD-related peritonitis caused by *C. freundii*, which was successfully treated with double antibiotic coverage.

Case Report

A 76-year-old male with end stage renal disease due to type II diabetes mellitus on PD for 6 months presented to the emergency room with abdominal pain and bloody peritoneal dialysate for 1 day. These symptoms were preceded by a self-limited diarrheal illness 3 days ago. He was on regular maintenance automated PD using a cycler and reported no history of breakdown of aseptic technique or contamination during the catheter care. Upon examination, he was hypotensive with a blood pressure of 98/54 mm Hg but afebrile and the catheter exit site was benign. A dialysate cell count and culture was obtained and the patient was started on empirical intravenous broad-spectrum antibiotic coverage with vancomycin and aztreonam (he was allergic to penicillin). PD was continued during the hospital stay with the addition of 500 units of unfractionated heparin per liter of dialysate. His dialysate white blood cell count was >3700 with 92% neutrophils and *C. freundii* was isolated upon its culture. The isolate was resistant to ampicillin, but was sensitive to gentamycin and ciprofloxacin. Intravenous vancomycin was discontinued. A computed tomography scan of the abdomen showed no evidence of intestinal perforation, appendicitis or diverticulitis. Subsequently, his clinical condition stabilized with subsiding abdominal pain clearing of dialysate in 2 days. His antibiotic coverage was switched to oral Ciprofloxacin along with intraperitoneal gentamycin, requiring an additional daytime manual exchange with 6-h dwell time in order to provide sustained antibiotic exposure to the infected peritoneal membrane, which is not possible with the cycler-assisted PD exchanges. The antibiotics were continued for a total duration of 14 days, and he was discharged in a stable condition. A 22-month follow-up period showed no further episode of peritonitis.

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Discussion

Peritonitis caused by the members of the family *Enterobacteriaceae* is an important cause of mortality and morbidity in PD patients and accounts for up to 12% of all peritonitis episodes in some series.[3] *Citrobacter* species, a part of this family, were not commonly associated with peritonitis until recently, when they were described among the SPICE organisms causing severe peritonitis. Most commonly, *C. freundii* has been associated with urinary tract infections, superficial wound infections and bacteremia especially in elderly, immunocompromised and hospitalized patients.[4,5] It colonizes the gastrointestinal tract of humans and other animals and its translocation to the blood stream in dialysis patients especially in the setting of abnormal bowel habits is implicated in the development of peritonitis.[6,7]

Our patient had a particularly severe peritonitis with hemodynamic instability, and prompt use of intravenous broad spectrum antibiotics was life-saving. We encountered a bacterial strain that was resistant to ampicillin; a commonly described property of *C. freundii* and ascribed to the *ampC* gene, which provides high-level resistance to ampicillin and first generation cephalosporins.[1] Often, the isolates are sensitive to aminoglycosides, quinolones and carbapenems.[2] Indeed, the last published guidelines of the International Society of PD in 2010[8] recommend following the sensitivity patterns in case of SPICE organisms and consider using double antibiotic coverage for 2–3 weeks.

Earlier literature reports a high incidence of mortality and morbidity from catheter losses from PD-related peritonitis caused by *C. freundii*.[1] Prompt institution of broad antimicrobial coverage in unstable patients and following the culture sensitivity pattern reduces mortality and catheter losses from peritonitis caused by *C. freundii*.

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