

2022

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Recommended Citation

Roy, Sasmit; Singh Garcha, Amarinder; Patel, Sumit; Rahman, Ebad Ur; and Adapa, Sreedhar (2022) "Brevibacterium casei induced peritonitis in a patient undergoing continuous cyclor peritoneal dialysis: Case report and Literature review," *Journal of Community Hospital Internal Medicine Perspectives*: Vol. 12: Iss. 1, Article 13.

DOI: 10.55729/2000-9666.1012

Available at: <https://scholarlycommons.gbmc.org/jchimp/vol12/iss1/13>

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Brevibacterium casei Induced Peritonitis in a Patient Undergoing Continuous Cycler Peritoneal Dialysis: Case Report and Literature Review

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Abstract

Brevibacterium casei is an extremely rare organism that can lead to peritonitis in End-stage renal disease patients of peritoneal dialysis. Out of only five overall *Brevibacterium* species peritonitis reported worldwide, only two of them had *B. casei* subspecies peritonitis detected, with both needing peritoneal dialysis catheter removal and change in dialysis modality to hemodialysis. Our patient, an elderly 63-year-old Hispanic male, was on peritoneal dialysis at home and presented with features suggestive of peritonitis. He was diagnosed subsequently with *B. casei* and started on broad spectrum intraperitoneal antibiotics. However, he did not need dialysis modality change and recovered fully after 3 weeks of appropriate intraperitoneal antibiotics therapy. Longer antibiotics therapy and frequent clinical follow-up plus better clinician awareness are needed to prevent this rare infection.

Keywords: *Brevibacterium* species, Peritonitis, Peritoneal dialysis, *Brevibacterium casei*, End-stage renal disease, Atypical microorganism

1. Introduction

Peritonitis is a serious, life-threatening complication of peritoneal dialysis (PD) that can lead to significant morbidity and mortality. It is caused mostly by gram-positive organisms. *Brevibacterium casei*, a gram-positive coryneform bacterium, an atypical microorganism which is an extremely rare cause of peritonitis in PD patients. *B. casei* has been reported to cause relapsing peritonitis, sometimes requiring removal of PD catheter and change of modality of dialysis.

2. Case report

A 63-year-old Hispanic male with end-stage renal disease (ESRD) on continuous cycler peritoneal dialysis (CCPD) for the preceding two years, presented to the peritoneal dialysis clinic with complaints of low-grade fever for 2 days and diffuse

abdominal pain along with a cloudy peritoneal dialysis effluent. The abdominal pain was dull, diffuse with moderate intensity. Each peritoneal dialysis exchange led to pain. He had no associated diarrhea, constipation, nausea, or vomiting. His past medical history included diabetes mellitus, essential hypertension, and end-stage renal disease. His home medications were metoprolol succinate 50 mg twice daily, calcitriol 0.5 µg daily, calcium acetate 667 mg tabs 2 tablets thrice daily with meals, glipizide 10 mg daily and long-acting insulin Lantus. His CCPD modality consisted of four nighttime exchanges with, 2.5 Liter(L) per exchange of 2.5% dextrose solution, and 2 L of icodextrin daytime dwell.

His clinic vital signs - temperature of 101 Fahrenheit (F), blood pressure 151/79 mm Hg, pulse rate 67 beats per minute, respiratory rate 17 breaths per minute, room air oxygen saturation of 98%. Gastrointestinal system examination suggested diffuse

Received 17 August 2021; revised 26 October 2021; accepted 3 November 2021.
Available online 31 January 2022

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<https://doi.org/10.55729/2000-9666.1012>

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tenderness with guarding but no rigidity, audible bowel sounds, with a peritoneal dialysis catheter in the right lower quadrant with no localized tenderness or visible discharge. All of the other remaining systemic physical examination was unremarkable.

Laboratory data on presentation was unremarkable with normal complete blood count and normal electrolytes except for elevated creatinine of 6.52 mg/dl and blood urea nitrogen of 64 mg/dl, which were his usual baseline dialysis laboratory values. The initial peritoneal dialysis fluid demonstrated increased leucocyte count of 243/microliter with neutrophil percentage high of 85%. The patient was commenced on empiric intra-peritoneal cefazolin and ceftazidime in the clinic. Three days after incubation, PD fluid culture grew *Brevibacterium* (group B) in the aerobic bottle, which was found to be sensitive to vancomycin (minimum inhibitory concentration 0.25 µg/mL). Broth microdilution method (Pasco, Detroit, MI) was utilized for antibiotic susceptibility and interpretations were deciphered according to Funke et al.¹ breakpoint recommendations for *Corynebacterium* and associated coryneforms. The peritoneal fluid culture showed grayish white colonies with shiny surfaces, notable for *Brevibacterium* species.² 16S rRNA gene sequencing was used, as per interpretative criteria defined by the U.S. Clinical and Laboratory Standards Institute (CLSI).³ GenBank database (U.S. National Institutes of Health, Bethesda, MD, USA), was used along with the BLAST algorithm for sequence alignment. 99.1% compatibility in 16S rRNA sequence to the GenBank sequence of the type of strain of *B. casei* (ATCC 35513T) was found.

Antibiotics were changed to intraperitoneal vancomycin for a total 3-week duration. The PD catheter was salvaged and repeat peritoneal dialysate (PD) fluid analysis after 2 weeks and 4 weeks of completing therapy showed a WBC count of <20 cells/micro-L. We admit there are no standard guidelines for duration of antibiotics for these rare species or recommendations for surveillance, but because of rarity of this species and its nature of complications, we opted to pursue three weeks course to help better clearance of the micro-organism. The patient was continued on peritoneal dialysis with no modality change and did not encounter any further complications.

3. Discussion

Peritonitis is a serious and life-threatening complication of PD potentially leading to significant morbidity, catheter loss, ultrafiltration loss,

permanent membrane damage, transfer to hemodialysis, and death.^{4,5} There is a wide discrepancy of peritonitis rate among PD patients in different countries for reasons unknown.⁵ A recent multicenter study conducted worldwide in seven countries across 209 facilities, showed an overall peritonitis rate of 0.26/patient-year, 0.35 to 0.40/patient-year in Thailand, the United Kingdom, and Australia/New Zealand and 0.26 to 0.29/patient-year in Canada, Japan, and the United States.⁶

A retrospective study demonstrated peritonitis to be independently associated with a higher risk of cardiovascular and all-cause mortality plus infection-related mortality in patients who have been on peritoneal dialysis for duration beyond 2 years.⁷ In the United States, approximately 62% of cases of peritonitis are caused by gram-positive organisms (31% being coagulase-negative *Staphylococcus*), 20.5% by gram-negative organisms (mostly *E. coli*, *Klebsiella*, *Pseudomonas*), 3.92% by fungi, and 15.9% reported as culture-negative peritonitis.⁸ Among fungi, *Candida albicans* and newly emerging *Candida parapsilosis* are the commonest organisms.⁹

Brevibacterium genus is a coryneform bacterium with 45 different species but only 10 have been isolated from clinical samples.¹⁰ It is a gram-positive, catalase-positive, aerobic, immobile bacterium that is a part of the normal microbiota of the skin and had rarely been thought to be a cause of pathology in immunocompetent human beings.¹⁰ *Brevibacterium* was first described in 1953 by Dr. Robert Breed,¹¹ and the first reported isolation of *B. casei* from clinical cases was documented by Gruner E et al., in 1993 from Switzerland.¹² Thereafter, *Brevibacterium* species have now been identified as a cause of peritonitis in dialysis patients,^{13–17} catheter-related bloodstream infection,¹⁸ brain abscess,¹⁹ and endocarditis, pericarditis, osteomyelitis, endophthalmitis, discitis. Cases of peritonitis have been reported due to *Brevibacterium otidis*¹⁴ and *Brevibacterium iodinum*¹³ and two relapsing peritonitis cases with *B. casei*.^{15,17} They are summarized in Table 1.

Diagnosis of *Brevibacterium* may be challenging as gram stain usually shows gram-positive rods like diphtheroids. Biochemical testing could further differentiate the organisms,²⁰ but the gold standard test is 16S rRNA gene sequencing to identify species.² *Brevibacterium* is generally resistant to penicillin and 3rd generation cephalosporins and sensitive to fluoroquinolones and vancomycin.² *B. casei* can cause relapsing peritonitis even after treatment with intraperitoneal antibiotics. In previously published case reports of peritonitis due to *Brevibacterium* species,^{14,16} removal of PD catheter

Table 1. Summary of case reports published on *Brevibacterium peritonitis*.

Author	Year	Location	Age/Gender	Species	Dialysis modality	Treatment	Outcome	Modality changed
Antonious S et al. ¹³	1997	Greece	69/F	<i>B. iadinum</i>	CAPD	IP Cefuroxime, then IP Ciprofloxacin	Improved	No
Wauters G et al. ¹⁴	2000	Belgium	73/F	<i>B. otitidis</i>	CAPD	IP Cefazolin plus IP Genamicin	Improved	No
Poesen K et al. ¹⁵	2012	Belgium	39/M	<i>B. casei</i>	CCPD	IP Vancomycin	Delayed recovery	Yes, switched to HD
Choi JS et al. ¹⁶	2012	Korea	52/M	Species not identified	CAPD	IP Ceftazidime and IP Cefazolin	Delayed recovery	No
Althaf M et al. ¹⁷	2014	Saudi Arabia	33/F	<i>B. casei</i>	CCPD	IP Ceftazidime and IP Cefazolin	Delayed recovery	Yes, switched to HD

Legend: F: Female; M: Male; B: *Brevibacterium*; IP: Intraperitoneal; CAPD: Continuous Ambulatory Peritoneal Dialysis; CCPD: Continuous Cycler Peritoneal Dialysis; HD: Hemodialysis.

was necessary for effective treatment of peritonitis. In our case, the patient was treated with intraperitoneal vancomycin alone and his PD catheter was salvaged with the effective continuation of peritoneal dialysis. International Society for Peritoneal Dialysis guidelines recommend 2 weeks of antibiotics for most gram-positive organisms except 3 weeks for *Staphylococcus* and *Enterococcus* while 3 weeks of antibiotics for most gram-negative bacilli.⁵ Through our case, we suggest at least 3 weeks of IP antibiotics would be preferable in these types of gram-positive organisms to help ensure adequate clearance of the organism and prevent its relapse. Surveillance PD culture should be done in 2 weeks and 4 weeks of recovery to ensure that this organism, which has a high rate of recurrence, doesn't recur.

As per published data, this is only the third reported case of peritonitis by *B. casei* and 6th overall *Brevibacterium* species induced peritonitis. Also, this could be the first reported case of *B. casei* peritonitis from North America. Unlike previous cases of peritonitis caused by this organism, our patient did not require removal of peritoneal dialysis catheter and was able to continue peritoneal dialysis without relapse of the infection.

Ethics approval

Our institution does not require ethical approval for reporting individual cases or case series.

Data availability

PubMed, Goggle Scholar databases. The authors declare that data supporting the findings of this article are available within the article.

Funding disclosures

None to disclose.

Consent

The patient consented for publication of this study and the written consent form is available to authors for submission if requested.

Conflict of interest

The authors have no conflict of interest to declare.

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