

Case report

Peritoneal Dialysis-Associated Peritonitis Caused by Rare Pathogens: *Cellulosimicrobium Cellulans* and *Brevundimonas Vesicularis*

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Abstract

Peritonitis is one of the most important complications of peritoneal dialysis (PD) and a leading cause of PD failure. Most frequently, there are isolated gram-positive microorganisms, and a minor proportion of gram-negative bacteria that is lately increasing. Herein, we present two rare cases of PD-associated peritonitis caused by uncommon microorganisms: *Cellulosimicrobium cellulans* and *Brevundimonas vesicularis*.

We concluded that an early diagnosis and appropriate antibiotic therapy may lead to successful outcomes, even without catheter removal.

Keywords: peritoneal dialysis, gram-negative microorganisms, early diagnosis, antibiotic treatment

Introduction

Peritonitis is one of the most important complications of peritoneal dialysis (PD) and a leading cause of PD failure [1]. Gram-positive microorganisms are most commonly isolated, whereas Gram-negative bacteria account for approximately 15%-35% of all cases [2-4]. However, in recent years, a decrease in the incidence of Gram-positive peritonitis and a corresponding increase in cases caused by Gram-negative organisms have been observed. Herein, we present two rare cases of PD-associated peritonitis caused by uncommon microorganisms: *Cellulosimicrobium cellulans* and *Brevundimonas vesicularis*.

Case 1.

A 49-year-old man presented to the emergency department with a two-day history of abdominal pain and turbid peritoneal fluid. He has been receiving peritoneal dialysis for 4 years. His medical history was notable for diabetes mellitus. At presentation, his vital signs were as follows: blood pressure 112/80 mmHg, pulse rate 100 beats/min, temperature 36 °C. Physical

examination revealed no additional abnormalities except for abdominal tenderness. The catheter exit site was clean and there was no findings suggestive of tunnel infection. Laboratory tests at admission showed a haemoglobin level of 14.5 g/dl, leukocyte count of $7.26 \times 10^3/\mu\text{L}$, neutrophil count of $5.23 \times 10^3/\mu\text{L}$, platelet count of $126.000 \times 10^3/\mu\text{L}$. Blood urea was 85.4 mg/dl, creatinine was 8.16 mg/dl and C-reactive protein (CRP) level was 120 mg/dl. Analysis of the peritoneal fluid revealed a white blood cell count of $206/\mu\text{L}$ from which 61.7% were polymorphonuclear leukocytes. Empirical treatment with intraperitoneal ceftazidime 4 g/day and cefazolin 4 g/day was initiated. *Cellulosimicrobium cellulans* growth was detected in peritoneal fluid culture 48 hours after initiation of therapy. According to the antibiogram results (Table 1), cefazolin and ceftazidime were discontinued and intravenous vancomycin 1000 mg was initiated. As no dialysis failure occurred during the course of peritonitis, haemodialysis was not required. On the fifth day of treatment, the dialysate leukocyte count decreased to $61/\mu\text{L}$. The patient was discharged after completing the three-week course of vancomycin therapy.

Table 1. *Cellulosimicrobium cellulans* antibiotic susceptibility pattern

Antibiotic	Susceptibility
Piperacilin/Tazobactam	Resistance
Ciprofloxacin	Resistance
Imipenem	Resistance
Colistin	Resistance
Cefepime	Resistance
Ceftazidime	Resistance
Levofloxacin	Resistance
Vankomicin	Sensitive

Case 2.

A 46-year-old male patient admitted to the emergency department with a 2-day history of abdominal pain and cloudy peritoneal fluid. He has been receiving peritoneal dialysis for 5 years. His medical history was notable for hypertension and coronary artery disease. At admission, his vital signs were as follows: blood pressure 112/80 mmHg, pulse rate 100 beats/min, fever

36°C. Physical examination revealed abdominal tenderness, with no other abnormal findings. The catheter exit site was clean and there were no signs suggestive of tunnel infection. Laboratory investigations showed haemoglobin level of 15.6 g/dl leukocyte count of $6.13 \times 10^3/\mu\text{L}$ neutrophil count of $4.85 \times 10^3/\mu\text{L}$ platelet count of $113.000 \times 10^3/\mu\text{L}$. Serum urea and creatinine levels were 92 mg/dl and 6.9 mg/dl, respectively, while CRP level was 111.31 mg/dl. Analysis of the peritoneal fluid revealed a leukocyte count of $3854/\mu\text{L}$, of which 86.3% were polymorphonuclear leukocytes. Dialysate culture was examined due to the suspected peritonitis. Empirical treatment with intraperitoneal ceftazidime 4 g/day and cefazolin 4 g/day was initiated. After 48 hours, *Brevundimonas vesicularis* growth was isolated from the peritoneal fluid culture. Based on antibiogram (Table 2), cefazolin and ceftazidime were discontinued and intravenous amikacin 1000 mg was initiated. Since no dialysis failure occurred during the episode of peritonitis, haemodialysis was not required. On the fifth day of treatment, the dialysate leukocyte count was $24/\mu\text{L}$. The patient was discharged after completing a 3-week course of amikacin treatment.

Table 2. *Brevundimonas vesicularis* antibiotic susceptibility pattern

Antibiotic	Susceptibility
Piperacilin/Tazobactam	Resistance
Ciprofloxacin	Resistance
Imipenem	Resistance
Colistin	Resistance
Cefepime	Resistance
Ceftazidime	Resistance
Levofloxacin	Resistance
Amikacin	Sensitive

Discussion

Although the exact source of infection could not be determined, environmental exposure and contamination during peritoneal dialysis procedures should be considered. Both *Brevundimonas vesicularis* and *Cellulosimicrobium cellulans* have been isolated from environmental sources, including water and soil, suggesting that accidental inoculation through contaminated dialysis equipment, dialysis fluids, touch contamination during exchanges, or lapses in aseptic technique may represent plausible routes of infection in PD patients. Among gram negative bacteria, *Brevundimonas* spp. are rarely implicated in human infections according to the available literature [5]. In a review conducted by Shang *et al.*, in 2012, only 15 cases of bacteraemia caused by these bacteria were reported [6]. Peritonitis due to *Brevundimonas vesicularis* is extremely rare, and therefore, data regarding its antibiotic susceptibility are limited. Additionally, although 31 cases of infection caused by *Cellulosimicrobium cellulans* have been reported in

the literature, only four of these were associated with peritonitis [7]. In most previously reported cases, catheter removal was required for a successful treatment. According to the 2022 ISPD guidelines, catheter removal is recommended in refractory or treatment-resistant peritonitis [8]. In contrast, in our case, peritonitis was successfully treated with intraperitoneal vancomycin without the need for catheter removal.

Christiadi *et al.*, successfully treated a case of peritonitis caused by *Brevundimonas vesicularis*-associated peritonitis using a 21-day regimen consisting of intraperitoneal gentamicin (10 days), cefepime (11 days) and oral ciprofloxacin (11 days), based on treatment protocol recommended for *Pseudomonas aeruginosa* [9]. In contrast, in the case reported by Paramasivam *et al.*, the peritoneal catheter had to be removed due to treatment resistance [5]. In our patient, antibiotic susceptibility testing revealed sensitivity to amikacin and the patient responded well to daily intravenous amikacin therapy.

Conclusion

In conclusion, *Brevundimonas vesicularis* and *Cellulosimicrobium cellulans* have been reported as rare causes of peritoneal dialysis-associated peritonitis. Early diagnosis and appropriate antibiotic therapy may lead to successful outcomes, even without catheter removal. These cases highlight that individualized antibiotic selection based on susceptibility testing can be effective in selected patients. Furthermore, our cases contribute to the limited literature on these uncommon pathogens by demonstrating that conservative management with targeted antimicrobial therapy may be a feasible alternative to the catheter removal in carefully selected patients who respond to treatment. Thus, these organisms should be considered in the differential diagnosis of peritonitis in patients undergoing peritoneal dialysis.

Conflict of interest statement. None declared.

References

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