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CASE REPORT

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Opportunistic peritonitis in peritoneal dialysis: The example of *Paracoccus yeei*

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Abstract

Paracoccus yeei, a Gram-negative coccobacillus, is an emergent opportunistic pathogen. It originates from soil and water. VITEK and MALDI-TOF are used for identification. There are few reports of peritoneal dialysis peritonitis. Its presentation is usually indolent. It can be successfully treated with several antibiotics: β-lactams, aminoglycosides, without removing the catheter.

KEYWORDS

infectious diseases, nephrology

1 | INTRODUCTION

We report a case of *Paracoccus yeei* peritonitis in a patient undergoing automated peritoneal dialysis. Blood bottles inoculated with the dialysate grew a Gram-negative coccobacillus identified as *P yeei* by MALDI-TOF. The patient was successfully treated with a 3-week course of intraperitoneal amoxicillin after a transient shift to CAPD. The few reported cases of *P yeei* peritonitis show an indolent course. The microbe is susceptible to beta-lactams and aminoglycosides. It can be identified by VITEK (BioMerieux), MALDI-TOF, and 16 rRNA sequencing. Intraperitoneally administered treatment is successful without catheter removal.

There are two modes of peritoneal dialysis: continuous ambulatory peritoneal dialysis (CAPD) and automated peritoneal dialysis (APD). Automated peritoneal dialysis is performed by a machine filling-in and emptying the belly during the night, with a fresh solution refill every morning. For CAPD, the patient must manually fill-in and empty his/her belly and exchanges are made at least four times during daytime. Infectious complications of peritoneal dialysis (PD) comprise peritonitis, catheter exit site, and tunnel infections. Over 0.5 episodes/patient-year rate of peritonitis has been reported in some facilities [1] with up to 5% mortality rate.[2] The biological definition of infectious PD peritonitis is effluent cell count with white bloods cells (WBC) over 100/μL, with more than 50% PNM after a dwell time of least 2 hours. In 10%-20%, no etiological organism can be detected. This rate can be decreased by direct inoculation of dialysate in blood-culture bottles [3] or amplification and identification of 16S rRNA. Some peritonitis may be truly aseptic. Skin colonizers such as *S epidermidis* and *S aureus*, Gram-negative organisms, or even fungus are involved owing to the mode of entry: skin and catheter-related, gut-associated translocation or hematogenous seeding. Various unexpected exogenous opportunistic micro-organisms originating from the patient's environment have been reported to cause exit site, tunnel infection, and peritonitis.[4,5] *Paracoccus yeei* is an aerobic

Gram-negative coccobacillus, found in soil and water. It can develop biofilms on plastic surface and has recently been identified as an opportunistic pathogen in human disease.[6] Few cases of *P yeei*-induced peritonitis in patients undergoing APD have been described.[7-10] We report such a case successfully treated with intraperitoneal amoxicillin in a patient experiencing several episodes of exogenous catheter infections.

2 | CASE REPORT

A 50-year-old woman presented in September 2018 to the emergency department for diffuse abdominal pain with anorexia, diarrhea, and shivering for 4 days but was afebrile. She had been on APD since 07/2012 for the treatment of end-stage renal disease of unknown origin. Her medical history reveals chronic depression, social isolation, linguistic barrier, hypertension, and two previous episodes of APD peritonitis with removal followed by reinsertion of DP catheter. Laboratory analysis revealed the following: white blood cell count of 9.190/μL with normal differentiation and a C-reactive protein level: 47.7 mg/L (normal value: <10 mg/L). The peritoneal effluent looked cloudy. Effluent WBC was 2.111/μL with 1.598 neutrophils/μL, 49% PNM according to the machine. Another effluent sampled the next day showed 995 WBC/μl, with 53% PNM. The peritoneal catheter exit site was of normal appearance. Empirical treatment was initiated with intraperitoneal (IP) vancomycin (75 mg/L) and amikacin (12 mg/L) according to local guidelines. Incubated peritoneal fluid (Bactec Plus Aerobic; Becton Dickinson, Franklin Lakes, NJ, USA) yielded a positive culture for gram-negative cocci. These were identified as *Paracoccus yeei* using matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF) (Bruker Daltonics, Bremen, Germany). Drug susceptibility was tested for ampicillin and amoxicillin-clavulanate, both of which were susceptible. Empiric treatment was discontinued on the second day of hospitalization and replaced by amoxicillin 150 mg IP per liter of dialysate. Antibiotic was administrated on CAPD, amoxicillin 250 mg per bags 3 times on a day at the beginning. During treatment, she was shifted to CAPD until the effluent WBC fall under 100/μL. There was no dry night nor dry day. When effluent WBC cells were under 100/μL, we restarted APD with 2 g of amoxicillin in the long dwell. The total treatment duration was 3 weeks. Subsequent effluent analyses showed a progressive decline and normalization of effluent cytology on the 9th day following diagnosis. However, the patient developed other catheter's infections with *S oralis*, *P mirabilis* involving the exit site, later *P putida* and *C freundii* peritonitis, and lastly a *S pneumoniae* peritonitis in January 2020.

3 | DISCUSSION

The genus *Paracoccus* compromises 17 species found in in soil and brines. Only *P yeei* has been identified as a pathogen causing disease in humans as it possesses specific genes of virulence.[6] Infections with this opportunistic bacterium are rare and are mostly reported in immunocompromised patients. The case reports consist of a myocarditis in a heart transplant patient, peritonitis in PD, and bacteremia in a patient with cirrhosis.[11-13] It is an exclusive aerobic, catalase and oxidase-positive, nonmotile Gram-negative (cocco)-bacillus, readily identified by the VITEK™ 2 GN (BioMérieux), MALDI-TOF, or 16S rRNA sequencing using available reference databases. Previous reports have demonstrated antibiotic susceptibility to beta-lactams, fluoroquinolones, and aminoglycosides. In vitro, it is usually susceptible to most antibiotics including penicillins, cephalosporins, carbapenems, aminoglycosides, quinolones, and tetracyclines. However, as a Gram-negative coccobacillus, it is intrinsically resistant to vancomycin, a drug usually used as empirical therapy.[9] We analyzed the reported cases of *P yeei* associated DP peritonitis in Table 1. Presentation is usually mild with no fever and no or little abdominal pain. It affects patients with various degrees of immune suppression. Several treatments active on Gram-negative cocci have been applied. Treatment outcome is usually successful, without removing the DP catheter. Most of the patients are on APD. Amoxicillin and other beta-lactams are likely effective treatment options for *P yeei*. Our patient received IP amoxicillin for 3 weeks. IP administration of antibiotics is the preferred route to treat peritonitis for a duration of 2 −3 weeks according to the germ identified. IP dosing recommendations are available for many antibiotics.[2] However, the antibiotic with the narrower spectrum of activity and the least toxicity should be preferred over others. The incidence of PD peritonitis varies greatly according to the reporting centers and ranges from 0.2 to over 0.5 episodes per patient/year.[1] Various interventions are recommended to prevent catheter and tunnel infections. Skin/catheter-related exogenous infections can be prevented by general hygiene, patients' education and training in practicing home PD, S. aureus decolonization, and antibiotic ointment of the exit site, among others.[14] Endogenous, bacterial translocation-associated peritonitis can be prevented by avoidance of constipation, and antibio-prophylaxis prior to various invasive endoscopic procedures.[15]

4 | CONCLUSION

Environmental germs of low virulence can cause peritoneal dialysis catheter-associated peritonitis providing opportunistic circumstances. We report a case of *P yeei* PD peritonitis successfully treated with intraperitoneal amoxicillin in a

TABLE 1 Description of previously published case reports of *Paracoccus yeei* DP peritonitis

Demography	Clinical manifestation	Biology	Peritoneal fluid analysis	Diagnostic method	Treatment	Outcome	Ref.
50-year-old female ESDR APD	Cloudy effluent Apyretic Abdominal pain	WBC 9.190/µl CRP 47.7 mg/l	WBC 2.111/µl PMN 49%	Aerobic culture MALDI-TOF	IP vancomycin +amikacin -> Amoxicillin 3 weeks	cured	Our case
25-year-old male ESRD APD	Apyretic Abdominal pain	WBC 5.000/µl PMN 72% CRP 63 mg/l	WBC 315/µl PMN 75%	Gram Stain neg Aerobic culture/BA +CA VITEK 2 GN 16S rRNA sequencing	IP piperacillin +cephalothin ->?	cured	[7]
46-year-old female ESDR APD	Cloudy effluent Apyretic Abdominal pain		WBC 790 /µl PMN 75%	Blood culture	vancomycin and ceft vancomycin and ceftazidime azidim vancomycin and ceIftazidime e IP vancomycin +ceftazidime -> Ceftazidime 2 weeks ambulatory	cured	[8]
81-year-old female Type II diabetes ESRD CAPD	Cloudy effluent No fever No abdominal pain	WBC 8.900 /µL, CRP 10.9 mg/L	WBC 105/µL PMN% not reported	Gram Stain neg Aerobic culture/ BA MALDI-TOF 16S rRNA sequencing	IP gentamicin +vancomycin ->? Ambulatory 2 weeks	cured	[9]
51-year-old man ESDR Diabetes APD	Cloudy effluent Apyretic No pain		WBC 4.390/µl PMN 84%	Gram Stain neg Conventional culture medium	IV vancomycin +ceftriaxone -> ceftriaxone 3 weeks	cured	[10]
72-year-old male Diabetes HTA, ESRD APD	Cloudy effluent Apyretic Abdominal pain	WBC 6.700/µl	WBC 350/µl PMN 32%	Aerobic culture Difficulties in identification	IP vancomycin 2 g (as he was previ- ously colonized with MRSA) and gentamicin 50 mg IP vancomycin +gentamicin -> Gentamicin 2 weeks	cured	[16]

Abbreviations: ->, switched to; APD, automated peritoneal dialysis; BA, blood agar plates; CA, chocolate agar plates; CAPD, continuous ambulatory peritoneal dialysis; CRP, C-reactive protein; ESRD, End-stage renal disease; HTA, blood hypertension; IP, intraperitoneal route; IV, intravenous route; PMN, polymorphonuclear; WBC, white blood cells.

patient experiencing several episodes of infections with various germs. *P yeei* shows sensitivity to various antimicrobials. This Gram-negative aerobic coccobacillus is now easily identified using VITEK or MALDI-TOF. Various prophylactic measures can be implemented to reduce the rate of PD-associated peritonitis from both exogenous and endogenous sources.

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CONFLICT OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

FC, BA, and TF: followed the case and reviewed the manuscript. ME: reviewed the manuscript. MB: identified the germ and reviewed the manuscript. CP: followed the case and organize the case reporting.

ETHICAL STATEMENT

The patient provided written informed consent to the publication of her case. Anonymity has been preserved.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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