Two Cases of Continuous Ambulatory Peritoneal Dialysis-Associated Peritonitis Due to *Plesiomonas shigelloides*

Patrick C. Y. Woo, Susanna K. P. Lau, Samson S. Y. Wong,
and Kwok-yung Yuen*

*Department of Microbiology, The University of Hong Kong, University Pathology Building,
Queen Mary Hospital, Hong Kong*

We describe herein the first two cases of *Plesiomonas shigelloides* continuous ambulatory peritoneal dialysis-related peritonitis. Both patients presented with abdominal pain and turbid dialysis effluent with or without fever. Both recovered after 10 days of intraperitoneal administration of cefazolin and tobramycin. The route of transmission may have been direct contamination of the connection device or bacterial translocation through the gastrointestinal tract.

CASE REPORTS

Case 1. A 73-year-old Chinese woman was admitted to the hospital in July 1999 because of fever, abdominal pain, and cloudy dialysis effluent for 1 day. She had end-stage renal disease of unknown etiology and had been undergoing continuous ambulatory peritoneal dialysis (CAPD) for 3 years. She also had hypertension, chronic atrial fibrillation, ischemic heart disease, and congestive heart failure, for which she was receiving isosorbide mononitrate and simvastatin. There was no recent history of diarrhea. Upon admission, she had a temperature of 38.5°C, with generalized abdominal tenderness and turbid dialysis effluent. The hemoglobin level was 10.5 g/dl, the total white cell count was 17.5×10^9/liter (with neutrophil levels of 16.4×10^9/liter, lymphocyte levels of 0.5×10^9/liter, monocyte levels of 0.4×10^9/liter, eosinophil levels of 0.1×10^9/liter, and basophil levels of 0.1×10^9/liter), and the platelet count was 357×10^9/liter. The serum urea and creatinine levels were 17.2 mmol/liter and 543 µmol/liter, respectively, with normal levels of liver enzymes. The total leukocyte count of the dialysis fluid was $3,870 \times 10^6$/liter. Gram stain of the dialysis effluent after centrifugation revealed only the presence of numerous leukocytes; no microorganisms were seen. Intraperitoneal administration of cefazolin and tobramycin were started for empirical treatment of CAPD peritonitis.

Culture of the dialysis effluent obtained upon admission yielded pure growth of gram-negative rods on horse blood agar as nonhemolytic, smooth, shiny, and opaque colonies that were 2 mm in diameter after incubation at 37°C in 5% CO_2 for 24 h. The isolate also grew on MacConkey agar. The isolate was cytochrome oxidase positive and was motile. It was positive for lysine decarboxylase, ornithine decarboxylase, and arginine dihydrolase. It was identified as *Plesiomonas shigelloides* by the Vitek GNI+ system (software version VTK-R07.02) (bioMerieux, Hazelwood, Mo.) and the API 20E system (bioMerieux) (biochemical profile no. 714420457) with greater than 99% confidence. The isolate was susceptible to ampicillin, cephalothin, cefuroxime, ceftriaxone, ceftazidime, imipenem, gentamicin, ciprofloxacin, and cotrimoxazole. Two sets of blood cultures (BACTEC 9240; Becton Dickinson, Paramus, N.J.) taken upon admission were negative for bacteria after 7 days of incubation. All subsequent cultures of the dialysis effluent were negative, and the patient received 10 days of intraperitoneal cefazolin and tobramycin administration.

Case 2. A 62-year-old Chinese woman was admitted to the hospital in July 2001 because of abdominal pain and cloudy dialysis effluent for 1 day. She had a history of end-stage renal disease as a result of immunoglobulin A nephropathy and had been undergoing CAPD for 6 years. She also had hypertension, type B aortic dissection, and a right parieto-occipital infarct as a result of a prior cerebrovascular incident. There was no recent history of diarrhea. Upon admission, she was afebrile, with generalized tenderness over the abdomen and turbid dialysis effluent. The hemoglobin level was 10.5 g/dl, the total white cell count was 5.1×10^9/liter (with neutrophil levels of 4.1×10^9/liter, lymphocyte levels of 0.7×10^9/liter, monocyte levels of 0.2×10^9/liter), and the platelet count was 195×10^9/liter. The serum urea and creatinine levels were 25.5 mmol/liter and 972 µmol/liter, respectively, with normal levels of liver enzymes. The total leukocyte count of the dialysis fluid was $21,400 \times 10^6$/liter. Gram stain of the dialysis effluent after centrifugation revealed only the presence of numerous leukocytes; no microorganisms were seen. Intraperitoneal administration of cefazolin and tobramycin was started for empirical treatment of CAPD peritonitis.

Culture of the dialysis effluent obtained upon admission yielded two organisms. The first organism was a gram-negative rod (moderate growth) that appeared on horse blood agar as nonhemolytic, smooth, shiny, and opaque colonies that were 2 mm in diameter after incubation at 37°C in 5% CO_2 for 24 h. The isolate also grew on MacConkey agar. The isolate was cytochrome oxidase positive and was motile. It was positive for lysine decarboxylase, ornithine decarboxylase, and arginine dihydrolase. It was identified as *P. shigelloides* by the Vitek GNI+ system (bioMerieux) and the API 20E system (bioMerieux) (biochemical profile no. 714420457) with greater

* Corresponding author. Mailing address: Department of Microbiology, The University of Hong Kong, Rm. 423, University Pathology Building, Queen Mary Hospital, Hong Kong. Phone: (852) 2855-4892. Fax: (852) 2855-1241. E-mail: hkumicro@hkucc.hku.hk.

than 99% confidence. The isolate was resistant to ampicillin and cotrimoxazole but was susceptible to cephalothin, cefuroxime, ceftriaxone, ceftazidime, imipenem, gentamicin, and ciprofloxacin. The second (scanty growth) organism was a gram-positive coccus that appeared on horse blood agar as nonhemolytic, smooth, and gray colonies that were 1 to 2 mm in diameter after incubation at 37°C in 5% CO_2 for 24 h. The isolate also grew on MacConkey agar. The isolate was weakly catalase positive and was nonmotile. Lancefield serogrouping using Streptex (Murex Biotech Ltd., Dartford, United Kingdom) revealed that it belonged to group D. It was able to grow on bile-esculin agar and 6.5% NaCl and to hydrolyze esculin. It was identified as *Enterococcus faecalis* by the Vitek GPI system (bioMerieux) and the API 20 Strep system (bioMerieux) with greater than 99% confidence. The isolate was sensitive to ampicillin, vancomycin, and high-content gentamicin. Two sets of blood cultures (BACTEC 9240; Becton Dickinson) taken upon admission were negative for bacteria after 7 days of incubation. All subsequent cultures of the dialysis effluent were negative, and the patient received 10 days of intraperitoneal cefazolin and tobramycin administration.

P. shigelloides was formerly classified under the family *Vibrionaceae*, because its phenotypic characteristics are similar to those of members of the genera *Vibrio* and *Aeromonas* (8). Recently, using information obtained from analysis of 16S rRNA gene sequences, it was found that *P. shigelloides* was more closely related phylogenetically to species in the genera of the *Enterobacteriaceae* family than to species of the *Aeromonas* genus (7, 10). Clinically, the most common *P. shigelloides* infection in humans is gastroenteritis, with water and seafood such as oysters being the most common sources of infection. In addition to gastroenteritis, cases of bacteremia, septic arthritis, osteomyelitis, meningitis, endophthalmitis, cellulitis, spontaneous bacterial peritonitis, cholecystitis, and pancreatic abscess have been described previously (2). In this article, we describe the first two cases of *P. shigelloides* peritonitis in patients with CAPD.

The most common pathogens associated with peritonitis in patients with CAPD are the gram-positive bacteria, which constitute 60 to 80% of all isolates. These include coagulase-negative staphylococci, *Staphylococcus aureus*, and diphtheroids, which are essentially part of the normal skin flora. The reason for their predominance as causative agents in CAPD-related peritonitis is presumably associated with the portal of entry along the Tenckhoff catheter in situ. Gram-negative bacteria are much less frequently isolated. The *Enterobacteriaceae* and *Pseudomonas* species are the gram-negative bacteria more commonly involved. Less frequently seen are *Acinetobacter* species, anaerobic bacteria, the atypical mycobacteria (especially the rapidly growing mycobacteria), *Mycobacterium tuberculosis*, streptococci, *Candida albicans*, and the rarely encountered fungi (6, 12).

The route of transmission in the present two cases of CAPD-related peritonitis caused by *P. shigelloides* may have been direct contamination of the connection device or bacterial translocation through the gastrointestinal tract. CAPD-related peritonitis has been previously reported to be associated with other bacteria that cause diarrhea, including members of the *Campylobacter*, *Salmonella*, *Shigella*, *Aeromonas*, and *Vibrio* (1, 3, 4, 5, 9, 11, 13) genera. It was obvious that some patients acquired their infections through direct contamination of the catheters. The patient with *V. alginolyticus* peritonitis had been scuba diving off the South Australian coast and had changed his peritoneal dialysis fluid on the beach without taking adequate precautions (11). For the two patients with *Aeromonas* infections, the one with *Aeromonas caviae* peritonitis had sprayed the catheter connector site using a bottle that previously contained a disinfectant but was subsequently used as a container for watering house plants, and the same bacterium was cultured from the plant and the inner tube of the spray (1). The one with *Aeromonas hydrophila* peritonitis also had gardened extensively, and he admitted that dirt tended to collect under his fingernails (4). On the other hand, the other patients—especially those with histories of diarrhea—had probably acquired the infection through the oral route. In these patients, the bacteria could have reached the peritoneal cavity by translocation across the intestinal wall into the peritoneal cavity or direct contamination of the connection device by the hands of patients that were contaminated with the bacteria. Our two patients with *P. shigelloides* CAPD-related peritonitis both presented in summer, which coincided with the period during which *P. shigelloides* gastroenteritis was most prevalent in our locality (unpublished data). However, neither patient showed any history of recent gastroenteritis or exposure to likely contaminated water. The portal of pathogen entry for these patients remained elusive.

REFERENCES

1. **Al-Wali, W., R. Baillod, J. M. T. Hamilton-Miller, and W. Brumfitt.** 1988. Houseplant peritonitis. Lancet **2:**957.
2. **Brenden, R. A., M. A. Miller, and J. M. Janda.** 1988. Clinical disease spectrum and pathogenic factors associated with *Plesiomonas shigelloides* infections in humans. Rev. Infect. Dis. **10:**303–316.
3. **Doðukan, A., O. Oymak, H. Taskapan, S. Çinar, B. Tokgöz, and C. Utas.** 2000. *Shigella sonnei* peritonitis in a patient on CAPD. Perit. Dial. Int. 20:806.
4. **Eisele, G., and G. R. Bailie.** 1995. Successful treatment of *Aeromonas hydrophila* peritoneal dialysis-associated peritonitis using intermittent intraperitoneal gentamicin. Clin. Nephrol. **44:**402.
5. **Hirsch, D. J., and K. K. Jindal.** 1993. Recurrent salmonella peritonitis in a patient on CAPD. Perit. Dial. Int. **13:**163.
6. **Lau, S. K. P., P. C. Y. Woo, S. K. Chiu, K. W. Leung, R. W. H. Yung, and K. Y. Yuen.** 2003. Early diagnosis of *Exophiala* CAPD peritonitis by 18S ribosomal RNA gene sequencing and its clinical significance. Diagn. Microbiol. Infect. Dis. **46:**95–102.
7. **MacDonnell, M. T., and R. R. Colwell.** 1985. Phylogeny of the *Vibrionaceae*, and recommendation for two new genera, *Listonella* and *Shewanella*. Syst. Appl. Microbiol. **6:**171–182.
8. **Murray, P. R., E. J. Baro, M. A. Pfaller, F. C. Tenover, and R. H. Yolken (ed.).** 1999. Manual of clinical microbiology, 7th ed. American Society for Microbiology, Washington, D.C.
9. **Orr, K. E., R. Wilkinson, and F. K. Gould.** 1993. *Salmonella enteritidis* causing CAPD peritonitis. Perit. Dial. Int. 13:164.

10. **Ruimy, R., V. Breittmayer, P. Elbaze, B. Lafay, O. Boussemart, M. Gauthier, and R. Christen.** 1994. Phylogenetic analysis and assessment of the genera *Vibrio*, *Photobacterium*, *Aeromonas*, and *Plesiomonas* deduced from small-subunit rRNA sequences. Int. J. Syst. Bacteriol. **44:**416–426.

11. **Taylor, R., M. McDonald, G. Russ, M. Carson, and E. Lukaczynski.** 1981. *Vibrio alginolyticus* peritonitis associated with ambulatory peritoneal dialysis. Br. Med. J. 283:275.

12. **Wong, S. S. Y., P. C. Y. Woo, P. L. Ho, and T. K. F. Wang.** 2003. Continuous ambulatory peritoneal dialysis-related peritonitis caused by *Streptococcus bovis*. Eur. J. Clin. Microbiol. Infect. Dis. **22:**424–426.

13. **Wood, C. J., V. Fleming, J. Turnidge, N. Thomson, and R. C. Atkins.** 1992. *Campylobacter* peritonitis in continuous ambulatory peritoneal dialysis: report of eight cases and a review of the literature. Am. J. Kidney Dis. **19:** 257–263.