Case Report

Cat-induced *Pasteurella multocida* peritonitis in continuous ambulatory peritoneal dialysis

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**A B S T R A C T**

*Pasteurella multocida* is a zoonotic pathogen found in the oral cavities of both domestic and wild animals. Although *P. multocida* has been involved in a wide range of human diseases, only a limited number of studies on *P. multocida* peritonitis in patients undergoing peritoneal dialysis (PD) had been carried out. We herein present the case of *P. multocida* peritonitis in a patient undergoing continuous ambulatory PD, which is believed to have resulted from contact with cats. We suggest that patients undergoing PD and having domestic animals at home should be educated about the possible transmission of the infection from the animals; in addition, these patients should also maintain a high level of personal hygiene.

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**Introduction**

*Pasteurella multocida* is an aerobic Gram-negative cocco-bacillus, and forms the normal oropharyngeal flora of many animals including household cats and dogs. This microorganism can be transmitted to humans through animal bites, scratches, or licks. Various human infections caused by *P. multocida* have been reported, including soft-tissue infections, pulmonary infections, meningitis, septic arthritis, and spontaneous bacterial peritonitis in patients with cirrhosis [1]. *P. multocida* is a rare cause of peritoneal dialysis (PD)-related peritonitis, and most reported cases were related to patients undergoing continuous cycling PD (CCPD; 75% of reported cases) [2]. The first case of infection was reported by Paul and Rostand in Alabama in 1987; since then, there has been an increase in the incidence of *P. multocida* infections in humans, which is mainly attributed to the increase in the number of people breeding pets in their home [3].

However, thus far, only 26 cases of *P. multocida*-related peritonitis have been reported in PD patients. Most reported cases are related to patients undergoing cyclic PD [3].

In this study, we present the case of a *P. multocida*-related peritonitis suspected to be caused through contact between cats and the patient undergoing chronic continuous ambulatory PD (CAPD). This is the first confirmed case of *P. multocida* infection in a CAPD patient in Korea. Furthermore, standard safety measures are suggested for the CAPD patients to prevent transmission of *P. multocida* infection from pets.

**Case report**

A 25-year-old woman with end-stage renal disease due to an unknown cause on CAPD for the past 2 years was admitted to the hospital with a 2-day history of diffuse abdominal pain and cloudy PD effluent. The patient was obese with a blood pressure of 145/95 mmHg, a heart rate of 96 beats/minute, and a body temperature of 38.8 °C. An abdominal examination was performed, which revealed distended abdomen with diffuse abdominal tenderness, moderate guarding with no rebound, and hypoactive bowel sounds. There was no evidence of
exit-site or catheter tunnel infection. The tubing of the PD catheter was intact with no visible evidence of damage.

Results of laboratory tests revealed the following measurements: white blood cell (WBC) count, 12,860 cells/mm$^3$; hemoglobin, 11.3 g/dL; hematocrit, 33.7%; platelet count, 337$ \times 10^3$/mm$^3$; blood urea nitrogen, 42.4 mg/dL; and creatinine, 5.1 mg/dL. The patient’s turbid effluent was inoculated (approximate volume: 10 mL) in two blood-culture bottles. Following this, 50 mL of dialysate was collected and centrifuged. The sediment after centrifugation was processed for further culture procedures. Under suspicion of peritonitis, the patient was treated with empirical intraperitoneal cefazolin, ampicillin/sulfamethoxazole, cefazolin, gentamicin, imipenem, levofloxacain, and trimethoprim/sulfamethoxazole. The organism was identified by a commercial identification kit (VITEK 2 g-negative identification card, bioMérieux, Inc., Marcy l’Etoile, France). Other peritoneal effluent cultures including fungal and acid-fast bacillus cultures were negative. After antibacterial therapy for 4 days, the patient’s dialysate WBC count decreased to 54/mm$^3$, her abdominal symptoms improved, and the turbid dialysate became clear. Antibiotics were administered for 10 more days and she was discharged without any complications.

Upon further questioning regarding the home CAPD environment, the patient revealed that she had three cats at home. However, she stated that CAPD exchange was performed only on more days and she was discharged without any complications.

Table 1. Previous case reports on peritoneal dialysis peritonitis caused by Pasteurella multocida

| References | Age (y) | Gender | Dialysis mode | Animal contact | Dialysate culture | Antibiotics |
|------------|--------|--------|---------------|----------------|-------------------|-------------|
| Frankel et al [6] | 55 | Male | CAPD | Cat exposure | Positive | Gentamicin, ciprofloxacin |
| Kitching et al [7] | 75 | Male | CAPD | Cat bite | Positive | Cefamandole |
| MacKay et al [8] | 73 | Male | CAPD | Cat exposure | Positive | Ceftazidime |
| Cooke et al [9] | 73 | Female | CAPD | Cat exposure | Positive | Gentamicin, ciprofloxacin |
| Antony et al [5] | 48 | Female | CAPD | Dog exposure | Positive | Cefazolin, gentamicin |
| Sol et al [3] | 7 | Female | CAPD | Cat exposure | Positive | Ampicillin |
| Present case | 25 | Female | CAPD | Cat exposure | Positive | Cefazolin, gentamicin |
| Logman et al [10] | 12 | Female | CCPD | Cat exposure | Positive | Gentamicin |
| Chadda et al [11] | 16 | Male | CCPD | Cat bite | Positive | NA |
| Malik et al [12] | 21 | Female | CCPD | Cat exposure | Positive | Gentamicin, ceftriaxone |
| Van et al [13] | 22 | Female | CCPD | Cat exposure | Positive | Ciprofloxacin |
| Kanaan et al [14] | 24 | Female | CCPD | Dog, cat exposure | Positive | Ciprofloxacin |
| Elsey et al [15] | 25 | Male | CCPD | Cat exposure | Positive | NA |
| Rondon et al [4] | 38 | Male | CCPD | Cat exposure | Positive | Ampicillin, levofloxacain |
| Mugambi et al [11] | 36 | Female | CCPD | Cat exposure | Positive | Ciprofloxacin |
| Urribarri et al [16] | 42 | Female | CCPD | Cat, dog exposure | Positive | Gentamicin, penicillin |
| Musio et al [17] | 46 | Female | CCPD | Cat exposure | Positive | Ciprofloxacin, piperacillin |
| Breton et al [18] | 46 | Female | CCPD | NA | Positive | Ceftazidime |
| Olea et al [19] | 46 | Female | CCPD | Cat exposure | Positive | Ceftazidime |
| Sillery et al [20] | 46 | Female | CCPD | Cat exposure | Positive | Ampicillin |
| Hamali et al [21] | 49 | Male | CCPD | Cat exposure | Positive | Cefazolin, tobramycin |
| Mat et al [2] | 52 | Male | CCPD | Cat exposure | Positive | Cefazolin |
| London et al [22] | 54 | Male | CCPD | Cat exposure | Positive | Gentamicin |
| Paul et al [23] | 55 | Female | CCPD | Cat exposure | Positive | Gentamicin |
| Jos et al [24] | 55 | Male | CCPD | Cat exposure | Positive | Gentamicin, ampicillin/sulfactam |
| Malik et al [12] | 58 | Male | CCPD | Cat exposure | Positive | Gentamicin |
| Satomura et al [25] | 58 | Male | CCPD | Cat exposure | Positive | Cefazolin, ceftazidime |

CAPD, continuous ambulatory peritoneal dialysis; CCPD, continuous cycling peritoneal dialysis; NA, not applicable.

Discussion

Despite technological improvements, PD-related peritonitis due to $P$. multocida infection caused by contact with contaminated pets continues to be a problem, and most reported cases were related to patients undergoing CCPD. However, the CAPD procedure requires patients to have dialysis kits (bags and tubes) at home, and a majority of these patients have pets in their home. Therefore, when CAPD patients carry out their own dialysis at home, there is an increased incidence of transmission of the $P$. multocida infection from the animals to the owners.

However, in the presented case, there was no documented CAPD line puncture or leakage, and therefore, the possible route of transmission is through her cats’ scratches or licks when she left her dialysis room, or transmission of the oropharyngeal colonization with $P$. multocida to her hands or dialysis supplies. A majority of PD-related peritonitis cases caused by $P$. multocida have been associated with pet cats; regular contact with domestic cats, cat bites, or scratches of dialysis tubes had been reported in 92.6% of patients with PD-related peritonitis (25/27 cases) [3]. It is known that $P$. multocida colonization is found in the oral cavity of cats (70–90%) and dogs (66%) [1]. In addition, it is also reported that one-third of healthy livestock breeders were found to be oropharyngeal carriers of this pathogen [4]. Although PD-related peritonitis cases caused by $P$. multocida have been reported worldwide, the present case is the first to be reported in Korea.

Despite the preponderance of CAPD, PD-related peritonitis cases caused by $P$. multocida less frequently occurs in patients undergoing CAPD than in patients using cycling devices (7/27 cases including the present case) [3]. The reason for this is not clear, but it is postulated that the relatively short time of PD exchange gives less chance for cats to come into contact with dialysis tubes. Furthermore, long tubes necessary for cyclic PD seem to be more attractive toys for cats [2]. The clinical
characteristics of *P. multocida* peritonitis in patients undergoing CAPD are not different from those in patients using cycling devices, and are summarized in Table 1.

The symptoms of PD-related peritonitis caused by *P. multocida* begin within 24 hours and improve within 48–96 hours of the initiation of antibiotics therapy [4]. Previous studies have reported that the common symptoms of PD-related peritonitis cases caused by *P. multocida* are low- to moderate-grade fever, severe abdominal pain, and cloudy dialysate. Dialysate of PD-related peritonitis caused by *P. multocida* has a wide range of WBC counts (200–16,000 cells/mm³) with increased levels of PMN leukocytes. However, Gram staining of dialysate or blood culture is usually negative [4].

It is reported that *P. multocida* is susceptible to antibiotics, including penicillin, ampicillin, amoxicillin–clavulanic acid, aminoglycosides, fluoroquinolones, cephalosporins, and vancomycin. Although the duration of antibiotic therapy has not yet been determined, results of previous reports suggest that 2–3 weeks of intraperitoneal antibiotic treatment should suffice [5].

Besides clinical therapies, because there is a possibility of transmission of *P. multocida* infection through contact (e.g., biting and scratching) with an infected animal, these pet animals should be kept away from PD catheters, bags, or tubes while the patients perform their own dialysis at home. The more desirable way to prevent transmission of infection is not to have a pet at the patient’s home.

In conclusion, we report a rare case of PD-related peritonitis caused by *P. multocida* in a CAPD patient. There was no evidence of puncture of dialysis tubes or leakage of PD fluid, and therefore, we suspected possible contamination of the dialysis bags by household cats’ scratches or licks when the patient left the dialysis room. There was also a possibility of transmission of patient’s oropharyngeal colonization with *P. multocida* via her hands to the dialysis supplies. Because many people have pets at home, they should be reminded that pets are a possible source of peritonel contamination for PD patients. Therefore, domestic animals should be kept away from PD catheters, bags, or tubes and should not be allowed in the room during exchanges.

**Conflicts of interest**

The authors declare there is no conflict of interest.

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