



## Case Report

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

Il Kim, Young Wook Kim, SungJin Chung, Hye Eun Yoon, Seok Joon Shin\*

Department of Internal Medicine, Incheon St. Mary's Hospital, The Catholic University of Korea, Incheon, Korea

## A B S T R A C T

## Article history:

Received 22 April 2013  
 Received in revised form  
 23 September 2013  
 Accepted 23 October 2013  
 Available online 29 January 2014

## Keywords:

Cat  
*Pasteurella multocida*  
 Peritoneal dialysis  
 Peritonitis

*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.

© 2014. The Korean Society of Nephrology. Published by Elsevier. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## Introduction

*Pasteurella multocida* is an aerobic Gram-negative coccobacillus, 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

\* Corresponding author. Division of Nephrology, Department of Internal Medicine, Incheon St. Mary's Hospital, The Catholic University of Korea, 56 Dongsu-ro, Bupyeong-gu, Incheon 403-720, Korea.  
 E-mail address: imkidney@catholic.ac.kr (SJ Shin).

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<sup>3</sup>; hemoglobin, 11.3 g/dL; hematocrit, 33.7%; platelet count, 337 × 10<sup>3</sup>/mm<sup>3</sup>; 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 and gentamicin. The patient's initial dialysate WBC count was 4,992/mm<sup>3</sup> with 98% polymorphonuclear (PMN) cells, and the red blood cell count was 86/mm<sup>3</sup>. Gram staining of the collected peritoneal fluid was negative. Bacterial culture results indicated that the organism was *P. multocida*, which was found to be sensitive to ampicillin, ampicillin/sulbactam, cefazolin, gentamicin, imipenem, levofloxacin, 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<sup>3</sup>, 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 in her room and did not find any puncture or tearing of dialysis bags, and therefore, she was unsure whether the cats had come into the room and had contact with the CAPD bags and tubes.

## 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

**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
Loghman et al [10]	12/Female	CCPD	Cat exposure	Positive	Gentamicin
Chadha 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, levofloxacin
Mugambi et al [1]	36/Female	CCPD	Cat exposure	Positive	Ciprofloxacin
Uribarri 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
Hamai 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	Cefazolin
Paul et al [23]	55/Female	CCPD	Cat exposure	Positive	Gentamicin
Joh et al [24]	55/Male	CCPD	Cat exposure	Positive	Gentamicin, ampicillin/sulbactam
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.

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/mm<sup>3</sup>) 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 peritoneal 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.

## References

- [1] Mugambi SM, Ullian ME: Bacteremia, sepsis, and peritonitis with *Pasteurella multocida* in a peritoneal dialysis patient. *Perit Dial Int* 30:381–383, 2010
- [2] Mat O, Moenens F, Beauwens R, Rossi C, Muniz-Martinez MC, Mestrez F, Dhaene M: Indolent *Pasteurella multocida* peritonitis in a CCPD patient. 25 Years of “cat-bite peritonitis”: a review. *Perit Dial Int* 25:88–90, 2005
- [3] Sol PM, van de Kar NC, Schreuder MF: Cat induced *Pasteurella multocida* peritonitis in peritoneal dialysis: a case report and review of the literature. *Int J Hyg Environ Health* 216:211–213, 2013
- [4] Rondon-Berrios H, Trevejo-Nunez GJ: Pets or pest: peritoneal dialysis-related peritonitis due to *Pasteurella multocida*. *J Microbiol Immunol Infect* 43:155–158, 2010
- [5] Antony SJ, Oglesby KA: Peritonitis associated with *Pasteurella multocida* in peritoneal dialysis patients—case report and review of the literature. *Clin Nephrol* 68:52–56, 2007
- [6] Frankel AH, Cassidy MJ: *Pasteurella multocida* peritonitis in CAPD: beware of the cats. *Perit Dial Int* 11:184–185, 1991
- [7] Kitching AR, Macdonald A, Hatfield PJ: *Pasteurella multocida* infection in continuous ambulatory peritoneal dialysis. *NZ Med J* 109:59, 1996
- [8] MacKay K, Brown L, Hudson F: *Pasteurella multocida* peritonitis in peritoneal dialysis patients: beware of the cat. *Perit Dial Int* 17:608–610, 1997
- [9] Cooke FJ, Kodjo A, Clutterbuck EJ, Bamford KB: A case of *Pasteurella multocida* peritoneal dialysis-associated peritonitis and review of the literature. *Int J Infect Dis* 8:171–174, 2004
- [10] Loghman-Adham M: *Pasteurella multocida* peritonitis in patients undergoing peritoneal dialysis. *Pediatr Nephrol* 11:353–354, 1997
- [11] Chadha V, Warady BA: *Capnocytophaga canimorsus* peritonitis in a pediatric peritoneal dialysis patient. *Pediatr Nephrol* 13:646–648, 1999
- [12] Malik A, Mailey KS, Bastani B: *Pasteurella multocida* peritoneal dialysis-associated peritonitis: a report of two cases and review of the literature. *J Nephrol* 18:791–793, 2005
- [13] Van Langenhove, Daelemans R, Zachee P, Lins RL: *Pasteurella multocida* as a rare cause of peritonitis in peritoneal dialysis. *Nephron* 85:283–284, 2000
- [14] Kanaan N, Gavage P, Janssens M, Avesani V, Gigi J, Goffin E: *Pasteurella multocida* in peritoneal dialysis: a rare cause of peritonitis associated with exposure to domestic cats. *Acta Clin Belg* 57:254–256, 2002
- [15] Eelsey RM, Carson RW, DuBose Jr TD: *Pasteurella multocida* peritonitis in an HIV-positive patient on continuous cycling peritoneal dialysis. *Am J Nephrol* 11:61–63, 1991
- [16] Uribarri J, Bottone EJ, London RD: *Pasteurella multocida* peritonitis: are peritoneal dialysis patients on cyclers at increased risk? *Perit Dial Int* 16:648–649, 1996
- [17] Musio F, Tiu A: *Pasteurella multocida* peritonitis in peritoneal dialysis. *Clin Nephrol* 49:258–261, 1998
- [18] Breton-Jr M, Salavert LM, Viudes FA, Perez BC, Gobernado SM: Abdominal infection by *Pasteurella* spp. A report of 3 cases. *Rev Clin Esp* 200:139–142, 2000
- [19] Olea T, Hevia C, Bajo MA, del PG, Selgas R: *Pasteurella multocida* and *Candida albicans* peritonitis. *Nefrologia* 26:136–138, 2006
- [20] Sillery J, Hargreaves J, Marin P, Lerma E, Kuznia C, Abbe C: *Pasteurella multocida* peritonitis: another risk of animal-assisted therapy. *Infect Contr Hosp Epidemiol* 25:5–6, 2004
- [21] Hamai K, Imai H, Ohtani H, Komatsuda A, Kodama T, Wakui H: Repeated cat-associated peritonitis in a patient on automated nocturnal intermittent peritoneal dialysis. *Clin Exp Nephrol* 3:59–61, 1999
- [22] London RD, Bottone EJ: *Pasteurella multocida*: zoonotic cause of peritonitis in a patient undergoing peritoneal dialysis. *Am J Med* 91:202–204, 1991
- [23] Paul RV, Rostand SG: Cat-bite peritonitis: *Pasteurella multocida* peritonitis following feline contamination of peritoneal dialysis tubing. *Am J Kidney Dis* 10:318–319, 1987
- [24] Joh J, Padmanabhan R, Bastani B: *Pasteurella multocida* peritonitis following cat bite of peritoneal dialysis tubing. With a brief review of the literature. *Am J Nephrol* 18:258–259, 1998
- [25] Satomura A, Yanai, Fujita T, Arashima Y, Kumasaka K, Nakane C: Peritonitis associated with *Pasteurella multocida*: molecular evidence of zoonotic etiology. *Ther Apher Dial* 14:373–376, 2010