Case Report

Pets or Pest: Peritoneal Dialysis-related Peritonitis due to Pasteurella multocida

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INTRODUCTION

Pasteurella multocida is a pathogen found as a part of the normal oropharyngeal flora of household pets and has been implicated in a range of human diseases. P. multocida is a rare cause of peritoneal-dialysis peritonitis, with only 18 cases reported in the literature to date. Most cases have occurred as a result of a cat either biting, or licking, the peritoneal dialysis tubing. We describe a severe case of P. multocida peritonitis in a patient with end-stage renal disease undergoing continuous cycler peritoneal dialysis believed to be caused by a close contact with a cat.

CASE REPORT

A 38-year-old Native American man with end stage renal disease due to anti-neutrophil cytoplasmic antibody associated vasculitis on continuous cycler peritoneal dialysis for 5 years, presented to the emergency department with a 1-day history of severe, diffuse abdominal pain, subjective fever, chills, and a cloudy peritoneal dialysis effluent. The patient had a significant past medical history of hypertension and anti-neutrophil cytoplasmic antibody associated vasculitis, with a history of multiple pulmonary vasculitic relapses requiring maintenance immuno suppression with prednisone and oral cyclophosphamide.

Physical examination revealed an alert, oriented, and obese man with a blood pressure of 110/70 mmHg, a pulse of 89 beats/min, and a temperature of 37.1°C. A head exam revealed a Cushingoid facies and the cardiopulmonary exam was unremarkable. Abdominal examination revealed a soft abdomen, with moderate to severe tenderness to palpation throughout, moderate guarding with no rebound and normoactive bowel sounds. There was no erythema or discharge at the peritoneal dialysis catheter.

Pasteurella multocida is a Gram-negative bacteria found in the oropharynx of many domestic animals. P. multocida can cause a variety of human infections, but it remains a rare cause of peritoneal dialysis-related peritonitis. We describe a severe case of peritoneal dialysis-related peritonitis due to P. multocida infection caused by close contact with a cat.

KEYWORDS: Pasteurella multocida, peritoneal dialysis, peritonitis

Pasteurella multocida is a pathogen found as a part of the normal oropharyngeal flora of household pets and has been implicated in a range of human diseases. P. multocida is a rare cause of peritoneal-dialysis peritonitis, with only 18 cases reported in the literature to date. Most cases have occurred as a result of a cat either biting, or licking, the peritoneal dialysis tubing. We describe a severe case of P. multocida peritonitis in a patient with end-stage renal disease undergoing continuous cycler peritoneal dialysis believed to be caused by a close contact with a cat.
exit site. The tubing of the peritoneal dialysis catheter was intact with no macroscopic evidence of damage.

Laboratory tests revealed a white blood cell (WBC) count of $5.7 \times 10^3/\mu L$, hemoglobin of 8.7 g/dL, hematocrit of 25.5%, and a platelet count of $109 \times 10^3/\mu L$. His serum chemistries were as follows: sodium $= 141$ mmol/L, potassium $= 3.3$ mmol/L, chloride $= 98$ mmol/L, total carbon dioxide $= 23$ mmol/L, glucose $= 99$ mg/dL, blood urea nitrogen $= 51$ mg/dL and creatinine $= 13.2$ mg/dL. Initial peritoneal fluid analysis revealed a WBC count of 4,936 cells/μL with 96% neutrophils, and a red blood cell count of 149 cells/μL. Gram stain of peritoneal fluid was negative for any organisms. Computed tomography of the abdomen with intravenous contrast revealed no evidence of intra-abdominal pathology.

Based on the history, physical examination and the findings in the peritoneal dialysis fluid, a diagnosis of peritoneal dialysis-related peritonitis was made. Empiric treatment was initiated with vancomycin (2 g intraperitoneally) in a 6-hour dwell every 5 days, and ceftazidime (1 g intraperitoneally) in a 6-hour dwell every day. The patient was stable and was transferred to the medical floor. A few hours after arrival to the medical floor, his systolic blood pressure decreased to 80 mmHg with no response after 1 L of normal saline bolus intravenously. The patient was then transferred to the intensive care unit where vasopressors, stress-dose steroids, and intravenous piperacillin/tazobactam (2.25 g intravenously every 8 hours) and vancomycin (750 mg intravenously every 48 hours) were initiated. His symptoms markedly improved within 72 hours of initiation of therapy. Vancomycin was stopped and treatment with piperacillin/tazobactam continued when preliminary culture report indicated the growth of a Gram-negative rod. Final culture results indicated the organism was *P. multocida*, which was found to be sensitive to ampicillin, ampicillin/sulbactam, cefazolin, gentamicin, imipenem, levofloxacin, and trimethoprim/sulfamethoxazole. The patient was then switched to ampicillin (2 g intravenously every 12 hours) for 7 days. He then completed a 2-week course of oral levofloxacin (750 mg orally every 48 hours) upon discharge. Upon further questioning, the patient reported that he had a cat at home and that the cat had been playing with the tubing leading to the cycler machine the morning before admission. Later that day, during his peritoneal dialysis exchange, he noticed a minimal fluid leakage on the floor. The patient then stopped his drain, immediately disconnected from his y-set, and did two rapid manual exchanges. He did not report the incident to his physician or dialysis unit nurse coordinator. Due to the severity of his infection, the peritoneal dialysis catheter was removed and the patient switched to hemodialysis. He has been on hemodialysis ever since and continues to do well.

**Discussion**

*P. multocida* is a small Gram-negative coccobacillus that is a component of the normal upper respiratory tract flora of fowl and mammals, especially felines.1,2 A wide range of infections have been reported, including soft tissue infections and, less commonly, septic arthritis, osteomyelitis, sepsis, and meningitis, particularly in immunocompromised hosts.1,3

*P. multocida* is a rare cause of peritoneal dialysis-related peritonitis. A review of the literature revealed only 18 previously reported cases (Table).4–17 Almost all reported cases of peritonitis complications associated with *P. multocida* were due to close contact with cats. This may reflect the higher prevalence of colonization with *P. multocida* in cats versus dogs (70–90% vs. 50–66%, respectively) and the sharper teeth of cats.2,10

The mechanism of transmission is thought to be due to a cat bite, or scratch, of the peritoneal dialysis tubing, or bags, though exposure without biting or scratching and even the absence of any exposure has been described.2,5,6,10,12–14

Patients who have household cats have a high prevalence of oropharyngeal colonization with *P. multocida*. This is demonstrated by the finding that one third of animal breeders whose livestock had suffered from Pasteurellosis were found to be oropharyngeal carriers of this organism.10 Therefore, potential contamination resulting from break in technique could also be possible.10 Despite the preponderance of continuous ambulatory peritoneal dialysis, most of the reported cases of *P. multocida* peritonitis are in patients on CCPD. One possible explanation for this is that the length of tubes necessary for the cycler makes them attractive toys for cats, or that they stay in prolonged contact with the environment, as opposed to continuous ambulatory peritoneal dialysis.2

The onset of symptoms in patients with *P. multocida* peritoneal dialysis-related peritonitis is typically less than
### Table. Reported cases of peritoneal dialysis-related peritonitis due to *P. multocida*

<table>
<thead>
<tr>
<th>Case</th>
<th>Age (yr)/sex</th>
<th>Etiology of end stage renal disease</th>
<th>Other comorbidities</th>
<th>PD type</th>
<th>Animal exposure</th>
<th>PD tubing break/leak</th>
<th>Treatment</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>55/F</td>
<td>Hypertension</td>
<td>–</td>
<td>CCPD</td>
<td>Cat</td>
<td>Yes</td>
<td>Vancomycin IP, Gentamicin IP</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>25/M</td>
<td>Alport’s syndrome</td>
<td>HIV</td>
<td>CCPD</td>
<td>Cat</td>
<td>No</td>
<td>Gentamicin IP, Cephradine IP</td>
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<tr>
<td>3</td>
<td>55/M</td>
<td>Polyarteritis nodosa</td>
<td>–</td>
<td>CAPD</td>
<td>Cat</td>
<td>No</td>
<td>Vancomycin IP, Gentamicin IP, Ciprofloxacin PO</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>54/M</td>
<td>Hypertension</td>
<td>–</td>
<td>CCPD</td>
<td>Cat</td>
<td>Yes</td>
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<tr>
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<td>75/M</td>
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<td>–</td>
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<td>Cat</td>
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<td>Vancomycin IP, Cefamandole IP</td>
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</tr>
<tr>
<td>6</td>
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<td>–</td>
<td>CCPD</td>
<td>Cat</td>
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<td>Vancomycin IP, Gentamicin IP, Penicillin PO</td>
<td>9</td>
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<tr>
<td>7</td>
<td>12/F</td>
<td>Focal segmental glomerulosclerosis</td>
<td>–</td>
<td>CCPD</td>
<td>Cat</td>
<td>Yes</td>
<td>Cephapirin IP, Gentamicin IP</td>
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</tr>
<tr>
<td>8</td>
<td>73/M</td>
<td>Chronic glomerulonephritis</td>
<td>–</td>
<td>CAPD</td>
<td>Cat</td>
<td>No</td>
<td>Vancomycin IP, Ceftazidime IP</td>
<td>10</td>
</tr>
<tr>
<td>9</td>
<td>55/M</td>
<td>Polyarteritis nodosa</td>
<td>–</td>
<td>CCPD</td>
<td>Cat</td>
<td>Yes</td>
<td>Vancomycin IP, Gentamicin IP, Amoxicillin/Sulbactam PO</td>
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<tr>
<td>10</td>
<td>47/F</td>
<td>Type 1 DM</td>
<td>–</td>
<td>CCPD</td>
<td>Cat</td>
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<td>Piperacillin IV, Ciprofloxacin PO</td>
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<tr>
<td>11</td>
<td>22/F</td>
<td>Medullary cystic kidney disease</td>
<td>–</td>
<td>CCPD</td>
<td>Cat</td>
<td>Yes</td>
<td>Vancomycin IP, Amikacin IP, Ciprofloxacin PO</td>
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<tr>
<td>12</td>
<td>24/F</td>
<td>Chronic pyelonephritis</td>
<td>–</td>
<td>CCPD</td>
<td>Cat</td>
<td>No</td>
<td>Ciprofloxacin PO</td>
<td>13</td>
</tr>
<tr>
<td>13</td>
<td>52/M</td>
<td>IgA Nephropathy</td>
<td>Hypertension, gout</td>
<td>CCPD</td>
<td>Cat</td>
<td>No</td>
<td>Amykacin IP, Cefazolin IP</td>
<td>2</td>
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<tr>
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<td>48/M</td>
<td>–</td>
<td>–</td>
<td>CCPD</td>
<td>Cat</td>
<td>No</td>
<td>Cefazolin IP, Gentamicin IP, Amoxicillin IV</td>
<td>14</td>
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<tr>
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<td>73/F</td>
<td>Autosomal dominant polycystic kidney disease</td>
<td>–</td>
<td>CAPD</td>
<td>Cat</td>
<td>Yes</td>
<td>Vancomycin IP, Gentamicin IP, Ciprofloxacin PO</td>
<td>15</td>
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<tr>
<td>16</td>
<td>21/F</td>
<td>Congenital small kidneys</td>
<td>–</td>
<td>CCPD</td>
<td>Cat</td>
<td>Yes</td>
<td>Gentamicin IP, Ceftazidime IP</td>
<td>16</td>
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<tr>
<td>17</td>
<td>58/M</td>
<td>Cyclosporine nephrotoxicity</td>
<td>Orthotopic heart transplant</td>
<td>CCPD</td>
<td>Cat</td>
<td>Yes</td>
<td>Gentamicin IP, Vancomycin IP</td>
<td>16</td>
</tr>
<tr>
<td>18</td>
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<td>Hypertension, type 2 DM</td>
<td>–</td>
<td>CAPD</td>
<td>Dog</td>
<td>No</td>
<td>Cefazolin IP, Gentamicin IP</td>
<td>17</td>
</tr>
</tbody>
</table>

*aAll patients were fully recovered after treatment. PD = Peritoneal dialysis; F = female; M = male; CCPD = continuous cycler peritoneal dialysis; CAPD = continuous ambulatory peritoneal dialysis; IP = intraperitoneally; PO = orally; IV = intravenously; DM = diabetes mellitus.*
24 hours.\textsuperscript{10} Patients usually present with low grade temperature, severe abdominal pain, and a cloudy effluent. Nausea and vomiting are sometimes reported. Peripheral WBC counts can vary from normal to severe leukocytosis with bandemia. Peritoneal dialysate WBC counts are usually very elevated. Gram staining of the peritoneal dialysate is usually negative. Almost all patients recover from symptoms within 48–96 hours of the initiation of antibiotic therapy.

Penicillin is the antibiotic of choice for \textit{P. multocida} infection although aminoglycosides, fluoroquinolones, and cephalosporins are also effective. Vancomycin is usually not effective.\textsuperscript{1,2,10} The appropriate duration of antibiotic therapy has not been defined, but it appears from the current literature that 3 weeks of antibiotics should be sufficient.

In conclusion, \textit{P. multocida} peritonitis in patients undergoing peritoneal dialysis is a rare occurrence that has been almost exclusively associated with the biting or licking of the dialysis tubing, or peritoneal dialysis bags, by domestic cats. It is clear from our case presentation that the supposedly healing touch of a dog’s, or cat’s, tongue could be fatal for a patient undergoing peritoneal dialysis. We recommend that peritoneal dialysis patients who have pets at home should be alerted to the danger of acquiring infections from them. Personal hygiene when handling pets should be emphasized. Also, pets should be kept away from designated bag changing areas, especially during exchanges.\textsuperscript{18}

References