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Campylobacter fetus Peritonitis and Bacteremia in a Patient Undergoing Continuous Ambulatory Peritoneal Dialysis[▽]

M. P. Romero Gómez,[1]* A. García-Perea,[1] G. Ruiz Carrascoso,[2] M. A. Bajo,[3] and J. Mingorance[2]

Servicio de Microbiología y Parasitología, Hospital Universitario La Paz, Paseo de la Castellana, 261, 28046 Madrid, Spain[1]; Unidad de Investigación, Hospital Universitario La Paz, Paseo de la Castellana, 261, 28046 Madrid, Spain[2]; and Servicio de Nefrología, Hospital Universitario La Paz, Paseo de la Castellana, 261, 28046 Madrid, Spain[3]

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We report a case of *Campylobacter fetus* peritonitis and bacteremia in a patient undergoing continuous ambulatory peritoneal dialysis.

CASE REPORT

The patient was a 29-year-old woman with chronic renal insufficiency secondary to vasculitis. Her renal function had been gradually deteriorating, and in October 2008, she underwent continuous ambulatory peritoneal dialysis (CAPD) therapy accompanied with oral cyclophosphamide (75 mg/day) and steroids (20 mg/day). In March 2009, she was admitted to our CAPD unit with a 3-day history of fever (38.0°C), abdominal pain, and diarrhea. She reported a cloudy peritoneal effluent 12 h after an incorrect manipulation of connecting the bag to the peritoneal catheter. On physical examination, her blood pressure was 120/75 mmHg, pulse rate was 76 beats per minute (bpm), and body temperature was 36.8°C, and she complained of diffuse abdominal pain on palpation. The peritoneal effluent was cloudy and contained 4,160 leukocytes/μl, with 93% polymorphonuclear cells, 2% lymphocytes, 5% macrophages, and no red cells. The Gram stain revealed numerous polymorphonuclear leukocytes but no microorganisms. A sample of peritoneal effluent was collected for culture on the following three agar plates: sheep blood agar, chocolate blood agar, and *Brucella* blood agar plates. The sheep blood agar and chocolate blood agar plates were incubated at 35°C in an atmosphere with 5% CO_2 for 48 h. The *Brucella* blood agar was incubated at 35°C in an anaerobic atmosphere for 2 days. After 48 h of incubation, a pure culture of small gram-negative curved rods was obtained in sheep blood agar and anaerobe blood agar media. Both were identified as *Campylobacter* spp. (positive oxidase reaction, negative hippurate test, and in vitro sensitivity to nalidixic acid). We used pyrosequencing of three variable regions of the 16S rRNA genes with a PyroMarkID system (Biotage, Sweden) for species identification. Briefly, fragments of hypervariable regions V1, V3, and V6 were sequenced, yielding a total of 110 bp (1). A BLAST search (http://blast.ncbi.nlm.nih.gov/Blast.cgi) of GenBank unambiguously identified the isolate as *Campylobacter fetus* (100% sequence identity to fragments 58 to 93, 435 to 473, and 987 to 1018 of *C. fetus* strain 03-427; GenBank accession number AY621303).

A clinical diagnosis of peritonitis was made, and the patient was discharged with intraperitoneal broad-spectrum antibiotic therapy [vancomycin (1 g/day), tobramycin (50 mg/day), and ampicillin (1 g/day)]. Two days later, she came in for a control visit without symptoms of diarrhea, abdominal pain, or fever. The peritoneal effluent appeared clear (250 leukocytes/μl, with 34% polymorphonuclear cells, 20% lymphocytes, 2% eosinophils, and 44% macrophages). The culture of the peritoneal effluent was sterile. Two days later, she came in again for a new control. The peritoneal fluid had 50 leukocytes/μl, with 7% polymorphonuclear cells, 19% lymphocytes, and 74% macrophages. Microbiological culture was sterile again. The ampicillin treatment was discontinued, but intraperitoneal treatment with vancomycin (1 g/day) and tobramycin (50 mg/day) was maintained for another 2 weeks.

Four months later, the patient came to our hospital with pain and erythema in the left ankle and diffuse thoracic pain, with fever as high as 38°C, a blood pressure of 90/60 mmHg, and a heart rate of 72 bpm. Laboratory tests showed a hemoglobin concentration of 8.5 g/dl, a leukocyte count of 7.20×10^3 leukocytes/μl (92.9% polymorphonuclear cells), a platelet count of 293×10^3 platelets/μl, a C-reactive protein (CRP) level of 65.70 mg/liter, a serum creatinine level of 7.98 mg/dl, a bicarbonate level of 28.3 mmol/liter, and a lactic dehydrogenase level of 193 IU/liter.

Clinical examination revealed severe pain in the left ankle. She did not report prior trauma, recent travel, or any exposure to animals or unpasteurized food products. The initial clinical impression was sepsis secondary to cellulitis. Samples were taken for blood culture, and an intravenous regimen of teicoplanin (400 mg/day) and ceftriaxone (1 g/day) was started.

Blood cultures were incubated in an automated VersaTrek culture system (Trek Diagnostic Systems, Inc.). Both aerobic and anaerobic bottle cultures became positive after 2 days of incubation for faintly staining slender, spiral, and gram-negative bacilli. Samples from two bottles were subcultured onto 5% sheep blood agar, chocolate agar, and Preston *Campylobacter* selective agar. The plates were incubated at 36°C in a 5% CO_2 atmosphere. The sheep blood agar and Preston agar plates were also incubated in a microaerophilic atmosphere at 42°C, but there was no growth after 48 h. The organism was identified as *C. fetus* by the cell morphology on wet preparation, the positive catalase test, the negative hippurate test,

* Corresponding author. Mailing address: Servicio de Microbiología y Parasitología, Hospital Universitario La Paz, Paseo de la Castellana, 261, 28046 Madrid, Spain. Phone: 34 91 727 72 48. Fax: 34 91 727 73 72. E-mail: mpromero.hulp@salud.madrid.org.

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resistance to nalidixic acid, susceptibility to cephalothin, and inability to grow at 42°C. According to disk sensitivity test results and using the breakpoints recommended by the CLSI for *Campylobacter* spp., the isolate was sensitive to erythromycin, gentamicin, ceftriaxone, clindamycin, tetracycline, and chloramphenicol and was resistant to ciprofloxacin. The phenotypic identification was confirmed by 16S rRNA gene pyrosequencing.

The patient's subsequent hospital course was uneventful, and 6 days after admission, she was discharged on the above-described oral therapy with amoxicillin-clavulanic acid (1 g/8 h). On follow-up as an outpatient, she remains well at the present time.

Discussion. Continuous ambulatory peritoneal dialysis (CAPD)-associated peritonitis is the most common complication of this type of renal replacement therapy (9). Most series have found CoNS to be the most frequently encountered agents (40 to 60% of all positive cultures), followed by *S. aureus* and *Streptococcus* spp. (10 to 20% each), members of the family *Enterobacteriaceae* (5 to 20%), nonfermentative gram-negative rods (3 to 15%), and gram-positive rods (2 to 4%). Values for mixed bacteria, fungi, mycobacteria, and anaerobes are generally lower than 5% (2, 7). *Campylobacter fetus* bacteria are unusual causes of peritonitis, and to our knowledge, only one case (8) of *C. fetus* peritonitis and bacteremia in a patient undergoing continuous ambulatory peritoneal dialysis has been reported in the medical literature.

C. fetus is a gram-negative, slender, spirally curved bacterial pathogen. In contrast to other *Campylobacter* species infections, *C. fetus* infections are associated with debilitated or immunosuppressed patients. In the present case, the patient had been receiving treatment with oral cyclophosphamide and steroids for 6 months before the first infectious episode because her renal function had been gradually deteriorating. *C. fetus* has been reported as a cause of extraintestinal infections, including enteritis, bacteremia after medical device, peritonitis, pneumonia, pleuritis, and meningitis (3–6). Bacteremia is the most common infection, while it is an unusual cause of diarrhea. *C. fetus* seems to have a predilection for the vascular endothelium and can predispose patients to septic thrombophlebitis, endocarditis, infected aneurysms, and cellulitis as a result of bacterial insult to the endothelium (3, 4).

To our knowledge, this is the second (8) case of *C. fetus* bacteremia after previous peritonitis in a patient undergoing continuous ambulatory peritoneal dialysis reported in the medical literature.

In the first case reported, the patient was a 62-year-old man being treated by CAPD, who developed peritonitis due to *C. fetus*, received antibiotic therapy, and relapsed 6 weeks later with septicemia. Blood culture yielded a similar organism, thereby suggesting that a clinically silent metastatic infection originated during the episode of peritonitis, probably at an old arteriovenous fistula. In that case, those authors suggested the following two possible sources of *C. fetus* infection: a direct contamination of the peritoneal catheter from the hands of the patient, who had bought a puppy 3 weeks before developing his peritonitis or, more probably in view of the time lag, penetration through the intestinal mucosa after oral ingestion.

The portal of entry of the pathogen in the present case is not known, but the patient related an incorrect manipulation of connecting the bag to the peritoneal catheter, so it seems likely that the peritonitis followed a septic manipulation of the peritoneal catheter. Contamination of the peritoneal cavity could also follow transluminal migration of intestinal bacteria after alterations in the peritoneal wall, the intestinal wall, or both, owing to their permanent bathing with dialysate. In the second admission into the hospital, the clinical examination revealed a severe pain in the left ankle, and the initial clinical impression was septic cellulitis. *C. fetus* seems to have predilection for the vascular endothelium, and this suggests, again, that a silent infection might have developed during the episode of peritonitis in the left ankle of the patient, probably at the level of vascular endothelial tissue, and was the cause of the bacteremia in the second episode of infection. However, this could not be confirmed because no tissue specimens were sent for microbiological culture.

In summary, *C. fetus* peritonitis and bacteremia associated with CAPD are uncommon, but the risk of relapses after apparently successful treatment seems to be high in these cases.

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