

Ciprofloxacin Treatment of Bacterial Peritonitis Associated with Chronic Ambulatory Peritoneal Dialysis Caused by *Neisseria cinerea*

M. Taegtmeier,^{1*} R. Saxena,² J. E. Corkill,³ H. Anijeet,² and C. M. Parry³

Tropical and Infectious Diseases Unit,¹ Department of Renal Medicine,² and Department of Medical Microbiology and Genitourinary Medicine,³ Royal Liverpool University Hospital, Prescot Street, Liverpool L7 8XP, United Kingdom

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Bacterial peritonitis is a well-recognized complication of chronic ambulatory peritoneal dialysis (CAPD) in patients with end-stage renal failure. We present a case of peritonitis due to an unusual pathogen, *Neisseria cinerea*, unresponsive to the standard intraperitoneal (i.p.) vancomycin and gentamicin, which responded rapidly to oral ciprofloxacin.

CASE REPORT

At the end of December 2005, a 38-year-old man with end-stage renal failure, managed with CAPD for 2.5 years, was admitted with diarrhea, severe abdominal pain, and cloudy peritoneal dialysis fluid. The patient was an insulin-dependent diabetic with a number of complications other than renal failure. These included peripheral and autonomic neuropathy, ischemic heart disease, and two previous myocardial infarctions. He had had one previous episode of peritonitis 1.5 years prior to this admission, although no organism was isolated at the time. At the time of admission, he was taking flucloxacillin orally at a dose of 500 mg four times daily for an infected foot ulcer.

He was admitted to the hospital because of a 2-day history of diarrhea and a 1-day history of severe abdominal pain with nausea and vomiting. He recognized the cloudy dialysis fluid and diagnosed himself with peritonitis. On examination, he was afebrile, with a diffusely tender abdomen. The exit site of the peritoneal dialysis cannula was not inflamed. Investigations revealed a dialysis fluid cell count of 2,582 white blood cells per μl and 96% polymorphs but with no organisms seen on the Gram stain of a spun deposit and a C-reactive protein (CRP) level that was elevated at 135 mg/liter.

His empirical treatment was a standard regimen of i.p. vancomycin (2 g) on day 1 and gentamicin (40 mg) in the last peritoneal fluid exchange of each day. However, 2 days after initiating treatment he remained unwell with a tender abdomen and his CRP level had risen further to 314 mg/liter. At this stage, the microbiology laboratory reported that a *Neisseria* species had been isolated from his initial dialysis fluid and treatment with ciprofloxacin (500 mg orally twice daily) was commenced. His i.p. vancomycin was stopped, but the gentamicin was continued. Within 24 h, his symptoms had improved and his CRP level and peritoneal dialysis fluid cell count declined over the succeeding days. He completed a course of oral ciprofloxacin and i.p. gentamicin for 10 days with full recovery from peritonitis.

A spun deposit of the admission sample of cloudy dialysate had been cultured on blood and chocolate agar in an atmosphere with increased carbon dioxide, and a further sample of the unspun fluid had been injected into standard blood culture bottles (BacT/Alert; bioMérieux, Basingstoke, United Kingdom). Direct culture plates were negative after 48 h of incubation, but the fluid inoculated into the blood culture bottles yielded an oxidase-positive, gram-negative diplococcus. The isolate was identified as *N. cinerea* on the basis of biochemical

TABLE 1. Case reports and outcomes of *Neisseria* peritonitis associated with CAPD

<i>Neisseria</i> sp.	Yr	Initial antimicrobial(s)	Eventual antimicrobial(s)	Outcome	Reference
<i>N. cinerea</i>	1994	Vancomycin (i.p.), tobramycin (i.p.)	Ciprofloxacin (i.p.), ceftriaxone (i.v.) ^a	Cure	6
<i>N. cinerea</i>	1996	Vancomycin (i.p.), gentamicin (i.p.)	Vancomycin (i.p.)	Cure	5
<i>N. cinerea</i>	2006	Vancomycin (i.p.), gentamicin (i.p.)	Ciprofloxacin (oral), gentamicin (i.p.)	Cure	This report
<i>N. meningitidis</i>	1995	Vancomycin (i.p.), gentamicin (i.p.)	Ceftriaxone (i.v.), ciprofloxacin (i.v.)	Death	8
<i>N. meningitidis</i>	1998	Vancomycin (i.p.)	Penicillin (oral)	Cure	3
<i>N. mucosa</i>	1993	Vancomycin (i.p.), ceftazidime (i.p.)	Vancomycin (i.p.), ceftazidime (i.p.)	Cure	12
<i>N. mucosa</i>	2003	Cefazolin (i.p.), tobramycin (i.p.)	Ceftriaxone (i.p.)		11
<i>N. mucosa</i>	2005	Cephalothin (i.p.), gentamicin (i.p.)	Ceftriaxone (i.p.)	Cure	14
<i>N. sicca</i>	1994	Vancomycin (i.p.)	Ceftazidime (i.p.)	Cure	13
<i>N. sicca</i>	2001	None	Levofloxacin	Cure	10
<i>N. subflava</i> biovar <i>perflava</i>	1999	Cotrimoxazole (oral)	Ceftazidime (i.p.)	Cure	15

^a i.v., intravenous.

* Corresponding author. Mailing address: Tropical and Infectious Diseases Unit, Royal Liverpool University Hospital, Prescot Street, Liverpool L7 8XP, United Kingdom. Phone: 44 151 706 3835. Fax: 44 151 706 5944. E-mail: miriamt2000@yahoo.com.

testing (API/NH; bioMérieux, Basingstoke, United Kingdom) and 16S rRNA gene sequencing. The isolate was susceptible to ciprofloxacin (MIC, 0.012 mg/liter by E test [BioStat, Stockport, United Kingdom]) but resistant to vancomycin (MIC, >256 mg/liter). The gentamicin MIC was 1 mg/liter, and the oxacillin MIC was 24 mg/liter.

N. cinerea is generally considered a nonpathogenic organism that is a common nasal and oropharyngeal commensal (9). There are rare reports of its causing tonsillitis, lymphadenitis (2), and proctitis (4). A patient with systemic lupus erythematosus was reported as having had *N. cinerea* causing CAPD-associated peritonitis on two separate occasions (5, 6). Other *Neisseria* species have caused CAPD-associated peritonitis, as summarized in Table 1. In most of these reports, the peritonitis failed to respond to the standard empirical therapy of i.p. vancomycin and gentamicin (7). In three cases, therapy with a fluoroquinolone was effective, as in the present case. In this case, although the gentamicin MIC for the organism was 1 mg/liter, the patient failed to respond to the initial i.p. therapy, perhaps because of the poor intracellular penetration of gentamicin.

Currently, around 5 to 10% of CAPD-associated peritonitis is culture negative (1) and fastidious organisms such as *Neisseria* species may contribute to this value. While some do respond to a combination of vancomycin and gentamicin, the lack of response to standard first-line i.p. therapy should alert clinicians to the possibility of a rarer cause of peritonitis, in this case an oropharyngeal organism. Oral ciprofloxacin is a simple and well-tolerated antimicrobial that could be considered a useful addition to empirical therapy under these circumstances.

REFERENCES

- Bunke, M., M. E. Brier, and T. A. Golper. 1994. Culture-negative CAPD peritonitis: the Network 9 Study. *Adv. Perit. Dial.* **10**:174–178.
- Clausen, C. R., J. S. Knapp, and P. A. Totten. 1984. Lymphadenitis due to *Neisseria cinerea*. *Lancet* **1**:908.
- Conrads, G., G. Haase, N. Schnitzler, I. Ehrhard, and H. Schmitt. 1998. *Neisseria meningitidis* serogroup B peritonitis associated with continuous ambulatory peritoneal dialysis. *Eur. J. Clin. Microbiol. Infect. Dis.* **17**:341–343.
- Dossett, J. H., P. C. Appelbaum, J. S. Knapp, and P. A. Totten. 1985. Proctitis associated with *Neisseria cinerea* misidentified as *Neisseria gonorrhoeae* in a child. *J. Clin. Microbiol.* **21**:575–577.
- George, M. J., J. A. DeBin, K. E. Preston, C. Chiu, and S. S. Haqqie. 1996. Recurrent bacterial peritonitis caused by *Neisseria cinerea* in a chronic ambulatory peritoneal dialysis (CAPD) patient. *Diagn. Microbiol. Infect. Dis.* **26**:91–93.
- Haqqie, S. S., C. Chiu, and G. R. Bailie. 1994. Successful treatment of CAPD peritonitis caused by *Neisseria cinerea*. *Perit. Dial. Int.* **14**:193–194.
- Kent, J. R., and M. K. Almond. 2000. A survey of CAPD peritonitis management and outcomes in North and South Thames NHS regions (U.K.): support for the ISPD guidelines. *International Society for Peritoneal Dialysis. Perit. Dial. Int.* **20**:301–305.
- Kleinpeter, M. A., and N. K. Krane. 1995. *Neisseria meningitidis* peritonitis in a CAPD patient: first case report and review of the literature. *Adv. Perit. Dial.* **11**:168–171.
- Knapp, J. S., and E. W. Hook III. 1988. Prevalence and persistence of *Neisseria cinerea* and other *Neisseria* spp. in adults. *J. Clin. Microbiol.* **26**:896–900.
- Konner, P., B. Watschinger, P. Apfalter, W. H. Horl, and A. Vychytil. 2001. A case of continuous ambulatory peritoneal dialysis peritonitis with an uncommon organism and an atypical clinical course. *Am. J. Kidney Dis.* **37**:E10.
- Lee, W. C., W. C. Yang, T. W. Chen, C. H. Huang, and C. C. Lin. 2003. Unusual presentation of *Neisseria mucosa* peritonitis with persistent ultrafiltration failure and clear effluent. *Perit. Dial. Int.* **23**:198–199.
- Macia, M., N. Vega, R. Elcuaz, T. Aterido, and L. Palop. 1993. *Neisseria mucosa* peritonitis in CAPD: another case of the “nonpathogenic” *Neisseriae* infection. *Perit. Dial. Int.* **13**:72–73.
- Neu, A. M., B. Case, H. M. Lederman, and B. A. Fivush. 1994. *Neisseria sicca* peritonitis in a patient maintained on chronic peritoneal dialysis. *Pediatr. Nephrol.* **8**:601–602.
- Shetty, A. K., S. K. Nagaraj, W. B. Lorentz, and M. Bitzan. 2005. Peritonitis due to *Neisseria mucosa* in an adolescent receiving peritoneal dialysis. *Infection* **33**:390–392.
- Vermeij, C. G., D. W. van Dam, H. M. Oosterkamp, and C. A. Verburgh. 1999. *Neisseria subflava* biovar *perflava* peritonitis in a continuous cyclic peritoneal dialysis patient. *Nephrol. Dial. Transplant.* **14**:1608.