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CASE REPORT

Nocardia asteroides peritoneal dialysis-related peritonitis: First case in pediatrics, treated with protracted linezolid

Mohamed El-Naggari[a,*], Ibtisam El Nour[a], Dana Al-Nabhani[a], Zakaria Al Muharrmi[b], Heba Gaafar[c], Anas A.W. Abdelmogheth[a]

[a] *Sultan Qaboos University Hospital, Child Health Department, Oman*
[b] *Sultan Qaboos University Hospital, Microbiology Department, Oman*
[c] *Sultan Qaboos University Hospital, Pharmacy Department, Oman*

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Summary *Nocardia asteroides* is a rare pathogen in peritoneal dialysis-related peritonitis. We report on a 13-year-old female with *Nocardia asteroides* peritonitis complicated by an intra-abdominal abscess. Linezolid was administered intravenously for 3 months and followed by oral therapy for an additional 5 months with close monitoring for adverse effects. The patient was discharged after 3 months of hospitalization on hemodialysis. The diagnosis and management of such cases can be problematic due to the slow growth and difficulty of identifying Nocardia species. The optimal duration of treatment for Nocardia peritonitis is not known. Linezolid can be used for prolonged periods in cases of trimethoprim/sulfamethoxazole-resistant cases with close monitoring for adverse effects.

Introduction

Peritoneal dialysis (PD) is a widely used modality for renal replacement therapy. Peritonitis is a common problem in patients undergoing continuous ambulatory peritoneal dialysis (CAPD) and represents the most frequent cause of hospitalization

* Corresponding author at: Sultan Qaboos University, Child Health Department, PO Box 35, Al-Khod 123, Oman. Tel.: +968 98178236; fax: +968 24144103.
E-mail address: mnaggari@yahoo.com (M. El-Naggari).

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Peritoneal catheter loss, technique failure, discontinuation of CAPD, and mortality are exhibited by these patients. *Staphylococcus* species are usually implicated in infectious cases of peritonitis in patients undergoing CAPD. Fungi and higher bacteria such as *Nocardia asteroides* are less frequent causative agents [1].

Nocardiosis was named after the French veterinarian Edmond Nocard in the late 1800s and is an infection caused by gram-positive aerobic bacteria of the genus *Nocardia* [2]. Despite its universal presence in soil, organic matter and water, *Nocardia* is a rare pathogen of PD-related peritonitis [2]. Human infections are primarily observed in immunocompromised hosts and typically originate in the lungs and then spread to other organ systems, including the brain, skin and kidney [4].

Linezolid is a synthetic oxazolidinone, which is a novel class of antibiotics with clinical utility in the treatment of infections caused by gram-positive aerobic bacteria. Linezolid binds to a site on the bacterial 23S ribosomal RNA of the 50S subunit to prevent the formation of a functional 70S initiation complex, which is an essential component of the bacterial translation process. Linezolid is primarily indicated for the treatment of infections caused by resistant gram-positive organisms particularly methicillin-resistant *Staphylococcus aureus* and vancomycin-resistant *Enterococcus* species. Linezolid also exhibits *in vitro* activities against some gram-negative anaerobes and mycobacterial species, including *Mycobacterium tuberculosis* and *Nocardia* spp. [5—7]. Here, we report the first case of *Nocardia asteroides* peritonitis in a pediatric patient who was treated with a protracted course of linezolid.

Case report

A 13-year-old female had been receiving CAPD for 3 years due to diffuse global sclerosis complicated by end-stage renal failure. She also had familial leukodystrophy with cerebellar ataxia and pyramidal features. She presented with high-grade fever, leakage from the exit site of the peritoneal catheter, and diffuse abdominal pain for 7 days. She was admitted with a suspected catheter exit-site or tunnel infection complicated by peritonitis.

On presentation, she was lethargic, tachypneic (40—45 breaths/min) with no respiratory distress, tachycardic (heart rate 125—135 beats/min), with a temperature of 40.2 °C. Her weight was 18 kg (below the 3rd percentile for age and sex). Physical examinations were all within normal limits except for generalized, mild abdominal tenderness and neurological findings consistent with the primary disease. The exit site exhibited no inflammation, but there was marked dialysate leakage. The laboratory data revealed the following: white cell count 10,300/mm^3, hemoglobin 5.9 g/dL, platelets 505,000/mm^3, C-reactive protein 146 mg/L, albumin 24 g/L, ALT 15 U/L, AST 24 U/L, Na 125 mmol/L, K 3.6 mmol/L, bicarbonate 17 mmol/L, creatinine 847 μmol/L, and urea 20.9 mmol/L. The dialysate was turbid with white sediment, and the leukocyte count 300/mm^3 (neutrophils 90% and lymphocytes 10%). Gram-stain of the dialysate revealed gram-positive bacilli, and a modified Kinyoun stain revealed partially acid-fast branching bacilli. In blood agar, the colonies exhibited a chalky white, cotton candy appearance with reductus on the surface, which denoted *Nocardia* species. The isolate was ultimately identified as *Nocardia* species after 2 weeks of incubation.

The running peritoneal dialysis prescription was for Bicavera peritoneal fluid at a 1000-ml volume, 10-min input, indwelling time of 4 hr and an output of 20 min. We used an alternating cycle of 1.5% and 2.3% for a total of 5 cycles. We used rapid cycles in and out with no rest indwelling time until the fluid was clear because the fluid was still turbid and full of sediment. Next, we initiated a 1.5-h cycle (10 min input with an indwelling time 1 hr and out at 20 min) with a small volume of 600 ml 1.5% glucose. A short-cycle regimen and small fill volume were used for more efficient dialysis and to decrease the dialysate leakage. The patient was initiated on intraperitoneal vancomycin, ciprofloxacin and intravenous (IV) cloxacillin. Amphotericin-B was added after 4 days due to suspected fungal peritonitis. Because no clinical improvement was observed, ciprofloxacin was replaced with intraperitoneal ceftazidime, the IV cloxacillin was stopped, and IV meropenem and amikacin were added. The child went into cardiac arrest and septic shock after 10 days of conservative management with the different antibiotic regimens. A peritoneal culture grew *Nocardia asteroides* after 2 weeks that exhibited sensitivity to linezolid, imipenem and amikacin and resistance to trimethoprim-sulfamethoxazole. Repeated blood culture revealed no growth with no isolation of organisms even after a prolonged incubation period.

The catheter was removed, and the child was managed in the pediatric intensive care unit with continuous venovenous hemofiltration (CVVH), mechanical ventilation and inotropic support. CVVH was performed because the child was very sick, and conventional pediatric hemodialysis is not available in our institute. The case was complicated