Clinical Vignettes

Mycobacterium Porcinum Peritonitis in a Patient on Continuous Ambulatory Peritoneal Dialysis

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Mycobacterium porcinum has been reported to cause a variety of illnesses including wound infections, respiratory tract infections, osteomyelitis and catheter-related bacteremias. We report the first case of *M. porcinum* peritonitis in a patient on continuous ambulatory peritoneal dialysis (CAPD). A 67-year-old woman on CAPD presented with three weeks of constitutional symptoms and abdominal pain. Peritoneal fluid cultures on day three grew acid-fast rods. Nocardiosis was suspected and the patient was empirically treated with amikacin and trimethoprim-sulfamethoxazole. The dialysis catheter was removed. Two weeks later final culture results revealed *M. porcinum*. Ciprofloxacin and trimethoprim-sulfamethoxazole were initiated with good clinical response.

KEY WORDS: mycobacterium; porcinum; peritonitis; dialysis.

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INTRODUCTION

Continuous ambulatory peritoneal dialysis (CAPD) and hemodialysis are effective therapies for end stage renal disease.¹ CAPD is generally offered to young independent patients and those with unstable hemodynamics. It involves multiple exchanges of fluid, electrolytes and waste products during the day, followed by an overnight dwell.² Peritonitis is a common complication of CAPD.³ During the 1960s, this complication occurred as frequently as 5.2–7.5 episodes per patient, per year of dialysis, but this rate has now declined to one case per patient, every 1 to 2 years.^{4,5} Improvements in exchange systems design have helped decrease the occurrence.⁶ Though the incidence is on the decline, nearly 28% of patients switch to hemodialysis because of recurrent peritonitis.^{5,7,8} It is also implicated as a cause of death in 1–6% of patients on peritoneal dialysis (PD).⁹

Fifty percent of cases of CAPD related peritonitis are caused by gram positive cocci (*Staphylococcus epidermidis* and *Staphylococcus aureus*), followed by 15% aerobic gram negative organisms, with fungi, anaerobes and mycobacteria accounting for less than 10% of cultured isolates.^{10,11} In 8%–27% of

cases, the causative organism is not isolated. These cases are collectively termed “culture negative” peritonitis. Nontuberculous mycobacteria (NTM) probably account for a significant number of these infections. Although rare, NTM peritonitis is an important clinical entity as these infections are not well known to clinicians, are difficult to diagnose and can lead to significant morbidity.¹²

Mycobacterium porcinum is a rapidly growing NTM that was recently identified as capable of causing human infections.

We report a case of dialysis catheter-associated peritonitis caused by *M. porcinum* in a patient on CAPD. We also review the literature on *M. porcinum* infections and provide a brief overview on NTM peritonitis, its diagnosis and treatment.

CASE PRESENTATION

A 67-year-old woman with end stage renal disease on CAPD presented with a three-week history of malaise, lethargy, poor appetite, low-grade fever (98–99°F) with night sweats and abdominal discomfort. She also reported one week of non-bloody watery diarrhea that had resolved just prior to admission. She denied any change in color of the peritoneal dialysate. On arrival to the emergency room, she was febrile (101.1°F) and hypotensive (blood pressure 88/50 mmHg). Physical examination revealed minimal abdominal tenderness. The PD catheter exit site did not have any erythema or discharge. The rest of the physical examination was within normal limits. A computerized tomography of the abdomen and pelvis was normal. Peripheral blood white blood cell (WBC) count was 23,800 cells/mm³. Peritoneal fluid analysis showed a WBC count of 2,833 cells/mm³, with 75% polymorphonuclear cells. Gram stain did not reveal bacteria. Empiric intraperitoneal vancomycin and intravenous gentamicin were initiated. On day three, the peritoneal fluid culture showed many colonies of gram-positive, acid fast rods. The organisms were described as linear and beaded, with the colonies having a flaky appearance and a musty odor. Repeat cultures were positive for similar organisms. Based on these microbiologic attributes, Nocardia peritonitis was suspected and the antibiotics were switched to amikacin and trimethoprim-sulfamethoxazole. The isolates were sent out to a reference laboratory for species identification and sensitivity.

The patient continued to have prostration with persistent low grade fever, malaise and poor appetite, raising doubts about our presumptive diagnosis of Nocardia peritonitis. Her clinical course was further complicated by the development of paralytic ileus manifested by abdominal distention, nausea and vomiting. The PD catheter was removed and hemodialysis

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Table 1 Classification of NTM

Runyon Group	Species
Group I: Photochromogens	<i>M. kansasii</i> <i>M. marinum</i>
Group II: Scotochromogens	<i>M. goodii</i> <i>M. scrofulaceum</i>
Group III: Nonchromogens	<i>M. avium</i> complex <i>M. terrae</i> complex <i>M. ulcerans</i> <i>M. xenopi</i> <i>M. simiae</i> <i>M. mageritense</i> <i>M. szulgai</i> <i>M. asiaticum</i>
Group IV: Rapid Growers	<i>M. fortuitum</i> <i>M. porcinum</i> <i>M. chelonae</i> <i>M. abscessus</i>

Source: Runyon, EH. Anonymous mycobacteria in pulmonary disease. *Med Clin North Am* 1959; 43:273

was initiated. Subsequently, the patient showed gradual improvement in symptoms. Two weeks later final peritoneal fluid culture results identified the organism as belonging to Mycobacterium fortuitum group. Further analysis by 16S ribosomal sequencing identified *M. porcinum* as the causative organism. It was sensitive to ciprofloxacin, sulfamethoxazole and linezolid, and was resistant to clarithromycin. Antimicrobial therapy was changed to ciprofloxacin 500 mg after each hemodialysis along with trimethoprim-sulfamethoxazole-DS BID. The patient continued to improve clinically, having no further abdominal complaints or fever. She received a total of six months of therapy with ciprofloxacin and trimethoprim-sulfamethoxazole.

DISCUSSION

Runyon and Thimble classified NTM into four groups: Group I – Photochromogens (slow growing, form pigmented colonies in light), Group II – Scotochromogens (slow growing, form pigmented colonies in dark), Group III – Nonchromogens (slow growing, do not form pigmented colonies) and Group IV – Rapid Growers (Table 1).^{13,14} Rapid growers are so named because, unlike other groups, they form colonies within 7–10 days on special media. *M. porcinum* is a group IV NTM. It is a gram-positive, acid fast, pleomorphic bacillus, negative for pigmentation.¹⁵

Mycobacteria are uncommon causes of peritonitis accounting for 3% of cases. Recent reports, however, suggest that the incidence of NTM peritonitis in patients on CAPD is on the rise.¹⁶ NTM are ubiquitous in nature and are frequently isolated from soil and water.¹¹ Infection of the peritoneum is thought to be initiated via colonization of the dialysis fluid and catheter.¹² As with bacterial infections, fever, abdominal pain and cloudy dialysis fluid are the most common presenting symptoms.¹² But the presentation is generally subacute, with initial vague systemic complaints followed by abdominal symptoms.¹⁷ Vomiting, diarrhea and weight loss may also occur. Long-term complications such as adhesions, dialysis catheter dysfunction, loss of peritoneal clearance and ultrafiltration capacity can occur.¹²

Diagnosis of NTM peritonitis can be challenging. The lack of identification of a likely organism and a lack of clinical

response to empiric antibiotics after 72 hours should alert the physician to the possibility of mycobacterial infection. On culture media, rapidly growing mycobacteria generally require 3–5 days to produce any visible growth.¹⁷ On non-selective media these organisms appear beaded, poorly staining gram-positive rods resembling diphtheroids.⁷ Caution should be exercised not to disregard them as non-pathogenic organism, solely based on their morphologic appearance. If there is a clinical suspicion of NTM peritonitis repeat cultures should always be obtained to confirm the diagnosis and rule out possible environmental contamination because of the ubiquitous nature of these organisms.¹⁸ Once confirmed, NTM should be identified to the species level and tested for susceptibility.

NTM peritonitis should be differentiated from Nocardia peritonitis. CAPD peritonitis due to Nocardia species is exceedingly rare,¹⁹ with the majority of cases occurring in the immunocompromised. Moreover, Nocardia peritonitis is not symptomatically different from other causes of peritonitis.²⁰ In our patient, Nocardia peritonitis was suspected solely based on the microbiologic attributes.

Among NTM, *M. fortuitum* is the most common organism reported to cause CAPD related peritonitis.¹⁷ Reports of peritonitis caused by *M. chelonae*, *M. abscessus* and *M. phlei* have also been published.^{5,7,17} Ours is the first reported case of PD catheter-associated peritonitis caused by *M. porcinum* as a separate species in the literature.

Tsukamura et. al. originally described *M. porcinum* in 1983 as a cause of submandibular lymphadenitis in swine.²¹ But it was not until 2004 that it was identified in human clinical isolates.²² It has been isolated from a variety of in-vivo and ex-vivo sources. Wallace et. al.¹⁵ in their review identified 45 clinical isolates of *M. porcinum*. The most common site of isolation was wound infections (62%), followed by respiratory (18%), central intravenous catheter related infections (16%) and lymph nodes (2%). They also reported two isolates from tap water in a bone marrow transplant unit. Geographically, most of their isolates (82%) came from southern coastal states of the United States. Later Schinsky and coworkers²² in 2001 described 13 clinical isolates of *M. porcinum* predominantly originating in wounds and respiratory tract. *M. porcinum* post-operative sternal osteomyelitis has also been cited in the literature.²³ Although Wallace et al. have reported a peritoneal catheter exit site infection,¹³ in our review we did not identify any case of peritonitis caused by *M. porcinum*.

Antimicrobial susceptibility patterns among Group IV NTM tend to be fairly predictable based on the species. In general, they are resistant to typical anti-tuberculosis agents (isoniazid, rifampin, pyrazinamide and ethambutol) but fortunately show susceptibility to other antimicrobial agents.^{7,17} *M. porcinum* is generally susceptible to ciprofloxacin, gatifloxacin, levofloxa-

Table 2 Key Points from Case Study

Key Points	
1	Non-tuberculous mycobacteria (NTM) are a potential cause of refractory/relapsing CAPD peritonitis
2	The diagnosis of NTM peritonitis requires distinction of NTM from common contaminants.
3	Therapy includes catheter removal and prolonged course of antibiotics

cin, sulfamethoxazole and linezolid.⁵ There is no generalized consensus on the duration of therapy. Though four to six weeks of therapy may be sufficient in uncomplicated cases,¹² a longer duration (6 months) is probably required.¹⁸ PD catheter removal has been suggested by most investigators.¹⁸

Mortality data from NTM CAPD associated peritonitis is limited; however, significant morbidity can result from these infections. Intra-abdominal complications such as abscesses, intestinal fistula formation, adhesions, catheter exit site erosion and intestinal perforation can occur (Table 2).¹⁹

CONCLUSION

NTM are being increasingly recognized as a cause of refractory or recurrent peritonitis in CAPD patients. Diagnosis of NTM peritonitis can be challenging as there are no unique symptoms or physical findings. In addition, they are not easily identified in culture specimen. Moreover, they can be easily mistaken for non-pathogenic organisms. Clinicians should maintain a high index of suspicion for NTM peritonitis.

Conflict of interest: None disclosed.

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