Peritoneal Dialysis-Associated Peritonitis Caused by *Mycobacterium abscessus*

KEY WORDS: Encapsulating peritoneal sclerosis; *Mycobacterium abscessus*; nontuberculous mycobacterium; peritoneal dialysis-associated peritonitis.

Although rare, the incidence of nontuberculous mycobacteria (NTM) peritonitis in patients on peritoneal dialysis (PD) seems on the rise and is a diagnosis and treatment challenge (1). Song Y *et al.* summarized 57 cases from 41 papers and found that the mean time from diagnosis to initiation of appropriate treatment was 4 weeks (2). Among them, 8.8% had *Mycobacterium abscessus* infection. Early diagnosis of NTM peritonitis is very difficult since the symptoms and signs are indistinguishable from bacterial peritonitis and tuberculous peritonitis (1,2). Here we present 2 cases of PD-associated peritonitis caused by *M. abscessus* with distinct complications and outcome.

CASE DESCRIPTION

Case 1 was a 44-year-old woman on PD for 8 years admitted for refractory exit-site infection. She had catheter replacement and shifted to hemodialysis preplanned for peritoneal resting. Fever and chills occurred from day 3 after the operation. Empirical treatment with piperacillin-tazobactam and vancomycin was ineffective. Ascites check-up on day 10 post-operation showed cell counts of 1,134/mm^3, progressing to 53,512/mm^3 on day 14, and both tests had positive smear stain of acid-fast bacilli (AFB). We started anti-tuberculosis drugs on day 10 and removed the catheter, but no significant improvement was seen. In the 4th week, the follow-up ascites study showed negative result of the tuberculosis-polymerase chain reaction (TB-PCR) test (Cobas TaqMan MTB PCR test, Roche Diagnostics, Basel, Switzerland), so we shifted the treatment to anti-NTM regimen with meropenem, amikacin and clarithromycin. The final culture result came out in the 5th week with *M. abscessus* infection. The patient later developed progressive nausea, vomiting, abdominal pain, and signs of bowel obstruction in the 3rd month. Her abdominal computed tomography (CT) showed peritoneal thickening with calcification, loculated ascites, and suspicious encapsulating peritoneal sclerosis (EPS). Exploratory laparotomy found no thick, sclerotic covering on visceral surfaces, but only great omentum adhesion to peritoneum with marked indurations. Pathological findings confirmed the NTM peritonitis (Figure 1). She expired in the 8th month due to left renal hemorrhage and complicated retroperitoneal infection.

Case 2 was a 58-year-old diabetic female on PD treatment for 5 years. Tunnel infections happened twice in 5 months before this admission. Wound debridement with PD catheter replacement was performed during the second episode of tunnel infection. Unfortunately, fever with chills and turbid dialysate (cell count: 286/mm^3) occurred 3 weeks after the operation. However, a clean exit site without discharge was noted during this period, and negative results for all cultures were reported from both the exit site and the tunnel area. Empirical intra-peritoneal cefazolin and gentamicin were given and gram stain was negative. The Tenckhoff catheter was removed on the second day after admission due to refractory tunnel infection and PD-associated peritonitis. Acid fast bacilli stain of her peritoneal fluid revealed a positive result and tuberculosis-PCR showed negative. Following the previous experience from case 1, NTM infection was highly suspected and intravenous imipenem, amikacin, and oral clarithromycin were used. The dialysate culture proved to be *M. abscessus* 10 days later. Abdominal CT showed mesentery infiltration and abscess in the anterior low abdominal wall. After 2 debridements for the abdominal wall abscess and the anti-NTM therapy, she was discharged uneventfully and received another 6 months of oral antibiotics including clarithromycin, ciprofloxacin, and doxycycline, with no recurrence of infection in 12 months of follow-up.

DISCUSSION

These 2 important cases highlight that PD-associated NTM peritonitis may have severe complications including mimicking EPS as in case 1, and timely diagnosis and treatment to localize the infection is life-saving. Encapsulating peritoneal sclerosis is a rare but a severe complication of PD. Long PD treatment duration and peritonitis episodes are important risk factors

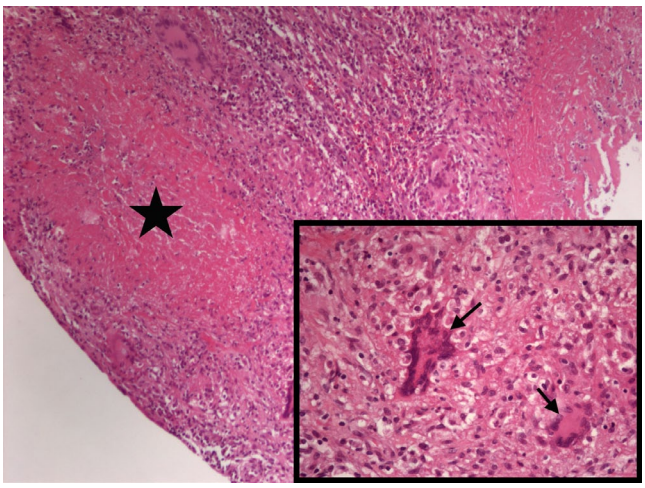

Figure 1 — Peritoneal pathology in case 1. Chronic granulomatous inflammation with caseous necrosis (star) and Langhan's giant cells (arrows) were noted. (Hematoxylin and eosin stain, magnification ×100 and ×400 in the lower right corner.)

for EPS (3,4). Clinical symptoms of abdominal pain, nausea, vomiting, severe malnutrition, and body weight loss (5) with typical abdominal CT with peritoneal thickening, bowel tethering, peritoneal calcification and entrapped fluid collection are suggestive of EPS (5,6). Although our case 1 had a PD history for 8 years and a peritonitis episode with bowel obstruction and typical image findings, her laparotomy and peritoneal biopsy finally confirmed the NTM peritonitis. The intra-abdominal disseminated NTM infection proven by pathology findings may explain the ominous outcome of case 1.

The dramatic differences between the outcome of case 1 and case 2 might be the timing for initiating NTM-targeted treatment. We started treating case 1 as NTM peritonitis in the 4th week, which turned out to be disseminated intra-abdominal

TABLE 1
Published Reports of Peritoneal Dialysis-Associated Peritonitis Caused by *Mycobacterium abscessus*

Case number Location (Ref)	Age/ Sex	AFB Stain	Time to initiate NTM treatment since symptom onset	Tenckhoff removal	Antibiotics (duration)	Antibiotics Susceptibility	Complication	3-month mortality
Case 1 Taiwan	44/F	Yes	28 days	Yes	Clarithromycin (165 days) Amikacin (68 days) Meropenem (165 days) Levofloxacin (111 days)	Amikacin:S Clarithromycin:S Ciprofloxacin:R Cefoxitine:I	Abscess	No[a]
Case 2 Taiwan	58/F	Yes	3 days	Yes	Imipenem (70 days) Amikacin (50 days) Clarithromycin (234 days) Ciprfloxacin (217 days) Doxycycline (180 days)	Amikacin:S Clarithromycin:S Ciprofloxacin:R Cefoxitine:I Doxycycline:R	Abscess	No
Case 3 Hong Kong (9)	39/F	No record	No record	Yes	Amikacin (8 weeks) Clarithromycin (28 weeks) Meropenem (4 weeks)	Amikacin:S Clarithromycin:S Levofloxacin:R Cefoxitine:I	Abscess	No
Case 4 Hong Kong (9)	45/M	No record	No record	Yes	Amikacin (4 weeks) Moxifloxacin (20 weeks) Azithromycin (6 weeks)	Amikacin:S Clarithromycin:S Levofloxacin:R Cefoxitine:S Moxifloxacin:S	No	No
Case 5 Saudi Arabia (10)	60/F	Yes	10 days	Yes	Clarithromycin (8 weeks) Amikacin (8 weeks)	Amikacin:S Clarithromycin:S	No	No
Case 6 Saudi Arabia (10)	64/F	Yes	6 days	Yes	Clarithromycin (12 weeks)	Amikacin:R Clarithromycin:S Ciprofloxacin:R	No	No
Case 7 Singapore (11)	70/M	No	12 days	Yes	Meropenem (no record) Clarithromycin (4 weeks) Amikacin (4 weeks)	Amikacin:S Clarithromycin:S Linezolid:S	Abscess	Yes
Case 8 Singapore (11)	50/M	No	9 days	Yes	Clarithromycin (12 weeks) Ciproxin (12 weeks)	Amikacin:S Clarithromycin:S	No	No
Case 9 Singapore (11)	56/M	No	10 days	Yes	Clarithromycin (2 weeks) Amikacin (6 weeks)	Amikacin:S Clarithromycin:S	No	Yes
Case 10 Singapore (11)	60/F	Yes	7 days	Yes	Clarithromycin (12 weeks) Amikacin (6weeks)	Amikacin:S Clarithromycin:S	No	No
Case 11 Japan (12)	51/F	Yes	6 days	Yes	Clarithromycin (7 weeks) Ciproxin (3 weeks) Amikacin (3 weeks)	No record	Abscess	No

Ref = reference; AFB = acid-fast bacilli; NTM = nontuberculous mycobacterium; F = female; M = male; S = susceptible; I = intermediate; R = resistance.
[a] Mortality in the 8th month.

infection with poor outcome. Possible reasons for our delaying anti-NTM treatment included stopping PD and shifting to hemodialysis preplanned for peritoneal resting, initial vague peritoneal sign, and PD catheter removed later. More importantly, the ascites smear revealed positive for AFB, and delayed application of TB-PCR had misled us to suspect TB peritonitis. Based on the experience of case 1, we were highly alert when tests were positive for AFB and negative for prompt TB-PCR occurred in the 2nd case. Therefore, we were able to apply anti-NTM regimens on the 3rd day after symptom onset, and she recovered well after eradicating the relative localized infection. Another point worthy of discussion was the use of antibiotics. Basic regimen for NTM could be amikacin, clarithromycin, and imipenem. Nevertheless, severe neurologic complications like seizure have been reported in uremic patients during imipenem therapy (7), which is why we used meropenem in case 1. However, there is a high prevalence of meropenem resistance in *M. abscessus* in Taiwan. Meropenem had poorer potency against the NTM infection than imipenem (8). Based on the unfortunate experience of case 1 and the above report, we treated case 2 with imipenem.

The characteristics of 9 cases of PD-associated peritonitis caused by *M. abscessus* by literature review and our 2 cases are summarized in Table 1 (9–12). All reports are from Asia. Only 6 of the 9 cases (66.7%, no record in 2 cases) had positive AFB stain, which was compatible with the previous findings that negative AFB stain in NTM peritonitis is common (2). A relatively higher complication rate (45.5%) and 3-month mortality (18.2%) of *M. abscessus* peritonitis compared with the rates of other NTM peritonitis cases were noted (2). The commonly utilized antibiotics were clarithromycin, amikacin, quinolones, and carbapenem. There is no consensus on the duration of NTM therapy which may vary from 2 to 12 months, based on clinical judgment according to the severity of infection (13).

CONCLUSION

Nontuberculous mycobacteria is indeed a threat in immunocompromised groups, such as uremic patients. Nontuberculous mycobacteria should be highly suspected by positive AFB smear and negative TB-PCR results, and confirmed by timely identification of culture results, especially for those that grow quickly. Early initiation of proper treatment of NTM may prevent late and severe complications.

DISCLOSURES

The authors declare no financial conflicts of interest to declare.

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