CASE REPORT

Chryseobacterium indologenes peritonitis in peritoneal dialysis

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SUMMARY

Peritoneal dialysis-related peritonitis remains a major complication of peritoneal dialysis in patients with end-stage renal disease. *Chryseobacterium indologenes* is a rare organism that has been reported to cause infections mostly in hospitalised patients with severe underlying diseases. We report the first case of *C indologenes* peritonitis in a patient on peritoneal dialysis outside of Asia. Our patient with end-stage renal disease on peritoneal dialysis grew *C indologenes* from peritoneal fluid when he presented with abdominal pain and cloudy effluent. The patient responded well to intraperitoneal antibiotic therapy. Tenckhoff catheter did not require removal. This case demonstrates the importance of considering rare causes of peritonitis, such as *C indologenes*, in patients on peritoneal dialysis. Given the resistance of such organisms to commonly used broad-spectrum antibiotics, antimicrobial susceptibility testing must be assessed as early as possible to assure appropriate antibiotic coverage to avoid untreated peritonitis leading to peritoneal dialysis failure.

BACKGROUND

Peritonitis, a major complication of peritoneal dialysis (PD), results from contamination with microorganisms, irritating chemicals or both causing inflammation of the peritoneum.[1] Similar to any infectious process, peritonitis attracts host defense cells into the peritoneum as part of the inflammatory process and is diagnosed as having an increase in the peritoneal fluid white cell count from less than 8 cells/mm^3 in uninfected patients, to above 100 cells/mm^3 after a dwell time of at least 2 h in those who are infected.[2] Such an increase in the white cell count makes the peritoneal fluid cloudy and easy to recognise. It is worth mentioning that up to 10% of patients may have a white cell count of less than 100 cells/mm^3 upon presentation for reasons such as being immunocompromised. A majority of peritonitis cases are associated with neutrophilic predominance in the peritoneal fluid (usually >50% neutrophils), but a predominance of lymphocytes may be seen with occasional fungal and mycobacterial infections.[2] Peritonitis complicating PD often does not result in bacteraemia and is associated with lower amylase and lipase levels in the peritoneal fluid than other causes of peritonitis. A positive dialysate effluent culture confirms the diagnosis, but there have been reports of culture-negative peritonitis. Pathogenic skin bacteria from touch contamination or catheter-related infection predominates the aetiological landscape.[2] Although antibiotics treat peritonitis, it reoccurs in 20–30% of patients who continue to remain on PD.[1] Early diagnosis and appropriate treatment of bacterial peritonitis prevent transfer to haemodialysis due to catheter removal,[2] permanent membrane damage[3] and mortality.[4] In this paper, we report the first case, to our knowledge, of *Cindologenes Chryseobacterium indologenes*-associated peritonitis outside of Asia in a patient with end-stage renal disease on PD who responded to antibiotic therapy and without Tenckhoff catheter removal.

CASE PRESENTATION

A 51-year-old African-American man with a history of HIV (on highly active antiretroviral therapy, CD4 absolute count of 200 mm^3, CD4 percentage of 22% and viral load <20 copies/ml), hypertension and end-stage renal disease presented with sharp bilateral lower abdominal pain, some loose stool, nausea and non-bloody emesis. He denied any recent travel or sick contacts. He was diagnosed with peritonitis when the initial cloudy peritoneal fluid revealed 13 440 WBCs mm^3 along with 19 RBCs mm^3.

INVESTIGATIONS

Peritoneal fluid analysis in the first 4 days

Day	Peritoneal fluid analysis
1	WBC 13 440, RBC 19, cloudy (on repeat WBC 15 100, RBC 12, cloudy)
2	WBC 210, RBC 0, slightly cloudy
3	WBC 105, RBC 0, clear
4	WBC 0, RBC 0, clear

TREATMENT

The patient received two doses of oral morphine for pain management and one dose of intravenous ertapenem along with one dose of intravenous vancomycin to treat peritonitis. He was subsequently started on empiric intraperitoneal cefazolin and ceftazidime, and oral fluconazole. Blood cultures were negative. On hospital day 4, the organism cultured from the peritoneal fluid was identified as *C indologenes* with sensitivity shown below.

Antimicrobial susceptibility test against *C indologenes* isolated from our patient

Antibiotic	Sensitive (S)/resistant (R)
Ampicillin/sulbactam	R
Cefazoline	R
Cefepime	S
Ceftazidime	S
Ceftriaxone	R
Ciprofloxacin	S
Gentamycin	R
Imipenem	R
Piperacillin/tazobactam	S
Tobramycin	R
Trimethoprim/sulfamethoxazole	S

OUTCOME AND FOLLOW-UP

Peritonitis resolved with a 21-day regimen of intraperitoneal ceftazidime and oral fluconazole for antifungal prophylaxis. The Tenchkoff catheter did not require removal.

DISCUSSION

C indologenes (formerly known as *Flavobacterium indologenes*), a Gram-negative, lactose non-fermenting, oxidase-positive, rod-shaped bacillus with a distinct yellow to orange pigment, appears ubiquitously in nature, especially in soil, plants and water sources despite chlorination, and often recovered from wet surfaces and water sources in hospitals.[5 6] *C indologenes* belongs to Centers for Disease Control group IIb. It has been mostly reported to cause pneumonia or bacteraemia in immunosuppressed adults with various malignancies,[7–11] or severely sick hospitalised patients in Asia, mainly Taiwan.[12 13]

C indologenes-associated infection was first reported in 1993 in a patient with ventilator-associated pneumonia.[14] *C indologenes* has been reported to cause primary bacteraemia,[9 13] catheter-related bacteraemia,[7 10 11 15] wound sepsis,[13 16] cellulitis,[17] pyelonephritis,[13] peritonitis,[13] biliary tract infection,[13] urinary tract infection,[18] pneumonia[13 14] and keratitis of the eye.[19] Infections caused by all *Chryseobacterium* species combined represent only 0.03% of all bacterial isolates collected by the SENTRY Program during the 5-year period evaluated (1997–2001) with about 40% due to *C indologenes*.[20] Some estimates suggest that, to date, there have been 283 reported cases of *C indologenes*-associated infections, most of which have been in countries like Taiwan and India.[12 13 18 21–23] Only about 10 of the reported cases of *C indologenes* seem to have occurred outside of Asia, including few in the USA.[7 15 17] Most of the infections have been associated with indwelling devices, especially intravascular catheters and mechanical ventilators.[7 10 11 14 15 18] However, removal of the indwelling device was not required for successful treatment in a number of the reported cases.[22 23]

Despite their rare prevalence, the incidence of *C indologenes*-associated infections has been increasing around the world for unknown reasons.[13] One recent study suggests that frequent exposure to broad-spectrum antibiotics, such as colistin and tigecycline, may be associated with increased prevalence of healthcare-associated *C indologenes* infections.[12] Two other reported cases of peritonitis involving this organism have been in Taiwan and those patients were not on PD.[22 23]

	Patient 1	Patient 2	Patient 3
Location	Taiwan	Taiwan	USA
Age (year)	44	44	50
Gender	Male	Male	Male
Underlying conditions	Chronic diverticulitis	Neuroendocrine tumour of liver, chronic kidney disease	HIV, end-stage renal disease, hypertension
On peritoneal dialysis	No	No	Yes
Other associated conditions	None	Central venous catheter, immunosuppression	Immunosuppresion
Other bacteria isolated	Group D streptococci	*Escherichia coli*	None
Antibiotic treatment	Cefoxitin, tobramycin, metronidazole	Cefepime, fosfomycin	Ceftazidime
Outcome	Recovered	Died of other causes	Recovered

One case report of PD-related peritonitis with *C indologenes* and *Sphingomonas paucimobilis* in South Korea did not respond to antibiotic therapy and required catheter removal.[24]

Our patient was immunocompromised due to his HIV status and renal failure, and had no history of travelling abroad. Fortunately, for our patient, he was able to remain on PD and his PD catheter did not have to be removed. Of note, approximately 6 months after *C indologenes* peritonitis, the patient received a living-related kidney transplant. The transplant team reports both the patient and kidney are doing well.

International Society for Peritoneal Dialysis (ISPD) recommends the start of intraperitoneal antibiotics as soon as possible when one suspects peritonitis.[2] The initial empiric antibiotics must cover both Gram-positive and Gram-negative organisms and center-specific selection of empiric therapy dependents on the local history of sensitivities, while keeping in mind the patient's history of organisms and sensitivities.[2] Vancomycin or a first-generation cephalosporin, such as cefazolin, can be used to cover Gram-positive organisms along with a third-generation cephalosporin, such as ceftazidime, or aminoglycosides to cover Gram-negatives.[2] Owing to the possibility of fungal peritonitis following antibiotic treatment, centres with high baselines rates of fungal peritonitis would benefit from using an oral fungal prophylaxis, such as fluconazole. The length of the therapy recommended by ISPD ranges from 2 to 3 weeks depending on the organism.[2]

Despite extensive guidelines for treating peritonitis, there are currently no specific guidelines for treating *C indologenes* and antibiotic selection for treatment of this rare infection can be challenging. Studies suggest that most isolates of *C indologenes* have resistance to carbapenems, aminoglycosides, chloramphenicol, tetracyclines, macrolides, linezolid and vancomycin.[7 20] Hence, clinicians should use antimicrobial susceptibility testing in order to ensure definitive and appropriate treatment of *C indologenes*-associated infections and prevent complications of peritonitis to occur.

In conclusion, we report the first case of *C indologenes*-associated PD peritonitis responding to antibiotic therapy and without catheter removal. Although there were a number of published cases of *C indologenes* causing various infections, we could only find three other reports of peritonitis, two non-PD-related peritonitis observed in Taiwan and one case of *C indologenes* PD-related peritonitis in South Korea, which did not respond to antibiotics and required catheter removal.

Isolates from our patient's peritoneal fluid exhibited resistance to ampicillin/sulbactam, cefazoline, ceftriaxone, gentamycin, imipenem and tobramycin. Our case demonstrates the importance of considering rare causes of peritonitis such as *C indologenes* in patients undergoing PD. *C indologenes* may be resistant to commonly used broad-spectrum antibiotics. Antimicrobial susceptibility testing ensures for successful treatment in order to avoid peritonitis complications. Furthermore, PD catheter removal may not be required in all cases of *C indologenes* peritonitis.

Learning points

- *Chryseobacterium indologenes* is a rare organism affecting hospitalised patients with severe underlying disease and have a compromised immune system.
- One should always consider rare causes of peritonitis in patients on peritoneal dialysis.
- Catheter removal is not always required for treatment of peritoneal dialysis-related peritonitis.
- Antimicrobial susceptibility testing is a key for ensuring successful treatment of peritonitis.

Contributors All authors contributed to the concept, care of patient, and preparation of manuscript.

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REFERENCES

1 Levison ME, Bush LM. Chapter 71: Peritonitis and intra-abdominal abscesses. In: Mandell GL, Bennett JE, Dolin R, eds. *Principles and practice of infectious diseases*. 7th edn. Philadelphia, PA: Churchill Livingstone Press, 2009:1011–34.
2 Li PK, Szeto CC, Piraino B, *et al*. Peritoneal dialysis-related infections recommendations: 2010 update. *Perit Dial Int* 2010;30:393–423.
3 Woodrow G, Turney JH, Brownjohn AM. Technique failure in peritoneal dialysis and its impact on patient survival. *Perit Dial Int* 1997;17:360–4.
4 Perez-Fontan M, Rodriguez-Carmona A, Garcia-Naveiro R, *et al*. Peritonitis-related mortality in patients undergoing chronic peritoneal dialysis. *Perit Dial Int* 2005;25:274–84.
5 Murray PR, Pfaller MA, Tenover FC, *et al*. *Manual of clinical microbiology*. 6th edn. Washington, DC: ASM Press, 1995:528–30.
6 Steinberg JP, Burd EM. Chapter 237: Other Gram-negative and Gram-variable bacilli. In: Mandell GL, Bennett JE, Dolin R, eds. *Principles and practice of infectious diseases*. 7th edn. Philadelphia, PA: Churchill Livingstone Press, 2009:3015–33.
7 Shah S, Sarwar U, King EA, *et al*. *Chryseobacterium indologenes* subcutaneous port-related bacteremia in a liver transplant patient. *Transpl Infect Dis* 2012;14:398–402.
8 Lin JG, Wang WS, Yen CC, *et al*. *Chryseobacterium indologenes* bacteremia in a bone marrow transplant recipient with chronic graft-versus-host disease. *Scand J Infect Dis* 2003;35:882–3.
9 Christakis GB, Perlorentou SP, Chalkiopoulou I, *et al*. *Chryseobacterium indologenes* non-catheter-related bacteremia in a patient with a solid tumor. *J Clin Microbiol* 2005;43:2021–23.
10 Akay M, Gunduz E, Gulbas Z. Catheter-related bacteremia due to *Chryseobacterium indologenes* in a bone marrow transplant recipient. *Bone Marrow Transplant* 2006;37:435–6.
11 Nulens E, Bussels B, Bols A, *et al*. Recurrent bacteremia by *Chryseobacterium indologenes* in an oncology patient with a totally implanted intravenous device. *J Clin Microbiol* 2011;7:391–3.
12 Chen FL, Wang GC, Teng SO, *et al*. Clinical and epidemiological features of *Chryseobacterium indologenes* infections: analysis of 215 cases. *J Microbiol Immunol Infect* 2012. doi:10.1016/j.jmii.2012.08.007; e-pub 26 Sep 2012.
13 Hsueh PR, Teng LJ, Yang PC, *et al*. Increasing incidence of nosocomial *Chryseobacterium indologenes* infections in Taiwan. *Eur J Clin Microbiol* 1997;16:568–74.
14 Bonten MJ, Van Tiel FH, Van Der Geest S, *et al*. Topical antimicrobial prophylaxis of nosocomial pneumonia in mechanically ventilated patients: microbiological observations. *J Infect* 1993;21:137–9.
15 Stamm WE, Colella JJ, Anderson RL, *et al*. Indwelling arterial catheters as a source of nosocomial bacteremia: an outbreak caused by *Flavobacterium* species. *N Engl J Med* 1975;292:1099–102.
16 Kienzle N, Muller M, Pegg S. *Chryseobacterium* in burn wounds. *Burns* 2001;27:179–82.
17 Green BT, Nolan PE. Cellulitis and bacteremia due to *Chryseobacterium indologenes*. *J Infect* 2011;42:219–20.
18 Bhuyar G, Jain S, Shah H, *et al*. Urinary tract infection by *Chryseobacterium indologenes*. *Indian J Med Microbiol* 2012;30:370–2.
19 Lu PC, Chan JC. *Flavobacterium indologenes* keratitis. *Ophthalmologica* 1997;211:98–100.
20 Kirby JT, Sader HS, Walsh TR, *et al*. Antimicrobial susceptibility and epidemiology of a worldwide collection of *Chryseobacterium* spp.: report from the SENTRY Antimicrobial Surveillance Program (1997–2001). *J Clin Microbiol* 2004;42:445–8.
21 Maravic A, Skocibusic M, Samanic I, *et al*. Profile and multidrug resistance determinants of *Chryseobacterium indologenes* from seawater and marine fauna. *World J Microbiol Biotechnol* 2013;29:515–22.
22 Hsueh PR, Hsiue TR, Wu JJ, *et al*. *Flavobacterium indologenes* bacteremia: clinical and microbiological characteristics. *Clin Infect Dis* 1996;23:550–5.
23 Lin YT, Jeng YY, Lin ML, *et al*. Clinical and microbiological characteristics of *Chryseobacterium indologenes* bacteremia. *J Microbiol Immunol Infect* 2010;43:498–505.
24 Yoon JS, Hwang EA, Chang MH, *et al*. Peritonitis by *Chryseobacterium indologenes* and *Sphingomonas paucimobilis* in a patient undergoing continuous ambulatory peritoneal dialysis (CAPD). *Korean J Nephrol* 2007;26:801–5. Korean.