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CASE REPORT

Listeria peritonitis in patients on peritoneal dialysis: two cases and a review of the literature

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ABSTRACT

Two cases are reported of patients on continuous ambulatory peritoneal dialysis who presented with peritonitis caused by *Listeria monocytogenes*. They were successfully treated with intraperitoneal and intravenous administration of amoxicillin. In patients on peritoneal dialysis, *Listeria monocytogenes* is a very rare cause of peritonitis, with only 11 cases reported to date, and mainly occurring in immunocompromised patients. In contrast to the majority of the reported cases, neither of our patients had received immunosuppressive drugs. To our knowledge, these are the first two cases of *Listeria* peritonitis reported in the Netherlands.

KEYWORDS

Peritoneal dialysis, *Listeria monocytogenes*, peritonitis

INTRODUCTION

Listeria monocytogenes (LM) is a food-borne pathogen which may cause serious systemic infections with meningitis, septicaemia and endocarditis. The majority of human cases are attributable to contaminated foods such as milk, other diary products and meat.[1]

In patients on peritoneal dialysis, *Listeria monocytogenes* is a very rare cause of peritonitis. Data from Al-Wali[2] as well as a repeated PubMed search yielded only 11 cases reported in the English language.

We present the first two cases in the Netherlands of *Listeria* peritonitis in patients receiving continuous ambulatory peritoneal dialysis (CAPD). They were successfully treated with amoxicillin.

CASE REPORT

Patient A is a 62-year-old man with renal failure due to chronic glomerulonephritis (histologically not examined), for which he had been treated with CAPD in the past two years. His medical history included hypertension and replacement of a stenotic aortic valve. He had never experienced an episode of peritonitis. His medication included furosemide, metoprolol, pantoprazole, phenprocoumon and sevelamer. He presented with fever of almost 39 °C and abdominal discomfort. He did not complain of diarrhoea or vomiting, but he had noticed a cloudy PD effluent. On physical examination there was some tenderness in the lower abdomen without abnormalities in the PD catheter tract. Laboratory findings were unremarkable except for a white blood cell (WBC) count of 11.4 x 10^9/l (normal 4.0 to 10.0 x 10^9/l). Examination of the PD fluid revealed a WBC of 552 x 10^6/l (normal <100 x 10^6/l), 97% of which were granulocytes. A diagnosis of PD-associated peritonitis was made, and the patient was started on an empirical antibiotic regime with cefuroxim and gentamicin intraperitoneally. Yet, the fever increased as did the abdominal pain, while the PD-fluid leucocyte count rose to 3520 x 10^6/l. Gram's staining of the PD fluid revealed the presence of Gram-positive rods, suggestive for infection with *Listeria*. Amoxicillin 1000 mg thrice daily intravenously was added to the antibiotic regimen. A CT scan of the abdomen did not show signs of perforation or intra-abdominal abscesses. Subsequent cultures of PD fluid obtained on two consecutive days confirmed infection with *Listeria monocytogenes*. Antibiotic treatment was changed to amoxicillin intraperitoneally at a dose of 150 mg/l with each PD exchange. Within two days the symptoms improved, as did the PD effluent cell count. Blood cultures obtained

on admission remained sterile. The antibiotic treatment was continued for three weeks after normalisation of the PD cell count.
When obtaining a more detailed history, the patient denied ingestion of possible contaminated foods.

Patient B is a 71-year-old man diagnosed with end-stage renal disease due to hypertension and resection of his right kidney in 1952 for tuberculosis. He had been on CAPD for four years at the time of presentation. Further relevant medical history included carcinoid of the lung for which a lobectomy had been performed three years previously. One year before presentation he had had peritonitis with *Streptococcus parasanguinis* and *Clostridium* species. He presented with fever and a decrease in appetite without abdominal discomfort and with a cloudless dialysate, without diarrhoea or vomiting. His medication included folic acid, iron sulphate, erythropoietin, acenocoumarol, multivitamin, doxazosine, pantoprazole and sevelamer. At presentation his temperature was 39.0 °C and physical examination showed peritoneal tenderness.
Laboratory findings revealed a dialysate WBC count of 290 x 10^6/l of which 58% were granulocytes. Empirical treatment was started with intraperitoneal vancomycin and gentamicin according to the local protocol. In the next days, abdominal discomfort continued and his body temperature remained subfebrile. Dialysate WBC count showed a decrease to 103 x 10^6/l on the second day of admission.
Gram's staining of the PD effluent revealed Gram-positive bacilli, which were later identified by culture as *Listeria monocytogenes*. Amoxicillin 2000 mg twice daily intravenously was added to the regimen. Within the next four days, the symptoms resolved and the patient was discharged after 14 days. Intravenous antibiotic therapy was continued via a central venous catheter for a total of six weeks.
Further history taking disclosed the ingestion of cheese from non-pasteurised milk two weeks before hospital admission.

DISCUSSION

LM is a food-borne pathogen that may cause severe infections in pregnant and immunocompromised individuals. It is a facultatively anaerobic, nonsporulating Gram-positive, facultative intracellular rod that grows over a broad range of temperatures.[3] Infections follow ingestion of contaminated food containing the bacteria in high concentrations. The essential determinant of pathogenesis is the transcriptional activator PrfA, which activates the majority of genes required for cell entry and intracellular parasitism.[3] LM induces its own internalisation by cells that are not usually phagocytic, which is mediated by host surface proteins. The bacteria grow and subsequently spread from cell to cell.
Listerial infections can present as several clinical syndromes of which meningitis and septicaemia are the most common. Peritonitis is a much less common consequence of infection by *Listeria monocytogenes*. Spontaneous bacterial peritonitis due to LM has been well described in patients with cirrhosis of the liver and appears to be caused by transmigration of the organism through the intestinal wall into the systemic circulation.[4-6] *Listeria* peritonitis in patients on peritoneal dialysis might have a similar pathogenesis. PD-associated *Listeria* peritonitis is an exceedingly rare occurrence with only 11 cases reported earlier in the English-language literature (*table 1*). The two patients reported here were not connected in any way and were treated in two different dialysis centres.
PD-associated peritonitis caused by *Listeria* does not present differently from that caused by the usual causative micro-organisms, with progressive abdominal pain, cloudy PD effluent and possibly fever, sometimes preceded by nausea, vomiting and diarrhoea.[1,2,7-14] No late sequelae such as development of encapsulating peritonitis[15] were described in this very small sample of patients. Of note, the majority of patients received immunosuppressive drugs or were in a poor general health (*table 1*). Cell-mediated immunity, in which interferon γ and tumour necrosis factor (TNF) play important roles, is essential in controlling LM infection. In immunocompromised patients, as well as pregnant women, these defence mechanisms are depressed causing an increased number of *Listeria* infections.[16] The two patients in the present report did not appear to have obviously compromised immunity other than chronic renal failure (and their age, which in itself has an influence on innate and adaptive immunity).[17-19] This raises the question whether PD patients should receive a strict advice to refrain from consuming products from non-pasteurised milk; given the rare incidence thus far of LM in PD patients not on immunosuppressants such an advice does not seem appropriate.
No randomised clinical trials have compared antimicrobial agents for the treatment of LM infections. Ampicillin is regarded as the antibiotic of choice. The clinical outcome of patients with LM-associated CAPD peritonitis, as reported in the various cases, was uniformly favourable with good responses to intraperitoneal (IP) or intravenous (IV) ampicillin therapy and continuation of CAPD without needing to remove the PD catheter (*table 1*). The use of vancomycin, which is included in many empirical regimens for treating PD-related peritonitis, was associated with a high incidence of treatment failure (*table 1*), despite

Table 1. *Summary of reported cases with Listeria peritonitis on peritoneal dialysis*

Reference	Age	Underlying disease	Immunosuppresive drugs	Therapy	Route	Duration	Remarks
Myers et al. 1983[12]	71	ITP	Prednisone	Erythromicin (penicillin allergy)	IP and IV	2 weeks	
Allais et al. 1989[7]	31	SLE	Prednisone	Vancomycin and ampicillin	IV	4 weeks	Failure on vancomycin
Al Wali et al. 1990[2]	53	Wegener's granulomatosis	Cyclophosphamide	Vancomycin, aztreonam and ampicillin	IP	3 weeks	Failure on vancomycin
Dryden et al. 1991[9]	60	CLL	Prednisone	Vancomycin, amoxicillin and gentamycin	IV	5 days	Failure on vancomycin
Hart et al. 1991[10]	67	Severe cardiac failure, alcoholism	None	Amoxicillin	IP	2.5 weeks	
Lunde et al. 1992[11]	38	Chronic glomerulonephritis	None	Ampicillin and tobramycin	IP	2 weeks	
Banjeri et al. 1994[8]	66	Polymyositis	Prednisone	Vancomycin, ampicillin and gentamicin	IP	4 weeks	Failure on vancomycin
Tse et al. 2003[14]	37	SLE	Prednisone and azathioprine	Ampicillin and amikacin	IV	4 weeks	Septic shock, catheter removed
Ahmad et al. 2008[1]	28	SLE	Prednisone	Ampicillin, cefazoline and ceftazidim	IP	3 weeks	
Stylianou et al. 2008[13]	68	Cardiac pathology	None	Vancomicin and netelmicin	IP	6 weeks	Died of heart failure Resolution of peritonitis
Present report	62	Chronic glomerulonephritis	None	Amoxicillin	IP	3 weeks	
Present report	71	Hypertension	None	Amoxicillin	IV	6 weeks	

CLL = chronic lymphatic leukaemia; IP = intraperitoneal; ITP = idiopathic thrombocytopenic purpura; IV = intravenous; SLE = systemic lupus erythematosus.

good sensitivity *in vitro*.[2,7-9] This is due to the fact that LM is an intracellular pathogen; vancomycin has less efficacy in such types of infection considering its mechanism of action.

Dosage and duration of treatment with ampicillin varied among the reported cases. Our patients were treated with prolonged courses and high doses of amoxicillin, in parallel with the guidelines for treatment of other serious *Listeria* infections. Antibiotic treatment of PD peritonitis can be delivered by either the IV or IP route; IP treatment is generally preferred as it results in higher local levels of antibiotics and can be easily administrated at home once initial clinical improvement has occurred. Most authors treated for not less than three weeks, although some cases also reported good responses to shorter treatment regimens.

CONCLUSION

Listeria monocytogenes (LM) is a very rare cause of peritonitis in patients on peritoneal dialysis (PD), usually occurring in patients with compromised immune function due to medication, disease and/or old age. Successful treatment can be achieved with amoxicillin or ampicillin, either IP or IV; treatment with vancomycin is not recommended for this infection. When treated early and with the appropriate antibiotics, the prognosis is favourable. On the basis of the current limited experience, no advice can be given on the duration of treatment, but three weeks appears to be adequate.

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