CASE REPORT

Unusual *Listeria monocytogenes* peritonitis in peritoneal dialysis patient with liver cirrhosis: a case report and review of literature

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Received: 20 January 2017 / Accepted: 12 March 2017 / Published online: 22 March 2017
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Abstract Spontaneous *Listeria* peritonitis is well described in liver failure, but is uncommon in peritoneal dialysis patients. Atypical cases where peritonitis symptoms develop after systemic manifestations are rare and challenging for diagnostic. A 57-year-old peritoneal dialysis patient with history of ethylic cirrhosis was admitted after epileptic seizure. On admission, patient was soporous without signs of peritonitis and meningitis. Patient's peritoneal effluent was clear, with normal leukocytes. Cranial CT scan showed no abnormalities. Laboratory exams revealed positive inflammatory syndrome. Despite antibiotic therapy, next day, symptoms aggravated with coma development. Peritoneal effluent became cloudy and its leukocyte count rose up. Effluent microscopy revealed Gram-positive bacilli. Patient was started with intraperitoneal Vancomycin and Amikacin. Patient's clinical condition deteriorated with lethal outcome. Post-mortem analysis of effluent and blood culture showed growth of *L. monocytogenes*. Apart from idiopathic etiology, goat-milk curd, that patient had started consuming 10 days before admission, could theoretically be considered as possible infection vehicle. *L. monocytogenes* peritonitis in peritoneal dialysis patients is rare, but must be considered in immunocompromised or patients with concomitant liver failure, especially after Gram-positive bacilli identification in peritoneal effluent. In case of suspicion of *Listeria* peritonitis, Ampicillin should be initiated, because bacteria often poorly respond to currently recommended empiric regimens.

Introduction

Listeria monocytogenes is Gram-positive bacillus, that may cause serious infections with systemic manifestations—septicaemia or meningoencephalitis, especially in immunocompromised [1]. It is often spread through contaminated fruit and dairy products [2].

Although spontaneous *Listeria* peritonitis is well described in patients with liver cirrhosis, it is uncommon in patients treated by continuous ambulatory peritoneal dialysis (CAPD) [3]. CAPD peritonitis caused by *L. monocytogenes* mostly presents with typical symptoms, abdominal pain and cloudy peritoneal effluent [4, 5]. Rarely, peritonitis symptoms develop after systemic manifestations, as happened in following case.

Case report

We present a case of 57-year-old male patient, with end-stage renal disease due to chronic glomerulonephritis, who had been treated with CAPD since October 2010, without previous peritonitis episodes. He had concomitant alcoholic liver cirrhosis with evidence of esophageal varices and splenomegaly with low platelet count (between 68 and $123 \times 10^9/L$ on regular controls). His regular therapy consisted of beta-blocker, Calcitriol and proton-pump inhibitor (PPI). He attended regular controls that consisted of interview, physical exam and laboratory tests.

On the regular visit on 2nd of March 2015, his physical finding and tests were unremarkable. During interview, he mentioned that he had started consuming goat curd by gastroenterologist's recommendation. Ten days later, on 12th of March, he was admitted to our hospital after grand-mal epileptic seizure. On admission, he was soporous, febrile

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(38.8 °C), hypotensive (90/60 mmHg), without abdominal tenderness. Neurologist described patient as aphasic, motorically agitated, with negative Brudzinski's sign and no evidence of focal neurological deficit. His peritoneal effluent appeared clear and its cell count was normal. Blood tests showed elevated C-reactive protein (CRP 96 mg/L) and leukocyte count ($18.1 \times 10^9/L$) with low platelet count ($78 \times 10^9/L$). Cranial CT scan showed no abnormalities. After sampling of blood and peritoneal fluid cultures, intravenous antibiotics were initiated: 2 g of Ceftriaxone q.d. and 500 mg of Metronidazole t.i.d. Considering negative CT scan, the absence of meningeal irritation and neurological deficit, low platelet count and patient's psychomotor agitation, the decision was made not to perform lumbar puncture.

Next day, peritoneal effluent became cloudy, and effluent leukocyte count rose to $6245/mm^3$ with neutrophil predominance. Effluent microscopy showed Gram-positive bacilli existence, so culture was resampled. Patient was started with intraperitoneal empiric antibiotic therapy: Vancomycin 2 g q.d. and Amikacin 100 mg b.i.d. Yet, patient's clinical condition continued to deteriorate, he had another epileptic seizure, and developed coma. Despite the treatment, patient died 46 h after admission. Post mortem blood and peritoneal effluent cultures showed growth of *L. monocytogenes*.

Discussion

CAPD related peritonitis is rarely caused by *L. monocytogenes*. There are only a few such cases described by far,

but none in our and surrounding countries—Table 1 [4, 15]. In described cases, *L. monocytogenes* peritonitis mostly occurred in CAPD patients who were immunocompromised or ones with liver cirrhosis [4, 15]. However, in all described cases, peritonitis presented as primary manifestation of *L. monocytogenes* induced disease [4, 15]. Our patient is specific since peritonitis developed secondarily, after systemic infection. As mentioned, peritonitis symptoms occurred 24 h after patient had already developed systemic and neurologic symptoms. That was possibly one of the reasons of poor outcome. Primary peritonitis symptoms, abdominal pain, cloudy peritoneal effluent, would probably alert patient to seek medical help earlier, and facilitate diagnostic and treatment. Liatsos with authors came to similar conclusion [16]. He analyzed 128 cases of *Listeria* peritonitis, of which 17 cases of CAPD associated peritonitis, and found that CAPD patients had better survival rate, because they tended to interpret early peritonitis symptoms, such as abdominal pain, as more alarming [16]. Liatsos even identified absence of abdominal pain as one of the predictors of unfavourable outcome. Others were age (over 56 years), isolation of bacteria in hemoculture, and inappropriate antimicrobial treatment [16]. Our patient had all of them.

There are no clinical trials that compared antibiotic efficacy in treatment of *L. monocytogenes* peritonitis, but experience in described cases shows that Ampicillin should be considered as antibiotic of choice [4, 15]. The patients treated with Ampicillin had more favorable outcome without significant peritoneal damage [16]. By current recommendations, most of the empirical protocols for CAPD peritonitis treatment include Vancomycin for

Table 1 Reported cases of CAPD associated *Listeria* peritonitis

References	Age	Condition	Therapy	Outcome	Remarks
Myers et al. [4]	71	ITP	Erythromycin IP and IV	Cure	
Allais et al. [5]	31	SLE	Vancomycin, Ampicillin IV	Cure	Vancomycin failure
al-Wali et al. [6]	53	Mb. Wegener	Vancomycin, Aztreonam and Ampicillin IP	Cure	Vancomycin failure
Dryden et al. [7]	60	CLL	Vancomycin, Amoxicillin and Gentamycin IV	Cure	Vancomycin failure
Hart et al. [8]	67	Cirrhosis	Vancomycin, Gentamycin, Ampicillin IP	Cure	Vancomycin failure
Lunde et al. [9]	38	CGN	Ampicillin and Tobramycin IP	Cure	
Tse et al. [10]	37	SLE	Ampicillin and Amikacin IV	Cure	
Ahmad et al. [11]	28	SLE	Cefazolin and Ceftazidim, Ampicillin IP	Cure	
Stylianou et al. [12]	68	Cardiac failure	Vancomycin IP	Deceased	
Benjelloum et al. [13]	64	Cardiac failure	Vancomycin and Cetazidim, Gentamycin IP	Cure	Vancomycin failure
Bierhoff et al. [14]	62	CGN	Amoxicillin IP	Cure	
Bierhoff et al. [14]	71	Hypertension	Amoxicillin IV	Cure	
Moscovici et al. [15]	70	Cardiac failure	Ampicillin and Gentamycin IP	Cure	
Present case	57	Cirrhosis	Vancomycin and Amikacin IP	Deceased	Vancomycin failure

ITP idiopathic thrombocytopenic purpura, IP intraperitoneal, IV intravenous, SLE systemic lupus erythematosus, CLL chronic lymphatic leukaemia, CGN chronic glomerulonephritis

Gram-positive and second antibiotic for Gram-negative coverage [17]. Although *L. monocytogenes* is susceptible to Vancomycin “in vitro”, intracellular growth of microorganism makes Vancomycin not as effective “in vivo” [18]. That is why we should always consider possibility of *L. monocytogenes* infection in a case of Gram-positive bacilli isolation in high-risk group of patients. In case of our patient, mentioned antibiotic selection was made based on suspicion of possible Pseudodiffertic bacili or *Acinetobacter* infection, also Gram-positive, the most common in our unit and usually susceptible to Vancomycin.

Another interesting question is the possible vehicle of infection. One of the possibilities is that infection was transmitted through goat curd which patient had started consuming several weeks before admission. Goat curd has a high percentage of essential amino-acids, can lower intestinal pH value and regulate intestinal microbiota, so it's often recommended by gastroenterologists in liver disease [19]. Nevertheless, it can also be perfect medium for zoonotic bacteria transmission, such as *Campylobacter*, *Listeria* or *E. coli* [20]. That must be kept in mind especially if we consider the fact that presence of *L. monocytogenes* in raw goat milk can be up to 2.2% [20]. Another risk factor that could contribute to *L. monocytogenes* development in our patient is concomitant PPI therapy, that could cause bacterial overgrowth in small intestine by acid production suppression, and so increase the risk of transluminal bacterial migration [21].

Conclusion

L. monocytogenes is a rare cause of peritonitis in CAPD patients, but has to be considered in cases with Gram-positive bacilli on peritoneal effluent microscopy, especially in high-risk group of patients. Mostly, *L. monocytogenes* peritonitis present with typical symptoms, pain and cloudy peritoneal effluent, but there are also atypical cases, where peritonitis symptoms develop after systemic manifestations. Early recognition of *Listeria* infection and adequate antibiotic therapy, increase the odds of successful treatment. Better control of possible risk factors, careful selection of concomitant medication and avoiding of suspicious foods, could prevent infection in susceptible individual.

Compliance with ethical standards

All the authors have declared no competing interest.

All procedures performed involving our patients were in accordance with the ethical standards of the institutional health committee at which the treatment of patient was performed.

Informed consent was obtained from father of deceased patient included in the presented case report.

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