Listeria infection presenting as myositis and rhabdomyolysis, needing renal replacement

Introduction

A previously well 74-year-old man with no medical history presented with a 3-day history of vomiting, epigastric pain and fevers. Blood white cell count, inflammatory markers and creatine kinase level were significantly elevated, indicating severe sepsis-driven rhabdomyolysis. Admission blood cultures subsequently grew *Listeria monocytogenes*; with CSF analysis also consistent with Listeria infection. The patient required multiorgan support on an intensive care unit including haemodiafiltration. This case reminds physicians that Listeria infection should be considered in cases of sepsis in high-risk populations and it can rarely lead to multi-organ failure including renal failure requiring renal replacement therapy.

Discussion

Listeria monocytogenes is a Gram-positive aerobic and facultative anaerobic organism which functions as an intracellular pathogen. Most cases arise after oral ingestion and invasion via the intestinal mucosa. The majority of invasive cases occur in conjunction with predisposing conditions, most commonly pregnancy, immunocompromised states such as organ transplant, glucocorticoid therapy, malignancies and extremes of age (young children or adults >60 years). This was shown in *Listeria illnesses, deaths, and outbreaks--United States, 2009–2011* (Centers for Disease Control and Prevention, 2013). In the UK the majority of cases present in people over 60 years of age, with higher incidence of bacteraemia, CNS infection and mortality in this group, as per Public Health England Infection Reports (2015). In large case series worse outcome was associated with age older than 70 years, as shown by Guevara et al (2009).

At presentation this patient had a creatine kinase level of 24464 IU, indicating significant rhabdomyolysis which ultimately led to oliguric renal failure and haemodiafiltration, despite aggressive intravenous fluid resuscitation.

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CASE REPORT

A 74-year-old man presented to secondary care with a 3-day history of vomiting, epigastric pain and generalized headache. His medical history was unremarkable and he was not on any regular medications. Observations demonstrated a temperature of 39°C and haemodynamic stability with oxygen saturations of 95% on room air. He was alert and orientated; there were occasional end-inspiratory crepitations bibasally with no other abnormalities on cardiovascular, abdominal and neurological examination. Initial investigations were as per *Table 1* and his electrocardiogram was normal. Initial treatment consisted of intravenous fluids (at 167 ml/hr), antiemetics and broad spectrum antibiotics (piperacillin/tazobactam and single dose 5 mg/kg gentamicin).

Over the next 24 hours the patient's condition deteriorated. Pyrexia was persistent and he became increasingly agitated with fluctuating delirium, worsening myalgia and increasing oxygen requirements. A full body computed tomography scan showed bilateral atelectasis with a small right pleural effusion. A magnetic resonance imaging scan of the thighs showed fluid within the fascial planes of the medial compartment of both legs. High STIR (short tau inversion recovery) signal was seen in the adductor magnus muscles bilaterally, indicating possible myositis. After microbiology advice antibiotic cover was switched to ceftriaxone, clindamycin and clarithromycin to cover atypical respiratory pathogens, intracranial infection and soft tissue infection.

In the context of continued decline the patient was transferred to the intensive care unit on day 2 of his admission. Lumbar puncture produced a clear colourless fluid with a CSF protein of 3.33 g/litre, glucose 3.2 mmol/litre, white blood cell count 310 cells/μl (21% polymorphs, 79% mononuclear cells). CSF culture was initially negative after 48 hours with no organisms on Gram stain. On day 3, fully sensitive *Listeria monocytogenes* was isolated from the admission blood cultures. CSF polymerase chain reaction also confirmed the presence of *Listeria*, confirming a diagnosis of invasive listeriosis. Antibiotic therapy was switched to high-dose intravenous amoxicillin and gentamicin. The patient was then established on amoxicillin intravenous and co-trimoxazole orally on day 5 and completed 4 weeks of both antimicrobials.

During intensive care admission the patient's neurological status and respiratory function deteriorated with persistent myoclonic jerks. The patient was intubated and ventilated on day 4 because of respiratory and neurological problems. Oliguric renal failure developed on day 6, requiring 48 hours of renal replacement therapy (continuous venovenous haemodiafiltration). A magnetic resonance imaging scan of the head done on day 7 did not show any abnormalities. The patient was gradually weaned and extubated on day 14 of his admission.

Following step-down to a medical ward the patient experienced complex partial seizures, prompting the introduction of levetiracetam with subsequent prevention of further events. The patient was eventually discharged home after 31 days in hospital, and has made an excellent recovery at a 3-month interval with no further seizures and only mild residual renal impairment.

Table 1. Initial investigations

		On admission	Reference ranges
Laboratory results	C-reactive protein	295 mg/litre	0–5 mg/litre
	Troponin I	292.5 ng/litre	0–34.2 ng/litre
	Creatine kinase	24 464 U/litre	30–200 U/litre
	White blood cells	13.7x10^9/litre	3.7–11x10^9/litre
	Neutrophils	12.1x10^9/litre	1.7–7.5x10^9/litre
	Potassium	3.4 mmol/litre	3.5–5.1 mmol/litre
	Sodium	139 mmol/litre	136–145 mmol/litre
	Inorganic phosphate	1.0 mmol/litre	0.8–1.5 mmol/litre
	Urea	7.9 mmol/litre	3.2–7.4 mmol/litre
	Serum creatinine	101 umol/litre	63–111 umol/litre
Venous blood gas (room air)	pH	7.46	7.31–7.41
	pCO_2	4.9 kPa	4.7–6.0 kPa
	pO_2	4.2 kPa	10.5–13.5 kPa
	Lactate	2.0 mmol/litre	0.5–2 mmol/litre
	Bicarbonate	26.1 mmol/litre	22–26 mmol/litre
Arterial blood gas 24 hours from admission (10 litres O_2 via non-rebreathe mask)	pH	7.44	7.35–7.45
	pCO_2	4.3 kpa	4.7–6.0 kPa
	pO_2	11.7 kPa	10.5–13.5 kPa
	Lactate	0.9 mmol/litre	0.5–2 mmol/litre
Radiological findings	Chest radiograph	Linear atelectasis at the right lower zone. No focal consolidation	
	Computed tomography of the head	No evidence of abnormality	
Urinalysis	Blood	+++	
	Protein	100 mg/dl	

In the absence of any other cause for the rhabdomyolysis it was attributed to sepsis secondary to Listeria infection.

There are isolated case reports of listeriosis causing rhabdomyolysis leading to renal failure requiring renal replacement therapy (Thomas and Ravaud, 1988; Clark et al, 1989; Kobashi et al, 1998; Kutleša et al, 2009). In the cases of Kobashi et al (1998) and Kutleša et al (2009) the patients were similarly older in age without any other predisposing conditions, and made a good recovery. There are no reports of Listeria-induced myositis (as evidenced by the findings of the magnetic resonance imaging of the thighs) which is a novel finding in this case.

Sepsis-induced rhabdomyolysis by other pathogens is well characterized (Kumar et al, 2009) especially for Legionella and Streptococcus. It is unclear how Listeria can induce rhabdomyolysis, as the pathogenic mechanisms of the organism have not been fully elucidated as reported by Vázquez-Boland et al (2001). **BJHM**

LEARNING POINTS

- Listeria infection can result in myositis and rhabdomyolysis and require renal replacement therapy despite optimal initial management.
- Physicians should consider Listeria polymerase chain reaction and lumbar puncture (where indicated) in culture-negative sepsis with or without rhabdomyolysis, especially in at-risk populations, and provide appropriate antibiotic coverage.
- Outcome from Listeria sepsis can be favourable with appropriate treatment even in patients over 70 years of age.

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