Case Report

Leptospirosis-induced meningitis and acute renal failure in a 19-month-old male child

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An unusual case of leptospirosis is described in a 19-month-old male child presenting with meningitis and acute renal failure without jaundice. Some aspects concerning the pathogenesis and treatment of this potentially life-threatening disease are also discussed. Leptospirosis was diagnosed on the basis of history and serological tests.

Case report

A previously healthy 19-month-old male child presented with a 7 day history of fever, repeated vomiting, irritability and abdominal pain. In the preceding 24 h, he had become drowsy and oliguric. All routine immunizations had been administered. The area in which the family lives had been flooded 1 week prior to the onset of symptoms. Physical examination revealed a temperature of 37.8 °C, a heart rate of 120 beats min⁻¹, a respiratory rate of 36 breaths min⁻¹, blood pressure of 80/50 mmHg and a body weight of 9.9 kg. He had a stiff neck and conjunctival suffusion. The white blood cell count was $1.2 \times 10^{10} \text{ l}^{-1}$, with 78 % polymorphonuclear neutrophils, 16 % lymphocytes and 6 % monocytes. The haemoglobin level was 6.33 mmol l⁻¹ and the platelet count was $1.82 \times 10^{11} \text{ l}^{-1}$. Blood chemistry revealed the following: potassium 4.3 mmol l⁻¹ (normal range 3.4–4.8 mmol l⁻¹); sodium 138 mmol l⁻¹ (normal range 135–145 mmol l⁻¹); glucose 5.9 mmol l⁻¹ (normal range 3.9–6.1 mmol l⁻¹); creatine kinase 4.6 µkat l⁻¹ (normal range 1.00–6.67 µkat l⁻¹); urea nitrogen 59 mmol l⁻¹ (normal range 2.9–8.9 mmol l⁻¹); creatinine 265 µmol l⁻¹ (reference value <88.4 µmol l⁻¹; Marotto *et al.*, 1997); aspartate aminotransferase 1.23 µkat l⁻¹ (normal range 0.17–0.67 µkat l⁻¹); and bicarbonate 15 mmol l⁻¹ (normal range 22–26 mmol l⁻¹). Bilirubin was normal. A computed tomography scan of the brain was normal and a lumbar puncture was performed. The cerebrospinal fluid was clear and contained 68 leukocytes mm⁻³ (36 % polymorphonuclear neutrophils, 59 % lymphocytes, 5 % monocytes), 2.21 g protein l⁻¹ and 3.5 mmol glucose l⁻¹. A Gram stain and routine culture showed no micro-organisms. No bacteria were identified in the urinary sediment or were grown in routine culture. The chest X-ray was normal.

Due to the acute renal failure (ARF) and meningitis, the patient was transferred to the intensive care unit for observation. With a presumptive diagnosis of acute bacterial meningitis, antibiotic treatment with ceftriaxone (100 mg kg⁻¹ per day for 7 days) and dexamethasone (0.6 mg kg⁻¹ per day for 4 days) was initiated, together with intravenous fluid therapy (without overload). Over the first 24 h, the irritability, vomiting and abdominal pain diminished markedly and urine output rose from <0.5 ml kg⁻¹ h⁻¹ to >1 ml kg⁻¹ h⁻¹, increasing to 6 ml kg⁻¹ h⁻¹ by day 3 post-admission (Fig. 1).

As the area in which the family lives had been flooded 1 week prior to the onset of symptoms, a diagnosis of leptospirosis was hypothesized. To confirm the diagnosis, IgM anti-*Leptospira* antibodies were detected using an IgM ELISA. Paired serum samples collected on days 1 and 10 revealed a fourfold rise (from 1/200 to 1/800) in the antibody titre for *Leptospira interrogans* serovar *icterohaemorrhagiae*, as determined by microscopic agglutination test. Serological tests for Epstein–Barr virus, hantaviruses, dengue virus and yellow fever virus, as well as for hepatitis A, B and C viruses, were

Fig. 1. Urine output and serum creatinine levels over time.

Abbreviation: ARF, acute renal failure.

negative. By day 3, clinical parameters and liver function had returned to normal, as had kidney function (Fig. 1). The patient was therefore discharged to the infirmary. The long-term evolution (>1 year) was favourable.

Discussion

Leptospirosis is a zoonotic disease found worldwide. It is caused by spirochaetes of the genus *Leptospira* and presents a wide spectrum of clinical manifestations (Marotto *et al.*, 1999). It is a serious public health problem in both urban and rural environments and is mainly associated with recreational activities (water sports) and flooding (Ko *et al.*, 1999). In our patient, the most likely source of infection was exposure to contaminated floodwater.

In a retrospective study of 43 consecutive urban-dwelling children presenting with leptospirosis (35 boys and eight girls, 4–14 years of age), 79% had ARF, 70% were jaundiced, 65% had thrombocytopenia, 56% presented with elevated transaminase levels, 23% had meningitis and 11.6% had haemorrhagic manifestations (Marotto *et al.*, 1997). Our patient had meningitis, elevated transaminase levels and ARF. Renal failure has been defined as an acute reduction in renal function together with a serum creatinine level higher than $88.4 \mu\text{mol l}^{-1}$ (Marotto *et al.*, 1997). Leptospirosis-induced impaired renal function is generally accompanied by hyperbilirubinaemia and jaundice (Marotto *et al.*, 1997; Feigin & Anderson, 1992). However, our patient presented ARF without jaundice or hyperbilirubinaemia, which is unusual and made the diagnosis more difficult.

Leptospirosis-related ARF is commonly characterized by polyuria and hypokalaemia, presenting lower morbidity and mortality than do the oliguric forms (Seguro *et al.*, 1990; Magaldi *et al.*, 1992; Marotto *et al.*, 1997). This may be related to tubular dysfunction, decreased proximal sodium absorption leading to increased distal potassium secretion and vasopressin resistance causing polyuria (Seguro *et al.*, 1990; Magaldi *et al.*, 1992). Upon admission, our patient had oliguric ARF and metabolic acidosis. Initially, urine output was low, but increased markedly after fluid replacement (without overload) and antimicrobial treatment (Fig. 1). However, no hypokalaemia was observed and the patient required no dialysis or furosemide administration.

Antimicrobial treatment benefits leptospirosis patients, whether children or adults, decreasing the duration of the illness, reducing the accompanying thrombocytopenia and limiting the severity of the renal failure (Marotto *et al.*, 1997; Katz *et al.*, 2001). In a clinical study, the time to recovery of renal function (normalization of serum creatinine) was significantly shorter in patients treated with penicillin G or ampicillin than in untreated patients (Marotto *et al.*, 1997). A recent clinical study demonstrated that ceftriaxone and penicillin G were equally effective treatments for severe leptospirosis (Panaphut *et al.*, 2003). A randomized double-blind clinical trial involving patients with late-stage leptospirosis demonstrated shorter hospital stays and less fever in

penicillin-treated patients (Watt *et al.*, 1988). Another clinical study showed that antimicrobial therapy benefited children with severe late-stage leptospirosis (Marotto *et al.*, 1997). In our patient, ceftriaxone was initiated on day 7 and was well tolerated. Normal renal function was restored (Fig. 1) and long-term evolution was favourable.

Karande *et al.* (2005) recently reported the case of a 10-year-old male leptospirosis patient presenting only acute aseptic meningitis. Our case of acute febrile illness originally was misdiagnosed as acute bacterial meningitis, as some of the clinical features were unusual. In addition, potential risk factors for leptospirosis were overlooked upon admission. Consequently, cerebrospinal fluid and urine samples were not examined for leptospires using dark-ground microscopy or culture. Cultures of blood and urine samples obtained after the patient had received ceftriaxone were all negative for leptospires. Although PCR facilitates diagnostic evaluation, especially after the administration of antibiotics, it was not available at our facility.

A few cases of leptospirosis in children under 2 years of age have been reported previously (Katz *et al.*, 2001; Verma *et al.*, 2003). However, this is the first documented case of anicteric leptospirosis-induced ARF and meningitis in such a child. Since leptospirosis can be asymptomatic or present influenza-like symptoms such as myalgia and headache, it is often overlooked and is generally underdiagnosed. Paediatricians and general practitioners must be aware of the potential presence of this illness when faced with any child who presents with the history and clinical findings described above (Verma *et al.*, 2003; Karande *et al.*, 2005). Accurate diagnosis and prompt treatment continue to be the cornerstones of the successful management of this potentially life-threatening disease, reducing morbidity and mortality, particularly in endemic areas.

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