Acute renal failure in children due to leptospirosis

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Introduction

Leptospirosis is a widespread zoonosis caused by the spirochete *Leptospira interrogans*. Although a disease of wild and domesticated animals, primarily rodents and livestock, human infection has been recognized since it was described by Weil in 1886. Infected animals act as reservoirs excreting *Leptospires* in their urine and the organism gains access through the skin and mucous membranes after human contact with contaminated fresh water.

Leptospirosis occurs in an unusually high frequency in Hawaii and the Pacific Basin islands[1,2]. Within the past 10 years numerous cases of leptospirosis have occurred on Kosrae in Micronesia, with a majority of cases occurring in the pediatric population. We present here our experience with 16 children from the Pacific region who developed severe manifestations of leptospirosis with acute renal failure (ARF) as the cardinal feature, but accompanied by hyperbilirubinemia, pancreatitis, and thrombocytopenia.

Materials and methods

During a thirteen year period from 1980 to 1993, sixteen children with leptospirosis were hospitalized at Kapiolani Medical Center for Women and Children in Honolulu, Hawaii. The primary reason for admission was ARF which was defined as a serum creatinine of 2 mgm/dL or greater and/or a urine output of less than 1 cc/kg/hr/24 hrs. All children resided in a geographic location where leptospirosis is common and demonstrated positive acute and/or convalescent antibodies against leptospires.

"Infected animals act as reservoirs excreting *Leptospires* in their urine and the organism gains access through the skin and mucous membranes after human contact with contaminated fresh water."

Results

Sixteen children fulfilled the review criteria for leptospirosis. Their average age was 13 years and ranged between 5.8 and 18.5 years. There were 12 males (75%) and 4 females (25%). There were 13 from Kosrae, 2 from Hawaii, and one from Guam. The most common presenting symptoms and signs were fever (75%), headache (62%), myalgia (56%), conjunctivitis (56%), and abdominal pain (50%). Transfer to Kapiolani Medical Center for Women and Children occurred an average of 6 days following the onset of symptoms. The average length of hospitalization was 8.8 days with a range of 2 to 16 days. The entire course of acute illness from onset to hospital discharge lasted an average of 14.9 days with a range of 9 to 16 days.

The urinalysis was quite variable at the time of presentation. Proteinuria exceeded 2+ (100 mgm/dL) in four patients and was absent at follow-up in the five patients. Urinary red blood cells exceeded 10 RBC/hpf in one patient while pyuria was more prominent, numbering greater than 10 wbc/hpf in five patients. Casts were rarely found.

All children developed varying degrees of oliguric ARF (12 of 16, 75%) or polyuric ARF (4 of 16, 25%). Six were oliguric at onset. Oliguria lasted an average of 3.2 days, with a range of 1 to 5 days. The average maximum BUN was 115 mgm/dL with a range of 55–185 mg/dL. The average maximum creatinine for the sixteen children was 10.6 mgm/dl with a BUN to creatinine ratio of 10.8. Hypokalemia was not noticed, although in many cases, the first determination of serum potassium was days after presentation and initiation of medical therapy. Hyperkalemia (serum potassium of 5.5 mg/dL or greater) however, was present in 4 of 16. Metabolic acidosis ($T CO_2$ < 23 meq/L) was present in 10 of 16. Ten children were treated with either hemodialysis (8 of 16) or peritoneal dialysis (2 of 16). Hemodialysis was required only for an average of 3.75 treatments in each of 8 children.

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Jaundice was clinically evident in 7 (44%) of patients, although 13 of 16 had hyperbilirubinemia with the average total bilirubin being 8.2 mgm/dL, ranging from 0.4 to 23.3 mgm/dL for all patients. The elevated bilirubin was primarily conjugated/direct. Despite the common finding of hyperbilirubinemia, elevation in hepatocellular enzymes was less common. Six of 16 exhibited elevated AST (SGOT), while 4 of 14 were found to have elevated ALT (SGPT). GGTP was elevated in 4 of 17.

Notable but less common was the development of acute pancreatitis in one male and acute rhabdomyolysis in another. One patient experienced bleeding problems due to thrombocytopenia. Low platelet counts (<130,000 cu/mm) were present in 9 of 16 patients. The hemoglobin or hematocrit was reduced in a similar number of patients (hemoglobin < 12gm/dL or hematocrit 37%). Serum albumin levels were consistently depressed in all eleven patients in which it was determined. However, the degree was modest, averaging 2.2 mgm/dL.

Discussion

There are few reports in the medical literature of ARF in children due to leptospirosis[3]. We observed sixteen children and adolescents who presented with common features of leptospirosis (fever, myalgia, abdominal pain, headache, jaundice and conjunctivitis) who developed severe renal failure, ten requiring dialysis. The presenting symptoms and signs in our patients were similar to those previously described[3, 4]. Our patients were predominantly male (75%). Others have observed a female predominance[3]

"Symptoms usually preceded the recognition of acute renal failure, jaundice, or thrombocytopenia by only a few days."

The short period of oliguria (average 3.2 days), considering the rapid development and magnitude of ARF, was interesting and of considerable clinical importance. Hemodialysis is an invasive, potentially complicated, and expensive procedure. The cost of a single acute hemodialysis treatment ranges between $US500 and $US1000. In patients with mild and uncomplicated ARF, the somewhat predictable short period of oliguria might obviate the need for such therapy.

Pancreatitis was documented in one child in this series and has been observed by others[3]. Three of four patients recently cared for at Tripler Army Medical Center in Hawaii, exhibited clinical and laboratory evidence of pancreatitis. Elevated amylase, lipase, epigastric pain and tenderness were the basis for the diagnosis. Abdominal pain conceivably due to pancreatic inflammation was not uncommon in our patients (50%) however in only one patient did we obtain pancreatic enzymes. We suspect that had enzymes been obtained additional cases of pancreatitis would have been identified.

The prognosis of these children appears excellent. There were no deaths despite severe multiorgan involvement. ARF, hepatic dysfunction, thrombocytopenia with bleeding diathesis, and occasionally pancreatitis complicated the clinical course of the majority of these children. Although follow-up was usually within days after hospital discharge all children appeared to be recovering. The average creatinine at the time of follow up was 1.3 mgm/dL with a range of 0.7-3.3 mgm/dL in 14 patients. The urinalysis was normal in 4 of 5 tested soon after hospital discharge.

Leptospirosis with ARF, even when complicated by multiorgan dysfunction appears to carry an excellent prognosis in children. The duration of oliguria is commonly brief and in selected cases may respond to conservative medical management. Pancreatitis may be a common yet little recognized manifestation of leptospirosis in children.

References

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