Acute renal failure as an initial manifestation of acute lymphoblastic leukemia

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ABSTRACT

Acute lymphoblastic leukemia (ALL) is the most common malignancy in children. Acute renal failure is a well-recognized complication of ALL after initiation of chemotherapy. Renal failure as the primary manifestation of ALL is rare. Here, we report three children who presented with acute renal failure and hyperuricemia and were subsequently diagnosed to have ALL.

Key words: Acute renal failure, children, hyperuricemia, leukemia

Introduction

In acute leukemia, renal complications occur due to several factors including leukemic infiltration of the kidneys, therapy-related side effects such as tumor lysis syndrome, nephrotoxic drugs, and septicemias.[1] Hyperuricemia, as a manifestation of tumor lysis syndrome, is a well-recognized complication,[2] and in most cases, it occurs after the initiation of chemotherapy. Renal failure as the primary manifestation of acute lymphoblastic leukemia (ALL) is rare. Here, we report three children who presented with acute renal failure and hyperuricemia and were subsequently diagnosed to have ALL despite initial normal white cell counts and normal peripheral smear in one of them.

Case Reports

Case 1

An 8-year-old boy presented with fever, arthralgia, and oliguria. He was treated elsewhere symptomatically. On examination, he had pallor, no lymphadenopathy or hepatosplenomegaly. His blood pressure was 110/70 mm Hg. Investigations showed hemoglobin of 5.2 g/dl; white blood cell count 5,410/cumm; differential count – polymorph 54.8%, lymphocytes 27.2%, monocytes 4.4%, basophils 0.4%, eosinophils 0.2%, platelets 90,000/cumm; and renal functions showed BUN 48 mg/dl and creatinine 3 mg/dl. The peripheral smear was normal. Urine analysis was normal. Serum electrolytes and arterial blood gas analysis were normal. He was given peritoneal dialysis for a week. In view of severe pain in the joints, considering leukemia, uric acid was found to be 18.4 mg/dl and lactate dehydrogenase (LDH) 1,658 U/L. Ultrasound abdomen showed mild nephromegaly. In view of fever, cytopenia involving two cell lineages (anemia and thrombocytopenia), hyperuricemia, and elevated LDH levels, bone marrow biopsy was performed which showed acute leukemia. Flow cytometry confirmed Pre B-cell ALL. Renal parameters normalized within a week of treatment with steroids as per induction protocol, hydration, rasburicase therapy indicating uric acid nephropathy as a cause of renal failure. Currently he is on chemotherapy and is doing well since past 1 year.

Case 2

A 7-year-old girl was brought with complaints of fever, joint pain, and decreased urine output for 3 days. On examination, she was pale, had cervical lymphadenopathy, but no hepatosplenomegaly. She was normotensive. Investigations showed hemoglobin 7.1 g/dl; white blood cell count 24,700/cumm; differential count: Polymorph 30.2%, lymphocytes 68.1%, monocytes 2.2%, eosinophils 0.3%, basophils 0.2%, and platelets 80,000/cumm. Renal

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function tests showed BUN of 44 mg/dl and creatinine 2.9 mg/dl; renal ultrasound was normal. Peripheral smear showed occasional blast cells. Uric acid was 30 mg/dl and LDH 2,163 U/L. Serum electrolytes, arterial blood gas analysis, and urine analysis were normal. In view of fever, lymphadenopathy, anemia, leukocytosis, blasts in the peripheral smear, hyperuricemia, and raised LDH levels, bone marrow biopsy was planned to rule out hematologic malignancies. Bone marrow biopsy showed acute leukemia and flow cytometry was suggestive of T-cell ALL. She was treated with steroids as per induction protocol with rasburicase and hydration therapy. Renal parameters were normalized after 2 days, which indicates that renal failure was due to uric acid nephropathy. Currently she is receiving chemotherapy and is doing well since 1 year.

Case 3

A 13-year-old boy presented with bilateral swelling in the neck for one week, cough, dyspnea, and reduced urine output for 3 days. Physical examination showed cervical lymphadenopathy and hepatosplenomegaly. He was found to have hypertension, which was controlled with nifedipine. Investigations revealed hemoglobin of 5 g/dl; white blood cell count 300,100/cumm; platelet count 75,000/cumm; uric acid 32.2 mg/dl; LDH 12,720 U/L; and peripheral smear showed 90% blast cells. Renal functions showed BUN 38 mg/dl and creatinine 2.4 mg/dl; urine analysis was normal. Serum electrolytes and arterial blood gas analysis were normal. Renal ultrasound was normal. Bone marrow biopsy and flow cytometry showed features suggestive of ALL (T-cell type). He was started on dialysis, chemotherapy, and tumor lysis supportive measures. Renal parameters normalized after 2 weeks, indicating again the possibility of uric acid nephropathy. Currently he is on chemotherapy.

A renal biopsy was not performed in our patients as there was complete resolution of renal failure and a definite diagnosis of leukemia was obtained.

Discussion

Renal involvement is not uncommon in ALL, but renal failure is a rarely a presenting symptom in ALL.[3,4] Renal involvement can present as renal enlargement due to leukemic infiltrates or as renal failure due to uric acid nephropathy.[5,6] However, other causes such as nephrotoxic drugs, infections, and obstructive uropathy due to para-aortic lymph nodes, retroperitoneal mass, urolithiasis, or ureteral clots can also occur.

Urate nephropathy as the sole presentation of acute leukemia without other evidence of malignancy is rare.[7] The reason why some patients develop hyperuricemia in the absence of significant tumor load still remains unclear. It is presumed that tumors with a high mitotic index may predispose to more spontaneous lysis and cell deaths.

Although leukemic infiltration of kidney may present in all types of leukemia, it more often occurs with lymphoblastic leukemia. Leukemic infiltrates may lead to significant impairment of renal function if it is bilateral and diffuse and in particular involves the cortical region.[8] In all our patients, there was no significant renal enlargement (although case 1 had mild nephromegaly) or any obstructive evidence in ultrasonogram such as any significant lymph node enlargement. None of our patients were dehydrated or given nephrotoxic drugs prior, or found to have septicemia. Uric acid was very high in all cases, and with normalization of uric acid, there was resolution of renal failure, which could explain that renal failure in our patients could be due to urate nephropathy. However, renal biopsy was not performed in our patients as there was complete and dramatic resolution of renal failure in all the three patients.

We recommend that uric acid estimation be done in the event of unexplained renal failure. Hyperuricemia and acute renal failure without any obvious cause met in clinical practice should arouse a suspicion of occult malignancy. Bone marrow biopsy should be performed even if blood counts and peripheral smear are normal with no evidence of leukemia clinically. Bone marrow aspirate should be repeated if normal initially, particularly if hyperuricemia and/or acute renal failure persists.

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