

# Acute Lymphoblastic Leukaemia Presenting with Acute Renal Failure: Report of Two Cases

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## Abstract

Acute renal failure is a well-recognized complication of acute leukaemias. However, serious renal failure caused by leukaemic infiltration as a primary manifestation is unusual. Here we report two patients with acute lymphoblastic leukaemia presenting with acute renal failure due to leukaemic infiltration. The first patient died before the administration of specific therapy for leukaemia, whereas the second case recovered after chemotherapy. She was discharged without necessitating dialysis therapy.

## Introduction

Acute renal failure (ARF) is a well-recognized complication of acute leukemias.<sup>1</sup> In acute leukaemia, renal complications occur due to several factors including preexisting disorders, nephrotoxic drugs, septicaemias, leukaemic infiltration of the kidneys and therapy-related side effects such as tumour lysis syndrome.<sup>1,2</sup> ARF may present at the time of diagnosis. However, primary manifestation of leukaemia rarely occurs in the kidney.<sup>3</sup>

Leukaemic infiltration of the kidneys is commonly seen late in the course of disease but may be established at the diagnosis of leukaemia.<sup>4</sup> However, clinical nephropathy and serious renal failure caused by leukaemic infiltration is unusual as an early presentation.<sup>2,5</sup> We report two cases of acute lymphoblastic leukaemia (ALL) presenting with ARF secondary to leukaemic infiltration.

## Case 1

The first patient was a 19 year-old male, admitted to the emergency room with sudden transient visual loss, convulsions, nausea and vomiting. He did not have a significant past medical history other than right facial paralysis that occurred two weeks ago. On admission, his blood pressure was 220/120 mmHg, heart rate 120/min, and body temperature 36.8 °C. Laboratory work-up revealed the following levels: blood urea nitrogen (BUN), 102 mg/dL; creatinine, 14.9mg/dL; potassium, 6.1 mEq/L; calcium, 11.2 mg/dL; phosphate, 3.3 mg/dL; uric acid, 6.5 mg/dL; lactate dehydrogenase, 1182 IU/L; pH, 7.21; PCO<sub>2</sub>, 26.3 mmHg;

HCO<sub>3</sub>, 10.5 mEq/L; platelet count, 105.000/mm<sup>3</sup>. His haemoglobin level and white blood cell (WBC) count were within normal limits (14.9 g/dL; 9430/mm<sup>3</sup>, respectively). Abdominal ultrasonography showed bilateral increased renal parenchymal echogenicity (grade 2) and bilateral enlarged kidney sizes (right 15.5 cm, left 14 cm) (figure 1). The renal scan findings with dimercaptosuccinic acid (DMSA) and mercaptoacetyltriglycine (MAG3) were concordant with non functional kidneys. Haemodialysis was performed immediately. After three days, a pericatheteral

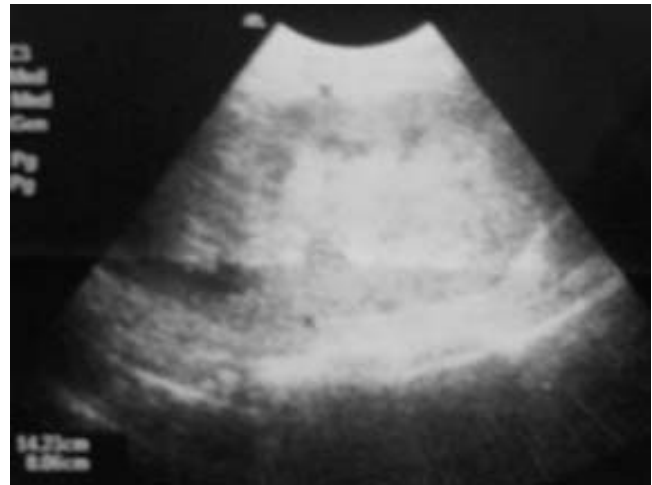


Figure 1: Ultrasound image from case 1 showing a markedly enlarged echogenic left kidney.

blood leakage and skin haemorrhage developed at the entering site of internal jugular venous haemodialysis catheter. During the follow-up period, anaemia, thrombocytopenia and leukocytosis occurred (haemoglobin, 6.3 g/dL; platelet count, 40.000/mm<sup>3</sup>; WBC count, 26.300/mm<sup>3</sup>). A bone marrow biopsy was performed after determination of blasts in the peripheral blood smear. Diffuse and haematolymphoid cell infiltration was seen in the bone marrow pathological analysis, and diagnosed as ALL. Immunoperoxidase studies demonstrated positive staining of the neoplastic cells for CD7 and CD3, but CD56 and Tdt were negative. Unfortunately, the disease progressed very rapidly and the patient died at hospital day

24 before the administration of chemotherapy.

## Case 2

The second patient was a 40 year-old woman who was admitted for evaluation of general muscular weakness, oedema, nocturia, nausea and vomiting. On presentation, her blood pressure was 140/90 mmHg, heart rate 92/min, and body temperature 38.3°C. Bilateral lower extremity oedema and tenderness in bilateral costovertebral angles were noted. The rest of the examination was unremarkable. Serum biochemistry analysis showed that BUN was 21 mg/dL, creatinine 2.69mg/dL, potassium 4.7 mEq/L, calcium 8.6 mg/dL, uric acid 7.1 mg/dL, albumin 3.8 g/dL, serum iron 13 µg/dL, iron binding capacity 208 µg/dL, and serum ferritin 372 ng/mL. Haematological data revealed that haemoglobin was 10.4 g/dL, WBC count 8960 /mm<sup>3</sup>, platelet count 347.000/mm<sup>3</sup>. The peripheral blood smear did not have any abnormal cells. During the clinical course, BUN increased gradually to 71 mg/dL and creatinine to 5.69mg/dL within two weeks. Creatinine clearance was 10.2 mL/min and 24-hour urinary protein excretion was 424 mg per day. Abdominal ultrasonography revealed bilateral increased renal parenchymal echogenicity (grade 2) and bilateral enlarged kidney sizes (right 18 cm, left 17.5 cm). Haemodialysis was performed followed by renal biopsy to investigate the etiology of renal failure. The pathological analysis was concordant with diffuse interstitial leukaemic infiltration (figure 2). For this reason, the bone marrow biopsy was performed and diagnosis of ALL was verified. The patient was treated according to ALL protocol. Barely 3 weeks after treatment, BUN and creatinine reduced (17 mg/dL; 1.0mg/dL, respectively). At the end of the 1st month of therapy, kidney dimensions and parenchymal features became normal. Haemodialysis therapy was stopped and

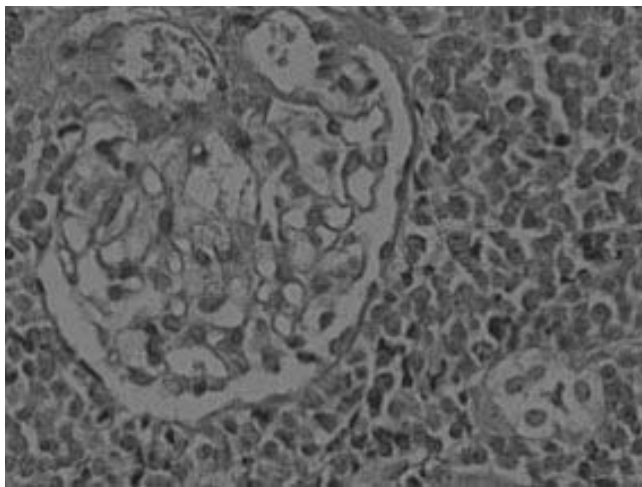


Figure 2: Renal biopsy specimen from case 2 revealing diffuse interstitial leukaemic infiltration (HE, x 20).

remission was observed in the bone marrow biopsy specimen.

## Discussion

In patients with leukaemia, several factors including infection, obstructive uropathy, uric acid nephropathy or leukaemic infiltration by itself contributes to the pathogenesis of renal failure.<sup>6</sup> Infections caused by opportunistic organisms can result in renal failure during the course of the treatment.<sup>7</sup> Severe uric acid nephropathy may follow chemotherapy in up to 10 percent of patients with ALL.<sup>6</sup> Obstructive uropathy may result from enlargement of hilar or paraaortic lymph nodes, retroperitoneal mass, urolithiasis or ureteral clots.<sup>6,8</sup>

Clinically significant malignant infiltration of the kidneys is uncommon but should be suspected in patients presenting with ARF and diffusely enlarged kidneys in case of active malignancy. Although often attributable to other causes, in selected cases, ARF may be caused by the direct effects of the infiltrative process.<sup>2</sup>

Renal infiltration occurs in approximately 50 percent of patients with leukaemia. Although the leukaemic infiltration of the kidney may present in all types of leukaemia, it often occurs with lymphoblastic leukemia. Leukaemic infiltration may lead to significant impairment of renal function if it is bilateral and diffuse and in particular involves the cortical region.<sup>6</sup>

Biopsy serves a vital role in the management of renal disease in the setting of malignancy, allowing the exclusion of a medical disorder. In cases of infiltrative disease, histopathology can define the precise nature of the infiltrate, guiding therapy and predicting response.<sup>4</sup>

In our cases, bilateral kidney sizes were increased in the absence of urinary tract obstruction. Blood uric acid levels were within normal limits. Furthermore, there was no evidence of other factors which may lead to renal failure such as infection, dehydration, hypercalcaemia and nephrotoxic drug administration.

We were not able to perform renal biopsy in the first patient as he did not give consent. Unfortunately, the patient died before the administration of specific therapy for leukaemia. Although there was no histopathologic evidence, we concluded that the cause of renal failure was leukaemic infiltration because other factors causing renal failure were excluded.

In the second patient, kidneys were enlarged and there were no other factors leading to renal failure. Diffuse interstitial leukaemic infiltration was also identified on renal biopsy specimen with light microscopy. The patient's renal function improved dramatically after the initiation of chemotherapy,

supporting the hypothesis that the etiology of renal failure was leukaemic infiltration.

In conclusion, these cases suggest that ALL may present with ARF due to leukaemic infiltration. In addition, it is important to recognize this cause of ARF because it is usually sensitive to chemotherapy as it was seen in the second case.

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