

Renal Involvement In Leukemia: A Report Of Two Cases

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Citation

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Abstract

The kidneys are a site of extra medullary leukemic involvement that are usually involved late in the course of the disease. Renal leukemic involvement can give a myriad of appearances on imaging and is usually associated with extra medullary leukemic involvement elsewhere. We present 2 such cases of leukemic infiltration of the kidneys in two different clinical settings along with a review of the literature. In both cases however, the renal functions were maintained.

CASE 1

A 7 year old female child presented with history of fever, cough and loss of appetite for 2 weeks. The past history was non contributory. On examination, the child had fever, pallor and few petechiae on trunk. Abdominal palpation revealed soft tissue masses in bilateral lumbar regions which were bimanually palpable. No other obvious organomegaly was seen.

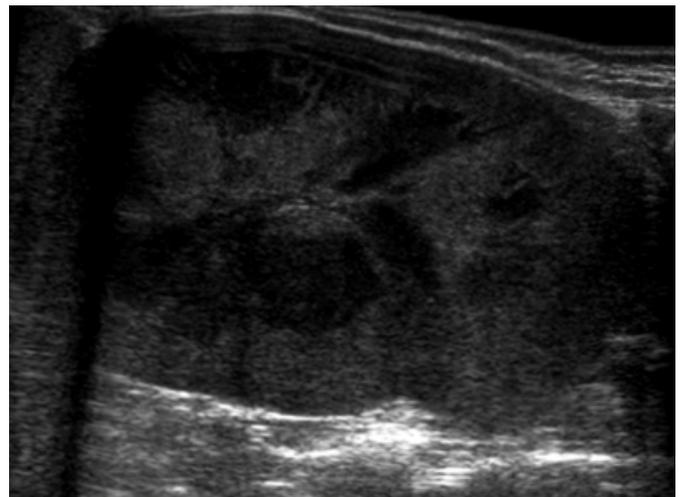
Complete Hemogram showed Hemoglobin of 8gm/dl with a Total Leukocyte Count of 78,000. Peripheral smear revealed elevated leukocyte count with 80% blasts. Renal and liver functions were normal.

Bone marrow aspiration findings were suggestive of acute lymphoblastic leukemia

Ultrasonography of abdomen revealed markedly enlarged bilateral kidneys. No obvious focal lesions were seen. The cortico medullary differentiation (CMD) was mildly accentuated (Figure-1).

Figure 1

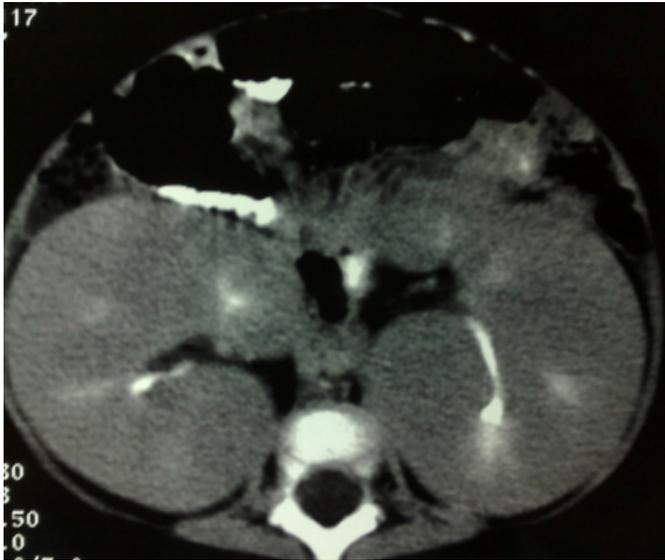
Figure 1: Extended Field Of View (EFOV) image showing enlarged right kidney with accentuated CMD and a hypo echoic medulla. The left kidney (not shown) had a similar sonographic appearance.



Contrast enhanced CT scan of the abdomen revealed marked, smooth, symmetrical enlargement of bilateral kidneys which showed striated nephrogram (Figure-2). No focal lesions were seen. Renal contrast excretion was prompt and simultaneous.

Figure 2

Figure 2: Contrast enhanced CT image at the level of renal hila shows bilateral, smoothly enlarged kidneys showing a striated nephrogram. No focal lesions were identified.



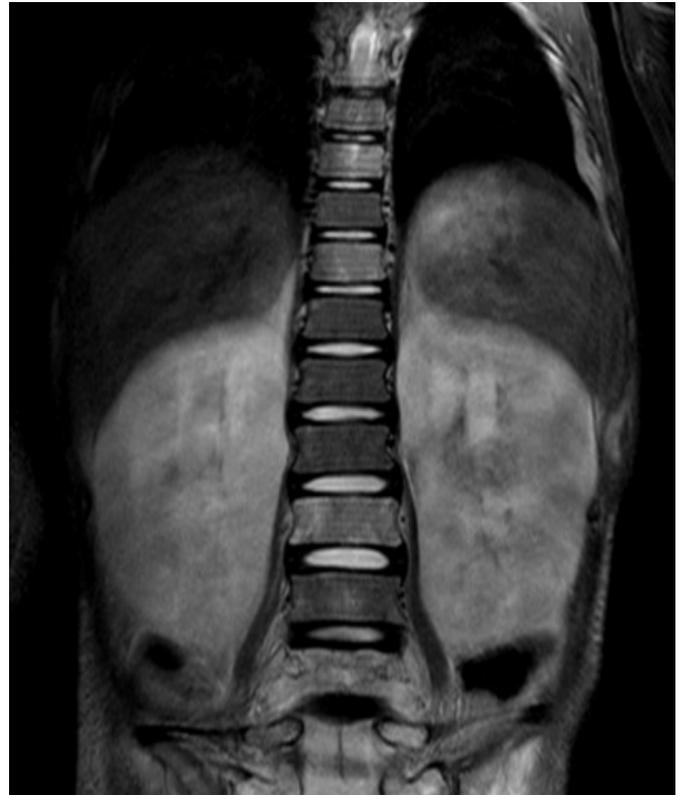
Fine Needle Aspiration (FNA) of the enlarged kidneys was suggestive of diffuse leukemic infiltration of the renal parenchyma.

CASE 2

A 12 year old male child presented to the pediatric out patient clinic with complaints of back pain and radicular nerve pain along the both legs. No other history was forthcoming. The physical examination was unremarkable except for mild reduction in power of leg muscles on right side (4/5). The child was referred for an MR scan to ascertain the cause of radiculopathy. MR scanning of the spine revealed areas of signal alteration at multiple vertebral levels, showing decreased signal intensity on T1W images and appearing iso to hyper intense on T2W images. The vertebral bodies appeared hyper intense on STIR sequence (Figure-3) and showed patchy post contrast enhancement.

Figure 3

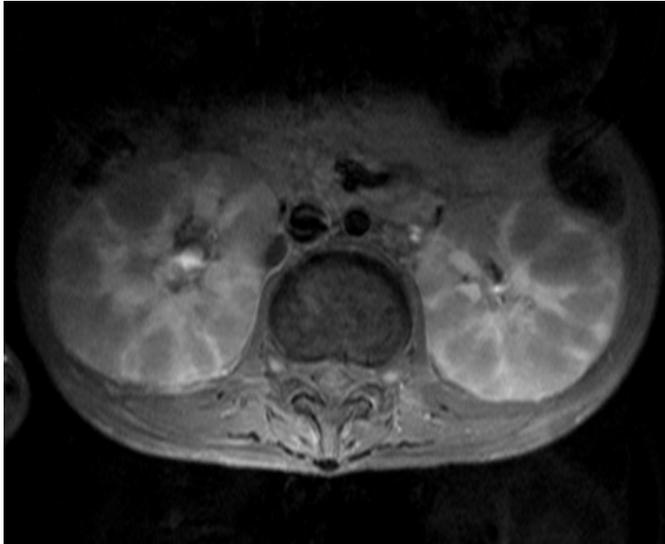
Figure 3: STIR Coronal image showing altered vertebral marrow signal at multiple levels, with smoothly enlarged bilateral kidneys.



The vertebral morphology was preserved with no evidence of any destructive lesion. There was minimal accompanying enhancing extra dural soft tissue, compressing the thecal sac and bilateral exiting neural foramina at L2 level. Associated bilateral renal enlargement was also seen with multiple large hypo intense nodular deposits within the renal parenchyma causing attenuation of the pelvicalyceal systems (Figure-4).

Figure 4

Figure 4: post gadolinium axial T1WI image at the level of kidneys shows patchy enhancement of vertebral body with presence of enhancing extra dural soft tissue. Associated smooth enlargement of bilateral kidneys is also seen with presence of multiple hypo intense, non enhancing nodular deposits in bilateral kidneys



Due to involvement of multiple vertebral levels and associated bilateral enlarged kidneys, a presumptive diagnosis of infiltrative disorder (likely myelo proliferative), was given. Subsequent peripheral smear and bone marrow aspiration confirmed the presence of multiple blast cells with a final diagnosis of acute lymphoblastic leukemia.

DISCUSSION

Renal enlargement in leukemia has been described as a frequent occurrence, both at diagnosis and at autopsy¹²³, the enlargement being attributed to leukemic infiltration or simple hypertrophy or hyperplasia²⁴.

As shown by Frei et al², as many as 30% of enlarged kidneys in leukemic patients are not due to infiltration by malignant cells per se. When the kidneys are enlarged without leukemic infiltration, there is said to be an association with hepato splenomegaly.

The gross morphology and radiographic images depend upon the mechanism of renal involvement, the pattern of growth, and the distribution of lesions. Once within the kidneys, tumor proliferation is initially interstitial, with the nephrons, collecting ducts and blood vessels acting as scaffolding for tumor growth. Since the nephrons are unaffected early in the course of the disease, the renal function usually remains preserved. Further growth leads to

destruction of renal parenchyma scaffolding, resulting in an expansile growth pattern. Depending on whether the growth pattern is uniform, non uniform, eccentric, uni or multi focal, various patterns of renal involvement result.

On ultrasound, the imaging findings include diffuse renal enlargement, single or multiple hypo echoic lesions and accentuation of CMD. Leukemic/lymphomatous nodules are usually hypo echoic and homogeneous. Their US appearance reflects the homogenous nature of lymphoma deposits, which offer very few tissue interfaces to the ultrasound beam.

Hilmes et al⁵ described the CT appearance of leukemic involvement in a retrospective study of 12 cases. The most common pattern on imaging was bilateral nephromegaly followed by bilateral multiple low attenuation masses. Other findings may include large areas of wedge shaped and geographic low attenuation, solitary unilateral low attenuation mass, solitary bilateral low attenuation masses and unilateral nephromegaly.

They also found that all the twelve cases with renal involvement had additional evidence of extra medullary leukemic involvement, which included mediastinum, pericardium, peritoneum, spleen, liver, pancreas, lymph nodes, spinal canal, brain, skin, orbit, testis and gingivae.

Isolated renal involvement of kidneys as a primary feature is very rare with only few published reports. The differential diagnosis of low attenuation masses in children includes infection, nephroblastomatosis, simple cysts, angiomyolipomas and lymphomas.

Renal lymphomatous involvement can appear quite similar to renal leukemic involvement. The only differentiating feature may be the involvement of peri nephric space in lymphoma, which is not seen in leukemia.

The causes of bilateral enlarged kidneys in children include obstructive uropathy, Vesico Uretric Reflux, infections, Autosomal Recessive Polycystic Kidney Disease, Multicystic Dysplastic Kidney, leukemia, lymphoma and some storage disorders.

The correct diagnosis requires imaging studies, urine gram stain and culture, bone marrow biopsy and FNA of the enlarged kidneys if required.

On MR imaging, tumors have lower signal intensity than normal cortex with T1-weighted sequences and are relatively

iso- or hypo intense with T2-weighted sequences. They enhance less than the renal parenchyma following intravenous administration of gadolinium-based contrast material

Although all kinds of leukemias can infiltrate the kidneys, ALL is most the frequent, followed by M4 and M5 variants of AML₅.

The presence of renal leukemic involvement does not appear to commonly cause renal dysfunction, although few cases of renal failure secondary to diffuse bilateral infiltration have been reported^{6,7,8,9}.

Other causes of deranged renal functions in a patient with leukemic infiltration of kidneys include prior chemo therapy and associated tumor lysis syndrome or obstructive uropathy secondary to enlarged retro peritoneal lymph nodes.

Enlarged kidneys in ALL are thought to be an unfavorable prognostic sign¹⁰. At present, systemic chemotherapy remains the basic treatment even with renal leukemic infiltrates. Our cases illustrate sonographic, CT and MR findings in leukemic involvement of kidneys with associated

extra medullary involvement.

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