

PUZZLING RENAL UPPER POLE HYPERECHOGEN CITY IN CHILDREN

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Ultrasonography appears to be an important tool for the early diagnosis increased renal medullary and cortical echogenicity, but it did not apps specific enough for diagnosis. Four patients with the diagnosis of increased echogenicity of the renal parenchyma in the upper pole were evaluated determine their primary disease. In two patients urinary tract infection w found as a possible cause of the renal parenchyma changes, one of them h lobar nephronia. In the other two there were no real causes for renal disease They had normal variant of renal architecture.

Key words: hyperechoic renal paranchyma, children, urinary infection

Increased renal parenchymal echogenicity on ultrasound is a frequent finding in children. Hyperechoic renal parenchyma may be the sign of metabolic diseases, infection, fibrosis, vascular congestion, protein deposition, tubular ectasia [1-3]. The purpose of this study was to investigate underlying cases increased renal parenchymal echogenicity in the upper pole of the kidney detected by ultrasound in children.

Patients and methods

Four patients (3 girls and a boy) with the diagnosis of increased echogenicity of the renal parenchyma in the upper pole of the kidneys were evaluated to determine their primary disease. Patients had been admitted to the Nephrology Department of the Child Health Center because of abdominal pain in all four cases. Each patient had "routine" abdominal ultrasound, series of biochemical tests, urine analysis. Serum electrolytes, urea, creatinine, calcium, phosphorus alkaline phosphatase, magnesium, pH, and bicarbonate levels were measure Three patients had renal isotope tests and two had CT.

Results

Case 1.

After being treated for urinary tract infection, six years old girl had an abdominal pain and hematuria. A focal corticomedullary hyperechogenicity was seen in the upper pole of the right kidney by ultrasound (Fig. 1a.). She had a slightly dilated pelvis in both kidneys. Tc-99m DMSA scan showed a decreased parenchymal activity in the upper and lower pole in the right kidney as a sign of infection (Fig. 1 b.). After treatment of urinary tract infection the local parenchymal hyperechogenicity was unchanged. Tc-99m MAG-3 scan showed a functional obstruction in both kidneys.

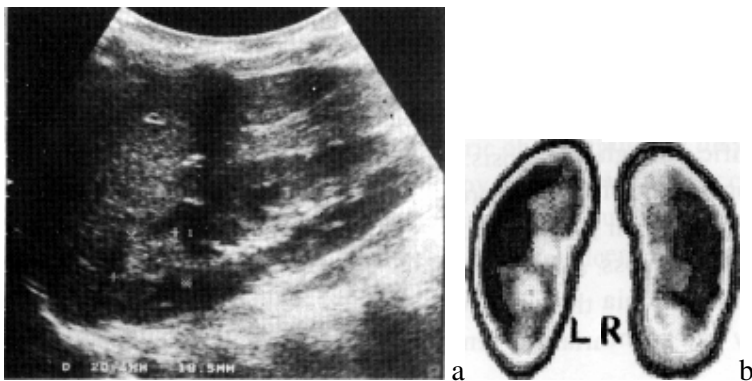


Fig. 1: On longitudinal sonogram of the right kidney, corticomedullary hyperechogenicity was seen in the upper pole. Pelvis was slightly dilated (a). Tc-99m DMSA scan showed a decreased parenchymal activity in the upper and lower pole in the right kidney (b).

Case 2.

Eight years old girl had abdominal pain and urinary tract infection. She had a focal corticomedullary hyperechogenicity in the upper pole of the both kidneys (Fig. 2.). DMSA scan showed a decrease parenchymal activity in this area. CT scan showed lobar nephronia (Fig. 2b.). Six months after antibiotic treatment normal ultrasound findings were found. (Fig. 2c.)

Case 3.

13 years old girl had vomit and abdominal pain and a hyperechogenic area was seen in the upper pole of the right kidney (Fig. 3a.). Tc-99m DMSA scan was normal. The repeated ultrasound showed the same entity (Fig. 3b.). Ten months later the CT scans showed a normally enhancing, widened tissue of Bertin septum (Fig. 3c.).

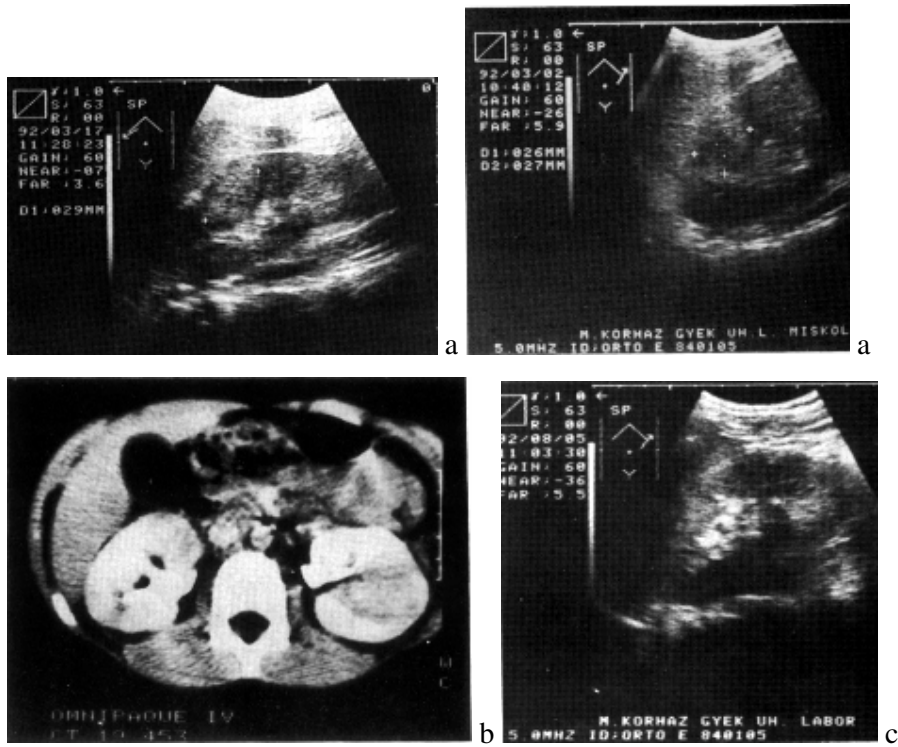
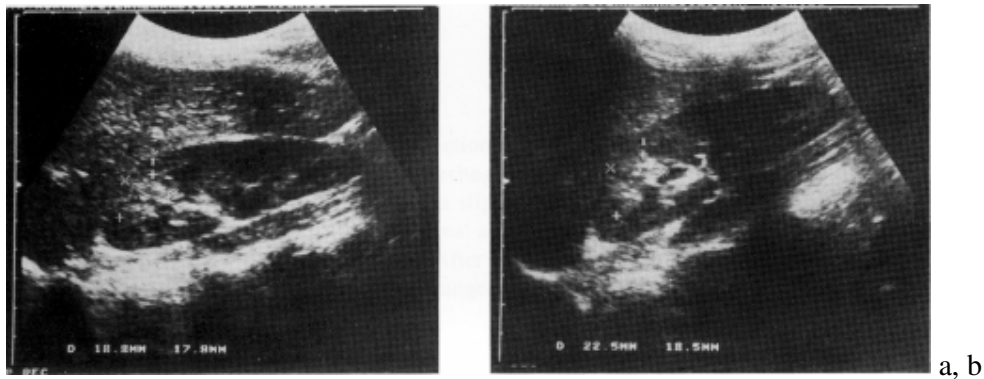


Fig. 2. Longitudinal sonogram showed a corticomedullary hyperechogenicity in the upper of the both kidneys (a). CT scan showed poorly enhanced renal parenchyma in both kidneys which was proved to be lobar nephronia (b). Six months later normal ultrasound findings were in both kidneys (c).



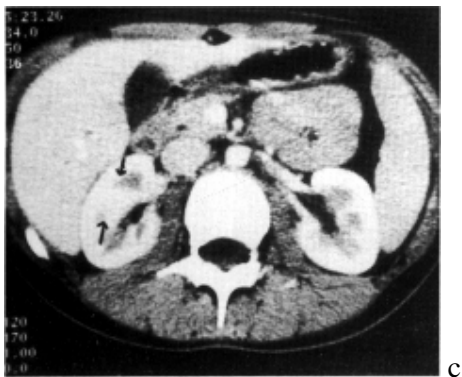


Fig. 3. Longitudinal sonogram showed a hyperechogenic area in the upper pole of the right kidney (a). Six months later there was no change on US scan (b). Ten months later CT scans showed a normally enhancing, widened cortical tissue of Berlin septum (arrows) (c).

Case 4.

Five years old boy was admitted because of abdominal pain. On ultrasound both kidneys were of normal sizes and in the upper pole of the right kidney there was a parenchymal hyperechogenicity



(Fig. 4.). Two central echo complexes separated with an interposed column of normal renal parenchyma (Berlin). Both echo complex may show hyperechogenicity because of the increased fatty tissue or a simple false reflection. We did not find any cause of abdominal pain.

All four patients had no hypercalciuria. Their urinary Ca/Cr ratio was lower than 0.50. Biochemical tests and urine analysis were normal in each patient. The sizes of the kidneys were generally noted to be normal for patient age.

Discussion

Ultrasonography appears to be an important tool in the early diagnosis of increased renal corticomedullary echogenicity [1, 2].

Increased echogenicity of the renal pyramids (Table 1) is seen with medullary tubular ectasia, deposits of certain substances such as calcium, urates, or proteins. Increased echogenicity of the renal cortex (Table 2) if of heterogeneous origin and may affect any or all of the four constituents of the kidney: glomeruli, tubules, interstitium, and vessels [4].

Schultz et al [5] concluded that the pattern of increased medullary echogenicity did not appear specific enough for diagnosis. Compared with the diversity of possible histologic changes, the sonographic features are nonspecific and not indicative of the type of pathologic involvement nor do they correlate with the severity of the disease. Key elements in the differential diagnosis are: the age of the child, the history, the clinical presentation, and a knowledge of the natural history of the various renal disorders. Medical renal disorders most frequently present with a nonspecific increased echogenicity of the renal cortex or pyramids. Exceptions are the terminal stage of nephronophthisis, the hemolytic-uremic syndrome of the glomerular thrombotic microangiopathic type, and in polycystic renal diseases, where relatively characteristic pattern may be seen [4].

The sonographic findings may be due to infection, tumor, normal variant of the renal architecture (doublesystem with columns of Berlin), and calcification [6, 7]. Urinary tract infection is well known to cause the scarring which is visible on ultrasound but its specificity is far less than the finding of isotopes [8, 9]. In our first case she had infection earlier and the scarring was the cause of the hyperechogenicity. Acute lobar nephronia is a focal form of acute bacterial nephritis

Fig. 4. On longitudinal sonogram of the right kidney corticomedullary hyperechogenicity was seen in the upper pole. Two central echo complex is separated with an interposed column of normal renal parenchyma (Berlin) (arrows) capillaries, these areas progressed to necrosis and later to scarring.

Ultrasonography is the best screening and diagnostic method in renal infection. However, both false-positive and false-negative findings have been reported [13]. It has been shown that in all reported cases with acute lobar nephronia, CT.

Increased renal cortical echogenicity scan gave the most accurate diagnosis [10, 14]. Lobar nephronia must be differentiated from renal infarct, renal abscess, lymphoma, and renal cell carcinoma. The age of the patients, the clinical signs and symptoms, and the response to treatment are helpful in making the correct diagnosis. It is recommended that CT scan be considered when ultrasonography is not diagnostic, whereas clinical and laboratory findings suggest severe renal involvement. In contrast, none of our patients had underlying disease.

Nayir et al [1] found increased renal medullary echogenicity in 50 children and most of them had distal renal tubular acidosis and vitamin D toxicity and different tubulopathy. The most common

ultrasonography pattern in Naylor patients was the appearance of a hyperechoic rim around the medulla. This was also found in patients with hyperparathyroidism [15].

Nephrocalcinosis was not present in our patients. If nephrocalcinosis can be excluded as a cause of increased renal medullary echogenicity, a large differential diagnosis remains. The ultrasound finding of renal medullary cysts associated with increased echogenicity has been suggested to be diagnostic of juvenile nephronophthisis [16]. But they conclude that at presentation the absence of cysts does not rule out the diagnosis of juvenile nephronophthisis. Medullary cysts are not required for the diagnosis of juvenile nephronophthisis [17]. This is illustrated by the lack of cysts seen in 30% of autopsy cases [18]. Whether these acystic cases are variants of juvenile nephronophthisis or simply represent an early stage in the progression of juvenile nephronophthisis.

Hricak et al [19] studied the ultrasound scans appearance of various renal pathologies and demonstrated increased cortical echogenicity in renal parenchymal disease. In their study only two patients had a pure tubular disorder (acute tubular necrosis), but it is noteworthy that neither had increased cortical echogenicity. Jequier et al [3] noted increased echogenicity of the renal medulla in children with X-linked hypophosphataemic rickets (X-LH) and considered their findings diagnostic of nephrocalcinosis. They also noted increased cortical and medullary echogenicity in two children with cystinosis and suggested the findings could be explained by tubular atrophy, interstitial fibrosis and glomerular sclerosis rather than nephrocalcinosis. The cortical echogenicity is probably unrelated to calcium deposition and has previously been suggested to be due to fibrosis. However, interstitial fibrosis is usually associated with marked reduction in GFR and this was not seen in all our patients with cortical echogenicity.

The renal parenchyma consist of the cortex, which is peripheral, contains the glomeruli, and has several extensions to the edge of the renal sinus (the septa of Berlin), and the medulla (containing the renal pyramids) which is more central and adjacent to the calyces. In our two cases (Case 3 and 4), we found columns of Berlin [6, 7].

With the new high-resolution, real-time scanners and careful technique, almost all of the variants of the normal kidney can be recognized. The less experienced examiner who is unfamiliar with the protean appearance of the normal kidney is apt to suspect an abnormality (e.g. mistake hypertrophic columns of Berlin for a tumor) and perhaps recommend unnecessary studies (intravenous urography, voiding cystourethrography, computed tomography, renal scintigraphy) [7].

Long-term follow-up of children with hyperechoic renal parenchyma may demonstrate the evaluation of the healing process and define the appropriate treatment protocol needed to minimize parenchymal damage.

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