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Traumatic Kidney in a Patient With Unilateral Renal Cystic Disease

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Abstract

Renal trauma occurring in patients with unilateral renal cystic disease (URCD) is extremely rare. Unilateral renal cystic disease is benign, nonprogressive, nonfamilial, nonencapsulated, and unrelated to cysts in other organs. It should be differentiated from autosomal dominant polycystic kidney disease (ADPKD) parenthesis, multicystic dysplastic kidney disease, multiple renal simple cysts, and cystic renal neoplasms. We report a case of a 15-year-old male with URCD admitted to the hospital sustaining blunt trauma to his right flank after a motor vehicle crash. Final diagnosis in this case was renal injury in a URCD patient. The patient was treated conservatively and subsequently discharged. Unilateral renal cystic disease can be diagnosed and followed by a combination of imaging methods and functional studies. The management of URCD is conservative. Although the disease is stable, nephrectomy may occasionally be indicated when there is a strong suspicion for malignancy.

Keywords

kidney injury, polycystic kidney disease, renal cystic diseases, renal trauma, unilateral renal cystic disease

Introduction

Renal cystic disease encompasses a wide range of hereditary, nonhereditary, and acquired diseases. It can present as an isolated manifestation, accompanied by extra renal abnormalities, or be part of a well-defined syndrome.[1] The classification of renal cystic disease is presented in Table 1.[1-3] Unilateral renal cystic disease (URCD) was first described in 1979 by Cho et al[4] as localized (segmental) cystic disease of the kidney. This is a rare and poorly understood entity. Other terms used for URCD are segmental polycystic kidney disease, multiple unilateral renal cysts, and unilateral polycystic renal disease.[1,2] Traumatic kidney injuries can be found in from 1% to 5% of all trauma patients and may be classified as either blunt or penetrating.[5,6] Blunt trauma is the most common mechanism, accounting for 71% to 95% of the traumatic renal injuries.[6,7] Renal trauma occurring in patients with URCD is extremely rare and, to our knowledge, this has never been reported. We report a case of URCD in an adolescent male diagnosed by ultrasound and computed tomography (CT) examinations done during the initial evaluation of his injuries.

Case Presentation

A 15-year-old male was admitted to an emergency department with abdominal trauma after a motor vehicle crash. He stated that his right flank hit the motorbike and he felt pain in this region. Physical examination revealed bruises and minor abrasions on the right flank. He was hemodynamically stable (blood pressure: 110/60 mm of HG, heart rate: 93 bpm) and had a normal respiratory rate. An indwelling Foley catheter was inserted, and no gross hematuria was observed. Laboratory tests included red blood cells count, hemoglobin concentration, hematocrit, platelet count, blood

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Table 1. Classification of Renal Cystic Diseases.[1-3]

1. Autosomal dominant polycystic kidney disease (ADPKD)
2. Autosomal recessive polycystic kidney disease (ARPKD)
3. Unilateral renal cystic disease (URCD) or localized or segmental cystic disease of the kidney
4. Solitary and multiple renal simple cysts
5. Dysplastic kidney
6. Pluricystic kidney of multiple malformations syndromes
7. Juvenile nephronophthisis and medullary cystic kidney disease
8. Medullary sponge kidney
9. Glomerulocystic kidney disease
10. Multilocular renal cyst-cystic nephroma and congeners (cystic partially differentiated nephroblastoma; nephroblastoma with cysts; cystic congenital mesoblastic nephroma)
11. Renal cysts in hereditary syndromes
12. Renal lymphangioma/peripyelic-pericalyceal lymphangiectasis (hygroma renalis)
13. Pyelo-calyceal cyst; peripelvic/parapelvic cyst; peripelvic/perinephric pseudocyst; lymphocele
14. Acquired renal cystic disease
15. Renal cell carcinoma with cystic change
16. Primary renal sarcoma
17. Pseudo-cystic change of the kidney (hydronephrosis)

urea nitrogen (6.4 μM/L), serum creatinine (107 μM/L), electrolyte concentrations, and urinalysis were within normal limits. The white blood cell count was elevated 20,480/mL (normal value less than or equal to 10,000/mL). Screening of family members was negative for kidney disease. He had never undergone a kidney examination in the past.

Ultrasound revealed disruption of the right upper pole structures with intraparenchymal and subcapsular hematoma. The remaining right kidney was heterogeneous and hypoechoic due to the aggregate of multiple sac-like structures with calcified walls. No evidence of fluid/fluid levels were noted (Figure 1). An urgent CT scan showed hemorrhagic contusion, subcapsular hematoma, and a renal laceration that did not involve the collecting system of the upper pole of the right kidney (Figure 2). The radiologist noted some hypo-dense regions in all phases at the middle portion of the kidney suspecting they may represent segmental infarctions without active bleeding. This case was classified as a Grade-IV right renal injury according to the American Association for Surgery of Trauma (AAST) renal injury grading scale. The urologist however felt there was a discordance between urinalysis and clinical examinations versus the CT result. He suggested a consult with senior radiologists about the CT scan result as the treatment of Grade-III and Grade-IV renal injury is different.

In conclusion, these hypo-dense areas were determined to be cysts. This patient was eligible for the diagnosis of URCD, which includes diagnostic findings such as multiple unilateral renal cysts, which are nonfamilial and unrelated to cysts in other organs. The renal trauma was reclassified as a Grade-III and treated conservatively. In addition, in the right liver (segment 6), there was a 2 to 3 area of poor enhancement in the late phase (Grade II-III according to double asking me to AAST). There was no evidence of cystic structures in the liver, pancreas, spleen, and left kidney. The patient was re-examined by ultrasound, repeat blood count, and urinalysis. All results were within normal limits. After 7 days, the patient recovered well and was discharged with no complications. During the following 12 months, the cystic lesions were noted to be unchanged and renal function was maintained. The right renal cysts were uncomplicated, and there was no evidence of malignancy or dysplasia.

Discussion

The term polycystic refers to use multiple cystic lesions that are genetically determined in either the autosomal dominant adult form or the autosomal recessive infantile form. The term multicystic refers to multiple cystic lesions that can be small or large, segmental, unilateral, or bilateral, and often sporadic.[1,8,9]

Unilateral renal cystic disease is a rare multicystic disease characterized by cysts of various sizes localized in a diffusely enlarged kidney. These cysts penetrate part or all of the normal parenchyma in one kidney without forming a distinct encapsulated mass. A significant proportion of URCD cases are undetected because many patients are asymptomatic, so there is a paucity of data about imaging, inspection, biopsy, or nephrectomy.[2,8,10]

Unilateral renal cystic disease is morphologically and microscopically difficult to differentiate from Autosomal dominant polycystic kidney disease (ADPKD). Unilateral renal cystic disease is benign, nonprogressive, nonfamilial, nonencapsulated, and unrelated to cysts in other organs. The pathogenesis is unclear but may involve a somatic mutation. Another hypothesis is that they derive from a maldevelopment of the kidney. Most patients are encountered in adulthood; however, newborns, infants, and children have also been noted to have this disease.[10,11]

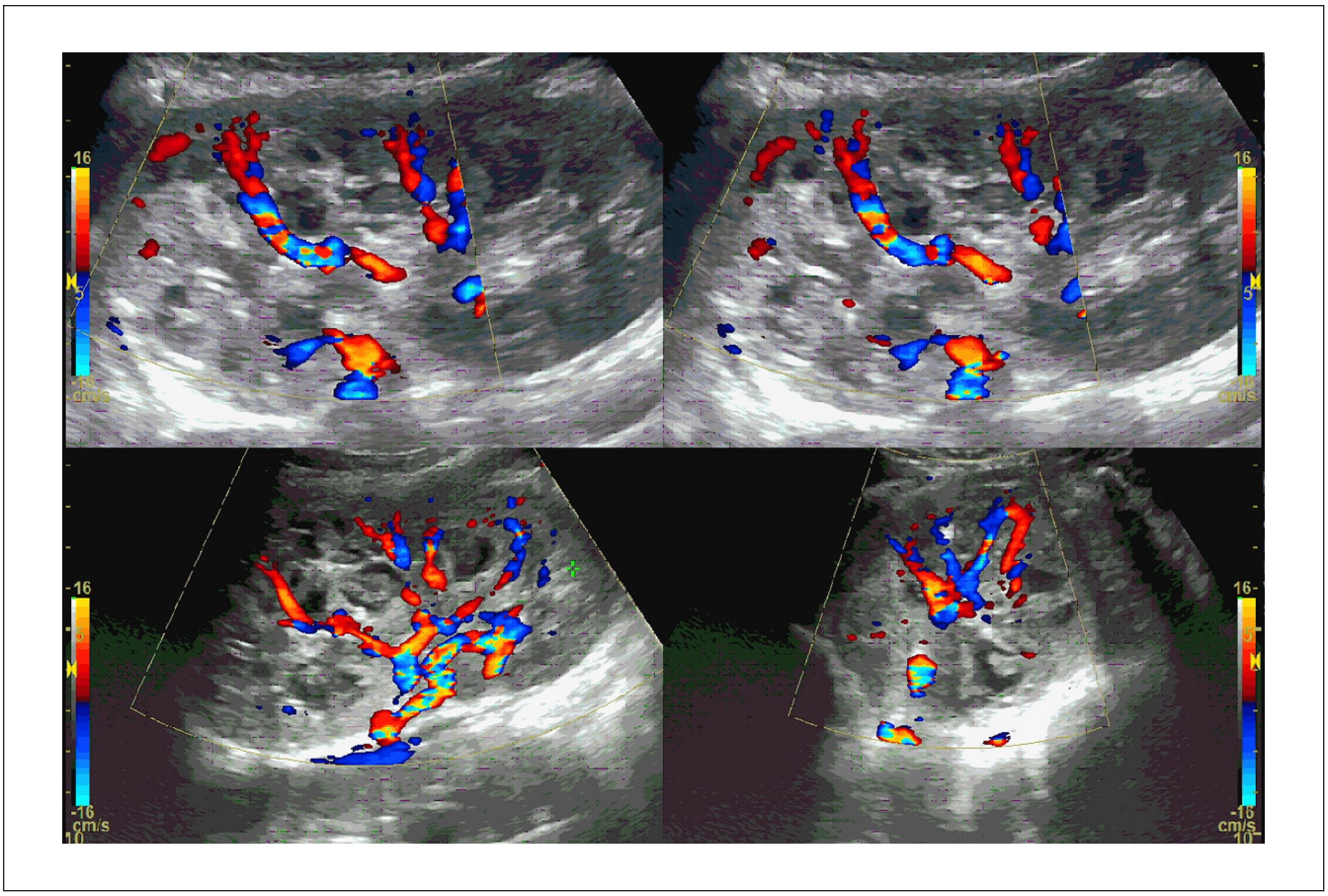

Figure 1. Ultrasound images of the right kidney demonstrated a heterogeneous hypoechogenic renal parenchyma structure as a multicystic form accompanied by contusion of renal parenchyma at the superior pole. However, ultrasound is difficult to assess the initial URCD in the setting of trauma because the URCD image will mingle into hematoma contusion.
Abbreviation: URCD, unilateral renal cystic disease.

Nephrolithiasis and hyperattenuating cysts are not usually seen in URCD but are common in ADPKD. If URCD appears locally, it also imitates multicystic dysplastic kidney and cystic neoplasm of kidney. It is useful to acquire accurate diagnostic information to assist with the differential diagnosis. Unilateral renal cystic disease presents as cysts with normal intervening renal parenchyma, whereas cystic neoplasm presents as a focal encapsulated mass that compresses adjacent renal parenchyma. The most common clinical manifestations of neoplasms are pain, a palpable flank mass, hematuria, and hypertension.[6,8,12,13]

The most important differential diagnosis of URCD is ADPKD. In cases of asymptomatic onset, ADPKD can mimic URCD, especially in children. In this case, long-term follow-up and screening of family members may be necessary to differentiate between the 2 entities. Extra-renal manifestations of ADPKD such as cystic lesions in the liver, pancreas, or cerebral aneurysms are not seen in URCD.[9,14,15]

Unlike ADPKD, patients with URCD have neither a genetic background, nor a progressive deterioration of renal function. Preserved renal function in the URCD kidney is near-normal when compared with the remaining normal kidney. In the case of multicystic dysplastic kidney, in which the intervening parenchyma is dysplastic and dysfunctional, renal function studies may differ between the normal and the disease kidney. This entity is common in infants and children. Autosomal dominant polycystic kidney disease may show mild enhancement but less than normal kidney tissue perfusion.[14-17]

It should be noted that when the kidney in a URCD patient is traumatized, the trauma workup and assessment may lead to inaccurate grading of the renal injury as in our case. Frequently, radiologists will upgrade the AAST renal trauma scores in the presence of an associated URCD kidney than they would in the absence of URCD. This misinterpretation of the morphology may seriously affect the treatment method and may not be beneficial to the patient. Such was the case with our patient.

Conclusion

Unilateral renal cystic disease is a rare cystic disease of the kidney. Differentiating URCD from ADPKD in a patient with renal trauma is important, especially from a genetic,

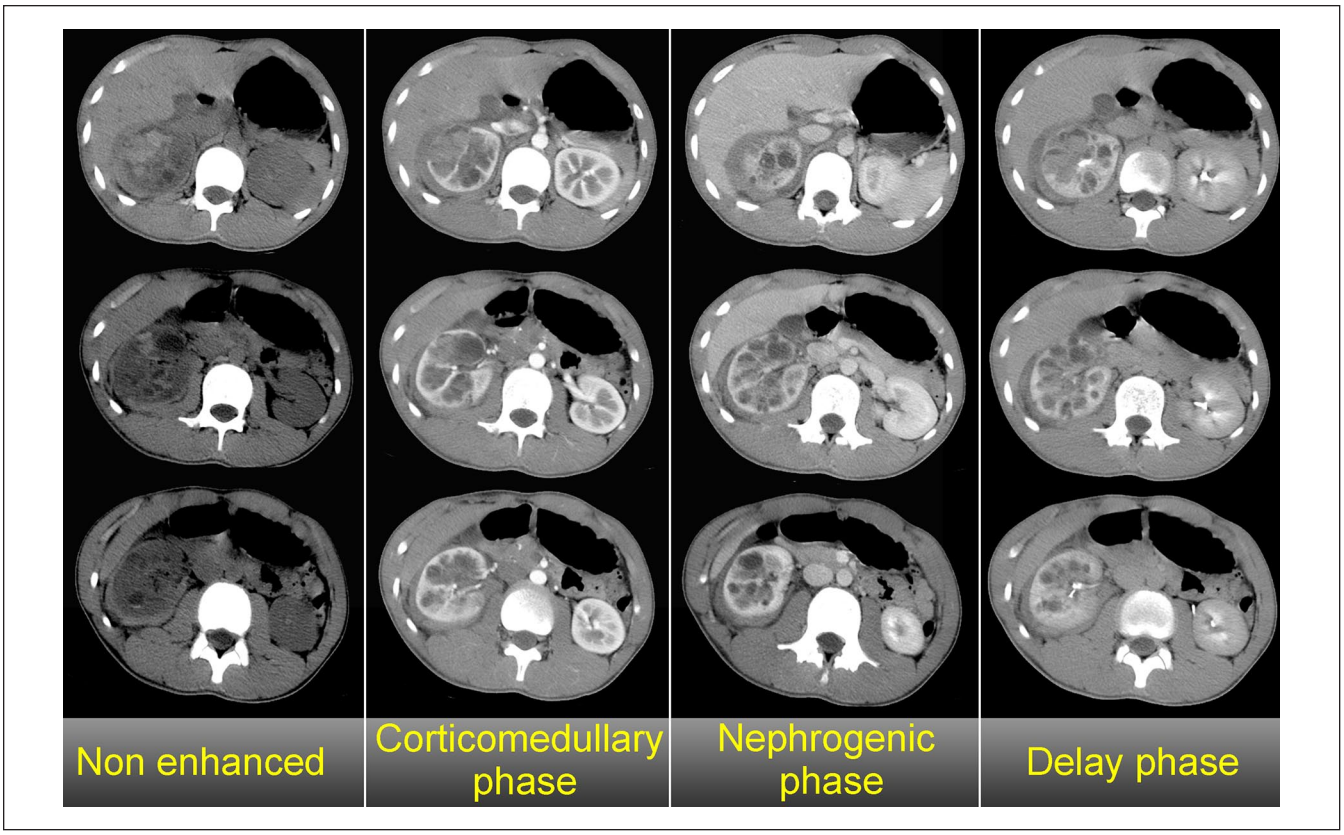

Figure 2. CT unenhanced phase and contrast-enhanced phase images showed multiple variably sized cysts in the mild enlarged right kidney separated by contrast-enhanced normal parenchyma. The images showed hemorrhagic contusion and laceration in the upper polar of the right kidney with subcapsular hematoma. The appearance of the left kidney was normal.
Abbreviation: CT, computed tomography.

prognostic, and treatment perspective. Unilateral renal cystic disease can be diagnosed and followed by imaging methods. Although the disease is stable, it may require nephrectomy when or if there is a strong suspicion of malignancy.

Author Contributions

V.T.H., T.H.H., and V.C.: collected the data and wrote the manuscript; T.T.T.N., C.T.T., and D.T.H.: reviewed and revised the manuscript. All authors have read and approved the final manuscript.

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Ethics Approval

Institutions of authors do not require ethics committee approval for a case report or case series containing information of fewer than 3 patients.

Informed Consent

Informed consent was obtained from the patient in this case report. No identifying information has been used in this article.

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