Complications of Sporadic, Hereditary, and Acquired Renal Cysts: Cross-Sectional Imaging Findings

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Commonly encountered in the general adult and elderly population, in most cases simple renal cysts are confidently diagnosed on imaging studies and do not require further workup or treatment. However, large or growing renal cysts sometimes cause symptoms or signs such as hypertension, palpable mass, flank or abdominal pain, obstructive uropathy, and hematuria, which may indicate the need for minimally invasive percutaneous or laparoscopic treatment. Furthermore, severe complications such as cystic hemorrhage, rupture, or superinfection may occur, particularly in patients with polycystic renal disorders, either hereditary (namely adult polycystic kidney diseases) or acquired in chronic renal failure. This pictorial essay reviews and discusses the cross-sectional imaging appearances of symptomatic and complicated sporadic, hereditary, and acquired renal cysts. Early cross-sectional imaging with multidetector computed tomography or magnetic resonance imaging or both, including contrast enhancement unless contraindicated by renal dysfunction, is warranted to investigate clinical and laboratory signs suggesting retroperitoneal hemorrhage or infection in patients with pre-existent renal cysts, particularly if large, multiple, or hereditary.

Introduction

Commonly encountered in the adult and elderly population, in most cases simple renal cysts (SRCs) are confidently diagnosed on imaging studies, represent incidental findings without clinical importance, and do not require further investigation, follow-up, or treatment. Although no precise data exist on the percentage of symptomatic cases, SRCs sometimes cause a palpable mass, flank or abdominal pain, hypertension, or hematuria.[1,2]

Furthermore, SRCs may sometimes undergo severe complications such as hemorrhage, rupture, and infection, which require prompt diagnosis and treatment.[2-5] Cyst superinfection and bleeding may occur in patients with large or multiple sporadic SRCs and more frequently in patients with hereditary or acquired polycystic renal disorders. One of the most common inherited disorders, autosomal dominant polycystic kidney disease (ADPKD) occurs in 1:400-1:1000 white individuals and involves the progressive development of renal cysts that originate from both collecting ducts and nephrons, with or without associated liver cysts and abnormalities in other organ systems. ADPKD leads to progressive kidney enlargement, hypertension, and ultimately decreased function and accounts for 10%-15% of patients on renal replacement therapy. Conversely, acquired cystic kidney disease (ACKD) refers to the secondary development of multiple cysts in patients with chronic renal failure due to different, noncystic kidney disorders, which occurs in 50% and 90% of patients after 3-5 years and 5-10 years of dialysis, respectively.[2,6-10]

Symptomatic Renal Cysts

The well-known imaging hallmark of a SRC includes the characteristic anechoic sonographic appearance with posterior through-transmission, homogeneous waterlike computed tomography (CT) attenuation (Fig 1) and markedly T1-hypointense and T2-hyperintense magnetic resonance imaging (MRI) signal intensity, without appreciable wall thickening, irregularities, peripheral, or septal enhancing tissue after intravenous contrast.[11,12]

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Curr Probl Diagn Radiol 2014;43:80–90.

0363-0188/$36.00 + 0
http://dx.doi.org/10.1067/j.cpradiol.2013.12.002

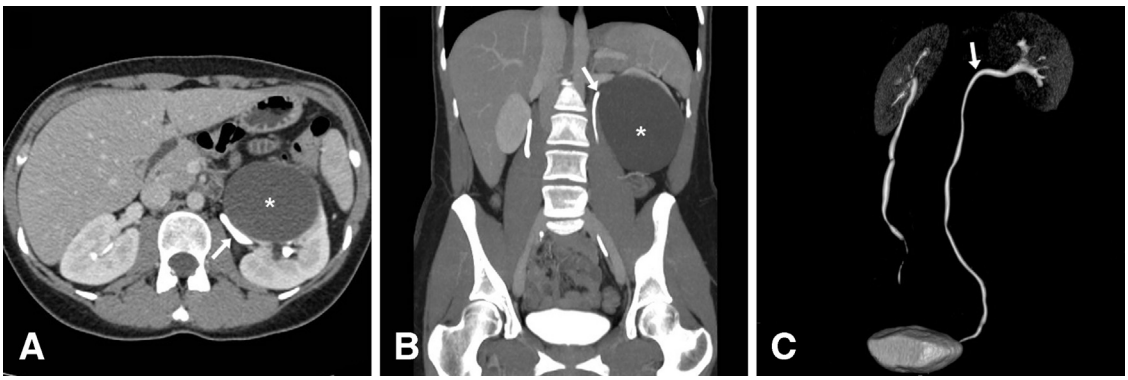

FIG 1. Solitary large (11 × 9 cm^2) simple renal cyst with mass effect in a 31-year-old woman with hypertension and vague lumbar pain. Axial (A) and coronal (B) images from single-pass triple-bolus multidetector CT-urography show left-sided fluid-attenuation ovoid cyst (*) with imperceptible walls, which displaces and moderately compresses the opacified ipsilateral renal pelvis and proximal ureter (arrows). Mass effect on the collecting system is best demonstrated by 3-dimensional volume-rendering image (C).

Sporadically, sizeable uncomplicated SRCs may be associated with clinical complaints such as palpable mass, dull flank or abdominal pain, or hematuria. In the general population, the presence, size, and number of cysts do not correlate with renal function impairment measured by glomerular filtration rate. Conversely, an established association exists between SRCs and hypertension (Fig 1), particularly in men, people older than 60 years, and those with multiple, large, or peripheral cysts. In ADPKD, local ischemia caused by cyst expansion leads to activation of the renin-angiotensin system. As a result, hypertension affects 50%-75% of adults with ADPKD and preserved renal function and up to 80% of those with end-stage renal failure.[1,2]

Ultrasound is usually the first-line imaging modality to detect SRCs, whereas multidetector CT-urography and MRI optimally show cyst size, location, mass effect with compression of the renal parenchyma, dislocation, and upstream dilatation of the urinary collecting system (Fig 1). Alternatively, a rapidly enlarging SRC (Fig 2) may underlie the patient's symptoms. As imaging of suspected SRC complications usually requires enhancement by intravenous contrast for both CT and MRI, knowledge of the patient's renal function is crucial to weigh the benefit of a comprehensive cross-sectional study against the concern for contrast media–induced nephrotoxicity and nephrogenic systemic fibrosis, respectively. In ADPKD, significant renal enlargement usually precedes the decline in renal function.[2,13]

Chronic pain is a frequent complaint in patients with ADPKD, which is grossly related to the kidneys' size and results from mass effect within the abdomen, including compression on surrounding structures, traction of renal pedicles, and distension of the renal capsules.[2,14]

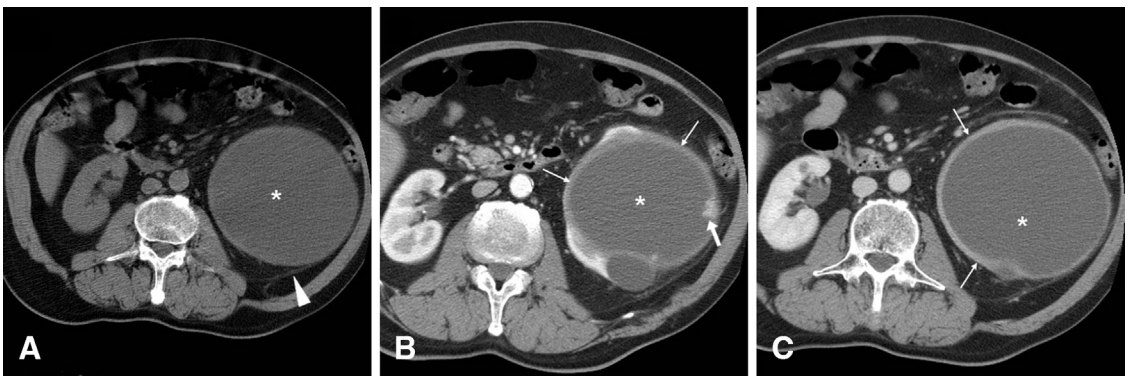

FIG 2. Enlarging, symptomatic renal cyst in a 60-year-old man with acute flank pain. Unenhanced (A), arterial (B), and portal venous (C) phase images show large (15 × 13 cm^2) left renal cyst (*), which is enlarged compared with the 9-cm simple cyst described in the ultrasound report dating 3 months earlier. On CT images, minimal mural thickening (thin arrows) is noted, with a focal intraluminal projection (arrow in B). Percutaneous aspiration relieved the patient's symptoms and excluded suspicion of cyst superinfection.