Type 2 calyceal diverticulum with an unusual appearance in the lower pole of the kidney

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ABSTRACT

A 45-year-old woman presented to our clinic with intermittent left flank pain. The family physician referred her for renal cystic mass with a calcified appearance. The non-contrast spiral abdominal computed tomographic (CT) scan demonstrated the mass-like cystic lesion with a densely calcified lesion in the lower pole of the kidney. A detailed history revealed that she underwent shock wave lithotripsy (SWL) for the lower pole renal stone one year ago. After SWL, the stone fragments migrated to the dependent diverticulum region and produced the misleading appearance of a Bosniak type III lesion. Contrast-enhanced computed tomography (CT) scan was done for further evaluation, and finally, the diagnosis of the calyceal diverticulum was confirmed in the lower pole of the kidney. Calyceal diverticula are the outpouching of the pyelocalyceal system lined by non-secretory transitional epithelium. It is a rare condition that occurs in less than 0.5% of the population. Most patients are asymptomatic and have been discovered incidentally in routine imaging modalities. As most of the patients are asymptomatic, many do not need intervention. However, in some instances, patients present with flank pain, hematuria, urinary tract infection, and stone formation in the diverticulum. They are in the differential diagnosis of renal cystic lesions such as simple renal cyst, renal cortical abscess, and parapelvic cyst. In renal cystic lesion besides of simple renal cyst or renal cystic mass, we should keep the differential diagnosis of the calyceal diverticulum type 2, especially in patients that underwent SWL for renal stones; the fragmented residual stone may have migrated to this dilated region and produce the deceptive appearance of a Bosniak type III lesion.

CASE REPORT

CASE REPORT

A 45-year-old woman presented to our clinic with intermittent left flank pain. The family physician referred her for renal cystic mass with a calcified appearance. Urinalysis revealed microscopic hematuria. Other laboratory tests, including urea and creatinine, were normal. The physical examination and vital signs were normal. The patient had a spiral non-contrast abdominal computed tomographic (CT) scan that demonstrates the mass-like cystic lesion with a

densely calcified lesion in the lower pole of the kidney (Figure 1a). A detailed history revealed that she had a renal stone that underwent SWL one year ago. Reviewing the first CT scan revealed no mass-like lesion in the previous imaging. A calyceal diverticulum (type 2) was revealed that communicated with the collecting system in the lower pole of the kidney (Figure 1b). The ultrasound image depicted a cystic lesion that extended in the lower pole of the left kidney (Figure 2). After SWL, the stone fragments migrated to the dependent diverticulum region and produced the misleading appearance of the renal cystic lesion resembling a Bosniak type III lesion. The contrast-enhanced computed tomography (CT) scan was performed for further evaluation. Finally, the diagnosis of a calyceal diverticulum was confirmed in the lower pole of the kidney (Figure 3a and b). The patient was reassured about nonmalignant pathology and diagnosis of a type 2 calyceal diverticulum and followed up to pass residual stones.

DISCUSSION

Etiology & Demographics:

Calyceal diverticula are the outpouching of the pyelocalyceal system lined by non-secretory transitional epithelium [1]. It is a rare condition that occurs in less than 0.5% of the population. Females are more commonly affected than men, with a ratio of 2:1. The most common type is classified as type 1; this type is attached to the fornix of the minor calyx and connected to the pyelocalyceal system by a slim infundibulum, and the less common type 2, the diverticulum is connected to the major calyx or renal pelvis directly and primarily found in the middle pole of the kidney [2,3]. The exact etiology is unidentified, but infection, trauma, infundibular obstruction, post-surgical injuries, renal papillary necrosis, and congenital etiology are possible etiologic factors [4,5].

Clinical & Imaging Findings:

Most patients are asymptomatic and have been discovered incidentally on routine imaging modalities. The ultrasound finding may be similar to other cystic lesions, and definite diagnosis is difficult by US alone. With the increasing use of contrast-enhanced CT, most of the cases are discovered by this modality. With new techniques like three-dimensional reconstructions, the communication can be revealed, and a definite diagnosis accomplished.

Magnetic resonance imaging (MRI) is also helpful in suspected cases; especially in contrast studies, spatial resolution is excellent for differentiating the two types of calyceal diverticula.

Treatment & Prognosis:

As most of the patients are asymptomatic, many do not need intervention. However, in some instances, patients present with flank pain, hematuria, urinary tract infection, and stone formation in the diverticulum. If the stone needs intervention, the SWL is the first modality. The other endourologic modalities like percutaneous nephrolithotomy (PCNL) and retrograde intrarenal surgery (RIRS) are viable options in cases with a history of unsuccessful SWL treatment. Where diverticula are inaccessible for endourologic management (anteriorly located cysts), laparoscopic excision or open surgery are the last resorts [6].

Differential Diagnosis:

In the differential diagnosis of renal cystic lesions are simple renal cyst, renal cortical abscess, parapelvic cyst, renal tuberculosis lesions, the upper pole of a duplicated renal system, and renal cystic mass [7]. Simple renal cysts are the most common benign renal lesions in ultrasound imaging. Renal cysts show no enhancement in contrast imaging. A new update of the Bosniak classification was released in 2019 [8]. Parapelvic cysts are the other condition in the renal pelvis, and there is no connection between them. They are in the differential diagnosis of high-grade hydronephrosis.

Infectious etiologies include renal cortical abscess, tuberculosis cavity, and renal hydatid cyst. A comprehensive history is essential to guide these diagnoses [9-11]. The non-functional upper pole in a duplicated renal system is suspected on renal US by split renal sinus and in children with vesicoureteral reflux, which could be confirmed by renal scintigraphy scan or magnetic resonance urography (MRU) [12].

TEACHING POINT

We present a patient with a type 2 calyceal diverticulum with two peculiar characteristics. The first one is the uncommon location (the lower pole of the kidney), whereas most of this type of diverticulum is reported in the central pole of the kidney. The second point is the unusual appearance of a Bosniak type III cyst. In patients who underwent SWL for renal stones, fragmented residual stones may have migrated to this dilated region and produced a Bosniak type III deceptive appearance.

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FIGURES

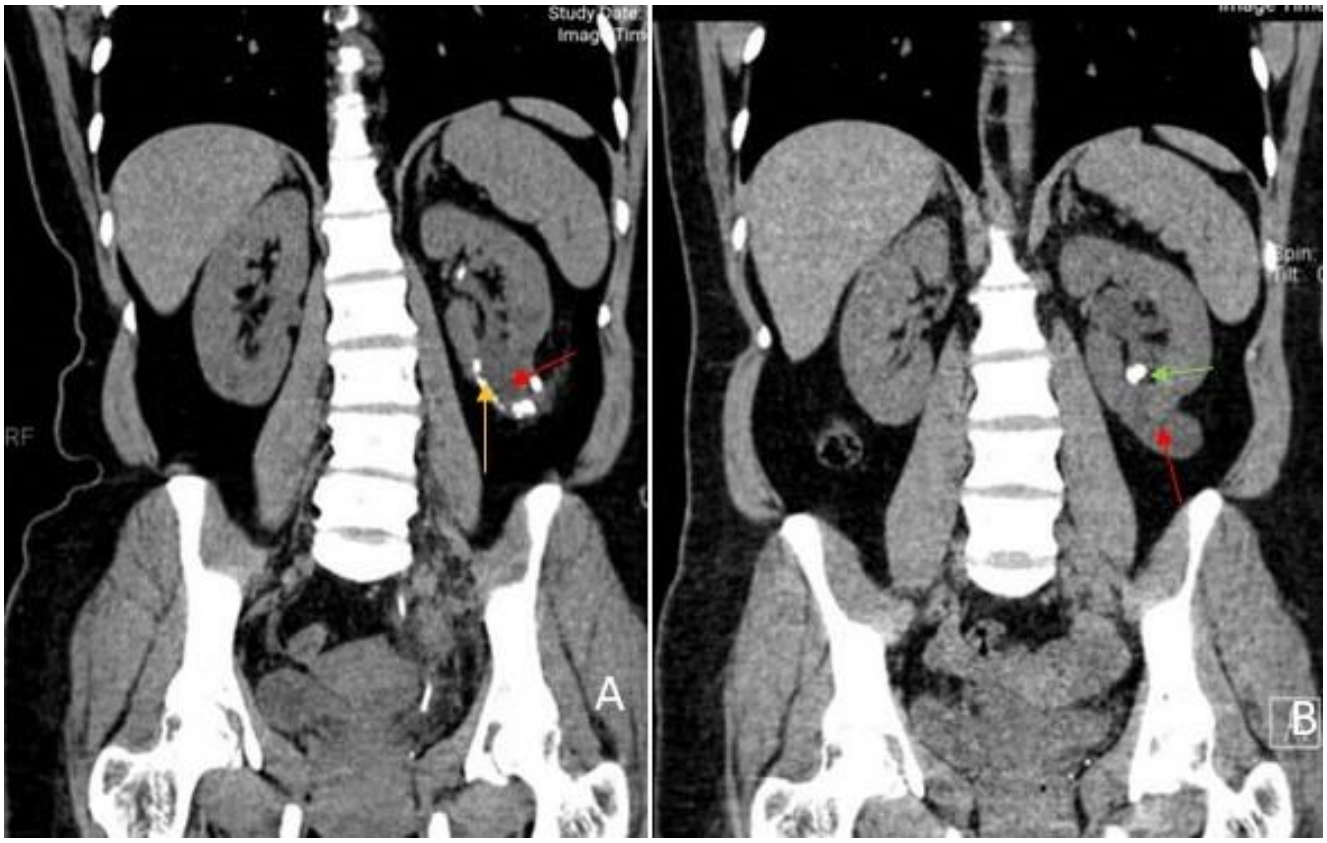

Figure 1: A 45-year-old woman with left calcified renal mass, turning out to be a type 2 calyceal diverticulum.

Findings: A) Non-contrast renal CT scan (coronal view) reveals a mass-like lesion in the lower pole of the kidney that resembles a Bosniak type III lesion (red arrow) with a calcified area in the peripheral zone of the lesion (yellow arrow)
B) The first spiral non-contrast renal CT scan (coronal view) before SWL reveals a cystic mass in the lower pole (red arrow) and renal stone in the lower pole (green arrow)

Technique: Non-contrast spiral abdominal CT scan, coronal view (Multi-detector spiral CT, Siemens,64 slices, 2mm slice thickness, 110 kVp,120 mAs)

Figure 2 (left): A 45-year-old woman with a left cystic renal mass in the lower pole of the left kidney, turning out to be a type 2 calyceal diverticulum.

Finding: A cystic renal mass in the lower pole of the left kidney resembled severe hydronephrosis with the extension into the lower pole. A calcified area resembles a cystic lesion's extension into the lower pole.

Technique: Transabdominal ultrasound, 3.5MHZ, GE volusion S8 ultrasound machine

Figure 3: A 45-year-old woman with left cystic renal mass and renal stone, turning out to be a type 2 calyceal diverticulum.

Findings:(A) Early phase after contrast administration revealed renal stone fragments in the center of a cystic lesion (red arrow) (B) Delayed phase of a contrast enhanced abdominal CT, the contrast filled the diverticulum cavity and revealed communication between the diverticulum and the calyceal system.

Technique: Contrast abdominal CT scan, coronal view after administration of 70 ccs, visipaque contrast medium (Multi-detector spiral CT, Siemens,64 slices,5mm slice thickness,110 kVp,399 mAs)

Etiology	The exact mechanism is unidentified: congenital and acquired
Clinical presentation	Asymptomatic, flank pain, hematuria, Stone formation
Age predilection	Adults or infants can occur in the age category
Incidence	Rare, about 0.5 % general population
Gender ratio	Females are more commonly affected than men, with a ratio of 2:1
Risk factors	Infection, trauma, infundibular obstruction, post-surgical injuries, renal papillary necrosis
Treatment	SWL, PCNL, RIRS, laparoscopy, open surgery in symptomatic cases, otherwise conservative treatment in asymptomatic cases
Prognosis	Good
Imaging findings	US: cystic lesion in the peripheral area of renal cortex CT scan: A contrast study reveals the communication of the diverticulum with the collecting system MRI, MRU: like CT but with better spatial resolution, maybe potent in differentiating type 1 from type 2 Renal scintigraphy scan: especially helpful in the diagnosis of the non-functional upper pole in the duplicated collecting system

Table 1: Summary table of calyceal diverticulum.

Diagnosis	General	US	CT
Renal cortical cyst	Increase in incidence with age	Hypoechoic cortical mass	Hypodense lesion: water equivalent density, non-enhancing
Parapelvic cyst	Located in the vicinity of the renal pelvis, no connection with the collecting system	Hypoechoic lesions	Hypodense lesion: water equivalent density, non-enhancing
Renal abscess	History of fever and urinary tract infection	Well-defined hypoechoic area with internal echo or debris	Well-defined mass with thick irregular wall, gas formation is suggestive
Non-functional upper pole	Usually discovered during vesicoureteral reflux work-up	The cystic lesion in the upper pole of the kidney	Duplicated renal collecting system during contrast study
Renal cystic tumor	Cystic lesion with thickness in septa or cyst wall	Hyper-, iso-, or hypoechogenic	Bosniak type III-IV lesion, enhancing in contrast study
Renal tuberculosis	Small renal cortical mass with deformed calyces	From isoechoic renal mass to total renal loss	Multifocal renal mass associated with hydronephrosis affected any part of the kidney

Table 2: Differential diagnosis table for calyceal diverticulum.

ABBREVIATIONS

CT = Computed tomography
MRI = Magnetic resonance imaging
PCNL = Percutaneous nephrolithotomy
RIRS = Retrograde intrarenal surgery
SWL = Shock wave lithotripsy

KEYWORDS

Calyceal diverticulum type 2; Contrast-enhanced CT Scan; Hydrocalyx; Left renal cystic mass; Bosniak classification

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