Calyceal diverticulum simulating a renal tumor

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Calyceal diverticulum (CD) is a rare anatomic anomaly with an incidence of 0.2% to 0.6% in the patients undergoing renal imaging. They are considered benign lesions and malignancy is exceedingly rare. For diagnosis it is suggested to perform a multiphasic contrast-enhanced computed tomography (CT) evidencing a diverticulum of the pelvicalyceal system with thin-walled cavities communicating with the central collecting system. However, they can be usually mistaken as kidney cancers leading to unjustified nephrectomy. Here, we present a case of a 34-year-old patient who underwent surgery in 2022 due to suspected kidney cancer and histopathological analysis surprisingly reported a CD.

Key Words: calyceal diverticulum, kidney cancer, partial nephrectomy

Introduction

Calyceal diverticulum (CD) can be defined as a cystic intrarenal urine-filled cavity lined by non-secretory transitional epithelium that communicates with the collecting system. It is a rare anatomic anomaly with an incidence of 0.2% to 0.6% in the patients undergoing renal imaging.[1] Their etiology is controversial; however, most cases are thought to be congenital resulting from failure of regression of the third and fourth generation ureteric buds. A smaller percentage of cases may be acquired, resulting from obstructing stones or infection.[2]

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There are two types of CD: type 1, the more common type that communicates with a minor calyx, and type 2 characterized by connecting with a major calyx or the renal pelvis.[3] Fifty percent of cases of pyelocalyceal diverticulum are complicated by calculi and milk of calcium. This is likely due to a combination of urinary stasis and repeated infection.

CD are usually asymptomatic but when complications such as hemorrhage, infection, and cyst rupture occur they can manifest with symptoms like flank or loin pain, renal colic, urinary frequency, hematuria or fever.

They are considered benign lesions and malignancy is exceedingly rare, with only four cases reported in the literature.[4]

At the radiological examination, the diverticula of the pelvicalyceal system look like thin-walled cavities that communicate with the central collecting system. They can be empty or filled with urine, stones or calcium milk. A large CD may be difficult to distinguish from

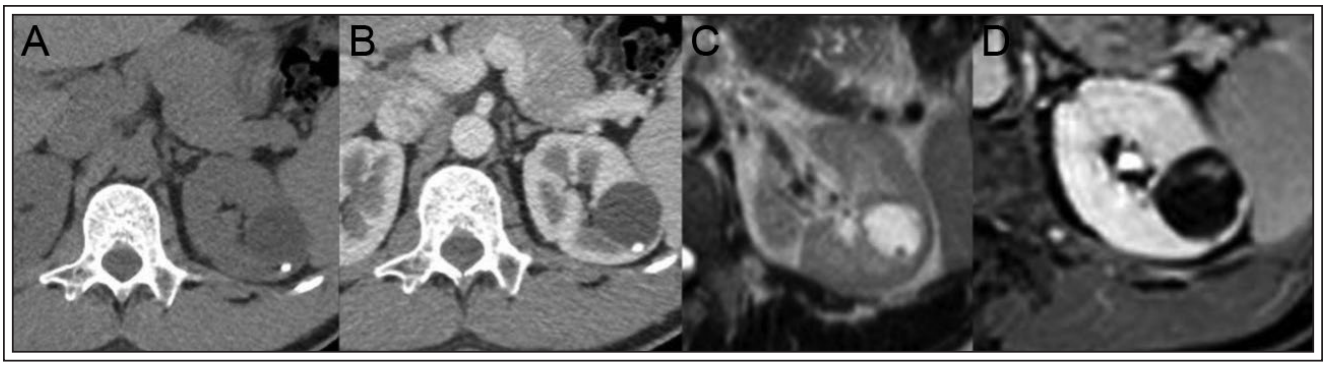

Figure 1. Axial CT pre **(A)** and post-contrast IV **(B)**, showing a cystic lesion in the left kidney with a small calculus inside. **C)** axial T2wi, same cystic lesion with homogeneous liquid content. **D)** T1wi excretory phase after IV contrast injection, the cystic lesion with minimally thickened septum.

a hydrocalyx due to calyceal obstruction from benign or malignant causes. For diagnosis it is suggested to perform a multiphasic contrast-enhanced computed tomography (CT), evidencing at the excretory phase filling of the cavity through retrograde reflux of the contrast agent from the calyceal system through an infundibulum.[5]

However, they can be usually mistaken as kidney cancers leading to unjustified nephrectomy.[6,7] Here, we present a case of a 34-year-old patient who underwent surgery in 2022 due to suspected kidney cancer and histopathological analysis surprisingly reported a CD.

Case report

A 34-year-old male with no significant personal and family background was referred to our center for presenting on a multiphasic contrast-enhanced CT scan performed in context of an episode of macroscopic hematuria, a cyst like structure at the upper left renal pole of 44 mm x 31 mm x 34 mm with a fine septum and a 6 mm calcification, Figure 1. Patient´s body mass index (BMI) was 21 kg/m^2 with a normal physical exam and no weight loss or smoking history was referred to the medical staff. The urine test showed 20-25 red blood cells per high power field, urine culture was negative and serum creatinine value was 1.01 mg/dL. A cystoscopy was performed where no pathological findings were identified, and we decided to request a magnetic resonance imaging (MRI) to complete the lesion assessment. The MRI showed the same renal mass and characterized it as a Bosniak III according to the Bosniak Classification (version 2019) consistent with a primary organic lesion, Figure 2.

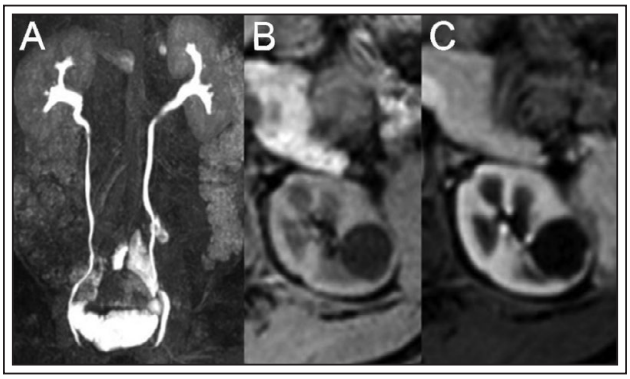

Figure 2. A) MRI urography showing lack of contrast filling of the renal cyst. Axial T1wi pre **(B)** and **(C)** post-contrast injection, showing the cystic lesion.

Then we decided to perform a laparoscopic left partial nephrectomy by a transabdominal approach. Renal mobilization was followed by pedicle dissection. Later the lesion was circumscribed by electric scalpel and arterial clamp was performed. Time for tumor resection was 8 minutes and for the two-plane suture was 6 minutes, resulting in a total of 14 minutes of warm ischemia. An abdominal drainage was left at the surgical site.

On the second postoperative day the abdominal drainage was removed (since debit was less than 50 mL in 24 hours) and the patient was discharged with no events during hospitalization.

Histopathological analysis surprisingly informed a 3 cm x 2 .5 cm cyst at the level of the renal parenchyma, Figure 3, with urothelial lining without atypia compatible with a CD.

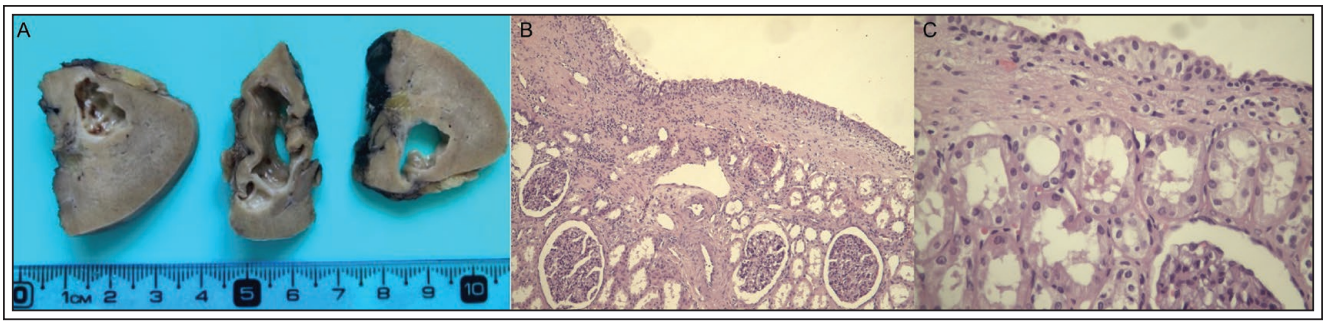

Figure 3. A) Macroscopic view of the specimen. **B)** Histological section (H&E – Magnification 10×) of the diverticulum. **C)** Histological section (H&E – Magnification 40×) revealing diverticulum's urothelial lining.

Discussion

CD are rare benign lesions and do not have specific clinical symptoms.[6,8] Malignancy associated with these pathologies is exceedingly rare, with only four cases reported in the literature, all of them related to the presence of urinary tract stones, with or without recurrent urinary tract infection (UTI).[4] Stone formers with frequent UTIs have twice the risk of developing an upper tract malignancy compared with patients without this problem. The mechanism is thought to be mediated through chronic inflammation leading to urothelial proliferation and eventual malignant transformation. Therefore, CD requires differential diagnosis with various benign and malignant neoplasms of the kidney to avoid an unjustified nephrectomy.[6,8] Here, we demonstrate the clinical case of a cyst like structure at the upper left renal pole in a 34-year-old patient who underwent surgery in 2022 due to suspected kidney cancer.

Usually, pyelocalyceal diverticulum have an appearance like a simple cyst at ultrasonography, MRI, and non-enhanced or nephrographic phase contrast-enhanced CT. As long as the infundibulum is patent, in the excretory phase of imaging the structure fills with contrast material because of communication with the renal collecting system and layering of contrast material is seen within the cyst like structure.[9] Though, a large CD, especially those type 2, may be difficult to distinguish from a hydrocalyx due to calyceal obstruction from benign or malignant causes. They can be empty or filled with urine, stones or milk of calcium.[6] Our patient's images did not suggest communication between the cyst like structure and the renal collecting system. On the other hand, a 6 mm calcification was documented on the inside of the formation.

The Bosniak classification of cystic renal disease provides a useful guide to managing these lesions.[10] Cystic renal masses are characterized and differentiated into five separate categories (I, II, IIF, III, and IV) by attenuation, contrast material enhancement (perceived vs. measurable), and the presence of calcifications and septations.[2] The Bosniak criteria were introduced to allow the use of specific imaging findings to help separate nonsurgical from surgical cystic masses and guide patient management. According to this classification, categories III and IV should undergo surgical intervention.

Regardless of the evolution in diagnostic imaging methods, up to 15% of resected tumors are actually benign. An in-depth knowledge of the various diseases that can manifest as cystic renal disease and their associated imaging findings will allow the radiologist to provide useful information to clinicians and positively affect patient care.

Despite making the diagnosis of CD after a surgical removal, we think that it would be beneficial for patients to have this differential diagnosis in mind when analyzing a renal tumor. Moreover, this denotes the importance of performing a partial nephrectomy, especially in those cases where radiological features can be confusing.

Conclusion

In conclusion, knowledge of CD as a differential diagnosis to complicated renal cystic lesions is important since incorrect diagnosis may lead to misdiagnosis and unnecessary surgical interventions resulting in further risk and possible complications for these patients. We consider that for the correct diagnosis it is essential a multiphase CT including excretion phase to get a precise characterization. Multidisciplinary collaboration between radiologists and urologists is a necessity to correctly diagnose renal cystic masses and decrease redundant surgery. □

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