CASE REPORT

Calyceal diverticulum: a benign imitator of serious pathology

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SUMMARY

A 72-year-old man with lung cancer underwent positron emission tomography CT (PET-CT) as a part of cancer staging. As an incidental finding, the PET-CT revealed a renal mass with metabolic and morphological characteristics of a malignant tumour. A diagnostic CT scan revealed a Bosniak III renal cyst, and malignancy could not be excluded. For correct Bosniak classification, a multiphasic contrast-enhanced CT was performed and the renal mass was finally diagnosed as a calyceal diverticulum. This case report summarises how calyceal diverticula may mimic serious pathology, leading to diagnostic difficulties.

BACKGROUND

A calyceal diverticulum (CD) is an example of a benign cyst-like mass that in some cases can imitate malignant pathology.¹ We present a case in which a renal cystic mass had the appearance of a malignant lesion, but which, after the application of a multiphasic contrast-enhanced CT, was finally diagnosed as a CD. This case report provides evidence that most imaging modalities including conventional CT scans can be inadequate and misleading in the diagnosis and classification of complicated renal cystic lesions.

CASE PRESENTATION

A 72-year-old man with chronic obstructive pulmonary disease, due to cough and unexplained weight loss underwent investigation on the suspicion of lung cancer. The chest X-ray and CT of the thorax showed a tumour in the left lung. The diagnosis of a squamous cell carcinoma was established by CT-guided biopsy.

In order to stage the lung cancer, a positron emission tomography CT (PET-CT) was performed. The PET-CT findings were consistent with lung cancer (T3) with involvement of the mediastinal lymph nodes (N2). As an incidental finding, the PET-CT also revealed a focal area in the parenchyma of the upper left renal pole with a very high uptake of fluorodeoxyglucose (FDG). The size of the mass was approximately 2 cm in diameter, with a tumour-like appearance containing some calcification. This renal lesion metabolically and morphologically created suspicion of a renal cell carcinoma or other malignancy. The patient was referred for further imaging and urological investigation. No other malignant lesions were found.

As part of further investigation, the PET-CT was compared with a diagnostic CT scan the patient had undergone 14 days earlier. The radiologists

reported that the conventional CT images exhibited a complicated cystic lesion. The lesion was consistent with a category III Bosniak renal cyst, indicating possible malignancy. Since a benign renal cyst could not explain the metabolic properties found on PET-CT, the aetiology of the renal mass remained uncertain. A subsequent multiphasic contrast-enhanced CT was performed, showing that the cystic lesion was slowly filled with contrast and had a narrow communication with the pelvicalyceal system. The lesion was finally diagnosed as benign CD (figure 1).

DIFFERENTIAL DIAGNOSIS

CD mimics different pathologies depending on which imaging modality is used. On an unenhanced CT scan, the lesion might show up as a complicated renal cyst, while on a PET-CT the lesion might resemble a malignant tumour due to increased FDG uptake. In this case, the incidental finding could even have represented a cancer metastasis and would have changed the stage of lung cancer from T3N2M0 to T3N2M1b, which could potentially have caused a change in the treatment of the patient.

Other important differential diagnoses to consider include a hydrocalyx, where a renal calyx is drained by an obstructed infundibulum resulting in dilation of the calyceal system,^{2 3} or a renal abscess, which also has some morphological properties similar to CD.¹

OUTCOME AND FOLLOW-UP

CD do not require any intervention or follow-up as long as they are asymptomatic.³ Regarding the lung cancer diagnosis, the patient was found to be inoperable due to severely reduced lung function, instead treatment with chemotherapy was initiated. The patient in this case report died from a cardiac arrest 3 months after the PET-CT examination.

DISCUSSION

A CD is a small urine-filled cavity within the renal parenchyma, developed as an outpouching of the renal caliceal system. It is lined with transitional epithelium and communicates with the collecting system through an infundibulum.³ Typical sizes range from 0.5 to 2.0 cm in diameter² and there are two anatomical variations. The most common is type 1, in which the CD is located in the upper or occasionally lower renal pole and communicates with a renal calyx. Type 2 CDs are larger and

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Figure 1 (A) Positron emission tomography CT with fluorodeoxyglucose was performed for TNM staging showing an invasive lung cancer (arrowhead) and suspicious metabolic activity in the left kidney (arrow). A multiphase CT including excretion phase was performed. (B) Non-contrast CT image, (C) arterial phase, (D) venous phase and (E) excretion phase CT 15 min after intravenous contrast administration of the lesion (arrow) showing contrast filling in the anterior part of the cystic lesion fully compatible with a benign calyceal diverticula.

typically found in the interpolar region communicating with the renal pelvis. CD can either be congenital or secondary due to obstruction or infection within a calyx or vesicoureteral reflux. The exact aetiology however remains unknown. They are benign and usually asymptomatic requiring no intervention, although symptoms may arise from the development of stone or infection within the diverticulum.

CD is relatively uncommon, with a reported incidence of 4.5%.³ However, CD constitutes a significant clinical problem, since it often shows up incidentally on radiological images and as described in our case the appearance may resemble complex renal cysts or even a renal cell carcinoma depending on the image modality used.

In our case report, we demonstrate that correct diagnosis of CD can be made utilising a multiphasic contrast-enhanced CT. The excretory phase will demonstrate filling of the cavity through retrograde reflux of the contrast agent from the caliceal system through an infundibulum. This anatomical property also explains accumulation of the tracer, during a PET scan, falsely giving the impression of high metabolism in a focal area.

Recently, a similar case was published¹ describing a 58-year-old woman undergoing follow-up for breast cancer with no known metastases, but onset of thoracic spine pain. Nuclear medicine bone scan showed an incidental finding of a focal area with increased tracer uptake in the left kidney. Subsequent ultrasound and a CT scan with contrast in the portal venous phase demonstrated a complex renal cyst. Only after urological referral, a CD was considered as a differential diagnosis. An intravenous urogram demonstrated filling of the lesion and communication with the calyceal system, and the mass was finally diagnosed as a CD.

Owing to the widespread use of radiological imaging techniques such as CT, PET and ultrasound, renal cysts are discovered incidentally with increased frequency.⁴ A renal cystic mass often represents a benign lesion such as a simple cyst. In some cases, however, the lesion signifies a pathological finding and possible malignancy. Since malignancy cannot readily be ruled out, unless further invasive investigations are performed, the diagnostic approach to complex renal cysts represents a significant clinical problem. Possible malignancy of renal cystic lesions is evaluated based on their radiological appearance, and divided into five categories according to the Bosniak Renal Cyst Classification.⁵

The Bosniak classification was developed in 1986, as a tool to assess the a priori risk of malignancy, based solely on the CT appearance of a renal cystic mass. According to this classification, categories I and II are thought to be benign, category III exhibits structural findings that are suspicious of malignancy and category IV lesions are obviously malignant. The general rule is that categories III and IV should undergo surgical intervention. Since many category III lesions after surgery are found to be benign, a fifth category (IIF) was added, describing cystic masses that were not worrisome, but still required follow-up to verify stability over time and thereby ruling out malignancy.⁵ The addition of category IIF seems promising in detecting lesions that will eventually develop into malignancy,⁶ while lesions such as a CD over time typically remains unaltered, ruling out malignancy. These conclusions were supported by a recent study, which found that 15% of surgically resected renal tumours is actually benign.⁷

In conclusion, knowledge of CD as a differential diagnosis to complicated renal cystic lesions is important, since incorrect diagnosis may lead to misdiagnoses and unnecessary surgical

interventions resulting in further risk and possible complications for these patients. Correct diagnosis requires multiphase CT including excretion phase. Multidisciplinary collaboration between radiologists and urologists may increase diagnostic accuracy and decrease redundant surgery.

Learning points

- Complicated renal cystic lesions represent a major clinical problem, since it is difficult to exclude malignancy without invasive investigations.
- A calyceal diverticulum (CD) is a benign and usually asymptomatic outpouching of the renal caliceal system, typically found incidentally on radiological imaging.
- Depending on the chosen radiological image modality, CD can imitate serious and malignant pathology.
- Correct diagnosis of a CD requires multiphase CT including excretion phase.
- Collaboration between radiologists and urologists is a necessity in order to correctly investigate and diagnose renal cystic masses.

Competing interests None.

Patient consent Obtained.

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