A 70-Year-Old Man with Spontaneous Renal Tumor Rupture with Perinephric Infiltration in the Retroperitoneal Space – A Case Report

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The study contains only de-identified data, including anonymized images. The study does not contain any data or images that would de-anonymize the patient.

HUMAN AND ANIMAL RIGHTS
Not applicable

ABSTRACT

Kidney cancer is one of the 10 most common malignancies worldwide. In contrast, spontaneous rupture of a renal tumor is an extremely rare situation, both in the clinic and in descriptions in the literature. In the given paper we describe one such case. The left kidney of a 70-year-old patient hemorrhaged, and initially the cause was not determined. Investigations showed that he suffered from malignant neoplasm of the kidney except for the renal pelvis (C64). This case is unprecedented, due to the fact that there was just a spontaneous rupture of the detected tumor. The probable cause was dual antiplatelet treatment.

CASE REPORT

BACKGROUND

Kidney cancer is one of the most common malignancies occurring in the population worldwide. It is observed to occur twice as often among men as among women. The highest incidence is observed among patients aged 60-70 years [1]. According to data from the National Cancer Registry in Poland, in 2022 the number of cases of malignant neoplasm of the kidney except the renal pelvis (C64) was 3298, while the number of deaths reached as many as 1350 people [2]. The trend is upward in both sexes [3]. Factors that are considered conducive to the development of kidney cancer include: hypertension, obesity, exposure to chemical agents such as tannins and trichloroethylene. Consumption of decaffeinated coffee also increases this risk, while standard coffee with caffeine lowers it, as does consumption of fatty fish, fruits and vegetables. An additional risk factor is genetic predisposition, including

mutations in the VHL gene, PTEN, FLCN and the TSC1/2 gene [1,4]. Smoking, due to the carcinogenic effects of substances in cigarette smoke, may also contribute to kidney cancer [3].

INTRODUCTION

The kidney is an even organ of the genitourinary system, located bilaterally on the posterior abdominal wall at the level of the Th10-L3 vertebrae, with the left kidney usually placed slightly higher than the right. The shape of this organ resembles a bean, with typical dimensions of 10-12 cm in longitudinal dimension and 5-6 cm in transverse dimension. Its weight can range from 120 to 200 grams [5].

Kidney cancer ectopically produces parathormone, vitamin D, ACTH, insulin and prostaglandins. Increased production of the renal hormones erythropoietin and renin is also observed [3].

The initial stages of renal cell carcinoma are usually asymptomatic, so only 30% are detected at an early stage. The classic triad of symptoms includes hematuria, low back pain and a tumor palpable through the abdominal layers [6]. Nevertheless, these symptoms occur in only 7-15% of patients. The pain may be colicky or dull [3].

Early renal cell carcinoma can be successfully treated with organosaving surgery, while patients with high grade are eligible for nephrectomy [7]. Nephrectomy is also performed in selected patients in the generalized stage of the disease. Unfortunately, at the time of diagnosis, almost 1/3 of kidney cancers have already metastasized to other organs.

The patient we are discussing here was initially diagnosed with a renal tumor. When making a clinical diagnosis, however, it is important to remember that not every kidney tumor is cancer. A tumor can be a lipoma, angiomiolipoma, hemangioma, fibroma or just a malignant neoplasm [3], which it turned out to be in this case. The first four of these are benign tumors that occur much less frequently than malignant ones. The described patient was qualified for a nephrectomy precisely because of the high local progression of the disease radiologically indicating an oncological background, but it was not performed due to concomitant cardiac problems and the estimated high risk of death during anesthesia. Spontaneous rupture of the kidney is an extremely rare situation and is defined as a break in the continuity of its parenchyma. Patients then develop subcapsular hematomas (as we are dealing with in our patient) or retroperitoneal hematomas. Spontaneous rupture, which should be differentiated from renal colic, usually causes pain, which the patient also reported. It is also associated with bleeding, which usually resolves spontaneously. Imaging studies are of primary importance in such a situation [9].

The progression of the disease is assessed according to the TNM classification, which determines the stage of the tumor, the presence of distant and lymph node metastases, and the presence of a tumor stump in the venous system [3].

This classification includes [3]:

- T1 - tumor < 7cm in diameter that is confined to the kidney
- T2 - tumor > 7cm in diameter that is confined to the kidney
- T3a - tumor infiltrating the adrenal gland or perinephric tissues, does not cross the renal fascia capsule
- T3b - tumor suppository present in the renal vein or vena cava below the diaphragm
- T3c - tumor suppository in the vena cava above the diaphragm
- T4 - tumor infiltrates beyond the renal fascia
- N0 - no lymph node metastasis
- N1 - metastasis to a single regional lymph node
- N2 - metastasis to more than one local lymph node
- M0 - no distant metastasis
- M1 - distant metastasis

CASE REPORT

On July 30, the patient presented to the ED for sudden severe pain in the lumbar region. Sonography revealed an enlarged kidney (dimensions 17.4 cm x 10.6 cm), and a 10 cm x 6.5 cm tumor in the middle and lower pole, raising the suspicion of a tumor or subcapsular hematoma. A CT scan was also performed, which also visualized a renal cyst measuring approximately 5.2 cm with a densitometry of 67 HU.

In the CT scan (Figure 1), the right kidney correctly secreted shadow urine, and the left kidney did not secrete shadow urine, indicating that it was not functioning properly. Both kidneys underwent marked contrast enhancement (Figure 2), which meant that they were well circulated. The extensive subcapsular hematoma surrounding the left kidney, already detected on ultrasound, was also confirmed. The CT scan clearly showed a multicystic tumor in the upper pole of the left kidney (Figure 3). It measured 6.6 cm x 5.3 cm and had a densitometry of about 27 HU. It did not enhance after administration of the shadowing agent, suggesting a bleeding cyst. Hyperdense blood bands in the perirenal adipose tissue and the retroperitoneal space on the left side were also visualized.

A follow-up CT scan was performed on August 14. The tumor-like lesion in the upper pole of the left kidney did not enlarge. An extensive, partially hemolyzed hematoma around the left kidney also persisted. The kidney also began to secrete shadow urine (Figure 4). The left kidney was clearly enhancing after contrast administration, but a cystic mass was once again isolated in the upper pole (Figure 5). The patient was treated with dual antiplatelet drugs ticlopidine and ASA. On August 16, antiplatelet treatment was discontinued. On follow-up CT scan, a subcapsular hematoma of the kidney persisted.

In October, the patient was admitted to the Pulmonology Department for the diagnosis of radiographic changes suspected to be metastatic in the lungs, detected in September. A CT scan of the chest with contrast was performed, which showed diffuse small nodules up to 0.6 cm in diameter in the right lung and 1 cm in diameter in the left lung. After abdominal CT, the nodule was graded as cT4 N1 M1. There was perinephric infiltration

in the retroperitoneal space and periaortic lymph nodes were involved. The tumor caused left renal affunction, and the patient was referred for qualifying nephrectomy.

It was noted that since the onset of the disease, the patient had significantly lost weight (by 10 kg for 2 months). Weight loss, bone pain, which the patient complained of, and elevated blood pressure are symptoms seen in advanced renal cell carcinoma [3].

In November, the patient was admitted to the Urology Department for a nephrectomy. He reported in his history that he had been treated for hypertension for many years. He was determined to have NYHA level II/III heart failure. A CT showed a tumor infiltrating the free wall of the right ventricle and filling its lumen [Figure 6]. The patient was disqualified from left kidney surgery due to cardiac problems and poor general condition. Conservative treatment was implemented. Considering the tests performed and the overall clinical condition since July, the lesion was considered to be renal cell carcinoma. A CT scan showed a cystic-lite tumor measuring 13.2 x 11.8 x 18.6 cm, affecting almost the entire left kidney, leaving only residual parenchyma in the anterior-posterior part. The tumor was located partially tangential to the left lumbar muscle. Infiltration of the renal vein and inferior vena cava was not noted. The kidney in the late stage was not secreting urine-it was not filtering plasma properly.

The patient's condition deteriorated significantly a year later in July. By then, he had been hospitalized several times for cardiovascular reasons and had been in the Orthopedic Department for a pathological fracture of the left subtrochanteric femur caused by the metastasis.

Cardiac ECHO suggested massive pulmonary embolism, which was confirmed by angio-CT, a large thromboembolic plug in the right ventricular outflow tract and pulmonary trunk was visualized, as well as multiple nodular lesions in both lungs. Because of the poor prognosis, cardiac surgeons abandoned surgical removal of the embolic material, and treatment was limited to the low-molecular-weight heparin, antibiotic therapy and circulatory support drugs. The embolism in his case may have been a complication of the cancer as well as immobilization from the fracture.

On July 26, he suffered a cardiac arrest. In view of the terminal stage of metastatic renal cancer, massive pulmonary embolism and multiple organ failure, resuscitation was abandoned; the patient died.

DISCUSSION

Etiology & demographics

The incidence trend for kidney cancer is upward [3]. Predisposing factors may be commonly available products or situations in everyday life. Awareness on how to detect these cancers is extremely important, and if suspicious symptoms are noticed, prompt reporting to the appropriate doctor.

Spontaneous renal ruptures have not been widely described in the literature to date due to the small number of cases. The most common causes of spontaneous renal rupture include renal tumors, which account for about 61% of cases [10]. The neoplasms that most often contribute to spontaneous renal rupture are giant hemangioendothelioma and renal cell carcinoma [10]. Vascular diseases are responsible for about 18% of cases, and among these, spontaneous renal rupture is most commonly found in patients with nodular arteritis [11]. There are some cases of rupture caused by renal stones, coagulopathies, aneurysms of the renal artery, and a ruptured renal cyst [12]. The pathomechanism of spontaneous renal rupture is not well understood. Some authors suggest that the cause may be an increased pressure in the renal vein caused by tumor congestion, leading to its dilatation and congestion [10]. According to other reports, rupture may be the result of direct tumor infiltration involving the renal capsule and/or the vascular component [10]. Causes of spontaneous renal rupture also include taking antiplatelet drugs, as previously mentioned [8], as well as abscesses, hemophilia and tuberculosis [13]. Confirmation that spontaneous renal tumor rupture involving spontaneous rupture of the renal parenchyma is extremely rare is provided by the fact that a 2022 review of the medical literature mentions the existence of only 15 reported cases. Among them, kidney tumors were the cause of spontaneous rupture in more than 50% in the male gender [13].

Clinical & imaging findings

Nowadays, kidney tumors are most often detected completely incidentally during sonography or abdominal CT scans. For diagnosis, a physical examination is also necessary, which focuses on viewing the abdominal layers to look for protrusions resulting from the presence of a tumor. In a palpation examination, one hand is placed by the physician in the lumbar region, while the other hand tries to feel the kidney. In the case of men, the scrotum is also viewed, as the presence of varicocele may suggest pressure on the seminal vein [3]. The most commonly performed imaging studies include sonography and, until recently, urography. Urography is a morphological and functional examination in which a renal tumor gives typical images. These include distortion of the outline of the kidney; compression and displacement of the calyxes; defects in the renal collecting system or fragmentation of the collecting system [3]. Despite the fact that it is a dedicated examination for the detection of urolithiasis, the detection of cancer in it may be an incidental phenomenon. A heterogeneous structure is seen on ultrasound. Muscle infiltration and the presence of metastases are also assessed. The presented clinical case of a patient diagnosed with cancer of the left kidney, which then spontaneously ruptured, is clinically extremely rare. The kidney spontaneously ruptured because this diagnosis was not preceded by trauma. One reason for this condition may have been that

the patient was taking double antiplatelet therapy [8]. Due to, he was using a high dose of them, taking dual medications for cardiac reasons. The combination of ASA and ticlopidine was the standard recommended treatment at the time.

Treatment & prognosis

The primary treatment for advanced renal cell carcinoma is radical nephrectomy [3,7]. This procedure involves removal of the kidney along with the fat capsule and surrounding lymph nodes [3].

Currently, the most important diagnostic test in such cases is computed tomography (CT). Typical CT findings include the presence of high-density masses within the renal capsule with effusion into the perinephric space. CT also enables detection, localization, and assessment of the extent of perinephric hemorrhage [13].

Treatment should be individually tailored to the clinical condition of the patient. Most cases require surgical intervention to prevent death. If CT scans confirm the presence of a perinephric hematoma, nephrectomy is almost always necessary [13].

Differential Diagnoses

Abdominal pain is a common feature of all cases of spontaneous renal rupture, regardless of pathogenesis, as it arises from irritation of the retroperitoneal nerve plexus. The symptoms are similar to acute abdominal pain and require differentiation from other gastrointestinal diseases [13]. The most common cause of spontaneous renal rupture is renal neoplasms, particularly angiomyolipoma and renal cell carcinoma [11]. Vascular causes include polyarteritis nodosa, renal artery aneurysms and arteriovenous malformations, which can rupture spontaneously [11]. Cases have also been described in which the cause of rupture was renal stones, coagulopathies, aneurysms of the renal artery, and a ruptured renal cyst [12]. Anticoagulant use and antiplatelet are important iatrogenic contributors [11,15].

CONCLUSIONS

Spontaneous renal rupture is an extremely rare phenomenon. It is a condition where parenchymal bleeding occurs without prior injury. Tumors are one of the most common causes. Taking antiplatelet treatment exacerbates the risk of occurrence. The patient we described had both a renal tumor and was taking dual antiplatelet treatment. This is what likely led to spontaneous rupture in his case.

TEACHING POINT

Spontaneous rupture of renal cell carcinoma, though extremely rare, appears on contrast-enhanced CT as a heterogeneous or cystic renal mass enveloped by high-attenuation subcapsular or perirenal hematoma, sometimes showing parenchymal discontinuity and active contrast extravasation. Prompt recognition of this imaging constellation distinguishes it from trauma and directs urgent oncologic and surgical management.

QUESTIONS

Question 1: What does the clinical diagnosis of T4 N1 M1 renal neoplasm mean?

(a) the tumor infiltrates beyond the fascia of the renal capsule, distant metastases are present and to multiple lymph nodes

(b) the tumor is less than 7cm in diameter, no lymph node metastasis, no distant metastasis present

(c) tumor infiltrates the adrenal gland, no distant metastasis, metastasis to a single regional lymph node

(d) tumor infiltrates beyond the fascia of the renal capsule, distant metastases are present, metastasis to a single regional lymph node

(e) the tumor is more than 7cm in diameter, single lymph node metastasis is present, and no distant metastasis is present

[TNM classification is crucial in the clinical diagnosis of tumor staging. It also evaluates the presence of lymph node metastasis, distant metastasis the presence of a tumor suppository in the venous system [3]].

Question 2: What is the most common cause of spontaneous rupture of the kidney?

(a) hemorrhagic renal cyst associated with autosomal dominant polycystic kidney disease

(b) malignant and benign tumors of the kidney, especially renal cell carcinoma and hemangioendothelioma

(c) nodular arteritis in the course of systemic vasculitis

(d) chronic hypertension with complicated renal parenchymal damage

(e) renal artery embolization as a complication of endovascular procedures

[The most common causes of spontaneous renal rupture include renal tumors, which account for about 61% of cases [10]. The cancers that most often contribute to spontaneous renal rupture are angiomyolipoma and renal cell carcinoma].

Question 3: What is produced by kidney cancer?

(a) erythropoietin, vitamin B, aldosterone

(b) aldosterone, vitamin D, parathormone

(c) parathormone, ACTH, vitamin D

(d) renin, vitamin B, ACTH

(e) aldosterone, renin, ACTH

[Ectopic production of parathormone, vitamin D, ACTH, insulin and prostaglandins by renal cell carcinoma is observed. Production of erythropoietin and renin is also increased [3]].

Question 4: What is included in the triad of kidney cancer symptoms?

(a) hematuria, pain in the lumbar region, a tumor palpable through the abdominal layers

(b) proteinuria, pain in the lumbar region, tumor palpable through the abdominal layers

(c) hematuria, pain in the lumbar region, disturbances

(d) proteinuria, hematuria, elevated blood pressure

(e) hematuria, elevated blood pressure, low back pain

[The triad of symptoms includes hematuria, pain in the lumbar region (this is the location of the kidney-it is of a dull or colicky nature) and the tumor is palpable through the abdominal integuments. Note that these symptoms occur in only 7-15% of patients [3]].

Question 5: Which of the following mechanisms is most likely to explain the pathophysiology of spontaneous renal rupture in renal cell carcinoma?

(a) direct destruction of the renal cortex by anaerobic bacteria

(b) acute ischemia of the kidney due to thrombosis of the renal artery

(c) infiltration of the renal capsule by the tumor with disruption of vascular integrity and increase in intrarenal pressure

(d) autoimmune glomerular injury with secondary renal edema

(e) excessive activation of the RAA system leading to distal tubule injury and hemorrhage

[Rupture may result from direct tumor infiltration involving the renal capsule and/or vascular component [9]].

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FIGURES

Figure 1: CT coronal image, excretory phase - the right kidney correctly secreted shadow urine, the left kidney did not secrete shadow urine.

Figure 2: CT axial image, venous phase - both kidneys were properly contrast enhanced. The left kidney is surrounded by an extensive subcapsular hematoma.

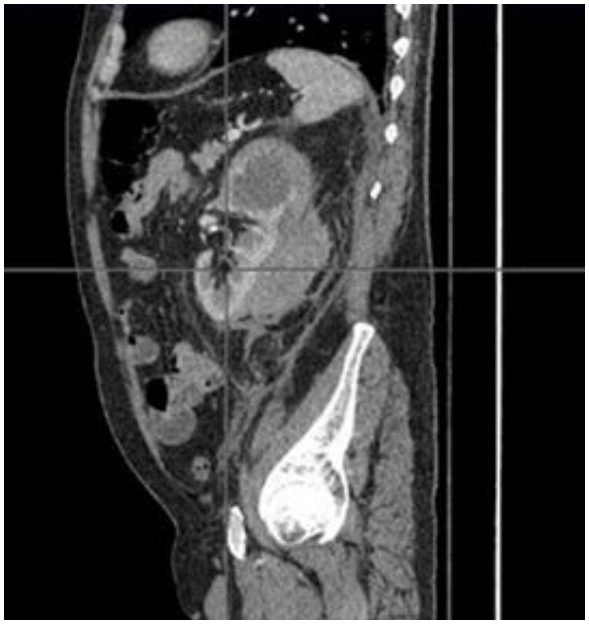

Figure 3: CT saggital image, venous phase - a cystic tumor in the upper pole of the left kidney.

Figure 4: CT axial image excretory phase - hemolyzed hematoma around the kidney. The kidney begins to secrete shadow urine.

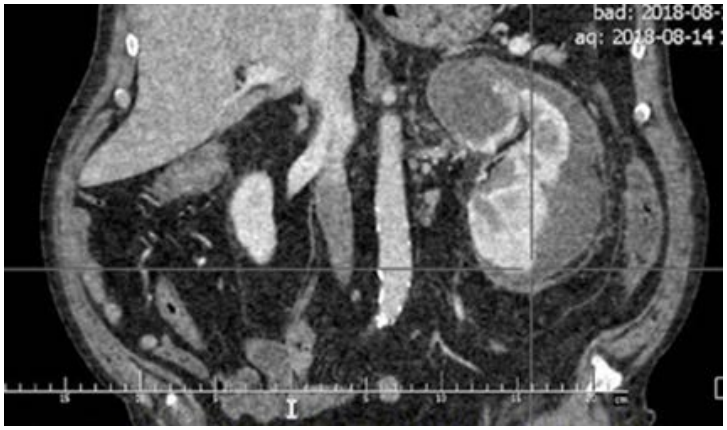

Figure 5: CT coronal image venous phase - a nodular cystic mass in the upper pole of the left kidney. A hematoma around the kidney.

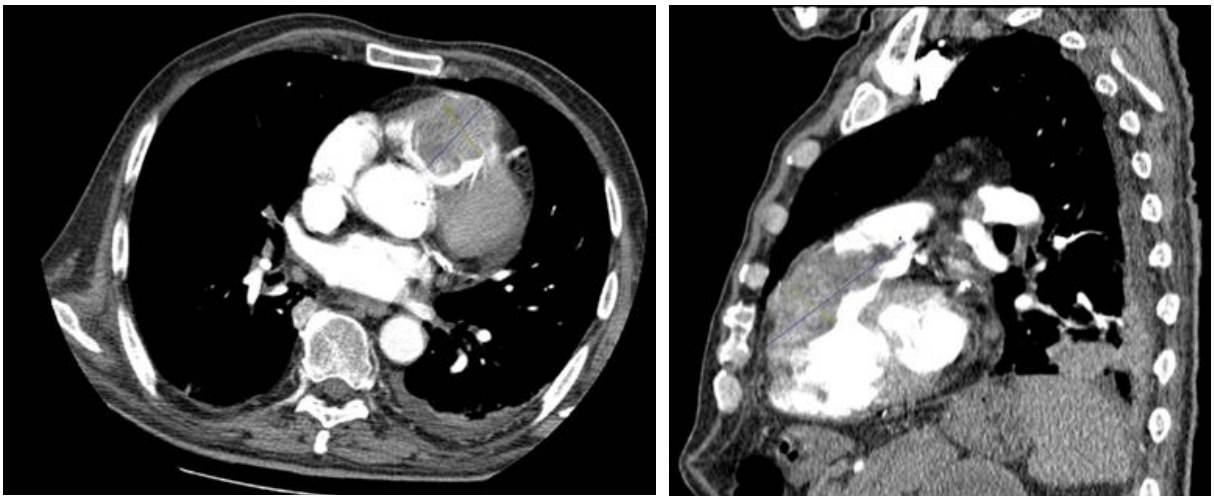

Figure 6: CT - a tumor infiltrating the free wall of the right ventricle and filling its lumen

Table 1

Parametr	**Details**
Incidence	Rare – only 15 cases have been reported in the literature up to 2022 [13].
Gender ratio	Kidney cancer is observed to occur twice as often among men as among women [1]. However, spontaneous rupture of a renal tumor is such a rare clinical condition that it is not specified which sex is more commonly affected.
Age predilection	Renal tumors are the most common cause of spontaneous rupture. Kidney cancer most often affects patients aged 60-70 [1,11].
Risk factors	Renal neoplasms, renal stones, taking antiplatelet treatment, polyarteritis nodosa, renal artery aneurysms and arteriovenous malformations, coagulopathies, aneurysms of the renal artery, and a ruptured renal cyst [11,12].
Treatment	The primary treatment is radical nephrectomy [3,7].
Diagnostic techniques	The most important diagnostic test cases is computed tomography (CT) [13].
Differential diagnoses	The symptoms are similar to acute abdominal pain and require differentiation from other gastrointestinal diseases [13].

KEYWORDS

kidney, spontaneous rupture, renal tumor.

ABBREVIATIONS

ACTH = Adreno Cortico Tropic Hormone
ED = Emergency Department
CT = Computed Tomography
ASA = Acetyl Salicylic Acid
TNM = Tumor, Nodules, Metastases
HU = Hounsfield Scale
NYHA = New York Heart Association

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