Kidney cancer and atrial tumor thrombus: A case report

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Abstract

Background: Renal cell carcinoma accounts for 2 to 3% of all malignant neoplasias in the adult. It has an incidence of 84,400 new cases annually and more than 34,000 deaths are attributed to the disease per year. Kidney cancer has a preference for invading the venous system in 10% of cases, with the possibility of affecting the renal vein and the inferior vena cava with the presence of tumor thrombi.

Clinical case: A 48-year-old man had a history of smoking and presented with no chronic degenerative diseases. He had clinical symptom onset of abdominal pain and increased abdominal perimeter, weight loss, and edema in his right pelvic limb, 2 months earlier. Physical examination revealed a right hemiabdominal tumor and edema of the right leg. A contrast-enhanced tomography scan identified a right kidney tumor and tumor thrombus at the level of the atrium. A transesophageal echocardiogram showed the presence of a right atrial tumor thrombus.

Conclusion: Radical nephrectomy and thrombectomy with cavotomy and atriotomy are standard management for intention-to-cure treatment in patients with renal cell carcinoma and supradiaphragmatic tumor thrombi.

Keywords: Renal cell carcinoma, Tumor thrombus, Radical nephrectomy, Thrombectomy.

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Introduction

Renal cell carcinoma corresponds to 2 to 3% of all malignant neoplasias in the adult. It has an incidence of 84,400 new cases annually and more than 34,000 deaths are attributed to the disease per year. It is considered the most lethal urologic cancer, surpassing prostate cancer and bladder cancer. It predominantly affects men, with a 1.5:1 man:woman ratio, and its peak patient age at the time of presentation is 60 to 70 years. Established risk factors are smoking, high blood pressure, obesity, and a family history of a first-degree relative with kidney cancer. Renal cell carcinoma has a preference for growth in the lumen of the venous system, in a cephalad direction from the ostium of the renal vein. That condition is known as tumor thrombus and presents in 10% of all cases. The renal vein and infradiaphragmatic vena cava are the most affected venous structures, at 2 and 3%, respectively. Atrial involvement is rare and presents in 0.5 to 1% of cases.

Case presentation

A 48-year-old man had a history of smoking from 23 to 47 years of age, with a smoking index of 12. He had no chronic degenerative diseases, such as diabetes mellitus, no high blood pressure, and no past surgical history. The symptoms of his current illness of two-month progression were abdominal pain, increased abdominal perimeter, 2 kg weight loss, edema in the right leg, and no gross hematuria.

Physical examination revealed blood pressure of 130/75 mmHg, heartrate of 90 beats per minute, respiratory rate of 22 breaths per minute, temperature 37° C, ECOG functional status of 0, Kramer 1 jaundice of the conjunctiva, a solid, irregular tumor with a 15 cm diameter in the right hemiabdomen that was nonpainful upon palpation, and no abdominal distension. There was right leg edema extending from the pretibial region to the inguinal region, with no fovea.

The laboratory test results showed thrombocytopenia, increased serum creatinine, hyperglycemia, hyponatremia, increased transaminases, and increased total bilirubin due to both direct bilirubin and indirect bilirubin (table 1).

Table 1. Laboratory test reports

Complete blood count	
Hemoglobin	13.2 g/dl
Hematocrit	42%
Leukocytes	8.8 thousand/ml
Neutrophils	78%
Platelets	129 thousand/ml
Blood chemistry, liver function tests, and serum electrolytes	
Glucose	129 mg/dl
Urea	59.9 mg/dl
Creatinine	1.7 mg/dl
ALT	153 U/l
AST	59 U/l
LDH	2110 U/l
Total bilirubin	3.1 mg/dl
Indirect bilirubin	1.8 mg/dl
Direct bilirubin	1.3 mg/dl
Sodium	126 mmol/l
Potassium	4.3 mmol/l
Calcium	8.3 mg/dl

Non-contrast-enhanced and contrast-enhanced tomography identified a tumor thrombus at the level of the right atrium that extended to the ostium of the right renal vein (figure 1), with no pulmonary or liver metastases and

no bile duct ectasia. It also identified a 15 cm right kidney tumor, with 15 HU in the non-contrast-enhanced phase and 59 HU in the arterial phase (figures 2, 3, and 4). The transesophageal echocardiogram showed a tumor thrombus in the right atrium, occupying 95% of its lumen (figure 5).

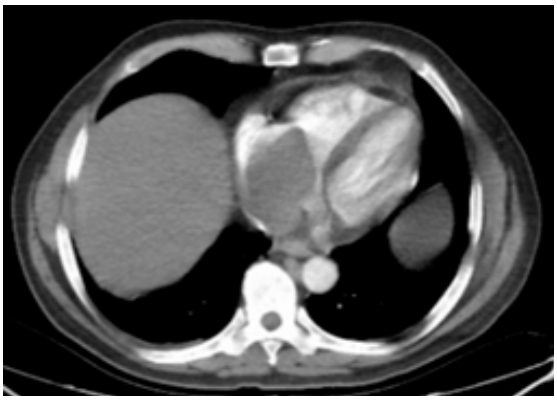

Figure 1. Non-contrast-enhanced and contrast-enhanced tomography scan showing a filling defect at the level of the atrium.

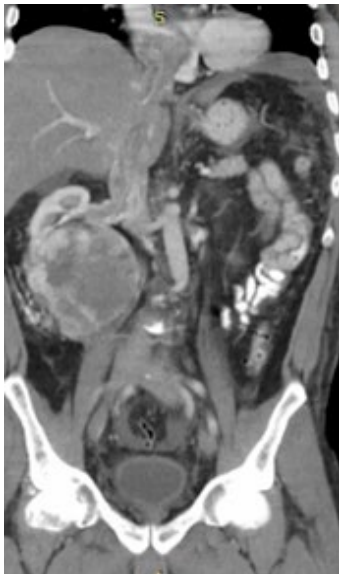

Figure 2. Non-contrast-enhanced and contrast-enhanced tomography scan showing a filling defect at the level of the atrium, thrombus at the level of the inferior vena cava and renal vein, and right kidney tumor.

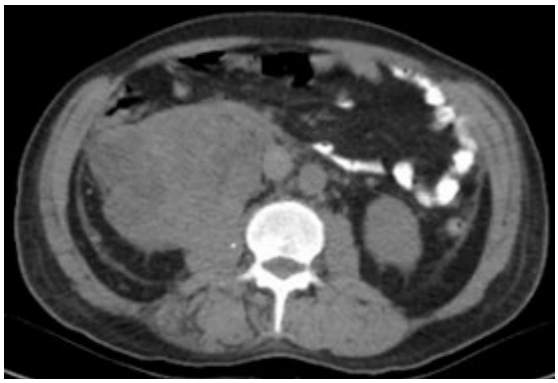

Figure 3. Non-contrast-enhanced tomography scan showing the right kidney tumor, with attenuation value of 15 HU.

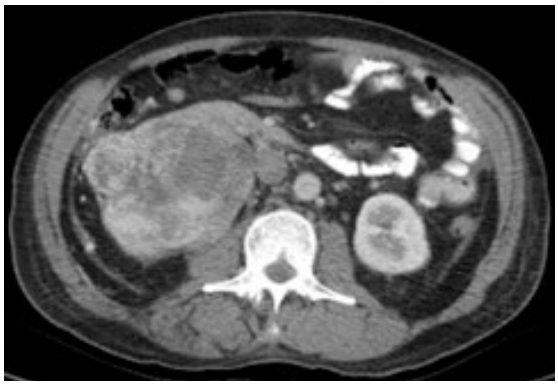

Figure 4. Contrast-enhanced tomography scan showing the right kidney tumor, with attenuation value of 59 HU.

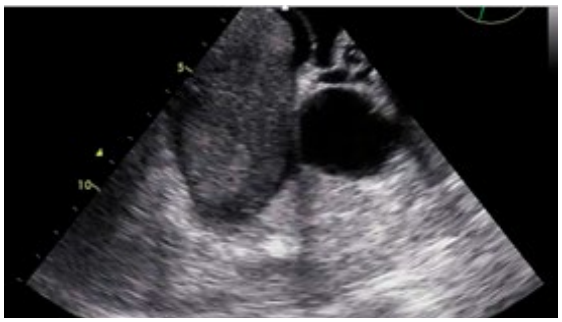

Figure 5. Transesophageal echocardiogram showing the thrombus in the right atrium, occupying 95% of its lumen.

Through further study, T3c N0 M0 right kidney tumor with a Neves IV tumor thrombus was diagnosed, along with Stauffer's syndrome. The patient was evaluated at the internal medicine service because of hyperglycemia, hyponatremia, and hyperazotemia, and medically treated with ultra-rapid insulin and basal insulin, as well as fluid and electrolyte therapy. Right radical nephrectomy was performed, and the inferior vena cava thrombus was resected through venotomy with the Chevron approach. Intracavitary resection of the atrial thrombus was carried out through sternotomy and cardiopulmonary by-pass (figures 6 and 7). Intraoperative blood loss was 2000 ml, and the patient required transfusions of 10 units of red blood cells, 4 units of fresh frozen plasma, and 4 units of apheresis platelets, with extracorporeal circulation pumping time of 1 hour and 20 minutes.

The patient was placed in the heart unit after surgery. On the third postoperative day he was moved to the ward in satisfactory condition, with improved biochemical parameters, normalized kidney function, and normalized serum transaminases. He was released in stable condition to continue with outpatient follow-up.

The anatomopathologic study showed Fuhrman 2 clear cell renal cell carcinoma (figure 8). The 12 cm kidney tumor was dependent on the lower kidney pole and interpolar region, with renal sinus involvement (figure 9) and a tumor thrombus that did not affect the vascular endothelium (figure 10).

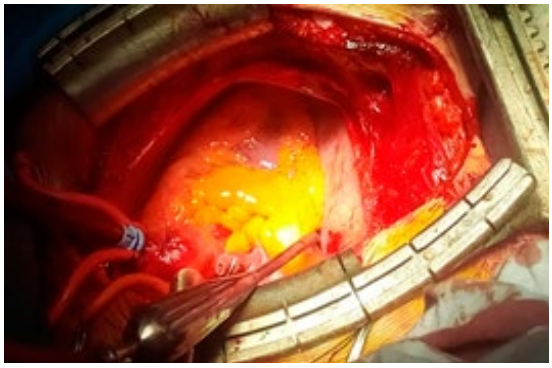

Figure 6. Cardiopulmonary bypass.

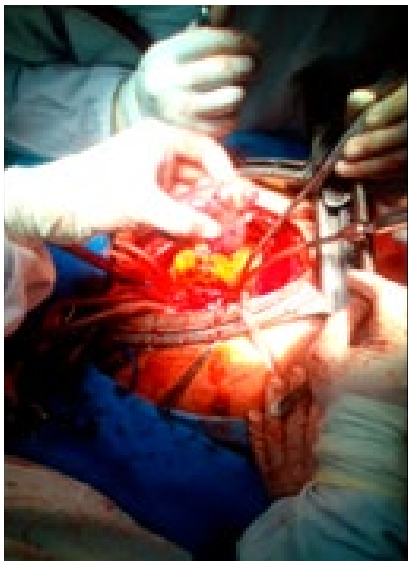

Figure 7. Atriotomy and atrial thrombus extraction.

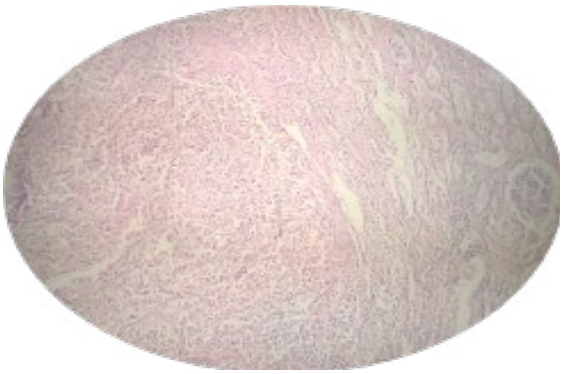

Figure 8. Clear cell renal cell carcinoma, Fuhrman grade 2.

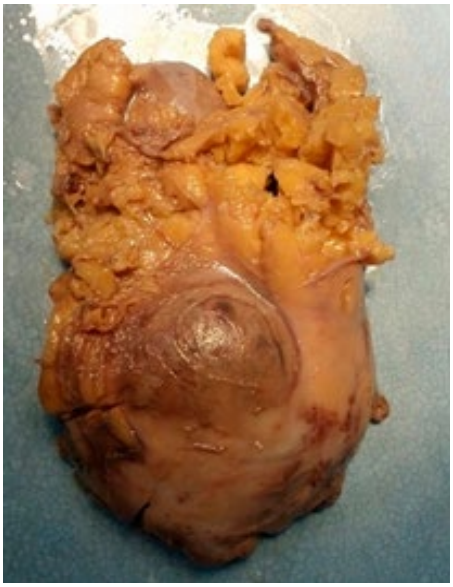

Figure 9. Right kidney tumor.

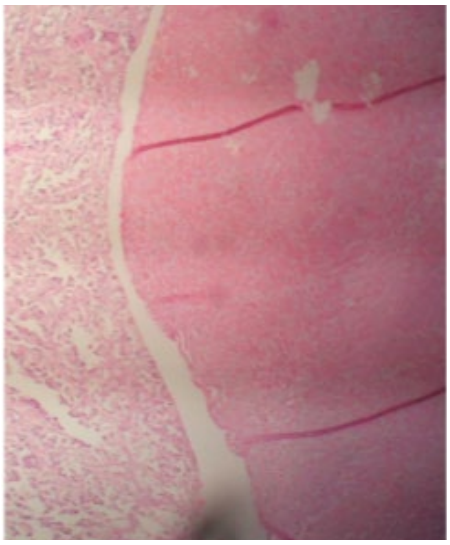

Figure 10. Tumor thrombus, with no involvement of the endothelium.

Discussion

Renal cell carcinoma has an incidence of 84,400 new cases annually and 34,000 deaths are attributed to the disease per year. In Mexico, the pathology presents in approximately 3.6% of the population,[1] and it is considered the most lethal urologic cancer. The majority of cases are in men and the disease has a 1.5:1 man:woman ratio, with peak presentation in patients 60 to 70 years of age. The established risk factors are smoking, high blood pressure, and obesity.[2] Renal cell carcinoma encompasses a wide spectrum of histologic entities. The most common are the clear cell tumors in 70-80% of patients, papillary disease in 10 to 15%, chromophobe tumors in 3 to 5%, and collecting duct carcinoma in < 1%.[3]

Clear cell renal cell carcinoma is the most common. It is a circumscribed tumor with no capsule and macroscopically it is yellow-gold in color, with increased vasculature, and the presence of necrosis. The von Hippel-Lindau gene mutation located on chromosome 3 is a frequently found condition.[2-3] Clinical symptoms vary and more than 50% of the cases are incidental findings in imaging studies performed for other intra-abdominal pathologies. The clinical triad is palpable tumor, abdominal pain, and gross hematuria and presents in 6 to 10% of cases. Thirty percent of cases present with paraneoplastic syndromes, such as polycythemia, due to increased erythropoietin production characteristic of the tumor, or to compression of the renal artery. High blood pressure is caused by increased serum renin levels, hypercalcemia is due to tumor production of parathyroid hormone-like peptides with increases in bone resorption or osteolytic metastases, with a consequent increase in serum calcium. Non-metastatic liver dysfunction, known as Stauffer's syndrome, is conditioned by a lymphocytic inflammatory infiltrate, with ensuing increases in interleukin 6, which conditions regions with hepatic necrosis.[3]

Diagnosis is made through imaging studies, and contrast-enhanced computed tomography is the gold standard. All masses on the renal topography that present with increased attenuation of more than 15 Hounsfield units after contrast medium application are considered kidney cancer. Surgical removal is indicated if the condition of the patient allows it. However, nuclear magnetic resonance imaging with gadolinium provides more accurate information, with respect to venous system involvement.[2-3]

Said compromise is rare, with only 10% of patients presenting with that condition. The most affected veins are the renal vein (3%), the infradiaphragmatic inferior vena cava (2%), and the inferior vena cava (0.5 to 1%).[4] The Neves-Zincke classification categorizes thrombus at the level of the ostium of the renal vein as 1, thrombus in the inferior vena cava below the suprahepatic veins as 2, thrombus in the inferior vena cava above the suprahepatic veins as 3, and thrombus in the supradiaphragmatic inferior vena cava as 4.[4-5] Radical nephrectomy and thrombectomy with cavotomy and atriotomy are standard management as intention-to-cure treatment in patients with renal carcinoma and supradiaphragmatic tumor thrombi, with a 5-year survival rate of 69%.[5-6]

Conclusions

Kidney cancer has a high prevalence and high mortality rate in Mexico. Clinical symptoms vary and the classic triad presents in a small group of patients. When the triad does present, prognosis is generally bleak because the disease is usually advanced. The pathology also presents with a broad spectrum of paraneoplastic syndromes in one-third of patients, but most cases of kidney cancer are diagnosed as incidental findings in imaging studies.

Complementary diagnostic studies include laboratory tests, such as red blood cell count, platelet count, and neutrophil count, as necessary, as well as baseline and overall kidney function tests, and liver function tests to look for paraneoplastic processes or to standardize the biochemical prognostic factors. Contrast-enhanced tomography is the imaging study of choice.

Radical nephrectomy is recommended, if the patient's condition allows it, along with thrombectomy for locally advanced disease. Patients with metastatic disease will benefit from surgical treatment with the intention to obtain histologic samples and thus guide *a posteriori* targeted molecular therapy. In patients with severe deterioration of their functional status, surgical treatment is solely palliative therapy.

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