

A rare case report of one stage surgical treatment for left renal cell carcinoma with level IV intravenous tumor thrombus combined with severe coronary artery stenosis

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Abstract

Rationale: Renal cell carcinoma (RCC) exhibits a natural tendency to extend from the kidney into inferior vena cava (IVC) and growing into the right atrium is a rare complication. We report a 65-year-old patient with an RCC with intravascular extension through renal vein into the IVC and right atrium combined with severe coronary artery disease. This case has not been described in the literature and there is no treatment guideline for it.

Patient concerns: A 65-year-old patient was admitted to our clinic with complaints of edema of both lower extremities.

Diagnoses: On the basis of the magnetic resonance imaging scan and coronary angiography, we strongly suspected an RCC with intravascular extension through renal vein into the IVC and right atrium combined with severe coronary artery disease.

Interventions: We performed open left radical nephrectomy, IVC, and right atrium thrombectomy under cardiopulmonary bypass and coronary artery bypass grafting on beating heart.

Outcomes: The postoperative course was uneventful. The patient has been discharged from hospital.

Lessons: Coexistence of severe coronary artery disease and RCC infiltrating inferior vena cava and right atrium rendered this operation as very high-risk procedure. We hope that our operational manners can prove the possibility of simultaneous difficult cardiac and urologic operation. The basic point of our report concerns the fact that the oncologic treatment was not delayed despite severe heart disease.

Abbreviations: CABG = coronary artery bypass grafting, CT = computed tomography, IVC = inferior vena cava, IVTT = intravenous tumor thrombus, MRI = magnetic resonance imaging, RCC = renal cell carcinoma.

Keywords: coronary artery bypass grafting, renal cell carcinoma, tumor thrombus, vena cava

1. Introduction

Renal cell carcinoma (RCC) exhibits a natural tendency to extend from the kidney into inferior vena cava (IVC) and growing into the right atrium is a rare complication.^[1] The incidence of tumor thrombus in IVC is 4% to 10%.^[2] The incidence of tumor thrombus in the right atrium is 0.3% to 1.0%.^[3] We would like to report a case of a 65-year-old patient with a renal cell

carcinoma with extended intravascular growth into the IVC combined with history of severe coronary artery disease.

2. Case

A 65-year-old male patient suffered from edema of both lower extremities for 20 days. He underwent ultrasound examination which indicated that the left kidney was occupied by solid lesions. Computed tomography (CT) showed the left renal tumor with extended intravascular growth into the IVC and right atrium, which was type IV thrombus according to the Mayo classification.^[4] Magnetic resonance imaging (MRI) confirmed the result of CT (Fig. 1). Distant metastases and lymph node involvement were not found in preoperative imaging. The clinical stage was T3cN0M0. The patient suffered from severe coronary artery disease and underwent coronary stent implantation 4 years ago. Preoperative coronary angiography revealed anterior descending coronary artery focal stenosis reaches 75% (Fig. 2). The risk of urologic operation in patient with so advanced circulatory insufficiency would be extremely high. On the contrary, it could be extremely unfavorable due to the delay of oncological treatment.

After discussion, the operation was conducted with an interdisciplinary approach by urologists and cardiothoracic surgeons. In the first part of the operation, the patient was

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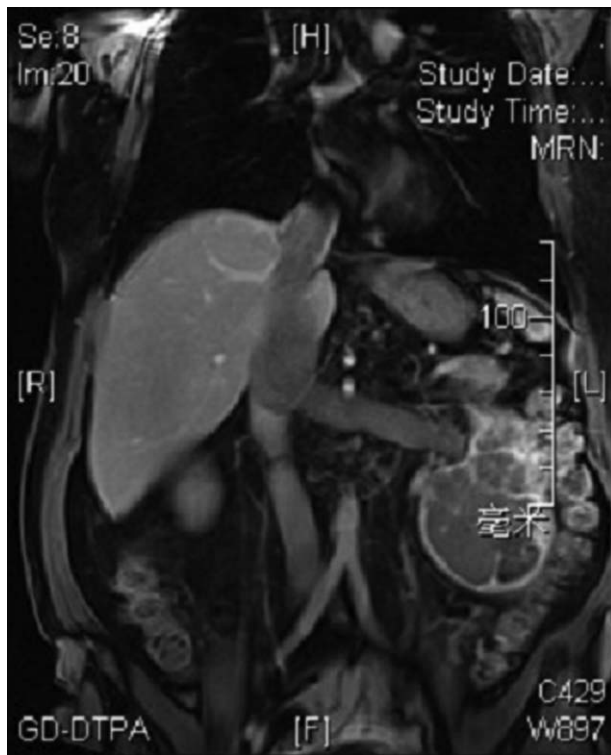


Figure 1. The preoperative imaging showed that left renal carcinoma sized approximately 9cm, juxtahepatic vena cava is fully filled with tumor mass and the tumor thrombus up to the right atrium.

placed supine position. We cut the sternum to prepare to establish cardiopulmonary bypass, which can prevent the tumor thrombus from falling off. Secondly, infrahepatic vena cava, the double renal vein, and the left renal artery were fully exposed. It was found that the left renal vein and infrahepatic vena cava became obviously thickened, and the tumor thrombus could be touched. Here we ligated and divided the left renal vein, left lumbar vein, and left reproductive vein. The caudal IVC, right renal vein then



Figure 2. Anterior descending coronary artery focal stenosis reaches 75%.

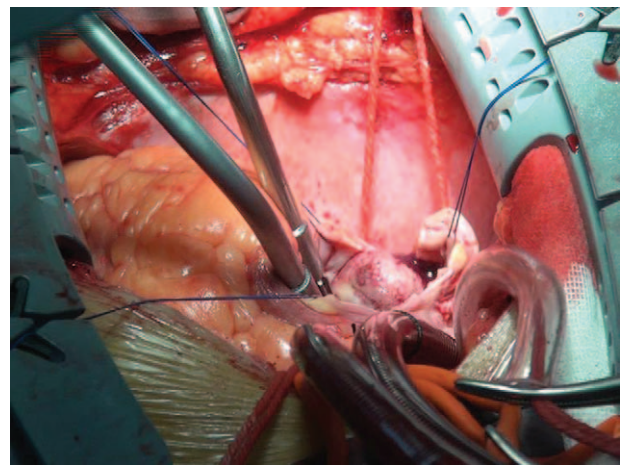


Figure 3. Tumor embolus size of approximately 2.5cm in the right atrium.

were completely clamped in order. Thereafter cardiopulmonary bypass was established. Simultaneously the left saphenous vein was harvested for grafting. There was a tumor thrombus sized approximately 2.5 cm when we incised the right atrium (Fig. 3). The IVC wall was cut at the entrance of the left renal vein, and the tumor thrombus extending upward. The 14 F catheter was inserted into the right atrium through the IVC, filling the air sac and pulling the tumor thrombus down. The tumor thrombus was removed completely (Fig. 4). Remove the left kidney, ureter, and adrenal gland. Finally, coronary artery bypass grafting (CABG) was performed in the case of beating heart. The pathological study presented poorly differentiated papillary renal cell carcinoma. The postoperative course in the ward was uneventful and the patient was discharged from hospital on the 30th postoperative day. Postoperative targeted therapy was applied in our cases according to our and some domestic institute's experience (400mg of sorafenib twice a day). In the present case, the patient has remained asymptomatic without any evidence of recurrence during 6 months of follow-up. The



Figure 4. The thrombus extended into the IVC with a length of approximately 13cm.

patient provided informed consent for the publication of his clinical and radiological data.

3. Discussion

The intravascular growth into the IVC up to the right atrium is a specific complication of renal cell carcinoma.^[1] Accurate determination of the superior extent of the tumor thrombus is crucial because it determines the surgical approach. MRI provides better delineation of the caval wall and the relationship to the hepatic veins. Especially when a tumor thrombus invade into the vessel wall and reconstruction of the vena cava may be necessary. IVC and RV diameter on CT or MRI has been correlated with wall invasion. Although many patients with metastasis have poor prognosis, IVC thrombus without distant metastasis has a more optimistic prognosis.^[5] Some researchers showed that venous tumor thrombus did not affect prognosis.^[6] In addition, when left untreated, prognosis is quite poor for the majority of patients with this disease.^[7] Therefore, surgical intervention for RCC patients with venous extension should be considered as an option. Recent study found that cytoreductive nephrectomy with thrombectomy before targeted therapy improved the survival of patients with mRCC with venous tumor thrombus.^[8]

Usually the resection of level 0–II intravenous tumor thrombus (IVTT) is performed without cardiopulmonary bypass using a simple clamping technique. Open IVC thrombectomy is the current standard modality for RCC with IVC thrombus.^[9] Some studies indicated that laparoscopic and robot-assisted laparoscopic IVC thrombectomy is safe and feasible for RCC with level II IVC thrombus.^[10] However, levels III and IV IVTT require cardiopulmonary bypass as a saving procedure to avoid the fatal complications caused by bleeding or embolism. When considering cardiopulmonary bypass procedure for level III or IV IVTT, a cardiology consultation should be requested and a coronary angiography performed if necessary. Because of its complexity, surgery should be performed by an experienced team including anesthesiologists, cardiac, and urological surgeons in the various surgical approaches. About incision types, a midline incision is done mainly in association with a sternotomy for levels III and IV IVC thrombus. The advantages of this incision are that it allows a single incision to provide good access to the IVC, renal pedicle, and contralateral kidney.^[11] In addition, when IVC thrombectomy is done for left RCC; however, right renal artery blood flow cannot return to the venous system if the right renal vein is clamped, due to the anatomical difference. For this reason, the right renal warm ischemia time was a factor in the cases of left RCC with IVC thrombus, which increased the difficulty of the operation.

Another question is how to treat patients who have both oncologic diseases and coronary artery disease. If the cardiac operation is performed first, a delayed tumor resection may increase the immunosuppressive effect of extracorporeal circulation may accelerate tumor growth and disseminate cancer cells^[12] and additionally the doubling of costs has to be considered. There is also an advantage in avoiding second operation and anesthesia. So we decided to treat both diseases in one operation. We should also notice that the therapeutic effect and overall survival rate require further investigation with a larger sample size and longer follow-up.

To the best of our knowledge, this is the first reported case of patient, who underwent 1-stage open left radical nephrectomy, IVC, and right atrium thrombectomy under cardiopulmonary bypass, CABG on beating heart. In conclusion, coexistence of severe coronary artery disease and renal cell carcinoma infiltrating inferior vena cava and right atrium rendered this operation as very high-risk procedure. We hope that our operational manners can prove that 1-stage cardiac and uro-oncologic operation can be a safe and beneficial procedure.

4. Conclusion

The present case illustrates that 1-stage surgical treatment is a feasible and effective method for left renal cell carcinoma with level IV IVTT combined with severe coronary artery stenosis. Treatment must be individualized to every patient based on tumor biology and patient performance status. We hope this surgical method and new concept can provide a patient-oriented approach reducing peri- or postoperative potentially fatal complications.

Author contributions

Resources: Hui Zhang, Dingqi Sun, Yong Li, Qi Tan.

Validation: Qiang Fu.

Writing – original draft: Zhenqing Wang, Keqin Zhang.

Writing – review and editing: Zhenqing Wang, Qiang Fu.

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