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Pure laparoscopic radical nephrectomy and inferior vena caval tumor thrombus removal in patients with complicated renal tumor

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To the Editor: Renal carcinoma is one of the most commonly encountered urological malignant carcinomas, accounting for 2% to 3% of all adult malignant carcinomas; mortality is over 40%.[1] With recent developments in medical technology, surgical, and auxiliary treatment of renal carcinoma has improved greatly. Once considered as a high-risk group, patients with renal carcinoma and inferior vena caval tumor thrombosis can receive ideal treatment now.

We performed pure laparoscopic radical nephrectomy and inferior vena caval tumor thrombus removal in five patients, two men and three women aged 39 to 71 years (mean: 59 years). Two patients had frank hematuria, two had flank pain, and one was asymptomatic. Three patients were affected in the left kidney and two in the right kidney. Three had grade I tumor thrombosis, and two had grade II. Tumor length ranged from 2.0 to 4.1 cm in the grade II group, and tumor size ranged from 3.8 to 11.2 cm for all patients. One patient had renal hilar lymph node metastasis and another had bone metastasis.

All patients provided the appropriate consent forms. All five patients underwent successful pure laparoscopic radical nephrectomy and inferior vena caval thrombus removal. Two patients with right kidney carcinoma had grade I thrombosis, and we chose a right retroperitoneal incision. We first transected the renal artery and then sutured the inferior vena cava. In the three patients with left kidney carcinoma, one patient had a grade I thrombus, and we chose a right-sided 30° oblique position and a transperitoneal incision to isolate the kidney. After ligating the renal artery, we changed the patient to a left-sided 30° oblique position. We opened the right paracolic sulcus, and when we reached the entries of the left renal vein and inferior vena cava, we occluded the vena cava laterally at its junction with the renal vein. The lateral vena cava was sutured after removing the kidney and thrombus. The remaining two patients had grade II thrombi, and underwent similar procedures. After isolating the vena cava, we temporarily occluded the right renal artery and occluded the vena cava proximal and distal to the thrombus. We then opened the vena cava and removed the thrombus and sutured the vena cava [Supplementary video, http://links.lww.com/CM9/A90].

For the patient with left kidney carcinoma and grade I thrombosis, we chose a right transperitoneal incision with a right-sided 30° oblique position to isolate the kidney before ligating the renal artery. The patient was then changed to a left-sided 30° oblique position. We opened the right paracolic sulcus to expose and isolate the junction of the left renal vein and inferior vena cava, then occluded the inferior vena cava laterally at the entrance of the renal vein and removed the kidney and tumor thrombus followed by suturing the inferior vena cava. For the two patients with grade I thrombosis, the initial procedure was similar. After isolating the inferior vena cava, we temporarily occluded the right renal artery and the vena cava proximal and distal to the thrombus. We then opened the vena cava wall to remove the thrombus, and sutured the vena cava laparoscopically. Pre- and post-operative creatinine levels were recorded and compared [Figure 1].

Surgery in all five patients was completed successfully with no thrombus lost as an embolus. Mean operation time was 360 ± 45 min, and mean intra-operative blood loss volume was 500 ± 180 mL. One patient received an infusion of an 800 mL suspension of red blood cells. Mean hospitalization duration was 11 ± 3 days. Histopathology confirmed transitional cell carcinoma, Fuhrman grade II, in four patients; one patient had sarcomatoid carcinoma. All five patients received post-operative targeted therapy; four received sorafenib, and one received sunitinib. Patients were followed for 2 to 18 months, and their median survival time was 11 months. There was no significant difference in blood creatinine level pre- and post-operatively (72 ± 11 mg/dL *vs.* 84 ± 7 mg/dL, $P = 0.15$).

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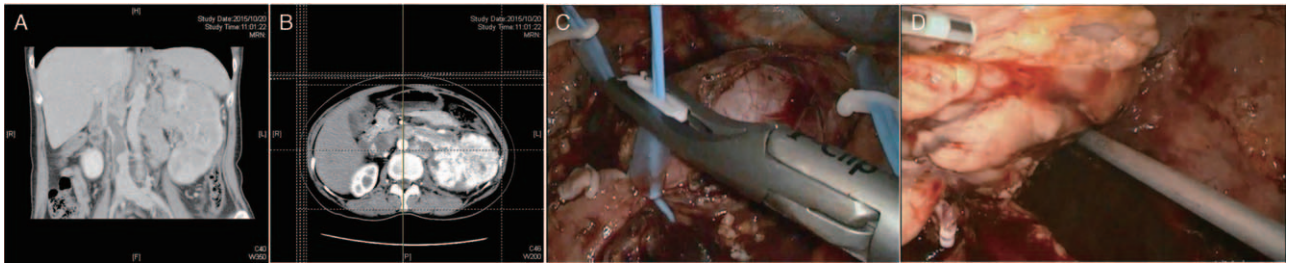

Figure 1: Plain computed tomography showing left kidney carcinoma with inferior vena caval thrombosis (A). The tumor and thrombus (coronal section; B). Isolating the vena cava and exposing the vena caval wall containing the thrombus (C). Removing the thrombus (D).

Locally-advanced renal cell carcinoma often invades the venous system, which has been reported in 4% to 10% of patients with renal carcinoma, usually affecting either the renal vein or inferior vena cava.[2] For patients with venous system tumor thrombosis, radical nephrectomy with vena caval tumor thrombus removal is the only curative treatment. Cost *et al*[3] first reported pure laparoscopic radical nephrectomy and inferior vena caval tumor thrombus removal. A retrospective analysis of laparoscopic radical nephrectomy with removing the inferior vena caval thrombus revealed that most procedures involved right kidney carcinoma. This right-sided predominance may be because the right renal vein is relatively short and closely adjacent to the inferior vena cava. A second reason is that, for right kidney carcinoma, the branches of the reflux veins, that is, gonadal vein, adrenal vein, and lumbar veins, provide sufficient compensatory drainage, which allows removal of the invaded part of the vena cava when necessary. For left kidney carcinoma with inferior vena caval thrombosis, most thrombi are grade I, usually lower in grade than for right kidney carcinoma, but if tumor invades the vena cava, the tumor is usually more aggressive, which makes the procedure more challenging. Third, there are not enough reflux veins for the right renal veins, and when removing invaded partial vena cava, venous bypass or autologous kidney transplantation is required. These differences make it relatively easier to perform right kidney carcinoma with vena caval thrombus removal. With left renal carcinoma, complicated procedures are necessary for the renal vein and inferior vena cava, which increase the difficulty. More importantly, for procedures involving right kidney carcinoma, it is possible to transect and reconstruct the inferior vena cava, and there is no need to preserve the left renal vein, considering the sufficient compensatory drainage. In contrast, damaging the right renal vein must be avoided with left kidney tumors.

Pre-operative targeted therapy may lower the tumor thrombosis stage, which in turn reduces surgical difficulty.[4] However, a recent clinical study reported that lower tumor thrombosis stage was seen in only 12% of patients receiving pre-operative targeted therapy, and the surgical plan was implemented successfully in only 4% of patients.[5] Furthermore, some urologists reported that targeted therapy could increase both adhesions around the lesion and intra-operative bleeding, increasing the surgical difficulty.

One of our patients with inferior vena caval tumor thrombosis and remote vein thrombosis received a temporary filter. The remote vein thrombosis resolved 3 days after post-operative anti-coagulation therapy, and the filter was removed. Our recommendation for placing a filter is to make this decision on a per-patient basis.

For left kidney carcinoma with tumor thrombosis, some centers selected a retroperitoneal route to treat the renal vessel first, and a peritoneal route to address the inferior vena cava, which provided satisfactory results.

Our results show that although pure laparoscopic radical nephrectomy and inferior vena caval tumor thrombus removal is still one of the most challenging procedures in urology, the procedure is safe and feasible. However, surgeons must perform a thorough and careful pre-operative assessment and have laparoscopic expertise, especially in vascular suturing techniques.

Conflicts of interest

None.

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