

Single-stage resection with intraoperative filter placement for right renal carcinoma with vena cava extension

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ABSTRACT

A unique feature of renal cell carcinoma is the extension of tumor into the inferior vena cava (IVC). We present the case of a 67-year-old man with a right renal mass, renal vein and IVC tumor thrombus, and acute occlusion of the common iliac veins. He underwent right radical nephrectomy, caval thrombectomy, bilateral iliofemoral vein thrombectomies, and intraoperative placement of an infrahepatic IVC filter. Intraoperative IVC filter placement should be considered a viable option for patients undergoing radical nephrectomy with thrombectomy for tumor invasion into the IVC with known lower extremity thrombosis. (*Journal of Vascular Surgery Cases, Innovations and Techniques* 2021;7:691-3.)

Keywords: Case report; Caval thrombus; Inferior vena cava filter; Renal cell carcinoma; Vena cava thrombectomy

Renal cell carcinoma (RCC) comprises 2% to 3% of malignant diseases in adults.¹ A unique feature of RCC is extension of tumor into the inferior vena cava (IVC). Tumor thrombus will occur in 4% to 10% of cases.² The standard of care is radical nephrectomy with caval thrombectomy.

Our patient had had RCC with tumor invasion into the infrahepatic IVC with significant thrombus burden of the lower extremities. Open right nephrectomy was completed with IVC thrombectomy, bilateral iliofemoral vein thrombectomies, and intraoperative IVC filter placement. Our patient provided written informed consent for the report of his case.

CASE REPORT

A 67-year-old man had presented with a 5-day history of bilateral lower extremity edema. Computed tomography revealed a right renal mass with tumor invasion into the IVC. Venous duplex ultrasound showed acute occlusion of the iliofemoral and more distal veins of both lower extremities. An intravenous heparin infusion was initiated. Magnetic resonance imaging revealed a right renal mass measuring 9.7 × 4.6 × 8.3 cm, with extension beyond the perinephric fat (Figs 1 and 2). The mass

had extended to the infrahepatic IVC with occlusion of the common iliac veins. The patient proceeded to the operating room with urology, vascular, and cardiothoracic surgery teams.

Operative intervention. Right radical nephrectomy was performed through a midline laparotomy. Because of the tumor extension and caval tumor thrombus, nephrectomy included open caval thrombectomy. Bilateral iliofemoral thrombectomy was also performed, followed by transfemoral placement of a suprarenal IVC filter.

The bilateral common femoral veins were circumferentially dissected and controlled proximally and distally with silastic vessel loops. A purse string suture was placed bilaterally at the saphenofemoral junction using 4-0 polydioxanone suture to assist with closure after the thrombectomies.

The renal artery was double ligated using 0-0 silk suture. The IVC was circumferentially dissected and controlled proximally 3 cm above the right renal vein and distally 5 cm below the left renal vein. The left renal vein was circumferentially dissected and controlled with silastic vessel loops. Next, 2000 U of heparin was administered. After a 3-minute circulation period, the IVC was proximally and distally controlled. Low dose heparin was used because of intraoperative blood loss from the retroperitoneal dissection of the mass. An anterior cavotomy was performed, and the tumor thrombus was removed with the combination of a Freer elevator and ringed forceps. The lumen of the IVC was flushed with heparinized saline and closed primarily with running 4-0 Prolene suture (Ethicon, Inc, Johnson & Johnson, Raritan, NJ). The closure of the venotomy was completed with no evidence of stenosis.

We then performed the bilateral iliofemoral thrombectomies. The right common femoral venotomy was made in the center of the purse string suture. A no. 6 Fogarty catheter, followed by a no. 8 Fogarty catheter was passed retrograde into the IVC. Multiple passes were made for removal of thrombus until brisk outflow was achieved. The procedure was repeated on the left common femoral vein.

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Author conflict of interest: none.

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The editors and reviewers of this article have no relevant financial relationships to disclose per the Journal policy that requires reviewers to decline review of any manuscript for which they may have a conflict of interest.

2468-4287

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<https://doi.org/10.1016/j.jvscit.2021.08.008>

An ALN IVC filter (Aln Implants Chirurgicaux, Bormes-les-Mimosas, France) was then placed. An 8F sheath was placed through the right common femoral venotomy and guided to the level of the IVC, ~2 cm cephalad to the suture line but caudad to the intrahepatic space, using digital palpation. Fluoroscopic guidance was used to ensure appropriate intrahepatic placement of the IVC filter and to establish a radiologic baseline showing full deployment of the filter tines. The sheath was removed, and the right common femoral venotomy was closed with the purse string suture. The bilateral groin incisions and abdominal incision were closed in standard fashion. The total operative time was <4 hours, and the blood loss was 2.6 L.

Postoperative course. Intraoperative resuscitation included 6 L of crystalloid, 4 U of packed red blood cells, 6 U of packed platelets, 2 U of fresh-frozen plasma, and 1 L of albumin. An intravenous heparin infusion was started on postoperative day 1. On postoperative day 2, his platelet count had decreased by 50%. The findings from a heparin-induced thrombocytopenia blood panel was positive, and argatroban was started. Apixaban was initiated on postoperative day 6. On postoperative day 8, the patient was discharged to a rehabilitation unit. The final pathologic examination revealed papillary renal cell carcinoma grade 3 without sarcomatoid or rhabdoid features. The renal vein margin was positive, and cabozantinib was initiated. A computed tomography scan at 4 months postoperatively showed liver metastasis and peritoneal carcinomatosis. Cabozantinib was initially continued. However, because of the side effects of the chemotherapy and the desire for an improvement in quality of life, the patient was transitioned to palliative care.

DISCUSSION

IVC tumor thrombus occurs in 4% to 10% of patients diagnosed with RCC. The Neves classification can be used to further define the extent of tumor thrombus. Level I indicates tumor involvement within the IVC at the level of the renal vein. Level II indicates tumor involvement above the renal vein but below the liver. Level III indicates tumor involvement that is retrohepatic. Supradiaphragmatic invasion into the IVC or extension into the right atrium is classified as level IV.

To date, the research concerning IVC filter use has been sparse. The use of an IVC filter has been left to the decision of the surgeons. A Cochrane Database review was completed in 2010, which stated that no recommendation could be made regarding IVC filter use.³ It has been shown that preoperative placement of IVC filters can cause additional challenges intraoperatively with resection.⁴ Preoperative filter placement can complicate proximal surgical control and tumor thrombus removal.⁵ Another concern with the preoperative placement is incorporation of tumor into the filter.^{6,7} Thus, preoperative filter placement was avoided in the present patient owing to concern for proximal control of the IVC.

Our patient's case presented with a unique challenge owing to the symptomatic lower extremity venous

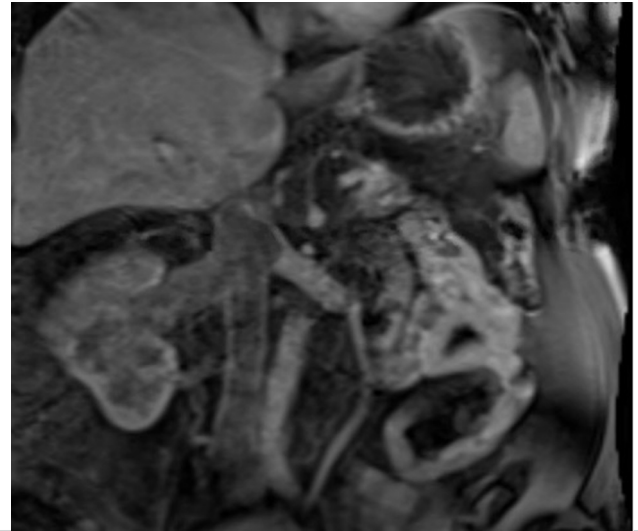


Fig 1. Coronal view of magnetic resonance image of abdomen with evidence of inferior vena cava (IVC) extension.

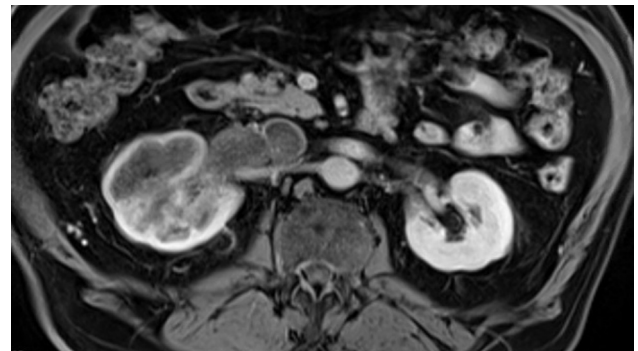


Fig 2. Axial magnetic resonance image of abdomen displaying renal vein and inferior vena cava (IVC) extension.

thrombus. In patients with iliofemoral deep vein thrombosis that extends into the IVC, the risk of post-thrombotic venous hypertension, recurrent deep vein thrombosis, and severe post-thrombotic syndrome is higher.⁸ Previous reports have recommended low-molecular-weight heparin and early surgical management.⁵ However, because of the symptomatic nature, we decided to proceed with mechanical thrombectomy and IVC filter placement.

In our patient, the use of an IVC filter was believed to be the safest option given his risk of postoperative bleeding and the risk of embolus. The specific risks in our patient included an elevated body mass index and the development of large collateral subcutaneous vessels as a complication of the tumor thrombus. The patient and family decided to pursue palliation because of the metastasis, side effects of chemotherapy, and desire for improved quality of life. Therefore, the patient did not undergo follow-up venous duplex ultrasound and continued receiving apixaban with the IVC filter in place.

CONCLUSIONS

IVC tumor thrombus occurs in 4% to 10% of patients with a diagnosis of RCC. Patients with tumor thrombus involving the IVC without metastatic disease secondary to RCC have a 5-year survival of 34% to 72%, which makes surgical resection a viable treatment option.⁴ Extensive thrombus can make the decision regarding the timing of anticoagulation therapy postoperatively challenging owing to the 30% risk of perioperative mortality secondary to bleeding or intraoperative embolization associated with no IVC filter used.⁶ We believe that surgeons should make a multidisciplinary care plan to determine the anti-coagulation therapy and how to best prevent embolic events. Intraoperative IVC filter placement should be considered a viable option for patients undergoing radical nephrectomy with thrombectomy for tumor invasion into the IVC with extensive lower extremity thrombosis.

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Submitted Jul 30, 2020; accepted Aug 23, 2021.