

Palliative iliac vein-to-right atrium bypass in a patient with a prior vena cava ligation for invasive renal cell carcinoma

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Renal cell carcinoma can involve the inferior vena cava and extend into the right atrium. Cure is rarely achieved in patients with concomitant metastases, but cytoreductive nephrectomy and eradication of the entire tumor thrombus can extend survival and prevent symptoms of venous congestion; however, the invasive nature of the tumor thrombus can make resection with negative margins difficult. We present a patient with aggressive renal cell carcinoma that demanded an iliac vein-to-right atrium bypass after inferior vena cava ligation during a previous attempt at curative resection with nephrectomy and caval thrombectomy. (*J Vasc Surg Cases* 2015;1:6-8.)

Renal cell carcinoma (RCC) is a locally invasive cancer that can progress to involve the inferior vena cava (IVC) and even the right atrium. Despite this aggressive pattern of invasion, surgical resection with negative margins allows for a 5-year overall survival that can approach 65% in patients without distant metastases.¹ For patients with metastatic disease, in addition to palliative treatment, cytoreductive nephrectomy is associated with an extended median survival.² Eradication of the tumor burden can demand not only a radical nephrectomy but also a tumor thrombectomy using cardiopulmonary bypass (CPB).³

Given the complex nature of these neoplasms, preoperative planning before embarking on surgical resection is crucial. We present a case of an aborted RCC resection mandating an infrarenal caval ligation at another hospital, which was successfully treated at our institution with an iliac vein-to-right atrium bypass. Explicit consent was obtained from the patient to publish the material included in this report.

CASE REPORT

A 69-year-old woman with locally advanced RCC presented to our urology clinic after having undergone embolization of her tumor, radical right nephrectomy, and partial IVC resection at

another hospital. According to operative reports, the tumor thrombus was densely adhering to the IVC wall and, therefore, could not be safely resected. Accordingly, the infrarenal vena cava was stapled after unsuccessful retrieval of the more superior component of the malignant thrombus. She was given adjuvant sunitinib but had to stop due to a number of adverse effects, most notably, hypertension. As a result, the patient suffered from progressive ascites and bilateral lower extremity edema totaling a body weight gain of 60 pounds in 2 months.

A computed tomography scan obtained during her evaluation demonstrated a hyperenhancing mass extending from the nephrectomy surgical bed to the inferior cavoatrial junction. Multiple bilateral pulmonary nodules were also evident. Owing to involvement of the hepatic veins with thrombus, there were perfusion changes compatible with hepatic congestion that correlated clinically to her significant ascites (Fig 1).

Her treatment options included continued chemotherapy with systemic anticoagulation and a palliative care consultation or aggressive resection and IVC reconstruction. She opted for the latter and was taken to the operating room for residual tumor thrombectomy and iliac vein-to-right atrium bypass. The right iliac artery and vein were circumferentially dissected. The tumor mass was easily identified in the retroperitoneum and behind the liver. The mass was adherent to the liver, hepatic vessels, and retroperitoneal soft tissue structures and, thus, was deemed unresectable.

The right external iliac vein was opened, and an 8F Fogarty balloon catheter was introduced for direct thrombectomy of the femoral vein. A 12-mm polytetrafluoroethylene (PTFE) graft was sewn to the external iliac vein and an 8-mm Dacron (DuPont, Wilmington, Del) chimney to the iliac artery for additional venous drainage and arterial inflow, respectively, during CPB. CPB was instituted and the patient cooled to 25°C.

Owing to dense adhesions between the liver and the retroperitoneum, the right atrium was opened to facilitate tumor extraction, with careful attention to clear the hepatic veins to mitigate the patient's progressive ascites. For this portion of the operation, we used short periods of low-flow bypass with vacuum-assisted drainage to facilitate exposure of the vena cava. A Coda balloon catheter (Cook Medical, Bloomington, Ind) was used to remove

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Fig 1. Computed tomography (CT) scan after the initial operation. Residual tumor thrombus is visible in the retrohepatic inferior vena cava (IVC; *arrow*).

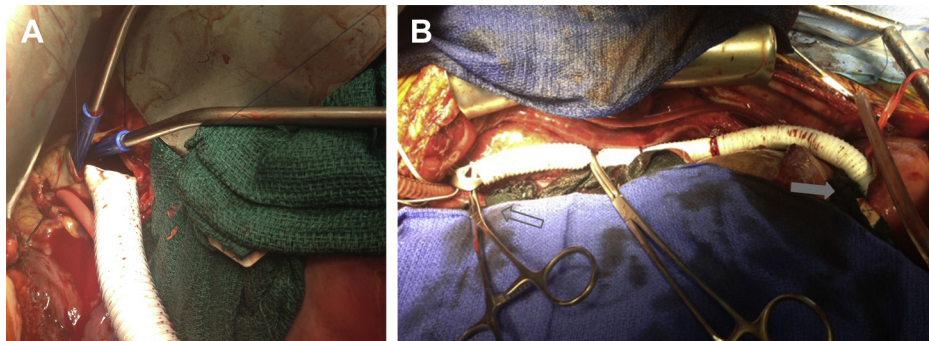


Fig 2. **A**, Distal anastomosis to the right atrium. **B**, Completed iliac vein-to-right atrium bypass. Note the course of the conduit over the dome of the liver. The *solid arrow* denotes the right atrial anastomosis, and the *clear arrow* denotes the iliac vein anastomosis.

further thrombus from the retrohepatic IVC. A 16-mm PTFE graft was sewn to the right atrium in an end-to-side fashion and tunneled laterally across the dome of the diaphragm and into the retroperitoneum (Fig 2). The distal aspect of the graft was sewn to an additional 16-mm PTFE graft into which a Celect IVC filter (Cook) had been deployed and secured with 4-0 Prolene (Ethicon, Somerville, NJ) suture to prevent future embolic phenomenon (Fig 3). The 16-mm graft was then sewn to the previously created 12-mm right external iliac PTFE graft.

The patient was slowly warmed throughout the venous reconstruction and was separated from CPB without incident. Her hospital course was uneventful, her jaundice gradually resolved, and she was discharged on postoperative day 8. Over

the ensuing 2 to 3 months, the patient reported complete resolution of her abdominal and lower extremity edema.

She continued sunitinib therapy, but due to progression of her metastatic foci, was enrolled in a clinical trial 4 months postoperatively. She was alive 8 months after her second operation and has not experienced subsequent ascites or lower extremity swelling. Furthermore, the patient states that her recovery is back to its baseline and reports a fully independent performance status.

DISCUSSION

Caval tumor extension occurs in 4% to 10% of patients with RCC, and surgical management of these aggressive neoplasms can be challenging.⁴ Caval thrombectomy is

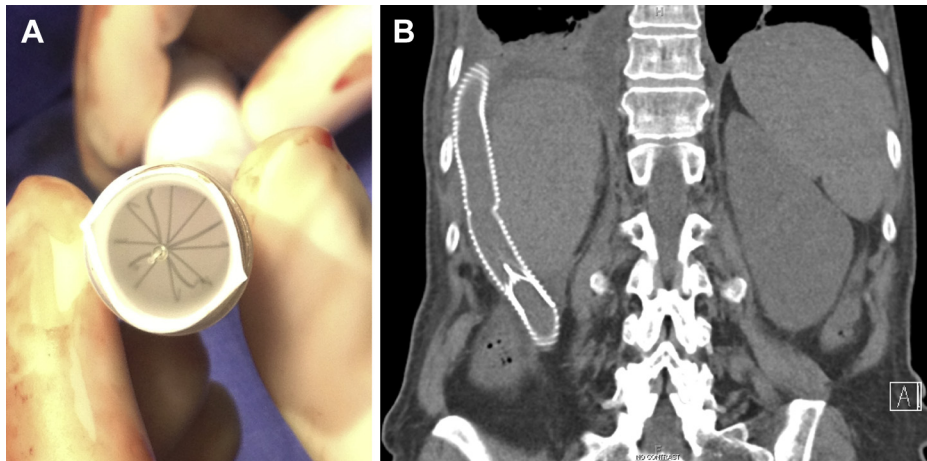


Fig 3. **A,** Deployed vena cava filter within the 16-mm polytetrafluoroethylene (PTFE) conduit. **B,** Postoperative computed tomography (CT) scan after reconstruction. Note the deployed vena cava filter within the conduit.

associated with an in-hospital mortality rate of up to 10% and a complication rate as high as 25%.¹ However, patients who do not undergo surgical resection demonstrate an expected median survival of only 6.9 months.^{1,5} Therefore, in the appropriately selected patient, surgical resection should be strongly considered for curative intent. Options include primary venorrhaphy, patch or interposition grafting, and in certain instances, caval ligation.^{4,6-8}

Given this patient's substantial tumor burden and the fibrosis resulting from her previous operation, a complete IVC resection with tumor excision was not feasible. In addition, because she had documented pulmonary disease, heroic resection would likely result in minimal oncologic benefit. Accordingly, to ameliorate her hepatic and lower extremity congestion, an external iliac vein-to-right atrium bypass was performed with PTFE.

Successful reconstructions for central vein stenosis and malignant superior vein cava syndrome have been described in small series, but a complete bypass of the IVC after prior ligation has not been reported.^{9,10} Tumor clearance was facilitated via a right atriotomy, which was then incorporated into the distal anastomosis. Rather than use hypothermic circulatory arrest, we decided to use low-flow CPB, which allows for air handling and avoids deep hypothermia and its associated coagulopathy.

CONCLUSIONS

This technique for reconstruction should not be used in all patients; however, it provides a safe method of reconstituting venous drainage from the lower extremities in salvage situations in patients who must undergo IVC ligation. Patient selection is therefore a key element in the workup for this aggressive surgical approach. Accordingly, caval reconstruction should only be pursued in individuals with acceptable baseline functional status and a relatively stable oncologic burden. Symptomatic control via reconstitution of venous flow can allow patients to receive adjuvant systemic therapy with new biologic agents, which offer the

best opportunity for improvement in survival. Lastly, because this patient cohort is at high-risk for venous thrombosis and subsequent embolic phenomenon, placement of a filter within the bypass graft should be strongly considered.

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