

Percutaneous suction thrombectomy of large tumor thrombus causing massive pulmonary embolism

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ABSTRACT

We describe a patient who underwent a renal cell carcinoma resection with inferior vena cava thrombectomy complicated by tumor embolization. This resulted in massive pulmonary embolism requiring venous-arterial extracorporeal membrane oxygenation. The patient was ineligible for systemic or catheter-directed thrombolysis because of the recent surgical resection and postoperative hemorrhage. Hence, the patient underwent percutaneous suction thrombectomy with successful removal of the tumor thrombus and significant clinical improvement. This report represents a unique case of suction thrombectomy for the removal of tumor embolus from the pulmonary circulation and highlights the ability of suction thrombectomy in the management of massive pulmonary embolism. (*J Vasc Surg Cases and Innovative Techniques* 2018;4:244-7.)

Keywords: Pulmonary embolism; Continuous aspiration embolectomy; Renal cell carcinoma

CASE REPORT

A 66-year-old man originally presented to an emergency department with acute-onset right flank pain. Imaging demonstrated a 6.0- × 6.5- × 8.4-cm right kidney mass that was infiltrative into the retroperitoneal space, involving the right renal vein and extending 5 mm into the inferior vena cava (IVC). In addition, prominent perirenal lymph nodes were present, although no metastatic disease was noted on imaging. The mass was highly suggestive of a renal cell carcinoma (RCC). The patient had excellent functional status with an Eastern Cooperative Oncology Group score of 0 and had no significant weight loss. By imaging, the tumor was stage III (T3bN1M0).

The patient underwent elective resection of the mass through right radical nephrectomy and IVC thrombectomy. Efforts to identify the most proximal extent of the tumor included intraoperative ultrasound and transesophageal echocardiography (TEE). The right side of the liver was mobilized, allowing vascular

control of the IVC 4 cm cranial to the right renal vein. Despite control of the IVC, the TEE showed that the thrombus had embolized initially to the right atrium. At this juncture, the cardiothoracic surgery service was consulted, with the intention of placing the patient on cardiopulmonary bypass and removing the tumor embolus from the right atrium. Before the cardiothoracic surgeon's arrival, however, the tumor embolized farther into the pulmonary arterial system during the course of the IVC thrombectomy despite control of the proximal and distal IVC. The patient's clinical status deteriorated rapidly, with worsening oxygenation and hemodynamic collapse. There was severe right-sided heart strain on TEE, with massive right ventricular dilation. The decision was made by the cardiothoracic surgeon to place the patient on venous-arterial extracorporeal membrane oxygenation (ECMO) through the common femoral vessels and to initiate systemic anticoagulation with heparin. The RCC resection was then completed, and the midline laparotomy was closed.

The patient was transferred to the intensive care unit in critical condition. The patient required several transfusions of packed red blood cells and had decreasing urine output with marked abdominal distention, concerning for hemoperitoneum and abdominal compartment syndrome. The abdomen was therefore promptly explored, which revealed large hemoperitoneum with diffuse oozing from the surgical bed. There was a small amount of bleeding noted from the spleen, which was repaired, and the abdomen was temporarily closed.

The patient failed to improve hemodynamically despite adequate hemostasis and stable hemoglobin levels. The right ventricle also showed significant dilation when attempts were made to wean the patient from venous-arterial ECMO. Computed tomography angiography (CTA) was performed, which demonstrated significant bilateral pulmonary embolism (PE) to the main pulmonary arteries (Fig 1). He was determined

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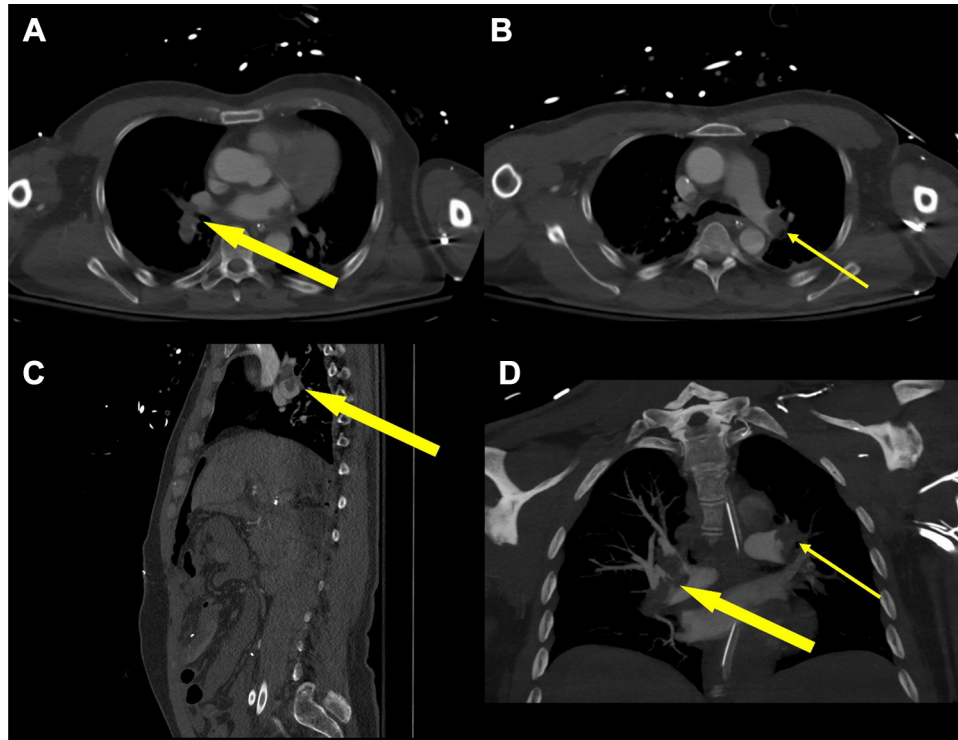


Fig 1. Computed tomography angiography (CTA) demonstrating the extent of the tumor embolus to the right (*large arrows*) and left (*narrow arrows*) pulmonary arterial circulation, resulting in a massive pulmonary embolus. **A** and **B**, Representative axial images. **C** and **D**, Sagittal and coronal images, respectively.

to not be a candidate for open embolectomy by the cardiac surgery service because of the severe coagulopathy and concern for further hemodynamic compromise with induction of general anesthesia. In addition, because of the recent intra-abdominal hemorrhage and splenic laceration, he was not a candidate for systemic thrombolysis or catheter-directed thrombolysis (CDT). Therefore, the vascular surgery service was consulted to evaluate for possible aspiration thrombectomy.

The patient was taken to the angiography suite, and pulmonary angiography was performed (Fig 2). Bilateral emboli were identified in the lobar branches, with the largest burden noted in the right superior trunk and interlobar artery. The initial Miller index was 16 by CTA.¹ The Miller index provides a numeric score to quantify the effect of occluded pulmonary arterial branches, with a maximal score of 9 for the right lung (3 for the upper lobar branch, 2 for the middle lobar branch, and 4 for the lower lobar branch) and 7 for the left lung (2 for the upper lobe and lingula and 3 for the lower lobe branch).¹ Selective angiography was performed, and access was obtained to each lobar branch. Mechanical aspiration thrombectomy using the Indigo Continuous Aspiration Mechanical Thrombectomy device (Penumbra, Inc, Alameda, Calif) was performed. There was concern that solid tumor material was likely present in the emboli and would not respond to chemical thrombolysis. Several passes were made with a CAT8 catheter without the flow-separator within the right inferior, medial, and left inferior pulmonary arterial branches with successful extraction of solid tumor thrombus (Fig 3). Completion pulmonary arteriography demonstrated



Fig 2. Initial angiogram demonstrating a large filling defect in the right superior and interlobar pulmonary arteries (*arrow*).

improvement in flow to the treated segmental branches (Fig 4). Estimated blood loss was 500 mL. Several further passes with the CAT8 catheter were also performed on the left because of the CTA findings of significant thrombus in the left pulmonary artery. However, minimal thrombus was extracted from the left side. Completion angiography showed the Miller index to have been reduced to 4. The tumor thrombus was sent for pathologic evaluation and demonstrated carcinoma cells of renal origin.

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