Catheter-Directed Thrombolysis for Massive Pulmonary Embolism Resulting from Thrombosis in a Duplicated Inferior Vena Cava: A Case Report

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Pulmonary embolism (PE) associated with duplicated inferior vena cava (IVC) is rare, and there are no reports of this condition treated with catheter-directed thrombolysis. We present the case of a 54-year-old man who developed massive PE caused by thrombi in a duplicated IVC that detached during transcatheter angiography. After implantation of a retrievable filter in the common IVC, the patient underwent catheter-directed thrombolysis. He was asymptomatic at discharge, with complete resolution of thrombosis and successful retrieval of the filter. The patient had an uneventful 9-month follow-up with no further complications.

Duplicated inferior vena cava (IVC) is a common malformation of the IVC, often recognized incidentally during surgery or imaging work-up.[1] Duplicated IVC with associated pulmonary embolism (PE) is rare. Reported treatment methods include anticoagulation, IVC filter insertion, and systemic thrombolysis.[2–4] Catheter-directed thrombolysis has been shown to be a safe and effective treatment for acute massive and submassive PE.[5] However, there is no report of catheter-directed thrombolysis treatment of PE in a patient with duplicated IVC. The present case describes a patient who experienced massive PE resulting from thrombosis in a duplicated IVC, which was incidentally identified during transcatheter angiography. The patient was successfully treated with catheter-directed thrombolysis and retrievable filter placement.

CASE REPORT

A 54-year-old man was admitted to our hospital complaining of a 10-day history of progressive swelling and pain in the left lower extremity. Three weeks before the onset of symptoms, he had undergone radical resection for gastric cancer at a local hospital, with postoperative bed rest. At presentation for the lower limb swelling, color Doppler ultrasonography showed a thrombus in the left common femoral vein. The surgeon initiated standard anticoagulation treatment using low-molecular-weight heparin. Repeated color Doppler ultrasonography of the lower limbs revealed thrombosis extending to the left iliac vein, indicating anticoagulation failure. Retrievable filter placement and catheter-directed thrombolysis were recommended. In preoperative laboratory tests, coagulation, liver, and renal function results were within normal limits.

Intraoperative monitoring showed an initial heart rate of 80 beats per minute, oxygen saturation of 98%, and blood pressure of 130/90 mm Hg. Baseline pulmonary angiography via a 5F pigtail catheter (Cook Medical, Bloomington, IN, USA) through the right internal jugular vein showed no significant filling defect in the pulmonary artery or its branches. The 5F pigtail catheter was advanced to the right common iliac vein with a guidewire. Subsequent venography showed that the right common iliac

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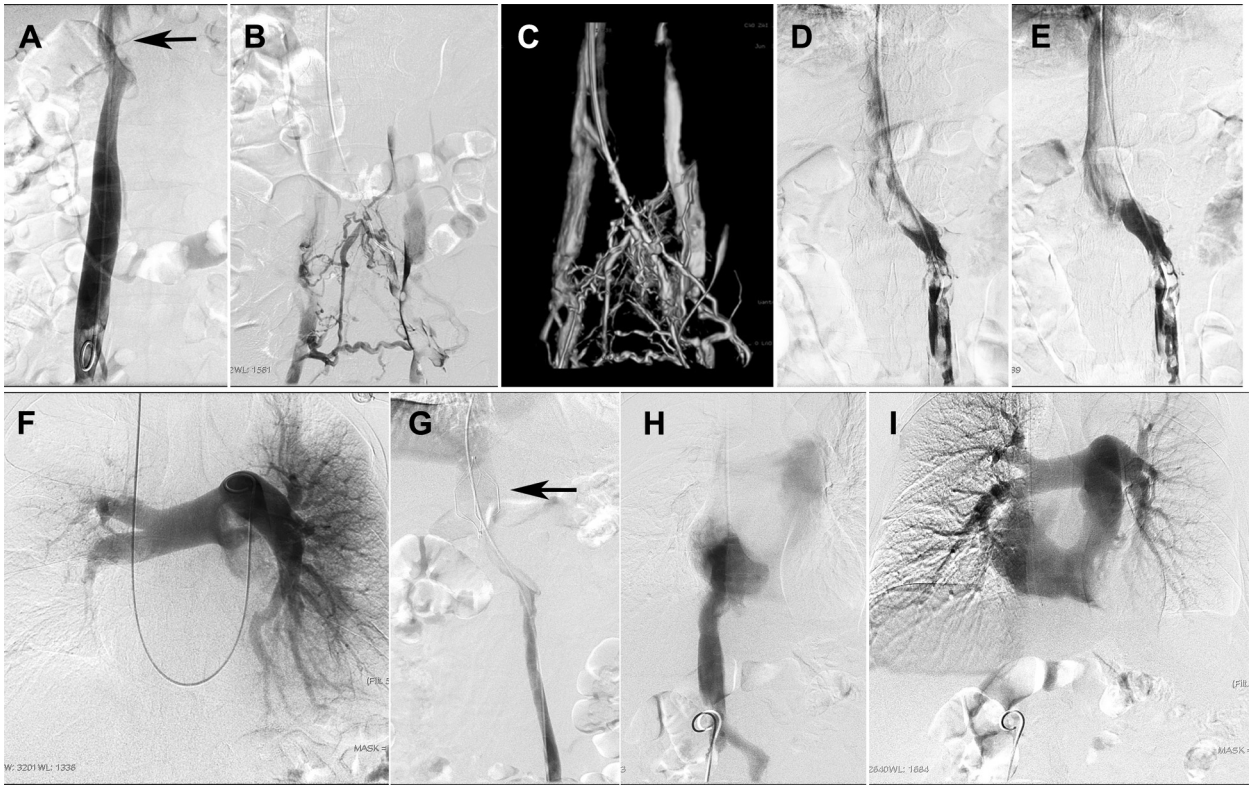

Fig. 1. PE associated with duplicated IVC. **(A)** Initial venography via a 5F pigtail catheter shows the right common iliac vein continuing cephalad to form the right IVC with a filling defect (*arrow*) at the level of the left renal vein. **(B)** Venography via a 5F angiographic catheter shows left iliac vein thrombosis and the left common iliac vein ascending on the left side of the spine to form the left IVC. **(C)** Three-dimensional digital subtraction angiography shows thrombosis in the left IVC and many interiliac communicating veins connecting the bilateral iliac veins and IVCs. **(D** and **E)** Venography of the left IVC shows many floating thrombi and one large detached clot extending into the common IVC. There is no display of the azygos or hemiazygos veins. **(F)** Pulmonary angiography shows right upper and lower pulmonary artery embolization. **(G)** The left IVC thrombi completely dissolved with catheter-directed thrombolysis; appropriate positioning of the filter was maintained in the common IVC (*arrow*). **(H** and **I)** Angiography after filter removal shows no perforation of the common IVC or residual thrombus in the pulmonary artery.

vein ascended to form the IVC on the right side of the spine and an IVC filling defect was noted at the level of the left renal vein (Fig. 1A). This finding was initially considered an artifact caused by prominent inflow from the left renal vein. The pigtail catheter was replaced with a 5F angiographic catheter (Cordis Corp., Fremont, CA, USA), which was advanced to the left common iliac vein. Venography revealed thrombosis in the left iliac vein. The left common iliac vein did not pass the spine at the level of the L5 vertebral body to join a normal IVC on the right but instead ascended on the left side of the lumbar vertebra with the proximal portion poorly visualized (Fig. 1B). Three-dimensional digital subtraction angiography showed the duplicated IVC ascended along either side of the spine with rich perforating vessels communicating between the bilateral IVCs and iliac veins. It also revealed thrombosis in the left IVC (Fig. 1C). There was no evidence of iliac vein compression. To assess drainage of the left IVC, a 5F angiographic catheter was inserted into the left IVC through a right internal jugular vein-superior vena cava-right atrium-common IVC approach. Venography showed that the left IVC crossed to the right side of the spine to join the right IVC at the level of the left renal vein, forming the common IVC in the posterior segment of the liver, and draining into the right atrium. There was a large number of thrombi in the entire left IVC, with one large clot extending into the common IVC, which detached during the venography (Fig. 1D, E). During the procedure, electrocardiography showed a suddenly accelerated heart rate of 120 beats per minute with a drop in blood pressure to 88/56 mm Hg and oxygen desaturation to 87%, indicating the occurrence of massive PE. Hemodynamic and respiratory support was provided with 10 mg of intravenous dopamine and oxygen delivery through nasal cannula, respectively. After removal of the 5F angiographic catheter, pulmonary angiography via a