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Diagnostic Imaging

Inferior vena cava filter placement in a left IVC and drainage into duplicated SVC via hemiazygous continuation

*Jennifer Sweeney MD**, *Nainesh Parikh MD, MBA*

Department of Diagnostic Imaging Moffitt Cancer Center, Department of Oncologic Sciences, Moffitt Cancer Center, College of Medicine University of South Florida, 12901 Magnolia Drive Tampa, FL 33612, USA

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ABSTRACT

Left-sided inferior vena cava (IVC) is the second most common anatomical anomaly of the IVC. We report a drainage pattern of the left IVC into a left duplicated superior vena cava (SVC) diagnosed during IVC filter placement consultation. The patient was a 66-year-old man with symptomatic hematuria caused by bladder cancer diagnosed with IVC thrombus and a left IVC found on a staging computed tomography urogram. The patient underwent computed tomography pulmonary angiogram, which ruled out pulmonary embolism, but demonstrated hemiazygous continuation of the left IVC above the diaphragm to meet a persistent left SVC (prevalence approximately 0.3%-0.5%) (Kim et al. 1995) [1] emptying into the right atrium via the coronary sinus. We report a novel drainage pattern of the left IVC into a duplicated left SVC via hemiazygous continuation.

Introduction

Inferior vena cava (IVC) anomalies are infrequent but of high importance to recognize because of the frequency of request of IVC filter placement. Although rare, left-sided IVC typically drains into the left renal vein with continuation into the right IVC, or via azygous drainage into the superior vena cava (SVC). We report a novel drainage pathway that has not been described in the literature: left-sided IVC with drainage into a duplicated left SVC and subsequent drainage into the right atrium via the coronary sinus.

Case report

A 66-year-old man presented with hematuria from a newly diagnosed bladder cancer, and on staging computed tomography (CT), he was found to have deep venous thrombosis in the left common femoral vein (CFV), as well as nonocclusive IVC thrombus (Fig. 1). The CT also demonstrated a left IVC (Fig. 2A-C). Because the patient had symptomatic hematuria and in preparation of the transurethral bladder resection of tumor procedure, the patient was not a candidate for anticoagulation and an IVC filter placement was requested. To rule out

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* *Corresponding author.*
E-mail address: jennifer.sweeney@moffit.org (J. Sweeney).

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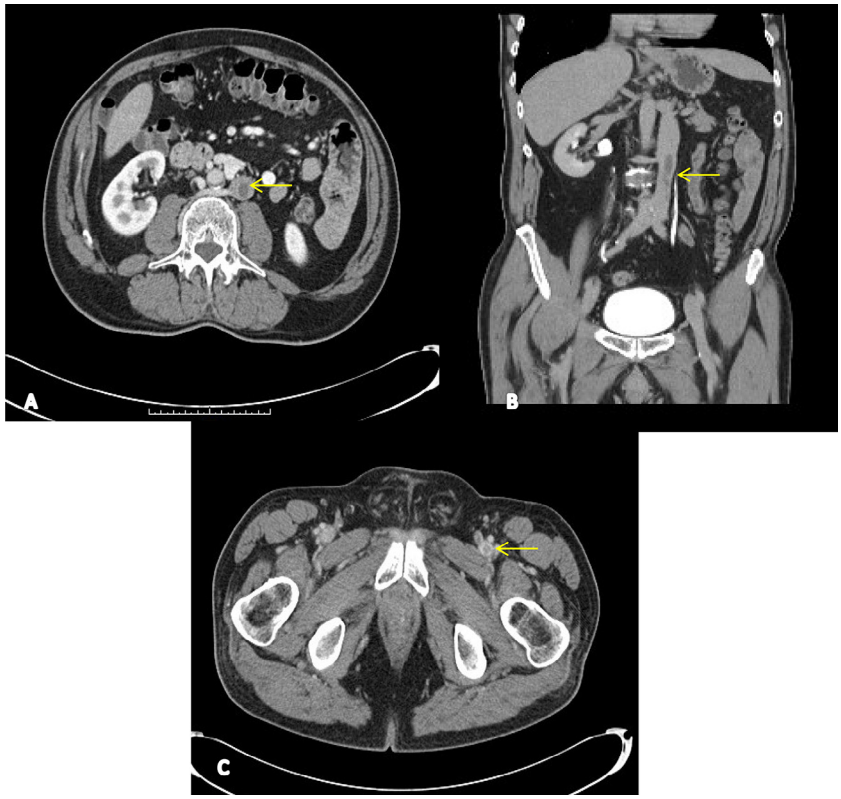

Fig. 1 – (A) Axial and (B) coronal computed tomography images depict thrombus in the infrarenal inferior vena cava and (C) the left femoral vein (yellow arrows).

pulmonary embolism (PE), the patient also had a CT pulmonary angiogram performed, which demonstrated the drainage pathway of the left IVC. Namely, there was hemiazygous continuation of the IVC connecting to a persistent left SVC with drainage into the right atrium via the coronary sinus (Figs. 2D-F and 3). At our institution the preferred venous access for IVC filter placement is from a right internal jugular (IJ) approach because of shorter bed rest, better control of the venous access

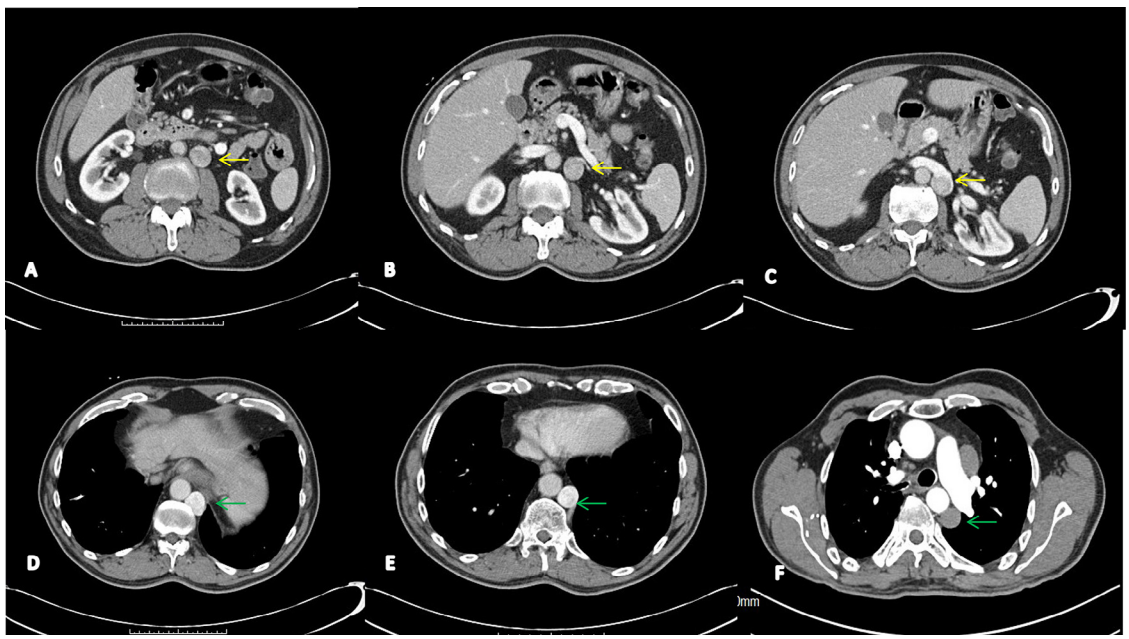

Fig. 2 – (A-C) Left inferior vena cava ascending from the abdomen (yellow arrows). (D-F) Continuation cephalad into a hyphertrophic hemiazygous vein (green arrows).

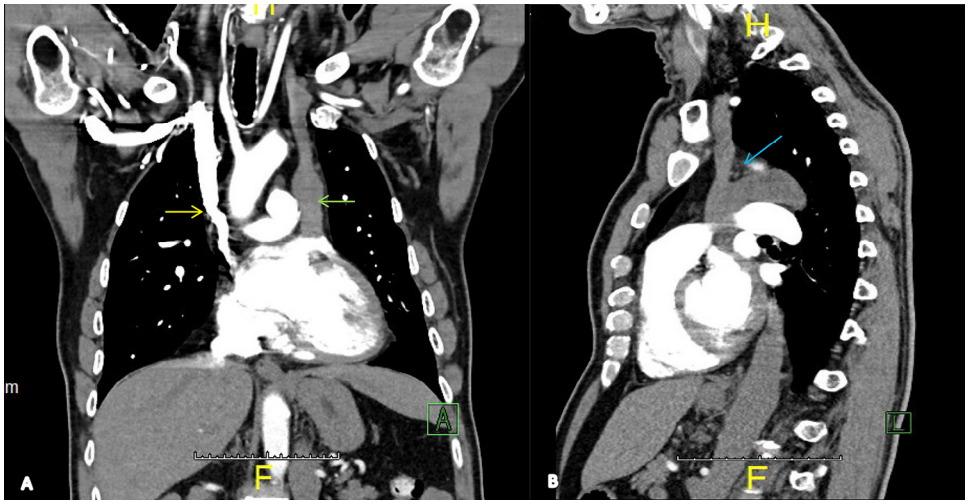

Fig. 3 – (A) Coronal computed tomography images demonstrate right superior vena cava draining to the right atrium (yellow arrow) and the left inferior vena cava draining via the coronary sinus to the right atrium (green arrow). (B) Sagittal computed tomography image demonstrates reverse curve confluence of the left superior vena cava and the left hemiazygous vein (blue arrow).

site for hemostasis, and prevention of angulation of the filter delivery sheath to prevent filter tilting, as well as the ability to remove the filter if there is malfunction or maldeployment. Because the left IVC drained into the left SVC, right IJ access was not possible for filter deployment. Left IJ access was considered; however, acute angulation of the left SVC and hemiazygous and infrarenal IVC made this approach suboptimal (Fig. 3). The right CFV was then chosen for venous access for filter placement. The case was discussed before starting with the referring physician and the patient so that both the patient and the referring physician understood the high likelihood that the filter would be permanent, given the difficult angulation of the left SVC and the hemiazygous vein. After this approach was all agreed upon, written informed consent was obtained from the patient. The patient was brought to the interventional radiology department, and the standard right CFV approach to deploying an IVC filter was undertaken. A venogram was performed via pigtail catheter before IVC filter placement, which demonstrated the nonocclusive IVC thrombus extending to the level of the L3 vertebrae, an IVC diameter of less than 28 mm, and bilateral single renal veins (Fig. 4). A Bard Denali filter (Peripheral Vascular, Inc., Tempe, AZ) was then deployed in the infrarenal IVC above the IVC thrombus. Post-IVC filter deployment venogram demonstrated the filter to be centered in the IVC and below the confluence of the renal veins (Fig. 4). The procedure was completed without complication. An abdominal CT performed 7 days later to evaluate urinary drainage after transurethral bladder resection of the tumor redemonstrated the filter to be positioned below the renal veins and above the nonocclusive thrombus (Fig. 4).

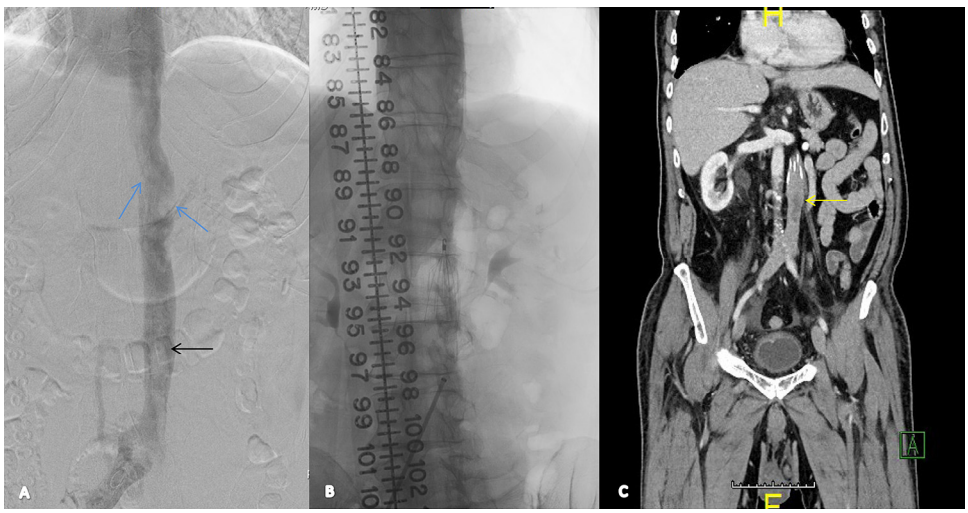

Fig. 4 – Left to right: (A) digital subtraction angiogram venogram demonstrates IVC thrombus (black arrow) and renal vein inflow (blue arrows), (B) infrarenal IVC filter placement, and (C) coronal computed tomography confirming IVC filter placement above the IVC thrombus (yellow arrow). IVC, inferior vena cava.

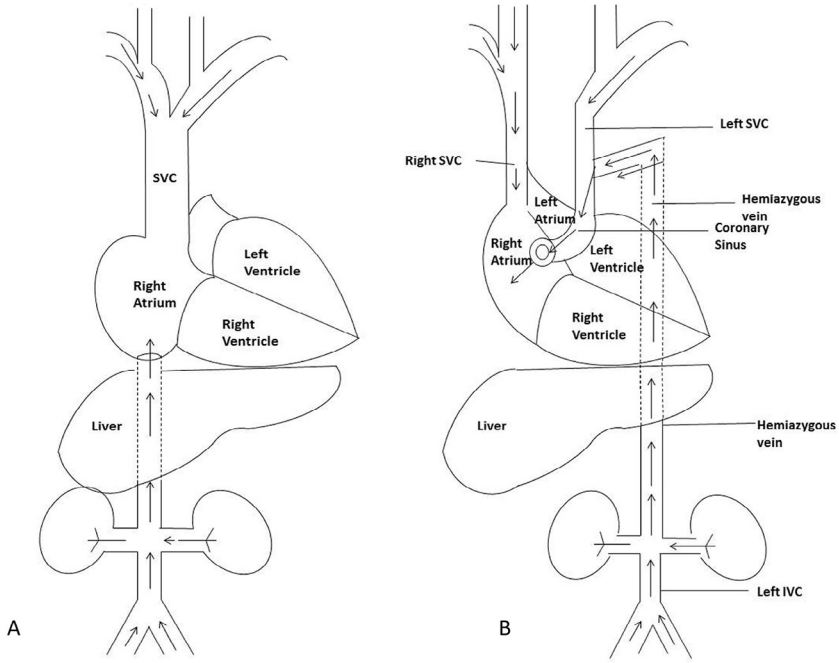

Fig. 5 – (A) The usual drainage pattern of the inferior vena cava on the right side of the body into the right atrium and a single right superior vena cava. (B) A left inferior vena cava with continuation into the hemiazygous vein to the duplicated left superior vena cava into the right atrium via the coronary sinus.

Discussion

IVC venous anomaly has been well described in the literature, including the embryogenesis and incidence [2], with the left IVC having been well documented [1]. Although myriad variations have been identified throughout the literature, we were unable to find a description of this particular anomalous venous anatomy. Left IVC with hemiazygous continuation to a persistent left SVC and drainage into the right atrium via the coronary sinus has not been reported ever before. This drainage pattern is illustrated in comparison with the usual IVC drainage pattern in Fig. 5. In addition to the very rare anatomy, the patient was complex because of his clinical presentation of IVC thrombus and contraindication for anticoagulation [3]. IVC filter was indicated because of the thrombus burden and location within the IVC [3]. No significant alternative therapeutic options were possible (eg, catheter directed thrombolysis) because the patient was already suffering from symptomatic hematuria and did not want to suffer possible complications from thrombolytic therapy. This case also highlights the importance of reviewing cross-sectional imaging when planning for IVC filter deployment. In this case, it was discussed with the patient and the referring physician that the IVC filter would likely never be retrieved because of the anomalous venous anatomy, thus avoiding any possible patient or referring physician frustration associated with the inability to remove the filter [4]. In conclusion, we report a novel drainage pathway of the left IVC into a duplicated left SVC via hemiazygous continuation; this is a pathway that has not yet been reported throughout the literature.

REFERENCES

[1] Kim HJ, Ahn IO, Park ED. Hemiazygous continuation of a left inferior vena cava draining into the right atrium via persistent left superior vena cava: demonstration by helical computed tomography. Cardiovasc Intervent Radiol 1995;18:65–7.
[2] Bass JE, Redwine MD, Kramer LA, Huynh PT, Harris JH Jr. Spectrum of congenital anomalies of the inferior vena cava: cross-sectional imaging findings. Radiographics 2000;20:639–52.
[3] Kinney TB. Inferior vena cava filters. Semin Intervent Radiol 2006;23:230–9.
[4] Petik B. Inferior vena cava anomalies and variations: imaging and rare clinical findings. Insights Imaging 2015;6:631–9.