Case Report

Renal artery stenosis on duplex ultrasound due to inferior vena cava filter leg impingement

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Abstract

We present a case study of renal artery duplex findings for new onset of hypertension in a young woman with a history of inferior vena cava filter placed a year prior and failed percutaneous retrieval. Duplex ultrasound showed significantly elevated velocities in the mid-right renal artery, consistent with renal artery stenosis. Computed tomography angiography images suggested that a leg from the inferior vena cava filter was impinging on her right renal artery, with perforation through the vena cava possibly into the wall of her duodenum. Open surgical intervention was required to disentangle the filter legs from the wall of the duodenum and relieve impingement on the right renal artery with thrombolysis of clot found within the right renal artery.

Keywords: Sonography, diagnostic imaging, colour Doppler, Doppler ultrasound, vascular, haemodynamics

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Introduction

A 26-year-old woman was diagnosed with a left lower extremity deep vein thrombosis (DVT) while in England. The imaging study that was performed in England stating the thrombus location and vessels involved was not available to review and the patient was unclear of the details of thrombus burden on further questioning. Upon being diagnosed at that time, her treatment included heparin and inferior vena cava (IVC) filter placement followed by being placed on Coumadin for 12 months. The surgical report describing the details, such as the placement of her filter device was also not available. It should be noted that the filter device was a specific type of ALN IVC filter made in France, and both the filter and retrieval kit are available only in Europe. After returning to the United States, she went to a neighbouring medical institution for attempted percutaneous retrieval of her IVC filter which was unsuccessful. Sometime later, she presented to her internist's office for her yearly physical examination. There, it was discovered that she had hypertension as evidenced by office blood pressure monitoring. She was not placed on anti-hypertensives at that time. Because of the identification of hypertension for a woman of her age, as well as her history of thrombophilia, she was referred to Massachusetts General Hospital's Vascular Center for consultation. During the examination, the patient described no complaints or had any significant leg swelling, nor did she have signs of venous disease on clinical examination. Following her examination, the Vascular Center physician

requested a renal artery duplex to determine a possible cause for her hypertension.¹

Methods

A duplex examination utilizing grayscale, color and Doppler was performed of the aorta, celiac, superior mesenteric and renal arteries using a Philips IU22 duplex ultrasound (Bothell, Washington, USA).

Results

On duplex ultrasound, the aorta and left renal artery and kidney sizes were within normal limits. However, there were significantly elevated velocities of 537 cm/s in the mid-right renal artery (Figure 1) that were consistent with 60–99% renal artery stenosis.² There was no evidence of IVC filter legs at, near or in the renal arteries on this examination. The Vascular Center physician then requested the patient have a computed tomography angiography (CTA) of her abdomen to further evaluate the etiology of her renal artery stenosis. The CTA images were compelling for the possibility that a leg from the IVC filter was indeed impinging on her right renal artery, and also that it appeared to perforate through the vena cava possibly into the wall of her duodenum (Figure 2).

Treatment included surgical intervention which required open surgical removal and disentangling of IVC filter legs in the wall of the duodenum and duodenal repair, removal of the filter leg impinging on the right renal artery with thrombolysis of clot found within the right renal artery

Figure 1 (a) Duplex Doppler ultrasound of the proximal right renal artery. (b) Duplex Doppler ultrasound of the mid-right renal artery showing significantly elevated velocities

Figure 2 (a) CTA with possible IVC filter leg perforating IVC. (b) Transverse CTA with IVC filter

and resection of the IVC and removal of the filter device. The IVC filter leg appeared to be contributing to direct external mechanical compression on the right renal artery.

Two years later, she returned to the Vascular Laboratory for a follow up. The post-operative renal duplex (Figure 3) demonstrated a widely patent right renal artery with significantly reduced velocity of 146 cm/s consistent with <59% renal artery stenosis. The patient's hypertension had also resolved following her IVC filter removal and renal artery thrombolysis. The IVC filter device complication was reported to the United States Food and Drug Administration (FDA) by the operative surgeon.

Discussion

The use of IVC filters for the management of DVT is widely accepted. Suitable indications for placement in patients who present with a thromboembolism are: having an absolute contraindication to therapeutic anticoagulation and failure of anticoagulation when there is acute proximal venous thrombosis.³ Previously reported non-bleeding complications associated with IVC filters include IVC

Figure 3 Post-operation Duplex Doppler ultrasound image of the right renal artery showing normal velocities

thrombosis, new DVT, new pulmonary embolism (PE) and filter migration.^{4,5} The British Society of Interventional Radiology (BSIR) recently evaluated placement and retrieval of 1434 IVC filters and reported that

88 patients demonstrated new lower limb DVT and/or IVC thrombosis following IVC filter placement.⁶ At the present time, there is no reported consensus to establish routine surveillance guidelines of IVC filters; however, there are guidelines encouraging IVC device retrievals when the duration of treatment for a DVT/PE has been met or when the risk of a PE is no longer high, and/or the contraindication for anticoagulation is no longer a consideration.⁷

In this case, the noninvasive renal artery duplex examination played a critical role in her clinical outcome. The use of non-invasive ultrasound for diagnosis of vascular stenoses cannot be underrated as this case clearly demonstrates. This renal artery ultrasound examination is painless, has no introduction of dye, exposure to radiation or the introduction of invasive devices to achieve desired results for clinical decision making.

DECLARATIONS

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Ethical approval: Written consent was obtained from the patient for publication of the details and images from this case

Guarantor: K. Hannon

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