

# Vena cava filter placement in a duplicated infrarenal inferior cava venous system with azygous continuation

Gustavo Lagrotta,<sup>1,2</sup> Mauricio Danckers,<sup>3</sup> Roberto Fourzali<sup>1</sup>

<sup>1</sup>Pulmonary Disease Fellow, Aventura Hospital and Medical Center, Aventura, Florida, USA  
<sup>2</sup>Graduate Medical Education, Nova Southeastern University, Fort Lauderdale, Florida, USA  
<sup>3</sup>Intensive Care Unit, Aventura Hospital and Medical Center, Aventura, Florida, USA

**Correspondence to**  
 Dr Gustavo Lagrotta;  
 gustavo.lagrotta@ventura.com

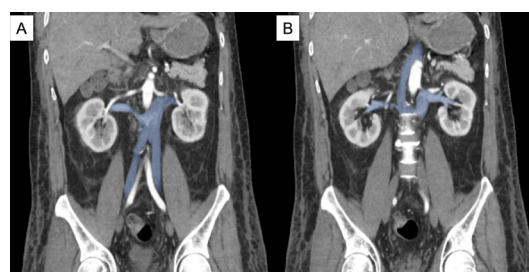
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## DESCRIPTION

A 50-year-old man with atrial fibrillation without anticoagulation presented to the hospital after tonic-clonic seizures, followed by pulseless cardiopulmonary arrest with return of spontaneous circulation after 2 min. Imaging demonstrated a left superior cerebellar thromboembolic ischaemic stroke associated with trace subarachnoid haemorrhage. Further studies revealed bilateral basilic and left cephalic superficial vein thrombosis, and right brachial and right popliteal deep vein thrombosis. Non-contrast chest and abdomen CT revealed a duplicated infrarenal inferior vena cava (IVC) with azygous continuation and absence of suprarenal IVC (figure 1A,B). Due to the inability to start systemic anticoagulation and anatomical variance, a retrievable vena cava filter (Cordis OPTASE) was placed in the right infrarenal IVC via femoral access site under fluoroscopy (video 1).

Several IVC congenital anomalies and their associations with findings such as thromboembolic events have been documented.<sup>1 2</sup> The development of the IVC begins between the sixth and eight gestational weeks and involves anastomoses between the paired embryonic cardinal veins. These form the hepatic, suprarenal, renal and infrarenal segments.<sup>3</sup> It is theorised that duplication of the IVC results from persistence of the supracardinal veins, with a prevalence of 0.2%–3.0% in the general population.<sup>4</sup> A classification of duplicated IVC has been proposed: type I (major duplication, where both IVCs have symmetrical trunks and similar size as the preaortic trunk) as seen in our patient, type II (minor type, where both IVCs have symmetrical trunks but are smaller than the preaortic trunk) and type III (asymmetrical type, where the left IVC has a smaller trunk than the right IVC, and with variable sizes of the preaortic trunk).<sup>5</sup> A novel type IV (left IVC with a larger trunk than the right IVC) has also been proposed.<sup>6</sup>

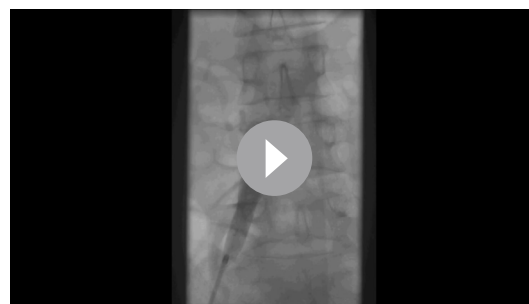
In addition, the absence of the suprarenal IVC with azygous continuation is theorised to be failure to form the right subcardinal–hepatic anastomosis, with resulting atrophy of the right subcardinal vein. The prevalence of azygous continuation has been noted to 0.6%.<sup>4</sup> However, these two IVC abnormalities presenting simultaneously have yet to be thoroughly documented and pose a particular challenge in our patient.



**Figure 1** Coronal view of contrast CT of the chest and abdomen. (A) Duplicated infrarenal IVC and (B) azygous continuation and absence of suprarenal IVC courses are shaded in blue. IVC, inferior vena cava.

These anomalies are typically incidental findings and the most current prevalence is likely underestimated.

The patient's anatomical variant prohibited for the eventual filter retrieval through jugular vein access.<sup>7</sup> In order to circumvent this issue, a retrievable vena cava filter was inserted in the right infrarenal IVC through the right femoral vein. This filter has a caudally oriented hook designed for a femoral vein retrieval.<sup>8</sup> It has shown safe insertion, removal and repositioning in patients with normal venous anatomy, and use in anatomical venous variants.<sup>9–11</sup> Complex variant and thrombus extension are crucial issues affecting the choice of procedure; thus, the optimal position for an IVC filter has yet to be established. Each approach is tailored to the specific anomaly of the case.<sup>12</sup> We present to the reader the novel deployment of a femoral access



**Video 1** IVC filter placement under fluoroscopy. Black arrow pointing to the location of the deployed retrievable vena cava filter. IVC, inferior vena cava.



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## Images in...

site retrievable IVC filter in a patient with a rare venous drainage anatomical variant.

### Patient's perspective

I feel really well, surprisingly well. Everyone I know, all of my family, is in shock of the quick recovery I've made. I have lingering discomfort in my flank, but otherwise I'm feeling good. The findings honestly haven't changed how I go on about my day, I'll still continue to be as healthy as I can in my life.

### Learning points

- Venous anomalies are commonly discovered as an incidental finding and likely occur at higher rates than what has been published.
- Proper anatomical evaluation, equipment selection and procedural planning are key when considering placement of an inferior vena cava filter in a patient with venous drainage system anatomical variants.

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### REFERENCES

- 1 Petik B. Inferior vena cava anomalies and variations: imaging and rare clinical findings. *Insights Imaging* 2015;6:631–9.
- 2 Paddock M, Robson N. The curious case of the disappearing IVC: a case report and review of the aetiology of inferior vena cava agenesis. *J Radiol Case Rep* 2014;8:38–47.
- 3 Malaki M, Willis AP, Jones RG. Congenital anomalies of the inferior vena cava. *Clin Radiol* 2012;67:165–71.
- 4 Bass JE, Redwine MD, Kramer LA, et al. Spectrum of congenital anomalies of the inferior vena cava: cross-sectional imaging findings. *Radiographics* 2000;20:639–52.
- 5 Natsis K, Apostolidis S, Noussios G, et al. Duplication of the inferior vena cava: anatomy, embryology and classification proposal. *Anat Sci Int* 2010;85:56–60.
- 6 Klinkhachorn PS, Ritz BK, Umstot SI, et al. Duplication of the inferior vena cava: evidence of a novel type IV. *Folia Med Cracov* 2020;60:5–13.
- 7 Kuyumcu G, Walker TG, Gregory Walker T. Inferior vena cava filter retrievals, standard and novel techniques. *Cardiovasc Diagn Ther* 2016;6:642–50.
- 8 Montgomery JP, Kaufman JA. A critical review of available Retrievable inferior vena cava filters and future directions. *Semin Intervent Radiol* 2016;33:079–87.
- 9 Rosenthal D, Swischuk JL, Cohen SA, et al. OptEase Retrievable inferior vena cava filter: initial multicenter experience. *Vascular* 2005;13:286–9.
- 10 Cordis Optease Retrievable inferior vena cava filter. *Biomedical Safety Standards* 2013;43:141.
- 11 Hashmi ZA, Smaroff GG. Dual inferior vena cava: two inferior vena cava filters. *Ann Thorac Surg* 2007;84:661–3.
- 12 Sartori MT, Zampieri P, Andres A-L, et al. Double vena cava filter insertion in congenital duplicated inferior vena cava: a case report and literature review. *Haematologica* 2006;91:ECR30.

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