CASE REPORT

Infrarenal inferior vena cava agenesis and recurrent deep vein thrombosis: a case report and literature review

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Abstract
Inferior vena cava agenesis is a rare congenital vascular defect often diagnosed as an incidental finding in asymptomatic patients. When symptoms arise, it can present with chronic venous stasis or unprovoked deep vein thrombosis (DVT). A 42-year-old man with history of unprovoked right lower extremity (RLE) DVTs was admitted for swelling, pain and erythema to the RLE, concerning for new DVT. Venous Doppler ultrasound showed a chronic DVT of the right proximal femoral vein in addition to an acute DVT of the distal femoral vein. Extensive thrombophilia workup was negative and additional imaging with abdominal computed tomography scan revealed the absence of the infrarenal inferior vena cava. Patient was treated with oral anticoagulation and compression stockings and discharged with clinical improvement. At 3-month follow-up, patient was completely asymptomatic. Recurrent unprovoked DVTs in young patients require exhaustive work up including imaging studies to rule out vascular anomalies.

INTRODUCTION
Inferior vena cava (IVC) agenesis is a rare vascular abnormality with prevalence 0.6% in the general population [1]. However, in young patients presenting with deep vein thrombosis (DVT), the prevalence can increase to above 5% [2].

IVC agenesis is most commonly identified incidentally in asymptomatic patients on radiologic imaging, including computed tomography (CT) scans and ultrasound (US). When symptomatic, common clinical findings of IVC agenesis include chronic varicose veins, stasis dermatitis, skin ulcerations, DVTs and in severe cases venous thromboembolisms [3].

Recently, vascular abnormalities have also been found to represent an important risk factor for development of unprovoked DVTs and should be included in the workup [4]. We present here the case of a middle-aged man with history of unprovoked DVT in the right lower extremity (RLE), presenting for acute DVT in the same limb.

CASE REPORT
A 42-year-old man with history of asthma, and two episodes of unprovoked RLE DVTs not on anticoagulation, presented to the emergency department after 3 days of progressive bilateral lower extremity swelling and pain.

The patient denied any recent trauma, travel history, prolonged immobilization, surgery or shortness of breath. He was...
a former smoker with 20 pack-year history, but denied illicit drug use. He has no pertinent family history, including history of coagulopathies. His first episode of RLE DVT occurred at 35 years of age and was treated with 6 months of warfarin 5 mg daily. The second unprovoked DVT episode occurred 5 years later and patient was then placed on lifelong anticoagulation with rivaroxaban 20 mg daily, but reports stopping medication after 10 months. Workup for underlying thrombophilia or etiology was complicated by poor health care follow-up with both prior DVT’s.

On physical exam, patient had bilateral lower extremity edema up to the thighs (right worse than left) that were warm to touch and tender to palpation. Tortuous veins were found in the posterior aspect of the legs bilaterally up to the mid-thigh, as well as chronic venous skin changes. Duplex US of RLE showed chronic DVT of the proximal and mid-femoral vein and an acute DVT of the distal femoral and popliteal veins. US also showed dampened respiratory variation in the right common femoral vein concerning for a proximal DVT. Subsequently, a pelvic CT scan was obtained to rule out proximal DVT and incidentally showed absent infrarenal segment of the IVC with dilation of the iliac, ascending lumbar, azygos and hemiazygos veins (Figures 1–3). During this time, extensive thrombophilia workup including prothrombin gene mutation, factor V Leiden, antithrombin III, protein S, protein C, homocysteine, anticardiolipin antibodies, lupus anticoagulant and beta-glycoprotein was negative.

The patient was treated with rivaroxaban 15 mg twice a day for 21 days, and then switched to 20 mg daily thereafter, with compression stocking. One month after hospitalization, the patient was seen in the emergency department with persistent RLE pain. Repeat duplex US demonstrated chronic DVT involving the proximal and mid-femoral vein in addition to proximal popliteal veins. Given concern for anticoagulation failure and the presence of an anatomical vascular abnormality, the patient was referred to the vascular surgery for consideration of an interventional procedure. Patient was deemed not appropriate for any surgical intervention, given the high rate of morbidity and was recommended to continue on lifelong anticoagulation and management of chronic varicose veins with elastic compression stockings.

The patient was seen 2 months later in the medical clinic and was found to have resolution of symptoms and repeat lower extremity duplex US was negative for acute or chronic DVT bilaterally.

**DISCUSSION**

IVC agenesis often is diagnosed in young patients presenting with unprovoked DVT and has been reported to be in association with kidney and IVC abnormalities with leg thrombosis syndrome [5].

During embryogenesis, the IVC derives from three separate segments of embryonic veins: posterior cardinal, subcardinal and supracardinal veins. If abnormal regression or persistence of this embryonic vein occurs, various abnormalities of the IVC can develop including complete absence, partial absence or presence of bilateral IVC [6]. In the absence of the infrarenal IVC, venous return from iliac veins will drain directly into the azygos and
hemiazygous venous systems. Since the azygos and hemiazygous veins are considered low caliber, collaterals can develop to permit adequate venous outflow from lower extremities. If the collateral system fails despite compensatory enlargement, it can impede blood return, which can lead to increased risk for thrombus formation [7].

Patients that present with unprovoked DVTs require thorough investigation for underlying malignancy and thrombophilia disorders. Of note, screening tests for thrombophilia disorders can be impacted by anticoagulants and should be performed after discontinuing vitamin K antagonists for 2 weeks or direct oral anticoagulants for 2–3 days [8]. To date, there are limited reports on the clinical association of unprovoked DVT and IVC agenesis in otherwise healthy middle-aged adults. One of the largest reports is from Lambert et al. [9] in which they reviewed 72 patients, 10 of which were their original patients, with IVC agenesis and DVT in an effort to document the clinical spectrum of disease. This study demonstrated that a majority of patients were young males (<40 years of age) who developed proximal DVT after intense physical exertion. They also reported that 35.4–60% of patients presented with bilateral DVT, whereas pulmonary embolism was present in 0.0–9.97% of patients. Thus, in young males with unprovoked DVT, it is recommended to rule out vascular abnormalities, particularly in those with proximal thrombosis with unclear etiology.

Limited evidence is available regarding the best treatment and duration for DVT secondary to IVC agenesis. However, most of the studies report good response with prolonged oral anticoagulation combined lifestyle modification, including leg elevation and compression stocking. There is evidence of DVT recurrence after anticoagulation discontinuation; therefore, lifelong anticoagulation should be considered [10]. We report a rare case of IVC agenesis in a middle-aged adult presenting with multiple unprovoked DVTs with poor medical compliance. We advocate for a thorough workup at initial presentation in patients with unprovoked DVTs and recommend lifelong anticoagulation therapy and routine follow-up in those found to have IVC agenesis to prevent recurrence as such in this patient.

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CONFLICT OF INTEREST

None declared.

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ETHICAL APPROVAL

No ethical approval was required.

CONSENT

Consent was obtained for the elaboration and publication of the article.

GUARANTOR

V.E.P. is the guarantor of submission.

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