Diagnosis and management of right external iliac vein "sandwich": A rare cause of iliofemoral deep venous thrombosis

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ABSTRACT

Several anatomic abnormalities predispose patients to iliofemoral deep venous thrombosis, the most common of which is compression of the left iliac vein between the right common iliac artery and lumbar vertebrae, or May-Thurner syndrome. Other areas of venous compression can occur but are rare. This case report describes the presentation, diagnosis, and management of a patient with compression of the right iliac vein "sandwiched" between the right internal and external iliac arteries. After treatment, the patient demonstrated significant improvement in symptoms. (J Vasc Surg Cases and Innovative Techniques 2019;5:314-8.)

Keywords: Deep venous thrombosis; Venous intervention; Pharmacomechanical thrombolysis; Catheter-directed thrombolysis

Iliac vein compression syndromes result from extrinsic venous compression by adjacent structures, such as arteries, bones, muscles, and ligaments. The morphologically normal vein is entrapped between rigid or semi-rigid surfaces, usually from an underlying anatomic abnormality. Repetitive trauma from extrinsic compression can produce inflammation, venous thrombosis, and intimal proliferation.[1-3] Diagnosis of iliac vein compression syndrome is based on clinical and imaging features. Clinical presentation includes pain, swelling, venous thrombosis, varicosities, and chest pain from pulmonary embolism.[4] The anatomic abnormality can be identified by various imaging techniques.

This report describes diagnosis and management of a rare iliac vein compression syndrome involving the right external iliac vein presenting with acute right iliofemoral deep venous thrombosis (DVT).

Written, informed consent was obtained from the patient for publication of this report.

CASE REPORT

A 76-year-old man presented with an acutely swollen right leg. Ultrasound identified intraluminal internal echoes, non-compressibility, and absence of flow phasicity in the deep veins from occlusive acute DVT extending from the right external iliac vein to the popliteal vein (Fig 1). Past medical history included four episodes of acute bilateral DVT in 12 years and chronic DVT treated for 5 years with warfarin, which was discontinued because of gastrointestinal bleeding. There is no known history of thrombophilia. He was prescribed rivaroxaban for acute DVT.

Computed tomography (CT) of the abdomen and pelvis demonstrated compression at the right external iliac vein origin between the right internal and external iliac arteries at the bifurcation and associated DVT (Fig 2). Thrombus was redemonstrated in the right external iliac, common femoral, and femoral veins with right leg enlargement and edema.

The right popliteal vein was punctured under ultrasound guidance using a micropuncture set, and a 7F sheath was placed. Venography demonstrated occlusive thrombus with meniscus sign in the right external iliac/common femoral vein. A hydrophilic wire (Glidewire; Terumo Medical Corp, Somerset, NJ) and 5F Kumpe catheter (AngioDynamics, Latham, NY) were used to cross the acute occlusion. A 4F infusion catheter (Cragg-McNamara; Medtronic Peripheral, Minneapolis, Minn) with side ports centered on the thrombus was left in situ with 1 mg/h of alteplase for 12 hours and 500 units/h of heparin through the side arm of the popliteal sheath. Follow-up venography at 24 hours demonstrated residual thrombus in the right external iliac and common femoral veins. After unsuccessful balloon maceration and venoplasty of the segment using sequential 8-mm × 4-cm, 10-mm × 4-cm, and 12-mm × 4-cm balloons (Boston Scientific, Malborough, Mass), pharmacomechanical thrombectomy (AngioJet Solent Omni catheter; Boston Scientific) was performed after the thrombus was "power pulsed" with 10 mg of alteplase. The right external iliac vein in the region of compression was stented with a 16-mm × 6-cm nitinol self-expanding venous stent (Zilver Vena; Cook Medical, Bloomington, Ind). As there was residual clot, additional thrombolysis was performed with a 4F infusion catheter (Cragg-McNamara) with 1.5 mg/h of alteplase and 500 units/h of heparin. Follow-up venography after 24 hours demonstrated reduced clot with small-volume

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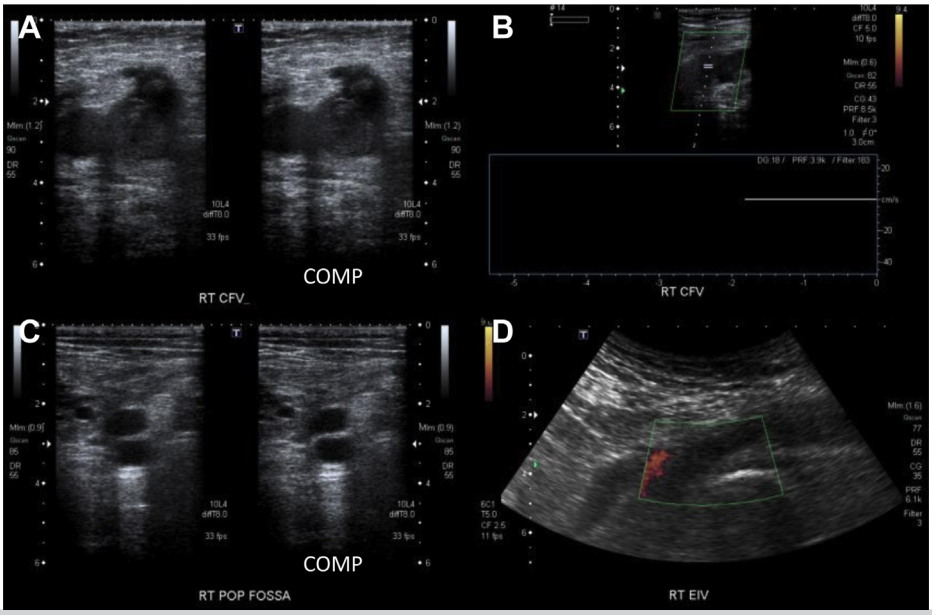

Fig 1. Duplex venous ultrasound images on presentation to the emergency department. **A,** Occlusive thrombus is noted in the right common femoral vein with intraluminal echoes and noncompressibility of the right common femoral vein. **B,** Intraluminal echoes with no venous waveform or filling of the right common femoral vein on spectral Doppler compatible with occlusive thrombus. **C,** Anechoic, noncompressible right popliteal vein compatible with acute thrombus. **D,** Occlusive thrombus in the right external iliac vein.

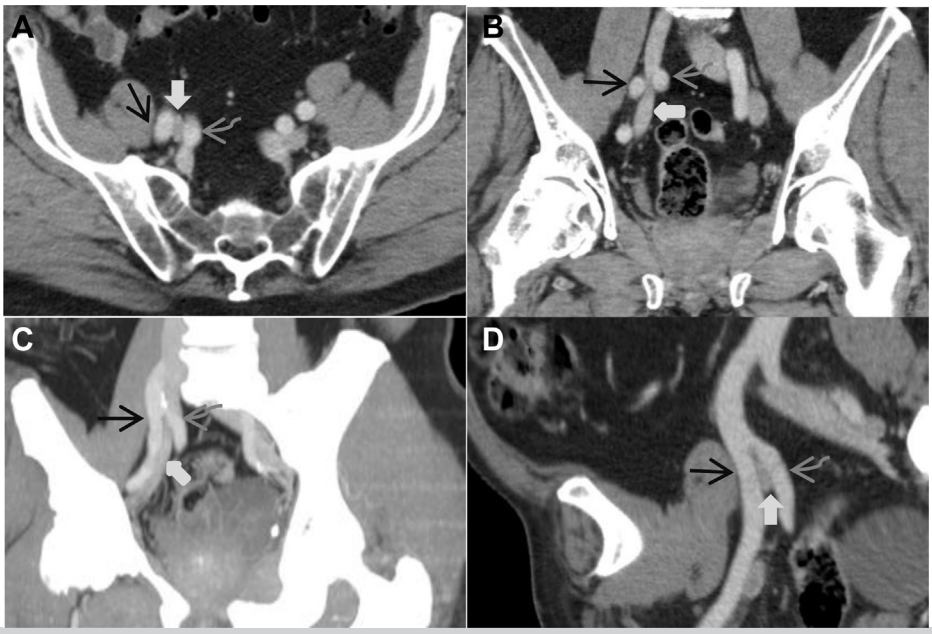

Fig 2. Contrast-enhanced computed tomography (CT) of the abdomen and pelvis. The *arrows* demarcate the position of the right external iliac artery (*black arrow*), right internal iliac artery (*gray curved arrow*), and right external iliac vein (*block arrow*). **A,** Axial portal venous phase image of the pelvis demonstrating compression of the right external iliac vein between the right internal and external iliac arteries. **B,** Coronal portal venous phase image demonstrating compression of the right external iliac vein between the right internal and external iliac arteries. **C,** Coronal maximum intensity projection image demonstrating compression of the right external iliac vein between the bifurcation of the right internal and external iliac arteries. **D,** Reconstructed image demonstrating compression of the right external iliac vein between the bifurcation of the right internal and external iliac arteries.

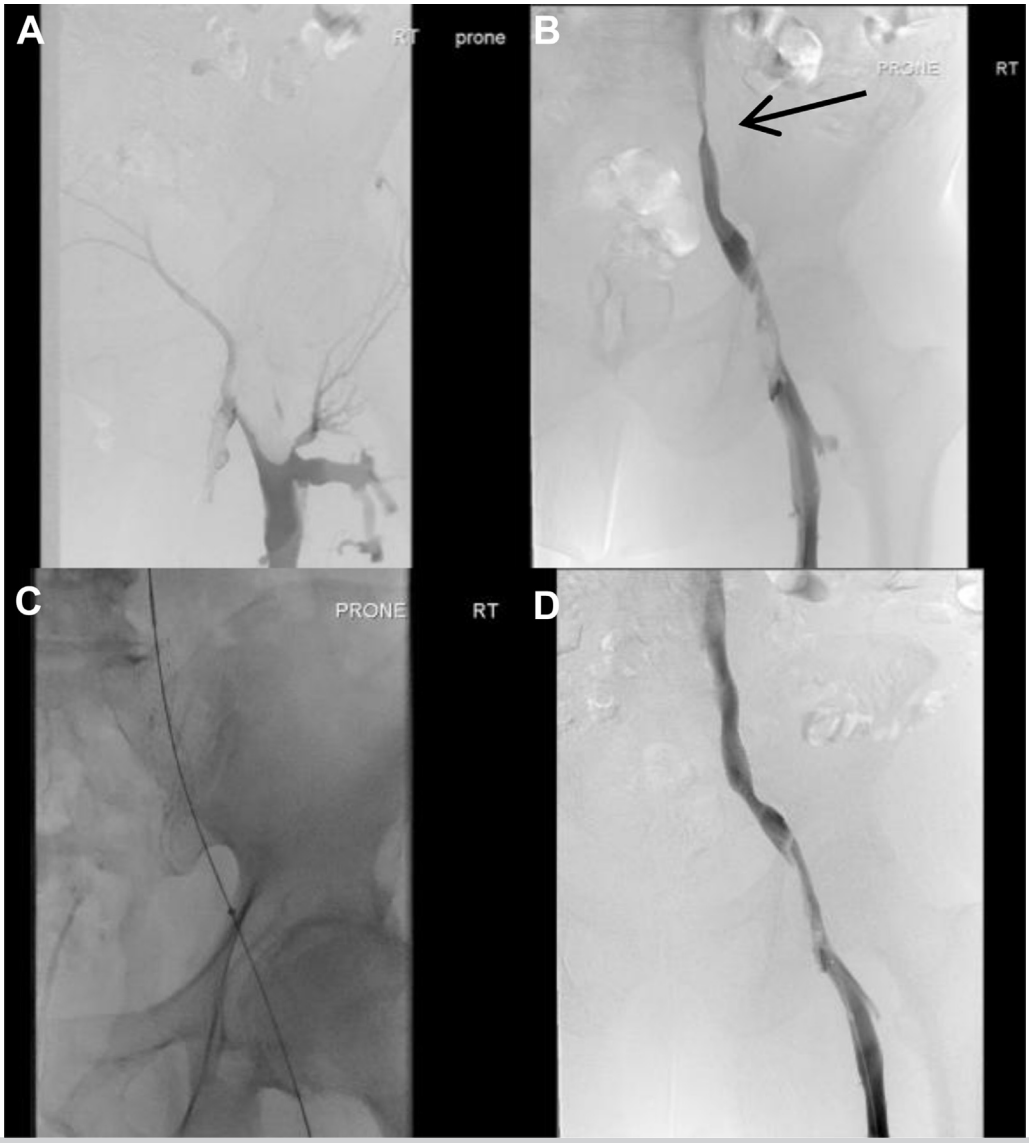

Fig 3. Venography images demonstrating diagnosis and management of the deep venous thrombosis (DVT) and vascular compression. **A,** There is a meniscus sign and expansion of the vein in the right proximal femoral vein/distal external iliac vein in keeping with thrombus. **B,** After 1 day of catheter-directed thrombolysis (CDT), thrombus remains in the right proximal femoral vein/distal external iliac vein. Note that in the proximal external iliac vein, there is a stenosis compatible with the area of vascular stenosis identified on computed tomography (CT; *arrow*). **C,** Insertion of a 16-mm × 6-cm self-expanding Zilver Vena venous stent in the region of the venous stenosis. **D,** After 2 days of catheter-directed thrombosis in addition to mechanical thrombectomy using the AngioJet Solent Omni catheter, there is a significant reduction in the volume of clot in the right proximal femoral vein/distal external iliac vein with small burden of residual clot. There is also improved flow in the deep venous system to the central veins.

eccentric thrombus, probably chronic, and patency of the stent with improved flow through the region of vascular compression (Fig 3; Video).

At discharge, the patient was prescribed rivaroxaban and clopidogrel for anticoagulation. Right leg swelling significantly improved 1 month after intervention.

Two months after the most recent presentation, he presented again with chest heaviness and dyspnea. CT pulmonary angiography noted webs in the segmental left and right lower lobe pulmonary arteries from chronic pulmonary embolism (Fig 4). Clinical presentation was cardiac related, unrelated to chronic pulmonary embolism, and appropriate medical care was administered.

DISCUSSION

Most iliac venous compression syndromes are left sided, secondary to May-Thurner syndrome (MTS), vascular constriction defined by compression of the left common iliac vein by the right common iliac artery.[2,5] There are multiple MTS variants, including ipsilateral common iliac

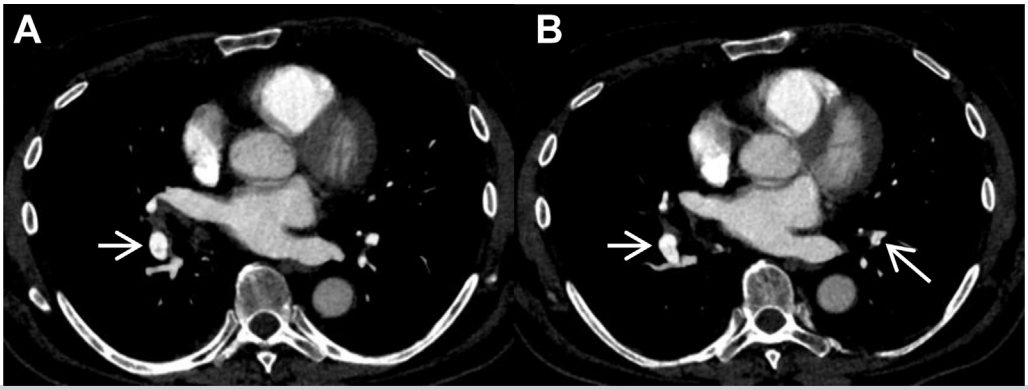

Fig 4. Computed tomography (CT) pulmonary angiography for chest pain and heaviness performed 2 months after thrombolysis of deep venous thrombosis (DVT). **A,** Web (*arrow*) in the right lower lobe pulmonary artery compatible with chronic pulmonary embolism. **B,** Web (*arrow*) in the right lower lobe pulmonary artery as well as in the left lower lobe at the origin of the anteromedial and lateral basal segmental arteries (*arrow*) in keeping with chronic pulmonary embolism.

vein compressed by ipsilateral common iliac artery.[4,6,7] This case report describes diagnosis and management of acute DVT from a separate rare iliac vein compression syndrome characterized by right external iliac vein compression at the bifurcation of the right common iliac artery with the vein "sandwiched" between the internal and external iliac arteries, the most common cause of right iliac vein compression.[8] Successful management of the case was based on management of MTS and published guidelines.

In a retrospective review, 80% of patients with iliofemoral DVT had extrinsic compression from anatomic abnormalities central to the thrombosed deep vein.[9] Our case highlights that the thrombotic workup should include anatomic imaging to identify extrinsic compression by anatomic variants. Intravascular ultrasound (IVUS) can also identify extrinsic venous compression, fibrosis, webs, spurs, and trabeculations in the venous system. IVUS is more sensitive than venography at characterizing the degree of stenosis, although venography is more specific.[10-12] IVUS is more sensitive than venography for assessing treatable iliofemoral vein stenosis and may be helpful in iliocaval stenting.[10,13] The clinical significance and role of IVUS in venous thromboembolism and obstructive lesions require further investigation.

Whereas published guidelines do not recommend anatomic imaging for a cause of chronic pulmonary embolism,[14] our case demonstrates that anatomic variants can predispose to chronic pulmonary thromboembolism. Consideration may be given to CT venography to exclude this pathologic process.

Berger et al[15] were among the first to treat MTS with catheter-directed thrombolysis (CDT) to prevent postthrombotic syndrome (PTS) from iliofemoral DVT and with stenting to alleviate the venous obstruction. This has become common practice for acute management of MTS. PTS is a chronic complication of DVT characterized by pain, swelling, edema, pigmentation, and venous ulcers in severe cases.[16] Management of patients with proximal DVT is controversial, with conflicting results from two large randomized controlled trials comparing CDT with anticoagulation. The Catheter-directed Venous Thrombolysis (CaVenT) study examined 209 patients with iliofemoral DVT, with reduction in PTS in patients receiving CDT at 2- and 5-year follow-up.[17,18] The Acute Venous Thrombosis: Thrombus Removal with Adjunctive Catheter-Directed Thrombolysis (ATTRACT) trial, which recruited 692 patients to evaluate pharmacomechanical CDT for DVT, demonstrated no difference in the rate of PTS with reduced severity in CDT patients.[19,20] A recent meta-analysis noted that pharmacomechanical CDT significantly increases the partial lysis rate with decreased dose of thrombolytic and decreased interventional time.[21] No prospective trials directly compare pharmacomechanical thrombectomy and CDT alone. Further studies, such as the Catheter Versus Anticoagulation Alone for Acute Primary Iliofemoral DVT (CAVA) trial (NCT00970619), may clarify the role of interventional treatment for acute DVT.

Several studies investigated stent patency in MTS patients, with 1-year patency rates ranging from 91% to 93% in acute and chronic DVT.[22,23] Studies up to 36 months noted primary and secondary stent patency rates of 91% and 95%, respectively.[24] The Society of Interventional Radiology, the Cardiovascular and Interventional Radiological Society of Europe, and the Society for Vascular Surgery support venous stenting in the management of nonthrombotic obstructive lesions.[13,25,26]

CONCLUSIONS

Management of iliofemoral DVT should include investigation of the etiology, including anatomic causes of venous compression using cross-sectional imaging. Whereas most iliac vein compression syndromes are

left sided, right-sided anatomic causes of the venous obstruction exist. The most common right-sided anatomic variant is the right internal and external iliac arteries sandwiching the right iliac vein. Principles of management from left-sided iliac vein compression syndrome (MTS), including pharmacomechanical thrombectomy, CDT, and venous stenting, can be applied to management of right-sided iliac vein compression syndrome and associated DVT.

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