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CASE REPORT

Endovascular treatment of iliac vein compression syndrome (May–Thurner)

Srinivas Chikkaswamy Budnur · Bhupinder Singh · Nagesh Chamarajnagar Mahadevappa · Babu Reddy · Manjunath C. Nanjappa

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Abstract May–Thurner syndrome is a rare condition that results from narrowing of the left common iliac vein (CIV) lumen due to pulsatile compression from the right common iliac artery (CIA) as it crosses anterior to it. We present a case of 24-years old female with left lower limb deep venous thrombosis (DVT). Duplex ultrasonography revealed extensive left-sided DVT. Magnetic resonance venogram suggested DVT with left CIV being compressed by right CIA. Pharmaco-mechanical catheter directed thrombolysis-thrombectomy followed by left iliac vein stent placement restored patency to the venous system, with resolution of symptoms.

Keywords Common iliac artery · Common iliac vein · Iliac vein compression

Introduction

May–Thurner syndrome is a rare vascular constriction that was first described in 1908 by McMurrich [1] and further defined anatomically by May and Thurner in 1956 [2]. May–Thurner syndrome is described as compression of the left common iliac vein (CIV) by the right common iliac artery (CIA) as it travels from the aortoiliac bifurcation to the right inguinal region [3]. Typically, this crossing over is considered to be anatomically normal. However, in some patients the compression of the vein between the vertebral body posteriorly and the artery anteriorly causes thickening of the inner wall of the vein, leading to intimal hyperplasia and thus to stenosis [2]. This compression may present symptomatically or be an incidental finding. Compression of the iliac vein has been documented in approximately 50 % of patients with left iliac vein thrombosis. However, some degree of compression of the left common iliac vein may also be an incidental finding: in one series, approximately one-fourth of asymptomatic subjects had compression of more than 50 % of this vessel [4]. While the prevalence of the disorder is unknown, in patients undergoing evaluation for lower extremity venous disorders the condition is found in 2–5 % of patients [5]. Knowledge of these variations is necessary to avoid misdiagnosis of symptomatic patients. We describe a rare case of May–Thurner syndrome that was treated percutaneously with a novel technique using site specific pharmacomechanical catheter-directed prolonged thrombolysis-thrombectomy (PCDT) system followed by left CIV stenting.

Case report

A 24-year-old female with no prior illness was admitted to emergency room with complaints of progressive swelling and pain left lower limb over last 1 week without antecedent trauma. She had previously been healthy and was not on any medication. She had no family history of venous thromboembolism or cancer. She was not addicted to tobacco, alcohol or any illicit drugs.

In the emergency department, she was not in acute distress. Relevant physical examination revealed blood

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S. C. Budnur · B. Singh (✉) · N. C. Mahadevappa · B. Reddy · M. C. Nanjappa
Department of Cardiology,
Sri Jayadeva Institute of Cardiovascular Sciences and Research, Bangalore, Karnataka, India
e-mail: dr_bhupinders@yahoo.in

pressure of 116/68 mmHg, pulse rate of 96 beats per minute, respiratory rate of 18 per minute and blood oxygen saturation of 99 % while breathing ambient air. Auscultation of the chest revealed no wheezes or crackles. Other system examination was essentially within normal limits. Her left leg showed no evidence of trauma but there was considerable swelling extending from her ankle to the upper thigh and the area of the swelling was markedly tender to palpation. Pulses were intact and equal to those of the lower extremities. No varicose veins were evident.

Routine lab investigations were within normal limits. D-dimer assay was positive (1400 μg/l). Two dimensional echocardiogram was within normal limit with no evidence suggestive of pulmonary embolism. Chest roentgenogram was normal. Venous duplex imaging revealed echogenic filled vein lumen occluding the vessel completely and non-compressibility of the vein with gentle pressure of the probe along with the absence of flow phasicity on spectral Doppler signal noted with respiration or augmentation manoeuvres involving common iliac vein, external iliac vein, common femoral vein, superficial femoral vein and popliteal vein. Magnetic resonance (MR) venogarm confirmed the venous doppler findings with etiology being May Thurner syndrome (Fig. 1).

Ascending venogram was done through left popliteal venous sheath and was showing extensive thrombotic occlusion of deep venous system up to common iliac vein (Fig. 2). In view of the risk of pulmonary embolism while giving lytic therapy in this case, we planned to place the inferior vena cava (IVC) filter prophylactically. But we could not use it, as the maximum IVC filter size(30 mm) available at that point in time in our catheterisation laboratory was smaller than size of measured IVC diameter(32 mm). So, we planned to go ahead with treatment with meticulous monitoring of patient. In view of heavy thrombus burden, thrombosuction was done with 6 F multipurpose catheter (cordis corporation, FL, USA) followed by catheter directed in situ fibrinolysis along with loco-regional fibrinolysis via left popliteal sheath in half divided dosage with total streptokinase infusion in a dose of 1 lakh units per hour. Venogram done 24 h later revealed resolution of thrombus in distal veins (Fig. 3a) but persistent thrombus at the level of common iliac vein (Fig. 3b). So, thrombolysis was continued for 4 days with daily echocardiographic interrogation for evidence of pulmonary embolism and meticulous monitoring for bleeding complications from local puncture sites or any other sites. Patient had haematuria without any significant fall in haemoglobin levels which recovered uneventfully. Thrombolysis was completed without any adverse bleeding events and any clinical or echocardiographic evidence of pulmonary embolism during hospital course.

On 4th day, the venogram revealed complete resolution of thrombus in the left external iliac vein but with residual partially occlusive thrombus in left common iliac vein, diagnostic of May–Thurner syndrome (Fig. 3c). Pullback pressure measurement revealed a mean venous pressure gradient of 5 mmHg across the compression point. Percutaneous balloon venoplasty with stenting was performed (Fig. 4a). Stenotic segment was first pre-dilated with

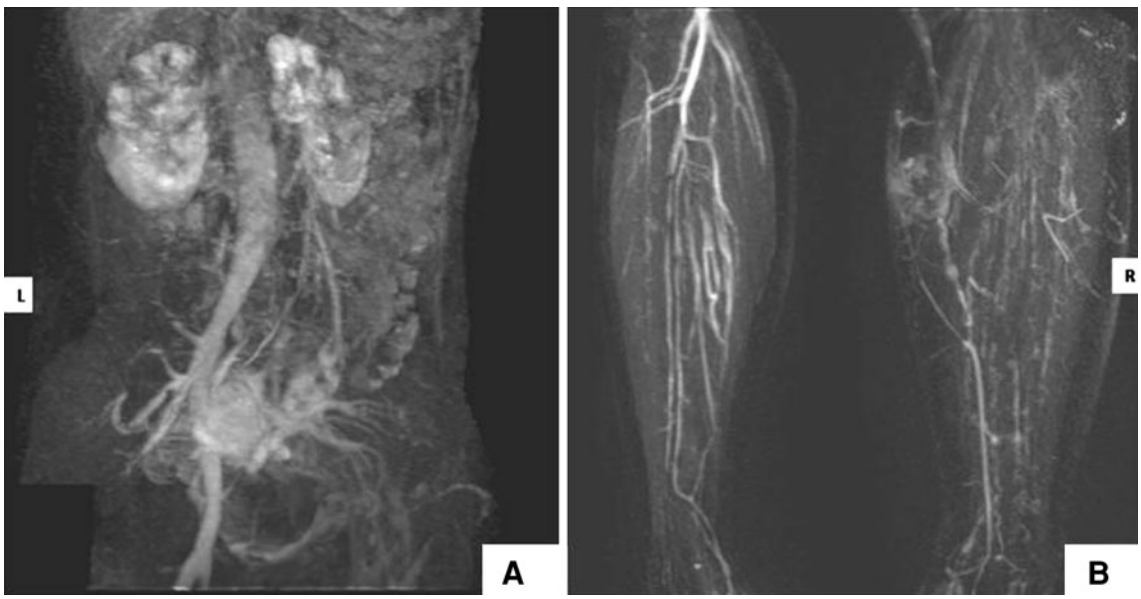

Fig. 1 Reconstructed magnetic resonance venogram showing non opacification of iliac and femoral veins (**a**) and faintly visualised left calf veins with gross soft tissue swelling (**b**)

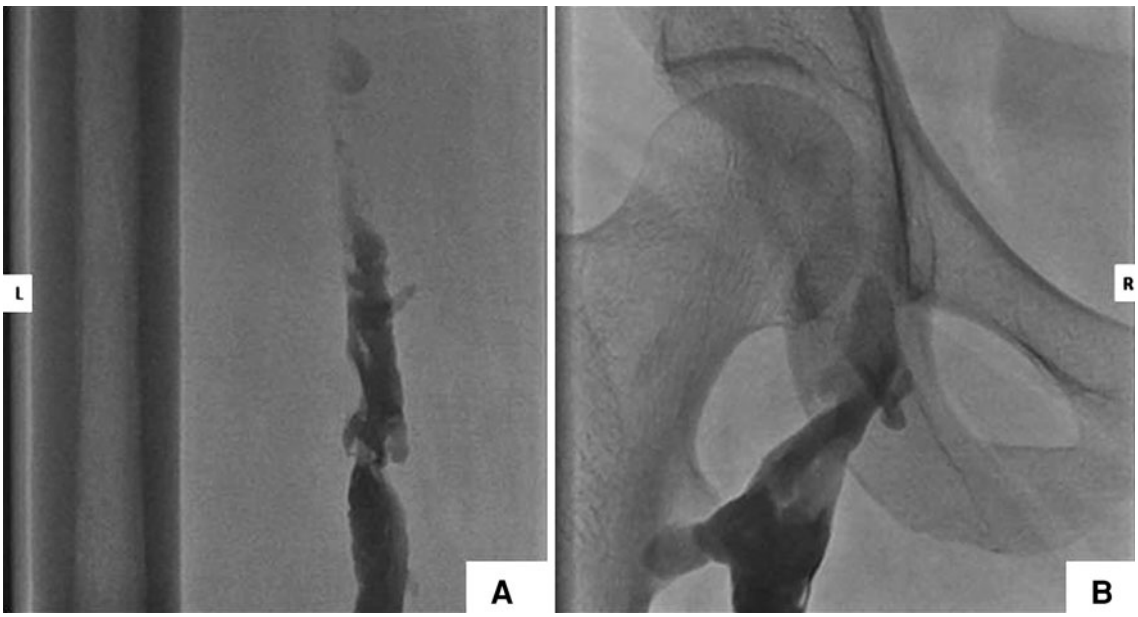

Fig. 2 Venogram demonstrating large thrombus burden in left superficial femoral (**a**) and left iliac veins (**b**) (patient is in the prone position)

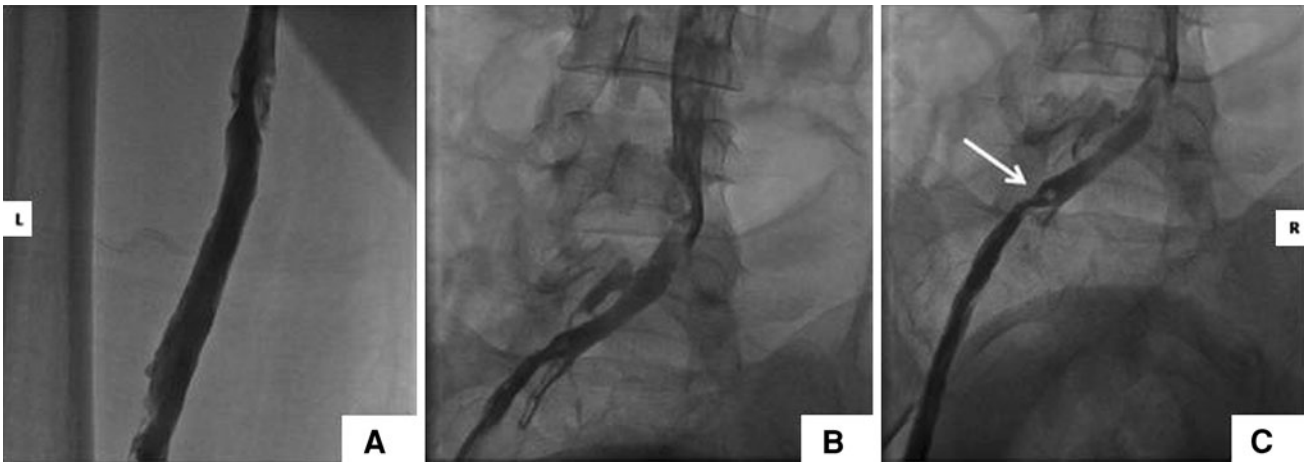

Fig. 3 Venogram demonstrating resolution of thrombus after pharmacomechanical thrombolysis in left superficial femoral vein (**a**), common femoral and iliac vein (**b**), and residual partially occlusive thrombus in left common iliac vein(**c**, *white arrow*) (patient is in the prone position)

8 × 40 mm semi-compliant balloon (Optopro Balloon, Cordis corporation, FL, USA) followed by deployment of nitinol self expandable 12 × 60 mm stent (Cordis corporation, Miami, FL, USA). Post dilatation was done with 12 × 40 mm semi-compliant balloon (Optopro Balloon, Cordis Corporation, FL, USA). Post stenting venogram revealed restoration of the flow in left CIV (Fig. 4b). The intravascular ultrasound (IVUS) accurately displays postdilation flaps or venous wall irregularities and confirms that the complete stent apposition to the venous wall, but we did not use it because of non-availability in our catheterisation laboratory. Instead, we have used the contrast injections in various angulations and bony landmarks as a guide for proper stent placement.

The patient remained on systemic anticoagulation and in next 2 days substantial improvement in leg pain and edema was noted. Pre-discharge echocardiogram revealed no evidence suggestive of pulmonary embolism. Patient was discharged on oral anticoagulation after confirmation of therapeutic international normalized ratio (between 2.0–2.5). Measurement of protein C, protein S, antithrombin-III and homocysteine levels and an immunologic analysis for anticardiolipin antibodies did not reveal any abnormalities. At 6 months of follow up, ultrasonography did not reveal any evidence of DVT in the left lower extremity. She did not suffer any further episodes of venous thrombosis as of her most recent follow-up at 9 months. Anticoagulation is planned for minimum of 12 months.

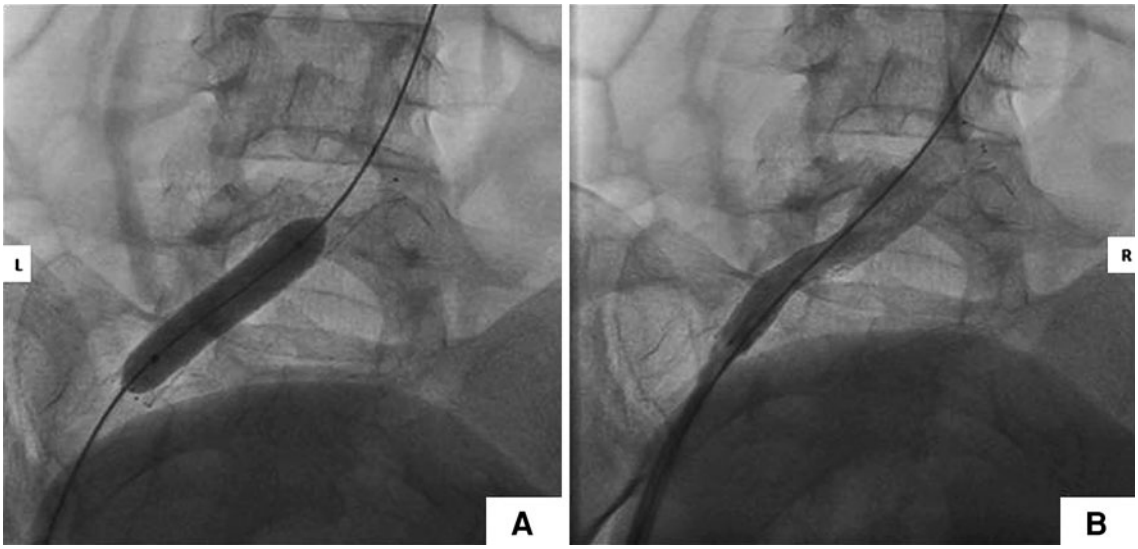

Fig. 4 Image showing deployment of stent in left common iliac vein (**a**) and subsequent venogram showing restoration of flow in common iliac vein (**b**) (patient is in the prone position)

Discussion

In 1957, May and Thurner examined 430 cadavers and documented the decrease in venous flow that resulted from intimal change in the left CIV. Since then the syndrome has been variously termed May–Thurner syndrome, iliac vein compression syndrome, Cockett syndrome or iliocaval compression syndrome [2, 6]. The pathophysiology lies in chronic, repetitive compression of left common iliac vein by the crossing over right common iliac artery causing the fibrosis of the vein, with synechiae and spurs that result in stenosis or even occlusion of the lumen. Thus, injury to endothelium along with the venous blood stasis secondary to above mentioned mechanism together contribute to thrombosis as classically described in Virchow's triad [7]. Iliac vein compression syndrome may present in three distinct clinical patterns. Patients may present with sudden leg swelling and pain associated with iliofemoral venous thrombosis, with the anatomic defect discovered after the clot has been removed by thrombolysis or surgical thrombectomy. This acute presentation is found most commonly in women in the 3rd or 4th decades of life. Iliac vein compression may also be discovered in patients with chronic leg complaints such as leg pain and swelling, varicose veins, or venous ulcerations that are suggestive of chronic venous insufficiency. In these patients, a short-segment stenosis or occlusion of the proximal left common iliac vein is discovered. Lastly, patients may present months or years after a known episode of iliofemoral DVT—with extensive occlusion of the left common and external iliac veins, in which instance venous drainage of the leg occurs mainly via collateral vessels that arise from the common femoral vein. Recent imaging data indicate that compression of the left CIV at the arterial crossover point may be present in 66 % of the general population without any venous symptoms [4]. Patients who are within this age group and present with a history of persistent left lower extremity swelling with or without deep venous thrombosis with no other obvious causes should have May–Thurner syndrome excluded. One must maintain a high index of suspicion to recognize iliac vein compression. Prospective studies have suggested that the sensitivity and specificity of MR venography for the detection of pelvic DVT is similar to that of invasive venography [8]. With the widespread use of venography in patients who are undergoing percutaneous procedures, it is now possible to identify a culprit lesion in some patients. Once identified, traditional therapy involves anticoagulation or surgical correction of the vein compression, either by a vein patch repair or by a venous crossover bypass graft. More recently, interventional radiological techniques such as intraluminal stent placement have been used [9]. Endoluminal reconstruction of the compressed iliac vein by means of a stent is a simpler and perhaps more elegant solution than surgery, especially for application to a young and otherwise healthy patient. Catheter-directed thrombolysis is an effective treatment in patients with iliofemoral deep-vein thrombosis [10], particularly those with limb-threatening thrombosis, who present within a week after the onset of symptoms and have a low risk of bleeding [11]. Berger et al. [12] were the first to describe catheter-directed thrombolysis followed by angioplasty with stent placement for the treatment of angiographically proven May–Thurner syndrome. Observational studies suggest that catheter-directed thrombolysis may preserve venous valve function, decrease symptoms of long-term venous insufficiency, and

improve the patient's health-related quality of life. A retrospective cohort studies have reported the shorter length of intensive care unit in-hospital stay, shorter treatment times, lower requirements for venograms in pharmacomechanical thrombectomy and catheter directed thrombolysis(CTD) group compared to CTD alone[13]. Recent treatment utilizing intraluminal venous stents has been associated with greater success, as it deals with thrombus formation and the mechanical obstruction both [10, 14]. The reported long-term success, which is defined primarily as patency of the left common iliac vein or venous bypass, is 40–88 % [15]. Now a days, IVUS is being used for defining the anatomical details of the obstruction as well as guiding the precise stent deployment at the iliac vein confluence, thus allowing optimum flow by reducing the chance of a portion of the stent from overhanging the right common iliac vein or protruding into the proximal inferior vena cava [16].

In our case, we highlight the importance of combined approach of using catheter directed in situ and venous sheath directed loco-regional prolonged thrombolysis, along with thrombosuction. Theoretically, this technique decreases the bleeding complications of systemic thrombolysis. A recently published randomised study has shown that addition of catheter directed thrombolysis should be considered in patients with a high proximal DVT and low risk of bleeding [17]. The success of this strategy also depends upon the risk profile of the patient for the bleeding complications, so appropriate patient selection is of utmost importance.

So, we describe a rare case of May–Thurner syndrome that was successfully treated with pharmacomechanical catheter-directed thrombolysis-thrombectomy (PCDT) system followed by endovascular stenting.

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