Catheter-directed therapy in deep vein thrombosis: May–Thurner syndrome

Introduction

Deep vein thrombosis is a common acute medical presentation with the potential to cause substantial long-term morbidity and economic burden. Deep vein thrombosis places patients at risk of post-thrombotic syndrome, a chronic complication manifesting as phlegmasia alba dolens and phlegmasia cerulea dolens.

This article presents a case of deep vein thrombosis secondary to May–Thurner syndrome and describes an endovascular approach to management. In light of recent developments regarding endovascular therapy in cases of deep vein thrombosis, this article outlines the authors' experience and discusses the latest evidence to highlight potential treatment strategies for complex cases of deep vein thrombosis.

Discussion

May–Thurner syndrome is a rare cause of deep vein thrombosis, whereby the right common iliac artery compresses the left common iliac vein causing spur formation in the vein wall, predisposing to localized thrombus formation. May–Thurner syndrome is estimated to account for 2–5% of cases of lower limb vein disorders (Mousa and AbuRahma, 2013).

Treatment approaches for deep vein thrombosis include pharmacological intervention (subcutaneous and oral anticoagulants), systemic or catheter-directed thrombolytic therapy, and mechanical intervention, such as endovascular thrombectomy and stenting (National Institute for Health and Care Excellence, 2015).

A Cochrane review (Watson et al, 2016) comparing thrombolysis *vs* standard anticoagulation demonstrated a 42% reduction in post-thrombotic syndrome at >5-year follow up. However, an increased risk of bleeding in the thrombolysis group was identified. A limitation of this review is the inclusion of all thrombolytic modalities, including systemic thrombolysis, over which catheter-directed thrombolytic therapy is now preferred.

The CaVenT Trial (Enden et al, 2012) compared catheter-directed thrombolytic therapy *vs* anticoagulation alone and demonstrated catheter-directed thrombolytic therapy to be cost effective, with a reduction in post-thrombotic syndrome in the thrombolysis arm at 2-year follow up.

Kim et al (2006) demonstrated immediate symptom resolution with catheter-directed thrombolytic therapy with or without stenting in 20 out of 21 patients with deep vein thrombosis secondary to May–Thurner syndrome. Of the eighteen who received stenting, only two had recurrent thrombosis at 6-month follow up.

CASE REPORT

A 32-year-old woman presented to the emergency department with a 1-day history of left buttock pain and left leg swelling. No risk factors for deep vein thrombosis were identified. Examination revealed extensive swelling and tenderness of the left leg. On investigation, D-dimer levels were elevated and Doppler ultrasound confirmed the presence of thrombus in the left femoral vein. The patient was started on enoxaparin 1.5 mg/kg once daily and encouraged to wear grade two compression stockings (for a minimum 12 hours per day, as tolerated).

Owing to the unprovoked nature of the deep vein thrombosis, a computed tomography venogram was performed to evaluate thrombus burden and assess for potential underlying causes. This demonstrated an extensive thrombus from the left common femoral vein to the left common iliac vein, without caval extension. Compression of the left common iliac vein against the L5 vertebral body by the right common iliac artery was identified, consistent with a diagnosis of May–Thurner syndrome (*Figure 1*).

Despite 5 days of therapeutic anticoagulation, progressive leg swelling was noted, impacting on patient mobility. The patient proceeded to definitive management with catheter-directed thrombolysis and subsequent venoplasty and stenting, provided by the interventional radiology service.

Interventional radiology performed ultrasound-guided access of the left popliteal vein and insertion of a 6 French sheath. An anterograde venogram demonstrated a large filling defect in the femoral vein extending to the common iliac vein with associated stricture (*Figure 2*). An infusion catheter was inserted over a guidewire to the level of the common iliac vein and recombinant tissue plasminogen activator was commenced at 1 mg/hour. A bolus of 5000 units of heparin followed by an infusion was delivered via the popliteal sheath, targeting an activated partial thromboplastin time of 2.5–3.5.

The patient was brought back to the angiography suite 24 hours later for repeat anterograde venogram, which demonstrated moderate residual thrombus. Thrombolysis was continued for a further 48 hours and subsequent anterograde venogram showed marked interval improvement. A tight stenosis of the left common iliac vein persisted, suggesting an acute on chronic occlusion. Venoplasty of the left external and common iliac veins was performed using an 8 and 10 French balloon, followed by 14 mm x 8 cm self-expanding stent deployment across the left common iliac vein stricture, resulting in successful recanalization.

Symptoms resolved over the following days, and the patient was discharged home on rivaroxaban 2 days post-stenting.

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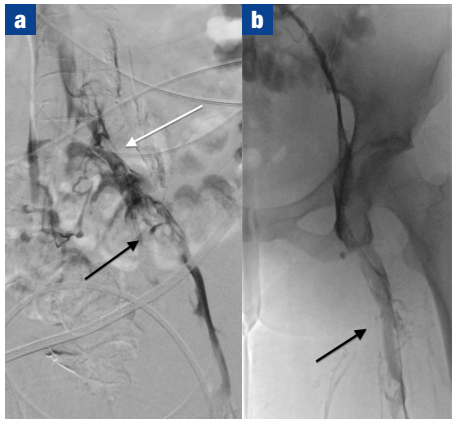
Figure 1. Compression of the left common iliac vein (black arrow) against the L5 vertebral body by the right common iliac artery (white arrow)

Figure 2. Thrombus burden in the **(a)** left common iliac and **(b)** femoral veins (black arrow) with stricture of the left common iliac vein (white arrow).



A much anticipated randomized controlled trial, ATTRACT (Vedantham et al, 2017), failed to show a significant reduction in post-thrombotic syndrome with catheter-directed thrombolytic therapy plus anticoagulation *vs* anticoagulation alone (47% occurrence in catheter-directed thrombolytic therapy group *vs* 48% in control). Furthermore, there was an increase in major bleeding in the catheter-directed thrombolytic therapy group (1.7% *vs* 0.3%). However, ATTRACT did not differentiate deep vein thrombosis based on aetiology, instead including all presentations of deep vein thrombosis. Given the diverse range of aetiologies and cohorts of patients presenting with deep vein thrombosis, and the variable potential outcomes based on these factors, the authors consider this to be a major study limitation.

In cases of underlying mechanical compression, catheter-directed thrombolytic therapy and subsequent venoplasty allows targeted management of both the deep vein thrombosis and the underlying aetiology. The authors hypothesize that with sub-group analysis in a trial such as ATTRACT, endovascular therapy for deep vein thrombosis may demonstrate positive benefit and acceptable safety parameters in specific patient cohorts. Ultimately, a randomized controlled trial is required to establish the role of endovascular therapy within these cohorts.

Endovascular pharmacomechanical devices are an emerging alternative to catheter-directed thrombolytic therapy, allowing rapid thrombolysis. Initial results from the prospective multicentre PEARL registry (Garcia et al, 2015) suggest acceptable safety and efficacy with this approach, while smaller studies (Bush et al, 2004; Bozkurt et al, 2015) have demonstrated high success rates in achieving clot removal and restoring flow. These interventions offer a rapid and single-procedural method of achieving vessel patency. **BJHM**

LEARNING POINTS

- Deep vein thrombosis is a common presentation and medical practitioners must be aware of all potential treatment modalities.
- This case demonstrates the effective application of endovascular therapy in May–Thurner syndrome, highlighting the potential role beyond anticoagulation alone in certain cases.
- Recent data fail to support catheter-directed thrombolysis for all cases of deep vein thrombosis. However, this does not account for the variety of aetiologies and patient sub-groups.
- While catheter-directed thrombolysis offers a promising alternative to anticoagulation alone in certain cases, ambiguity remains regarding the indications, potential benefits and complications.
- Evolving management strategies show potential in treating complex deep vein thrombosis and continued research is required to adequately define their roles.

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