

# Percutaneous Manual Aspiration Thrombectomy Followed by Stenting for Iliac Vein Compression Syndrome with Secondary Acute Isolated Iliofemoral Deep Vein Thrombosis: A Prospective Study of Single-session Endovascular Protocol

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## WHAT THIS PAPER ADDS

Single-session endovascular treatment with MAT as the first-line thrombus removal method is feasible, safe, and effective for IVCS with secondary acute isolated iliofemoral DVT, and can result in more efficient patient care.

**Objective:** To evaluate the feasibility, safety, and effectiveness of single-session endovascular treatment with manual aspiration thrombectomy (MAT) as the first-line method of thrombus removal for iliac vein compression syndrome (IVCS) with secondary acute isolated iliofemoral deep vein thrombosis (DVT).

**Methods:** This was a prospective clinical study. Twenty-six patients (19 women, 7 men, mean age 54 years) with left-sided acute iliac–common femoral DVT secondary to IVCS were enrolled. All patients presented with leg swelling or pains. Endovascular treatment, consisting of MAT, balloon angioplasty, and stent placement, was performed in the same setting. Overnight antegrade thrombolysis was performed in patients with residual thrombus after MAT. Patients were followed up by ultrasonography. The mean follow-up period was 17.8 months (12–25 months).

**Results:** Single-session endovascular procedures were performed successfully in all patients. The mean procedure time was 67 minutes (ranging from 45 to 90 minutes). Complete thrombus removal, including almost 100% of removal in 24 patients and little residual thrombus (<5%) in two, was achieved after repeated MAT. Thrombolysis was used in these two patients. Complete symptomatic relief was achieved in 25 patients (96%) and partial relief in one. The hospital stay ranged from 2 to 4 days (mean 2.7 days). Recurrent thrombosis within the stent was observed in one case and recanalized with thrombolysis. The 1-year primary and secondary patency rate was 96% and 100%, respectively. No symptomatic pulmonary embolization, bleeding, and venous reflux were observed. Five patients complained about transitory low back pains during balloon angioplasty.

**Conclusion:** Single-session endovascular treatment with MAT as the first-line thrombus removal method is feasible, safe, and effective for IVCS with secondary acute isolated iliofemoral DVT. Although limited, our experience suggests that patients thought to be at high risk of bleeding may be candidates for the present single-session endovascular protocol.

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Article history: Received 9 June 2013, Accepted 27 September 2013, Available online 7 October 2013

**Keywords:** Iliac vein compression syndrome, May–Turner syndrome, Deep vein thrombosis, Endovascular treatment, Manual aspiration thrombectomy, Single session

## INTRODUCTION

Iliac vein compression syndrome (IVCS), also known as May–Turner syndrome, is believed to be caused by extrinsic compression of the left common iliac vein

between the overlying right common iliac artery and the vertebral body, and it has been considered an anatomic risk factor for the left-sided deep vein thrombosis (DVT).<sup>1–3</sup> Approximately 50–60% of patients presenting with left-sided iliofemoral DVT are found to have common iliac vein synechiae or intraluminal web resulting from vein wall contact and compression.<sup>4</sup> The rate of recurrence (73%) is high in patients with acute left-sided iliofemoral DVT when the IVCS is not treated with stent placement.<sup>5</sup> This group of patients may be put at particularly high risk for post-thrombotic syndrome (PTS) and late disability.

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<http://dx.doi.org/10.1016/j.ejvs.2013.09.030>

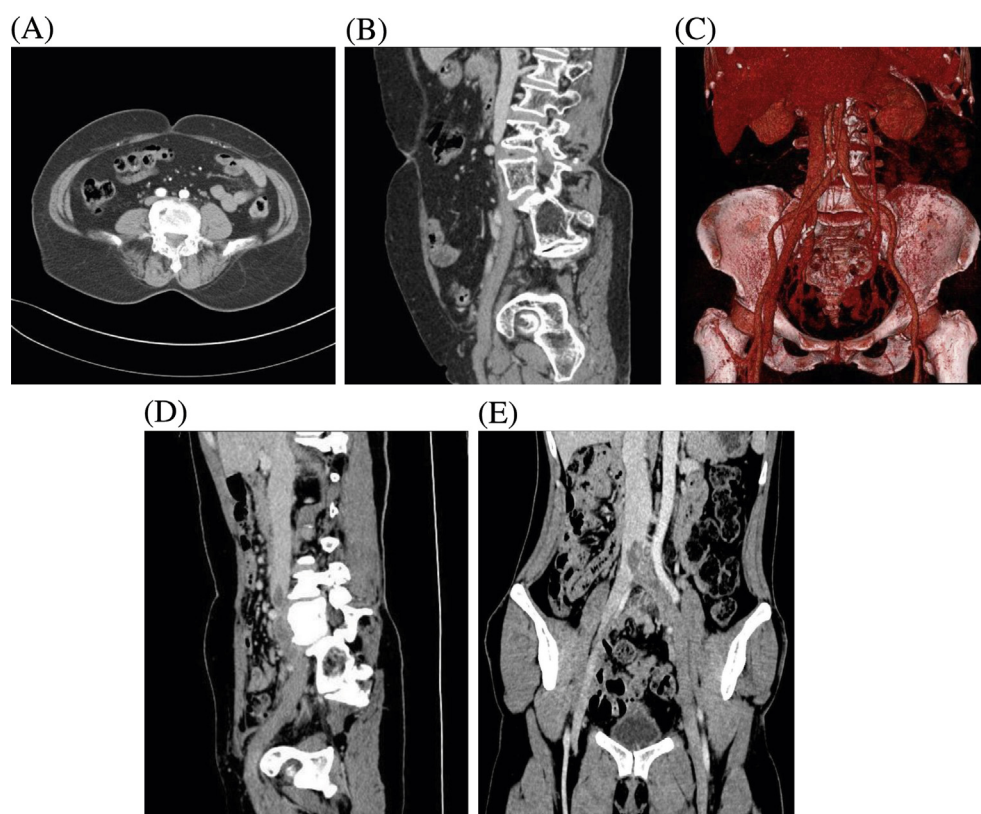
Endovascular treatments, consisting of catheter-directed thrombolysis (CDT), percutaneous mechanical thrombectomy (PMT), and stent placement, are currently considered to be the mainstay for DVT secondary to IVCS.<sup>6,7</sup> Although it may enhance thrombus lysis and prevent PTS, CDT has some specific disadvantages, such as the risk of bleeding, the long time to lysis, long hospital stay, and heavy economic cost incurred by the need for close monitoring, which may impede its widespread utilization.<sup>6–10</sup> PMT may increase the efficiency of thrombus clearance and lower the infusion dose and time of the thrombolytic agent,<sup>11–13</sup> but it may cause damage to vessel walls and valves, and even have the risk of pulmonary embolization (PE).<sup>6</sup> Besides, PMT devices may cause hemolysis and hemoglobinuria.<sup>14</sup>

Manual aspiration thrombectomy (MAT) is an effective and rational option for thrombus removal due to its advantages of rapidity and avoidance of bleeding complications.<sup>15,16</sup> Theoretically, MAT can result in more efficient patient care. The purpose of the present study was to prospectively evaluate the feasibility, safety, and effectiveness of single-session endovascular treatment with MAT as the first-line thrombus removal method for the treatment of IVCS with secondary acute isolated iliac–common femoral DVT.

## MATERIALS AND METHODS

### Patient population

This study was approved by the institutional review board and the ethics committee of our university. From July 2010 to June 2012, 26 consecutive patients with left-sided acute (1–14 days) isolated iliac–common femoral DVT due to IVCS were enrolled in the present prospective study based on the following inclusion and exclusion criteria. DVT was diagnosed based on the clinical and imaging findings. Color Doppler ultrasonography (CDU) was the most commonly used for imaging findings of DVT. IVCS were diagnosed by spiral computed tomographic (CT) venography. The patients were included in the study if they had stenosis or occlusion of the left common iliac vein ( $\geq 50\%$  luminal diameter reduction) caused by compression of the right common iliac artery and the vertebral body demonstrated by CT images (including cross-sectional images and images after three-dimensional construction using curved planar reformation and volume rendering) (Fig. 1), and thrombosis in any part of the iliac vein and/or the common femoral vein (Fig. 2). The patients were excluded from the study if they had thrombosis in the femoral vein, popliteal vein, or inferior vena cava (IVC), active internal bleeding, a recent cerebrovascular accident, allergy to thrombolytic agents, recent



**Figure 1.** Computed tomography (CT) evaluation of the underlying stenosis or obstruction and the extent of thrombus. (A) Cross-sectional image demonstrates considerable compression of the left common iliac vein by the right common iliac artery. (B) Curved planar reformation along the left iliofemoral vein demonstrates extrinsic compression of the left common iliac vein between the right common iliac artery and the spine. (C) Volume-rendered image shows lack of visualization of the left iliofemoral vein. (D, E) CT images demonstrate stenosis of the left common iliac vein caused by compression of the right common iliac artery and the vertebral body, and thrombus extension to the inferior vena cava.

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