



## Editorial

## Editorial: Endovascular treatment for acute proximal deep vein thrombosis




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Deep vein thrombosis (DVT) can cause both pulmonary thromboembolism (PTE) and post-thrombotic syndrome (PTS). DVT treatment aims to relieve the acute symptoms of limb swelling and pain, reduce the risk of PTE, and prevent long-term disability from chronic venous insufficiency including persistent leg pain and swelling, pigmentation, venous claudication, and skin ulceration. Standard anticoagulation can decrease PTE and thrombus propagation but cannot gain early reduction of thrombus burden. Approximately half of the patients with iliofemoral DVT treated by anticoagulation alone develop PTS [1,2]. Early thrombus removal appears to be important to gain rapid symptom relief, preserve valvular function, and prevent PTS [3–5]. Systemic thrombolysis is more effective than heparinization [6], but was discouraged by high rates of incomplete clot lysis and bleeding complications [7].

Catheter-directed thrombolysis (CDT) offers significant advantages over systemic thrombolysis, which can fail to reach and penetrate an occluded venous thrombus [8–10]. With CDT, clot lysis rate can be improved, and treatment duration and bleeding complication rate can be reduced by delivery of higher concentrations of drug to thrombus.

In this issue of the Journal, Okabe et al. reported that a 24-year-old woman with acute iliofemoral DVT and submassive PTE was successfully treated with CDT using alteplase after catheter aspiration and fragmentation for DVT in conjunction with retrievable inferior vena cava (IVC) filter which was removed after clot lysis [11]. The efficacy of endovascular treatment for acute iliofemoral DVT was also demonstrated in this case.

The CaVenT (Catheter-directed Venous Thrombolysis in Acute Iliofemoral Vein Thrombosis) study provided good quality evidence that venous patency rate and venous valvular function were better preserved in patients with acute iliofemoral DVT treated with CDT than anticoagulation alone [12]. This study was an open-label, randomized controlled trial which enrolled 209 patients with first-time iliofemoral DVT within 21 days from symptom onset. It demonstrated that iliofemoral patency after 6 months was significantly higher on CDT than anticoagulation

alone (65.9% vs 47.4%,  $p = 0.012$ ) and PTS assessed by Villalta score at 24 months was significantly lower on CDT than anticoagulation alone (41.1% vs 55.6%,  $p = 0.047$ ).

The ATTRACT (Acute Venous Thrombosis: Thrombus Removal with Adjunctive Catheter-Directed Thrombolysis) study is an ongoing US National Institutes of Health-sponsored, phase III, multicenter, randomized, open-label, assessor-blinded, parallel two-arm, controlled clinical trial [13]. Approximately 692 patients with acute proximal DVT involving the femoral, common femoral, and/or iliac vein are being randomized to receive pharmacomechanical catheter-directed thrombolysis (PCDT) [using the Trellis Peripheral Infusion System (Covidien, Inc., Mansfield, MA, USA) or the AngioJet Rheolytic Thrombectomy System (MEDRAD Interventional – Bayer, Minneapolis, MN, USA)] + standard therapy versus standard therapy alone. The primary study hypothesis is that PCDT will reduce the proportion of patients who develop PTS within 2 years. Secondary outcomes include safety, general and venous disease-specific quality of life, relief of early pain and swelling, and cost-effectiveness. This study will provide further evidence regarding the clinical utility of these techniques.

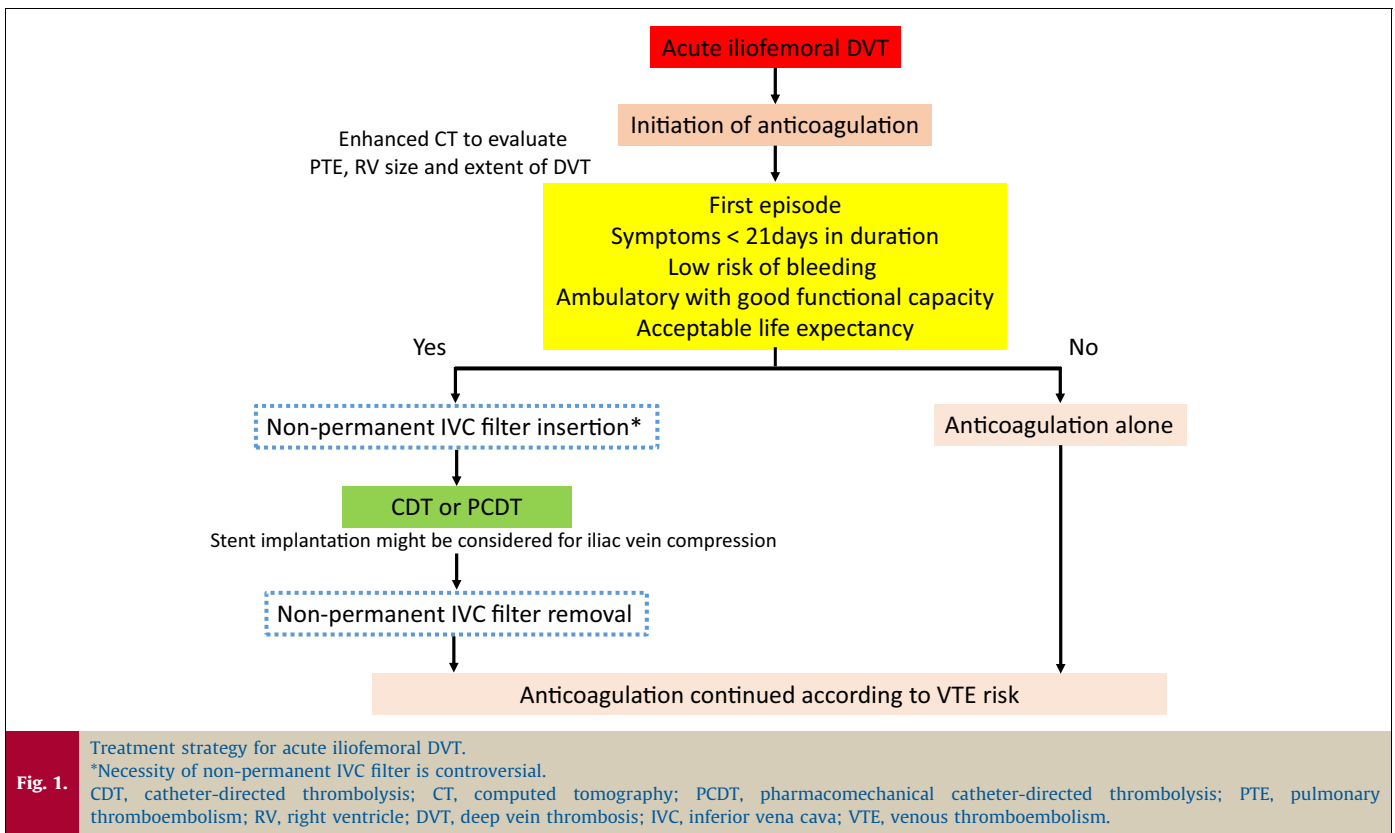
Supplementary stent implantation for persistent significant stenosis or obstruction in iliac vein following CDT or PCDT, especially left side so-called iliac compression syndrome, should be performed to gain outflow tract venous flow. Balloon venoplasty alone is often ineffective due to recoil. Venous stenting appears to improve the iliofemoral patency and clinical outcome [14].

The careful selection of patients is important to the success of these techniques, e.g. duration of symptoms, anatomic distribution and form of thrombus, and the risk of complications (Fig. 1). A scientific statement from the American Heart Association recommended the following: CDT or PCDT is reasonable as first-line treatment of patients with acute iliofemoral DVT to prevent PTS in selected patients at low risk of bleeding complications (Class IIa; Level of Evidence B). CDT or PCDT should not be given to most patients with chronic DVT symptoms (>21 days) or patients who are at high risk for bleeding complications (Class III; Level of Evidence B). Systemic fibrinolysis should not be given routinely to patients with iliofemoral DVT (Class III; Level of Evidence A) [15].

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There are a lot of unresolved issues such as the optimal dose of thrombolytic agents, appropriate duration from the onset for this treatment, necessity of non-permanent IVC filter for PTE protection during this procedure, and cost effectiveness of this treatment. Further evidence regarding this treatment should be evaluated in the future.

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