Case Report

Successful recanalization of the occluded vessel with the assistance of Targeted Adjustable Pharmaceutical Application System (TAPAS) in a patient with an acute deep vein thrombosis and May-Thurner syndrome

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Case report

A 90-year-old woman was admitted to the emergency department because of severe left leg edema in the past 4 days. Her symptoms were progressive, and she faced difficulty in moving her leg. She had a history of chronic respiratory failure following tracheostomy with ventilator support as well as Parkinsonism. Moreover, she presented with deep vein thrombosis. Heparinization was performed, which was ineffective, and phlegmasia cerulea dolens was noted (Fig. 1). Computed tomography revealed May-Thurner syndrome, with left common iliac vein compression via the right common iliac artery, resulting in thrombosis of the left iliac vein (Fig. 2A-C). Surgical thrombectomy was declined, and catheter-directed thrombolysis (CDT) was performed.

The occluded left common femoral vein was punctured under ultrasound guidance. A retrievable inferior vena cava filter was implanted. A 0.035” Terumo guidewire was advanced from the left common femoral vein to the inferior vena cava and snared out via right common femoral vein sheath. Initial right femoral vein sheath was removed, and an 8Fr crossover sheath was advanced to the left femoral vein with the support of the Terumo guidewire. A Fountain infusion catheter

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artery,

Fig. 1 – Acute deep vein thrombosis of left lower limb, evolving to phlegmasia cerulea dolens.

(treatment zone, 30 cm) was placed over the left femoral and popliteal veins to perform CDT. Overnight thrombolysis was performed with urokinase (50,000 units/h) administered via the Fountain catheter.

Following thrombolysis, angiography revealed mild residual thrombus over the left distal femoral vein and occlusion of the left iliac vein. Moreover, mild bloody sputum was noted. Fibrinogen level was 334 mg/dL at that time. The Fountain catheter replaced with the Ekosonic Endovascular System, which is a form of ultrasound-assisted CDT (USCDT; treatment zone, 18 cm), to shorten treatment duration and to decrease urokinase dose. Thrombolysis was performed with urokinase (25,000 units/h) administered via Ekosonic Endovascular System.

After 9 hours of USCDT, acute gastrointestinal bleeding was noted. Nasogastric tube showed coffee ground material, and her hemoglobin dropped from 12.4 to 8.9 g/dL. We stopped urokinase administration. Angiography revealed residual thrombus over the left common iliac vein (Fig. 3A). No additional thrombi were noted over the left external iliac or common femoral vein. Targeted Adjustable Pharmaceutical Application System (TAPAS) (Fig. 3B) was used to isolate the left iliac vein. Subsequently, 120,000 units of urokinase were infused into the system for 15 minutes; urokinase was then withdrawn to avoid drug drainage into the systemic circulation (Fig. 2C). The left iliac vein was dilated with an 8.0/80 mm Rival balloon at 10 atm and was then stented with 16.0/80 and 14.0/60 mm Wall stents. Angiography revealed mild residual thrombus without flow limitation. Vascular ultrasound showed good venous flow without thrombus.

Discussion

Venous thromboembolic events are not rare clinical scenarios, and bleeding complications are also frequent [1]. Therefore, clinicians must always attempt to balance thrombosis and bleeding. Generally, anticoagulation with heparin, vitamin K antagonists, direct thrombin inhibitors, or Xa inhibitors is enough to manage venous thromboembolism. Our case presented with May-Thurner syndrome, in which venous outflow obstruction is caused by extrinsic venous compression of the iliofemoral vein [2]. Thrombolysis followed by iliac vein stent implantation to restore the patency of the venous system was an efficient approach to resolve this condition. Reportedly, this approach has a technical success rate of around 90%, with a 1-year patency rate of up to 94% [3]. Phlegmasia cerulea dolens is a life-threatening situation with acute limb swelling, pain, and gangrene [4]. Patients with this condition might have underlying cancer, autoimmune disease, heparin-induced thrombocytopenia, pregnancy, postsurgery complications, or immobility, like in our case. Aggressive intervention is necessary to salvage this life-threatening condition, including anticoagulation, systemic thrombolysis, and thrombectomy. Surgical thrombectomy was declined by the patient’s family because of her old age; moreover, systemic thrombolysis carries a high intracranial bleeding rate of 3%-6% [5,6]. CDT was preferred because no intracranial bleeding was reported in the landmark prospective trial (CaVenT) [7]. Moreover, there were no differences in the safety outcomes of major and minor bleeding events between the traditional CDT and the USCDT groups with acute DVT [8]. USCDT has the additional benefits of shorter intervention duration, shorter hospitalization time, and fewer stent implantations. We shifted from CDT to USCDT to shorten the intervention time because the patient displayed signs of minor bleeding. ISTH major bleeding (decrease in hemoglobin levels by 2 g/dL) occurred 9 hours later, which prevented us from maintaining USCDT. We isolated the left iliac vein using TAPAS to administer localized thrombolytic therapy for treating thromboses in the scenario of acute gastrointestinal bleeding. TAPAS involves adjustable dual occlu-

Fig. 2 – CT of abdomen showed May-Thurner syndrome. Left common iliac vein was compressed by right common iliac artery, resulting in thrombosis of left iliac vein (A–C).
Fig. 3 – Double balloons of the TAPAS, inflated at 10/10 mm, respectively, to create an isolated treatment area between these 2 balloons; urokinase 120,000 U and Heparin 3000 U was infused to treat the thrombus between the balloons (arrows show the 2 balloons) (A). Targeted Adjustable Pharmaceutical Application System (TAPAS) Catheter Assisted Thrombolysis (ThermopeutiX, Inc., San Diego, CA) (B).

sion balloons that can isolate the target area. Thrombolytic agents were then infused via the system, and only the target area was treated without any systemic effects. No further bleeding events were induced by the intervention drugs. The patient recovered well without further bleeding episodes.

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