Endovascular treatment of traumatic iliac venous injury combined with phlegmasia cerulea dolens: a case report

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INTRODUCTION

Traumatic iliac venous injury (TIVI) is rare and often underestimated but can be fatal [1]. TIVI without pelvic bone fracture is reported to be even more rare [2,3]. Surgical repair or ligation is considered a first-line treatment modality [4]; however, it has not yet been established and remains controversial. In particular, urgent treatment is required when deep venous thrombosis (DVT) and subsequent phlegmasia cerulea dolens (PCD) are complicated by TIVI. It is difficult to treat those patients with surgery alone, and pharmacetic thrombolysis cannot be applied due to the trauma history. Here, we describe a case of unilateral traumatic iliac venous injury and subsequent diffuse venous thrombosis in the affected iliofemoral and infrapopliteal veins, combined with phlegmasia cerulea dolens, treated with endovascular management, including bare metal stent insertion and aspiration thrombectomy.

CASE REPORT

A 46-year-old male patient who had a pedestrian traffic accident was admitted to a regional trauma center. The patient was in a semicomatose state with unstable initial vital signs (blood pressure, 63/32 mmHg; heart rate, 110 beats/min). Complete blood count (serum hemoglobin, 13.5 g/dL; hematocrit, 39.6%) and coagulation profile (platelet count, 276 × 10³/mm³; international normalized ratio, 1.1) was normal. Contrast-enhanced abdominopelvic computed tomography (CT) showed a retroperitoneal hematoma, without evidence of pelvic bone fracture, and DVT in the adjacent right common and external iliac veins. Iliac venous rupture and subsequent adjacent hematoma formation were suspected, but it was thought that active venous bleeding had stopped due to the formation of venous thrombus; therefore, conservative treatment with blood transfusion (4 units of packed
red blood cells and 4 units of fresh frozen plasma) was initiated for the lesion. The patient's vital signs were stabilized. However, PCD developed in the right lower extremity 1 day later. Follow-up lower extremity CT venography showed not only an increased volume of pelvic hematoma and diffuse DVT involving the right iliofemoral and right infrapopliteal veins (Fig. 1A) but also decreased enhancement of the muscles of the right deep thigh and calf (Fig. 1B, C).

Urgent fasciotomy was performed at the bedside, and subsequent endovascular treatment for DVT and TIVI was requested. A retrievable filter (Denali; Bard Peripheral Vascular Inc., Tempe, AZ, USA) was inserted into the infrarenal inferior vena cava via the right internal jugular vein to prevent pulmonary artery embolism that might occur during the procedure. The patient was placed in a prone position, and the right popliteal vein was punctured under ultrasonographic guidance. An 8F sheath (Glidesheath; Terumo Interventional Systems, Somerset, NJ, USA) was inserted. Venography showed diffuse DVT involving the right iliofemoral vein and extravasation of contrast media from the right external iliac vein (Fig. 2A). One 14 \times 100\text{-mm} self-expandable bare metal stent (E-luminexx, Bard Peripheral Vascular Inc.) was inserted across the rupture site, and poststent balloon dilation was performed inside the stent using a 12 \times 100-
mm balloon catheter (Mustang; Boston Scientific Corp., Natick, MA, USA). Aspiration thrombectomy was performed in the right iliofemoral vein using an 8F guiding catheter (Mach 1, Boston Scientific Corp.). A large amount of the red thrombus was aspirated, but small DVT was still remaining in the external iliac vein and venous flow was not improved. Additional stent insertion was performed using a stent of the same size overlapping the existing stent, and additional poststent balloon dilation was performed using the same balloon catheter. Completion venography showed improved venous drainage and the absence of contrast media extravasation (Fig. 2B). The access sheath was removed, and access site hemostasis was achieved by manual compression. A 6-week follow-up CT venography showed a patent stent, a significantly decreased volume of the right pelvic hematoma without evidence of hemorrhage (Fig. 3A), and improved perfusion of the thigh muscles (Fig. 3B), although that of calf muscles were not (Fig. 3C).

Informed consent for publication of the research details and clinical images was obtained from the patient.

DISCUSSION

TIVI may be fatal, with a mortality of 50% to 70%, if left untreated [1,5]. Surgical treatments, including packing, surgical repair, or ligation, are considered the treatment of choice if conservative treatment fails [4,6]; however, surgery is challenging because the overlying hematoma interferes with the surgical field and the tamponade effect decreases during surgery [7]. Therefore, endovascular management has been reported as an alternative treatment modality, most of which involves covered stent insertion [6,8–10], and there are a few case reports of bare metal stent insertion [1,5,7].

Massive exposure to thrombogenic agents in the bloodstream due to traumatic vascular shearing injury can cause thrombosis [11]. In particular, massive amounts of iliofemoral and infrapopliteal DVT can occur in a short period of time due to acute blockage of the draining iliac vein, which can lead to complications such as PCD and phlegmasia alba dolens. Surgical or interventional procedures in most of the previously reported TIVI cases have been performed to treat hemorrhage due to iliac venous rupture rather than DVT and subsequent PCD. Hu et al. [12] reported a case in which PCD, which occurred after surgical ligation was performed for TIVI, was treated with surgical venous reconstruction.

In contrast, in our case, diffuse iliofemoral and infrapopliteal DVT and subsequent PCD were present and urgent intervention was requested. It is noteworthy that the contrast media leakage disappeared even though bare metal, not covered, stents were inserted. Stent placement likely pushed the remaining thrombus towards the injured venous wall, and hemostasis was achieved by covering the ruptured site.

Compared to covered stents, bare metal stents are suitable for emergency use because they usually have higher availability in hospitals and have lower migration risk, even with stents with relatively smaller diameters [5]. And it is also a method worth considering because venous pressure is much lower than arterial pressure. For this reason, the use of bare metal stents as treatment for venous injury is increasing [13]. Although not indicated in our case, prolonged balloon tamponade or additional coil embolization might be considered if bleeding is not resolved with bare metal stent insertion [14,15].

In conclusion, we successfully treated a patient with PCD complicated by TIVI-related DVT using aspiration thrombectomy, bare metal stent insertion and subsequent balloon tamponade.

Fig. 3. Follow-up contrast-enhanced computed tomography. (A) Patent stent (arrow) is shown with decreased volume of right pelvic hematoma with chronic changes (asterisk). (B) Perfusion of the thigh muscles are improved, (C) but that of calf muscles are not (arrows).
NOTES

Ethical statements
Informed consent for publication of the research details and clinical images was obtained from the patient.

Conflicts of interest
The authors have no conflicts of interest to declare.

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Conceptualization: JHK; Data curation: SP, JHH, JC; Visualization: JHH, JC; Writing–original draft: SP; Writing–review & editing: JHK.

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