ENDOVASCULAR MECHANICAL THROMBECTOMY OF THE INFERIOR VENA CAVA AND ILIAC VEINS WITH THE USE OF ASPIREX®S DEVICE IN A PAEDIATRIC PATIENT

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CASE REPORT
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ABSTRACT
Phlegmasia cerulea dolens, which is the most severe clinical presentation of deep venous thrombosis and results from an almost complete occlusion of the major and collateral venous outflow routes from the extremity, is very rarely seen in children. Here we describe the treatment of an 11-year-old boy with Down syndrome who presented with thrombotic occlusion of the inferior vena cava and both iliac veins. We present a step-by-step technique of endovascular mechanical thrombectomy of these veins with the use of the Aspirex®S thrombectomy device. Endovascular treatment was followed by local intravenous thrombolysis. Because of recurrent thrombosis, which occurred 4 days later, endovascular thrombectomy and thrombolysis were performed again. Finally, the treatment resulted in complete restoration of patency of occluded veins. Except for a minor local bleeding in the area of vascular access, there were no adverse events associated with endovascular management in this paediatric patient.

Key words: *Phlegmasia cerulea dolens*, endovascular mechanical thrombectomy, Aspirex.

INTRODUCTION

Phlegmasia cerulea dolens, which is the most severe clinical presentation of deep venous thrombosis and results from an almost complete occlusion of the major and collateral venous outflow routes from the extremity, is very rarely seen in children [1-6]. Here we present the treatment of severe thrombosis of the inferior vena cava and deep veins of both lower extremities in an 11-year-old boy.

CASE PRESENTATION

An 11-year-old male patient with Down syndrome was admitted to our hospital because of upper respiratory tract infection accompanied by high fever. After 2 days of hospital stay he was discharged with recommendation for further outpatient treatment. Still, after 5 days he was again admitted to the hospital because of swelling of both lower extremities, primarily on the left side, and also of the scrotum and penis (Fig. 1A). This severe oedema clinically manifested as *phlegmasia cerulea dolens*. CT angiography revealed thrombotic occlusion of the inferior vena cava (Fig. 1B) and bilateral occlusions of the external iliac and femoral veins, which on the left side was associated with thrombosis of superficial tributaries of the femoral vein. After consultation by paediatric cardiac surgeon, considering the fact that thrombotic material could not be removed surgically, the patient was managed with fibrinolytics (alteplase). However, fibrinolytic treatment was unsuccessful and the status of oedematous lower limbs deteriorated. Therefore we decided to perform percutaneous mechanical thrombectomy with the use of the Aspirex®S thrombectomy device (Straub Medical AG, Wangs, Switzerland).

INTERVENTION

Firstly, under sonographic control, we cannulated the right femoral vein with a 6F Brite tip® guiding catheter (Cordis, Fremont, CA, USA). We did not cannulate the popliteal vein because it was very narrow, about 2 mm

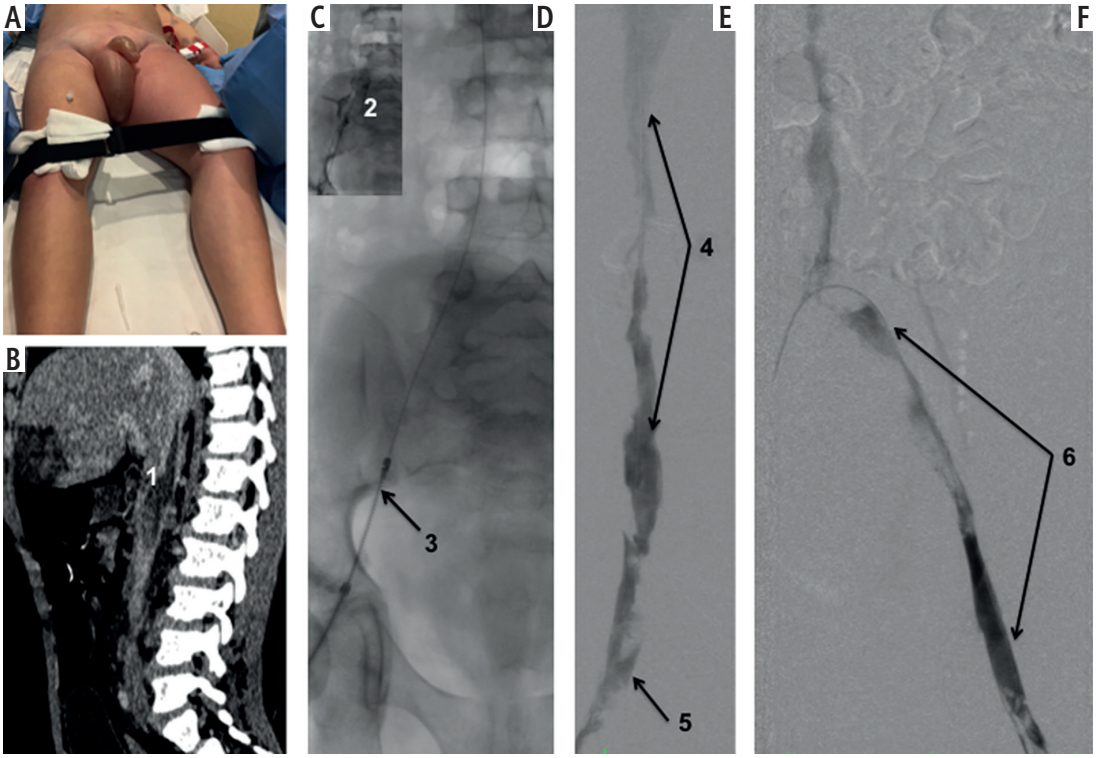

Fig. 1. A) Initial state of patient: large oedema of the lower limbs, scrotum and penis. **B**) CT angiography of the veins – visible large thrombus in distal part of the inferior vena cava (1), occlusion of the illiac veins. **C**) Venography of the external and common iliac vein – no flow of contrast, with a large thrombus (2). **D**) System of endovascular mechanical thrombectomy Aspirex advanced into the iliac veins (3). **E**) Venography of the partially recanalised inferior vena cava and iliac veins after the use of Aspirex (5) – visible residual 80-90% stenosis with a flow of contrast. **F**) Venography of the left external and common iliac veins (6) after thrombectomy with Aspirex system

in diameter. Catheter angiography confirmed thrombotic occlusion of the iliac vein and the inferior vena cava (Fig. 1C). With the use of a 260-cm-long AqWire™ hydrophilic guidewire (Covidien, ev3 Endovascular, Inc., Plymouth, MN, USA) and a vertebral diagnostic catheter we navigated through the occlusion to the right atrium and then to the left subclavian vein. We introduced the 6F Aspirex®S and with the use of this device we removed thrombi from the inferior vena cava and from the right common and external iliac veins (Fig. 1D). Control angiography revealed partially recanalised inferior vena cava (Fig. 1E). Of note, there were no anatomic abnormalities of the inferior vena cava, such as aplasia, septum or a web. We continued aspiration thrombectomy of the right iliac vein and inferior vena cava, and then we cannulated the left femoral vein with the 6F/45 cm Destination® guiding sheath (Terumo, Tokyo, Japan). Through this sheath we performed thrombectomy with the Aspirex®S device of the left femoral and iliac veins. Catheter angiography demonstrated partial recanalisation of these veins (Fig. 1F). Finally, we introduced the Fountain infusion catheter (Merit Medical Systems, Inc., South Jordan, UT, USA), which is equipped with a system of gradient-sized holes enabling uniform dispersion of therapeutic agent. Through this catheter, over the entire length of the iliac veins, alteplase was administered for 48 h (initial dose 3 mg, then 10 mg in infusion). We also administered a sub-therapeutic dose of low-molecular-weight heparin. This treatment was complicated by local bleeding (which required long compression and transfusion of blood) at the site of vascular access. After the treatment the patient improved clinically and control angiography demonstrated patent inferior vena cava and both iliac veins and partial reduction of swelling of the scrotum (Fig. 2A and 2D). Still, after 4 days both iliac veins reoccluded. We again performed aspiration thrombectomy with the Aspirex®S device (Fig. 2B and 2C), which was followed by local intravenous administration of alteplase for 72 h. There were no complications associated with the second treatment. The treatment with alteplase was then followed by administration of a low-molecular-weight heparin. Although there were still residual thrombi and stenoses of the iliac veins, we decided not to implant stents, considering the fact that the patient was a child and even a properly implanted stent in a few years would be too small and result in a difficult-to-manage narrowing of the iliac vein. The patient was discharged after 15 days of hospitalisation (without swelling of lower extremi-

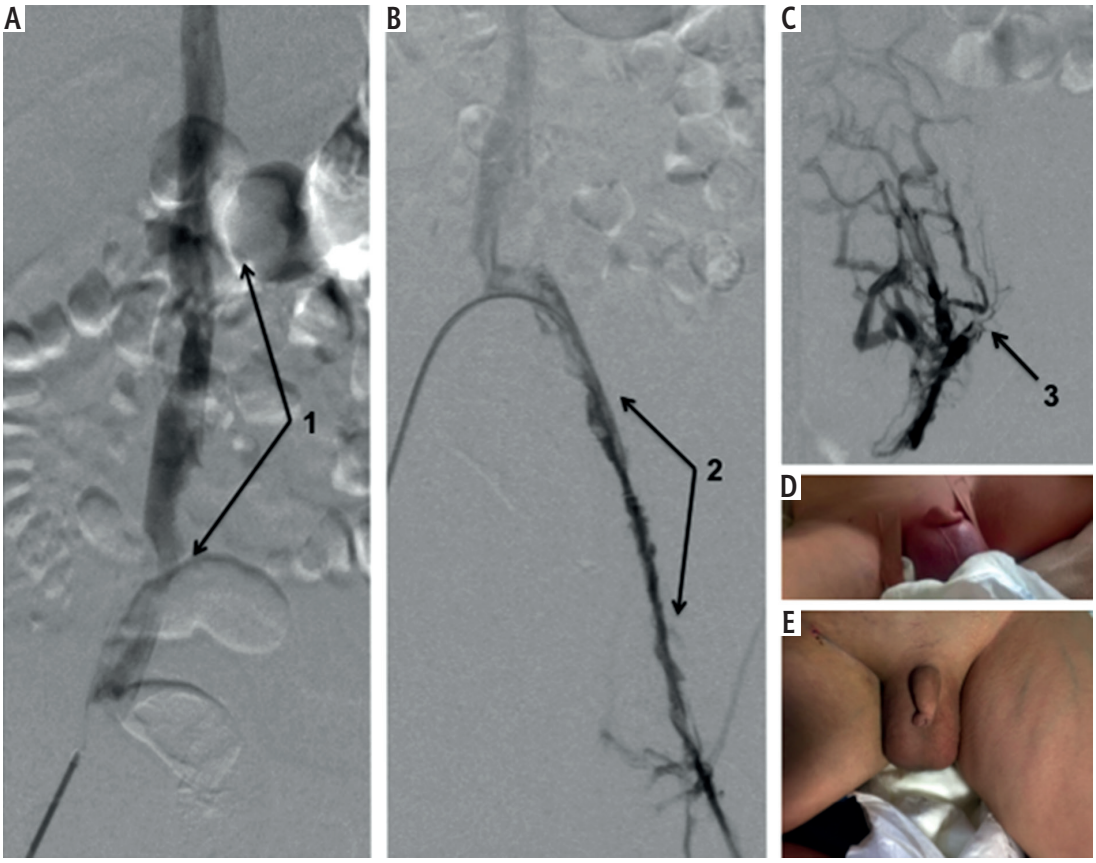

Fig. 2. A) Control venography – patent inferior vena cava (1). **B**) residual stenotic lesions in the left iliac veins (2). **C**) Recanalisation of the left internal iliac vein (3) – there was a good outflow from pelvic veins. **D**) Clinical improvement after first procedure – reduction of oedema of the scrotum, penis and lower limbs. **E**) Final clinical effect – no swelling of the left lower limb and scrotum

ties, and also of the scrotum and penis – Fig. 2E), with the recommendation of antithrombotic treatment with low-molecular-weight heparin. Control Doppler sonography performed 6 months later demonstrated good flow through the inferior vena cava and both iliac veins. Of note, there were no features of thrombophilia in laboratory investigation of the coagulation system.

DISCUSSION

Deep venous thrombosis is rarely seen in children. Its prevalence is at least 100-times less frequent than that of adults. Usually neonates and adolescents are affected and thrombosis is typically associated with the use of intravenous catheters or severe morbidities (sepsis, cancer, heart disease, etc.). Anatomic abnormalities, primarily aplasia of the inferior vena cava and May-Thurner syndrome, and/or disturbances of the coagulation syndrome can also be of an importance [1-7]. Unprovoked thrombosis in a child, such as in our patient is extremely rare. Current guidelines suggest conservative management of paediatric deep vein thrombosis. An invasive treatment can be performed only in children presenting with severe and limb-threatening thrombosis [1-3, 8]. Usually such a treatment consists of local administration of fibrinolytics. Recently, percutaneous mechanical thrombectomy with the use of different devices (such as AngioJet [Boston Scientific, Natick, MA, USA] or Trellis-8 [Covidien, Mansfield, MA, USA]), has been added to the armamentarium [8-10]. Our paper on the use of the Aspirex®S, to the best of our knowledge, is the first report of a successful use of this endovascular device for the treatment of deep vein thrombosis in a child.

Pulmonary embolism appears to be the most important complication associated with endovascular thrombectomy of the iliac veins and the inferior vena cava. Some authors used prophylactic cava filters in patients with occluded iliac veins but patent vena cava [8, 10]. In our patient the use of such a filter was not possible, since the inferior vena cava was totally closed by the thrombus. Local administration of alteplase improves the results of venous thrombectomy in paediatric patients and is associated with acceptable low rate of bleeding adverse events (less than 20%), which are usually of minor clinical relevance [8, 10].

CONCLUSIONS

Although most children presenting with deep vein thrombosis can be managed conservatively, in cases of

severe and limb-threatening thrombosis endovascular mechanical thrombectomy combined with local intravenous administration of a fibrinolytic agent seems to be a safe and efficient alternative.

The authors declare no conflict of interest.

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