ILIOCAVAL STENTING – CASE REPORT

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ABSTRACT

In a 45-year-old man, after a traffic accident with multiple trauma complicated with extensive thrombosis involving the inferior vena cava and iliac veins, rapid development of severe post-thrombotic syndrome with leg ulcers prevented final orthopaedic reconstructions and recovery. Three years after the accident endovascular reconstruction with venoplasty and stenting of the inferior vena cava and iliac veins was performed. He was successfully treated with the confluence technique, in which dedicated nitinol venous stents were used. After the procedure, collateral circulation disappeared and the ulcers healed. This allowed the end of orthopaedic treatment and rehabilitation. The patient recovered and did not require additional vascular interventions for 6 years after the procedure.

Key words: stent, deep venous thrombosis, inferior vena cava, iliac vein, iliocaval confluence.

CASE REPORT

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INTRODUCTION

In a patient with inferior vena cava and/or iliac vein chronic total occlusion or severe stenosis, which is associated with skin changes with risk for venous leg ulcer (C4b), healed venous leg ulcer (C5), or active venous leg ulcer (C6), venous angioplasty and stent recanalization is recommended to aid in venous ulcer healing and to prevent recurrence [1].

CASE PRESENTATION

A previously healthy, athletic, 45-year-old man was involved in a traffic accident on 19/09/2012, and he suffered multiple trauma as a result of it. He was transported to hospital in severe general condition, in haemorrhagic shock.

Multiple bone fractures including:

- transverse processes of L1 and L2 vertebrae on the left side,
- left iliac diaphysis,
- rear wall of the left ala of ilium,
- left femur,
- right pubic and ischial bone,
- head and subcapital part of the left humerus,
- left ulna,
- ribs I, V, VI, VII, VIII, and IX on the left side.

Internal organ damage:

- contusion of the lungs,
- rupture of the left diaphragm dome with a displacement of the stomach to the chest.

The patient underwent numerous repair operations and a long stay in the intensive-care unit.

During hospital stay, swelling of the left lower limb was observed, and ultrasound diagnosed a thrombosis of the left iliac veins, which was treated conservatively.

Persistent swelling of both lower limbs appeared after leaving the hospital and immobilization. Despite the maintenance of anticoagulant treatment and the use of compression stockings, pain intensified and ulceration of the left shin appeared, disqualifying the patient from final orthopaedic reconstructions.

The patient was referred to our centre in 2015.

The ultrasound examination revealed obstruction of the inferior vena cava and bilateral iliac veins. The diagnosis was confirmed in angio computed tomography (angioCT): obstruction of the inferior vena cava below the renal veins and obstruction of the common iliac veins (Fig. 1, 2).

The decision was made to perform endovascular reconstruction.

The procedure was performed under general anaesthesia. Access was through the femoral veins on both sides. Phlebography revealed extensive collateral and confirmed occlusion of the inferior vena caval (IVC) and iliac veins (Fig. 3, 4). The guidewires (Radifocus® Guide Wire M Stiff Type-Terumo) were guided through the obstruction to the upper segment of the IVC. In 2015 our centre did not have intravascular ultrasound (IVUS), so we relied on the angioCT reconstruction and on venography performed in several planes.

The predilation was performed with a 16 mm balloon (Atlas™ PTA Dilatation Catheter-Bard) – iliac veins on both sides and the IVC, then with a 22 mm balloon – IVC (Fig. 5). The entry level of renal veins into the IVC was marked by catheterization. The Sinus-XL (Optimed) stent (22 x 80 mm) was implanted to IVC, followed by

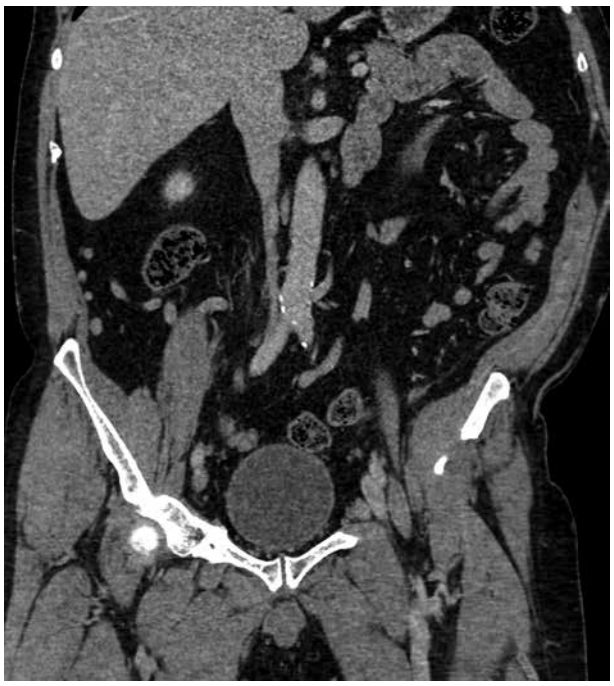

Fig. 1. Inferior vena cava

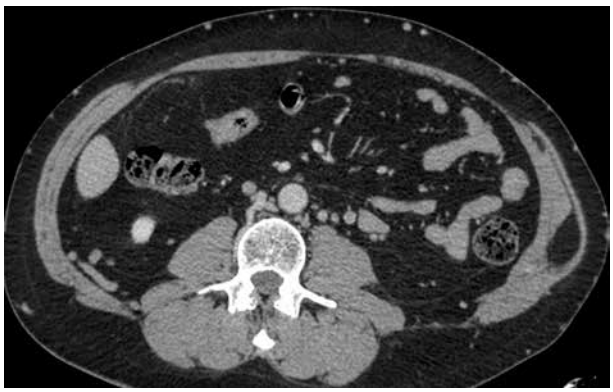

Fig. 2. Inferior vena cava

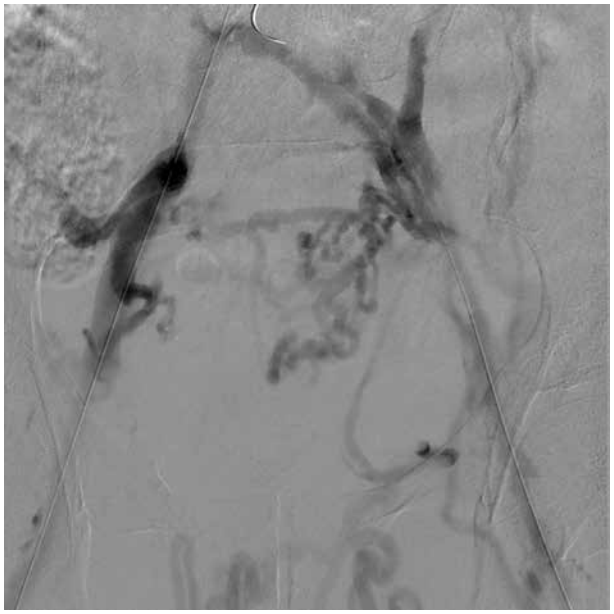

Fig. 3. Iliac veins. Collaterals (venogram performed through a catheter placed in both femoral veins)

Fig. 4. Level of virtual coronary intervention (venogram performed through a catheter placed in both femoral veins)

post-dilation with the same 22 mm balloon. The upper edge of the stent was placed directly below the level of the renal veins. The left side guidewire (contralateral side) was retracted into the iliac vein and then inserted into the stent (Fig. 6). Two Vici stents (Vici Venous Stent®-Veniti) were implanted at the same time, positioning their upper edges about 2 cm above the lower edge of the stent placed in the inferior vena cava. During post-dilation, the balloons placed in the Vici stents were inflated simultaneously so that one stent did not compress the other (Fig. 7). Control venography showed normal flow through the stents and loss of collateral circulation (Fig. 8).

In the following days, the collateral circulation visible on the skin disappeared and the ulcers healed.

The following anticoagulants were used: LMWH, VKA, and currently Dabigatran 2 x 150 mg.

At present, 6 years after the reconstruction, the patient does not report oedema. After supplementary orthopaedic treatment and rehabilitation he is able to walk properly, without any complaints. According to the ultrasound

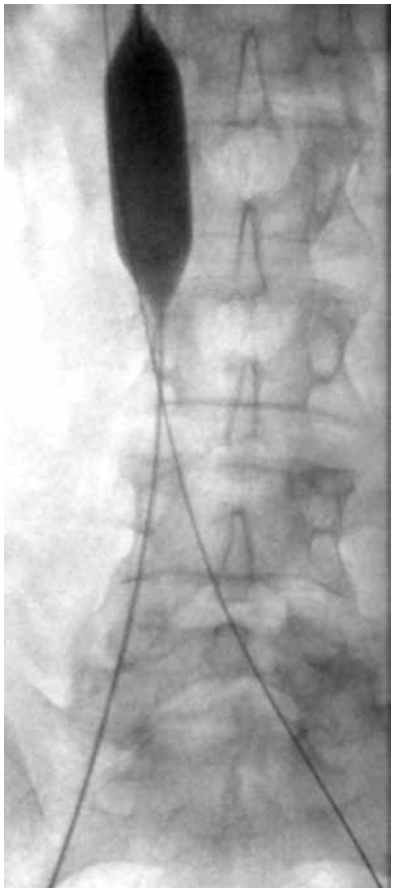

Fig. 5. Procedural steps: predilatation of infrarenal virtual coronary intervention

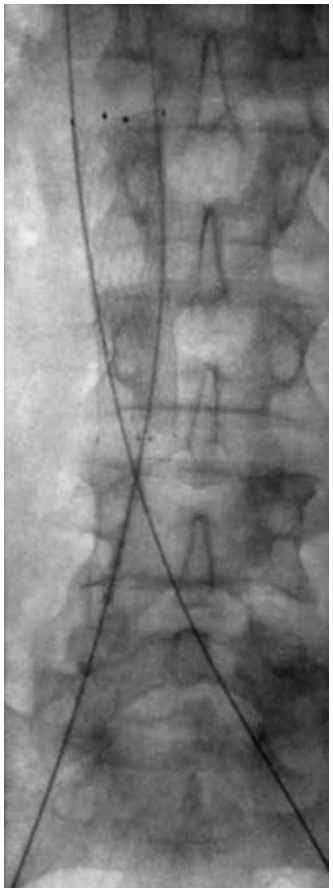

Fig. 6. Procedural steps: sStent in virtual coronary intervention

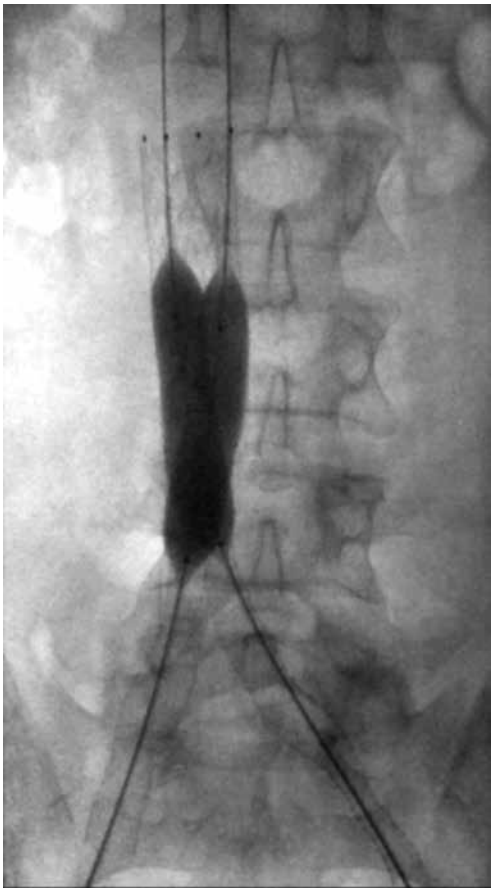

Fig. 7. Procedural steps: postdilatation of iliocaval confluence

Fig. 8. Procedural steps: final venogram

assessment, the stents remained patentable and did not require secondary reinterventions.

DISCUSSION

At that time, the centre had experience in iliac vein stenting, but the iliocaval confluence had never been reconstructed before.

At the beginning of 2015, the following venous stents were available on the market in Poland: Zilver Vena (Cook Medical), Sinus-Venous and Sinous-XL (Optimed), and Vici (Veniti). The Wallstent stent (Boston Scientific) received CE mark approval for venous indication 2 months after our procedure.

The selection of the SinusXL stent in the virtual coronary intervention (VCI) segment was simple – it was the only stent of this size available on the market.

We have been considering the selection of iliac stents. We chose a closed-cell stent – the Vici stent (Veniti) – because we felt that 2 such stents would work well together as kissing stents. We were concerned that in the case of using 2 open-cell stents, e.g. SinusVenous (Optimed), some elements of one stent could fall into the lumen of the other stent and cross them. We tested such situations

in vitro – holding 2 stents in our hands and press them against each other. We calculated the size of the stents needed in the iliac segment.

According to angioCT, we calculated the stent size in 22 mm VCI. At full expansion, the cross-sectional area was about 380 mm^2.

The cross-sectional areas for smaller stents were: 12 mm = 113 mm^2, 14 mm = 154 mm^2, and 16 mm = 200 mm^2. We decided that the best stent fit and use of the cross-sectional area would be obtained with two 16 mm stents.

It is clear that when the 2 stents are inserted as kissing stents inside the stent implanted in the VCI, the shape of surface area of all stents changes to elliptical. The shape of these ellipses depends on the radial forces of the stents used and the forces acting from outside (Fig. 9). Various techniques for endovascular reconstruction of an occluded inferior vena cava have been described in detail by Neglen [2]. He compared 3 techniques and concluded that the best option for the patients with limited caudal involvement of the IVC (< 5 cm) and a normal IVC above is the double-barrel stent configuration. If the changes in the IVC reach higher IVC, he decided that the doubling of the stent in IVC is prohibited and he preferred an inverted Y technique with fenestration. Although he noticed that this technique has the poorest stent-related outcome, with 11% late occlusions and a 37% reintervention rate. The Wallstent (Boston Scientific) was used in all configurations in this group. Similar stent configurations using the Wallstent have been reported by other authors. Some of them additionally used a Gianturco stent (Gianturco, Cook Medical) to provide additional radial force to the distal part of the Wallstent. The Gianturco stent can also be used as an extension beyond the Wallstent in IVC for the reconstruction of iliocaval confluence [3, 4].

Iliocaval confluence stenting using a large diameter stent in IVC and 2 stents inserted in the lower part of this large stent with the double-barrel technique was described by de Graaf (confluence technique) [5]. He used modern nitinol stents also available on the Polish market. Sinus-XL (Optimed) stents were used in the IVC. Bilateral extensions were performed with 16 mm nitinol stents: sinus-XL, sinus Venous and sinus XL-Flex (Optimed), and Zilver Vena (Cook Medical). The authors observed some cases of complete compression of the stent by a second, parallel stent (12-month patency rates were 85%, 85%, and 95% for primary, assisted-primary, and secondary patency, respectively). Thus, they decided to use additional parallel positioned balloon-expandable stents (AndraStent, Andramed) (in that group the primary patency was 100%).

In our patient, we decided to use the confluence technique described by de Graaf, with the modification of using closed-cell stents as kissing stents in order to avoid complications related to the strut interactions.

Fig. 9. Cross-section of the stents. Computed tomography performed 12 months after the procedure

The best tool for determining landing zones is IVUS [6], but in this case the lack of it was replaced by careful CT analysis, multiplanar phlebography, and renal veins catheterization. Additionally, IVUS provides the best visualization of the arrangement of the stents and cross-sectional area in place of their confluence. The authors now believe that such a check should be performed to exclude compression of the stent by a second, parallel stent.

Various anticoagulant and antiplatelet treatment regimens have been reported in the literature, but there are still no recommendations for treatment after vein stenting in post-thrombotic syndrome [7]. Analysing experts' opinions, it seems that in the case of long, complicated stent reconstructions, lifelong anticoagulation should be considered [8].

CONCLUSIONS

Endovascular recanalization of the IVC with iliocaval confluence is technically possible, safe, and durable. Successful reconstruction in a truly symptomatic patient can significantly improve the clinical condition.

The authors declare no conflict of interest.

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