

Endovenectomy And Stenting With A Functioning Arteriovenous Fistula In Extended Postthrombotic Occlusion Of Deep Veins

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Received Date: 29 Mar 2023

Accepted date: 25 Apr 2023

Published Date: 02 May 2023

1. Abstract

The article describes a case of surgical treatment of a 32-year-old female patient with multilevel postthrombotic deep vein occlusion of the left lower limb.

Endovenectomy from the common femoral vein with the placement of an arteriovenous fistula between femoral vessels was performed as the first stage. The patient was hospitalized again 3 months later and successfully underwent endovascular surgery with stenting of iliac veins and common femoral vein with a functioning arteriovenous fistula. The clinical outcome of the surgery was good. According to the data of ultrasound duplex scanning, after 13 months the stented segments of deep veins were not obstructed, the arteriovenous fistula functioned well. There was a significant regression of clinical symptoms. The Villalta score decreased from 13 to 5 in comparison with the initial one.

This observation demonstrates the possibility, efficiency and safety of long-term functioning of artificial arteriovenous fistula in a certain cohort of patients.

2. Keywords:

Postthrombotic occlusion of deep veins, Endovenectomy, Arteriovenous fistula, Stenting, Duplex scanning

3. Introduction

In the last decade percutaneous endovenous stenting has become the choice method in the treatment of obstructive lesions of iliofemoral veins and inferior vena cava. The efficiency of endovascular procedure has been proven in many studies[1-3]. The American Venous Forum recommends venous angioplasty and stenting in the treatment of symptomatic patients (with clinical classes CK-C6 according to CEAP classification) with chronic occlusions or severe stenosis of inferior vena cava or iliac veins (with or without reflux through the deep veins) along with standard compression therapy (level of recommendation and evidence of IB) [4]. The popularity of this endovascular technique has significantly increased in recent years due to the introduction of new imaging methods into clinical practice, the emergence of modern venous stent generation, high efficiency and reliable long-term results. Cumulative primary, primary-assisted and secondary permeability after stenting at up to 72 months reaches 67-80%, respectively, 76-88% and 90-93%, accompanied by low complication rates [5,6]. However, after hybrid operations (open + endovascular), performed for prolonged occlusions of the iliofemoral segment of deep veins, the results of permeability of stented veins are worse: primary, primary-assisted and secondary permeability after 36 months are 37.62 and 72%, respectively. The re-intervention rate reaches 53%. Nevertheless, it is noted that successful hybrid interventions significantly improve the quality of life, relieve pain and venous claudication[7,8].

When the occlusion extends to the common femoral vein (CFV), venous outflow from the limb is significantly impaired because drainage from the deep femoral vein (DFV) and femoral vein (FV) are blocked. In this situation, even if iliac vein stenting is successfully performed, the probability of stent thrombosis remains high due to decreased venous blood flow to the stented segment[9].

An alternative option for solving this problem in a certain group of patients was the procedure of surgical desobliteration of the CFV and its branches entries, which is defined by the term endophlebectomy or endovenectomy[10,11]. The main point of endovenectomy is to perform a longitudinal venotomy of the CFV and release its lumen from fibrosis deposition and synechiae. The vein lumen is sutured with primary sutures or with an autovein or xeno-pericardial patch. When indicated, a temporary arteriovenous fistula (AVF) is placed between the CFV and the common or superficial femoral artery. After the open stage of intervention, angioplasty and stenting of iliac vein and CFV obstruction are performed[11-13].

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4. Case Report

Female patient K., 32 years old, a physician, admitted on January 14, 2020 with complaints of persistent marked swelling of the left lower limb, heaviness, pain and venous claudication. She has been sick since October 2017 due to a deep vein thrombosis of the left lower limb while preparing for in vitro fertilization and iliofemoral re-thrombosis, which occurred in June 2018. The hematologist revealed the following thrombophilia types: homozygous mutation of PAM, MTR, heterozygous mutation of MTHFR, MTRR, ITGA2, high risk of venous thromboembolic complications, recurrent deep vein thrombosis of lower limbs. Dabigatran etexilate was administered in therapeutic doses (150 mg 2 times a day).

On admission, the left lower limb was expanded in volume due to edema on the shin +5 cm, on the thigh +8 cm compared to the contralateral limb. There was moderate pain while compressing the shin.

Laboratory tests included complete blood count and urine tests, biochemical blood test, coagulogram, thromboelastogram. According to physical examination, duplex ultrasound (DUS), verified by multiplanar phlebography, the diagnosis was: as the following postthrombotic syndrome of the left lower limb, occlusion of the iliac veins, common femoral vein and femoral vein (C_{3s} , E_s , $A_{d\text{ ctv EIV CFV f v}}$, P_o ; L3, CEAP classification, 202014).

On January 17, 2020, endovenectomy was performed from the CFV and proximal part of the external iliac vein (EIV) of the left lower limb with release of the DFV entries and creation of an AVF between CFV and the common femoral artery (CFA) according to the original technique. A free 3 mm diameter autovenous fragment was used for the AVF placement; one of its anastomoses was formed between the longitudinally dissected autovein and the CFV and serves simultaneously as an CFV autovenous patch after endovenectomy. The second anastomoses was performed with the CFA using a microsurgical technique. The attempt of recanalization of the extended occlusion of the external and common iliac veins (CIV) failed.

The patient was hospitalized again on March 12, 2020. The complaints of persistent swelling of the left lower limb and pain when walking remained. The left lower limb was expanded in volume due to edema on the shin +6 cm and on the thigh +21 cm compared to the right lower limb. Increased edema was probably associated with AVF functioning, verified by ultrasound examination, with proximal venous outflow block due to IVC and CIV occlusion. Despite this, AVF played a certain positive role, because the patency of the CFV and DFV were preserved, that made it possible to perform stenting of the iliac veins.

On March 13, 2020 under general anesthesia recanalization of the femoral, CFV and iliac veins were performed from the popliteal access under ultrasound control using a loop technique with subsequent pre-dilatation and three Wallstent-Uni Endoprosthesis stenting (Boston Scientific, Natick, MA, USA) sized 18x90 (two stents) and 14x60 (in the CFV) with adequate post-dilatation and control phlebography. During the procedure,

unfractionated heparin was administered intravenously under the control of activated clotting time (ACT). The stages of endovascular intervention are shown in.

Low molecular weight heparins in therapeutic doses (enoxaparin sodium) were administered in the postoperative period. Intermittent pneumatic compression of the operated limb was performed using the Flowpac device (Huntleigh Healthcare, Cardiff, UK).

In the postoperative period, the regression of edema of the left lower limb to +3 cm at the shin level and +6 cm at the level of the middle third of the thigh compared to the contralateral limb, was noted. The patient was discharged in a satisfactory condition on the 5 day after endovascular intervention. Postoperatively, this patient received low-molecular-weight heparin for 2 weeks, followed by life-long oral anticoagulant treatment (rivaroxaban). The anticoagulant therapy regimen is coordinated with the hematologist.

DUS, was performed during dynamic monitoring in 3, 6, 10 and 13 months after the second surgery[15]. When examined 13 months after endovascular intervention, the patient had no complaints. Some swelling of the thigh was observed. Palpation is painless, there are no trophic skin changes. D-dimer level was 114.9 ng/ml. The Villalta score decreased from 13 to 5 compared with the initial one[16].

According to the DUS data, the stents are patent without signs of deformation and stenosis. AVF is well-functioning, its diameter is 3.3 mm. High-velocity blood flow with arterial component with functioning AVF is recorded on Spectral Doppler. According to the results of echocardiography, right heart chamber sizes were normal. The systolic pressure in the pulmonary artery is 25 mmHg.

5. Discussion

The results of endovenous stenting mostly depend on the character of lesion of the iliofemoral segment of deep veins and inferior vena cava. In isolated occlusions (Type III), the results of both technical performance and patency of stented vein segments are significantly better than those in multilevel occlusions (Type IV)[17].

A difficult situation appears when the occlusion is prolonged on the CFV. A certain solution of this problem was the use of hybrid surgeries including open intervention on the CFV, angioplasty and stenting of iliac veins. At the same time, disobliteration of the CFV and the DFV entry provides maximum drainage from the thigh and distal parts of the limb, increases the venous blood flow into iliac veins and inferior vena cava. Arteriovenous fistula created between the CFA or SFA and CFV vein significantly decreases the probability of in-stent thrombosis in recanalized iliac veins[18]. The duration of AVF functioning is determined by high thrombogenicity of surgical area, time interval of complete stent endothelialization, inflow and outflow capacity, hemostasis status. With inadequate inflow from the femoral and/or DFV, an average

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duration of AVF functioning from creation to closure (some fistulas close independently) is 82 days (26-742)[19].

The patient we operated on was examined 13 months later. AVF functioned well and did not cause right heart overload according to both clinical data and echocardiography findings. It should be noted that the fistula diameter (3.3 mm) was optimal according to hemodynamic parameters[20]. Taking into account the character of deep vein lesion, complexity of open and endovascular surgeries and high-risk thrombophilia, it was decided to abstain from fistula dissection. The patient is under dynamic observation.

6. Conclusion

Thus, in a certain category of patients with extended deep vein occlusions when performing open endovenectomy with AVF formation and stenting, long-term fistula functioning as a factor maintaining patency of stented vein segments and not causing disturbances of central hemodynamics is possible.

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