Eur J Vasc Endovasc Surg (2017) ■, 1–7

Treatment of Femoral Vein Obstruction Concomitant with Iliofemoral Stenting in Patients with Severe Post-thrombotic Syndrome

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WHAT THIS PAPER ADDS

Endovascular stenting is a common treatment for severe post-thrombotic syndrome with a chronically obstructed iliofemoral venous segment. An adequate inflow to the stent is vital for the clinical and stent outcomes after iliofemoral vein stenting. The results of this retrospective study demonstrated that concomitant femoral stenting or angioplasty of an obstructive femoral vein in the presence of a patent profunda vein does not improve the outcomes after iliofemoral stenting in this patient group.

Background: The aim was to assess the clinical and anatomical outcomes of iliofemoral stenting, with concomitant femoral stenting or balloon angioplasty alone, in patients with severe post-thrombotic syndrome (PTS) and compromised inflow.

Methods: A database of patients with severe PTS who successfully underwent endovascular iliofemoral stenting was reviewed retrospectively. Patients with impaired inflow with chronic post-thrombotic obstructive lesions in the femoral vein (FV), but patent profunda vein, were selected and divided into two groups: the FV stenting (FV-S) group and the FV angioplasty (FV-A) group. Patients in the FV-S group were treated with concomitant iliofemoral and FV stenting, and patients in the FV-A group were treated with iliofemoral stenting and balloon angioplasty alone of the obstructed femoral vein. The clinical and stent outcomes were recorded and compared in the two groups.

Results: There were 45 patients in the FV-S group and 69 patients in the FV-A group. The groups were well matched for age, gender, and diseased limbs. The pre-procedural symptoms, CEAP classifications, VCSS scores, Villalta scores, and prevalence of active ulcers were also similar between the two groups. Immediate failure (<30 days post-procedure) in the femoral segment occurred more frequently in the FV-A group (70% in FV-A group vs. 24% in FV-S group, $p < .001$); however, all treated femoral vein segments had occluded at 12 months. There was no significant difference between the FV-S and FV-A groups in cumulative primary and secondary patency rates of the iliofemoral stent at 3 years (55% vs. 52%, $p = .71$, and 77% vs. 85%, $p = .32$, respectively). Complete pain relief, swelling relief, VCSS score, Villalta score, and freedom from ulcers at a median of 22 months (1–48 months) following the procedure were similar in the two groups.

Conclusions: Stent placement to treat post-thrombotic iliofemoral obstruction with concomitant obstructed femoral vein but patent profunda vein shows cumulative patency rates and clinical outcomes similar to previous reports. Adjunctive femoral stenting or angioplasty of the obstructed femoral vein does not appear to improve clinical or stent outcomes in patients with severe PTS.

Article history: Received 19 January 2017, Accepted 24 November 2017, Available online XXX

Keywords: Post-thrombotic syndrome, Chronic post-thrombotic obstruction, Stent, Iliac vein, Femoral vein

INTRODUCTION

Endovascular stenting has become the first line revascularisation approach in many centres for patients with post-thrombotic syndrome (PTS) as a result of chronic post-thrombotic obstructions in the iliofemoral venous segments.[1–3] Many patients with severe PTS have chronic iliofemoral vein obstruction combined with femoral (FV) lesions. Given that the profunda veins and great saphenous veins are usually not involved in extensive deep venous thrombosis,[4,5] they are important inflow vessels into the iliofemoral stent. As reported before, patients with long segment stenting that extends below the inguinal ligament and those with inadequate inflow are at a high risk of occlusion.[5,6] However, whether recanalisation of an obstructive FV with stents

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https://doi.org/10.1016/j.ejvs.2017.11.029

Please cite this article in press as: Ye K, et al., Treatment of Femoral Vein Obstruction Concomitant with Iliofemoral Stenting in Patients with Severe Post-thrombotic Syndrome, European Journal of Vascular and Endovascular Surgery (2017), https://doi.org/10.1016/j.ejvs.2017.11.029

improves iliofemoral inflow and therefore increases the iliofemoral stent patency rate has not been extensively examined. The aim of this study was to compare the stent and clinical outcomes of iliofemoral venous stenting extending into the FV or with FV angioplasty alone in patients suffering from severe PTS and chronic iliofemoral post-thrombotic obstruction extending into the FV, but with a patent profunda vein.

METHODS

Study design

A prospectively maintained database registry of patients with severe PTS that underwent endovascular iliofemoral stenting between January 2012 and December 2015 was retrospectively reviewed (Fig. 1). According to the checklists for PTS in the institution, duplex ultrasound was conducted to map the patency of the great saphenous vein and deep veins in the lower extremity. Ascending venography or venous computed tomography (CT) angiography was also performed when obtaining adequate imaging of the iliac vein and inferior vena cava was difficult with duplex ultrasound alone. Images were reviewed with particular focus on assessing the peripheral inflow into the common FV. Patients with iliofemoral vein obstruction without extension into the inferior vena cava were chosen, and among those only patients with obstructive FV disease and patent profunda vein were included in the study. The excluded patients are presented in Fig. 1, including clinical severity and access points. Patients with an occluded popliteal vein stented through the profunda FV, and patients with occluded profunda FV stented through the great saphenous vein were excluded from the present study. For each included patient the demographics, symptoms, Villalta score,[7] VCSS (Venous Clinical Severity Score), and clinical stage of the CEAP classification (Clinical Etiology Anatomy Pathophysiology classification)[8] were identified and recorded. All patients provided written informed consent before procedures, and the Institutional Review Board of the hospital approved the study protocol for this retrospective analysis.

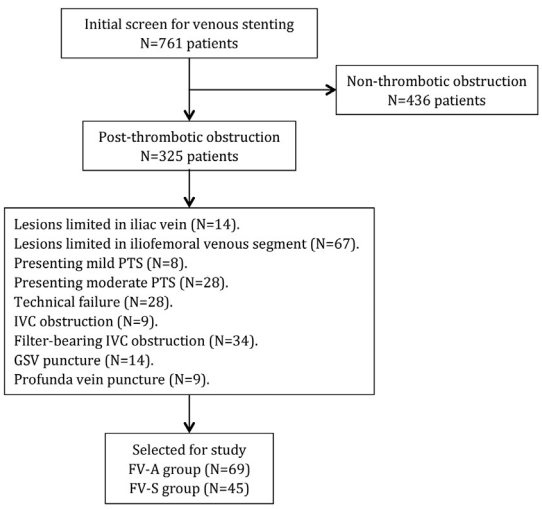

Figure 1. Study algorithm for selection of patients. FV = femoral vein; GSV = great saphenous vein; IVC = inferior vena cava; PTS = post-thrombotic syndrome.

Stenting procedure

After ipsilateral popliteal vein puncture under ultrasound guidance was achieved, heparin sodium 80 IU/kg was administered to achieve an activated clotting time of 250—300 s in all patients. Antegrade venography from the introducer sheath was obtained to define the existing venous anatomical features (Radifocus Introducer II; Terumo, Tokyo, Japan). Details of the balloon angioplasty and stenting procedure have been described in detail previously.[6,7] Briefly, a stiff straight .035 inch hydrophilic guidewire (Terumo Medical Corporation, Somerset, NJ, USA) was directed through the FV obstruction under the guidance of a matched multipurpose catheter or angled tip catheter (MP A1; Cordis Corporation, Miami Lakes, FL, USA; Trailblazer; ev3 Endovascular, Inc., Plymouth, MN, USA). The guidewire was then used to centrally track along the iliofemoral venous segment until the obstruction had been crossed. The progress of recanalisation by the guidewire and catheter was checked by intermittent oblique images and venography to ensure that the guidewire followed the iliofemoral venous segment anatomically through the pelvis. The guidewire was removed after the catheter was successfully advanced through the lesion, and venography was performed to ensure that the catheter tip was located within the lumen of the inferior vena cava.

A balloon catheter (EverCross, ev3 Endovascular, Inc, Plymouth, MN, USA; ReeKross, ClearStream Technologies, Wexford, Ireland; PowerFlex P3, Cordis Corporation Milpitas, CA; Mustang, Boston Scientific Corporation, Natick, MA, USA), with a diameter of 4—16 mm and a length of 60—220 mm, was used for serial dilation from the FV to the common FV, the external iliac vein and the common iliac vein. After balloon angioplasty, self expanding stents (Wallstent, Boston Scientific Corporation; Luminexx; Bard, Austin, TX, USA) with a diameter of 10—16 mm and a length of 60—150 mm were implanted. In the FV-S group (Fig. 2), the stents were deployed in the iliac vein and the common FV, and covered the obstructed FV (all the femoral stents were contiguous with the iliofemoral stents and jailed the inflow of the profunda vein). In the FV-A group (Fig. 3), the stents were limited to deployment in the iliac vein and the common FV just above the inflow from the profunda vein. Usually after the deployment of all stents, post-stent dilation was required because of the common occurrence of severe recoil. The optimum calibre of the stents in the FV, common FV, and iliac vein ranged from 10 mm to 12 mm, from 12 mm to 14 mm and from 14 mm to 16 mm, respectively. In the FV-A group, to achieve the best angiographic result in the FV, a prolonged (at least 180 s) dilatation was performed repeatedly in cases with residual stenosis or recoil. At the end of the procedure, venography was performed from the sheath to assess the success of the procedure and to identify potential recoil, stenosis, and thrombosis.

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