vein outflow obstruction, our data suggest that pelvic venous outflow lesions should be treated first and that ovarian vein reflux should be treated only if symptoms persist. We recommend that during pelvic venography, IVUS should be performed routinely as part of the diagnostic evaluation.

Secondary Interventions After Iliac Vein Stenting for Chronic Proximal Venous Outflow Obstruction

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Background: Iliac stent placement is an increasingly common procedure in the treatment of chronic proximal venous outflow obstruction (PVCO) but secondary interventions after vein stent placement remain poorly characterized. Our goals were to identify the incidence, indications, operative findings, and outcomes of secondary interventions after the primary iliac vein stent procedure in a single institution.

Methods: We retrospectively reviewed the clinical history of 490 patients (42.41% male, mean age: 60.77 years [range, 18–92 years], 93.28% follow-up with a mean follow-up of 308.59 days) who underwent iliac stent placement (Wallstent, Boston Scientific, Marlborough, Mass) for PVOO between October 2013 and June 2016. We specifically evaluated the clinical presentation, intraoperative findings, and outcomes among those patients who required a secondary intervention after an initial iliac vein stent procedure.

Results: Secondary interventions after an initial stent placement were identified in 50 of 490 patients (10.22%; mean age: 61.54 years [range, 19–92 years]; 55% female [n = 28]). Among these 50 patients, 56% (n = 28) of secondary interventions were due to recurrence of symptoms after the initial stent surgery. 24% (n = 12) were due to the development of new symptoms, and 20% (n = 10) were due to persistence of symptoms. Intraoperative findings during the secondary intervention included migration of the stent (8% [n = 4]), acute deep venous thrombosis/thrombophlebitis (12% [n = 6]), an additional lesion (ie, stenosis in a native iliac vein proximal or distal to the original lesion: 50% [n = 25]), stenosis within the stent (stenosis without finding of thrombus or isolated, focal intrastent thrombosis: 16% [n = 8]), impairment of flow of the contralateral vessel from the previous stent (12% [n = 6]), and no finding (2% [n = 1]). The types of secondary interventions were placement of a new stent (80% [n = 40]), isolated balloon angioplasty alone (6% [n = 3]), and catheter PMT (14% [n = 7]). Significant symptomatic improvement was observed after the secondary intervention in 90% of patients (n = 45); 2% (n = 1) of patients experienced only a transient improvement, and 8% of patients (n = 4) reported no improvement in their symptoms.

Conclusions: This study establishes a secondary intervention rate of 10% after iliac vein stent placement for chronic PVOO, identifies discrete and definable intraoperative findings as targets for quality improvement, and indicates that secondary interventions after vein stent placement are associated with a good outcome.

The Technical Evolution and Procedural Outcomes of the Contemporary Hybrid Operative Procedure for Incapacitating Post-Thrombotic Iliofemoral and Inferior Vena Caval Obstruction

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Background: Chronic, post-thrombotic iliobifemoral and inferior vena cava (IVC) obstruction is associated with debilitating post-thrombotic morbidity. Whereas balloon venoplasty and stenting of the post-thrombotic iliac veins are often successful, these procedures performed in the presence of a diseased or occluded common femoral vein (CFV) are frequently associated with incomplete recanalization and failure. Open surgical CFV endovenectomy is designed to provide venous drainage from the involved limb, to restore venous inflow to a recanalized iliacovascular segment, and to provide a nonoccluded landing zone for the iliac vein stent, thereby improving procedural success and reducing the severity of the post-thrombotic syndrome. During the past 8 years, the procedure has evolved to one in which success can be anticipated and complications and failure minimized.

Methods: Thirty-one patients undergoing CFV endovenectomy and proximal endoluminal reconstruction (iliac, IVC) have been analyzed. The initial techniques of patient management were compared with the present techniques, evaluating procedural complications and failures.

The initial procedure consisted of preoperative venography, CFV endovenectomy, patch venoplasty, and intraoperative passage of a guidewire into the patent IVC followed by venoplasty and stenting, with postoperative systemic antiocoagulation. Iliac vein rupture was treated with a stent graft.

The contemporary procedure begins with preoperative venography with guidewire/catheter advancement into the IVC the day before the operative procedure. Patients receive preoperative combined platelet inhibition. The following day, the patient is operated on. This procedure consists of a complete CFV endovenectomy, patch venoplasty, intraoperative balloon venoplasty and stenting of the IVC (if necessary) and iliac veins, landing of the stent into the endovenectomized CFV above the saphenofemoral junction, completion intravascular ultrasound, construction of a small (4-mm) distal CFV arteriovenous fistula, low-dose regional anticoagulation with unfractionated heparin through a popliteal vein sheath, conversion to oral anticoagulation with warfarin, early ambulation, and indefinite oral anticoagulation. Ruptured iliac veins are now treated with a second stent relining the first.

Results: Of the 17 patients, 9 (53%) treated with the early technique had major complications: 4 iliofemoral thromboses, 5 major wound bleeds, and 2 wound infections. One iliac vein rupture treated with a stent graft thrombosed. Of the 24 patients treated with the contemporary techniques, 2 (8%) had procedural complications: 1 seroma and 1 wound infection. One iliac vein rupture, treated with a second stent relining the first, remains patent.

Conclusions: The contemporary hybrid operative procedure for incapacitating post-thrombotic iliofemoral/venacaval obstruction increases procedural success and reduces complications compared with the initial technique. The contemporary technique is preferred for all patients undergoing hybrid operative management of iliofemoral/venacaval post-thrombotic occlusion involving the CFV.

Proceedings in Percutaneous Valvuloplasty

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Background: Experience in vein shaping by perivenous fluids led to the invention and first presentations of percutaneous valvuloplasty (PVP) by ultrasound-monitored perivenous injection in 2013. Meanwhile, ultrasound criteria have been improved, a simple test by perivenous saline injection has been established, and two pilot series with different cross-linked hyaluronan gels have been completed including a 1-year follow-up. Now, a comparison of those two studies is presented.

Methods: Patients with proximal great saphenous vein valve incompetence, preserved or reserved, were included according to 2.5-MHz ultrasound analysis were included. In series A, 23 patients (15 women, 8 men, 38-67 years, diameter, 7.0-11.5 mm [mean, 8.6 mm]) underwent PVP with hyaluronan gel consisting of large particles (>1 mm, Macrolane; Q-Med. Med. Surrey, UK). In series B, a smooth hyaluronan gel (particles <0.2 mm, prototype approved for aesthetic use) was chosen for 18 patients (12 women, 6 men, 34-69 years; great saphenous vein diameter, 7.0-11.8 mm [mean, 8.9 mm]; Fig 1).

Results: Orthograde flow was established in 22 of 23 cases in series A (95.6%) and 18 of 18 cases in series B (100%; Fig 2). Gel volumes were 12 to 35 mL (mean, 19.4 mL) vs 4 to 9 mL (mean, 6.9 mL). There were no adverse reactions. At 1-year follow-up, orthograde flow was present in 15 of 22 cases (68.2%; A) vs 14 of 18 cases (78.6%; B). Cases with recurring reflux successfully received supplementary hyaluronan injections; 2 to 6 mL. At 1-year follow-up, the assisted success rate was 97.6%. Both sub- stances decreased with time, but correlation with the vein diameter was not clear. Meanwhile, 5 of 11 initial cases with >2 years of follow-up

Fig 1. Principle of percutaneous valvuloplasty.
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