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Original Research

Surgical treatment of recurrent varicose veins in the lower limbs associated with endovascular treatment of iliac vein stenosis

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ABSTRACT

Objective: We present our experience with endovascular surgery for recurrent varicose veins (RVV) of the lower limbs combined with the iliac vein compression syndrome (IVCS).

Materials and methods: This study was a retrospective analysis of 6 patients with RVVs combined with IVCS who were admitted to our hospital between January 2007 and December 2014. Transfemoral venography was performed to confirm IVCS. Balloon dilation and stent placement were successful in all 6 patients. The varicose veins were treated by traditional surgery after the endovascular therapy. The visual analog pain scale (VAS) score and venous clinical severity score (VCSS) were collected before surgery and at 6-months follow-up, and were analyzed using the paired student t-test. Patency of the iliac vein was assessed via duplex Doppler ultrasound.

Results: The rate of technical success was 100%. There was a significant ($p < .001$) improvement in VCSS postoperatively. During the 6-month follow-up period, no RVVs were observed and the rate of iliac vein patency was 100%. Importantly, VAS ratings also decreased significantly ($p < .001$) during the follow-up.

Conclusion: Endovascular surgery for IVCS combined with traditional surgery focused on varicose veins is an effective procedure for treating RVVs of the lower limbs associated with IVCS within 6 months.

1. Introduction

Recurrent varicose veins (RVVs) of the lower extremities occur in 7%–65% of patients following treatment, and this rate is expected to increase with longer duration of follow-up. Lower limb RVV is a complex disease caused by several etiological factors [1–4]. The most important contributors are inadequate primary intervention and neovascularization. Tactical and technical errors such as neglect of the iliac vein compression syndrome (IVCS) are attributable to inadequate treatment and are reported to be the most important cause of RVV [5]. It is insufficient to ligate and strip varicose veins alone without identifying the source of reflux and all the incompetent veins associated with the venous reflux, while abnormal hemodynamics and obstructive component are uncorrected.

IVCS, also known as the May-Thurner syndrome, is the pathologic compression of the left common iliac vein by the right common iliac artery and the fifth lumbar vertebrae [6,7]. IVCS is more common in younger and middle-aged women and can result in chronic symptoms of venous hypertension such as edema and varicose veins. It is reported that IVCS is an independent etiologic factor for RVV [8]. In recent years, endovascular treatment has been developed as an effective technique for IVCS [9,10], but there are few reports regarding the treatment of RVVs caused by iliac vein compression. We report our experience with endovascular treatment for RVVs associate with IVCS including the clinical details, endovascular techniques, complications, and long-term outcomes.

2. Materials and methods

2.1. Patient selection and evaluation

Between January 2007 and December 2014, 181 consecutive patients (187 limbs) with RVVs, classified in accordance with a clinical definition adopted in the international consensus meeting held on "recurrent varices after surgery" in Paris, were studied [11]. All patients received transfemoral venography to ascertain disease etiology. Six patients were confirmed to have IVCS via venography and were included in this study. The mean patient age was 59.3 ± 3.8 years. Complaints included lower extremity swelling (4 cases), ulcer (6 cases), and leg skin pigmentation (6 cases), while comorbidities comprised

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hypertension (2 cases), diabetes mellitus (2 cases), and smoking (4 cases). The 6 patients were assessed before the operation and during follow-up using a visual analog pain scale (VAS) score and venous clinical severity score (VCSS).

The subjects underwent balloon dilation and stent insertion. After the endovascular therapy, 4 patients received great saphenous vein (GSV) ligation and stripping and transilluminated powered phlebectomy (TRIVEX), 1 patient received ligation and sclerotherapy, and 1 patient underwent ligation and TRIVEX. All procedures complied with the principles of the Declaration of Helsinki and written informed consent was obtained from all patients. The China-Japan Friendship Hospital ethics committee approved the study.

2.2. Technique

A 10-F introducer was used to access the left right common femoral vein in all patients under local anesthesia plus sedation (midazolam and sufentanyl), and a 0.35-inch guide wire was directed through the stenosed region of the iliac vein and advanced up to the inferior vena cava. Thereafter, we used a multi side-hole catheter to assess the location, length, and severity of the iliac vein stenosis and to note the collateral vessels via venography of the iliac vein and inferior vena cava. When it was ensured that the catheter was in the real lumen, balloon catheters (details are shown in Table 2) were delivered for dilation and were inflated for 20–30 s at 6–10 ATM. After the stenosis of the iliac vein was corrected, self-expanding stents of appropriate length and diameter (Table 2) were implanted in the target site. The length and diameter of the stent were determined by the length and diameter of the lesion. The cephalad end of the stent extended approximately 1.0 cm into the inferior vena cava (Fig. 1 a–d).

The varicose veins were treated after the endovascular therapy. TRIVEX and large saphenous vein ligation and stripping were performed in 4 patients, and 2 patients underwent ligation combined with sclerotherapy or TRIVEX, respectively.

All patients received intravenous heparin (100 IU/kg) immediately before the procedure, followed by 4000 IU low-molecular-weight heparin every 12 h for 3 days after endovascular surgery. Patients received dual antiplatelet therapy (aspirin, 100 mg/day orally; clopidogrel, 75 mg/day orally) for at least 6 months after the procedure.

The 6 patients wore an elastic bandage for 3 days and then wore graduated compression stockings (30–40 mmHg) for almost 3 months. The local ulcers were managed conservatively in the same from the preoperative period until healing. All patients were followed for 6 months after successful treatment and were asked to fill the VAS and VCSS. Symptoms such as edema were assessed and duplex Doppler ultrasound was used to evaluate stent patency during follow-up.

2.3. Data collection and statistical analyses

Individual data are reported as mean ± standard deviation or as the number of cases and proportion. All patient clinical data, VAS, and VCSS scales were entered into the database. SPSS version 21.0 was used for statistical analyses and paired student t-test was used for comparing VAS and VCSS pre-procedurally and during follow-up. $p < .05$ was considered significant.

Table 1
Demographic data of patients.

Variables	Value
Sex (male/female)	4/2
Age (years)	59.3 ± 3.8
Lower extremity swelling (n)	4
Ulcer (n)	**6**
With DVT (n)	0
Leg skin pigmentation (n)	6
Hypertension (n)	2
Diabetes mellitus (n)	2
Smoking (n)	4

DVT = deep vein thrombosis.

Table 2
Parameters of balloons and stents.

No. of patients	Diameter of balloon (mm)	Length of balloon (mm)	Diameter of stent (mm)	Length of stent (mm)
1	8	40	14	60
	10	40		
2	6	80	14	60
	12	40		
3	12	40	16	60
	14	40		
4	6	80	14	60
	12	40		
5	8	40	14	60
	10	40		
6	12	40	16	60
	14	40		

3. Results

Demographic data of the 6 patients are shown in Table 1. Catheterization, venography, balloon dilatation, and stent implantation were successful in all patients. The varicose veins were completely treated with large saphenous vein ligation and stripping, TRIVEX, or sclerotherapy. No complications were observed during the operation and follow-up.

As shown in Table 3, there was a significant decrease in VAS during follow-up from 8.2 to 1.7 (t-value, 17.8; $p < .001$). VCSS decreased from 8.2 to 2.8 (t-value, 12.6; $p < .001$). All the ulcerations and dermaitits (Fig. 2) were totally healed. No RVVs were observed and the patency of iliac vein was 100% during the follow-up period.

4. Discussion

Our results suggest that endovascular treatment is **a** safe and effective procedure for RVVs associated with IVCS. Ye et al. [8] reported venous stent placement as an effective method for IVCS treatment in chronic venous disease. Currently, there are a few reports on RVVs associated with IVCS.

Despite advances in treatment, the incidence of RVV remains high and RVVs have been reported to occur in 7–65% of patients after the primary operation [1–4]. The variations in RVV incidence may come from differences in RVV definition. We used the clinical definition of RVV adopted in an international consensus meeting held in Paris in 1998 regarding RVV after surgery [11]. The major causes of RVVs are as follows: 1) genuine persistent saphenofemoral confluence with inguinal reflux [12]; 2) disease progression that derives from the evolution of a remote or second saphenous system **s**uch as small saphenous vein [5,12]; and 3) neovascularization, referring to the formation of new blood vessels in an abnormal place [5,13], which occurs under the influence of various factors including mechanical stresses or inflammation [14]. Our study found some patients had RVV with IVCS and we simultaneously treated the IVCS via endovascular surgery.

IVCS is venous outflow obstruction caused by extrinsic compression of the arterial system and bony structures and intraluminal webs or spurs of the iliac vein [6,7]. Dzieciuchowicz et al. [15] reported that iliac vein lesions are common in patients with primary varicose veins (PVV) but are not associated with PVV. IVCS is accompanied by 2–5% of chronic deep venous insufficiency [16,17]. The presence of IVCS may be associated with RVV. The correction of outflow obstruction of the iliac vein may be helpful for the treatment of RVV. In this study, we performed transfemoral venography for 181 RVV patients and found