

## Original Article

# SUBFASCIAL ENDOSCOPIC PERFORATOR VEIN SURGERY: THE FIRST REPORT FROM IRAN

Ali Jafarian MD\*, Seyed-Hassan Emami-Razavi MD\*, Mehdi Neshati MD\*\*

**Background:** Chronic venous stasis ulcers of the leg are still a challenge in vascular surgery. Innovation of new surgical techniques using endoscopic instruments have ushered in a new era with less complications and better results. This study was designed to evaluate the safety and long-term outcomes of this technique for the first time in Iran.

**Methods:** Subfascial endoscopic perforator vein surgery was performed on 10 legs in 8 patients who had signs of chronic venous insufficiency (between September 2001 and September 2003). Patients were followed up for a mean of period 12.5 months.

**Results:** The operations were performed successfully in all patients. No serious complications occurred intraoperatively. There was no mortality or significant morbidity. Complete healing of skin ulcers was observed in 5 active and 2 healed ulcers in less than 12 weeks. There were 2 recurrences after 4 and 27 months, respectively.

**Conclusion:** Subfascial endoscopic perforator surgery is a safe procedure for the treatment of venous stasis ulcers. Rapid ulcer healing can be expected in selected patients.

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**Keywords:** Chronic venous insufficiency • subfascial endoscopic perforator surgery (SEPS) • venous stasis ulcer

## Introduction

Venous stasis ulcers, which result from chronic venous insufficiency (CVI), are a long-term disabling problem. Stasis ulcers and lipodermatosclerosis result from venous hypertension, caused either by primary venous insufficiency of deep, superficial, or perforator veins or as a late complication of deep vein thrombosis (DVT).<sup>1</sup> The latter is named post-thrombotic syndrome. Perforator veins, which connect deep and superficial venous systems, are thought to play an important role in the pathogenesis of these ulcers.<sup>2</sup>

Surgical therapy for this problem was introduced in 1938 by Linton who suggested the

subfascial ligation of perforators.<sup>3</sup> His procedure, which requires long incisions, has been modified several times due to infections and healing complications.<sup>4</sup>

A minimally invasive technique was used by European surgeons in mid-1980s for sectioning the perforator veins; these were followed by others in the United States.<sup>5,6</sup> Gloviczki and colleagues later reported a larger series of patients treated with this technique, called subfascial endoscopic perforator surgery (SEPS).<sup>7</sup>

This is the report of the first series of patients treated with this technique in Iran with intermediate-term follow-up.

## Patients and Methods

From September 2001 through September 2003, ten SEPSs were performed for 8 patients in the Imam Khomeini Medical Complex. All referred patients with signs and symptoms of CVI were enrolled in the study. Exclusion criteria were concomitant arterial disease and deep venous

**Authors' affiliations:** \*Department of General Surgery, \*\*Department of Cardiac Surgery, Imam Khomeini Medical Complex, Tehran University of Medical Sciences, Tehran, Iran.

•**Corresponding author and reprints:** Ali Jafarian MD, Department of General Surgery, Imam Khomeini Medical Complex, Keshavarz Blvd, Tehran 14197, Iran. Telefax: +98-21-66937185, E-mail: jafarian@tums.ac.ir.

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obstruction. Grade of CVI (1 to 6) was not included in exclusion criteria, although all patients had grade 4 or higher disease. Comprehensive explanation about the procedure and the expected outcome was delivered to each patient. Duplex study of deep, superficial, and perforator veins was done in all patients and incompetent perforators were marked, if possible.

The operation was performed under general or spinal anesthesia according to the patient's and anesthetist's preferences. Standard laparoscopic equipment was used. A tourniquet was applied on the upper thigh. CO<sub>2</sub> was insufflated through a 10 mm port inserted beneath the fascia 8 cm below the tibial plateau and 2 cm medial to its medial edge. Pressure was increased up to 30 mmHg. A second 10 mm port was used for instrument 6 – 8 cm posterior and inferior to the first port. Full dissection of the subfascial space in the medial half of the leg was done from the knee down to the medial malleolus.<sup>8</sup> Perforators, sized larger than 2 mm, were clipped and cut. Smaller perforator veins were cauterized. At the end of the operation, concomitant venous disorders including superficial dilated varicosities, incompetent saphenofemoral junctions (SFJs), and saphenopopliteal junctions (SPJ) were managed appropriately. Incisions were closed with fine absorbable sutures. Elastic bandages were applied from foot to thigh. Patients were ambulated the day after the operation and discharged on second postoperative day.

All data regarding the preoperative and intraoperative findings, as well as regarding follow-up visits, were recorded. Patients' feelings regarding the outcomes of the surgery were recorded using a three-point scale: satisfied, partially satisfied, and dissatisfied. Data are presented in numbers with no percentages stated due to the limited sample size.

## Results

Ten legs (6 left and 4 right) were operated in 8 male patients. The mean age of these patients was 39.6 years (range: 21 to 46 years). Two patients reported a history of trauma and fractured bones in the involved leg. A history of DVT was present in 3 others (4 limbs). Four legs had histories of previous open operations on varicosities and three SFJ ligations. The clinical findings of these patients are depicted in Table 1. As shown, all patients had active (grade 6) or healed (grade 5) stasis ulcers. The mean duration of symptoms was

**Table1.** Clinical findings of chronic venous insufficiency in 10 legs.

	Grade*	No.
Active ulcer	6	7
Healed ulcer	5	3
Pigmentations	4	10
Lipodermatosclerosis	4	4
Edema	3	7
Superficial varicose	2	3
<b>Total</b>		<b>10</b>

\* Grade of chronic venous insufficiency (grade 1 is telangiectasis and small venous spiders).

9.1 years (range: 2 to 14 years). Colored Doppler study showed incompetent perforators in 9 legs, as well as 2 SFJs and 1 SPJ incompetence. Femoral vein insufficiency was reported in 2 patients. None of the patients had deep vein obstructions.

The mean tourniquet time was 70 minutes (range: 50 to 90 minutes), which represents the operation time. A mean of 3.7 perforator veins per patient were detected (range: 1 to 6 veins). An average of 2.7 veins per patient were clipped and 1 vein cauterized, considering the size. Open ligation of one lower-third perforator was performed due to poor clip applicator access. Accompanying problems, which were managed surgically in 4 limbs, included 2 SFJ ligations, one SPJ ligation, and 2 superficial varicose pocket excisions.

There were few intraoperative complications. One perforator was retracted to the muscle after cutting and causing bleeding. It was packed with an elastic bandage according to routine procedure without any complications. Arterial bleeding from a muscular branch occurred in one patient after deflating the tourniquet. Distal pulses were normal on physical examination, so bleeding was controlled by compression and bandage. The patient had no additional problems during the postoperative course. One case of late wound infection occurred at the site of port insertion 2 months after the operation. Another patient incurred an infection in the stasis ulcer itself which was managed without hospital admission. There was no DVT in our patients.

One patient was lost to follow-up. The mean follow-up time was 12.5 months (range: 1 to 30 months) in the remaining 9 limbs. Complete healing of active ulcers was observed in 5 of 7 limbs (71%). The remaining 2 patients had partial epithelialization of the wound; both of them had a history of DVT. Healing of the skin and disappearance of the ulcer occurred in 2 other legs which presented with healed ulcers. At the first postoperative visit one month after the operation,

patients were satisfied of the outcome for 6 limbs. An additional 2 patients were partially satisfied and one patient was dissatisfied. The latter was a postthrombotic case with history of previous operation on the limb and no overt incompetent perforator on duplex study.

Recurrence of primary symptoms was seen in 2 patients 4 and 27 months after surgery, respectively. The first patient had a history of fracture and a previous operation on the limb; this patient presented with a healed ulcer again. Of note, this patient's job required long periods of standing and he did not use the elastic stocking on the affected limb after the operation. This patient was referred to us again 11 months after the postoperative visit. The second patient used elastic support continuously after the operation. In this case, the active ulcer recurred after 2 years. This patient had a history of DVT. Repeat duplex study showed SFJ incompetence and recurrent incompetent perforator veins in both veins. The primary duplex study in these patients did not show SFJ incompetence. The first patient was reoperated 12 months after the primary operation by open technique. The great saphenous vein was varicose in the leg and one perforator was detected in the middle-third of the leg.

## Discussion

CVI neither makes the patient bedridden nor medically compromised, but causes major lifelong disability. Many therapeutic options have been suggested for this disease. The disease has complex pathogenesis in which three systems including deep, superficial, and perforator veins may play a role.<sup>9</sup> It must be emphasized that all aspects of CVI should be addressed if success is anticipated and any procedure should be performed with careful selection.<sup>10</sup>

All of our patients were middle-aged males except for one twenty-one-year-old posttrauma patient. This represents the amount of active work potential that this disease can cause to be lost.

The technique was performed with standard laparoscopic instruments and no specific device was needed. This means that this technique can be performed wherever laparoscopy is available, provided that surgeons trained in endoscopic procedures are present. We had no significant problem in performing the operation. The learning

curve for this technique must be evaluated, but we think that it is not unreasonably steep. The time of operation steadily decreased with practice; from 90 minutes in first two patients to 50 minutes in the last two. The main intraoperative problem was positioning of the leg to achieve good exposure and optimal access for instruments. Routine use of tourniquet helps a lot towards working in a bloodless field. In the first patient, when the tourniquet time reached 90 minutes we deflated it. Thus, clipping the last perforator around the medial malleolus was very difficult in a bloody field. Duplex-guided marking of incompetent perforators did not help us in localizing them, as was desired. This may be because, the study was performed by different radiologists with variable degrees of experience in this field.<sup>11</sup>

There was no postoperative mortality or significant morbidity, that increases hospital stay associated with this procedure, in our patients.<sup>12</sup> The operation can be performed in outpatient settings and does not require more than overnight observation.<sup>13, 14</sup> We discharged our patients on the second postoperative day due to their preference to pass another day under observation or their needs to travel to other cities following hospital discharge.

Although primary healing of stasis ulcers can be achieved by medical treatment, the length of this plan, as well as high rates of noncompliance to it, cause high failure rates. Four of five active ulcers healed completely in less than 6 weeks and one within 12 weeks. This is shorter than reported times for more conservative strategies without the need for long-term rest and recovery.<sup>15, 16</sup> All patients accepted the procedure despite complete discussions about the unpredictable outcome of the surgery; this was likely because these had tried other therapeutic options already which were unsuccessful.<sup>17</sup> We found better outcomes in patients with prominent and dilated perforators, especially around the ulcer. Large perforators were observed in the 5 patients who had complete healing of the ulcers. It seems that intraoperative detection of dilated perforators helps the surgeon to predict the outcome of the procedure. Another important finding is that all failures of the procedure, including primary nonhealing or recurrence, occurred in patients with histories of trauma or DVT. This is compatible with other reports that emphasize patient selection and anticipate good results in cases with primary venous insufficiency.<sup>18</sup>

Routine use of elastic stockings was ordered postoperatively in addition to changes in lifestyle and avoidance of long periods of standing. None of the patients could adhere to these orders for a long time, but all of them used some form of elastic support during the first month. This may play a role in faster healing of the ulcers, but could not be considered as an important factor for the long-term results of the operation.

We concluded that SEPS is a safe procedure for the treatment of chronic venous stasis ulcers that results in low morbidity and short hospital stays. Good results can be expected with adequate patient selection, preoperative work-ups including duplex studies of the venous system, meticulous dissection of the subfascial plane, and concomitant management of superficial varices. It must be emphasized, however, that stasis ulcers have a complex pathophysiology of which perforators are only one component. This procedure can help if perforators are the major cause of disease. More rapid healing of the ulcers and long-term freedom from ulcer recurrence can be expected in these cases.<sup>19</sup>

This relatively new technique can be performed with safety and a success rate similar to those in other reports.

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## References

- 1 Scott HJ, Coleridge-Smith PD, Scurr JH. Histological study of white blood cells and their association with lipodermatosclerosis and venous ulceration. *Br J Surg*. 1991; **78**: 210 – 211.
- 2 Homans J. The operative treatment of varicose veins and ulcers based upon a classification of these lesions. *Surg Gynecol Obstet*. 1916; **22**: 143 – 158.
- 3 Linton RR. The communicating veins of the lower leg and the operative technique for their ligation. *Ann Surg*. 1938; **107**: 582 – 593.
- 4 DePalma RG. Surgical therapy for venous stasis. *Surgery*. 1974; **76**: 910 – 917.
- 5 Hauer G. The endoscopic subfascial division of the perforating veins-preliminary report [in German]. *Vasa*. 1985; **14**: 59 – 61.
- 6 Jugenheimer M, Junginger T. Endoscopic subfascial sectioning of incompetent perforating veins in treatment of primary varicosis. *World J Surg*. 1992; **16**: 971 – 975.
- 7 Gloviczki P, Cambria RA, Rhee RY, Canton LG, McKusick MA. Surgical technique and preliminary results of endoscopic subfascial division of perforating veins. *J Vasc Surg*. 1996; **23**: 517 – 523.
- 8 Gloviczki P, Rhodes JM. Management of perforator vein incompetence. In: Rutherford RB, ed. *Vascular Surgery*. 15th ed. Philadelphia: WB Saunders; 2000: 2021 – 2037.
- 9 Padberg FT Jr. Endoscopic subfascial perforating vein ligation: its complementary role in the surgical management of chronic venous insufficiency. *Ann Vasc Surg*. 1999; **13**: 343 – 354.
- 10 Rhodes JM, Gloviczki P, Canton L, Heaser TV, Rooke TW. Endoscopic perforator vein division with ablation of superficial reflux improves venous hemodynamics. *J Vasc Surg*. 1998; **28**: 839 – 847.
- 11 Hauer G, Bergan JJ, Werner A, Mitterhusen M, Nasralla F. Development of endoscopic dissection of perforating veins and fasciotomy for treatment of chronic venous insufficiency. *Ann Vasc Surg*. 1999; **13**: 357 – 364.
- 12 Lee DW, Chan AC, Lam YH, et al. Early clinical outcomes after subfascial endoscopic perforator surgery (SEPS) and saphenous vein surgery in chronic venous insufficiency. *Surg Endosc*. 2001; **15**: 737 – 740.
- 13 Bergan JJ, Murray J, Greason K. Subfascial endoscopic perforator vein surgery: a preliminary report. *Ann Vasc Surg*. 1996; **10**: 211 – 219.
- 14 Stuart WP, Adam DJ, Bradbury AW, Ruckley CV. Subfascial endoscopic perforator surgery is associated with significant less morbidity and shorter hospital stay than open operation (Linton's procedure). *Br J Surg*. 1997; **84**: 1364 – 1365.
- 15 Sato DT, Goff CD, Gregory RT, et al. Subfascial perforator vein ablation: comparison of open versus endoscopic techniques. *J Endovasc Surg*. 1999; **6**: 147 – 154.
- 16 Baron HC, Saber AA, Wayne M. Endoscopic subfascial surgery for incompetent perforator veins in patients with active venous ulceration. *Surg Endosc*. 2001; **15**: 38 – 40.
- 17 Nelzen O. Prospective study of safety, patient satisfaction, and leg ulcer healing following saphenous and subfascial endoscopic perforator surgery. *Br J Surg*. 2000; **87**: 86 – 91.
- 18 Kalra M, Gloviczki P. Subfascial endoscopic perforator vein surgery: who benefits? *Semin Vasc Surg*. 2002; **15**: 39 – 49.
- 19 Kalra M, Gloviczki P. Surgical treatment of venous ulcers: role of subfascial endoscopic perforator vein ligation. *Surg Clin North Am*. 2003; **83**: 671 – 705.