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Recurrent Varicose Veins Following Surgical Treatment: Our Experience with Five Years Follow-up

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Objective. *To report the 5 year outcome of varicose veins surgery and to establish the factors determining recurrence.*
Study Design. *Prospective observational study.*
Materials and Methods. *This study reports the outcome in 1326 patients treated in a day surgery centre of an institutional referral centre. Patients were investigated clinically and by colour flow duplex scanning before operation. Treatments used included flush ligation of the sapheno-femoral junction (SFJ) and the sapheno-popliteal junction (SPJ). Incompetence of the great saphenous vein (GSV) and small saphenous vein (SSV) were managed by stripping of these veins. Perforating vein ligation and hook phlebectomy were also used. Patients were evaluated 3 weeks and 5 years following treatment by clinical examination and duplex ultrasonography.*
Results. *412 patients were excluded from the study because they failed to attend for follow-up or did not wear elastic stockings post-operatively. No residual saphenous truncal reflux was found at the initial assessment 3 weeks following surgery.* ***After 5 years***, *recurrence of varicose veins occurred in 332 patients out of 1326 (25 %). Recurrences arose at the sapheno-femoral junction in 109 out of 862 patients (13%), at the sapheno-popliteal junction in 39 out of 132 patients (30%), in both saphenous regions 38 out of 107 patients (36%) and in 146 out of 225 subjects (65 %) with secondary varicose veins.*
Conclusion. *Varicose veins recurred despite technically correct surgery confirmed on post-operative duplex ultrasonography. The likelihood of recurrence increased in the presence of SSV reflux, perforating vein incompetence and post-thrombotic deep vein incompetence.*

Keywords: Varicose veins; Surgical treatment; Recurrent varicose veins; Ultrasound examination.

Introduction

Recurrent varicose veins remain a common, complex and costly problem in surgical practice despite improvements in preoperative investigation and surgery for varicose veins. We can define recurrent varices as ''the presence of varicose veins in a lower limb previously operated on for varices''.[1]

There are few epidemiological data specifically relating to recurrent varicose veins and the retrospective studies which have been published are not easy to compare because of differences in the definition of recurrence, differences in the initial treatment, the classification of recurrences and the method and duration of follow-up.

The reported rate of clinical recurrence ranges from 20% to 80% after an interval of between 5 and 20 years post-operatively.[2] Jones[3] investigated patients by colour flow duplex scanning (CFDS) and showed recurrence in 43% of patients 2 years after surgical ligation and in 25% after ligation and stripping of the saphenous trunk. Couffinhal[4] reported clinical and CFDS evaluation and showed a recurrence rate at 2 years of 16%. Creton[5,6] showed more frequent recurrence in the small saphenous vein (50% at 6 years) compared to the great saphenous vein (50% at 12 years). The rate of recurrence increases with time, probably because of progression of the disease. Nevertheless, the average time between the first and the second surgical treatments is long raging from 6 to 20 years.[7–10]

The advent of non-invasive vascular laboratory techniques such as CFDS has not only enhanced preoperative assessment facilitating better varicose vein surgery, but has provided better tools for monitoring surgical outcome. A few studies have reported the early outcome of treatment with this approach, but there is no moderate or long-term prospective study using CFDS after surgery that describes the anatomical and physiological changes that leading. Our study describes a 5-year follow-up of superficial vein surgery with clinical and CFDS evaluation. The aim of

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this study was to define the patterns of recurrence after 5 years of follow-up after varicose veins surgery and to establish the anatomical distributions of venous incompetence most likely to give rise to recurrence.

Materials and Methods

Patients referred to the Dept of Angiology of S. Giovanni Hospital, Rome, for primary superficial vein surgery for venous valvular incompetence, were invited to participate in a prospective observational study. Patients who gave informed written consent were included in the study. 1326 consecutive patients of 1738 evaluated participated in this series. We studied 968 women and 358 men, mean age 42 S.D. 12 years, during a period of 13 years (1989–2001) with a follow-up of 5 years. 412 patients left the study because they did not attend follow-up examinations or declined to wear elastic stockings, as we had requested. Patient demographic data, the type of operative procedure, and any history of deep venous thrombosis were recorded.

Our usual practice when treating patients with bilateral varicose veins is to treat one limb at a time, leaving a period of three months between the first and the second operation. In this way we allow complete recovery of the patient and resolution of symptoms and signs following surgical treatment. In this study, we considered each patient as a new referral if he was treated a second time for the other limb. Patients were assessed clinically and then in the vascular laboratory with CFDS as part of the routine pre- and post-operative evaluation. Clinical disease severity was graded according to the CEAP classification and with the clinical scoring system. All patients had symptoms corresponding to CEAP clinical class 2–4. Following the clinical and CFDS examination, each limb was assigned a clinical (C), an anatomical (A) and a disability (D) score. In order to compare the pre- and post-operative condition of each limb, the scores were added to produce a total severity score (C + A + D) (Table 1).[10] Varicose veins were defined as tortuous veins >3 mm, according to the definition suggested by a recent consenus group of the International Union of Phlebology.[11] We divided the patients into 4 anatomical groups according to the type of pre-operative venous incompetence resulting from pre-operative clinical and CFDS findings (Table 2).

Patients in group A ($n = 862$) were those affected by primary incompetence of sapheno-femoral junction and great saphenous vein. This was further divided into 3 sub-groups comprising group A1 with primary incompetence of sapheno-femoral junction alone, group A2 with primary incompetence of sapheno-femoral junction and perforators of thigh and group A3 which included patients with primary incompetence of sapheno-femoral junction and perforators of thigh and calf. Group B comprised those patients affected by primary incompetence of sapheno-popliteal junction and small saphenous vein ($n = 132$). Group C comprised patients with combined incompetence of sapheno-femoral and sapheno-popliteal junctions ($n = 107$). Group D included all patients with

Table 1. Case reports according to CEAP classification

Clinical class CEAP	
C0	0 limbs
C1	0
C2	1326
C3	38
C4	418
C5	0
C6	0
Clinical score (C)	
Pain	947 limbs
Edema	38
Venous claudication	137
Pigmentation	418
Lipodermatosclerosis	285
Ulcer size (largest)	0
Ulcer duration	0
Ulcer recurrence	0
Ulcer number	0
Anatomic score (A): (each part affected: 1 point, not affected: 0 points)	
Superficial veins (A)	
Telengiectasias/reticular veins	538 limbs
GSV above knee	1079
GSV below knee	969
Small saphenous vein	239
Non saphenous veins	342
Deep veins (D)	
Inferior vena cava	0
Common iliac	76
Internal iliac	0
External iliac	92
Pelvic/gonadal, and other	0
Common femoral	184
Deep femoral	7
Superficial femoral	225
Popliteal	67
Crural: anterior, tibial, posterior tibial, peroneal	34
Muscular/gastrocnemius, soleus, other	28
Perforating veins (P)	
Thigh	112
Calf	337
Disability score (D)	
Asymptomatic	0
Symptomatic, functioning without support device	908
Ability to work 8-hour day only with support device	418
Unable to work even with support device	0
Severity (CAD) score (C + A + D Total score)	

We report the clinical classes according to the advanced CEAP classification.

Table 2. Case report divided in groups according to the types of venous incompetence before surgery

Groups	No. of pts	% of all pts	Type of venous incompetence	No. of women	%	No. of men	%
A	862	65	Primary GS	672	78	190	22
A1	413	48	only junction	318	77	95	23
A2	243	28	junction + Hunter perforator	167	69	76	31
A3	206	24	junction + Hunter + leg perforators	148	72	58	28
B	132	10	Primary SS	99	75	33	25
C	107	8	Primary association (GS + SS)	74	70	33	30
D	225	17	Post-thrombotic, GS area	123	55	102	45

post-thrombotic syndrome in which saphenous varices arose secondary to deep vein incompetence ($n = 225$).

All patients were examined before surgical treatment and during the follow-up by means of clinical examination and colour flow duplex scanning (CFDS) by the same surgical team. Whole-leg CFDS with a high definition ultrasound system (128 XP/5 scanner − Acuson, Siemens Medical Solutions USA Inc., Malvern PA 19355, United States) with a 7-MHz linear probe was performed as described in literature.[10] All examinations were performed by one of two vascular physicians who were experienced in the management of venous disease. The deep and superficial systems fully investigated from the groin to the ankle. All named veins were assessed and variants sought. The presence of flow from the deep to superficial venous system in perforating veins was assessed in the thigh and calf. Imaging of the thigh veins was performed with the patient in a 30-degree reverse Trendelenburg position. Popliteal and calf veins were scanned with the patient sitting. Reflux was defined as retrograde flow persisting for 0.5 seconds or more after a manual compression-release manoeuvre or Valsalva manoeuvre. Incompetence in perforator veins was defined as bidirectional flow with similar compression-release manoeuvres proximal or distal to the perforating vein. In this study we did not take into account venous reflux of pelvic origin, considering only competence or incompetence of the SFJ in the analysis of these data.

The patients were treated by different vascular surgeons, using similar surgical procedures. A treatment plan was established for each patient according to the pattern of venous reflux demonstrated by CFDS in the pre-operative examination:

(a) stripping of GSV (from the sapheno-femoral junction to the medial malleolus), with ligation of the SFJ and inguinal tributaries,
(b) stripping of SSV (from the sapheno-popliteal junction to the lateral malleolus),
(c) division and extra-fascial ligation of the incompetent perforating veins identified with the CFDS, avulsion of tributary varicosities with Muller hooks.

Only incompetent perforators which marked venous reflux were ligated; no surgical correction of deep vein incompetence was carried out. Similar anaesthetic techniques were used in all patients: femoral and sciatic nerve blockade, mepivacaine 2% 10 ml + 10 ml NaCl solution, tumescent anaesthesia along saphenous and collateral veins with mepivacaine 2% 10 ml in 250 ml NaCl solution, propofol 50 mg i.v. during stripping manoeuvres, midazolam 1−2-mg i.v. for pre-medication.

In patients undergoing surgery in whom there was evidence of previous venous thrombosis on CFDS, surgical treatment was only undertaken if the CFDS showed complete re-canalization of deep venous system.

Compression was applied by bandaging the limb for a period of 3 days immediately following surgery. When the bandages were removed patients were supplied with a class 2 compression stocking to wear for 20 days. Subsequently patients only wore elastic compression when there was a clinical indication for this, such as post-thrombotic syndrome.

The first post-operative examination was performed after 2−3 weeks. Both clinical examination and CFDS were undertaken to assess the immediate results of surgery. After the initial follow-up assessment, practice varied between surgeons and a number of additional examinations were undertaken. Five years after surgical treatment all patients were invited to return for a further clinical examination and investigation by CFDS. Investigations were performed in the same vascular laboratory as the preoperative investigations. Clinical recurrence of varicose veins was defined as appearance of new varicose veins not present following surgical treatment. Clinical progress and venous anatomical changes demonstrated by the CFDS evaluation were recorded.

During post-operative CFDS examinations particular attention was given to the SFJ by identifying the configuration and number of recurrent channels of vein reflux and their connections in the groin. A

Valsalva manoeuvre was the most frequently used method to elicit venous reflux in these examinations. Patterns of reflux included: single narrow channel (diameter = <3 mm), single large channel (>3 mm), multiple small channels, and no connection between common femoral vein and superficial veins in the groin. In this latter group, reflux in the groin was from epigastric or pudendal veins. We defined neovascularisation as the presence of visible, small, thin-walled serpentine venous tributaries entering the site of the ligated saphenofemoral junction on CFDS. A successfully ligated junction was defined as the absence of any residual stump which could be identified during the CFDS examination.

Results

Clinical examination and CFDS showed no residual saphenous trunk or reflux at the first examination after surgical treatment (2–3 weeks). No patient was found to have residual incompetence of venous superficial system. Patients reported no symptom arising from the venous system at the first follow-up examination. The signs of chronic venous disease such as pigmentation and lipodermatosclerosis were still present.

Despite our policy of stripping the GSV to the ankle we encountered no case of complete saphenous nerve injury, neither did we encounter any other major complication such as haematoma or lymphocoele. Paraesthesia in the region of the medial malleolus were often present but we did not consider this to be a major complication because it diminishes with time and is not unacceptable to the patient.

After 5 years, the percentage of recurrences in all patients (1326) was 25% (332 patients) although the incidence of recurrence was different amongst the 4 groups. This rate was unaffected by age, gender or side of limb. The details of recurrence are shown in Table 3. The data here are derived from both clinical and duplex ultrasound examinations. Table 3 shows that in groups A1 and A2 (GSV with or without thigh perforating vein incompetence) there rate of recurrence was very low. However, in those patients with incompetent calf perforating veins recurrence was seen in one quarter. In patients with small saphenous vein reflux, with or without GSV reflux the recurrence rate was close to one third of limbs. Perhaps not surprisingly, the highest rate of recurrence was seen in those patients with post-thrombotic syndrome (65%).

Clinically, symptoms were present in 234 lower limbs out of 332 (70%) which the patients ascribed to the recurrent varicose veins. The symptoms included heaviness, oedema, pain or cosmetic and slight discomfort. However, the mean clinical severity score decreased from an average of 17.6 pre-operatively to

Table 3. Recurrence analysed according to the anatomical pattern of varices

Groups	No pts. with recurrence/ all pts. in the group	%	Type of recurrence
A	109/862 pts.	12.6	
A1	29/413	7	Small thin-walled serpentine venous tributaries at the groin (neovascularisation)
A2	29/243	12	16 (7%) with the presence of varicose veins in the groin; 13 (5%) with varicose veins in the proximal thigh
A3	51/206	25	14 (7%) with varicose veins in the groin and thigh connecting to incompetent thigh perforators; 16 (8%) with varicose veins in the medial thigh connecting to incompetent thigh perforators; 21 (10%) with varicose veins in the thigh and calf connecting to incompetent calf perforators.
B	39/132	30	18 (14%) with varicose veins in the popliteal fossa connecting to incompetent distal calf perforators (not connecting to saphenous trunks); 21 (16%) with varicose veins in the lateral and posterior area of the calf connecting to incompetent posterior perforators and gastrocnemius veins.
C	38/107	36	8 (8%) with varicose veins of calf and thigh connecting to the groin region; 19 (18%) with visible collateral varicose veins connecting to calf perforators; 5 (5%) with varicose veins in the popliteal fossa connecting with incompetent distal calf perforators (not connected to saphenous trunks); 6 (6%) with varicose veins in the lateral and posterior region of the calf connecting to incompetent posterior perforators and gastrocnemius veins.
D	146/225	65	25 (11%) with varicose veins in the thigh and calf connecting to the groin region; 42 (19%) with visible collateral varicose veins connecting to incompetent thigh perforators; 79 (35%) with visible varicose veins connecting to incompetent anterior calf perforators

9.7 at the five year assessment, showing an improvement of clinical condition.

Discussion

It is recognised in recent publications that there are three major sources of recurrence following varicose vein surgery.[10] The first group of causes are attributable to inadequate or incomplete initial treatment and result in recurrence in 55–70% of cases. These arise either due to a tactical error resulting in failure to identify all incompetent veins or due to failure to carry out technically adequate primary treatment (despite a correct preoperative diagnosis). The second group of causes arise from the progression of venous disease resulting in development of varices in previously normal veins. This accounts for about 20–25% of recurrences. The third cause of recurrence is neovascularisation where varices arise in the track of previously stripped or ligated veins and account for about 5–25% of recurrences. In our clinical practice we recognise the importance of correct pre-operative diagnosis and assiduous surgical treatment. The early post-operative assessment showed no residual varices, junctions or saphenous trunks confirming that we had succeeded in our aim of avoiding this common group of causes of recurrence.

It has long been accepted practice to dissect tributary vessels at the sapheno-femoral junction very carefully, taking each of the vessels back beyond the primary and even the secondary tributaries if possible. In practice, however, such dissection appears to cause neovascularization in the groin.[12–14] Duplex ultrasound surveillance supports this finding. It has now been amply confirmed that neovascularisation causes recurrent varicose veins. Clearly, this is a significant disadvantage of standard surgical treatment of varicosities. Prevention of neovascularisation remains a challenge. Local attempts to limit new vessel connections at the SFJ mechanically with fascial closure or a synthetic patch over the stump have been described, with mixed success.[12] Application of local inhibitors of angiogenesis or the new techniques of closure of the major venous junctions without incision at the groin may have a role.[13–15] These may minimise vascular growth factor release and initiation of neovascular reconnection.

Neovascularization[16–20] accounts for some cases of recurrence, but other factors relating to disease progression must also play a part. A number of studies[6,21–29] show that the pattern of recurrence is highly variable and there are often multiple sites of incompetence. Jiang[25] used CFDS to establish the patterns of recurrent varicose veins in 264 limbs which had previously undergone sapheno-femoral ligation in the groin. Recurrent sapheno-femoral junction incompetence was present in 172 (65%). Incompetence was found in great or small saphenous veins in 232 limbs (88%), perforators in 176 (67%), and deep veins in 156 (59%). Residual great saphenous veins were present in 43% of limbs where the GSV had been stripped and 74% of limbs where the GSV had not been stripped. An incompetent thigh perforator was present in 14% and 15% of these two groups, respectively. Multiple sites of incompetence were observed in the majority (75%) of patients. The pattern of reflux was unrelated to stripping or not of the great saphenous veins and the time from initial surgery. In our series above, the incidence of recurrence at 5 years corresponds to the that reported in previous publications.[25–28] Also the incidence of recurrence of SSV in our case report (30%) corresponds to the data reported in literature.[29] We observed a high rate of recurrence in patients with secondary varicose veins following previous deep vein thrombosis. Perhaps the high venous pressures which result from deep vein reflux encourage the development of new varices. Some may find it surprising that we undertook varicose vein surgery in these patients; however, we have often observed clinical benefit from this procedure. Such patients often have combined deep and superficial venous reflux and removal of large, incompetent saphenous trunks reduces the total amount of reflux in the limb. This is a logical treatment providing the deep veins are competent and the superficial veins are not the only remaining route of venous drainage.

The findings in this study suggest that the following anatomical features of venous disease increase the likelihood of recurrence: involvement of both saphenous systems, involvement of perforating veins, and involvement of deep venous system. The higher rate of recurrence in patients with SSV reflux could be related to the variable anatomy of small saphenous vein with possibility of leaving a long stump when ligating the sapheno-popliteal junction.

We have found that varicose veins recur despite successful surgical ligation of the sites of reflux confirmed on post-operative duplex ultrasonography. The likelihood of recurrence increased in the presence of SSV reflux, perforating vein reflux and post-thrombotic deep vein thrombosis.

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References

1 Perrin M, Guex JJ, Ruckley CV, dePalma RG, Royle JP, Nicolini P *et al*. Recurrent varices after surgery (REVEAS), a consensus document. *Cardiovasc Surg* 2000;**8**:233–245.
2 Eklof B, Juhan C. Recurrences of primary varicose veins. In: Eklof B, Gores E, Thulesius O, Berqvist O, eds. *Controversies in the management of venous disorders*. London: Bitterworths; 1989: 220–233.
3 Jones L, Braythwaite BD, Selwyn D, Cooke S, Earnshaw JJ. Neovascolarization is the principal cause of varicose vein recurrence: results of a randomized trial of stripping the long saphenous vein. *Eur J Vasc Endovasc Surg* 1996;**12**:442–455.
4 Couffinhal JC. Récidive de varices après chirurgie: definition, épidémiologie, physiopathologie. In: Kieffer B, Bahnini A, eds. *Chirurgie des veines des members inférieurs*. Paris: AERCV; 1996: 227–238.
5 Creton D. Hypothèses étiologiques des récidives variqueuses saphène interne: étude anatomique sur 211 cas. In: Negus D, Jantet G, Colleridge-Smith PD, eds. *Phlebology* 1995. London: Springer-Verlag, pp. 164–168.
6 Creton D. 125 reinterventions for recurrent popliteal varicose veins after excision of the short saphenous vein. Anatomical and physiological hypotheses of the mechanism of recurrence. *J Mal Vasc* 1999;**24**:30–37.
7 Puppinck P, Chevalier J, Espagne P, Habi K, Akkari J. Traitement chirurgical des récedives postopératoires de varices. In: Kieffer B, Bahnini A, eds. *Chirurgie des veines des members inférieurs*. Paris: AERCV; 1996:239–254.
8 Gedeon A, Barret A, Pradere B, Parent Y. Considérations sur le traitement chirurgical des récidives postopératoires de varices. *Phlébologie* 1982;**35**:519–521.
9 Darke S. The morphology of recurrent varicose veins. *Eur J Vasc Surg* 1992;**6**:512–517.
10 Kostas T, Ioannou CV, Touloupakis E, Dastalaki E, Giannoukas AD, Tsetis D *et al*. Recurrent varicose veins after surgery: a new appraisal of a common and complex problem in vascular surgery. *Eur J Vasc Endovasc Surg* 2004;**27**:275–282.
11 Allegra C, Antignani PL, Bergan J, Carpentier PH, Coleridge-Smith P, Cornu-Thénard A *et al*. The "C" of CEAP: suggested definitions and refinements: an International Union of Phlebology conference of experts. *J Vasc Surg* 2003;**37**:129–130.
12 Manfrini S, Gasbarro V, Danielsson G, Norgren L, Chandler JG, Lennox AF *et al*. . Endovenous management of saphenous vein reflux. *J Vasc Surg* 2000;**32**:330–342.
13 Min RJ, Zimmet SE, Isaacs MN, Forrestal MD. Endovenous laser treatment of the incompetent greater saphenous vein. *J Vasc Intervent Radiol* 2001;**12**:1167–1171.
14 Van Rij AM, Jiang P, Solomon C, Christie RA, Hill GB. Recurrence after varicose vein surgery: A prospective long-term clinical study with duplex ultrasound scanning and air plethysmography. *J Vasc Surg* 2003;**38**:935–943.
15 Kostas T, Ioannou CV, Touloupakis E, Daskalaki E, Giannoukas AD, Tsetis D *et al*. Recurrent varicose veins after surgery: a new appraisal of a common and complex problem in vascular surgery. *Eur J Vasc Endovasc Surg* 2004;**27**:275–282.
16 Glass GM. Neovascularization in recurrent sapheno-femoral incompetence of varicose veins: surgical anatomy and morphology. *Phlebology* 1995;**10**:136–142.
17 Nyamekye I, Shephard NA, Davies B, Heather BP, Earnshaw JJ. Clinicopathological evidence that neovascularization is a cause of recurrent varicose veins. *Eur J Vasc Endovasc Surg* 1998;**15**: 412–415.
18 Turton EP, Scott DJ, Richards SP, Weston MJ, Berridge DC, Kent PJ *et al*. Duplexderived evidence of reflux after varicose vein surgery: neoreflux or neovascularization? *Eur J Vasc Endovasc Surg* 1999;**17**:230–233.
19 Juhan C, Haupert S, Mitgen G, Barthelemy P, Eklof B. Recurrent varicose veins. *Phlebology* 1990;**5**:201–211.
20 Tong Y, Royle J. Recurrent varicose veins after short saphenous vein surgery: a duplex ultrasound study. *Cardiovasc Surg* 1996;**4**: 364–367.
21 Stonebridge PA, Chalmers N, Beggs I, Bradbury AW, Ruckley CV. Recurrent varicose veins: a varicographic analysis leading to a new practical classification. *Br J Surg* 1995;**82**(1):60–62.
22 Quigley FG, Raptis S, Cashmann M. Duplex ultrasonography of recurrent varicose veins. *Cardiovasc Surg* 1994;**2**:775–777.
23 Redwood NFW, Lambert D. Patterns of reflux in recurrent varicose veins assessed by duplex scanning. *Br J Surg* 1994;**81**:1448–1451.
24 Guex JJ, Hiltbrand B, Bayon JM, Henri F, Allaert FA, Perrin M. Anatomical patterns in varicose vein disease: a duplex scanning study. *Phlebology* 1995;**10**:94–97.
25 Jiang P, van Rij AM, Christie R, Hill G, Solomon C, Thomson I. Recurrent varicose veins: patterns of reflux and clinical severity. *Cardiovasc Surg* 1999;**7**:332–339.
26 Bradbury AW, Stonebridge PA, Ruckley CV. Recurrent varicose veins: correlation between preoperative clinical and hand-held Doppler ultrasonographic examination, and anatomical findings at surgery. *Br J Surg* 1993;**80**:849–851.
27 Jiang P, van Rij AM, Christie RA. Venous physiology in the different patterns of recurrent varicose veins and the relationship to clinical severity. *Cardiovasc Surg* 2000;**8**:130–136.
28 Loveday EJ, Lea Thomas M. The distribution of recurrent varicose veins: a phlebologic study. *Clin Radiol* 1991;**43**:47–51.
29 Vin F, Chleir F. Ultrasonography of postoperatively recurrent varicose veins in the area of the short saphenous vein. *Ann Chir* 2001;**126**:320–324.

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