Patterns of Saphenous Venous Reflux in Women Presenting with Lower Extremity Telangiectasias

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BACKGROUND Telangiectasias have been treated with sclerotherapy without concomitant assessment or treatment of saphenous veins.

OBJECTIVE To clarify if ultrasound (US) mapping of saphenous veins is justifiable, this investigation determined prevalence of specific patterns of saphenous vein reflux in women with telangiectasias.

METHODS US mapping of the great and small saphenous veins (GSV, SSV) was performed in 1,740 extremities of 910 consecutive patients, mostly women (86%). A subgroup of 269 limbs of women with telangiectasias (CEAP C1 class) was included in this study. Patterns of GSV and SSV reflux were classified as perijunctional, proximal, distal, segmental, multisegmental, and diffuse.

RESULTS Reflux was detected in 125 extremities (46%): 5% had reflux in both the GSV and the SSV, 39% had GSV reflux, and 2% had SSV reflux. The most common pattern of GSV reflux was segmental (73%, 87/119). Prevalence of reflux was significantly greater in GSV versus SSV ($p < .001$). GSV segmental plus distal reflux (40%, 108/269) was significantly more prevalent than saphenofemoral junction or near junction reflux (4%, 11/269; $p < .001$).

CONCLUSIONS US mapping of the GSV in women with telangiectasias is justifiable, even in asymptomatic extremities. Further research will determine if segmental reflux should be treated to avoid evolution to severe valvular insufficiency.

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Studies estimate that the prevalence of telangiectasias in the general population is approximately 80%.[1,2] Telangiectasias and/or varicose veins are present in more than 50% of women between 14 and 48 years.[3] Although they may be only of cosmetic concern, telangiectasias may be associated with symptoms such as pain, aching, heaviness, and pruritus.[4] Sclerotherapy is the most common treatment for telangiectasias.[5] Most likely, in the absence of varicose veins or other strong indication, treatment will be limited to sclerotherapy without evaluation and, consequently, without treatment of the great or small saphenous veins (GSV, SSV). Studies have shown that telangiectasias is rarely an isolated condition but is usually associated with incompetence in other elements in the venous drainage.[6] With the advent of color flow, duplex Doppler ultrasonography (US), management of these patients is taking new directions.[7,8] Extensive mapping of the superficial venous system of the lower extremities is feasible in reasonable time, without the morbidity and expenses of venography. There is, however, increasing concern regarding the cost/benefit ratio of exams with an inordinate frequency of normal findings. Specific criteria and/or documented justification to indicate saphenous vein US mapping are desirable.

The objective of this study was to determine prevalence and types of saphenous veins reflux patterns to justify or not requests of such exam in women with telangiectasias. A secondary objective

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 • Published by Blackwell Publishing •
ISSN: 1076-0512 • Dermatol Surg 2007;33:282–288 • DOI: 10.1111/j.1524-4725.2007.33063.x

was to delineate the possibility and the scope of a simplified screening protocol.

Methods

Data from US mapping of lower extremity veins were collected prospectively from 1,740 extremities of 910 consecutive patients. Most of the extremities examined were from women (85%, 1,485/1,740).

Patient Selection

Only data from women with telangiectasias, CEAP clinical class C1, were included in the analysis. A total of 269 lower extremities were included. Men were excluded, as were women presenting with varicose veins, edema, skin changes, or ulcers, CEAP in clinical classes C2 to C6. Women with history of previous venous surgery, deep venous thrombosis, and/or superficial venous thrombosis were also excluded. Venous thrombosis or obstruction and previous varicose vein surgery were the causes for excluding 324 extremities. Of the remaining 1,416 extremities, 295 (21%) were classified as C1: 26 limbs from men were excluded and 269 limbs from women remained as the data set for analysis. The mean age was 39 $\pm$ 11 (SD) and ranged from 17 to 68 years.

Medical History and Physical Examination

The physician performing the US examination first interviewed the patients and obtained the following history and description of signs and/or symptoms: leg pain (70%, 189/269), tiredness (46%, 124/269), weight sensation (44%, 118/269), burning sensation (19%, 51/269), and itching (5%, 13/269). Overall, 210 (78%) limbs were symptomatic and 59 (22%) were asymptomatic. The CEAP classification was initially established by visual inspection and additional information was gathered during the US examination.

Lower Extremity Venous US Examination

All US examinations were performed by a physician trained in vascular surgery and/or vascular medicine. Interviews for medical history and explanation of the US procedure preceded the actual examination.

The US protocol screened for venous obstruction,[9] a condition that may alter the treatment of superficial veins, and focused on detailed mapping of superficial and deep venous reflux, with particular attention to preoperative mapping of superficial veins. All US examinations were performed with a US scanner (Sonoline Siemens-Elegra, Issaquah, WA).

The standing position was used to detect deep and superficial venous reflux with transducer frequencies between 7 and 12 MHz. Venous flow was examined in longitudinal sections using color flow. Duration of reverse flow was measured with pulsed Doppler. The common femoral, midthigh femoral, above-knee popliteal, and distal posterior tibial veins were examined for deep venous reflux. The GSV and SSV were imaged continuously from the respective femoral or popliteal junction to the paramalleolar level. The SSV in the calf and the above-knee SSV (vein of Giacomini) were imaged into the thigh, as dictated by the patient's anatomy. Nonsaphenous superficial veins in the anterior, lateral, and posterior aspects of the thigh were also imaged, but those findings are not part of this report.

Duration of reverse flow was measured after the release of distal, muscular, manual compressions. Multiple compressions distal to the site of the US recording were performed to improve confidence in reflux detection. Valsalva maneuver was also part of saphenofemoral junction (SFJ) reflux evaluation. Reflux was established if the duration of reverse flow exceeded 500 msec in the superficial veins or 1,000 msec in the deep veins, as recommended by Labropoulos and coworkers.[10,11]

Reflux Patterns

Although not reported in detail here, sites of reflux source and drainage were mapped, measured in relation to the sole of the foot, and referred to other anatomic landmarks such as the popliteal crease. Six

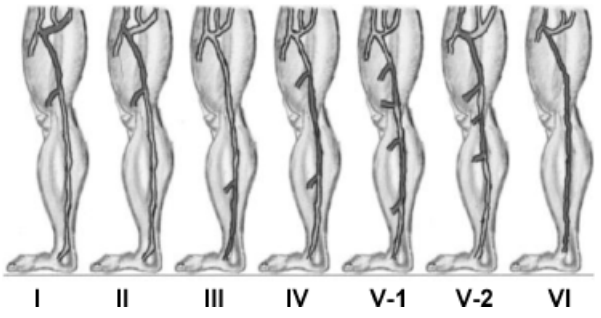

Figure 1. Patterns of great saphenous vein (GSV) reflux: (I) perijunctional from a saphenofemoral junction (SFJ) tributary into the GSV; (II) proximal GSV from the SFJ to a tributary or perforating vein; (III) distal GSV from a tributary or perforating vein to the paramalleolar level; (IV) segmental GSV from a tributary or perforating vein to another tributary or perforating vein. (V-1) Multisegmental, nonrefluxing SFJ; (V-2) multisegmental, refluxing SFJ; and (VI) diffused throughout the entire GSV. *Picture by Monique Salles-Cunha.

patterns of reflux, previously described by Engelhorn and coworkers,[12,13] were identified in the GSV and SSV as shown in Figures 1 and 2. SSV patterns of reflux were adapted according to the anatomic extension of the SSV into the thigh.

Perijunctional GSV or SSV Reflux GSV or SSV reflux originated from a tributary of the SFJ or the saphenopopliteal junction (SPJ), extended most commonly for a short segment of the GSV or SSV, and drained through a tributary or perforating vein.

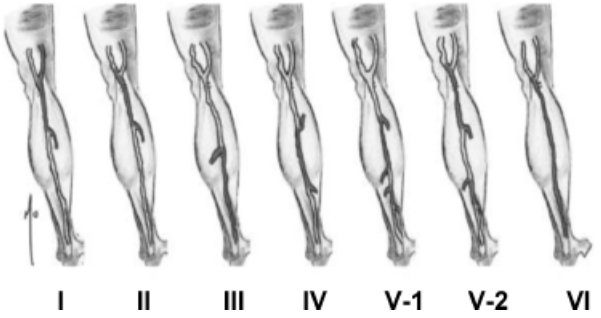

Figure 2. Patterns of small saphenous vein (SSV) reflux: (I) perijunctional from a saphenopopliteal junction (SPJ) tributary into the SSV; (II) proximal SSV from the popliteal junction to a tributary or perforating vein; (III) distal SSV from a tributary or perforating vein to the paramalleolar level; (IV) segmental SSV from a tributary or perforating vein to another tributary or perforating vein; (V-1) multisegmental, nonrefluxing SPJ; (V-2) multisegmental, refluxing SPJ; and (VI) diffused throughout the entire SSV. Picture by Monique Salles-Cunha.

Other types of reflux involving the SFJ or the SPJ, not reported in the analysis of the saphenous veins, were the common femoral or popliteal to nonsaphenous tributary and the nonsaphenous tributary to other nonsaphenous tributaries.

Proximal GSV or SSV Reflux GSV or SSV reflux originated directly from the femoral or popliteal vein via the SFJ or SPJ (or thigh segment), extended through the GSV or SSV, and drained through a tributary or perforating vein in the thigh or upper calf. Valvular competence was detected in the distal segment of the GSV or SSV at the lower leg.

Distal GSV or SSV Reflux GSV or SSV reflux originated from a tributary or perforating vein, most likely at the lower thigh or upper calf, and extended to the paramalleolar level. The SFJ or SPJ and a proximal segment of the GSV or SSV were competent.

Single-Segment GSV or SSV Reflux GSV or SSV reflux originated from a tributary or perforating vein and extended distally to another tributary or perforating vein above the malleoli. The SFJ or SPJ, a proximal segment and a distal segment of the GSV or SSV, was competent.

Multisegmental GSV or SSV Reflux GSV or SSV reflux was characterized by two or more refluxing segments separated by an intermediate competent segment. This pattern was subdivided in two subgroups: V1—the SFJ or the SPJ junction was competent without reflux; and V2—the SFJ or the SPJ was incompetent, being the source of reflux of the first incompetent segment.

Diffuse Reflux of the Entire GSV or SSV GSV or SSV reflux originated at the SFJ or SPJ (or thigh segment) and extended to the paramalleolar level.

Statistical Analysis

The following prevalences were compared statistically using chi-square test: GSV versus SSV reflux prevalence; SFJ plus perijunction versus segmental plus distal GSV reflux; and GSV plus SSV reflux in symptomatic versus asymptomatic extremities.

TABLE 1. Relation between Reflux in the Great And Small Saphenous Veins in Women with Telangiectasias

Small saphenous vein	*Great saphenous vein*		
	Reflux	*No reflux*	*Total*
Reflux	14	6	20 (7%)
No reflux	105	144	249 (93%)
Total	119 (44%)	150 (56%)	269 (100%)

Results

Women with telangiectasias, CEAP class C1, had GSV and/or SSV reflux detected in 125 of 269 extremities (46%). Table 1 shows the correlation between reflux in the GSV and SSV. Reflux in the GSV was detected in 44% (119/269) of the extremities in contrast to 7% (20/269) with reflux in the SSV. This difference in reflux prevalence was highly significant ($p < .001$ by chi-square). Only 5% (14/269) of the extremities had reflux in both GSV and SSV and only 2% (6/269) had reflux isolated with the SSV.

Table 2 lists prevalence of reflux patterns in the GSV and SSV. The most common pattern of reflux in the GSV was segmental (32%, 87/269), either single (28%, $n = 75$) or multiple (4%, $n = 12$) segments, without involvement of the saphenofemoral junction. Second in prevalence was distal reflux (pattern type III). Indeed, veins at or near the saphemofemoral junction were sources of reflux in only 11 (4% of 269) extremities. The femoral vein was the source of reflux in 9 of these 11 limbs. Nonfemoral sources of reflux at the saphenofemoral junction were rare (0.7%, $n = 2$). Prevalence of saphenofemoral junction or perijunction reflux, 4% (11/269) of all extremities, was significantly less than prevalence of segmental or distal GSV reflux, 40% (108/269) of all limbs ($p < .001$ by chi-square). Length of refluxing segment averaged 19 $\pm$ 16 cm (range, 3–80 cm). The median length was 14 cm.

The most common pattern of reflux in the SSV was also segmental (3%, 9/269), mostly a single segment, without involvement of the saphenopopliteal junction. The popliteal vein at the saphenopopliteal junction was a source of reflux in 6 (2%) extremities. Length of refluxing segment averaged 14 $\pm$ 8 cm (range, 1–28 cm). The median length was 15 cm.

Table 3 shows the correlation between saphenous reflux and presence of symptoms. Saphenous reflux failed to correlate with presence of symptoms ($p = .79$ by chi-square).

Discussion

A significant proportion of patients seeking treatment in a vein clinic are women with telangiectasias and no other apparent manifestations of venous insufficiency (CEAP C1). Routinely, telangiectasias

TABLE 2. Prevalence of Patterns of Great and Small Saphenous Vein Reflux in Women with Telangiectasias (n = 269 Extremities)

Reflux patterns	*Great saphenous vein*		*Small saphenous vein*	
	Number	*Percentage*	*Number*	*Percentage*
I. Perijunctional	2	0.7	2	0.7
II. Proximal saphenous	4	1.5	5	1.9
III. Distal saphenous	21	7.8	3	1.1
IV. Single segment	75	27.9	8	3.0
V1. Multisegment, competent SFJ or SPJ	12	4.5	1	0.4
V2. Multisegment, refluxing SFJ or SPJ	1	0.4	1	50.4
VI. Diffuse from SFJ or SPJ to ankle level	4	1.5	0	0.0
Total	119	44.2	20	7.4

SFJ, saphenofemoral junction; SPJ, saphenopopliteal junction.

TABLE 3. Relation between Saphenous Venous Reflux and Presence of Symptoms in Women with Telangiectasias

	Saphenous vein		
Clinical history	*Reflux*	*No reflux*	*Total*
Symptomatic leg	99	111	210 (78%)
Asymptomatic leg	26	33	59 (22%)
Total	125 (46%)	144 (54%)	269 (100%)

have been treated with sclerotherapy without concomitant assessment or treatment of saphenous veins. Such an approach may be incomplete but screening may not be cost-effective if prevalence of saphenous valvular insufficiency is low. US mapping of the saphenous vein is an excellent method to evaluate the source and drainage of reflux that may contribute or exacerbate the development of telangiectasias. US mapping can identify the patterns of saphenous reflux and guide treatment for telangiectasias and/or varicose veins.[12,13] We investigated if the prevalence of reflux warranted US evaluation of the GSV and/or SSV before treatment of telangiectasias. The data collected demonstrated a high prevalence of reflux in the GSV (46%) in extremities of women with telangiectasias. The presence of reflux by Doppler US was indicative of a venous problem that could be or could become more than cosmetic. Based on the detailed findings of this study, more than 40% of the extremities with telangiectasias have GSV segmental, distal, or multisegmental reflux. Reflux in the SFJ region was rare. This is in contrast to the traditional assumption that hemodynamic abnormalities in chronic venous disease develop in a retrograde fashion starting at the SFJ level.[14]

A short, screening protocol in these patients may include only detection of GSV reflux at mid- and lower thigh and at midcalf. The data indicated that screening of the SSV would be contraproductive, with a low prevalence of reflux. Somjen and coworkers[6] examined with Doppler US 37 legs with thigh telangiectasias and demonstrated that in 89% reticular vein incompetence was found close to telangiectasias. Often reticular vein incompetence was associated with reflux in larger epifascial veins and 15% incompetent perforating veins were detected between reticular veins and the deep venous system. The authors concluded that telangiectasias was rarely an isolated condition but was usually associated with incompetence in other veins draining the subcutaneous tissue. Weiss and Weiss[15] found reflux in thigh subcutaneous reticular veins in 618 of 700 patients (88%). These incompetent reticular veins were associated with groups or webs of telangiectasias and/or venulectasias on the lateral thigh in almost all cases.

Thibault and colleagues[16] studied 500 lower limbs with varicose veins and/or spider veins and found 47% incompetence of the superficial venous system. The duplex imaging findings were applied to determine the optimal treatment, i.e., whether surgery, sclerotherapy, or a combination of both would provide the best short- and long-term results in these patients. In the present study we found similar results, but the study population here were only women with telangiectasias. In the present analysis we did not include women with varicose veins, and we identify the patterns of saphenous reflux in women with telangiectasias.

A concern regarding the treatment of telangiectasias with sclerotherapy alone is the high incidence of recurrence. In 5 years, telangiectasias treated with sclerotherapy will recur in almost 100% of the extremities.[17] A parallel aspect of the problem was shown in this study: almost half of the women with telangiectasias (CEAP C1) also had saphenous vein reflux. In the presence of saphenous reflux or incompetent perforating veins, the surgical treatment of saphenous sources of venous hypertension can contribute to a greater success of sclerotherapy.[18,19] The veins that are potentially related to the telangiectasias can be treated before sclerotherapy. Effective sclerotherapy could be performed with a low dose of sclerosant, and complications such as phlebitis, neovascularization, skin pigmentation, and scars could be minimized.[20]

The natural history of varicose veins indicates that if these veins are not treated, they will continue to enlarge and affect other adjacent veins, spreading the effects of venous hypertension.[20] Studies demonstrated that the presence of venous reflux is a good predictor of future venous disease.[21–23] As the saphenous vein reflux progresses to include the SFJ, the risk of development of skin changes and even ulcers increases.

Telangiectasias, however, are not considered an advanced stage of chronic venous insufficiency; the treatment of saphenous reflux in these patients still remains controversial. Our data indicate that treatment of the SFJ or the SSV is rarely indicated in these patients. Treatment of small GSV segments, 10 to 20 cm in length, still needs further investigation to determine its effectiveness in relation to preventing or delaying future appearance of varicose veins or to the treatment and recurrence of telangiectasias. A finding of importance was that saphenous vein reflux at this early stage of disease did not correlate with symptoms. Besides reflux, the propensity to development of telangiectasias or small vessel networks and individual sensitivity affect the perception of the symptoms usually evaluated.[24] Our suggestion is that women with telangiectasias and GSV vein reflux as detected by the short protocol proposed above be fully evaluated with US and then followed periodically.

The authors conclude that US mapping of the GSV in women with telangiectasias is justifiable, even in asymptomatic extremities. A short screening protocol may include detection of GSV reflux at mid- and lower thigh and at midcalf. Further research will determine if segmental reflux should be treated to avoid evolution to severe valvular insufficiency or if it contributes to recurrence of telangiectasias.

References

1. Evans CJ, Fowkes FGR, Ruckley CV, Lee AJ. Prevalence of varicose veins and chronic venous insufficiency in men and women in the general population: Edinburgh Vein Study. J Epidemiol Community Health 1999;53:149–53.
2. Fowkes FG, Evans CJ, Lee AJ. Prevalence and risk factors of chronic venous insufficiency. Angiology 2001;52:(Suppl 1): S5–S15.
3. Scuderi A, Raskin B, Al Assal F, et al. The incidence of venous disease in Brazil based on the CEAP classification. Int Angiol 2002;21:316–21.
4. Zimmet SE. Sclerotherapy treatment of telangiectasias and varicose veins. Tech Vasc Interv Radiol 2003;6:116–20.
5. Frullini A, Cavezzi A. Sclerosing foam in the treatment of varicose veins and telangiectasias: history and analysis of safety and complications. Dermatol Surg 2002;28:11–5.
6. Somjen GM, Ziegenbein R, Johnston AH, Royle JP. Anatomical examination of leg telangiectasias with duplex scanning. J Dermatol Surg Oncol 1993;19:940–5.
7. Weiss RA, Weiss MA. Continuos wave venous Doppler examination for pretreatment diagnosis of varicose and telangiectatic veins. Dermatol Surg 1995;21:58–62.
8. Fronek HS. Noninvasive examination of the venous system in the leg: presclerotherapy evaluation. J Dermatol Surg Oncol 1989;15:170–3.
9. Salles-Cunha SX, Beebe HG. Guidelines of the American Venous Forum. Direct noninvasive tests (duplex scan) for evaluation of acute venous disease. In: Gloviczki P, Yao JS, editors. Handbook of venous disorders, 2nd ed. London: Arnold; 2001.p. 110–9.
10. van Bemmelen PS, Bedford G, Beach K, Strandness DE Jr. Quantitative segmental evaluation of venous valvular reflux with duplex ultrasound scanning. J Vasc Surg 1989;10:425–31.
11. Labropoulos N, Tiongson J, Pryor L, et al. Definition of venous reflux in lower-extremity veins. J Vasc Surg 2003;38:793–8.
12. Engelhorn CA, Engelhorn AL, Cassou MF, Salles-Cunha SX. Paterns of saphenous reflux in women with primary varicose veins. J Vasc Surg 2005;41:645–51.
13. Engelhorn CA, Engelhorn AL, Cassou MF, et al. Patterns of reflux in the saphenous veins based on color flow duplex ultrasound scanning. Vasc US Today 2003;8:109–28.
14. Labropoulos N, Giannoukas AD, Delis K, et al. Where does venous reflux start? J Vasc Surg 1997;26:736–42.
15. Weiss RA, Weiss MA. Doppler ultrasound findings in reticular veins of the thigh subdermic lateral venous system and implications for sclerotherapy. J Dermatol Surg Oncol 1993; 19:947–51.
16. Thibault P, Bray A, Wlodarczyk J, Lewis W. Cosmetic leg veins: evaluation using duplex venous imaging. J Dermatol Surg Oncol 1990;16:612–8.
17. Alderman DB. Therapy for essential cutaneous telangiectasias. Postgrad Med 1977;61:91.
18. Duffy DM. Remodelación vascular/neovasculatiozación inducida por escleroterapia. Phlebol Digest 1998;4:6–11.
19. Merlo I, Brito CJ, Silva RM, Janeiro MJC, Pinto-Ribeiro RS. Escleroterapia de varizes e substâncias esclerosantes. In: Brito CJ, Duque AC, Merlo I, et al., editors. Cirurgia vascular. Rio de Janeiro: Revinter; 2002.p. 1066–84.
20. Vin F, Benigni JP. Conférence de consensus sur la compression des membres. Phlébologie 2003;56:315–67.

21. Schultz-Ehrenburg U, Weindorf N, Mattes H, Hirche C. New epidemiological findings with regard to initial stages of varicose veins. Bochum Study I to III. Phlebology 1992;7:234–6.

22. Evans CJ, Allan PL, Lee AJ, et al. Prevalence of venous reflux in the general population on duplex scanning: the Edinburgh vein study. J Vasc Surg 1998;28:767–76.

23. Schultz-Ehrenburg U, Weindorf N, Hirche H. Early and pre-clinical signs of genuine varices–results of a longitudinal epidemiological study with children and juveniles (Bochum Study I–III). Phlebol Suppl 1995;1:37.

24. Salles-Cunha SX, Comerota AJ, Tzilinis A, et al. Ultrasound findings after radiofrequency ablation of the great saphenous vein: descriptive analysis. J Vasc Surg 2004;40:1166–73.

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