Associations of anterior accessory or thigh posterior tributary and great saphenous reflux patterns in early stages of chronic venous valvular insufficiency

Carlos Alberto Engelhorn,1,2 Ana Luiza Dias Valente Engelhorn,1,2 Sergio Xavier Salles-Cunha,2 Carolina B. Andrade,1 Danielle B. Santos,1 Gustavo T.M. Nakata,1 Fernando A. Haida1
1Pontifícia Universidade Católica do Paraná, School of Medicine; 2Angiolab-Laboratório Vascular Niño Invasivo, Curitiba, PR, Brazil.

Abstract

Varicose veins are a common disorder. Excessive ultrasound (US) mapping of lower extremity chronic venous valvular insufficiency includes the great saphenous vein (GSV), anterior accessory saphenous vein (AASV) and thigh posterior tributary to GSV such as the posterior accessory saphenous vein (PTSV, PASY).

The aim of this study was to determine associations between GSV-AASV-PTSV (including PASY) reflux in a specific sample population of Southern Brazilian women, nearly eunuchoid morphotype, with telangiectasis of reticular veins, various and intermittent edema.

In 1016 extremities of 513 women, 43±18 (18-81) years old were included. With previous venous thrombosis, surgery, suspicion of pelvic congestion syndrome, and men were excluded. Small saphenous vein and related thigh veins were excluded from analysis. GSV-AASV-PTSV reflux patterns were analyzed; prevalence was compared using y² statistics.

Reflex prevalence in AASV and/or thigh PTGV was 5.8% (39/691); 1.3% at PTGV (n=13) and 4.5% at AASV (n=6), significantly lower than GSV reflux: 73% (n=737) (P<0.001). AASV and/or PTGV reflux was associated with GSV reflux (31%, n=4859); common pattern was diffuse reflux, starting at AASV/PTGV saphenous junctions (56%, n=3359); otherwise, short, non-diffuse reflux was noted in part of the AASV/PTGV evaluated. Isolated AASV or PTGV reflux was rare (1%, n=11/1016) at the AASV, and 2 at the PTGV.

US mapping of AASV/PTSV in early stages of disease, in women without pelvic congestion syndrome, increased reflux detection by 1%, and improved definition of reflux patterns in about 6% of the extremities.

Introduction

Varicose veins and telangiectasias, associated with chronic venous valvular insufficiency (CVI) of lower extremities, are common and deserving special attention. CVI is a common subset of chronic venous insufficiency (CVI). Modern tendency is to become more specific on pathologic investigation. The focus of this work was on CVI exclusively, to avoid confusion with thrombosis or malformations. The following paragraphs summarize the focus on early CVI, introduce our great saphenous vein (GSV) reflux findings in early stages of disease, and questions if we should evaluate the anterior accessory saphenous vein (AASV) and thigh posterior tributaries (PTSV) such as the posterior accessory saphenous vein (PASY) in patients with aethetics more than so pathophysiological conditions.

An international consensus created the clinical, etiological, anatomic and pathophysiological classification (CEAP)1,2 CEAP has improved description of populations studied but investigation of specific subgroups is needed. We have focused on women with early stage.3,4 GSV reflux has been related to its diameter.5 Patterns of saphenous vein reflux were created, improved communicating with referring physicians.6,7 These patterns specified reflux sources and drainage points. Tributaries were more associated with GSV reflux than perforating veins in C1-C2 women.11 Most GSV reflux in C2 women was segmental, from one tributary to another.3 GSV reflux was mostly in the leg, rare in the saphenofemoral junction (SFJ).6 Telangiectasias were associated to segmental saphenous vein reflux.7 Segmental reflux, if not treated, evolved to multi-segmental saphenous reflux.2

Non-saphenous vein reflux has received its due attention.8 Reflux in gluteal, lateral or anterior thigh, or pubic veins raise suspicion of pelvic varicosities, particularly in the presence of symptoms of pelvic congestion syndrome.9 Patients with suspected pelvic varicosities were not included in this analysis.

Thigh accessory or tributaries to the GSV may be associated with saphenous or non-saphenous reflux. Most findings already described, however, were noted in patients with long-term CVI. The present analysis focuses on ultrasound (US) of the AASV and thigh PTSV in women with early telangiectasias, reticular veins, varicose veins and/or intermittent swelling.

Materials and Methods

Patients were referred by a variety of specialists to an IS accredited noninvasive vascular laboratory, Angiolab-Curitiba, a major city in Southern Brazil. Venous duplex examinations were pre-approved by insurance companies. A data base has been maintained prospectively. Retrospective analysis of GSV, AASV and PTSV patterns of reflux was performed. This project was part of protocol number 267-0084-000111 of the National Commission on Ethics in Research and approved by the Ethics Research Committees of Pontificia Universidade Católica do Paraná.
Inclusion criteria

Women with telangiectasias or reticular veins (CEAP class C1), varicose veins (C2), or intermittent swelling (suggested CVA versus C1 edema) were candidates for the study. Enzalut (E) was primary; anatomy (A) included superficial veins of the thigh and upper extremities (P) was reflux only. Data entry stopped when over 1000 extremities were posted.

Exclusion criteria

Exclusion of all men avoided gender variability. Women with constant, chronic ulcers, skin changes, and healed or open ulcers (C3, C4A, C4B, C5, C6), history of previous deep venous thrombosis (DVT), suspicion of pelvic venous insufficiency, venous malformations, and/or previous direct treatment of lower extremity veins were excluded. Exclusion based on treatment included surgery, minimal IVA thermal ablation, and chemical ablation with foam or sclerotherapy.

Venous oral medication, or compression stockings, or deep venous reflux due to valvular insufficiency only were not reason for exclusion.

Small saphenous vein (SSV), respective thigh extensions, and other leg veins besides GSV were not analyzed.

Patient population

US data from 1016 limbs of 513 women, 43 ± 13 (range 18−81) years old, were analyzed. Patients represented an estimated, middle class of Southern Brazil, mostly European descendent, from Portuguese, Spanish, Italian, German, and Ukrainian ancestry. This sample population did not represent the Brazilian multi-ethnicity, neither the various social classes. Specifically, rural or community groups were not represented. The women evaluated had asthma and/or functional interests; visual appearance, itching or slight burning sensation were common reasons to seek medical attention. Clinical presentations C1-C3 and suggested CVA, intermittent swelling, could be combined, varying from almost none to easily detectable.

Ultrasonographic duplex-Doppler examination

International recommendations were followed and adapted to cases of early stage venous valvular insufficiency. US examinations were performed and interpreted by physicians certified in vascular noninvasive testing. Patients received instructions prior to and during the examination. Siemens (Issaquah, WA, USA) Elega or Antares scanners were employed. The most commonly used transducer was centered at 7 MHz (4−9 MHz). DVT, venous obstruction, and/or malformations were ruled out with the patient supine or standing. Superficial venous mapping was performed in the standing position. Patient movement and periods of rest avoided freezing. Examinations lasted around 40 min. Valve or valve-like maneuvers such as talking and laughing were employed according to individual behavior. Muscle and venous compression maneuvers were performed manually, proximal and distally to probe placement. Backflow causing venous filling was commonly tested with multiple compression maneuvers to avoid false reflux data. Reverse flow through potential normal, valueless, limited saphenous segments, however, was reported if a draining tributary had reflux; apparently normal draining, via a perforating vein was described as reflux, particularly if a segmental dilation was noted in such segment. Short reflux segments, as short as 4 cm, were detectable with this compression technique. This approach emphasized testing variety and completeness, taking into consideration that daily life conditions were difficult to be reproduced in the vascular laboratory. Local changes in venous diameters were noted. Segmental reflux was recorded with information about source and drainage points. According to the original concept, reflux lasting less than 0.5 s was normal. Consequently reflux lasting longer than 0.5 s was considered not normal. Superficial vein reflux lasted longer than 1 s in most cases.

GSV and its tributaries were evaluated from the groin to the ankle. Although modern consensus mandates that the GSV term be used for the vein within the saphenous compartment, long, GSV reflux patterns may have included small tributary segments outside the saphenous compartment. Diffuse GSV reflux included either the GSV proper in the calf or the posterior or arch-posterior accessory vein extending to the ankle level. In general, the SFJ defined common femoral yes-or-no source of reflux and GSV yes-or-no reflux from a source at or near the junction. The superficial epigastric vein is an example of a non-common femoral source of GSV reflux. Non common femoral reflux source, however, was expected to have low prevalence in the population studied.

GSV reflux patterns as shown in Figure 1: i) segmental if from a tributary or perforating vein distal to the SFJ to a tributary or perforating vein proximal to the ankle; segmental reflux is most common in the calf than in the thigh or knee; ii) distal from a tributary or perforating vein to the ankle; iii) multi-segmental with two or more distinct refluxing segments but a normal SFJ; iv) multi-segmental with reflux at the SFJ; v) proximal from the SFJ to a tributary or perforating vein at the thigh or calf above the ankle, having a normal segment; vi) diffuse throughout the entire vein, from SFJ to the ankle; vii) perforation if nonfemoral saphenous, femoro-popliteal, or nonfemoral non-saphenous reflux at the ankle; or viii) no reflux.

AASV and PTV were investigated in the thigh. The AASV drained the anterior surface of the thigh, running parallel to the GSV, into the saphenous-femoral junction. AASV alignment with the femoral artery and vein were searched for proper identification. The PTVS, including PAVS, drained the posterior surface of the thigh into the proximal GSV segment. A clinical, noticeable, predominant Gicamini vein from the SSV to the GSV was not part of PTV statistics in this study. The PTVS included as such in this study drained primarily the posterior thigh. Origins and drainage of varicose veins were noted. Venous mapping included dis-
stances from source and drainage points of reflux to anatomic landmarks.

AASV and PTSV reflux were classified as diffuse or non-diffuse. Diffuse AASV reflux, throughout the vein segment studied, started at the femoral junction and continued at least to the mid-distal thigh or knee. Non-diffuse reflux occurred in segments shorter than the venous segment studied. PTSV reflux was diffuse if included the junction to the GSV and extended distally for the entire segment evaluated, usually to mid-cristal thigh. PTSV reflux was non-diffuse if shorter than the venous segment evaluated. Figure 2 diagrams common configurations. Figure 3 exemplifies AASV reflux at the femoral junction.

Statistics

Descriptive statistics indicated frequency or prevalence of GSV, AASV and/or PTSV reflux. Prevalence was compared using χ² statistics from Excel files.

Results

This session describes patterns and prevalence of GSV, AASV and PTSV reflux, and the relations between AASV or PTSV and GSV patterns of reflux.

Prevalence of great saphenous vein, anterior accessory saphenous vein and posterior tributary saphenous vein reflux

All GSV were examined. There were high percentages of insignificant or undetected AASV or PTSV; AASV and PTSV were evaluated for reflux in 48% (46/1016) of the limbs; AASV in 34% (348/1016), a PTSV in 9% (81/1016), and combined in 3% (30/1016) of the extremities.

Reflex was most prevalent in the GSV, 72% (727/1016), then the AASVs, 4.5% (46/1016), and least prevalent in the PTSVs, 1.3% (13/1016) (P<0.001 for all comparisons). Percentages of reflux per AASV or PTSV examined were 13% (46/348) and 15% (13/81) respectively.

Total prevalence of reflux in either GSV, AASV and/or PTSV was 73% (738/1016). Single or multiple locations of reflux were: i) GSV only: 579 limbs (56.8% of 1015 limbs); ii) AASV only: 3 limbs (0.3%); 3 with diffuse and 6 with non-diffuse reflux; iii) PTSV only: 2 limbs (0.2%) with non-diffuse reflux; iv) GSV and AASV: 57 limbs (5.6%), 33 with diffuse and 14 with non-diffuse AASV reflux; v) GSV and PTSV: 1 1 limbs (1.0%); 7 with diffuse and 4 with non-diffuse PTSV reflux; vi) AASV and PTSV: 6; vii) GSV, AASV and PTSV: 0 limbs; and viii) no reflux in the GSV, AASV and PTSV: 278 limbs (27.6%)

Non-diffuse reflux predominated in cases of isolated AASV or PTSV reflux, 73% (9/11) or 27% (2/11) with diffuse reflux (P=0.03).

Patterns of great saphenous vein reflux

Prevalence of GSV or reflux patterns were from most to least common: i) segmental reflux, 32.6% (n=325/1016 limbs); ii) no reflux, 28.4% (n=289/1016); iii) multi-segmental reflux with normal SFJ, 11.8% (n=123/1016); iv) proximal, 9.3% (n=99/1016); v) distal, 8.0% (n=81/1016); vi) diffuse reflux with SFJ reflux, 7.3% (n=74/1016); vii) diffuse reflux, 3.1% (n=31/1016), and viii) reflex reflux, 0.7% (n=7/1016).

Segmental or multi-segmental reflux patterns with normal SFJ were noted in 44%

Figure 2. Diagrams exemplifying diffuse or non-diffuse reflux of the anterior accessory saphenous vein (AASV) or thigh posterior tributary to saphenous vein (PTS V) in red, located anterior or posteriorly in the thigh in relation to the great saphenous vein in blue. Identification of the AASV and PTSV were consistent with descriptions by Cavezza et al. and Caggiani et al. Diffuse reflux was present in the entire segment evaluated. Non-diffuse reflux was limited to small vein segments, components of the entire venous segment evaluated. Short length, proximal reflux was included in the non-diffuse group. Dotted line indicating that the small to great saphenous connecting vein was not part of the PTSV analysis.

Figure 3. Duplex Doppler ultrasound showing anterior accessory saphenous vein (AASV) reflux at the femoral junction. A) Doppler reverse flow signal from the femoral to the AASV; B) color flow image of the common femoral and great saphenous vein (GSV) in blue and the AASV in red (anatomic variations are described, for example, in veins and lymphatics.com/en/fonation_sapheno_femoral_caap); and C) color flow image of a normal GSV in blue and Doppler signal showing GSV flow toward the common femoral vein.
Patterns of anterior accessory saphenous vein reflux

- Prevalence of AASV flow or reflux patterns were, from most to least common: i) insuffi- cent flow or size, 65.7% (n=680/1016); ii) no reflux, 29.7% (n=302/1016); iii) diffuse reflux, 2.6% (n=261016); and iv) non-diffuse reflux - segmental way from the junction or short proximal segment, 2.0% (n=20/1016).

- Prevalence of AASV diffuse reflux, proximal or segmental reflux was 4.5% (n=46/1016).

Patterns of posterior tributary to saphenous vein reflux

- Prevalence of PTSV flow or reflux patterns were, from most to least common: i) insuffi- cent flow or size, 91.3% (n=926/1016); ii) no reflux, 7.4% (n=75/1016); iii) diffuse reflux, 0.7% (n=7/1016), and iv) non-diffuse reflux - segmental reflux from the junction or short proximal segment, 0.6% (n=6/1016).

- Prevalence of PTSV diffuse reflux, proximal or segmental reflux was 1.3% (n=12/1016).

Relations between anterior accessory saphenous vein and great saphenous vein reflux patterns

Table 1 shows cross-tabulation between patterns of reflux in the AASV and GSV. Distribution of GSV reflux patterns was significantly different as a function of AASV patterns (P<0.001, χ² applied to 4×4 data of Table 1). Diffuse AASV reflux was associated with higher prevalence of SJV reflux.

Some two-by-two comparisons provided the following statistics: i) diffuse AASV plus SJV reflux showed significantly higher prevalence, n=14 of 26 (54%), than the expected prevalence of approximately 20%, n=5, as shown in Table 2 (P<0.001); and ii) non-diffuse AASV plus SJV reflux showed a real prevalence, n=4 of 20 (Table 1), equal to the expected prevalence of 20% (P=0.98).

Relations between posterior tributary to saphenous vein and great saphenous vein reflux patterns

Table 3 shows cross-tabulation between patterns of reflux in the PTSV and GSV. Distribution of GSV reflux patterns was not significantly different as a function of PTSV patterns.
patterns (P=0.17, χ² applied to 4×8 data of Table 3).

Summary

The population studied had a prevalence of 736 (728/1016) of reflux in the GSV and thigh AASV, PTSV. Reflux prevalence was 72% (728/1016) in the GSV, 45% (44/1016) in the AASV, and 1.3% (13/1015) in PTSV. Testing for AASV and PTSV reflux increased detection of reflux by 1% (11/1016) and improved definition of patterns of reflux in 5.8% (59/1016) of the lower extremities. AASV diffuse reflux correlated with a 2.5 times higher prevalence of GSV-SFJ reflux than expected in general (54% vs 20%).

Discussion

We emphasized ultrasound findings in early stages of CVI in women. CVI emphasizes venous insufficiency, not highlighted when the CVI expression, that includes thrombosis, is used. Attention to CVI increased with development of minimally invasive thermal and chemical ablation treatments such as laser or radio frequency and foam sclerotherapy. Advanced Doppler-ultrasonography have contributed to CVI understanding, diagnosis, treatment and follow-up.

International consensus occurred to minimize confusion in past phlebologic literature. Description of patient populations studied improved but studies of even more specific sample populations, based on gender for example, should be promoted.

Any venous segment could become an initial source of reflux and varicose veins. Segmental GSV reflux from a tributary source to a tributary drainage is the most common. A perforating vein source of reflux is not common finding in early stages of disease. Perforating vein drainage was considered reflux, particularly if segmental diameter changes were noted at sources and drainage points. Segmental reflux propagates mostly to multi-segmental reflux if not treated: reflux evolves from the weakest to the next weakest point, regardless of anatomic relationships. We investigated if AASV or PTSV could be weak sites for reflux development early on. PTSV were originally interpreted as the posterior accessory saphenous vein but this specific interpretation has been questioned leading to a more general PTSV description.

Most prevalence data represent a select clinic group and not the population in general. The sample in this study had GSV reflux with similar prevalence (72%) as previously reported for a varicose vein C2 group (77%), almost double than reported for a telangiectasia C1 group (44%). Saphenofemoral junction reflux is uncommon in early stages of disease; previously published prevalence in women with varicose veins or telangiectasias was less than 20%43 the prevalence found in the sample population of this study (Table 2). Reflux at the AASV contributed to SFI reflux; SFI reflux prevalence almost tripled in cases of diffuse AASV reflux (Table 2). Garcia-Gimeno described AASV reflux prevalence over 10% for a sample population with over 60% SFI reflux,22 a group apparently with more advanced disease than the one in this work. Determination of terminal valve patency is significant to design type of treatment. Brazilian custom is to treat telangiectasias and small reticular veins with 75% deoxycorticosterone solution. Modern technique involves foam sclerotherapy with polidocanol for relatively larger veins. Advanced technology has been implemented in clinics specialized in both symptomatic and aesthetic phlebology.25–28 Cold air sedation, laser ablation and liquid sclerosant with 75% deoxycorticosterone have been combined to treat small veins, resulting in the Cryo Laser and Cryo sclerotherapy or CLoCs technique.29 This procedure is guided by a near infra red imaging Vein Viewer (Luminex Co, Memphis, TN, USA). This device colors over the skin the more superficial veins than noted by the human eye or detected by US. The technique denominated augmented reality shows smaller nutrient veins underneath telangiectasias consistently.26 Results of the CLoCs technique was reported at the 2013 International Union of Phlebology (IUP) meeting showing improvement of skin conditions with 1% of the patients complaining of hyperpigmentation.

In this investigation, we focused on AASV and PTSV, not frequently included in CVI studies. AASV and PTSV were rarely the initial location of reflux in C1-C2-C3 women. Our and Seidel's data suggested propensity for early reflux and varicosity abnormalities more so in the calf than in the thigh.62,64 calf veins other than the GSV were not included in this analysis. Above-knee source of GSV reflux was expected to be less than 3% in C2 women.5

Saphenous accessory and tributary veins in the thigh are less vulnerable to hydrostatic pressures and kinetic energies than the great saphenous and the veins in the calf. Approximately 1 in 17 extremities tested may have AASV or PTSV reflux. On another angle, 1 in 100 extremities may have only AASV or PTSV reflux. If the goal is to detect CVI early to follow or treat patients, AASV and PTSV should be evaluated despite low reflux prevalence.

Significant changes in patterns of reflux are expected if a woman presents with premenstrual syndrome.7 Veins in all anatomic regions of the thigh have been evaluated if pelvic venous reflux is suspected, particularly if thigh varicosities are present. These patients, however, were excluded from this early stage of disease study. Also, the prevalence described herein cannot be applied to men in general or women C4, C5-C6 or even true C3 with constant edema.

In summary, it was confirmed that most women with early stages of CVI had segmental or distal GSV reflux not involving the SFI. Furthermore, prevalence of AASV or PTSV reflux was low, and mostly associated with SFI reflux. AASV or PTSV localized reflux, however, was the only abnormality detected in 1% of the extremities. Use of these veins altered reflux pattern definition in about 6% of the extremities, and AASV diffuse reflux indicated a great prevalence of SFJ reflux in the affected GSV.


