Online version at https://www.minervamedica.it

International Angiology 2022 June;41(3):223-31
DOI: 10.23736/S0392-9590.22.04855-6

ORIGINAL ARTICLE
VENOUS DISEASE

EDITOR'S CHOICE

Integrated anatomic and hemodynamic classification for primary superficial venous disease: results from an expert survey

Joel SOUSA [1, 2] *, Sergio GIANESINI [3, 4], Armando MANSILHA [1, 2]

[1]Department of Angiology and Vascular Surgery, S. João University Hospital, Porto, Portugal; [2]Department of Surgery and Physiology, Faculty of Medicine of the University of Porto, Porto, Portugal; [3]Department of Translational Medicine, University of Ferrara, Ferrara, Italy; [4]Department of Surgery, Uniformed Services University of Health Sciences, Bethesda, MD, USA

*Corresponding author: Joel Sousa, Department of Angiology and Vascular Surgery, S. João University Hospital, Alameda Prof. Hernâni Monteiro, 4200-319 Porto, Portugal. E-mail: joelferreirasousa@gmail.com

ABSTRACT

Background: There is general perception among vascular physicians that primary lower limb superficial chronic venous disease (CVD) can present in various clinical, anatomical and hemodynamical patterns. Nonetheless, and despite the diversity of classifications on this subject, none specifically addresses such patterns in an integrative form. In the authors opinion, an integrated anatomic and hemodynamic classification could prove a valuable tool for both patient stratification and treatment, as well as postoperative outcomes assessment and homogeneous comparison among groups. The purpose of this study was to collect expert opinion on the usefulness and applicability of a new integrated anatomic and hemodynamic classification for primary superficial venous disease, as well as the anatomic and hemodynamic variables to consider.

Methods: A survey was administered *via* a web-based platform to a worldwide selected group of experts on vascular pathology. The survey included 27 questions and collected data on physician demographics and clinical experience (6 questions); usefulness and applicability of a new classification (6 questions); and anatomic and hemodynamic variables to consider (15 questions). A 5-point Likert Scale was used for categorization, and open-ended questions were included for commentary.

Results: A total of 278 surveys were sent to experts worldwide, out of which 122 participated (response rate 43.9%). Most participants were European based (85.2%) vascular surgeons (85.2%), but experts from 39 countries across all continents were represented. 88.9% of the respondents agreed that primary varicose veins can be divided in different anatomic and hemodynamic patterns, although only 45.1% believe current classifications are appropriate to differentiate such patterns; 58.2% of respondents agree with an anatomical classification of varicose veins (VV) according to their area of distribution in the lower limb (anterior, posterior, medial, lateral), and 77.1% agree with a hemodynamic categorization of VV in 3 major patterns: VV related with saphenous insufficiency; VV related with pelvic insufficiency; isolated insufficient tributaries and

perforator veins. There is general consensus that an integrated anatomic and hemodynamic classification for primary superficial venous disease would be of great use for patient stratification (80.3%), treatment selection (72.2%) and postoperative outcome assessment (70.5%); furthermore, 68.9% of the respondents would use the aforementioned classification, as long as it remained simple and easy to apply in a clinical practice daily basis.

Conclusions: The results of the present survey demonstrate that vascular physicians involved in the treatment of primary superficial venous disease recognize the limitations on current varicose vein classifications and agree on the need for a more comprehensive classification for such pathology. Experts agree that an integrated anatomic and hemodynamic classification for primary superficial venous disease would be of great use for patient stratification, treatment selection and postoperative outcome assessment, as long as it remained simple and easy to apply in a clinical practice daily basis. Collected evidence provides significant insights on expert opinion on anatomic and hemodynamic variables to assess and may set the bases for a new classification. Further validations using methodologically solid strategies for expert consensus are required.

(*Cite this article as*: Sousa J, Gianesini S, Mansilha A. Integrated anatomic and hemodynamic classification for primary superficial venous disease: results from an expert survey. Int Angiol 2022;41:223-31. DOI: 10.23736/S0392-9590.22.04855-6)

Key words: Veins; Hemodynamics; Varicose veins.

Chronic venous disease (CVD) is a persistent, progressive, and frequently underestimated condition widely represented in the general population, with a high socioeconomic, physical, and psychological impact.[1, 2] It is defined by the presence of any abnormality of long duration affecting the venous system, manifested by symptoms and/or signs indicating a need for investigation and treatment. Such symptoms are variable and nonspecific and include pain, throbbing, tightness, heaviness, feeling of swelling, muscle tiredness, itching, cramps, burning sensations, restless legs, tingling or venous claudication.[3] Signs of CVD are also diverse, ranging from telangiectasias, reticular and varicose veins, edema, and skin changes.[3] Considering the plethora of CVD manifestations, it comes with no surprise that several different classifications have been proposed throughout the years, focusing on anatomic, hemodynamic or clinical severity aspects. Among such classifications, one of the first to experience widespread use was the 1978 Widmer's classification, which divided CVD in 3 stages depending on its clinical severity: stage I was defined by the presence of paraplantar telangiectasias; stage II by skin changes, such as pigmentation or lipodermatosclerosis; and stage III included active or healed venous ulcer.[4] Although useful, this classification was criticized for the low specificity between stages I and II, which significantly limited its reproducibility and clinical usefulness. Moreover, its scope was purely clinical and did not include any kind of hemodynamic assessment.[5, 6] This lack of clinical and physiologic integration was later addressed by Partsch who, in 1980, proposed a classification that included additional functional assessments of subclasses of CVD, according to the anatomic involvement of superficial, perforator, and deep veins.[7] Although this represented an important conceptual improvement, such measurements were to be performed using foot volumetry and ambulatory venous pressure, techniques that were not widely used at the time. As such, the widespread implementation of such classification was significantly hindered.[7] Around the same period, in 1979, Hach proposed a different classification, specifically focused on the hemodynamical aspects of chronic venous disease.[8] Unlike previous systems, Hach graded saphenous insufficiency in different levels, depending on the vein involved and the extension of reflux. Although innovative, such classification only assessed saphenous involvement, and did not consider the etiology of CVD, its anatomical extension and clinical severity.[8] This diversity of CVD classifications later motivated an effort to provide more precise and effective reporting standards for venous disease. To do so, an *ad-hoc* committee of the Society for Vascular Surgery and the North American chapter of the International Society for Cardiovascular Surgery developed the first Reporting Standards in Venous Disease, which were published in 1988.[5, 9] This document classified CVD in three levels of clinical sever-

ity (0 – asymptomatic; 1 – mild; 2 – moderate; 3 – severe) and considered two additional aspects: etiology and anatomic distribution of CVD, as well as need for imaging and physiologic tests to accurately diagnose and classify the disease. Unfortunately, this classification by clinical severity was restrictive, and could not accurately differentiate the whole spectrum of CVD clinical and hemodynamical manifestations. As such, the CEAP classification, now widely viewed as the gold-standard for CVD classification, quickly replaced the aforementioned clinical severity classification in the 1995 updated reporting standards.[10] The origin of the CEAP classification dates back to the 5th Annual Meeting of the American Venous Forum (1993), when Porter *et al*. suggested a classification for venous disease, similar to the TNM classification for cancer.[11] This suggestion laid the foundation for a consensus conference at the 6th annual meeting of the American Venous Forum (1994), where representatives from Australia, Europe, and the United States, chaired by Nicolaides, developed the CEAP consensus document, first published in 1996, and revised in 2004 and 2020.[5] Unlike previous systems, CEAP is an inclusive classification, reporting data on the clinical manifestations of CVD, its etiology, involved anatomy and underlying venous pathology. Nonetheless, although considered a universal classification for CVD, CEAP has several limitations. Most certainly, the three most relevant ones are related with the fact that CEAP does not consider the severity or evolution of the disease, rather providing a static output on a given period; C2 category summarizes all kinds of varicose veins, regardless of the hemodynamic pattern of insufficiency involved; and anatomic classification (A) does not provide insights on the regional distribution of varicose veins and is not correlated with the disease extension.[12] Although the aforementioned are some of the most relevant CVD classifications, there are, to our knowledge, 12 different classifications published in the literature, each with their own strengths and limitations.[7-10, 13-21] Despite such diversity, none specifically addresses the various clinical, anatomical and hemodynamical patterns of primary superficial venous disease in an integrative form. In the opinion of the authors, if available, an integrated anatomic and hemodynamic classification could prove a valuable tool for both patient stratification and treatment, allowing for patient-tailored interventions and providing more precise reporting standards for postoperative outcomes assessment. Therefore, the aim of this study was to collect expert opinion on the necessity and applicability of a new classification for primary superficial venous disease, as well as the anatomic and hemodynamic variables to consider.

Materials and methods

Survey design

The survey was designed using a common web-based survey platform (GoogleForms®, Google LLC, Mountain View, CA, USA) and contained 27 questions covering the following domains: A- Physician demographics and clinical experience (6 questions); B- Usefulness and applicability of a new classification (6 questions); C- Anatomic and hemodynamic variables to consider (15 questions). For categories B and C, a 5-point Likert Scale was used (strongly agree; agree; neither agree nor disagree; disagree; strongly disagree). Content validity was addressed by soliciting to all respondents to provide comments or feedback on questionnaire content. The questionnaire was written in English language, and no translations were provided. The full questionnaire can be consulted on Supplementary Digital Material 1 (Supplementary Text File 1).

Expert group selection

The survey was aimed for a group of experts on vascular pathology, selected from: European Society for Vascular Surgery (ESVS) Councilors and Executive Committee (ExCo) members; UEMS Section and Board of Vascular Surgery National Delegates and ExCo members; UEMS FEBVS examiners; reviewers and members of the Editorial Board of the European Journal of Vascular and Endovascular Surgery; reviewers and members of the Editorial Board of International Angiology journal. Potential participants were emailed a cover letter describing the survey, its extent, and goals, and requesting their voluntary and anonymous participation. The email also contained the link to the survey.

Survey administration and data analysis

Invitations to complete the survey were performed electronically *via* email on 29/03/2021, and responses were received and accepted until April 15, 2021. An electronic reminder and participation invitation were sent before closure of the survey, to maximize the response rate. Participants were not offered any compensation for completing the survey. The survey, survey responses, and data compilation were performed through GoogleForms®. Responses were collected anonymously and pooled. Appropriate descriptive statistics and percentages were recorded, and free text comments were reviewed for recurring statements and themes. Data analysis was performed using SPSS 27.0 (SPSS Inc., Chicago, IL, USA).

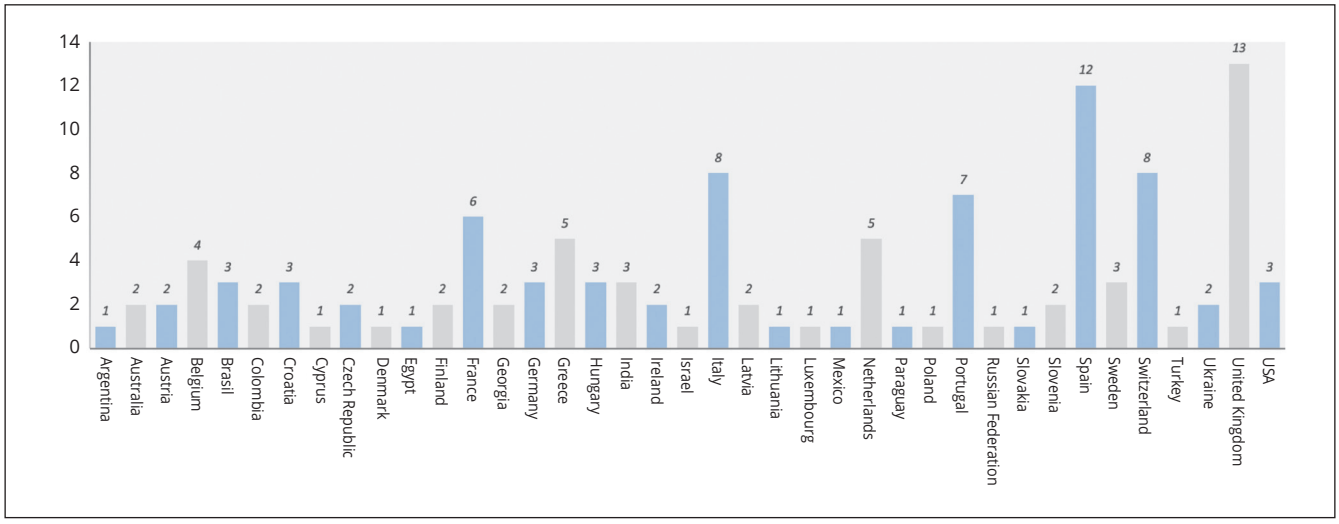

Figure 1.—Geographical distribution of the included experts.

Results

A group of 278 experts were selected and electronically invited to participate in the survey, out of which 122 responded, for a response rate of 43.9%. All responses were included for analysis. Not all respondents answered every question. Results are presented per section of the questionnaire for better description.

A: physician demographics and clinical experience

There was a clear predominance of vascular surgeons among the expert group (85.2%), although general surgery (1.6%), phlebology (4.9%), angiology/vascular medicine (6.6%), dermatology (0.8%) and interventional cardiology (0.8%) physicians were also included. Most experts developed their practices in Europe (85.2%), followed by America (8.2%), Asia (4.1%), Oceania (1.6%) and Africa (0.8%), for a total representation of 39 countries (Figure 1). Most professionals performed more than 100 cases of varicose vein surgery yearly (50%), using a vast array of venous techniques. Mean age was 55.3 years old (34-74±8.8). Table I summarizes expert group characteristics.

Table I.—*Expert group demographics and clinical experience.*

Specialization	N. (%)
Vascular surgery	104 (85.2)
General surgery	2 (1.6)
Phlebology	4 (4.9)
Angiology/vascular medicine	8 (6.6)
Dermatology	1 (0.8)
Interventional cardiology	1 (0.8)
Continent of practice	
Europe	104 (85.2)
America	10 (8.2)
Asia	5 (4.1)
Africa	1 (0.8)
Oceania	2 (1.6)
Number of cases of VV surgery performed yearly	
<10	11 (9,0)
10-50	27 (22,1)
50-100	21 (17,2)
>100	61 (50,0)
NR	2 (1.6)

B: usefulness and applicability of a new classification

The vast majority of respondents (88.9%) agreed that primary varicose veins can be divided in different anatomic and hemodynamic patterns (B1: 51.6% strongly agree; 36.9% agree). Nonetheless, only 45.1% agreed that current varicose vein classifications are adequate to properly differentiate such patterns (B2: 2.5% strongly agree; 42.6% agree), while 70.5% of the experts considered that a universal classification or reporting standards for primary varicose veins are lacking (B3: 18.0% strongly agree; 52.5% agree). The majority of the respondents believe that such classification would be useful in physicians' daily practice (B4: 23.8% strongly agree; 51.6% agree) and could provide insights on the selection of the best treatment technique according to the pattern (B5: 34.4% strongly agree; 52.5% agree) as well as studying pattern-associated recurrences (B6: 30.3% strongly agree; 59.0% agree). Table II and Figure 2 report questions B1-B6 and respective response rates. Descriptive response rates can be consulted on Supplementary Digital Material 2 (Supplementary Table I).

TABLE II.—*Questions B1-B6: usefulness and applicability of a new classification for primary superficial venous insufficiency.*

B	Questions
1	Do you agree that primary varicose veins can be divided in different anatomic and hemodynamic patterns?
2	Do you believe current varicose vein classifications are adequate for proper differentiation of such superficial primary venous insufficiency patterns?
3	Do you believe there is a lack for a universal classification/reporting standards for primary varicose veins?
4	Do you believe such classification would be useful in physicians' daily practice?
5	Do you believe proper anatomic and hemodynamic classification of primary varicose veins could provide insights on the selection of the best treatment technique according to the pattern?
6	Do you believe such classification could be useful for studying pattern-associated recurrences?

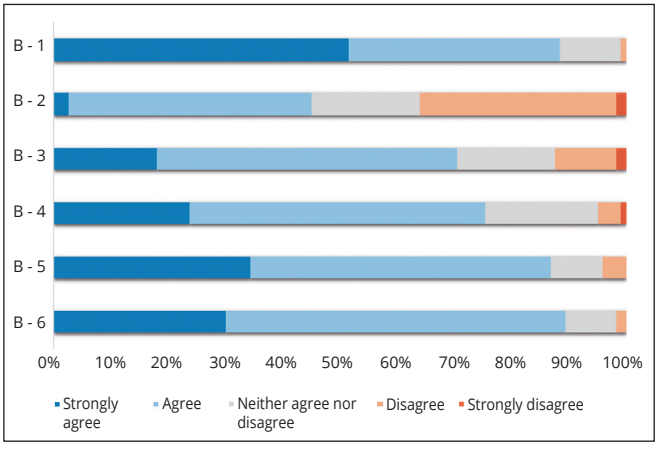

Figure 2.—Expert opinion on the usefulness and applicability of a new classification for primary superficial venous insufficiency.

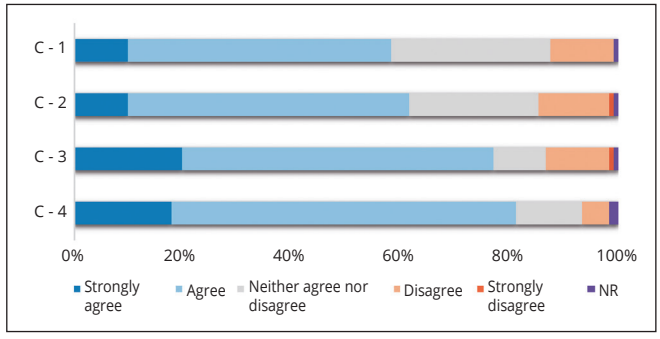

Figure 3.—Expert opinion on the proposed anatomic and hemodynamic categorization of primary venous insufficiency.
NR: not responded.

C: anatomic and hemodynamic variables to consider

Overall, most of the respondents agreed that an anatomic division of the lower limb into four different compartments is possible (C1: 9.8% strongly agree; 48.4% agree) and intuitive for daily practice use (C2: 9.8% strongly agree; 51.6% agree). Regarding the hemodynamic categories of primary varicose veins, there was general consensus (C3: 19.7% strongly agree; 57.4% agree) that not only varicose veins can be categorized in three patterns of disease (varicose veins related with saphenous insufficiency; varicose veins related with pelvic insufficiency; isolated insufficient tributaries and perforator veins), but also such categorization is intuitive for daily practice use (C4: 18% strongly agree; 63.1% agree). Table III and Figure 3 report questions C1-C4 and respective response rates. When discussing saphenous vein hemodynamic patterns of insufficiency, 74.6% of the experts (C5: 13.9% strongly agree; 60.7% agree) share the opinion that saphenous vein insufficiency can be classified in 4 categories: diffuse, proximal, distal, and segmental. Consensus among the experts was observed for all the proposed hemodynamic definitions of saphenous insufficiency (C6-C11). Used definitions and respective response rates are reported in Table IV and Figure 4. Regarding the usefulness of the aforementioned anatomic and hemodynamic classifications, 80.3% of the experts agree that their combination would allow for proper differentiation of

TABLE III.—*Questions C1-C4: anatomic and hemodynamic classification of primary superficial venous insufficiency.*

C	Questions
1	Do you agree that, in an anatomic point of view, the lower limb can be divided in 4 compartments: anterior, posterior, medial and lateral?
2	Do you believe that such anatomic division is intuitive for daily practice use?
3	Do you agree that, in a hemodynamic point of view, the following categories properly summarize the various patterns of varicose veins?
	Varicose veins related with saphenous insufficiency
	Varicose veins related with pelvic insufficiency
	Isolated insufficient tributaries and perforator veins
4	Do you believe that such hemodynamic division is intuitive for daily practice use?

TABLE IV.—*Questions C5-C11: proposed hemodynamic definitions for patterns of saphenous insufficiency.*

C	Questions
5	Do you agree that, in a hemodynamic point of view, saphenous vein insufficiency can be classified in four different categories: diffuse, proximal, distal, segmental?
6	In your opinion, is the following definition of diffuse saphenous insufficiency appropriate? Diffuse insufficiency - saphenous trunk insufficiency throughout all its extension
7	In your opinion, are the following definitions of proximal saphenous insufficiency appropriate? 7.1. For great saphenous vein (GSV): incompetence of the GSV in the thigh, up to its distal third or proximal calf, where it drains through incompetent perforator or tributary veins; 7.2. for small saphenous vein (SSV): incompetence of the SSV in its two most proximal thirds, where it drains through incompetent perforator or tributary veins; 7.3. for accessory saphenous veins (ASV): incompetence of the ASV in its two most proximal thirds, where it drains through incompetent perforator or tributary veins;
8	Do you agree that, in a hemodynamic point of view, proximal GSV and ASV insufficiency is properly divided in the following subcategories: proximal saphenous insufficiency with terminal valve insufficiency proximal saphenous insufficiency without terminal valve insufficiency
9	In your opinion, is the following definition of distal saphenous insufficiency appropriate? 9.1. For great saphenous vein (GSV): saphenous vein is competent until the distal third of thigh or proximal calf. The reflux originates at this level, from an insufficient or perforator vein, and extends to the paramalleolar region; 9.2. for small saphenous vein (SSV): saphenous vein is competent until its distal third. The reflux originates at this level, from an insufficient or perforator vein, and extends to the paramalleolar region; 9.3. for accessory saphenous veins (ASV): saphenous vein is competent until its distal third. The reflux originates at this level, from an insufficient or perforator vein, and extends distally
10	In your opinion, is the following definition of segmental saphenous insufficiency appropriate? Segmental insufficiency: saphenous vein reflux originates from a tributary or perfurator vein and extends distally to another tributary of perforator vein. The sapheno-femoral or sapheno-popliteal junctions are competent, as well as a proximal and distal segment of the saphenous vein involved
11	Do you agree that, in a hemodynamic point of view, segmental saphenous vein insufficiency is properly divided in the following subcategories: above knee below knee multi-segmental

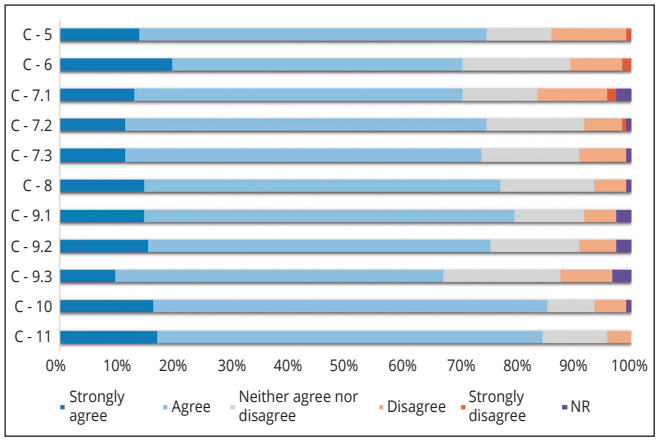

Figure 4.—Expert opinion on the proposed hemodynamic definitions for patterns of saphenous insufficiency.
NR: not responded.

superficial venous disease patterns (C12: 12.3% strongly agree; 68.0% agree) and, by doing so, improve treatment strategy selection according to the observed pattern (C13: 51.6% strongly agree; 36.9% agree). Moreover, 70.5% of the respondents (C14: 10.7% strongly agree; 59.8% agree) believe such classification would be useful to better understand varicose veins recurrence patterns. Most of the respondents (68.9%) would use the described classification on their daily practice, if available (C15: 14.8% strongly agree; 57.4% agree). Table V and Figure 5 report questions C12-C5 and respective response rates. Descriptive response rates for questions C1-C15 can be consulted on Supplementary Digital Material 3 (Supplementary Table II).

Discussion

Primary superficial venous disease is an extremely prevalent condition. It can present itself in various anatomical and hemodynamical patterns, and both presentation and treatment strategies vary along it. Several classifications for primary varicose veins have been described throughout the years, and although each has their unique set of advantages and disadvantages, there is no unanimous acceptance of any. Moreover, none specifically addresses both the anatomic and hemodynamic aspects of the disease in an integrative form. The existence of an integrated

TABLE V.—*Questions C12-C15: applicability of a classification based on the previous patterns.*

C	Questions
12	In your opinion, the aforementioned anatomic and hemodynamical classifications, when combined, would allow for proper differentiation of superficial venous insufficiency patterns?
13	In your opinion, the aforementioned classification can be useful to choose the most adequate technique for each pattern?
14	In your opinion, the aforementioned classification can contribute to better understand the recurrence pattern?
15	Would you use the described classification in your daily practice?

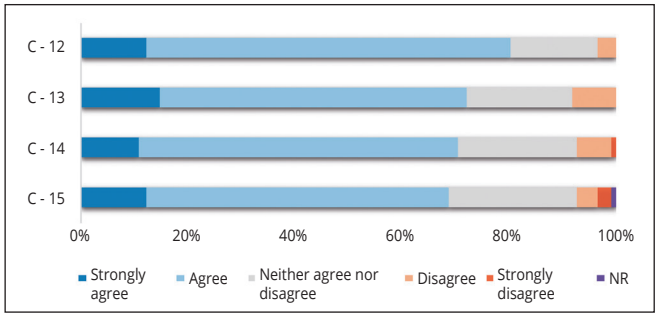

Figure 5.—Expert opinion on applicability of a classification based on the previous patterns.
NR: not responded.

anatomic and hemodynamic classification is an interesting concept since, theoretically, it could provide reporting standards for varicose veins natural history, treatment strategies and postoperative results. With this in mind, the authors designed the current survey in order to collect expert opinion on this matter, particularly the usefulness of such classification and which anatomic and hemodynamic variables to consider. Questions were compiled in 3 sections (A, B, and C)) according to their specific purpose. The A section of the questionnaire recorded data on the demographic details of the respondents, aiming to assess experts group background and homogeneity. Respondents' practices span throughout 39 different countries from all 5 continents, but most of the experts are Europe-based (85.2%) Vascular Surgeons (85.2%). The authors believe this expert group is inclusive and provides appropriate representation of different healthcare settings and treatment strategies but acknowledge that this distribution may be associated with a non-negligible risk of sampling bias. Regarding the B section, it aimed to assess expert opinion on current classifications for superficial venous disease, as well as the usefulness of a new classification. This survey demonstrates very clearly that experts believe primary varicose veins can present in different anatomic and hemodynamic patterns, and that current classifications do not reflect these patterns. Moreover, and despite the existence of several published CVD classifications, experts believe that a new anatomic and hemodynamic classification is missing, and consensually agree that such classification would be of great use, potentially guiding treatment strategies and improve current understanding on recurrences. Moreover, current literature showed heterogeneity even in different countries recommendations on CVD management, despite the same available literature: a scientific paradox that could be explained also by the heterogenous outcome measure reporting due to the lack of an integrated comprehensive scoring system.[22] Finally, the rationale for the C section was to assess expert opinion on a proposition of anatomic and hemodynamic classification. Since varicose veins can be observed in all surfaces of the lower limb, with different patterns of severity and insufficiency, it comes with no surprise that categorizing such diversity is a cumbersome and difficult task. CEAP classification is generally accepted as the gold standard classification for CVD, and its anatomical component (A) addresses this point. According to this classification, superficial varicose veins can be divided in 6 categories, depending on their individual characteristics and point of reflux (reticular veins; great saphenous vein above knee; great saphenous vein below knee; small saphenous veins; anterior accessory saphenous vein; non-saphenous veins).[5] Although intuitive, CEAP does not disclose the actual anatomical location of the varicose veins, and fails to clarify prognostically relevant escape points for non-saphenous veins, such as those of pelvic origin. Moreover, the below knee / above knee classification proposed for GSV insufficiency is rather simple and does not reflect the various patterns of insufficiency observed in clinical practice. Aware of these limitations, the C section of the questionnaire was designed in 3 parts: questions C1 to C4 assessed expert opinion on a new conceptual anatomic and hemodynamic classification of primary venous disease; questions C5 to C11 specifically addressed expert opinion on hemodynamic patterns of saphenous insufficiency; and finally, questions C12-C15 inquired on the applicability of a classification based on the previous patterns. The first questions (C1-C4) collected opinions on a conceptual anatomical division of the lower limb in 4 compartments (anterior, posterior, medial

and lateral) and hemodynamical categorization in 3 classes (varicose veins related with saphenous insufficiency; varicose veins related with pelvic insufficiency; isolated insufficient tributaries and perforator veins). Most of the experts agreed with both concepts, although with different levels of acceptance. For the proposed anatomical division, 58.2% of the respondents agreed, although no consensus was obtained. Some of the reasons appointed for the disagreement were due to the linguistic terms applied, particularly the use of the word "compartment." Experts believe this term was inaccurate since it is generally used to reflect deep rather than superficial structures. The authors agree with this comment and believe such inaccuracy could be overcome by addressing the aforementioned anatomic areas by "regions" rather than "compartments." Regarding the hemodynamical categorization, this survey has demonstrated that experts consensually agree with this division (77.1% agreement rate) and consider it intuitive for daily practice use. Some experts pointed, however, that the absence of a specific categorization for recurrence due to neovascularization is a limitation of this concept. The authors acknowledge that neovascularization is a frequent cause of recurrence and superficial varicose veins, and therefore should be addressed. Nonetheless, the complexity of recurrent varicose veins' pathophysiology and venous anatomy is beyond the scope of this survey and has been extensively studied in recurrence-specific classifications.[23-26] The notion that saphenous insufficiency can present itself in various hemodynamic patterns is not new, and is the basis of the ascending, descending and multisegmental theories for varicose veins progression.[27-29] With this in mind, a hemodynamic division of saphenous insufficiency in 4 categories - diffuse, proximal, distal and segmental - was proposed (C5) and each pattern was subsequently defined (C6-C11). The authors believe this division is in accordance with previously published classifications and encompasses what is observed in clinical practice.[27, 29] This opinion is shared by the enquired experts, with consensus agreement observed for every question. Several comments have been provided for these questions, although the majority are due to linguistic reasons, rather than conceptual ones. Some experts pointed, however, the need for a better disclosure of deep veins competence. Although deep vein competence surely influences the anatomic and hemodynamic patterns of varicose veins, this survey was designed to specifically assess expert opinion on an integrated classification for primary superficial venous disease. The authors recognize the importance of secondary causes of varicose veins, but their assessment and classification are beyond the scope of this work. The final questions of the C section of the survey (C12-C15) aimed to inquire experts regarding the usefulness and applicability of the conceptual classification described. Experts reported with a >70% agreement rate that, if available, such an anatomic and hemodynamic classification could be of great use for proper differentiation of superficial venous disease patterns, treatment technique selection, and recurrence pattern understanding. Nonetheless, several experts reported simplicity as a key point on the usability of any classification, recalling that to be clinically applicable, such characteristic must be respected.

Limitations of the study

The present study has several limitations. We used a sample of convenience, with a clear predominance of European physicians, which may limit the generalizability of these findings. Moreover, while our response rate was an acceptable 43.9%, it is possible that the experts who did not respond to our survey believe there is no room for newer classifications or that such a categorization is not possible for a daily practice application. Finally, and similarly to all survey studies, there is the additional limitation of variability due to individual respondents' interpretation.

Conclusions

The results of the present survey demonstrate that vascular physicians involved in the treatment of primary superficial venous disease recognize the limitations on current varicose vein classifications and agree on the need for a more comprehensive classification for such pathology. Most experts believe that primary superficial venous disease clinically presents in different anatomic and hemodynamic patterns, recognize the inability for current classifications to address those patterns, and agree with the authors proposed anatomic (limb division in 4 compartments - anterior, posterior, medial, lateral), and hemodynamic categorizations (varicose veins related with saphenous insufficiency; varicose veins related with pelvic insufficiency; isolated insufficient tributaries and perforator veins). There is general consensus that an integrated anatomic and hemodynamic classification for primary superficial venous disease would be of great use for patient stratification, treatment selection, postoperative outcome assessment and related proper international guidelines recommendation improvement, as long as it remained simple and easy to apply in a clinical practice daily basis. Collected evidence provides significant insights on expert opinion on this matter and may set

the bases for a new classification. Further validations using methodologically solid strategies for expert consensus are required.

References

1. Nicolaides AN, Labropoulos N. Burden and Suffering in Chronic Venous Disease. Adv Ther 2019;36:1–4.

2. Guex JJ, Mariani F, Maleti O, Hamel-Desnos C, Vasdekis S, Staelens I, *et al.* European training requirements in phlebology. Int Angiol 2019;38:345–64.

3. Nicolaides A, Kakkos S, Baekgaard N, Comerota A, de Maeseneer M, Eklof B, *et al.* Management of chronic venous disorders of the lower limbs. Guidelines According to Scientific Evidence. Part I. Int Angiol 2018;37:181–254.

4. Widmer LK. Da Silva. Venen-, Arterien-Krankheiten, koronare, Herzkrankheit bei Berufstatigen (Basler Studie I bis III) [Venous, arterial diseases, coronary, heart disease in employees (Basel study I to III)]. Stuttgart: Verlag; 1981. [German].

5. Lurie F, Passman M, Meisner M, Dalsing M, Masuda E, Welch H, *et al.* The 2020 update of the CEAP classification system and reporting standards. J Vasc Surg Venous Lymphat Disord 2020;8:342–52.

6. Lurie F, Passman M. What is new in the 2020 update of the CEAP classification? Int Angiol 2020;39:443–4.

7. Partsch H. ["Betterable" and "nonbetterable" chronic venous insufficiency. A proposal for a practice-oriented classification]. Vasa 1980;9:165–7. [German].

8. Hach WS, Becker L. Changes in the deep veins in a truncal varicosis of the great saphenous vein [Veranderungen der tiefen Leitvenen bei einner Stammvaricose der V. saphena magna]. In: Muller-Wiefel H, editors. Microcirculation and blood rheology [Mikrozirkulation und Blutrheologie]. Baden: Witzstrock; 1980. [German].

9. Reporting standards in venous disease. Prepared by the Subcommittee on Reporting Standards in Venous Disease, Ad Hoc Committee on Reporting Standards, Society for Vascular Surgery/North American Chapter, International Society for Cardiovascular Surgery. J Vasc Surg 1988;8:172–81.

10. Porter JM, Moneta GL; International Consensus Committee on Chronic Venous Disease. Reporting standards in venous disease: an update. J Vasc Surg 1995;21:635–45.

11. Eklöf B, Rutherford RB, Bergan JJ, Carpentier PH, Gloviczki P, Kistner RL, *et al.*; American Venous Forum International Ad Hoc Committee for Revision of the CEAP Classification. Revision of the CEAP classification for chronic venous disorders: consensus statement. J Vasc Surg 2004;40:1248–52.

12. Rabe E, Pannier F. Clinical, aetiological, anatomical and pathological classification (CEAP): gold standard and limits. Phlebology 2012;27:114–8.

13. Nicolaides AN; Cardiovascular Disease Educational and Research Trust; European Society of Vascular Surgery; The International Angiology Scientific Activity Congress Organization; International Union of Angiology; Union Internationale de Phlebologie at the Abbaye des Vaux de Cernay. Investigation of chronic venous insufficiency: A consensus statement (France, March 5-9, 1997). Circulation 2000;102:E126–63.

14. Peripheral Venous Disorders LK. Prevalence and Socio-Medical Importance: Observations in 4529 Apparently Healthy Persons: Basle III Study. Bern: Hans Huber; 1978. p.1-90.

15. FA M. A proposal for a new classification of occlusive venous diseases of lower limbs. Alexandria Med J 1981;27:76–81.

16. Sytchev GG. Classification of chronic venous disorders of lower extremities and pelvis. Int Angiol 1985;4:203–6.

17. Pierchalla P, Tronnier H. [Diagnosis and classification of venous insufficiency of the leg]. Dtsch Med Wochenschr 1985;110:1700–2. [German].

18. Cornu-Thénard A, De Vincenzi I, Maraval M. Evaluation of different systems for clinical quantification of varicose veins. J Dermatol Surg Oncol 1991;17:345–8.

19. Enrici EA. Classification de la insuficiencia venosa chronica [Classification of chronic venous insufficiency]. In: Enrici EA, Caldevilla HS, editors. Insuficiencia Venosa Cronica de los Miembros Inferiores [Chronic Venous Insufficiency of the Lower Limbs]. Buenos Aires: Editorial Celcius; 1992. p.107-14.

20. Miranda C, Fabre M, Meyer P, Marescaux J. [Evaluation of an reference anatomo-clinical classification of varices of the lower limbs]. Phlebologie 1993;46:235–9. [German].

21. Beebe HG, Bergan JJ, Bergqvist D, Eklof B, Eriksson I, Goldman MP, *et al.* Classification and grading of chronic venous disease in the lower limbs. A consensus statement. Eur J Vasc Endovasc Surg 1996;12:487–91, discussion 491–2.

22. Gianesini S, Obi A, Onida S, Baccellieri D, Bissacco D, Borsuk D, *et al.* Global guidelines trends and controversies in lower limb venous and lymphatic disease: narrative literature revision and experts' opinions following the vWINter international meeting in Phlebology, Lymphology & Aesthetics, 23-25 January 2019. Phlebology 2019;34:4–66.

23. 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;82:60–2.

24. Fischer R, Linde N, Duff C, Jeanneret C, Chandler JG, Seeber P. Late recurrent saphenofemoral junction reflux after ligation and stripping of the greater saphenous vein. J Vasc Surg 2001;34:236–40.

25. Blomgren L, Johansson G, Dahlberg-AKerman A, Norén A, Brundin C, Nordström E, *et al.* Recurrent varicose veins: incidence, risk factors and groin anatomy. Eur J Vasc Endovasc Surg 2004;27:269–74.

26. Nicolaides A, Kakkos S, Baekgaard N, Comerota A, de Maeseneer M, Eklof B, *et al.* Management of chronic venous disorders of the lower limbs. Guidelines According to Scientific Evidence. Part II. Int Angiol 2020;39:175–240.

27. Engelhorn CA, Engelhorn AL, Cassou MF, Salles-Cunha SX. Patterns of saphenous reflux in women with primary varicose veins. J Vasc Surg 2005;41:645–51.

28. Yılmaz S, Çakır Peköz B, Dincer N, Deniz S, Oğuzkurt L. Classification of reflux patterns in patients with great saphenous vein insufficiency and correlation with clinical severity. Diagn Interv Radiol 2021;27:219–24.

29. Pittaluga P, Chastane S, Rea B, Barbe R. Classification of saphenous refluxes: implications for treatment. Phlebology 2008;23:2–9.

Conflicts of interest.—The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

Authors' contributions.—Joel Sousa and Armando Mansilha have given substantial contributions to the study conception; all authors equally contributed to the manuscript draft and critical revision for important intellectual content. All authors read and approved the final version of the manuscript.

History.—Article first published online: March 2, 2022. - Manuscript accepted: February 18, 2022. - Manuscript received: January 5, 2022.

Supplementary data.—For supplementary materials, please see the HTML version of this article at www.minervamedica.it