

## Management Strategies for Patients with Varicose Veins (C2–C6): Results of a Worldwide Survey

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### WHAT THIS PAPER ADDS

This is the first worldwide survey to show how patient related and duplex ultrasound related factors influence management strategies in varicose veins patient (C2–C6). The identification of these factors may contribute to a more personalized approach in clinical practice.

**Objectives:** This study evaluated how patient characteristics and duplex ultrasound findings influence management decisions of physicians with specific expertise in the field of chronic venous disease.

**Methods:** Worldwide, 346 physicians with a known interest and experience in phlebology were invited to participate in an online survey about management strategies in patients with great saphenous vein (GSV) reflux and refluxing tributaries. The survey included two basic vignettes representing a 47 year old healthy male with GSV reflux above the knee and a 27 year old healthy female with a short segment refluxing GSV (CEAP classification C2sEpAs2,5Pr in both cases). Participants could choose one or more treatment options. Subsequently, the basic vignettes were modified according to different patient characteristics (e.g. older age, morbid obesity, anticoagulant treatment, peripheral arterial disease), clinical class (C4, C6), and duplex ultrasound findings (e.g. competent terminal valve, larger or smaller GSV diameter, presence of focal dilatation). The authors recorded the distribution of chosen management strategies; adjustment of strategies according to characteristics; and follow up strategies.

**Results:** A total of 211 physicians (68% surgeons, 12% dermatologists, 12% angiologists, and 8% phlebologists) from 36 different countries completed the survey. In the basic case vignettes 1 and 2, respectively, 55% and 40% of participants proposed to perform endovenous thermal ablation, either with or without concomitant phlebectomies ( $p < .001$ ). Looking at the modified case vignettes, between 20% and 64% of participants proposed to adapt their management strategy, opting for either a more or a less invasive treatment, depending on the modification introduced. The distribution of chosen management strategies changed significantly for all modified vignettes ( $p < .05$ ).

**Conclusions:** This study illustrates the worldwide variety in management preferences for treating patients with varicose veins (C2–C6). In clinical practice, patient related and duplex ultrasound related factors clearly influence therapeutic options.

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**Keywords:** Varicose veins, Chronic venous disease, Patient characteristics, Clinical findings, Duplex ultrasound, Treatment strategies

### INTRODUCTION

Numerous successful treatment options are available for patients with uncomplicated and complicated varicose veins. These treatment options include thermal, chemical, or surgical ablation of the refluxing saphenous trunk(s) with

or without high ligation, phlebectomies or (foam) sclerotherapy of refluxing tributaries, and combinations of the above. As a result of the many available options, physicians may treat patients in many different ways. This may also cause some difficulties in selecting the best management strategy. Physicians have to decide whether to proceed to a more or less invasive treatment, or even refrain from treatment. Several factors will influence this decision: experience and preference of the physician, presence of symptoms, health related quality of life (HRQoL), severity of the chronic venous disease (CVD) and other patient related and duplex ultrasound (DUS) characteristics, as well as

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patient's preference.<sup>1,2</sup> Physicians obviously need to evaluate both the potential risks and benefits of any treatment they are considering, as well as the costs.<sup>3</sup>

To determine a proper management strategy in patients with CVD, physicians are usually referred to current guidelines like those of the Society for Vascular Surgery and the American Venous Forum.<sup>4</sup> They clearly state that "the scientific evidence must be combined with the physician's clinical experience to select the best treatment option for each individual patient."<sup>4–6</sup> Apart from guidelines, there are not many other useful tools available for assisting physicians to optimize their management strategy for the individual patient.

The objective of this survey was to evaluate more detailed criteria regarding patient characteristics, clinical and DUS findings, which may influence management decisions in patients presenting with uncomplicated or complicated varicose veins.

## METHODS

### Participants

The investigators contacted all national presidents of member societies of the International Union of Phlebology (Union Internationale de Phlébologie [UIP]), from 43 different countries between July and August 2013. Worldwide, these "key contacts" were asked to nominate 10–20 physicians (vascular surgeons, angiologists, dermatologists, phlebologists) per country who were known to have an interest in phlebology and had been performing varicose vein treatments for at least 5 years. If the president of the national phlebologic society could not be contacted, another colleague from the same country was contacted.

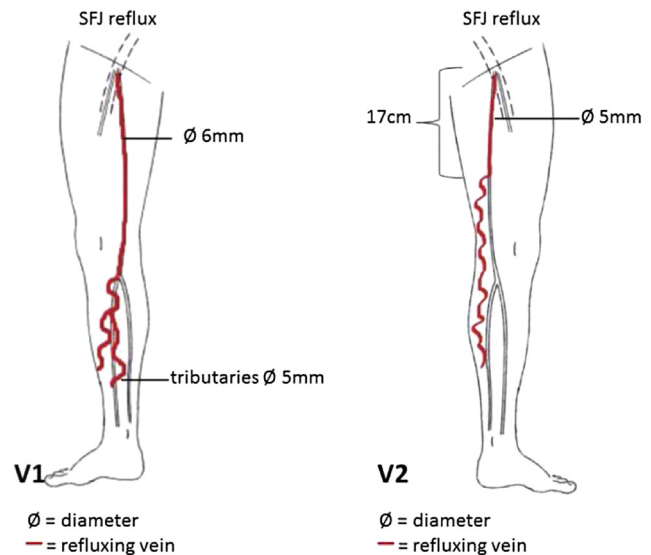
Physicians were considered eligible if they were familiar with the use of several currently used varicose veins treatment techniques, including phlebectomies, one of the techniques for endovenous thermal ablation (EVTA), and ultrasound-guided foam sclerotherapy (UGFS). They were also allowed to participate if they did not perform EVTA themselves, but delegated this to a colleague when indicated. The same was true for high ligation and stripping.

All nominated physicians were invited by email to complete the online survey between January and March 2014. The survey was available in English and Spanish.

### Survey

At the beginning of the survey, participating physicians were asked for their specialty, their practice (which techniques they perform themselves, and for which they refer a patient to a colleague), years of experience in treating phlebologic patients, country of education, and country of present clinical practice.

The survey further included two basic case vignettes of patients with great saphenous vein (GSV) reflux. Basic case vignette (V1) reported the case of a 47 year old healthy man (BMI 23.4 kg/m<sup>2</sup>) who presented with heaviness of the right leg. Physical examination of the legs demonstrated varicose



**Figure 1.** Overview of duplex ultrasound findings of basic case vignettes 1 (V1) and 2 (V2). SFJ = saphenofemoral junction.

veins without edema or skin changes on the right leg. DUS examination (Fig. 1) revealed reflux from the terminal valve at the saphenofemoral junction (SFJ) and GSV reflux above the knee. The diameter of the GSV was 6 mm at mid-thigh level. Refluxing tributaries (largest diameter, 5 mm) were seen at medial calf level. There was no GSV reflux below the knee. The deep venous system was patent and competent. The CEAP classification was C2SEpAs2,5Pr.

Following the description of V1, participants were first asked which management strategy they would like to perform in this patient. To answer this question, they were able to choose one or more of the 10 proposed potential answers, including EVTA, ligation and stripping, single stripping (also called isolated stripping), UGFS of the GSV, UGFS of the tributaries, concomitant phlebectomies, isolated phlebectomies, CHIVA (Cure Hémodynamique de l'Insuffisance Veineuse en Ambulatoire, a particular surgical treatment based on hemodynamics),<sup>7</sup> medical elastic compression stockings (MECS), no treatment, or "other", to be specified by the respondent, if the preferred treatment option was not one of the 10 above cited possibilities.

Subsequently, V1 was modified step by step, changing complaints, patient characteristics, clinical findings and DUS findings (Table 1). Participants were then asked whether they would change their strategy for the modified case and, if so, to indicate which treatment option(s) they would prefer. Participants were also asked to determine cut off values for GSV diameter, below which or above which they would change their treatment strategy. Only cut off values between 1–13 mm were further investigated in the survey.

After completion of the questionnaire concerning all the modifications of V1, a second basic case vignette (V2) was described: a 27 year old healthy female (BMI 23 kg/m<sup>2</sup>) complaining of heaviness and fatigue of the left leg. She presented with varicose veins in the medial thigh extending to the calf, without edema or skin changes. DUS (Fig. 1) revealed reflux of the GSV, from the terminal valve of the

**Table 1.** Modifications of basic case vignettes in the survey.**Case vignette 1 (C2SEpAs2,5Pr):***Complaints*

Asymptomatic, only cosmetic concern (C2AEpAs2,5Pr)

*Patient characteristics*

Older age &gt;80 yrs

Gender: female

Peripheral arterial disease (ankle brachial index &lt;0.6)

High body mass index (>40 kg/m<sup>2</sup>)

Chronic oral anticoagulant treatment

*Clinical findings:*

Skin changes: pigmentation (C2,4aSEpAs2,5Pr)

Venous ulceration (C2,6SEpAs2,3,5Pr)

*Duplex ultrasound findings*

Competent terminal valve

Focal dilatation of GSV above knee (12 mm)

Small diameter of GSV (cut off value determined by participant)

Large diameter of GSV (cut off value determined by participant)

**Case vignette 2 (C2SEpAs2,5Pr):***Duplex ultrasound findings:*

Diameter of short refluxing segment &lt;5 mm

Diameter of short refluxing segment &gt;8 mm

Length of refluxing GSV segment (cut off value determined by participant)

SFJ, to 17 cm below the SFJ. At this level, the GSV had a large refluxing tributary, while the GSV itself became very small without any reflux. The diameter of the cranial refluxing GSV segment was 5 mm. CEAP classification was defined as C2SEpAs2,5Pr.

Finally, participating physicians were questioned about the timing of the first follow up after the initial treatment and whether they want to schedule further visits or not. They were further asked to indicate which of the following parameters would influence their management strategy for persisting refluxing tributaries after successful ablation of the GSV: clinically visible or not, large or small diameter, superficial course or not, cosmetic complaints or not, presence or absence of symptoms, and clinical class, according to the CEAP classification.

**Statistics**

The McNemar test was used to compare paired proportions of preferred treatment options between the basic vignettes and modified vignettes. The Bonferroni test was used to correct for multiple testing. The change in distribution of management strategies between the basic case vignettes and modified case vignettes was compared using the Stuart-Maxwell test, which is used to compare paired proportions with more than two categories.

To be included in the analysis a particular treatment strategy had to be chosen by at least 5% of all respondents. Options or combinations of options chosen by less than 5% were summarized as “alternative” in the global analysis.

Multivariate logistic regression analysis investigated the association between physicians’ characteristics and the

preferred treatment strategy (e.g. surgical vs. non-surgical). Independent variables included time since certification, continent of clinical practice, and specialty. To prevent overfitting, a limited number of independent variables were included.

The Statistical Package for the Social Sciences (SPSS), version 21.0 software (IBM, Armonk, NY, USA) was used for data analysis. The distribution analyses were conducted using available software (<http://www.R-project.org>).

**RESULTS**

A total of 211 specialists from 36 different countries completed the survey (Table 2), resulting in a response rate of 58%.

**Basic case vignettes**

Participants chose a variety of different strategies for both V1 and V2 (Table 3). In V1 and V2, respectively 55% and 40% of participants proposed to perform EVTA, either with or without concomitant phlebectomies ( $p < .001$ ). In V2 11% preferred single phlebectomies as initial treatment, compared with only 6% in V1 ( $p = .01$ ).

Multivariate logistic regression analysis only revealed a significant association between the duration since certification (<20 years) and a less invasive treatment strategy (e.g. UGFS or EVTA of the GSV, conservative or no treatment) (data not shown).

**Modified case vignettes**

The main results of the survey regarding changes in proportion of the different management strategies in the modified case vignettes are summarized in Figs. 2 and 3.

**Table 2.** Characteristics of physicians participating in the survey.

Characteristics	n (%)
<b>Specialty</b>	
Surgeon (mostly vascular)	143 (68)
Dermatologist	26 (12)
Angiologist	25 (12)
Phlebologist	17 (8)
<b>Certified since</b>	
<10 years	25 (12)
10–20 years	72 (34)
>20 years	114 (54)
<b>Continent of current clinical practice</b>	
Europe	147 (70)
Latin America	30 (14)
Asia	13 (6)
North America	10 (5)
Oceania	11 (5)
<b>Techniques performed in own practice</b>	
EVTA	167 (79)
UGFS	182 (86)
Surgery	152 (59)
Phlebectomies	165 (78)
CHIVA	31 (15)

EVTA = endovenous thermal ablation; UGFS = ultrasound-guided foam sclerotherapy; CHIVA = conservative hemodynamic treatment.

**Table 3.** Treatment strategies proposed by the participants for the basic case vignettes (V1 and V2).

Treatment strategies	V1, n (%)	V2, n (%)
EVTA	43 (20)	16 (8)
EVTA + phlebectomies	73 (35)	67 (32)
EVTA + UGFS of tributaries	17 (8)	9 (4)
Ligation + stripping + phlebectomies	12 (6)	10 (5)
EVTA + ligation	13 (6)	15 (7)
UGFS of GSV + UGFS of tributaries	9 (4)	11 (5)
Single phlebectomies	5 (2)	23 (11)
Alternative	39 (19)	60 (28)

EVTA = endovenous thermal ablation; UGFS = ultrasound-guided foam sclerotherapy; GSV = great saphenous vein.

Interestingly, for most patient and DUS related factors, the change in distribution of management strategies between the basic vignettes and modified vignettes was significant.

### Patient characteristics (Fig. 2)

Looking at the different patient characteristics (Table 1), older age, peripheral arterial disease (PAD), and high body mass index (BMI) were considered relevant in altering the management strategy in respectively 61%, 64%, and 52% of participants. In the vignettes with one of these three patient characteristics modified, a quarter of participants proposed to convert their strategy into a less invasive treatment, mainly consisting of fewer phlebectomies, more UGFS of tributaries, and more MECS. In particular, in cases of PAD “no treatment” became a frequently preferred option (20%). Physicians who indicated they would prescribe MECS for patients with PAD as an alternative treatment usually added this would be a “light” compression stocking. Several participants answered they would first opt for an arterial revascularization. For patients with high BMI putting them on a diet, in addition to other conservative measures was often suggested. The use of oral anticoagulant treatment (coumarin) was a reason for adapting the treatment

strategy for 45% of participating specialists, and this mainly consisted of avoiding phlebectomies. Female gender clearly appeared to be less important for adapting the management strategy, as only 26% of respondents stated they would do so.

### Clinical findings

If the clinical class of V1 was modified from C2 (varicose veins) to C4a (pigmentation), the preferred treatment technique(s) did not change considerably. However, if the patient suffered from venous ulceration (C6), with GSV reflux extending down to the ankle, participants avoided phlebectomies and were more likely to consider another additional treatment (e.g. high ligation, UGFS of the GSV below the knee and/or UGFS of tributaries).

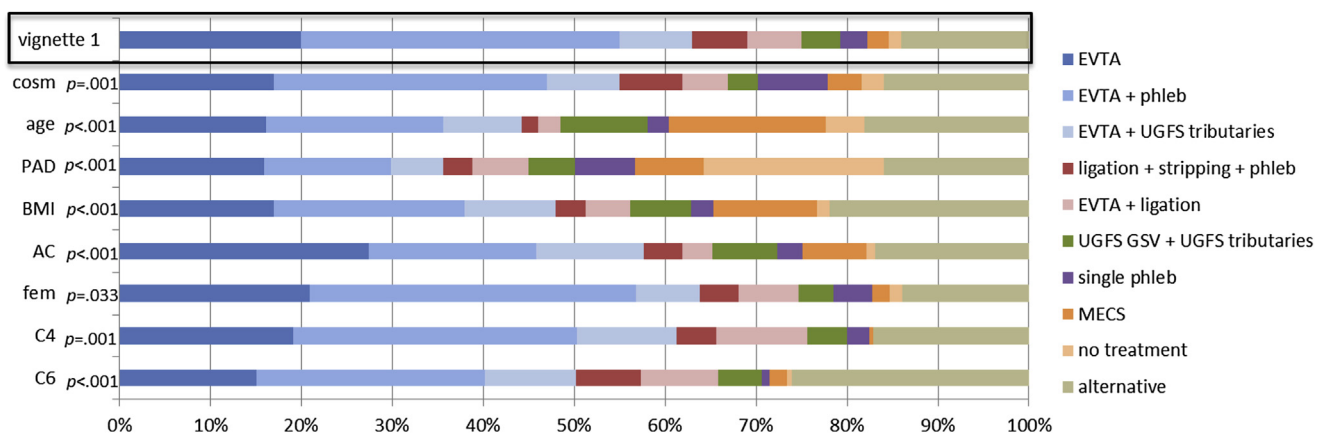
### Duplex ultrasound findings

If the terminal valve was competent, fewer participants would ablate or remove the refluxing GSV. Instead, 13% preferred single phlebectomies ( $p < .001$ ).

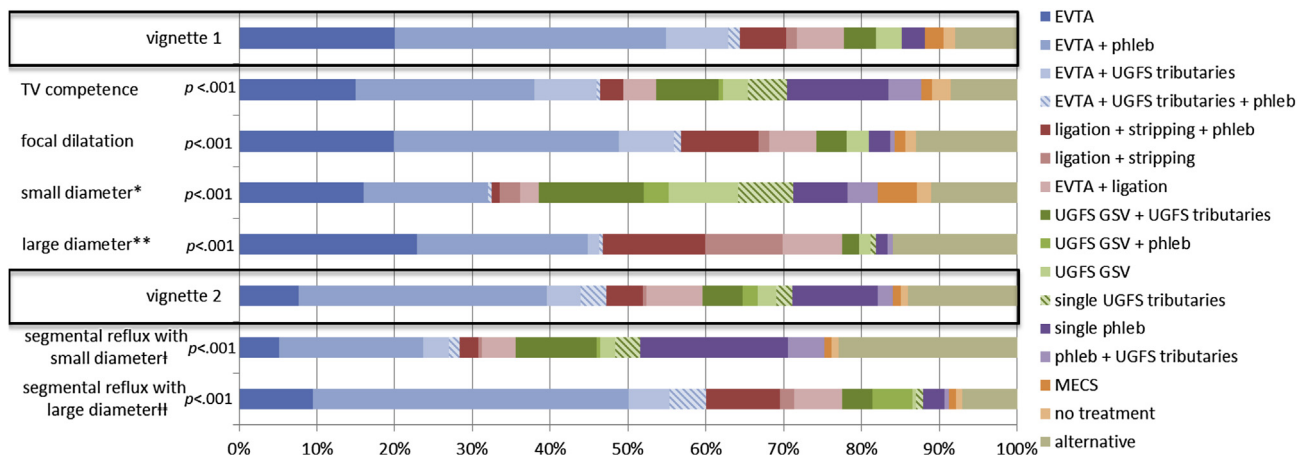
Presence of a focal dilation of the GSV did not result in a major shift of treatment strategy although the distribution of treatments altered significantly compared to the basic vignette ( $p < .001$ ).

A vast majority of respondents (74%) answered that vein diameter was important for the treatment strategy. They changed their management when the diameter of the GSV was less than a median of 4 mm (interquartile range [IQR] 3–5) or above 10 mm (IQR 7–10). If the diameter of the GSV was below 4 mm, 44% of participants indicated a change to a less invasive treatment compared to V1. If the diameter was above 10 mm, more EVTA with additional high ligation or classic surgery was proposed, representing 31% of all options.

The patient of V2 had GSV reflux from the terminal valve, only limited to a short segment of the GSV. If the diameter



**Figure 2.** Influence of cosmetic complaints, patient characteristics and clinical findings on management strategy ( $n = 211$ ).  $p$ -values represent the difference in distribution between vignette 1 and modified vignettes (cosm, age, PAD, BMI, AC, fem, C4, C6) and were measured using the Stuart-Maxwell test. cosm = only cosmetic complaints; PAD = peripheral arterial disease; BMI = body mass index; AC = anticoagulant treatment; fem = female gender; EVTA = endovenous thermal ablation; phleb = phlebectomies; UGFS = ultrasound-guided foam sclerotherapy; GSV = great saphenous vein; MECS = medical elastic compression stockings.



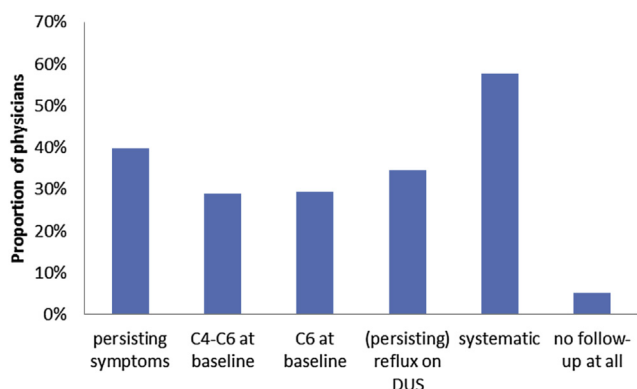
**Figure 3.** Influence of duplex ultrasound findings on management strategy. *Note.* *p*-values represent the difference in distribution between vignette 1 and adapted vignettes (TV competence, focal dilation, small diameter, large diameter) or between vignette 2 and adapted vignettes (segmental reflux with small diameter, segmental reflux with large diameter) and were measured using the Stuart-Maxwell test. V1 = basic case vignette 1; TV = terminal valve; V2 = case vignette 2; EVTA = endovenous thermal ablation; phleb = phlebectomies; UGFS = ultrasound-guided foam sclerotherapy; MECS = medical elastic compression stockings. \**N* = 155, small diameter was based on the cut off value for diameter of the GSV below which participants would consider changing their treatment strategy (median 4 mm). \*\**N* = 138, large diameter was based on the cut off value for diameter of the GSV above which participants would consider changing their treatment strategy (median 10 mm). †For this question of the survey, small diameter of segmental refluxing GSV was defined as <5 mm by the investigators. ‡Large diameter of segmental refluxing GSV was defined as >8 mm.

of the short refluxing GSV segment was modified to <5 mm, a change to a less invasive treatment was observed. If the short segment had a diameter >8 mm, participants less frequently selected single phlebectomies (*p* < .001) and more often EVTA with or without phlebectomies (*p* < .001).

Only 39% of the participants considered the length of refluxing trunk relevant for deciding whether or not to ablate the trunk. They suggested a minimal length of at least 10 cm (minimum 2 cm, maximum 45 cm).

**Follow-up and further treatment**

Seventy-one per cent of participants replied they would evaluate the immediate outcome of the proposed management strategy within 8 weeks after initial treatment. The



**Figure 4.** Reasons for further visits after initial follow up. Systematic was defined as “I would schedule patients for further follow up visits, irrespective of symptoms, physical and/or ultrasound examination.” DUS = duplex ultrasound.

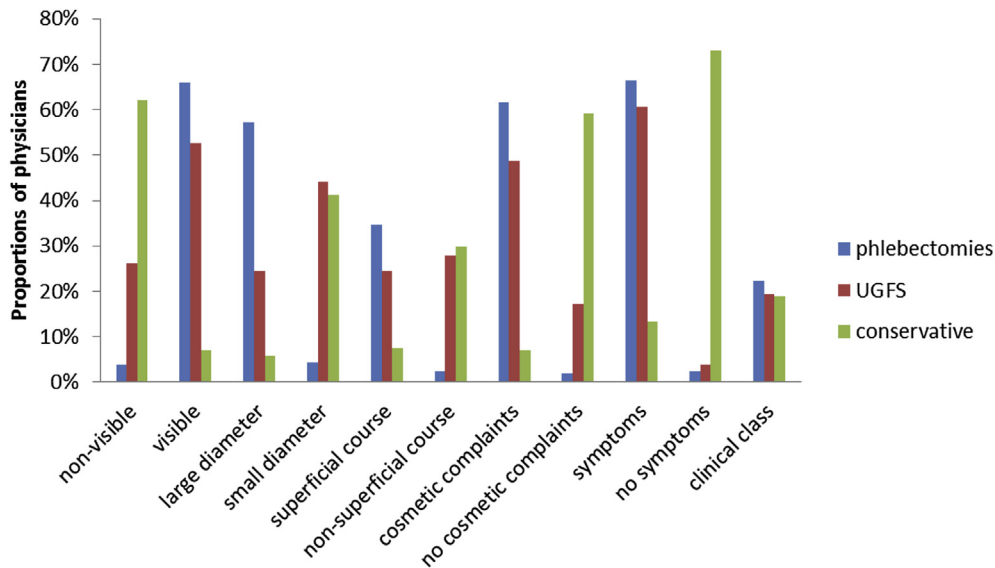
majority claimed to continue follow-up thereafter for various reasons (Fig. 4).

Over 60% of physicians proposed to treat persistent refluxing tributaries, in cases where there were symptoms, cosmetic concerns, or visible tributaries (Fig. 5). Phlebectomies seemed to be used as frequently as UGFS to treat refluxing tributaries. However, there was a preference for phlebectomies in cases where tributaries had a large diameter, a superficial course, or where they were visible, and a preference for UGFS in other cases (*p* < .001) (Fig. 5).

**DISCUSSION**

The results of this survey first of all illustrate that physicians all over the world use many different management strategies for treating patients with varicose veins. Second, EVTA has become a very popular option for treating patients with uncomplicated varicose veins with GSV reflux. Third, patient characteristics, clinical findings and DUS findings influence management decisions in patients presenting with varicose veins, as expected.

The large diversity in treatment methods may be partially explained by differences in available resources and/or health care policies in different countries, for example equipment, reimbursement of certain interventions, timing (treatment only allowed in one session, or in multiple sessions), and setting (hospital environment or private practice). However, when comparing the results among the participating continents or specialties, no major differences could be found. In 2006, a survey on the management of varicose veins was distributed among the members of the Vascular Society of Great Britain and Ireland. Only half of the respondents offered the same range of treatment in



**Figure 5.** Influence of different characteristics of persisting refluxing tributaries on the preferred management strategy. UGFS = ultrasound-guided foam sclerotherapy.

their National Health Service (NHS) and private practice. This was mainly due to restrictions for the treatment of varicose veins in their NHS practice.<sup>8</sup>

National and international guidelines for the management of chronic venous disorders, have only become available in recent years. Interestingly, the results of the present survey revealed that participants use several single or combined treatment strategies which are not cited in any guideline, and are not supported by the literature, for example adding high ligation to EVTA,<sup>9</sup> and some of the treatment strategies belonging to the ‘alternative’ group. Probably, in varicose vein treatment, as in other specialties, it might be useful to establish recommendations about “do nots”, to avoid overuse or misuse of procedures, potentially leading to harm or unnecessary health care spending. In the United States, an interesting initiative has been launched in 2012 by the American Board of Internal Medicine Foundation, who initiated the ‘Choosing wisely’ campaign (<http://choosingwisely.org>) to improve appropriate and necessary treatment. So far, about 60 specialty societies have published a “List of Five Things Physicians and Patients Should Question”, consisting of five recommendations about what should not be done. Unfortunately as yet, no recommendations have been made for “choosing wisely” in patients with varicose veins.

The EVTA option was very popular in both basic case vignettes. Nowadays, EVTA has largely replaced classic surgery as the treatment of choice for the incompetent GSV, and classic extensive surgery under general anesthesia can no longer be considered the gold standard.<sup>10</sup> After 100 years of status quo, it is surprising how fast minimally invasive endovenous treatment methods have been accepted worldwide.<sup>11</sup>

According to the survey, several patient characteristics influenced management strategies, in particular older age, concomitant PAD, high BMI, and oral anticoagulant

treatment. Older age resulted in a shift towards a less invasive treatment, with more participants choosing UGFS, MECS, or no treatment for uncomplicated varicose veins. This seems logical, in view of comorbid conditions and often limited mobility in elderly patients.

If severe PAD was present, participants were more likely to adapt their treatment strategy to a more conservative treatment (e.g. no treatment or light compression stockings). It was quite surprising to find several physicians prescribing MECS in a patient with an ankle–brachial index <0.6, although some of them clearly stated they would do so only after arterial revascularization. Two prospective studies reported a safe application of ‘modified’ compression therapy (not by means of stockings, but with inelastic material and reduced compression pressure of 20–30 mmHg) in patients with moderate PAD (ankle brachial pressure index between 0.8 and 0.5).<sup>12,13</sup> Nevertheless, extreme caution is necessary when compression is applied to legs with severe PAD to prevent skin necrosis.<sup>14</sup>

For patients with a high BMI, participants in the survey more frequently suggested conservative measures, in comparison to V1 (patient with a normal weight). Several studies stated that patients with a higher BMI are more likely to develop surgical site infections and anatomic failures after groin surgery or RFA.<sup>15,16</sup> Hence it seems logical to have these patients lose some weight before proceeding to endovenous or surgical treatment of varicose veins. If the patient was on chronic anticoagulant treatment, participants often avoided performing phlebectomies. In these patients phlebectomies may indeed exceptionally lead to major bleeding complications, in particular when large tributaries and perforating veins are involved.<sup>17</sup> Therefore, it may be wise to limit the number of phlebectomies, monitor INR, employ local anesthetic with adrenaline, or even tumescent anesthesia.<sup>17</sup> There are less concerns about treating patients on anticoagulation with EVTA or UGFS.<sup>18,19</sup>

As the majority of participants already recommended an intervention in the C2 patient of V1, it is not surprising to see no real changes in management of a patient with C4a, except for adding high ligation to truncal ablation. The same was true for C6 patients, apart from the many alternative options suggested by the participants.

DUS findings did alter treatment strategy, and it was mainly the diameter of the refluxing GSV trunk that was considered relevant. The presence of a focal dilatation of the trunk only led to minor changes in strategy in the present survey. According to a recently published retrospective study, terminal valve incompetence, a greater diameter of the GSV in the thigh, and the presence of a focal dilatation of the GSV were found significantly more frequently in cases treated by ablation of the GSV than in those treated with phlebectomies only (ASVAL method = ambulatory selective varices ablation under local anesthesia).<sup>20</sup>

GSV diameter was considered important in management decisions. Large diameter GSVs are almost always associated with terminal valve incompetence at the SFJ, and are related to increased hemodynamic impairment and higher C-class (C4–C6).<sup>21,22</sup> Recently, a randomized controlled trial, comparing UGFS with classic surgery, showed that patients with a large diameter GSV and distal GSV reflux at baseline had a higher probability of failure after UGFS.<sup>23</sup> On the other hand, according to several retrospective studies, particularly focusing on the early outcome after EVTA in larger veins (with a diameter >10 or >12 mm), no difference could be found in efficacy (obliteration rate) between these larger veins and those with a smaller diameter.<sup>24,25</sup>

In the case of a small diameter of the refluxing GSV almost one-third of participants indicated they would proceed to UGFS of the GSV and/or tributaries, or single phlebectomies without GSV ablation. One large prospective study demonstrated that UGFS of saphenous veins is more efficient in veins smaller than 6 mm diameter than in those with larger diameters.<sup>26</sup> Single phlebectomy has been investigated in two prospective studies, which showed abolition of reflux after single phlebectomies in the case of smaller diameter GSVs, a short refluxing GSV segment, clinical class C2, and relatively low impact of CVD on HRQoL before treatment.<sup>27,28</sup>

This study has a number of limitations. First of all, characteristics of non-responders were not recorded. Therefore, the authors were not able to exclude the presence of a selection bias. Second, as the survey was only available in English and Spanish, difficulties with the language may have been an issue. Third, two important participant characteristics were not recorded: work setting (hospital or private practice) and reimbursement of phlebologic care in country of present practice. These characteristics might have influenced the variety of treatment preferences.

In conclusion, this study illustrates the worldwide variety in management preferences for treating patients with varicose veins (C2–C6). In clinical practice, patient related and DUS related factors clearly influence therapeutic options.

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## CONFLICT OF INTEREST

None.

## FUNDING

None.

## APPENDIX A. SUPPLEMENTARY DATA

Supplementary data related to this article can be found online at <http://dx.doi.org/10.1016/j.ejvs.2014.11.006>.

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