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Compression therapy – current practice of care: level of knowledge in patients with venous leg ulcers

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Summary

Background and objectives: Compression therapy is a mainstay in the causal treatment of patients with venous leg ulcers. It facilitates healing, reduces pain and recurrences, and increases quality of life. Up until now, there is a scarcity of scientific data with respect to the level of care and the specific knowledge of patients with venous leg ulcers.

Patients and methods: At first presentation, patients with venous leg ulcers anonymously answered a standardized questionnaire. Participating facilities nationwide included 55 outpatient care services, 32 medical practices, four wound centers, and one specialized care center.

Results: Overall, 177 patients (mean age of 69.4; 75.1 % women) participated in the study. The average duration of florid venous leg ulcers was 17 months. With regard to compression therapy, 31.1 % of patients received none; 40.1 % got bandages; 28.8 % had stockings. Of the latter, 13.7 % were treated with compression class III; 67.4 %, with compression class II; and 19.6 %; with compression class I. While 70.6 % put on their stockings after getting out of bed in the morning, 21.1 % wore them day and night. In 39.2 % of individuals, the stockings caused them discomfort. Merely 11.7 % owned a donning device. On average, bandages were worn for 40.7 weeks, and 69 % were used without underpadding. In 2.8 % of patients, ankle and calf circumference was measured to monitor therapeutic success. 45.9 % reported doing leg exercises.

Conclusions: Although it is considered a basic therapeutic measure in venous leg ulcers, one-third of all patients received no compression treatment. Moreover, given the long duration of ulcers, adequate product selection and correct use have to be questioned, too. Our findings indicate that improvements in the level of knowledge among users and prescribers as well as patient training are required.

Introduction

Internationally, annual treatment costs for patients with venous leg ulcer (VLU) vary from € 4,000 to € 30,000, depending on the individual healthcare system [1]. With up to 70 %, VLU is the most common form of leg ulcer in Germany [2, 3]. In 2003, the Bonn Vein Study ascertained a prevalence of VLU of 0.1 % (in Germany), thus affecting approximately 80,000 individuals [4]. The Remedies and Therapeutic Appliances Report issued by the Barmer Ersatzkasse (one of

Germany's largest statutory health insurances) confirmed this number for the year 2012, with approximately 72,000 patients affected by florid VLUs [2]. Compression therapy – as causal treatment – is essential in this condition [5]. However, depending on the presence and severity of comorbidities such as peripheral artery disease (PAD) or sensory deficits in the extremities, such treatment may only be implemented to a certain extent or not at all [6]. Given that it reduces relapse rates and accelerates the healing process [7], adequate compression therapy represents the standard treatment according to current guidelines [8]. However, it is also a fact that many patients in Germany do not receive treatment in accordance with current guidelines [9, 10].

Adequate and skilled compression therapy reduces stress on the venous system caused by pressure and volume. Since phlebological compression bandages (PCBs) exert their main effects only after muscle pump activation, patients ought to be encouraged to do regular foot and walking exercises [11, 12]. Multi-component compression therapy is more beneficial with respect to the healing process than single-component compression treatment (e.g. short-stretch bandages) [8, 13, 14].

Treatment consisting of initial decongestion followed by a subsequent maintenance phase has proven useful. In patients with VLU, initial decongestion should be completed after three to four weeks [15]. During the subsequent maintenance phase, treatment should be switched from compression bandages to stockings in the form of 'ulcer stocking systems' or medical compression stockings (MCS) [15, 16]. Stockings are advantageous in that they maintain constant interface pressure over the course of several weeks, thus resulting in increased patient adherence [17]. Venous leg ulcers usually only require below-the-knee stockings [18, 19].

Compared to compression bandages, the prescription of MCS significantly improves the wearing comfort for patients [20]. Another advantage of MCS is that their use and effects are independent of the experience or skill of the person wearing them [21]. The use of donning devices is beneficial with respect to maintaining the quality of the fabric of MCS [22], and enables patients to handle their stockings unaided. Such devices therefore increase patients' quality of life as well as their adherence to the prescribed compression regimen [23]. In Germany, regulations currently provide for only one pair of MCS to be prescribed and reimbursed by the statutory health insurance every six months [6]. Initially, one-time prescription and reimbursement of two stockings or pairs is possible. If justified, another prescription is possible in exceptional cases [24]. For hygienic reasons, bandages have to be washed at up to 95°C after each use. Not only wearing but also washing contributes to the loss of strength of the fabric. Bandages should be able to withstand at least 15 washing cycles before losing their elasticity [25]. Accordingly, worn-out bandages have to be replaced. For hygienic reasons, medical compression stockings require daily washing in a separate laundry net at 30–40°C using mild detergents or special stocking detergents and a program for delicate fabrics [6]. The stockings should be air-dried on a laundry rack. Machine drying, radiators, or direct sun exposure are detrimental to elasticity and a potential coating. Ironing, chlorination, or chemical cleansing destroy the fabric. Both the underlying disease as well as friction caused by the compression fabrics may give rise to skin irritations and pruritus [26]. Daily skin care is therefore required. However, the aqueous components of topical agents should have evaporated prior to donning the stockings. Medical compression stockings do not slide well over moist skin [26]. Suitable skin care products should, for example, contain urea or glycerin. Moreover, given the increased risk of contact sensitizations in patients with chronic venous insufficiency (CVI), they should preferably be free of emulsifiers, fragrances, and preservatives [26, 27].

In nursing school, the curriculum on average provides for 1–2 hours to be spent on compression therapy. In medical school, this topic is rarely taught [28]. A cross-sectional study revealed that only one-half of patients wearing short-stretch bandages had a bandage that was "adequately wrapped" [5]. With respect to users (e.g. nurses, doctors), too, there was only limited knowledge regarding compression materials currently available as well as their use [28]. Of 891 participants, only 15 % knew about multi-component systems or ulcer stockings.

The objective of the current study was to determine – by patient survey – if and how the above-mentioned issues are actually implemented in daily practice, and to ascertain the level of knowledge of VLU patients regarding compression therapy.

Materials and methods

In this nationwide cross-sectional pilot study, patients with confirmed VLU answered an anonymized and standardized questionnaire about their previous compression therapy. The study was conducted between December 2014 and April 2015. Following oral informed consent, patients were enrolled at first presentation at one of the participating institutions. During this period, every newly registered patient seen in daily practice was asked to participate in the study. Given that all VLU patients who presented to one of the participating care facilities for the first time during this period were surveyed consecutively, sample size calculation was not required. Participation was voluntary and independent of the treatment at the institution. In order to include a patient group that was as heterogeneous as possible, specialized practices in urban centers as well as university and rural institutions were asked to participate (nonrandom sample). Nursing services – operating both in urban and rural areas – also participated in the study.

Inclusion Criteria

The following inclusion criteria were defined:

- First presentation at one of the participating institutions,
- No compression therapy or *(a)* compression therapy with short-stretch bandages or multi-component systems or *(b)* compression stockings,
- Age ≥ 18 years,
- Florid VLU,
- Oral informed consent,
- The patient is physically, mentally, and psychologically able to participate in the study.

Questionnaire

At the beginning of the study, a standardized questionnaire had to be developed for assessing the practice of care with respect to compression therapy from a patient's perspective. The introductory remarks specifically addressed the patient, and explained the objective and method of the survey. Apart from general patient information such as age, gender, occupation, and family status, various parameters concerning the "wound status" and VLU duration were surveyed. This was complemented by questions on treatment history, treating physician, as well as the person actually 'applying' the compression. The main part of the questionnaire dealt with the current practice of care and the level of knowledge with regard to compression therapy. A distinction was made between compression stockings and bandages. The section "compression stockings" contained questions with respect to wearing properties, interest in fashionable models, dealing with discomfort, self-management, prescription, type of stocking and care thereof, skin care, and donning devices. The section "compression bandages" contained questions as regards wearing properties, material/fabric and care thereof, as well as skin care. As treatment with compression bandages is regarded as initial therapy, which – following successful decongestion – should be replaced with MCS, the last question in this section was on measuring ankle and calf circumference to monitor therapeutic success. The questionnaire ended with a question on the type and frequency of leg exercises.

Given that this cross-sectional study on care provision is a pilot study, no potentially confounding or effect-modifying variables were specified prior to the beginning of the study.

In order to check the comprehensibility of the newly developed questionnaire, four patients were surveyed in the context of a pretest. Here, patients first completed the questionnaire. Its comprehensibility was then ascertained in a qualitative "face-to-face interview". Individual items were again asked orally and compared with the corresponding answers. In general, the pretest showed the questionnaire to be adequately comprehensible, resulting in the adjustment of the wording of only few items. Subsequently, various wound experts again checked and adjusted the questionnaire.

Practical implementation

At first presentation at the respective institution, patients were handed the questionnaire, filled it out, and returned it. The anonymized questionnaires were collected by the institution and returned to the study coordinator either by mail or personally. Collection of the questionnaires with simultaneous assignment to the participating institutions as well as data analysis was the responsibility of the study coordinator.

Statistics

The questionnaires were manually entered into the database, followed by a plausibility check and a check for missing values. Due to the excellent answer quality, missing values were rare and subsequently not substituted. For statistical analysis, the data set was then loaded into the analysis program SAS version 9.3 German (SAS Institute, Cary, North Carolina 27513-2414, USA).

Data were analyzed descriptively. For nominal and ordinal characteristics, absolute and relative frequencies were calculated. Metric and discrete features were described by mean values, median values, standard deviation as well as minimal and maximal values. For the main results, simple 95 % confidence intervals (95 %-CI) were calculated using binomial distribution. Qualitative questions were independently pooled by two reviewers according to content-related criteria and subsequently grouped by consensus.

Results

Ninety-two study centers all over Germany participated in this study: 55 outpatient care services, 32 medical practices (surgery, dermatology, phlebology, general medicine), four clinical wound centers, and one specialized care center for patients with chronic wounds. Overall, 177 patients (24.9 % men, 75.1 % women) with a mean age of 69.4 years (median: 71 years, range: 30–94) were included. 83.6 % were no longer working, 64.4 % lived together with their partner or family members, almost 17 % lived alone, and 2.8 % lived in an assisted-living facility.

Prior to presentation at one of the participating institutions, 69.4 % of VLU patients had been treated by their general practitioner; 14.7 % by a dermatologist; 13.6 % by a surgeon; 0.6 % by a phlebologist and 6.8 % by other health professionals, for example, non-medical (alternative) practitioners or gynecologists. Given that patients were not allowed to give multiple answers in this regard, this item only referred

Table 1 Measures of location and spread of quantitative variables by compression type.

	Variable	n	Mean	Median	Standard deviation	Minimum	Maximum
None so far	*Wound duration (months)*	55	13.6	11	8.0	4	45
	Number of consulted physicians	55	3	3	1.5	1	8
Stockings	*Wound duration (months)*	51	22.3	10	53.1	1	360
	Number of consulted physicians	51	3.6	3	2.5	1	13
Bandages	*Wound duration (months)*	71	15.8	15	10.6	1	49
	Number of consulted physicians	71	3.7	3	2.0	1	12

to the most recent health professional involved. The average duration of VLU was 17 months (median: 13 months, range: 1–360). During this time, patients had on average consulted 3.5 physicians (median: 3, range: 1–13). Individuals who had not received any compression treatment showed an average VLU duration of 13.6 months (median: 11 months, range: 4–45); those wearing stockings, 22.3 months (median 10 months, range 1–360); patients with compression bandages, 15.8 months (median: 15 months, range: 1–49) (Table 1).

Compression treatment

At first consultation, 31.1 % (95 %-CI: 24.3–37.9) of patients had no compression therapy; 28.8 % (95 %-CI: 22.1–35.5) had stockings and 40.1 % (95 %-CI: 32.9–47.3) had bandages. Of all patients treated with stockings (n = 51), 19.6 % used MCS of compression class (CCL) I; 64.7 % CCL II; 13.7 % CCL III and 2 % medical antithrombosis stockings. No patient was treated with ulcer stocking systems. Of the patients treated with compression bandages (n = 71), 69 % had short-stretch bandages without underpadding; 12.7 % had multi-component systems (Table 2).

Stockings

On average, stockings (n = 51) had been used for 21.9 months (median: 7 months, range 0.5–360). Here, 74.5 % were skin-colored; 23.5 % black and 2 % of a different color. 62.8 % of participants knew that compression stockings were available in various colors. In this context, 49 % expressed interest in other colors; 5.8 % had stockings with a pattern; 23.5 % expressed an interest in the latter.

18.6 % of patients (n = 51) using MCS changed them daily; 33.3 % every other day; 29.4 % twice a week and 17.7 % once a week. 47.1 % donned their stockings themselves. 11.7 % had a donning device. Of these, 66.7 % used so-called sliders consisting of balloon silk; 33.3 % used metal frames. 50 % used their donning device regularly; 16.7 % had problems handling such a device.

Overall, 49 % put on their stockings after getting up in the morning; 21.6 % only after morning hygiene. 82.4 % of patients took off their stockings in the evening prior to going to bed; 11.8 % did so in bed; 5.9 % reported other times. On average, patients wore their stockings 11.3 hours per day (median: 12 hours, range: 4–16). 78.4 % received new stockings once every six months; 15.7 % once per year and 5.9 % less frequently. 72.6 % had an extra stocking or pair of stockings.

39.2 % of patients (n = 51) reported discomfort when wearing MCS. The most common complaint was pruritus (60 %), followed by constrictions (45 %), sweating (40 %), pressure marks (20 %), slipping in the shoe (20 %), cold feet (15 %) and other complaints (15 %).

82.4 % of patients with stockings (n = 51) used skin care products on their legs. Of these, 47.6 % used products containing urea; 26.2 % fatty cream and 26.2 % other products (Figure 1). 66.7 % treated the skin of their legs daily; 31 %

Table 2 Distribution within compression types (stockings n = 51, bandages n = 71).

Type of compression		n	%
Stockings	CCL I	10	19.6
	CCL II	33	64.7
	CCL III	7	13.7
	Medical antithrombosis stockings	1	2.0
Total		51	100
Bandages	Short-stretch bandages with underpadding	13	18.3
	Multi-component systems	9	12.7
	Short-stretch bandages without underpadding	49	69.0
Total		71	100

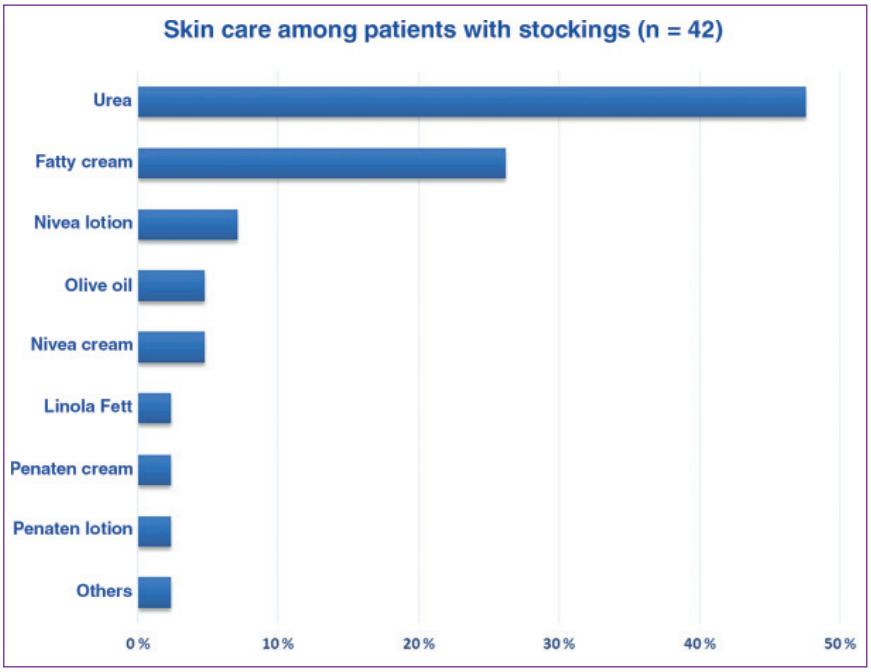

Figure 1 Skin care among patients with stockings (n = 51).

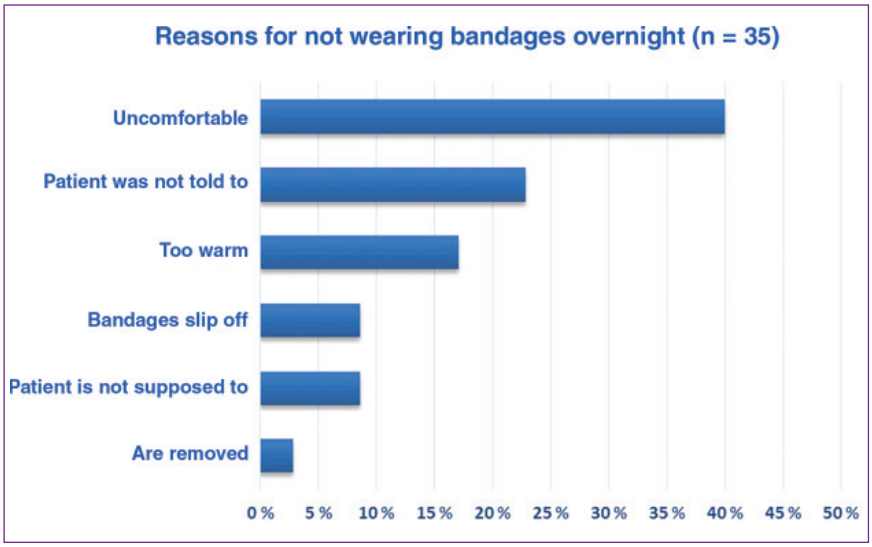

Figure 2 Reasons for not wearing bandages overnight (n = 35).

one to three times per week. 45.2 % of patients used cream on their legs in the evening; 42.9 % in the morning and 11.9 % in the morning and evening.

Compression bandages

On average, compression bandages (n = 71) had been used for 40.7 weeks (median: 36 weeks, range: 4–150). 87.3 % of patients used short-stretch bandages. 12.7 % had multi-component systems. The latter were used for an average of 27.3 weeks (median: 21 weeks, range: 5–78). Seven percent of patients put on the bandages themselves; 4.2 % with the help of relatives. Only 21.1 % wore the bandages day and night. Various reasons were given for not wearing bandages overnight (Figure 2). Sixty-nine percent of bandages were without underpadding. 9.9 % of bandages were wrapped in the morning before getting up; 42.3 % after getting out of bed in the morning; 33.8 % after morning hygiene and 1.4 % at noon. 50.7 % of patients removed the bandages in the evening before going to bed; 36.8 % reported doing this at an earlier time.

1.4 % of patients received new bandages about twice a month; 11.4 % once a month. Overall, 24.3 % used their

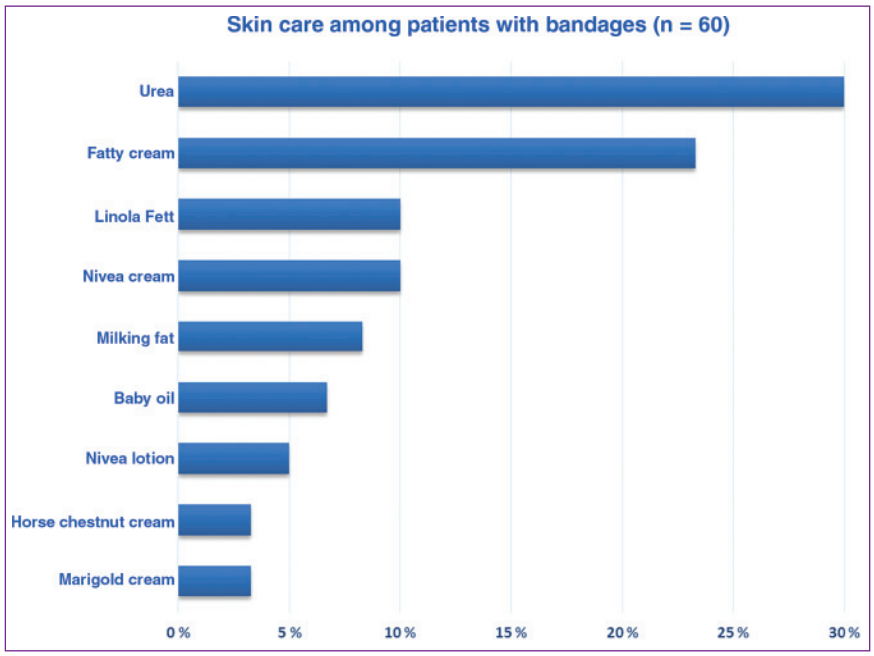

Figure 3 Skin care among patients with bandages (n = 71).

bandages for 2–3 months; 37.1 % for 4–5 months and 12.9 % for six months. The remaining patients were treated with multi-component systems for single use.

Although obsolete, bandages were fixed with metal clamps in 42.3 % of patients.

84.5 % of patients with compression bandages (n = 71) used skin care on their legs. Of these, 30 % used products containing urea; 23.3 % fatty cream and 46.7 % other products (Figure 3). 68.3 % treated their legs every time they changed bandages; 16.7 % twice per week and 6.7 % three times per week.

In 2.8 % of patients (n = 71), ankle and calf circumference was measured every 1–2 weeks to monitor therapeutic success.

Care of stockings and bandages

29.4 % of patients with MCS (n = 51) washed their stockings by hand. Overall, 70.6 % used a washing machine. Of these, 86.1 % used a temperature of 30–40°C; 11.1 % 60°C. Here, 58.8 % used mild detergent; 13.7 % in combination with fabric softener. 15.7 % used heavy-duty detergent; 7.8 % shampoo. After washing, 64.7 % dried their stockings hanging from a laundry rack, 19.6 % lying on the rack and 13.7 % used a radiator.

5.6 % of patients (n = 71) with bandages cleaned their bandages by hand; 81.7 % in a washing machine. Of these, 37.9 % used a temperature of 30–40°C; 58.6 % 60°C and 1.7 % 95°C. 40.3 % used heavy-duty detergent; 9.7 % in combination with fabric softener. 33.9 % used mild detergent; 8.1 % in combination with fabric softener. After washing, 45.2 % dried the bandages on a radiator; 38.7 % hanging on a laundry rack and 11.3 % lying on rack (Table 3).

Leg exercises

45.9 % of patients with compression therapy (n = 122) did daily leg exercises. In this context, 62.5 % did ankle extension/flexion exercises; 42.9 % stair climbing; 46.4 % walking; 5.4 % Nordic walking and 10.7 % other exercises. For this question, multiple answers were possible.

Discussion

According to current guidelines, compression therapy is the standard treatment for patients with VLU [8]. To date, there has been no study investigating the care situation with respect to compression therapy from a patient's perspective. Although VLUs had been present for an average of 13.6 months, 31.1 % (95 %-CI: 24.3–37.9) of patients had not received any compression therapy. This is in keeping with figures from the 2014 Remedies and Therapeutic Appliances Report of the Barmer GEK (one of Germany's largest statutory health insurances) [2]. According to that report, 61 % of VLU patients did not receive compression therapy at the time. In this context, it is also possible that – up to that point – some patients still did not realize the importance of this necessary therapeutic modality. However, this was not part of the study.

After the initial decongestion phase, treatment should be switched from bandages to stockings [15, 16] within

Table 3 Cleaning of compression stockings and bandages (n = 122).

	Stockings		Bandages	
	n	%	n	%
Washing				
▸ None	0	0.0	9	12.7
▸ Washing by hand	15	29.4	4	5.6
▸ Machine washing	36	70.6	58	81.7
Total	51	100.0	71	100.0
Machine washing (temperature in°C)				
▸ Cold	0	0.0	1	1.7
▸ 30–40°C	31	86.1	22	37.9
▸ 60°C	5	13.9	34	58.6
▸ 95°C	0	0.0	1	1.7
Total	36	100.0	58	100.0
Detergent				
▸ Mild detergent	30	58.8	21	33.9
▸ Mild detergent plus fabric softener	7	13.7	5	8.1
▸ Heavy-duty detergent	8	15.7	25	40.3
▸ Heavy-duty detergent plus fabric softener	0	0.0	6	9.7
▸ Shampoo	4	7.8	3	4.8
▸ Special stocking detergent	1	2.0	0	0.0
▸ Curd soap	1	2.0	0	0.0
▸ Green soap	0	0	2	3.2
Total	51	100.0	62	100.0
Drying				
▸ Laundry rack, lying	10	19.6	7	11.3
▸ Laundry rack, hanging	33	64.7	24	38.7
▸ Radiator	7	13.7	28	45.2
▸ Other	1	2.0	3	4.8
Total	51	100.0	62	100.0

3–4 weeks [15]. On average, bandages had been used for more than 40 weeks, thus ten times longer than ideally required. Treatment with stockings may increase patients' quality of life, since they are less slippery and bulky as well as better at maintaining the relevant interface pressure [17]. Furthermore, they accelerate the healing process and reduce recurrence rates [29]. Only 12.7 % of patients were treated with multi-component systems, which are superior to mere bandaging using short-stretch bandages [8]. On average, however, these systems were also used for more than 27 weeks. Moreover, 69 % of bandages had no underpadding, showing that appropriate bandaging and adequate knowledge about materials are not sufficiently prevalent among users. This has also been shown in a study that analyzed the level of knowledge about and practical application of compression therapy in Germany [28]. Almost 70 % of patients were treated by primary care physicians, 6.8 % even by healthcare providers not specialized in the treatment of VLUs such as non-medical (alternative) practitioners and gynecologists. Prior to first presentation, patients had – on average – consulted 3.5 physicians for their VLU. Apart from disease-related impairments, patients were thus further burdened by

stress caused by disappointing previous experiences and the time-consuming search for new healthcare providers. In this context, early referral to a specialist may assist in providing adequate therapy. Following initiation of proper treatment, the healing process for VLUs takes an average of 5.9 months [2]. Given that VLUs in the present study had on average persisted for 17 months, additional diagnostic workup would be indicated, in addition to appropriate expert adjustment of compression therapy as well as training measures. 78.9 % did not wear their bandages overnight; they were removed either during the day or in the evening before going to bed. Moreover, in 76.1 % of patients, new bandages were only applied after getting up in the morning. Thus, any potential therapeutic success achieved on the day before – in the form of incipient decongestion – would have been lost. 11.2 % put on the bandages themselves or with the help of relatives. In the majority of cases, however, no satisfactory results are to be expected when patients apply bandages themselves [5].

Worn-out bandages are unable to ensure therapeutic success [25]. Nevertheless, 50 % of patients used the same short-stretch bandages for four months or longer. Moreover, bandages were frequently not properly cared for. Only 33.9 % used mild detergent. Heavy-duty detergent and fabric softener have detrimental effects on the fabric. 45.2 % dried their bandages on a radiator, which further damages the material. Inefficient materials may also affect therapeutic success. Since proper care of the material is a factor that patients can directly contribute to, additional information and training sessions on this topic for patients and their relatives would be desirable [30].

Weekly measurements of ankle and calf circumference are a simple method for monitoring the success of efficient compression therapy. Such measurements were only performed in 2.8 % of participants. A 2014 study showed that 77 % of German users do not wrap compression bandages tight enough [28]. The widespread notion that compression bandages should be used as long as the VLU persists might be another reason why bandages were used for such a long period of time [31].

At initial presentation, 28.8 % of patients were already using stockings; these individuals had an average VLU duration of 22.3 months. Another factor leading to delayed resolution of VLUs might include treatment with an insufficient compression class. Although adequate treatment usually requires CCL III stockings [32], only 13.7 % were using this particular compression class; 83 % had a lower class. Apart from CCL, the stiffness of the fabric is also crucial for the success of compression therapy [13]. Given the difficulty of determining this parameter, it was not part of the study. None of the patients was treated with an ulcer stocking system. Although such systems have been established on the German market for 15 years, they are scarcely known among healthcare providers [28]. More than 70 % only put on their stockings after getting up in the morning, and thus at a time when leg decongestion was no longer optimal. 52.9 % of individuals were unable to independently don or doff their stockings; here, donning of the stockings prior to first getting up in the morning can certainly not be guaranteed. Moreover, inadequate care measures may have damaging effects on the properties of the fabric, thereby reducing the stockings' efficacy. Thirty-nine percent of patients did not clean their stockings with mild detergent but used fabric softener, heavy-duty detergent, or shampoo. At 60°C, 11.1 % used a washing temperature that was too high. Moreover, 13.7 % dried their stockings on a radiator, thus further damaging the fabric. The use of donning devices is beneficial with regard to maintaining the quality of the stocking material [22], however, only 11.7 % of patients possessed such a device, with only 50 % of them actually using it on a regular basis.

In this context, medical supply stores play a key role. On the one hand, they are distributors of MCS and donning devices; on the other hand, they advise patients with respect to correct use and product care.

Patients wore their MCS between 4 and 16 hours daily. Wearing them for too short a period of time may compromise therapeutic efficacy. Almost 40 % of surveyed patients reported complaints such as pruritus, constrictions, pressure marks, or sweating. Reasons for this may include the characteristics of the stocking or insufficient fitting. In addition, the skin may be irritated by friction caused by the compression material. Daily skin care with adequate products is therefore essential. However, neither patients wearing stockings nor those using bandages did so in an optimal way. Although more than 80 % used skin care products, only 67 % applied them every day. Products used included various substances of little benefit such as milking fat, Nivea® cream or lotion, baby oil, marigold cream. As these substances contain preservatives, fragrances, and emulsifiers, especially lanolin, they are marked by an increased potential for sensitization in VLU patients [26, 27]. More than 50 % of individuals wearing stockings used skin care products on their legs in the morning. This might pose a problem because stockings do not slide well over skin to which cream has just been applied, thus making it more difficult to don the stockings and resulting in a suboptimal fit. Patients may consequently experience discomfort when wearing their MCS. Used by 42.3 % of patients treated with bandages, metal clamps harbor an additional risk for injuries. Only 46 % of patients on compression therapy did daily leg exercises. This fact may have a negative impact on therapeutic efficacy, and confirms a 2012 study that showed that many patients did not receive treatment according to current guidelines [9].

This study – for the first time – provides some insight into the current practice of care and the level of knowledge with

respect to compression therapy in patients with VLU from a patient's perspective. Given the nonrandomized study design, the results are not representative, and may be applied to the German population only to a limited extent. Another limitation is the kind of patient survey and the recall bias associated with it. In particular, information about past events such as wound duration and number of VLU-related consultations may be affected. However, the present assessment of the practice of care and current compression therapy is not affected by this potential bias. With respect to the general use of compression bandages or stockings, thus regularly occurring events, the effects of this potential bias are also considered to be small [33]. Selection bias concerning the selection of participating centers and institutions or with regard to the selection of patients must be taken into account when interpreting the data.

In order to include a patient group that was as heterogeneous as possible, specialized medical practices in urban areas as well as university and rural institutions were asked to participate (nonrandom sampling). This was complemented by care services that operate both in urban and rural areas.

Conclusions for everyday clinical practice

The present findings highlight that there is still large potential for improvement as regards compression therapy of VLU patients in Germany. One possible tool for improving the current treatment situation might include coordinated and standardized training of patients, healthcare providers and users.

Conflict of interest

Kerstin Protz: Mrs. Protz has received consulting fees and/or honoraria for lectures from the following companies: 3M Medica, BSN medical, Paul Hartmann AG, Lohmann & Rauscher, medi, URGO, and Smith & Nephew.

Joachim Dissemond: Prof. Dr. Dissemond has received research funding and/or consulting fees honoraria and/or honoraria for scientific lectures from the following companies: 3M Medica, BSN medical, Paul Hartmann AG, Lohmann & Rauscher, and URGO.

Kristina Heyer: no conflict of interest.

Barbara Temme: Mrs. Temme has received honoraria for lectures from Juzo.

Karl-Christian Münter: Dr. Münter has received research funding and/or consulting fees and/or honoraria for scientific lectures from the following companies: BSN medical and URGO.

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