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Compression treatment at a glance

Preface

Compression treatment is considered the baseline treatment for venous insufficiency and oedema of various aetiology. After the diagnosis, the treating doctor has to decide on the appropriate stocking for the patient, including the appropriate compression class and duration of treatment.

In this context, we refer to the SIGVARIS brochure "Venous Disorders", a short and practice-oriented brochure for the doctor on the latest developments in phlebology.

This brochure is intended as supplement, with a focus on practical issues that may arise when prescribing medical compression stockings. It gives an overview of approved indications that require compression treatment, presents a summary of selected studies and provides answers to issues raised above – in short, the brochure is intended to provide practice-oriented and comprehensive information on the use of compression therapy at a glance.

All information provided is given as recommendations and should not be regarded as a guideline. Based on current information from clinical studies and experience from practice, the brochure is intended as guidance when making a treatment decision.

The decision on the choice of compression class, stocking model and duration of treatment is the responsibility of the attending physician, individually for each patient, taking into account the clinical situation and personal needs.

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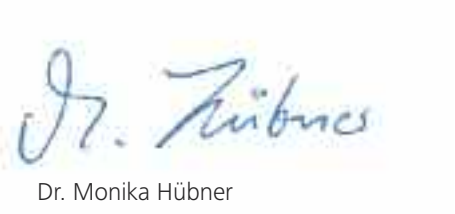

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Contents

Classification

The CEAP Classification was introduced in 1996 in an attempt to maintain a system that would allow the differentiated classification of venous diseases. Since then, this classification system has consolidated its position in the relevant literature and has been used extensively in the interim. It is used in particular within the scope of scientific publications.
Every letter in the CEAP classification system stands for a venous disease component:

C = Clinic: clinical signs (score of 0–6), a = asymptomatic, s = symptomatic
E = Etiology: etiological classification according to congenital, primary and secondary
A = Anatomy: affected segments of veins, superficial, deep, perforating veins
P = Pathophysiology: pathophysiological dysfunction, return, obstruction, return and obstruction

Clinic C0–C6	Definition	Comments
C0	No sign of venous disease	
C1	Spider veins and reticular varices	Spider veins: intradermal venulae < 1 mm. Reticular varices: subdermal, < 3 mm
C2	Varicose veins	Subcutaneous, > 3 mm
C3	Oedema	Fluid retention
C4	Skin changes	C4a: pigmentation, purpura, eczema C4b: hypodermitis, lipodermosclerosis, White atrophy
C5	Healed ulcer	
C6	Open ulcer	

Selection of compression class

CCL 1
18–21 mmHg
- Heavy, tired legs with a tendency to swelling in the legs
- Prevention of thrombosis and embolism in immobile patients
- Prevention of Economy class syndrome (deep vein thrombosis)
- Superficial varicose veins without leg oedema
- Superficial varicose veins during pregnancy

CCL 2
23–32 mmHg
- Varicose veins with mild leg oedema
- After varicose vein treatment (surgical procedures, sclerotherapy, endovenous treatments) to maintain treatment success
- Deep vein thrombosis
- Post-thrombotic syndrome
- Aseptic superficial thrombophlebitis
- After the healing of venous ulcers in patients with chronic venous insufficiency
- Severe varicose veins during pregnancy

CCL 3
34–46 mmHg
- Active venous leg ulcers
- Recurrent venous leg ulcers
- Forms of advanced CVI such as lipodermatosclerosis
- Reversible lymphoedema, lipoedema
- Post-traumatic syndrome
- Angiodysplasia

CCL 4
min 49 mmHg
- Irreversible lymphoedema
- Severe post-thrombotic syndrome

Stockings with the indications for class 3 and 4 should only be prescribed by medical specialists.

Recommendation

One size does fit all does not apply for compression stockings – each diagnosis is individual and requires individual assessment. The stage of the venous disorder must also be taken into consideration. By far the most commonly prescribed stockings are those with compression class 2.

Patient compliance also has an influence on the choice of compression class. Where a patient has difficulty handling a class 2 stocking, they may want to consider reliably wearing a class 1 stocking.

The primary goal of treatment is the improvement of the clinical findings.

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Indications and duration of compression treatment

Indications	**Duration of compression treatment** (based on practical experiences)
Leg symptoms	
Functional disorders such as a feeling of heaviness and muscle fatigue in the legs with a tendency to swelling in the legs	At all times during prolonged periods of sitting or standing, also recommended for associated occupations
Varicosis	
Superficial varicose veins with subjective manifestations (minor varicose dilatation of the cutaneous veins, reticular veins) (C1, C2)*	As long as symptoms persist and, where appropriate, as prevention in familiar stress situations
Advanced primary varicose veins with oedema (trunk or branch varices) (C2, C3)*	With temporary or permanent contraindications for sclerotherapy or surgery, or where these treatments, compared to compression, are not yet indicated or rejected by the patient
To optimise treatment success after: a) selective surgical removal of varicose veins (outpatient procedure) b) vein stripping c) after sclerotherapy d) after endoluminal ablation	Depending on findings and treatment from weeks to several months
Following varicose vein treatment	May prevent recurrence (this is suspected, has not yet been confirmed by studies)
Skin lesions caused by chronic venous insufficiency	
Eczema, erythema, hypodermitis (C4)*	After basic treatment, usually lifelong compression
Dermatosclerosis, purpura, atrophie blanche (C4)*	Usually lifelong compression
Healed venous ulcer (C5)*	From several months to lifelong compression, depending on the initial cause
Active venous leg ulcer ** (C6)*	From several months to lifelong compression, depending on the initial cause

continued on page 8

Indications and duration of compression treatment

Indications	**Duration of compression treatment** (based on practical experiences)
Thrombosis, thrombophlebitis, embolism	
Prevention of thrombosis / embolism	Temporary, as long as there is a risk; permanent with continuing risk
Thrombophlebitis or venous thrombosis (superficial venous thrombosis)	Short-term or long-term, depending on findings, at least until the regression of the palpable induration
Deep vein thrombosis	Between three months and two years, lifelong with permanent functional loss
Post-thrombotic syndrome	Lifelong compression
Non-venous oedema	
Postoperative oedema	Until oedema has subsided
Post-traumatic oedema after baseline treatment	Until oedema has subsided
Idiopathic cyclic oedema	In the short term, until the oedema is resolved
Reversible lymphoedema after complex decongestive therapy (CDT)	Lifelong compression
Irreversible lymphoedema with pronounced induration after complex decongestive therapy (CDT)	Lifelong compression
Stage II lipoedema and higher	Lifelong compression
Pregnancy	
Varicosis during pregnancy, with or without oedema (C2, C3)*	Up to 1 month after birth, ideally until the end of breastfeeding
Oedema during pregnancy	Up to 1 month after birth, ideally until the end of breastfeeding
Risk of thrombosis during pregnancy and/or post partum	During pregnancy and up to six weeks after delivery

Indications	**Duration of compression treatment** (based on practical experiences)
Other causes of venous circulatory disorders	
Slow retrograde flow of blood due to obesity (pressure on the deep leg veins in the groin/abdominal region)	Until the oedema, or the underlying cause is resolved
Oedema caused by stiff joints and skin lesions: Arthrogenic congestion syndrome	Lifelong or until the underlying cause is resolved
Oedema due to immobility: Paresis and partial paresis of the lower limbs	Lifelong or as long as the underlying cause remains, if positioning does not suffice **CAUTION!** Carefully weigh up the risk/benefit ratio due to the sensory disorder, which is a contraindication
Angiodysplasia	Usually lifelong compression

** According to CEAP classification, **see page 17 of the study 'Treatment of venous ulcers with compression stocking kits vs. bandages'

Recommendation

SIGVARIS has a comprehensive range of products in many standard sizes for the majority of patients. Legs are measured and the correct size of the stocking is selected from a broad range of sizes. Custom-made stockings are available for patients, who do not fit into standard sizes.

Choosing the appropriate model

	**A–D**	Calf	In many cases of venous insufficiency a calf stocking can provide clinical improvement. (see "Recommendation")
			Sufficient in pregnancy as prophylaxis, with thigh varices. AG or AT
	**A–G**	Thigh	Varicosis in the area of the femur with insufficiency of the saphenousfemoral junction (SFJ)/venous reflux/and or leg problems
			Deep vein thrombosis in the thigh area
			Superficial thrombophlebitis in the thigh
			Thigh varices in pregnancy
			After surgical varicose vein treatment in the thigh area (also after crossectomy)
			Lipoedema or lymphoedema in the thigh area
	A–G	Thigh with waist attachment	As an alternative to Panty for those patients with indication for AG, who cannot/ do not want to wear thigh stockings with grip tops
			For elderly patients, as they are easier to handle than Panties
			For men
	**A–T**	Panty*	For those patients with indication for AG, who cannot/do not want to wear thigh stockings with grip tops (e.g. soft connective tissue, poor fit of the grip top, abundant body hair)
			Patients with varicose veins in the groin area
	**A–T/U**	Panty Materna*	Pregnancy
			As an alternative to Panty for patients with larger waist circumference
			*The design of Panty und Panty Materna avoids any compression pressure on this part of the body

Recommendation

The majority of complications with varicose veins occur in the calf (oedema, skin changes), and the most frequently used stocking is therefore the AD (Calf).
With varicose veins in the thigh area, AD Calf stockings may aggravate the thigh complications. The most proximal point of insufficiency should be included in the compression, which is most commonly found in the groin region.
Thigh stockings or Panties would then be indicated.

Open toe or closed toe

	
Closed toe (shown in the example of an A–D Calf stockings)	**Open toe** (shown in the example of an A–G Thigh stocking)
Needed for medical reasons where compression is required in the toe area, e.g. with oedema in the feet area.	Suitable for all patients, who do not need a closed toe stocking
For orthopaedic reasons, with a pronounced hallux (the lower end of the open toe stocking may put pressure on the hallux).	More comfortable to wear in warm temperatures
	Better suited for elderly patients, as it is easier to put on
	May cause constriction at the toe end of the stocking (as such not suited for hallux)
	Allows monitoring the discolouring of the toes
Frequently, the decision is made by the patient, with factors such as habit, compliance, or footwear playing an important role.	

Recommendation

Specially made rubber gloves greatly help to apply and remove compression stockings and panties.

It is very important for compliance and thus the consistent wearing of the stockings if the patient is given precise instructions before they use their compression stocking for the first time.

Patients are advised to wash their stockings daily to retain the compression characteristics of the stocking. This can be done in a laundry bag in the normal washing cycle or by a hand wash. Fabric softener may not be used.

Relative and absolute contraindications

Relative contraindications – and possible solutions

Relative contraindication	Possible solution
Pronounced exuding dermatoses	First reduce with decongestive treatment with bandages, then compression is usually possible
Intolerance to the material of compression stockings	Choose other materials , such as natural rubber or cotton covered yarn
Severe sensory disturbances of the lower limbs	Compression treatment only under regular monitoring by medical or nursing staff
Advanced peripheral neuropathy (e.g. with diabetes mellitus)	Compression treatment only under regular monitoring by medical or nursing staff
Minor peripheral neuropathy	Use lower compression class, monitor symptoms
Rheumatoid polyarthritis	Decision for compression treatment after weighing up the risk/benefit ratio by the attending physician

Absolute contraindications – with comments

Contraindication	Comment
Advanced stage peripheral arterial occlusive disease	Presents with skin discolouration and/or necrosis. In case of doubt present to angiologist.
Septic phlebitis	With evidence of raised CRP. Septic phlebitis is difficult to distinguish from thrombophlebitis, which usually is not an infection. It is a classic indication for compression treatment (see page 8)
Phlegmasia coerulea dolens	
Decompensated heart failure	

Recommendation

Medical compression stockings may cause skin necrosis and pressure damage on peripheral nerves, in particular if used improperly.
Regular follow-up examinations by the doctor or nurses, particularly after primary care, are strongly recommended.

Selected studies
Relevant studies on medical compression stockings

Use of medical compression stockings in the general population – results of the Bonn Vein Study

Rabe E, Pannier-Fischer F, Bromen K, Schuldt K, Stang A, Poncar Ch, Wittenhorst M, Bock E, Jöckel KH
Bonn Vein Study of the German Society of Phlebology. Epidemiological study to investigate the prevalence and severity of chronic venous disorders in the urban and rural residential populations.
Phlebologie 2003; 32: 1–14.

Objective
The aim of this study was to assess prevalence of use of medical compression stockings (MCS) in the general adult population in Germany and discuss the indications for which MCS has been described as treatment, as well as the experience of patients with this treatment.

Methods
The participants in the Bonn Vein Study I were recruited from November 2000 to March 2002 using random sampling from the registries of residents of the city of Bonn and two rural communities in the area. A total of 3,072 men and women took part in the study. In addition to a clinical examination and duplex ultrasound, the patients were asked whether they already had had phlebology treatment for their leg discomfort or leg disorders in the past. If compression stockings had been worn in the past, they were also asked for details such as compression class, length and wearing time of the stockings, as well as effectiveness and recognition. In a follow-up study after 6.6 years, the Bonn Vein Study II, 861 men and 1,109 women of the Bonn Vein Study I were re-examined, with a response rate of 85.6% in the follow-up study.

Results:
Overall, 22.9% of the respondents (12.7% of men and 31% of women) had received phlebology treatment in the past. With 14.6%, medical compression stockings were the most common form of treatment in the general population (7.5% of men, 20.3% of women), and the median age when first prescribed was 45.5 years (SD 14.3 years). With increasing severity in the C-class, as per CEAP classification, the rate of prescriptions for MCS also increased significantly (1% in C0 patients up to 82% in C5/C6 patients). Of the 450 subjects who had used compression stockings in the past, 309 (68.6%) did not use compression stockings at the time of the survey. The remaining subjects wore their MCS usually five or more days per week (73%) and eight or more hours a day (89.4%). On average, 71.3% of the study participants indicated that treatment with MCS had improved the underlying diseases. Improvements were a reduction of the feeling of swelling (84.2%) as well as of the feeling of heaviness (89.4%), less leg pain after prolonged standing (60.9%) and a reduced feeling of tension in the legs (78.9%).
In the follow-up study, 16% of respondents declared that they had used medical compression stockings at one point in time. Not all of these respondents had an indication for ongoing treatment of this kind. Reasons for a temporary prescription of compression treatment were varicose vein surgery, sclerotherapy, or pregnancy. Of the patients receiving compression treatment, 40.1% had no permanent indication. Among the study participants with permanent indication, 45.8% regularly wore their MCS at the time of the investigation. The reasons for

Selected studies

non-compliance differed vastly. In 7.5% of the cases, the MCS were simply no longer prescribed by the doctor. In 75.8% of cases, the MCS were well tolerated and 76.1% were satisfied or very satisfied with the results of the treatment.

Conclusion:
Taking into account the non-permanent indications for compression treatment, compliance was almost 50%. Medical compression stockings were well tolerated and the patients were satisfied with the outcome.

Full details for these studies and more information are available at www.stemmerlibrary.com.

Low-strength compression stockings are not inferior to multi-layer bandages in the treatment of venous ulcers.

Brizzio E, Amsler F, Lun B, Blättler W
Comparison of low-strength compression stockings with bandages for the treatment of recalcitrant venous ulcers. Journal of Vascular Surgery 2009, Vol. 51, Issue 2, Pages 410–416.

Background
Compression is the mainstay in the treatment of chronic venous leg ulcers. Medical compression stockings (MCS) are suitable for the treatment of small ulcers and to prevent recurrence. The role of medical compression stockings with low compression strength in the treatment of treatment resistant ulcers, remains unclear.

Methods
A randomised, single-centre, open-label study was carried out on 60 legs of 56 consecutive patients with no previous compression treatment. SIGVARIS prototype compression stockings with a pressure of 20.7 mmHg (±5.5) at the ankle (measured without eccentric compression) were compared to multi-layer compression bandages. Eccentric padding was used in all patients. Wound treatment was tailored to each patient. The compression was maintained around the clock and changed weekly until the healing was complete. Endpoints were healed within 90 and/or 180 days. Healing time and quality of life were identified monthly within this period with the help of the questionnaire for patients with chronic venous insufficiency (Campbell).

Results:
Four patients (five legs) discontinued the study, two of them (three legs) were in the MCS group, the other two from the bandages group. Reasons for discontinuation were the exacerbation of the ulcer (2), systemic infection (2), and one patient died, however this was unrelated to the vein disorder (1). Characteristics of patients and ulcers were evenly distributed. The pressure of the medical compression stockings was significantly lower than the pressure of the compression bandages, while tissue elasticity was the same in both groups. There were no significant differences between the MCS group and the bandages group with regard to healing ratio and healing rate and both groups showed a similar quality of life. Overall, there were the following risk factors for unsuccessful healing: Advanced age of the patient (64.8 years vs. 57.6 years, $p = 0.021$), a low BMI (30.2 kg/m^2 vs. 34.1 kg/m^2, $p = 0.028$) longer presence of ulcers (36.3 months vs. 13.4 months, $p = 0.025$) and a larger initial ulceration area (17.9 cm^2 vs. 5.5 cm^2, $p = 0.001$). Recurrence of ulcer and reflux in the deep veins had no impact on healing. The size of ulcers that had not healed within 90 days, decreased from 17.9 cm^2 to 8.7 cm2 ($p < 0.001$).

Conclusion:
The study shows that compression bandages in the treatment of treatment-resistant venous ulcers offer no advantage over medical compression stockings. The optional use of MCS makes long-term care much easier and offers many other benefits. The data collected since the beginning of this study indicate that

Selected studies

compression treatment with two stockings on top of each other probably represents the most appropriate treatment option (see page 17). The first stocking, the underliner stocking, which keeps the dressing in place and generates a pressure of approximately 16 mmHg (permanent application) is worn day and night while the second sock offers an additional pressure of 20–30 mmHg and is worn only during the day (orthostatic application).

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The treatment of venous leg ulcers with a specifically designed compression stocking kit. Comparison with bandaging

Mariani F, Mattaliano V, Mosti G, Gasbarro V, Bucalossi M, Blättler W, Amsler F, Mancini St
The treatment of venous leg ulcers with a specifically designed compression stocking kit – Comparison with bandaging.
Phlebologie 2008; 37: 191–197.

Summary
Traditionally, venous leg ulcers are treated with firm non-elastic bandages. Medical compression stockings are not the first choice, although some comparative studies found them equally effective or superior to bandages.

Patients, methods:
We report on a multi-centre randomised trial with 60 patients treated either with short stretch multi-layer bandages or a two-stocking system (SIGVARIS® Ulcer X® Kit). Three patients were excluded from the study because their ankle movement was restricted to such an extent that they were unable put on the stockings. One patient withdrew his consent. Characteristics of patients and ulcers were evenly distributed. The proportion of ulcers that healed within four months, and the time to completion of healing were recorded. Subjective assessment was measured using a validated questionnaire.

Results:
Complete wound healing with bandages was achieved in 70% (21 of 30) of patients and with the Ulcer X® Kit in 96.2% (25 of 26) of patients ($p = 0.011$). Ulcers with a diameter up to approx. 4 cm healed twice as fast with the Ulcer X® Kit , larger ulcers as fast as with bandages.
The sum of problems encountered with bandages was significantly greater than with the stocking kit ($p < 0.0001$). In the stocking group there was no pain at night and in the morning, while the bandage group reported 40% and 20% respectively. Ulcer size and pain were the major predicative factors for delayed healing.

Conclusion:
The Ulcer X® Kit allows easy and safe treatment of common venous ulcers, provided there is good ankle movement to ensure painless application. Bandages, even when applied by experienced staff, are less effective and cause more problems.

Selected studies

Blazek C, Amsler F, Blaettler W, Keo HH, Baumgartner I, Willenberg T
Compression hosiery for occupational leg symptoms and leg volume: a randomized crossover trial in a cohort of hairdressers. Phlebology 2012; Mar 26. [Epub ahead of print].

Treatment of occupational symptoms and oedema with lower leg compression

Background

This clinical survey and controlled trial supported by SIGVARIS investigated the range and prevalence of leg-related symptoms and the impact of using compression stockings when compared to non-application as part of a randomised cross-over study.
The study was conducted between September 2009 and March 2010 at the Swiss Cardiovascular Centre, Department of Angiology, Bern University Hospital in Switzerland.

Methods

The study was conducted with a cohort of 108 male and female hairdressers in full and part-time employment. This occupation, which is almost entirely carried out in a standing position, may be associated with an increased risk of leg symptoms.
Exclusion criteria for participation: younger than 18 years, pregnancy, inability to stand and walk normally, history of persistent oedema or unknown cause, lymphoedema, superficial phlebitis, deep vein thrombosis and peripheral artery occlusive disease.
All study participants were examined in detail at the beginning of the study and in the further course:

- Semi-structured interview: Background, personal data, medical history
- Clinical examination of the legs (duplex sonography and measurement of leg volume)
- Assessment of symptoms and quality of life, based on a self-completing questionnaire with 62 questions

At the beginning of the study, 83% of respondents had no specific vein disease.

The participants were divided at random into two groups (randomised).

- During the first three weeks, Group A wore compression stockings from morning till evening with a tiered pressure of max 21 mmHg above the ankle.
- They did not wear the stockings outside work in their spare time. Group B did not wear any stockings during this period.
- After three weeks, the treatment was changed: Now, Group B wore compression stockings over a period of three weeks while Group A had no compression stockings.

Results:
The detailed personal, written and clinical examination of the participants' status quo at the beginning of the study represents the initial situation ("baseline") for the evaluation of changes during and at the end of the study. At the beginning of the study, it was found that

- 80% of the participants reported unpleasant feelings in their legs.
- 84% complained of tired legs
- Their mental state and the influence of the quality of life were a major issue: In 80% of cases, neuro-muscular symptoms, insomnia and the conviction to have unattractive legs, as well as a sense of nervousness/restlessness, emotional stress and depression were named as major symptoms.

Conclusion:
The study underlines the hypothesis that people, whose occupation forces them to regularly stand for long hours, suffer from leg symptoms and the feeling of swelled or heavy legs. These symptoms also occur in people with normal leg veins and affect their emotional health. Wearing compression stockings with a pressure of up to a max. pressure of 21 mmHg at the ankle can result in a significant improvement of these symptoms.

Effect of wearing compression stockings

Symptoms such as sleep disorders, the conviction of having unattractive legs and the feeling of dejection that generally accompany the pain and swelling, have improved.

Positive effects on the swelling were particularly achieved for study participants with complaints in both legs.

The improvement of neuromuscular symptoms, restlessness and emotional stress was particularly evident among younger participants.

Discomfort in the legs improved, particularly in cases with pain, where both legs were affected and in several places at the same time.

In older study participants, the volume of the lower leg was significantly reduced.

Pain and swelling decreased more or less simultaneously. There was no evidence for a causal relationship.

The relationship between physiological and psychological discomfort is evident. Leg symptoms significantly affected the mental state and the quality of life.

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