

# Compression Bulletin 24

Robert Stemmer Library on Compression Therapy

# SIGVARIS

In this issue:

## **Safety and efficacy of mild compression (18 – 25 mmHg) therapy in patients with diabetes and lower extremity edema**

In a pilot-study the authors investigated if diabetic compression stockings with mild compression (18 – 25 mmHg) are able to reduce edema formation in patients with diabetes mellitus without negatively impacting vascularity.

## **Therapy with compression stockings in Germany – results from the Bonn Vein Study**

The Bonn Vein Study is an epidemiological cross-sectional study in the adult general population in Germany between the age of 19 and 79 years.

## **Unexpected venous diameter reduction by compression stocking of deep, but not of superficial veins. A case report.**

Standing MRI was used to measure the venous diameters of superficial and deep leg veins in a patient with massive varicose veins connected with an incompetent great saphenous vein without and with different levels of compression.

## **Effect of multilayer high-compression bandaging on ankle range of motion and oxygen cost of walking**

To evaluate the effects of multilayer high-compression bandaging on ankle range of motion, oxygen consumption and subjective walking ability in healthy subjects.

## **Use of custom-made stockings to control postoperative leg and foot edema following free tissue transfer and external fixation of fractures**

Five patients with open fractures who had free tissue transfer, arterial end to end or end to side anastomoses and external fixators received custom made compression stockings 2 weeks after surgery in the mobilisation phase, before the external fixator was removed.

## **Compression therapy for preventing recurrence of venous ulcers – Update of Cochrane Database**

In this update randomised controlled trials evaluating compression bandages or hosiery for preventing the recurrence of venous ulcers were searched in the available databases.

**25<sup>th</sup> Annual Meeting of the AVF**  
February 27 – March 2, 2013  
Phoenix, Arizona

Robert Stemmer Library on Compression Therapy was created by Robert Stemmer. It is a complete collection of publications of scientific and medical journals. It consists of three parts:

- Handbook «Compression Therapy of the extremities», edited by Robert Stemmer in 1999 continuous literature updates, which are regular amendments of the handbook.
- The Compression Bulletin reports about important new publications.
- The table of contents of the Robert Stemmer Library:
  1. Introduction
  2. Historical overview
  3. Anatomy
  4. Venous return
  5. The basis of compression
  6. Mobilization
  7. Compression using mechanical devices
  8. Bandages
  9. Compression stockings
  10. Compression & mobilization strategiesThe Library is regularly updated with new publications; a selection is presented in the Compression Bulletin.

### **Editors**

Prof. Dr. H. Partsch, Vienna  
Prof. Dr. E. Rabe, Bonn

### **Co-Editors**

Dr. F. Pannier, Bonn  
Dr. B. Partsch, Vienna

### **International Advisory Board**

Asia: Dr. S. Hoshino  
Australia: Dr. GM. Malouf  
Europe: Prof. Dr. F. Vin  
North America: Dr. L. Villavicencio  
South America: Prof. Dr. E. Brizzio

### **SIGVARIS AG**

CH-9014 St. Gallen  
Tel. +41 71 272 40 00  
Fax +41 71 272 40 01

### **SIGVARIS SA**

F-68330 Huingue  
Tel. +33 3 89 70 2400  
F-42176 St-Just-St-Rambert  
Tel. +33 4 77 36 08 90

Wu SC, Crews RT, Najafi B, Slone-Riviera N, Minder JL, Andersen CA

## Safety and efficacy of mild compression (18 – 25 mmHg) therapy in patients with diabetes and lower extremity edema

*J Diabetes Sci Technol 2012; 6: 641 – 647*

### Background

Edema of the foot or in the lower extremity is a frequent finding in patients with diabetes mellitus. To avoid compromising arterial circulation compression treatment is usually not performed in these patients.

### Methods

In a pilot-study the authors investigated if diabetic compression stockings with mild compression (18 – 25 mmHg) are able to reduce edema formation in patients with diabetes mellitus without negatively impacting vascularity. The authors investigated 18 diabetic patients (9 males, 9 females) with a mean age of  $61 \pm 11$  years. All patients had lower extremity edema and the ankle brachial index (ABI) was  $1.1 \pm 0.21$ . All participants wore compression stockings with an ankle pressure of 18 - 25 mmHg during the waking hours. Follow-up visits were performed weekly for 4 consecutive weeks. The edema was quantified by circumference measurements at mid-foot, ankle and calf. The vascular status was followed by ABI measurements.

### Results

During the study the calf circumference showed a significant decrease of  $1.3 \pm 0.28$ cm ( $p < 0.05$ ) after the first week. Midfoot circumference was significantly reduced after 2 weeks, too ( $- 0,98 \pm 0,35$ cm). The ankle circumference showed a non-statistically significant trend towards reduction. No adverse events occurred during the study.

### Conclusion

The authors concluded that mild compression decreases swelling in diabetic patients with edema formation without compromising vascularity.

### Comment

This interesting study shows edema reduction in diabetic patients with edema formation in the foot and calf region. If confirmed in a larger study, diabetic edema could be an interesting indication for compression therapy. However, we must keep in mind that severe arterial occlusive disease or micro-angiopathy with necrotic lesions of the foot are still a contraindication for compression treatment in diabetic patients. In severe diabetic neuropathy with sensory loss there is also a risk for pressure damage of the skin by non-fitting stockings which may not be recognized by the patient early enough.

# Therapy with compression stockings in Germany – results from the Bonn Vein Study

*JDDG 2012 DOI:10.1111/j.1610-0387,2012.08048.x (online ahead of printed version)*

## Background

The use of medical compression stockings (MCS) in the treatment of chronic venous diseases is very common in Germany. Up to now no reliable data was available.

## Aim

The aim of the study was to gain reliable data on the treatment with MCS in Germany.

## Methods

The Bonn Vein Study is an epidemiological cross-sectional study in the adult general population in Germany between the age of 19 and 79 years. In the Bonn Vein Study I 3.072 participants were screened for chronic venous diseases, in the Bonn Vein Study II with a follow-up time of 6.6 years 1.978 participants from the first study were reinvestigated. Aside of incidence of chronic venous diseases and risk factors, data on treatment with compression stockings were gathered.

## Results

14.6% of the population (7.5% men, 20.3% women) reported having previously worn MCS. A mean of 71.3% reported an improvement in their venous disease as a result of MCS treatment. MCS were more often prescribed in higher C-stages. In 12.2% of the C2-population, 19.1% of the C3-population and 27% of the C4-C6 population MCS were prescribed in the follow-up period. However, about 60% of the CVI-population (C3 – C6) were not treated by MCS or compression bandages during the follow-up period of the Bonn Vein Study. In the population with a long-term indication for compression treatment the compliance for wearing compression stockings was approximately 75% if MCS had been prescribed previously.

## Conclusion

The authors conclude that although MCS is the most common treatment of chronic venous diseases in Germany there is still a severe lack of treatment with MCS in chronic venous insufficiency stages.

## Comment

This epidemiologic study demonstrates the high frequency of MCS treatment in chronic venous diseases in Germany. In the Bonn Vein Study compliance for compression treatment was much higher than in comparable publications. This was due to the fact that those who had no permanent indication for compression treatment like compression treatment after surgery or sclerotherapy or in pregnancy without varicose veins were not counted as incompliant if they did not use MCS on a lifelong basis. However, the data also demonstrate that even in chronic venous insufficiency stages (edema, skin changes or venous ulcers) only approximately 40% were treated with MCS or compression bandages in the follow-up period. This is in contrast to the fact that MCS treatment is considered to be the basis of treatment in chronic venous insufficiency.

Partsch H, Mosti G, Uhl JF

---

## Unexpected venous diameter reduction by compression stocking of deep, but not of superficial veins. A case report.

*Veins and Lymphatics 2012; 1:e3 doi:10.4081/VL.2012.e3 (online)*

### Background

Morphological studies on the effect of compression on the leg veins are rare and mostly performed in the supine position.

### Aim

To investigate the influence of compression applied with different pressures on the calibre of leg veins in the standing position by using MRI.

### Methods

Standing MRI was used to measure the venous diameters of superficial and deep leg veins in a patient with massive varicose veins connected with an incompetent great saphenous vein without and with different levels of compression. By constructing a realistic 3D vectorial model it could be clearly shown that the compression effect is not only restricted to a single cross section of the leg but does involve the whole calf segment.

### Results

In the standing position a compression stocking with a pressure of 22 mmHg was able to reduce the calibre of the lower leg deep veins. A dilated soleus vein was fully compressed by the stocking. At the same time the massively dilated superficial veins showed only a minimal narrowing and could only be compressed by an inelastic bandage exerting a resting pressure of 51 mmHg which increased to 83 mmHg in the standing position.

### Conclusion

Compression stockings around 22 mmHg may reduce the diameter of deep lower leg and muscle veins in the standing position. To empty varicose veins, for instance after venous ablation, much higher pressures are required.

### Comment

These surprising findings disprove the concept that external compression would act more on superficial than on deep veins and have some practical implications. Compression stockings are likely not able to narrow varicose veins in the upright position considerably but lead to a major diminution of deep vein diameters during standing, probably due to an increase of the higher tissue pressure in the deep muscle compartment. It may be assumed that the resulting improvement of deep venous hemodynamics will also result in a better drainage of the superficial veins.

Roaldsen KS, Elfving B, Stanghelle JK, Mattsson E

---

## Effect of multilayer high-compression bandaging on ankle range of motion and oxygen cost of walking

*Phlebology. 2012 Feb;27(1):5-12*

### Background

Compression bandaging may restrict ankle range of motion and gait capacity, thereby reducing calf-pump effectiveness. The influence of multilayer bandages on ankle joint mobility and gait capacity has been poorly investigated up to now.

### Aim

To evaluate the effects of multilayer high-compression bandaging on ankle range of motion, oxygen consumption and subjective walking ability in healthy subjects.

### Methods

22 healthy subjects (10 women and 12 men; aged between 63-83 years) were investigated. Treadmill-walking was performed at self-selected speed with and without multilayer high-compression bandaging (Profore™), randomly selected. The median pressures of the bandages, measured by a Kikuhime® pressure transducer, were 38-42 mmHg above the lateral malleolus and 19-21 mmHg at the proximal end. The primary outcome variables were ankle range of motion measured by a goniometer and oxygen consumption estimated by means of a sub-maximal bicycle-ergometry test. Additionally the subject's opinion was assessed by specific questions.

### Results

The bandages reduced the total ankle range of motion by 4% ( $p < 0,001$ ). No change in oxygen cost of walking was observed. Less than half the subjects reported that walking-shoe comfort or walking distance was negatively affected.

### Conclusion

Ankle range of motion decreased with compression, which could probably be counteracted with a regular exercise programme. There were no indications that walking with compression was more exhausting than walking without. Appropriate walking shoes could secure gait efficiency when using compression garments.

### Comment

The data in this study were obtained from healthy volunteers. In leg ulcer patients in whom restricted joint mobility is an important risk factor for delayed healing, a further restriction of ankle mobility due to bulky «multilayer» bandages is a considerable problem. Modern two-layer compression systems are likely associated with less restriction of ankle mobility.

Unal C, Gercek H

---

## Use of custom-made stockings to control postoperative leg and foot edema following free tissue transfer and external fixation of fractures

*J Foot Ankle Surg. 2012 Mar-Apr;51(2):246-8*

### Background

Patients with lower extremity trauma treated with free tissue transfer and external fixation of fractures almost always have postoperative oedema of the foot and leg. This is mainly due to postoperative reactive hyperaemia and inflammation and may lead to a painful and protracted healing course. Although compressive elastic stockings have been advised to be worn by patients with venous or lymphatic insufficiency, no such stocking has been described for postoperative use by patients with external fixators.

### Aim

of the present report was to describe a custom-made elastic compression stocking for patients who have undergone soft tissue reconstruction and fracture fixation with external fixators.

### Methods

Five patients with open fractures who had free tissue transfer, arterial end to end or end to side anastomoses and external fixators received custom made compression stockings 2 weeks after surgery in the mobilisation phase, before the external fixator was removed. To «fit» the external fixator in the compression stocking, an incision over the stocking was designed, which was closed after donning by Velcro-strips. The patients

continued to wear the stockings until the external fixators were removed and were followed up for an average of 10 months.

### Results

One week after stocking application there was no more difference of the circumferences between injured and healthy leg.

### Conclusion

Custom-made stockings can help to decrease postoperative oedema during the non-ambulatory and non-weight-bearing ambulatory period. They are easy to apply, affordable, and can be tailored from regular compression stockings according to the needs of the patients.

### Comment

Posttraumatic and postsurgical oedema of lower extremities is a very frequent and underestimated event, often associated with a non-diagnosed deep vein thrombosis. A continuation of wearing regular compression stockings (without a slit) for several months would therefore be recommendable to prevent postthrombotic syndrome.

## Compression therapy for preventing recurrence of venous ulcers – Update of Cochrane Database

*Cochrane Database of Systemic Reviews. 8:CD002303, 2012*

### Background

The prevalence of healed or active venous leg ulcers is about 1% in the adult population. The majority of venous ulcers heal with compression bandages or hosiery but the recurrence rate is high. In clinical guidelines the continuous use of compression treatment after ulcer healing is recommended to prevent ulcer recurrence.

### Aim

The aim of this Cochrane Review was to assess the effect of compression in preventing the recurrence of venous ulcers. If compression was found to be preventive the aim was to identify whether there is evidence to recommend particular levels of compression types or brands of compression to prevent ulcer recurrence after healing.

### Methods

In this update randomised controlled trials evaluating compression bandages or hosiery for preventing the recurrence of venous ulcers were searched in the available databases.

### Results

4 trials with 979 participants were eligible for inclusion in the review. In one trial the preventive effect of compression for the recurrence of venous ulcers six months after healing was demonstrated. In one trial no differences in reduction of recurrence after 5 years was found between high compression and moderate compression hosiery. In one study with a 3-year follow-up compression was found to reduce recurrence better than moderate compression. In the first study the compliance with medium compression stockings was found to be better than with high compression stockings. In the second study there was no significant difference. In another study no significant difference in recurrence between two types of medium compression hosiery was found.

### Conclusion

The authors conclude that there is evidence in one trial that compression hosiery reduces the risk of recurrence of venous ulcers compared with no compression. There is insufficient evidence for the selection of different types, brands or length of compression hosiery in the literature.

### Comment

Even in this very important issue of prevention of recurrence of venous ulcers only four prospective randomised studies could be included in this Cochrane Review. In only one of these studies compression was compared to no compression and found a significant lower recurrence rate in the compression group. As there is no significant evidence on the level of compression which is necessary to prevent venous ulcers no specific compression class can be recommended. It seems to be most important to choose the compression with the best compliance of the patient.

## Fax registration

Please send me your Compression Bulletin regularly, free of charge

NAME
FIRST NAME
SPECIALTY
INSTITUTION
STREET
TOWN/ZIP
COUNTRY
FAX NO.
E-MAIL ADDRESS

**Fax +41 71 274 29 27**

**SIGVARIS AG**  
CH-9014 St.Gallen  
Tel. +41 71 272 40 00

**SIGVARIS SA**  
F-68330 Huningue  
Tel. +33 389 70 2400  
F-42176 St-Just-St-Rambert  
Tel. +33 477 36 08 90

