

# Compression Bulletin 26

# SIGVARIS

In this issue:

## **Chronic venous disease progression and modification of predisposing factors**

Non-compliance in wearing MCS increases the risk of progression of chronic venous disease

## **Compression stockings after endovenous laser ablation of the great saphenous vein: a prospective randomized controlled trial**

Wearing MCS after endovenous GSV ablation reduces pain and improves physical function in the first week after the procedure

## **Compression stockings have a synergistic effect with walking in the late afternoon to reduce edema of the lower limbs**

This quantitative, cross-over randomized study was performed with water displacement volumetry

## **Development of combined two-piece elastic stockings**

Combined two-piece MCS are easier to don and doff

## **Effectiveness of intermittent pneumatic compression in reduction of risk of deep vein thrombosis in patients who have had a stroke (CLOTS 3): a multicenter randomized controlled trial**

IPC is an effective method to reduce the risk of DVT in stroke patients

## **Compression stockings significantly improve hemodynamic performance in post-thrombotic syndrome irrespective of class or length**

MCS improve venous filling index, venous volume, and time to fill

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### **SIGVARIS AG**

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

### **SIGVARIS SA**

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

## Chronic venous disease progression and modification of predisposing factors

*J Vasc Surg* 2010; 51:900-7.

### Aim

The aim of this study was to evaluate long-term characteristics of chronic venous disease (CVD) progression and its correlation with the modification of specific risk factors.

### Methods

In this prospective follow-up study, the contralateral limb of 73 patients (95% women; mean age, 48 +/- 12 years) undergoing varicose vein surgery was prospectively evaluated using physical and color duplex examination and was classified by CEAP. After 5 years of follow-up, the development of new sites of reflux in the contralateral, preoperatively asymptomatic limbs was assessed. In addition, the influence of predisposing factors including prolonged orthostasis, obesity, oestrogen therapy (ET), multiparity, and elastic stockings use (ESU) were assessed.

### Results

48 new sites of reflux (37 in the superficial system; 5 perforators; 6 deep veins) occurred in 38 limbs (52%). CEAP scores significantly deteriorated: clinical, 2.2 +/- 0.5 from 0.1 +/- 0.03 ( $P < .01$ ); anatomic, 3.8 +/- 1.2 from 2.6 +/- 2.5 ( $P < .05$ ); disability, 1.9 +/- 0.7 from 0 ( $P < .01$ ); and severity, 7.9 +/- 2.4 from 2.7 +/- 2.2 ( $P < .01$ ). Patient compliance to predisposing factor modification was low; no change was observed during follow-up (orthostatism,  $P = .9$ ; obesity,  $P = 0.7$ ; ET,  $P = .9$ ; multiparity,  $P = .4$ ; ESU,  $P = .3$ ). CVD progression was significantly lower in patients who controlled orthostatism vs those who maintained orthostatism or initiated it ( $P < .001$ ) and in patients who controlled preoperative obesity vs. those who became obese or maintained obesity ( $P < .001$ ). Patients non-compliant to ESU had a significantly higher incidence of CVD progression vs. those who started ESU or continued during the study ( $P < .001$ ). By binary logistic regression analysis, orthostatism ( $P = .002$ ), obesity ( $P = .009$ ), and non-ESU ( $P = .037$ ) were independent predictive factors for CVD progression, whereas multiparity ( $P = .174$ ) and ET ( $P = .429$ ) were not.

### Conclusion

The authors showed that in about half of patients with unilateral varicosities, CVD developed in the contralateral initially asymptomatic limb in 5 years. CVD progression consisted of reflux development and clinical deterioration of the affected limbs. Obesity, orthostatism, and non-compliance with ESU were independent risk factors for CVD progression.

### Comment

Varicose veins are a chronic progressive disease if untreated. Obesity and orthostatism are risk factors for progression. Non-compliance with compression treatment also increases the risk of progression. However, this is not a prospective randomized interventional study. The question if wearing compression stockings can lower the progression risk should be studied in future RCTs.

Bakker NA, Schieven LW, Bruins RM, van den Berg M, Hissink RJ

## Compression stockings after endovenous laser ablation of the great saphenous vein: a prospective randomized controlled trial

*Eur J Vasc Endovasc Surg* 2013; doi: 10.1016/j.ejvs.2013.08.001. [Epub ahead of print]

### Aim

The aim of this study was to determine if the duration of wearing compression stockings after endovenous laser ablation (EVLA) of the great saphenous vein (GSV) has influence on pain and quality of life.

### Methods

In this prospective randomized controlled trial, 109 consecutive patients with EVLA of the GSV without additional phlebectomies between Dec 2008 and Sept 2012 were analyzed. Exclusion criteria were deep vein insufficiency, ulceration, more than one insufficient vein in one leg, and use of anticoagulants. The patients were randomized either to group A (n = 37) using compression stockings for 48 hours after therapy or group B (n = 32) using compression stockings for 7 days. Pain (visual analogue scale [VAS]) and quality of life (SF-36) were analyzed 48 hours, 1 week, and 6 weeks after therapy. Occlusion rates were assessed by duplex ultrasound three months after treatment.

### Results

Both groups were comparable at baseline. After 1 week, there was a significant difference in pain (VAS score 3.7 [±2.1] vs. 2.0 [±1.1],  $p \leq .001$ ), and physical dysfunction (group A, 85.1 [±11.2] vs. group B, 95.7 [±10.1];  $p < .001$ ) as well as vitality (group A, 75 [±13.0] vs. group B, 83.7 [±13.4];  $p = .03$ ) in favor of group B. After 6 weeks, no significant differences in all endpoints were present. Duplex ultrasound imaging revealed complete GSV occlusion in all patients. No deep venous thrombosis was detected.

### Conclusion

The authors conclude that wearing compression stockings for longer than 2 days after endovenous GSV ablation without additional phlebectomies leads to reduced pain and improved physical function during the first week after treatment.

### Comment

The usefulness of compression after GSV treatment has recently provoked a lot of controversy. This study demonstrates short-term benefits of compression after EVLA of the GSV for postoperative pain and dysfunction.

Emilia Quilici Belczak C, Pereira De Godoy JM, Quilici Belczak S, Andreia De Moraes Silva M, Caffaro RA

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## Compression stockings have a synergistic effect with walking in the late afternoon to reduce edema of the lower limbs

*Int Angiology 2012; 31:490-3.*

### **Aim**

The aim of this study was to evaluate whether compression stockings and walking for a short period of time in the late afternoon reduces leg edema in patients with venous disease.

### **Methods**

In this quantitative cross-over randomized (in order of arrival at the clinic) study, sixteen patients (32 limbs) with venous disease were included. Lower leg volume was measured by water displacement volumetry before and after walking on a treadmill for 30 minutes with or without medical compression stockings (SIGVARIS made-to-measure stockings with 20-30 mmHg compression). Legs were assessed using the CEAP classification and divided into groups. Analysis of variance was used for statistical analysis with an alpha error of 5% being considered acceptable.

### **Results**

Wearing compression stockings while walking showed a significant higher leg volume reduction compared to walking without compression. When the CEAP classification was evaluated, it was noted that there was a statistically significant difference for the CEAP C0, C1, and C2 categories of legs using stockings compared to those that did not use.

### **Conclusion**

The authors conclude that compression stockings have a synergistic effect with walking in the late afternoon in reducing edema of the lower limbs in patients with venous disease.

### **Comment**

Although the results are limited by the small number of participants in the different C-stages (CEAP), this study demonstrates the synergy of walking and compression in the treatment of venous diseases. For optimum effects, compression needs the activation of the calf muscle pump.

Hirai M, Iwata H, Miyazaki K, Koyama A, Nakamura H

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## Development of combined two-piece elastic stockings

*Phlebology* 2013 Jun; 28(4):201-8.

### **Aim**

The aim of this study was to investigate the acceptability of newly developed combined two-piece elastic stockings, which are divided into two parts at the ankle.

### **Methods**

Elastic stockings consisting of two parts were developed: a proximal part reaching between point B and D and a foot part over the heel which covers point B and ends at B1. By superposition of the distal stocking exerting a pressure of 10 mmHg over the proximal stocking, which produces a pressure of 30 mmHg, a total pressure of 40 mmHg is obtained at B. In a modified version, a stirrup is added to the proximal leg part to prevent dislocation during walking.

The difficulty in putting on and taking off stockings, discomfort during daily activities and stocking shifts were compared between conventional and modified two-piece stockings in 30 healthy volunteers and 14 patients with lymphedema by applying both stockings alternately.

### **Results**

The two-piece elastic stockings were much easier to don and doff. However, after daily activities lymphedema patients complained about problems in the ankle area, like wrinkling, pain, and local edema formation which could have been avoided if the foot part was applied first and if the proximal part had a stirrup.

### **Conclusion**

Modified combined two-piece elastic stockings are easier to handle regarding donning and doffing compared with conventional one-piece elastic stockings, and the model with a stirrup can be used safely because of its low-level shift during daily activities.

### **Comment**

Overlapping stockings as described by the authors are also supplied by European producers in various combinations of different pressure ranges. Main indication is the venous leg ulcer situated in the ankle- or gaiter-region, where high compression pressure is desirable.

CLOTS (Clots in Legs Or sTockings after Stroke) Trials Collaboration  
Dennis M, Sandercock P, Reid J, Graham C, Forbes J, Murray G

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## Effectiveness of intermittent pneumatic compression in reduction of risk of deep vein thrombosis in patients who have had a stroke (CLOTS 3): a multicenter randomized controlled trial

*Lancet 2013; 382(9891):516-24.*

### Aim

Venous thromboembolism is a common cause of death and morbidity in in-hospital patients with stroke. The aim of this study was to assess the effectiveness of intermittent pneumatic compression (IPC) to reduce the risk of DVT in patients who have had a stroke.

### Methods

In this multicenter parallel group randomized trial, immobile patients with acute stroke were included. Patients from day 0 to day 3 of admission were allocated via a central randomization system (ratio 1:1) to receive either IPC or no IPC. Compression duplex ultrasound (CDU) of both legs at 7-10 days and, if applicable, at 25-30 days after enrolment was performed. Patients were followed up for 6 months to determine survival and later symptomatic venous thromboembolism. The primary outcome was DVT in the proximal veins detected by CDU or any confirmed symptomatic DVT in the proximal veins, within 30 days of randomization.

### Results

2876 patients were enrolled in 94 centers in the UK between Dec 2008 and Sept 2012. The median age was 76 years (IQR 67-84). The primary outcome occurred in 122 (8.5%) of 1438 patients allocated IPC and 174 (12.1%) of 1438 patients allocated no IPC. The absolute risk reduction was 3.6% (95% CI 1.4-5.8). Excluding the 323 patients who died before any primary outcome and 41 without any screening CDU, the adjusted OR for the comparison of 122 of 1267 patients vs. 174 of 1245 patients was 0.65 (95% CI 0.51-0.84;  $p = 0.001$ ). Deaths within the 30 days of the treatment period occurred in 156 (11%) patients allocated IPC and in 189 (13%) patients allocated no IPC ( $p = 0.057$ ); skin breaks on the legs were reported in 44 (3%) patients allocated IPC and in 20 (1%) patients allocated no IPC ( $p = 0.002$ ); falls with injury were reported in 33 (2%) patients in the IPC group and in 24 (2%) patients in the no IPC group ( $p = 0.221$ ).

### Conclusion

The authors conclude that IPC is an effective method to reduce the risk of DVT and to possibly improve survival in immobile patients after stroke.

### Comment

In the CLOTS1 trial, no beneficial effect of thromboprophylactic stockings had been shown to prevent DVT in stroke patients. In this study, a significant benefit could be demonstrated for IPC. This will have influence on future guidelines concerning DVT prophylaxis in stroke patients.

## Compression stockings significantly improve hemodynamic performance in post-thrombotic syndrome irrespective of class or length

*J Vasc Surg* 2013 Jul; 58(1):158-65.

### Aim

The aim of this study was to examine which strength/or length of compression stockings is the most effective in reducing venous reflux in patients with post-thrombotic syndrome and to determine the patient's preference.

### Methods

Thirty-four consecutive patients (40 legs, 34 male) with post-thrombotic syndrome were tested with four different stockings (class I (18-21 mmHg) and class II (23-32 mmHg), below-knee and above-knee thigh-length). The majority of patients had CEAP classes of > C4, the Villalta scale ranged between 2-22, median value was 10. Obstruction and reflux was observed on duplex in 47.5% legs, with deep venous reflux alone in 45%. Air plethysmography (APG) was used to measure the venous filling index (VFI), venous volume, and time to fill 90% of the venous volume. Stocking pressure was measured 5 cm above and 2 cm posterior to the medial malleolus. At the end of the study session, patients stated their preferred stocking based on comfort.

### Results

Additional superficial reflux was present in 32% of patients with deep reflux and obstruction and in 50% of patients with deep reflux alone. The VFI, venous volume, and time to fill 90% of the venous volume improved with all types of stocking versus no compression. Higher compression classes achieved a stronger reduction of venous volume with thigh-length stockings but not with below-knee stockings. There was a significant but weak correlation (Spearman) between stocking interface pressure measured directly with the Pico Press and the VFI improvement. Greater reflux at baseline resulted in a higher degree of reflux reduction. Twenty-one patients (legs) changed their preference of compression and 38% of these (8/21 patients, 9/21 legs) preferred an above-knee stocking.

### Conclusion

Compression stockings significantly improved reflux-parameters measured by air plethysmography. However, the hemodynamic benefit did not significantly change with the class or length of stocking. These results support the liberal selection of a GEC stocking based on patient preference.

### Comment

There is a considerable statistical spread of all quantitative data given, both for the APG results and for the pressures measured under the individual stockings. However, the study shows that there is a weak correlation between compression pressure and reduction of venous reflux and that more severe cases benefit more from stronger stockings. A stronger correlation could likely have been achieved if the stocking pressure would have been measured at the same site where the APG parameters were assessed. Another important parameter characterizing the hemodynamic effect of compression is the ejection fraction of the venous calf pump which was not measured.

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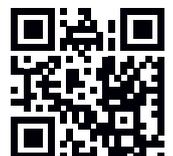
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