

COMPRESSION BULLETIN

Robert Stemmer Library on Compression Therapy

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- **Interface pressure and stiffness of ready made compression stockings: Comparison of in vivo and in vitro measurements**
Twelve legs from healthy volunteers were fitted with ready-made calf-length compression stockings of the European classes I, II and III.

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
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The Library is regularly updated with new publications; a selection is presented in the Compression Bulletin.

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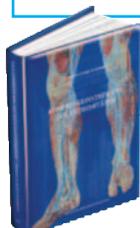
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**Special edition:
DGP 2007**



Kern Ph, Ramelet AA, Wütschert R, Hayoz D

Compression after sclerotherapy for telangiectasias and reticular veins: A randomized controlled study

BACKGROUND

The use of compression following sclerotherapy for telangiectasias varies much between different countries. In France and Italy postsclerotherapy compression in these patients is used only rarely whereas in Germany and Switzerland it is the rule. Only few published data exist concerning this topic. In addition it is suspected that compliance for compression after sclerotherapy might be low.

AIM

To perform a prospective randomized open-label trial to determine the relative efficacy of three weeks compression stockings 23 to 32 mmHg following sclerotherapy treatment of telangiectasias and reticular veins of the thigh.

METHODS

100 women presenting with telangiectasias and reticular veins on the lateral aspect of the thigh (C_{1A} or $sEPAS_{1PN}$) were randomly assigned to either wear thigh-long MCS providing 23-32 mmHg at the ankle (Sigvaris 702 Top Fine®, Switzerland) daily for 3 weeks or to no compression. Liquid sclerotherapy was performed during a single session with 60 to 100 injections and maximum of 10 ml of chromated glycerin. Outcome was assessed a) by patients' satisfaction analysis and b) by quantitative evaluation of photographs taken before and again at fifty-two days on the average after sclerotherapy by two blinded expert reviewers. In addition patients completed a Quality of Life questionnaire (SF36) before treatment and again at the control.

RESULTS

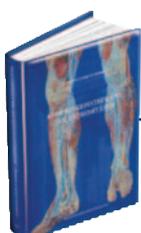
Data were analysed from 96 of 100 randomized patients. Patients' satisfaction was similar in both groups. The objective rating of vessel disappearance was significantly better with compression ($p = 0.026$) (figure 1). The inter-observer agreement was excellent (intraclass correlation coefficient = 0.93). Compression was well tolerated with a very low rate of discomfort claims. (17.5% discomfort). Microthrombi were less prevalent in the compression group (10% versus 15.2%). The incidence of pigmentation and matting was very low with no significant difference but a slightly better result in favour of the compression group. Compression treatment did not influence quality of life.

CONCLUSION

Wearing compression stockings (23-32 mmHg) for three weeks enhances the efficacy of sclerotherapy of leg telangiectasias by improving clinical vessel disappearance.

COMMENT

In recent studies, although with a small number of patients, it could be demonstrated that postsclerotherapy compression enhances effectivity of sclerotherapy and reduces side effects like pigmentation and matting. This is the first study showing these effects in a sufficient number of randomized patients. In addition it shows that compression does not interfere with quality of life in these patients.



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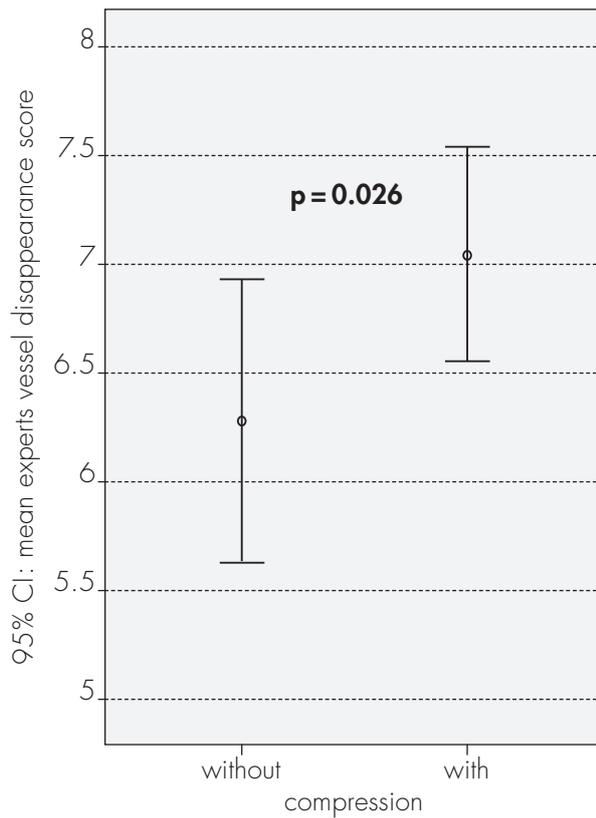
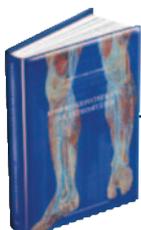


Fig. 1: Objective assessment by two independent blinded experts using a visual „a priori” score of vessel disappearance showed a significant better result for the patients wearing compression.

J Vasc Surg 2007; 45: 1212-1216

RCT, randomized prospective clinical trial, Chapter 10, Lan: Eng, Lit: 12/1, Sum: Eng



Nelson EA, Harper DR, Prescott RJ, Gibson B, Brown D, Ruckley CV.

Prevention of recurrence of venous ulceration: randomized controlled trial of class 2 and class 3 elastic compression.

AIM

To compare recurrence and compliance of two strengths of compression stockings in patients with healed venous ulcers.

METHODS

300 patients with recently healed venous ulcers were supplied with class 2 or class 3 knee or thigh length compression hosiery. After every 4 months refitting by specialized nurses was performed. The main outcomes were recurrence of venous ulcers and compliance during a follow-up period of 5 years.

RESULTS

107/300 patients (36%) had recurrent ulcers by 5 years, 59/151 (39%) in the group of class 2 stockings and 48/149 (32%) in class 3. Based on a Kaplan-Meier analysis the difference was not statistically significant, but the estimate of the effectiveness of class 3 hosiery was obviously diluted by the lower compliance rate in the class 3 group. In total 106 patients did not comply with their hosiery, 63 (42%) in class 3 and 43 (28%) in class 2. A higher risk of recurrence was associated with restricted ankle movement, with the history of four or more previous ulcers, restricted ankle movement and reduced ankle brachial pressure index.

CONCLUSION

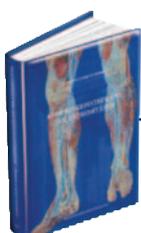
In order to minimize recurrence of venous leg ulcers patients should wear the highest level of compression that is comfortable.

COMMENT

This is an important randomized controlled trial of a large population with healed venous ulcers demonstrating a high rate of recurrence (36%) with purely conservative compression therapy despite a high degree of surveillance. For the daily practice additional attempts to abolish venous refluxes but also ways to increase the compliance of wearing the prescribed stockings should always be considered in order to diminish recurrence.

The indicated UK-class 2 („moderate“) corresponds to a pressure in the ankle region of 18-24 mmHg, UK-class 3 („strong“) to a pressure of 25-35 mmHg. For comparison: in the German classification class II is between 23-32 mmHg („medium“), class III between 34 and 46 mmHg („strong“).

J Vasc Surg 2006; 44: 803-8



Giannoukas AD, Labropoulos N, Michaels JA.

Compression with and without early ambulation in the prevention of post-thrombotic syndrome: a systematic review.

AIM

To evaluate the published work regarding the question if compression with or without early ambulation after proximal deep vein thrombosis (DVT) reduces the risk of post-thrombotic syndrome (PTS).

METHODS

Systematic review based on electronic and hand searching of the relevant literature.

RESULTS

From four randomized trials all but one showed a significant risk reduction of PTS using compression. Pooled analysis revealed that PTS developed in 61/254 (24%) in the compression group compared to 110/239 (46%) in the control group ($p = 0.0001$). This corresponds to a 48% risk reduction from the use of compression. In one trial the combination of immediate ambulation with compression in the acute stage of DVT produced a faster reduction of swelling and pain without an increased risk of pulmonary embolism compared to the control group. There was no difference in recurrent thromboembolic events between the compression and the control group.

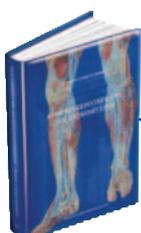
CONCLUSION

Compression with and without early ambulation appears to be safe and is more often associated with a decreased rate of PTS.

COMMENT

A meaningful comparison of the data is difficult due to different protocols especially concerning the timing of starting with ambulation and compression. All four trials included into this meta-analysis have been reported in previous issues of the Compression Bulletin (Brandjes et al. 1997, Ginsberg et al. 2001, Prandoni et al. 2004, Partsch et al. 2004). Based on the reported data the prescription of medical compression stockings after DVT is highly recommended.

Eur J Vasc Endovasc Surg 2006; 32: 217-21



Rastel D, Perrin M, Guidicelli H

Compression therapy after varicose vein surgery: results of a French national inquiry

(Résultats d'une enquête sur les techniques compressives et
contensives utilisées dans le traitement chirurgical des varices)

AIM

To estimate the frequency and duration of use as well as to identify the surgeon's rationale for prescribing postoperative compression.

METHODS

A survey on postoperative compression after varicose vein surgery was undertaken in 2001 among surgeons of the French speaking Vascular Surgery Society as well as non-members with a heavy caseload in varicose vein surgery. A questionnaire with 11 items for postoperative treatment and a patient form was sent to 675 surgeons.

RESULTS

The response rate was 41.5% (280 surgeons). Compression was widely used by 97.1% of the surgeons. It was the only postoperative treatment for 25.2% of the surgeons, was associated with anticoagulant treatment for 38.8% or non-steroidal anti-inflammatory drugs for 11.2%. Prescription was evidence based for only 11.6%. Compression therapy was mainly started postoperatively (93.2%). Elastic bandages (long stretch) were used by 87%. Duration of bandage therapy was variable (less than 8 days 38.8%, 8-15 days 24.5%). After bandage therapy, medical compression stockings (above knee 74.7%) or French class II (77.9%) were used. Compression stockings were prescribed for 8-15 days or 15-30 days by 12.7% and 84.6% of the surgeons respectively. Prolonged postoperative treatment was only prescribed by 28%, mostly for patients with trophic changes.

COMMENT

These results reflect the evidence based situation in literature in this question. Although there is some evidence that postoperative compression might be able to reduce haematoma, swelling and pain, studies have demonstrated no different results for different duration of compression. It seems however evident that patients with trophic changes or even ulcers due to CVI would have a benefit of long term compression also if varicose veins have been removed.

J Mal Vasc 2004; 29: 27-34

National inquiry, Chapter 10, Lang: Fr, Lit: 25/2, Sum: Eng, Fr



Benigni JP, Uhl JF, Cornu-Thénard A, Blin E

Compression bandages, influence of techniques of use on their clinical efficacy and tolerance

(Bandages de compression, influence des techniques de pose sur leur efficacité et leur tolérance)

AIM

To evaluate interface pressures and stiffness of different bandage systems with medium stretch bandages. To vary the technique of bandage in order to provide the lowest possible resting pressure and the highest possible working pressure.

METHODS

The interface pressures under bandage systems with a Biflex 16 bandage of 7 m × 8 cm and with a Biflex 17 bandage of 5 m × 8 cm were measured with the Kikuhime device. Five different techniques were used to make a bandage system. Two techniques with an overlap of 50% and 75% and a stretch of 30%. Two techniques with a superimposition of 2 bandages used in the same condition. One technique using turns of 8 or spike formation.

RESULTS

The resulting pressures are depending of the used technique and finally the number of layers at the measuring point. With two bandages superimposed and an overlap of 75% resting and working pressures can be higher than 100 mmHg. In the conclusions of the authors a good result with a low resting pressure of 23 mmHg and a high working pressure of 48 mmHg was obtained with a Biflex 16 bandage and the spike technique. These pressures allow a sufficient clinical effect and a maximum of safety even during bedrest or with slightly reduced ABI.

COMMENT

This study clearly shows that the interface pressure below a bandage system does not only depend on the construction of the single bandage used but also on the way how the bandage system is applied and combined. The more overlap and the more layers are used the higher resting and working pressure are rising. The question which pressure is necessary to treat different venous diseases has to be answered in clinical outcome studies with sufficient information of the bandage system.

Phlébologie 2007; 60: 85-92

Experimental Study, Chapter 8, Lang: Fr, Lit: 7/0, Sum: Eng, Fr



Partsch H, Partsch B, Braun W.

Interface pressure and stiffness of ready made compression stockings: Comparison of in vivo and in vitro measurements

AIM

To compare pressure and stiffness of ready-made medical compression stockings of different classes, measured on the leg and by laboratory testing.

METHODS

Twelve legs from healthy volunteers were fitted with ready-made calf-length compression stockings of the European classes I, II and III. (Pressures at the ankle given by the producer for this „position B“: 18-21 mmHg, 23-32 mmHg and 34-46 mmHg). In addition, two class I stockings were applied over each other. The in vivo interface pressure was measured using the medical stocking tester (MST) in position B1, 10 to 15 cm proximal to the inner ankle. Stiffness was defined by an increase of pressure due to an increase of stretch that reflects the elastic property of the textile and was assessed by measuring the difference of interface pressure between supine and standing position at B1. In the laboratory, the MST was used to check the pressure of these stockings on wooden leg models. Then circular slices were cut out from the stockings at the B1 level and stretched by a Zwick dynamometer in the transverse direction.

Force/extension-curves were plotted, from which the pressure and stiffness of each individual stocking was calculated.

RESULTS

The pressure profile measured on four positions along the leg by MST showed a degressive gradient on the wooden model but not on the human leg due to the

measuring geometry in the ankle region. Pressure values on the leg correspond to the in vitro measurements calculated from the force/extension-curve with a bias (difference of the means) of -2.1 and 4.1 mmHg. In 95% of the subjects, the difference was between -10.1 and 5.8 mmHg (Bland Altman plot).

The correlation between in vivo and in vitro measurement was highly significant ($P < 0.0001$, Spearman correlation coefficient; $r = 0.8161$). In vivo and in vitro measurement shows an increase of stiffness with increasing compression classes. Two class I stockings applied over each other revealed stiffness values that were even higher than those of class III stockings.

CONCLUSION

Pressure and stiffness can be measured in vivo, correlate well with the laboratory findings declared by the producer, and should be used in future studies, especially when different compression devices are to be compared.

COMMENT

The pressure measured in vivo at the ankle (position B) is frequently lower than that in position B1. This can be explained by the law of Laplace stating that the pressure is inversely proportional to the local radius. The curvature of the leg behind the inner ankle is mostly flat or even concave, so that the position B which is the traditional reference point for the stocking producers can not be recommended for in vivo measurements. For the clinician it is reassuring to know that the pressure ranges given by the producers of high quality stockings obviously correspond to the pressure values that are exerted on the skin.

J Vasc Surg 2006; 44:809-14



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