

COMPRESSION BULLETIN

Robert Stemmer Library on Compression Therapy

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- **Medical compression: effects on pulsatile leg blood flow**
In 14 healthy subjects, bilateral pulsatile blood flow was measured at five below-knee sites without compression in the lying position without and during compression of one leg to an average malleolar sub-bandage pressure of 40.7+/-4.0 mmHg.
- **Compression therapy in mixed ulcers increases venous output and arterial perfusion**
In 25 patients with mixed-aetiology leg ulcers inelastic bandages were applied with pressures from 20 to 30, 31 to 40, and 41 to 50 mmHg and the following measurements were performed before and after bandage application to ensure patient safety throughout the investigation: laser Doppler fluxmetry (LDF) close to the ulcer under the bandage and at the great toe, transcutaneous oxygen pressure (TcPO₂) on the dorsum of the foot, and toe pressure.

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:
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COMPRESSION BULLETIN 22

CLOTS (Clots in Legs Or sTockings after Stroke) Trial Collaboration

Thigh-length versus below-knee stockings for deep venous thrombosis prophylaxis after stroke: a randomized trial

BACKGROUND

Thromboprophylactic compression stockings are widely used for deep venous thrombosis (DVT) prophylaxis. Although below-knee stockings are used more often than thigh-length stockings, no reliable evidence indicates that they are as effective as thigh-length stockings.

OBJECTIVE

To compare the effectiveness of thigh-length stockings with that of below-knee stockings for preventing proximal DVT in immobile, hospitalized patients with stroke.

METHODS

Parallel-group trial with centralized randomization (minimization within centers) to ensure allocation concealment. The ultrasonographers who looked for DVT were blinded, but the patients and caregivers were not. Multicenter study in 112 hospitals in 9 countries. 3114 immobile patients hospitalized with acute stroke were included between January 2002 and May 2009. 1552 patients received thigh-length stockings and 1562 patients received below-knee stockings to wear while they were in the hospital. Ultrasonographers performed compression duplex ultrasonography in 1406 patients (96% of survivors) in each treatment group between 7 and 10 days after enrollment. They performed a second scan in 643 patients in the thigh-length stockings group and 639 in the below-knee stockings group at about 25 to 30 days. The primary outcome was symptomatic or asymptomatic DVT in the popliteal or femoral veins, detected on either scan.

RESULTS

Patients were retained in their assigned group for all analyses. The primary outcome occurred in 98 patients (6.3%) who received thigh-length stockings and 138 (8.8%) who received below-knee stockings (absolute difference, 2.5 percentage points [95% CI, 0.7 to 4.4 percentage points]; $P = 0.008$), an odds reduction of 31% (CI, 9% to 47%). Seventy-five percent of patients in both groups wore the stockings for 30 days or until they were discharged, died, or regained mobility. Skin breaks occurred in 61 patients who received thigh-length stockings (3.9%) and 45 (2.9%) who received below-knee stockings.

CONCLUSION

Proximal DVT occurs more often in patients with stroke who wear below-knee stockings than in those who wear thigh-length stockings. Limits of the study are incomplete blinding, two scans were not obtained for all enrolled patients and that the trial was stopped before the target accrual was reached.

COMMENT

In an earlier trial of the same group (Clots Trial I) the effectiveness of thigh-length thromboprophylactic stockings was compared with no stockings in the same population (1). In this study the DVT incidence with compression was 10,0 % compared to 10,5 % with no compression. Skin injury occurred more often in the compression group. The conclusion of the authors, which had also influence on current discussions and recommendations, was that thromboprophylactic stockings are not useful in stroke patients. It is interesting to see that the recent study, aside of methodological limits, shows a superiority of thigh-length over knee-length stockings for DVT prophylaxis in the same indication. It may be true that immobile stroke patients are not the best responders to compression in DVT prophylaxis as the muscle pump is inactive. These divergent results show also that important consequences should not be drawn quickly from a single study without controlling the results in further investigations. At least such results cannot be copied to other indication groups like post surgical patients. Recent MRI studies were able to demonstrate that even very low pressure (6 mmHg) exerted by a TPS stocking at thigh level is able to narrow deep veins in the lying position. This diameter reduction leads to an increase of venous blood flow velocity which may be the explanation for a thromboprophylactic effect of thigh-length stockings.

Ann Int Med 2010; 153: 553–62

1. The Lancet 2009; 373: 1958 – 1965 Effectiveness of thigh-length graduated compression stockings to reduce the risk of deep vein thrombosis after stroke (CLOTS trial 1): a multicentre, randomised controlled trial The CLOTS Trials Collaboration



COMPRESSION BULLETIN 22

Schul MW, Eaton T, Erdman B

Compression versus sclerotherapy for patients with isolated refluxing reticular veins and telangiectasia: a randomized trial comparing quality-of-life outcomes

OBJECTIVE

Prospective study of quality-of-life (QoL) benefits comparing compression stockings to sclerotherapy in subjects with symptomatic reticular veins and telangiectases.

METHODS

58 consecutive female patients with normal saphenous and deep venous systems and venous dysfunction score (VDS) ≥ 4 were randomized to either sclerotherapy (N = 29) or thigh high 20-30 mmHg compression stockings (N = 29). After finishing the compression arm, subjects in the compression arm were eligible to crossover to the sclerotherapy arm. Patient-reported QoL data were acquired using a modified Aberdeen Varicose Vein Questionnaire at five time spots, initially (T0), following compression trial (T1), after reticular vein sclerotherapy (T2), approximately three months after sclerotherapy for telangiectases (T3) and after 12 months (T4).

RESULTS

For patients in the compression arm, four key symptoms including aching, pain, leg cramps and restlessness were significantly reduced, while patients in the sclerotherapy arm of treatment reported broad symptom relief in all key symptoms assessed.

CONCLUSION

Isolated refluxing reticular veins and telangiectases may cause QoL impairment in selected patients and represent more than a cosmetic concern. Compression therapy offers relief of aching, pain, leg cramping and restlessness in patients with isolated refluxing reticular veins and telangiectases. Sclerotherapy of reticular veins offers a statistically superior broad spectrum relief of symptoms, while additional sclerotherapy of residual telangiectases in this cohort demonstrated additive relief of aching and pain. Symptom assessments at 12 months suggest ongoing symptom relief following sclerotherapy.

COMMENT

This study demonstrates that reticular veins and telangiectases may present with venous symptoms. Compression is able to reduce symptoms like pain, cramps and restless legs. The fact that the elimination of the pathologic veins further improves symptoms may be a hint that these symptoms are really of venous origin. The pathophysiological background is not well understood as no ambulatory venous hypertension may be present in this group. Possibly mediators of inflammation play a role in these patients. These results should be validated in further studies.

Phlebology 2011; 26: 148–56



Lamprou DA, Damstra RJ, Partsch H

Prospective, randomized, controlled trial comparing a new two-component compression system with inelastic multicomponent compression bandages in the treatment of leg lymphedema

BACKGROUND

Conventional multicomponent lymphatic compression bandages are bulky and may sometimes even inhibit joint mobility.

AIM

To compare the effectiveness of a two-component compression (2CC) system in the treatment of leg lymphedema with that of traditional inelastic multicomponent compression bandages (IMC).

METHODS

Thirty hospitalized patients with moderate to severe unilateral lymphedema (stage II-III) of the leg were included. Patients were divided in two groups; one (n=15) received a 2CC, and the other (n=15) received IMC. Primary outcome was volume reduction of the affected leg, measured by water-displacement volumetry; secondary outcome was loss of interface pressure measured by Picopress instrument®.

RESULTS

Median leg volumes before bandaging were 4,150 ml (2CC) and 4,360 ml (IMC). Median volume reduction was more pronounced with 2CC than with IMC (120 ml (2.9%) with the 2CC system and 80 ml (1.8%) with IMC after 2 hours ($p>.05$)). After 24 hours, volume reduction was 8.4% and 4.4% respectively ($p>.05$). Interface pressure dropped significantly within 2 hours of bandage application in both groups.

CONCLUSION

The two-component compression system is a suitable alternative to IMC in the conventional treatment of moderate to severe lymphedema.

COMMENT

The more pronounced edema reduction achieved by the two-component system in spite of comparable resting pressures of the two bandage systems may be explained by the fact that the less bulky new system allowed better mobility. Exercises in combination with compression have a crucial impact on the edema reducing outcome.

Dermatologic Surgery 2011; 37(7): 985-91



te Slaa A, Dolmans DE, Ho GH, Mulder PG, van der Waal JC, de Groot HG, van der Laan L

Prospective randomized controlled trial to analyze the effects of intermittent pneumatic compression on edema following autologous femoropopliteal bypass surgery

BACKGROUND

Postoperative edema of the revascularized leg after femoropopliteal bypass surgery is a common finding.

METHODS

In a prospective randomized trial, 62 patients were assigned to one group receiving compression stocking (CS) above the knee exerting 18 mmHg (class I) on the leg postoperatively (day and night) and a group in which intermittent pneumatic compression (IPC) on the foot was used postoperatively at night for 1 week. For IPC the A-V impulse technology was used building up a pressure of 130 mmHg in 0,4 seconds, with cycles of 20 seconds. All patients suffered from peripheral arterial disease, and all were subjected to autologous femoropopliteal bypass reconstruction. The lower leg circumference was measured preoperatively and at five postoperative time points.

RESULTS

57 patients could be analyzed (CS 28; IPC 29). Indications for operation were severe claudication (CS 13; IPC 13), rest pain (10/5), or tissue loss (7/11). Revascularization was performed with either a supragenicular (CS 13; IPC 10) or an infragenicular (CS 15; IPC 19) autologous bypass. Compared to baseline one day before surgery leg circumference increased postoperatively on day 1 (CS/IPC): 0.4%/2.7%, day 4 (2.1%/6.1%), day 7 (2.5%/7.9%), day 14 (4.7%/7.3%), and day 90 (1.0%/3.3%). On days 1, 4, and 7 there was a significant difference in leg circumference between the two treatment groups.

CONCLUSION

All patients developed edema after femoropopliteal bypass surgery. For the prevention and treatment of that edema the use of a class I CS proved superior to treatment with IPC. The use of CS remains the recommended practice following femoropopliteal bypass surgery.

COMMENT

The frequent problem of post reconstructive edema is thought to be caused by a combination of hyperaemia, increased capillary permeability, lymphatic and venous disruption and an up-regulation of inflammatory mediators due to reperfusion injury. Many surgeons avoid any kind of postoperative compression being afraid of negative consequences especially concerning a reduction of the arterial perfusion. This study shows that 18 mmHg thigh-length compression stockings worn day and night are able to reduce leg swelling effectively especially in the first postoperative week. The negative outcome of the group treated by IPC can be explained by the fact that only feet and not the whole leg were compressed and that treatment lasted only 12 hours during night without any compression during day-time.

World J Surg. 2011 Feb; 35(2): 446–54



COMPRESSION BULLETIN 22

Mayrovitz HN, Macdonald JM

Medical compression: effects on pulsatile leg blood flow

BACKGROUND

Usually it is assumed that external compression will always reduce arterial flow.

AIM

To measure the effect of foot-to-knee, four-layer compression bandaging on below-knee arterial pulsatile blood flow assessed by nuclear magnetic resonance flowmetry.

METHODS

In 14 healthy subjects, bilateral pulsatile blood flow was measured at five below-knee sites without compression in the lying position without and during compression of one leg to an average malleolar sub-bandage pressure of 40.7±/−4.0 mmHg.

RESULTS

The forefoot-to-knee compression bandaging caused a highly significant ($P<0.001$) increase in the bandaged leg pulsatile blood flow due to increases in both peak flow and pulse width.

It is hypothesized that arteriolar vasodilatation, induced either myogenically by reduced transmural pressure or by vasodilatory substance release triggered by increased venous shear stress and veno-arterial interactions, possibly combined with altered vascular compliance, produce the observed compression-related phenomenon.

CONCLUSION

The finding of a compression-associated pulsatile flow increase suggests an arterial linkage, which may play a role in the well-documented beneficial effects of compression bandaging in venous ulcer and lymphedema treatment. Possible beneficial effects of the arterial flow-pulse increase on venous ulcer outcome may be related to a decrease in leukocyte effects in the distal microvasculature.

COMMENT

These very important findings have been achieved using a sophisticated instrumentation which is not widely available. It would be interesting to repeat such investigations in patients with arterial occlusive disease in whom compression would be desirable because of concomitant edema.

International Angiology 2010; 29(5): 436–41



Mosti G, Iabichella ML, Partsch H

Compression therapy in mixed ulcers increases venous output and arterial perfusion

BACKGROUND

The use of compression therapy in patients with mixed arterial-venous leg ulcers is still a controversial issue.

OBJECTIVES

To define bandage pressures that are safe and effective in treating leg ulcers of mixed arterial-venous aetiology.

METHODS

In 25 patients with mixed-aetiology leg ulcers inelastic bandages were applied with pressures from 20 to 30, 31 to 40, and 41 to 50 mmHg and the following measurements were performed before and after bandage application to ensure patient safety throughout the investigation: laser Doppler fluxmetry (LDF) close to the ulcer under the bandage and at the great toe, transcutaneous oxygen pressure (TcPO₂) on the dorsum of the foot, and toe pressure. To assess efficacy on venous hemodynamics. Ejection fraction (EF) of the venous calf pump was measured.

RESULTS

LDF values under the bandages increased by 33% (95% confidence interval [CI], 17-48; $P < .01$), 28% (95% CI, 12-45; $P < .05$), and 10% (95% CI, -7 to 28), respectively, under the three pressure ranges applied. At toe level, a significant decrease in flux of -20% (95% CI, -48 to 9; $P < .05$) was seen when bandage pressure exceeded 41 mmHg. Toe pressure values and TcPO₂ showed a moderate increase, excluding a restriction to arterial perfusion induced by the bandages. Inelastic bandages were highly efficient in improving venous pumping function, increasing the reduced ejection fraction by 72% (95% CI, 50%-95%; $P < .001$) under pressure of 21 to 30 mmHg and by 103% (95% CI, 70%-128%; $P < .001$) at 31 to 40 mmHg.

CONCLUSION

Inelastic compression of up to 40 mmHg does not impede arterial perfusion in patients with mixed ulceration presenting an ankle-brachial pressure index >0.5 and an absolute ankle pressure of >60 mmHg. The highly reduced venous pumping function may even be normalized. Such bandages are therefore recommended in combination with walking exercises as the basic conservative management for patients with mixed leg ulcers.

COMMENT

Future studies are desirable investigating safety and efficacy of elastic compression stockings in these delicate indication of mixed arterial and venous disease.

J Vasc Surg 2012; 55: 122-28



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