Compression for Lymphedema: proof of efficacy

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DISCLOSURE OF CONFLICTS OF INTEREST

Medi covered my travel and accommodation expenses.
Revised Starling principle: microvascular fluid exchange

- Steady state: slight filtration prevails in most vascular beds
- Lymph transport, not venous capillary reabsorption, is the main process responsible for interstitial fluid balance

J.R. Levick and C.C. Michel. Cardiovascular Research 2010
LYMPHEDEMA

A clinical manifestation of lymphatic system insufficiency and deranged lymph transport

The central disturbance is a low output failure of the lymphatic system, that is, overall lymphatic transport is reduced

(ISL Consensus Document 2013)
PRIMARY LYMPHOEDEMA, STAGE III, IN OBESE PATIENT
LEG LYMPHOEDEMA

- **BANDAGE** (sub-bandage pressure > 45 mm Hg), **GARMENTS**, **Velcro devices**
- **MLD**
- **exercise/movement**
- **skin care**
- **IPC ?**
- **Drugs ?**
Effects of compression therapy in LYMPHOEDEMA

- INCREASE OF INTERSTITIAL PRESSURE! Hence:
- Reduction of capillary filtration
- Shift of fluid into non-compressed parts of the body
- Increase of lymphatic (protein !!) reabsorption and stimulation of lymphatic transport
- Improvement of the VASCULAR-MUSCLE PUMPS
- Breakdown of fibrosclerotic tissue
- Protection of the skin
COMPRESSION TREATMENT

* BANDAGES achieve a result in the intensive phase
* Adj. Velcro Devices

ELASTIC GARMENTS (stockings/sleeves) maintain the results in the chronic phase
ADHESIVE MULTI-LAYER BANDAGE FOR LYMPHOEDEMA
pressure drop in lymphoedema

The “Midland” between hosiery and bandages...

- VELCRO ADJUSTABLE COMPRESSION DEVICES
- Circ-aid / Juxta Fit
Adjustable Velcro Devices
CIRC-AID....

- non-elastic interlocking bands
- sustained and adjustable compression
- patient self-application
Lymphoedema „maintenance phase“

- custom-made flat-knitted compression stockings
- self-compression elastic bandages
- Adjustable Velcro Devices (also in the intensive phase..)
- pumps (at home)?
lymphoedema „maintenance phase“

- Flat knitted stockings
  - No crease
  - Even pressure distribution along the leg
  - Higher stiffness

- Round knitted stockings
  - Crease creating possible strangulations
  - Uneven pressure distribution along the leg
  - Low stiffness
lymphoedema „maintenance phase“

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congenital lymphedema before and after 6 weeks of compression

**Intensive therapy phase**
- inelastic multilayer
- multicomponent bandage

**Maintenance phase**
- Compression stockings
„Optimal“ pressure (highest amount of oedema reduction)

- LOWER LIMB: compression pressure about 40 mm Hg (initial pressure of 60 mm Hg)

- UPPER LIMB: 20-30 better than 40-50 mm Hg;

Some Literature....
Yasuhara et al 1996

• Observational Study

• Compression Stockings over 5 years reduce leg volume in lymphedema patients (especially secondary lymphedema)
Multilayer bandaging followed by compression hosiery was more effective than hosiery alone in reducing lymphoedema of the limb

compression therapy in arm lymphoedema

arm volume measured by water displacement

compression therapy in arm lymphoedema

low pressure (25 mm hg) > effective high pressure (50 mm hg)

Prospective, randomized controlled trial comparing the effect of CircAid® Juxta-Fit™ versus Trico bandages in the treatment of leg lymphedema. published in JVLD

R.J. Damstra, dermatologist
H. Partsch, dermatologist
Dutch Expert Center for Lymphovascular Medicine
Nij Smellinghe Hospital, Drachten (NL)
Aim of the study

• Compare a new compression device (ADJUSTABLE VELCRO DEVICE) for the treatment phase versus a traditional inelastic multicomponent compression:
  – In effectiveness: volume / interface pressure / DSI
  – In patient’s participation / selfmanagement
VELCRO device (juxta fit®) original for maintenance phase used
Volume reduction 0-24 hours

Juxtafit achieves a significantly more effective volume reduction than Trico after 24 hours (p<0.05)
Interface pressure loss B1 T0 – T2 – T24

Juxta loses significantly less pressure than Trico, after 2 h (p<0.001) and 24 h (p<0.05)

% Press loss 2h

% Pressure loss 24h

Juxta fit

T0-T2: md 53 ➔ 41 (22.6%)

T2-T24: md 55 ➔ 42 (23.6%)

Trico

md 67 ➔ 38 (43%): p<0.001

md 65 ➔ 33 (49.2%): p<0.05
Conclusions of trico vs juxta fit in initial treatment phase of lymphedema

• Juxta fit is more effective in volume reduction

• JF has lower SSI / DSI

• Self-management of the patient is contributory to better clinical effect

• JF is effective in the initial treatment phase of lymphedema AND the maintenance phase
Compression garments versus compression bandaging in decongestive lymphatic therapy for breast cancer-related lymphedema: a randomized controlled trial


* The group receiving bandaging experienced greater median volume reductions at 10 days (70 vs. 5 mL; \( p = 0.387 \)) and at 3 months (97.5 vs. 50 mL; \( p = 0.182 \)).

* The bandaging group also experienced a greater increase (WORSE RESULTS…) in median DASH (disability) scores at 10 days (+20.9 vs. +5; \( p = 0.143 \)) and at 3 months (+18.4 vs. +3.3; \( p = 0.065 \))
No difference in:

- Incidence of limb or genital LYM
- Median time of occurrence of LYM
- Frequency of complications
- QOL
- Body image
• Multilayer Bandage achieved much better outcomes than K-Taping
• K-Taping at the moment is NOT an alternative to compression bandage in BCRL
Intermittent Pneumatic Compression

- IPC is a model for short stretch bandage + walking
- additional value especially in immobile patients
- may shift fluid into non compressed parts
- should always be supplemented by compression as not able to remove protein content of edema
limb volume and protein content after IPC

131 I-albumin i.v. 3 days before

limb volume and protein content after IPC

11 legs with LE
before and 48 hours later after 3 h IPC

- decrease of leg volume
- no improvement of lymphoscintigraphy

Miranda F Jr et al. Lymphology 2001;34:135-41
limb volume and protein content after IPC

additional problem

risk of genital edema after pump compression

Boris M, Weindorf S, Lasinski BB. Lymphology 1998; 31: 15-20
Efficacy of manual lymphatic drainage and intermittent pneumatic compression pump use in the treatment of lymphedema after mastectomy: a randomized controlled trial


Significant differences in both groups before and after therapy. The baseline median volume difference of group 1 (CDT) was 630 (180–1,820), and after therapy it was 480 (0–1,410). In group 2 (CDT + IPC), the beginning median volume difference was 840 (220–3,460), and after therapy it was 500 (60–2,160).

No significant differences were observed between the two groups in terms of the above-mentioned parameters.
Physical therapies for reducing and controlling lymphoedema of the limbs

C Badger, N Preston, K Seers, P Mortimer

The Cochrane Database of Systematic Reviews 2006 Issue 1

• Only three studies involving 150 randomised patients were included
• One crossover study concluded that MLD provided no extra benefit at any point during the trial over sleeves
• The bandage plus hosiery versus hosiery alone trial, concluded that bandage plus hosiery resulted in a greater reduction in limb volume

• Currently not enough evidence to draw conclusions about the best physical therapy to use in the treatment of lymphoedema
Systematic review: conservative treatments for secondary lymphedema

Mark Oremus¹,², Ian Dayes³, Kathryn Walker¹,² and Parminder Raina¹,²*
Conclusions of the Review

• Literature contains no evidence to suggest the most effective treatment.

• Harms from treatment are minor and likely to have little clinical impact. The field of research into treating secondary lymphedema is open to advancement.
Indications for future studies

- P.La.C.E. in case of bandages
- Interface pressure, Static/dynamic stiffness index
- Volume assessment (water displacement, circumferences, Ultrasound, Optoelectronic devices, RM, CT)
- Lymphatic system function: lymphoscintigraphy (quali-quantitative)
The volume of a limb can be estimated from a number of circumference measurements. Each two are estimated the volume of the limb between them, considering this segment to be a truncated cone, using the formula given. These segments are then added together. The mid-foot or mid-hand and smallest ankle or wrist used and their position (?) noted for future reference. Vol = volume of segment, 'Ct' and 'Cb' the circumferences at each end, and 'h' the distance between them (e.g. 10 cm). The sum of these = total volume.
LYMPHOEDEMA

CLOSE FOLLOW-UP OF THE PHYSICAL-REHABILITATION TREATMENT (6 DAYS) WITH HIGH FREQUENCY ULTRASOUND
SECONDARY LYMPHEDEMA OF THE LEFT LOWER LIMB

B.B. Lee and coll.
Indications for future studies

• Fluid assessment (BIS)
• Tissue (Ultrasound, BIS, Tonometry)
• Moisture measurement?
• Disability ? QOL ?
• Compliance to compression device
LYMPHEDEMA TREATMENT
L-DEX (mean value and S.D.)
REDUCTION

58.75
+/- 29.89

36.15
+/- 24.13

- 38%
Raw Data Assessment

Unilateral or bilateral edema

Limb Segment (thigh and/or leg)

Fluid accumulation and tissue composition
BIOIMPEDANCE SPECTROSCOPY in LYMPHEDEMA

- 42 patients (10 male and 32 females, mean age 58.8) with primary or secondary lymphedema
- 11 patients were submitted to intensive decongestive treatment
Resistance percentage difference between limbs with vs without lymphedema

303.4 - 249.9 - 22%
Reactance percentage difference between limbs with vs without lymphedema

![Chart showing reactance percentage difference between limbs with and without lymphedema. The chart indicates a decrease of 44.6%.]
Resistance during treatment
11 patients
compression therapy: a rewarding challenge
Thanks for your attention. and thanks to Hugo, Robert and to the ... ghost of Giovanni