Dogmas revisited

ICC session, EWMA 25th Conference

London, May 13-15 2015

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ORIGINAL ARTICLE

Dogmas and controversies in compression therapy: report of an International Compression Club (ICC) meeting, Brussels, May 2011

Int Wound J 2013; 10:516–526

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Revue article/ summary

Materials and application techniques

- **Dogma 1: 'COMPRESSION AFFECTS THE SUPERFICIAL VEINS MORE THAN DEEP VEINS?' (G.MOSTI, J. F. UHL AND H.PARTSCH)**
- **Dogma 2: IS A PRESSURE GRADIENT THE BEST WAY TO IMPROVE HAEMODYNAMICS? ANSWERS FROM A COMPUTER MODEL. (M. CHAUVEAU, F. CROS AND P. GELADE)**
- **Dogma 3: COMPRESSION DEVICES APPLIED TO THE LEG MUST PROVIDE A PRESSURE GRADIENT WITH DECREASING PRESSURES FROM DISTAL TO PROXIMAL? (G. MOSTI)**
- **Dogma 4a: INELASTIC MATERIAL EXERTS LOW PRESSURE AT REST? (H. PARTSCH)**
- **Dogma 4b: IMMOBILE PATIENTS NEED ELASTIC COMPRESSION? (H. PARTSCH)**
- **Dogma 5: EFFECTS ON SKIN-CHANGES: STATIC OR DYNAMIC COMPRESSION? (M. FLOUR)**
- **Dogma 6: LEG COMPRESSION NEEDS ALWAYS TO INCLUDE FOOT AND ANKLE? (D. BENDER)**

Indications

- **Dogma 7: COMPRESSION BANDAGES NEED TO CONTAIN PADDING? (A. ANDRIESSEN AND J. SCHUREN)**
- **Dogma 8: ARTERIAL OCCLUSIVE DISEASE IS AN ABSOLUTE CONTRAINDICATION FOR USING COMPRESSION? (A. CORNU-TH´ENARD, G.MOSTI AND E. ARKANS)**
- **Dogma 9: LOW PRESSURE IS ENOUGH FOR ULCER HEALING? (D. MILIC)**
- **Dogma 10: VENOUS ULCER HEALING IS DUE TO STIFFNESS OR PRESSURE? (J. P. BENIGNI)**
- **Dogma 11: COMPRESSION AND LYMPHOEDEMA: THE HIGHER PRESSURE THE BETTER? (R. DAMSTRA AND H. PARTSCH)**
- **Dogma 12: LIPOEDEMA CANNOT BE IMPROVED BY COMPRESSION? (G. SZOLNOKY)**

Dogma 1: COMPRESSION AFFECTS THE SUPERFICIAL VEINS MORE THAN DEEP VEINS?

With the introduction of new imaging capabilities experimental data has now challenged this dogma (1,2).

- Magnetic resonance imaging (MRI) used while subjects adopt different postures including standing,
- three-dimensional (3D) reconstruction and volume quantification,
+
- intra-muscular pressure measurements

1. Uhl JF. 3D multi-slice CT to demonstrate the effects of compression therapy. Int Angiol 2010;29:411–5.

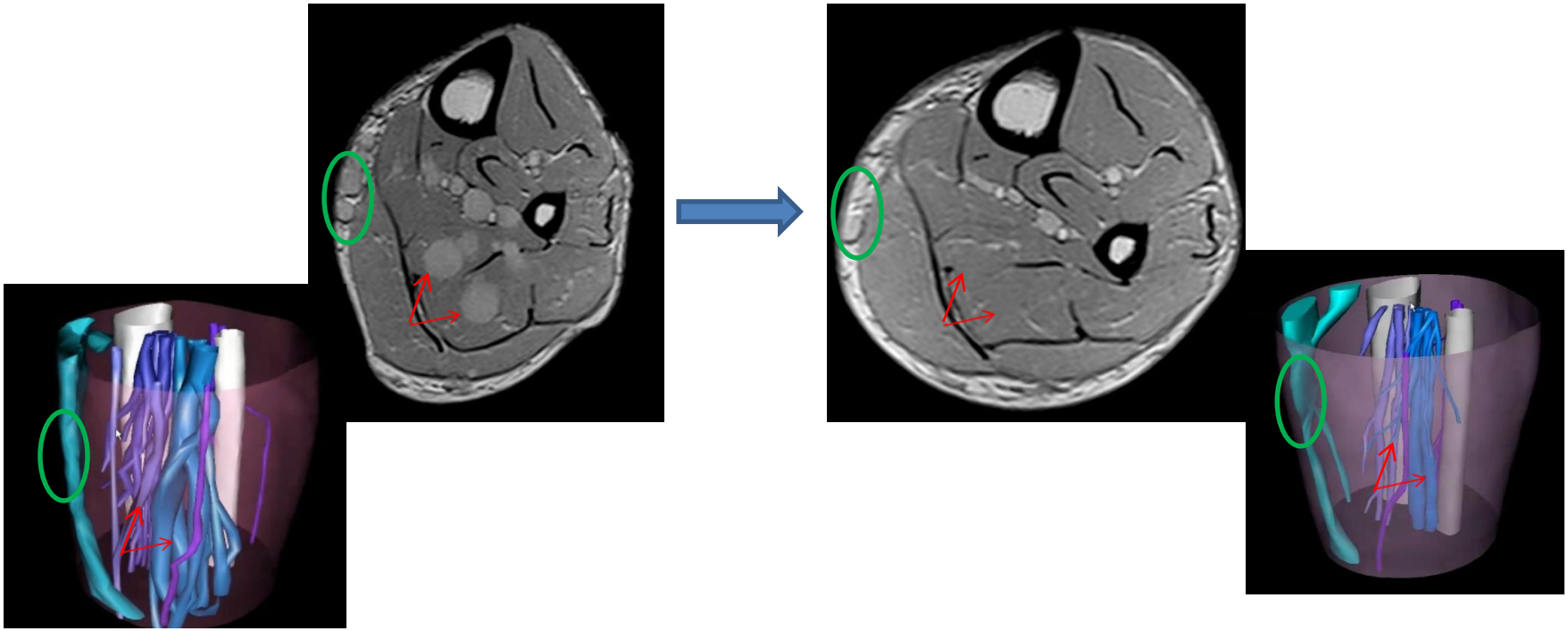
2. Partsch H, Mosti G, Mosti F. Narrowing of leg veins under compression demonstrated by magnetic resonance imaging (MRI). Int Angiol 2010;29:408–10.

Level of action of a compression device

- MRI, standing, results without and with compression

No compression

Compression stocking 22 mmHg

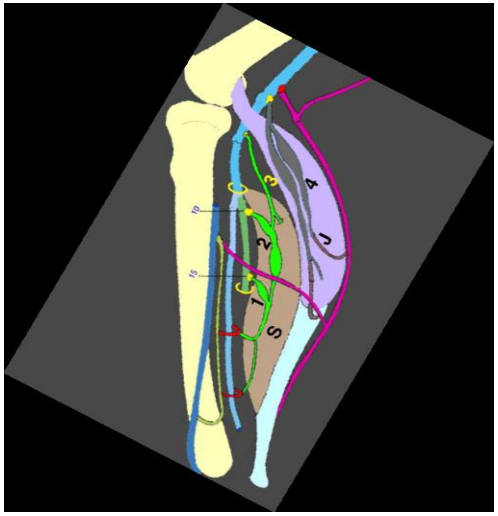


Partsch, Mosti. Int Angiol 2010;29:408–10.
Uhl JF. Int Angiol 2010;29:411-5

Dogma 1: Paradox of the level of impact of compression

- There is a correlation between the importance of compression P exerted and the intramuscular pressure (IMP)

- J.F. Uhl et J.P. Benigni, Phlebology 2014



Blood pressure cuff
at 0 to 50 mmHg

Kikuhime sensor device
Interface pressure IP

Pressure manometer
Intra-muscular pressure IMP

Linear correlation between **IP** and **IMP** in the P-range of 20 mmHg to 50 mmHg.

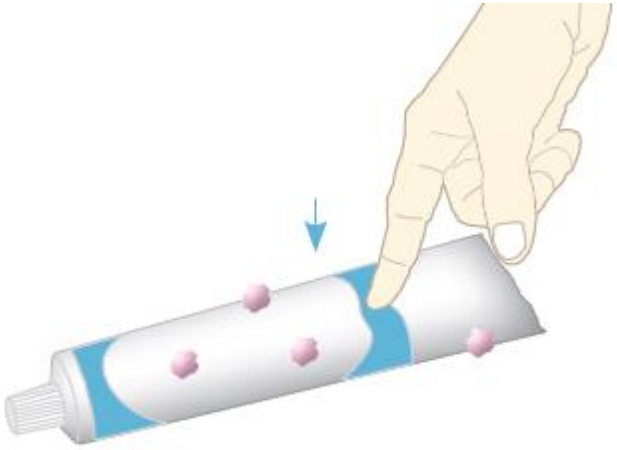
Pressure redistribution under compression

Compression bandages with a high SSI create an unyielding (rigid) but flexible cast or cylinder when applied to the lower limb. This acts like a closed system whereby external pressure applied to the leg is transmitted equally in all directions within the contained area. The principle involved is known as Pascal's Law .

Figure 6: A demonstration of Pascal's Law using a toothpaste tube

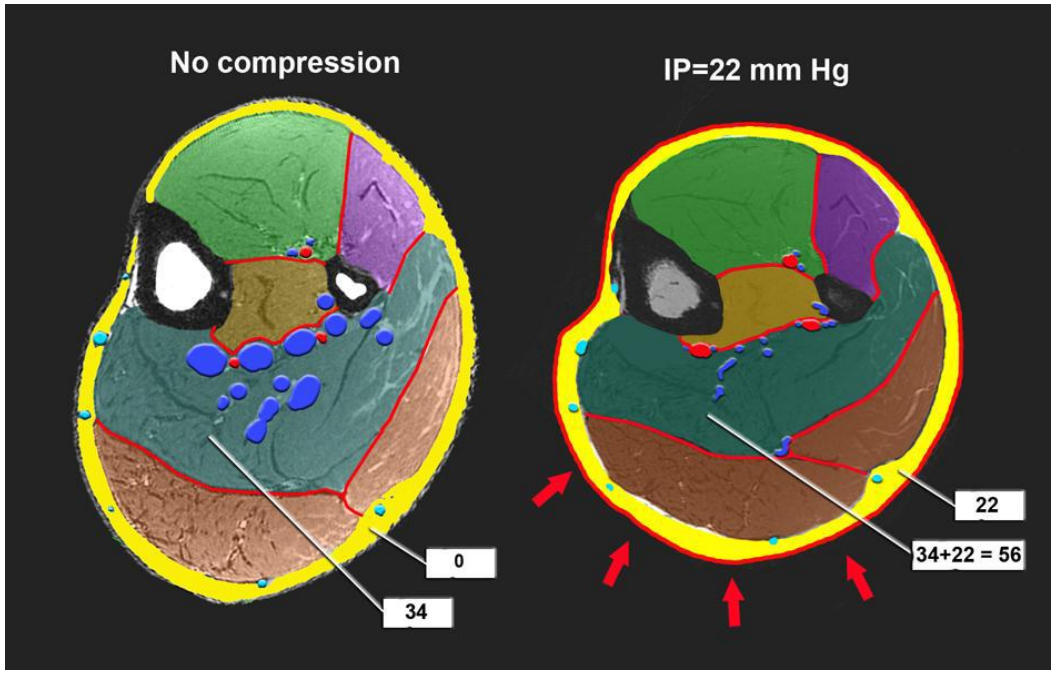
Pascal's Law states that pressure applied to an enclosed system of an incompressible fluid is distributed evenly.

This can be demonstrated using a capped tube of toothpaste in which several equally sized holes have been punched. When pressure is applied to the tube at one point, toothpaste will extrude from all of the holes at the same rate no matter how far they are from the point of applied pressure.



Wounds International. Principles of compression in venous disease. 2013.

Explanation of the compression paradox



In **standing** position, a pressure of 60 mmHg is needed to 'counteract' the augmented intra-venous hydrostatic pressure and to flatten the deep veins.

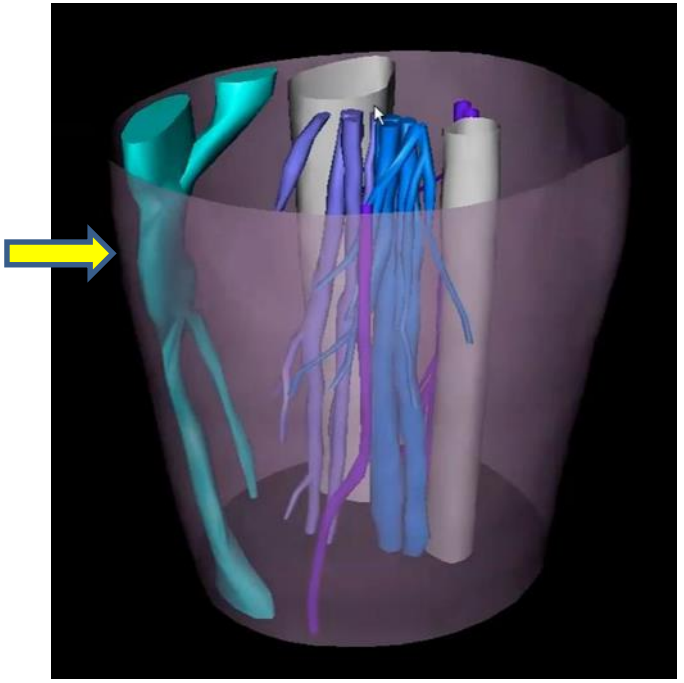
Standing, compression stockings exerting a **IP** P of ± 20 mmHg at the calf result in an intra-muscular P of 50-60 mmHg (sum of the **IP** and the basic standing **IMP**)

Dogmes Compression JIFA 2014 Benigni JP

... and what about the superficial veins?

These observations have a practical consequence :

- In order to flatten or to occlude a superficial (varicose) vein, a local and focal pressure of sufficient strength is needed: e.g. by applying an additional pressure (‘pelotte’) along the vein following treatment of large trunks or tributaries



Dogma 1: Paradoxical effect-level of compression devices

Conclusion (3)

Augmentation of the intramuscular pressure (IMP) has a direct impact on the venous pump in the calf.

The effects of compression treatment on the superficial venous system may in part / indirectly be due to this action on the deep venous system.

1- Mosti, Partsch EJVES. 2012 Sep;44(3):332-6
2- Mosti G. Phlebology. 2012 Feb;27(1):1-4.

Dogma 1: Paradoxical effect-level of compression devices

Conclusion (4)

These findings support the idea of a compression treatment focused on the calf muscles , and suggests that a digressive gradient might not be necessary.

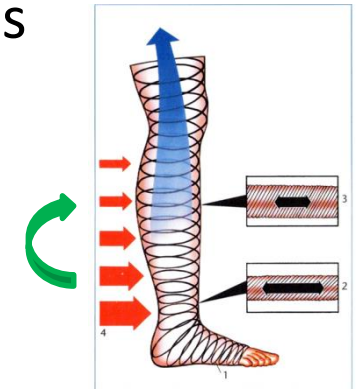
A higher or stiff compression pressure resulting in a higher intramuscular pressure at calf level is more effective on the calf muscle pump than a pressure which digressed to ≤ 20 mm Hg.

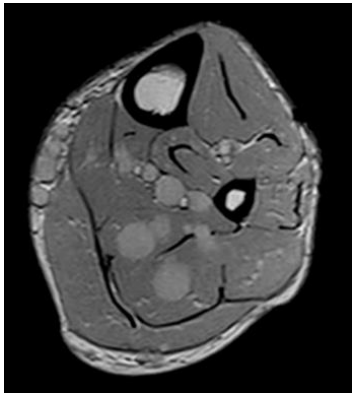
1- Mosti, Partsch EJVES. 2012 Sep;44(3):332-6
2- Mosti G. Phlebology. 2012 Feb;27(1):1-4.

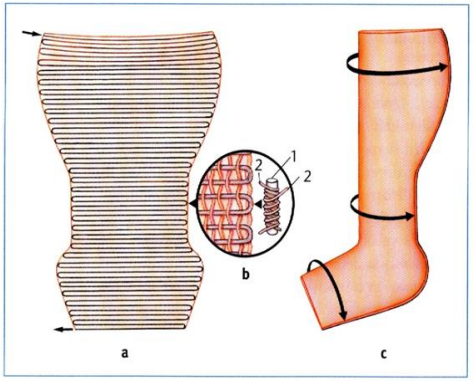
Dogma 2: Do we need a PRESSURE GRADIENT in order to IMPROVE the HEMODYNAMICS?

Answers from a COMPUTER MODEL.

- Couzan et al. put forward the idea that progressive compression, which is the opposite of digressive compression, could be more efficient because calf veins contain much more blood and are more accessible to compression, compared to ankle veins







- (progressive) stockings with high stiffness should be developed and clinically evaluated in the future

Dogma 2: Do we need a PRESSURE GRADIENT in order to IMPROVE the HEMODYNAMICS?

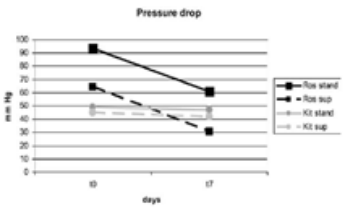
Answers from a COMPUTER MODEL.

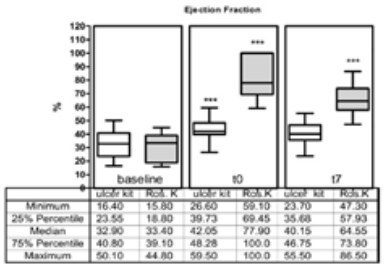
According to this mathematical model, in cases with superficial reflux due to venous vasodilation, the improvement of the ambulatory venous pressure (AVP) is independent from a digressive versus progressive compression profile; to the contrary: the results are better under a 'dynamic' compression and augment according to the walking pressure amplitudes.

This confirms Mosti's findings on the correlation between stiffness of a compression bandage and the improvement of hemodynamic parameters.

Hemodynamic effect over time

- Inelastic bandages maintain their hemodynamic effectiveness over time despite significant pressure loss;
- ***G Mosti, and H Partsch.*** *J vasc Surg 2010;52:925-31*



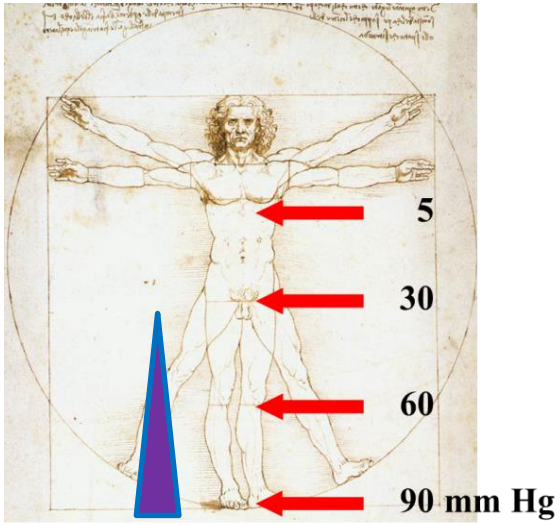


	ulcer kit	Ros. K	ulcer kit	Ros K	ulcer kit	Ros K
Minimum	16.40	15.80	26.60	59.10	23.70	47.30
25% Percentile	23.55	18.80	39.73	69.45	35.68	57.93
Median	32.90	33.40	42.05	77.90	40.15	64.55
75% Percentile	40.80	39.10	48.28	100.0	46.75	73.80
Maximum	50.10	44.80	59.50	100.0	55.50	86.50

Mosti G, Mattaliano V, Partsch H. Phlebology 2008;23:287–94.

Dogma 3: COMPRESSION DEVICES APPLIED TO THE LEG MUST PROVIDE A PRESSURE GRADIENT WITH DECREASING PRESSURES FROM DISTAL TO PROXIMAL?

The concept of a graduated digressive pressure was based on the assumption that under physiological conditions the flow will always go from a distal high pressure point towards a proximal point of lower venous pressure, and that progressive compression could hinder venous return.



(H. Partsch)

Experimental data have refuted this hypothesis, at least during 'walking'.

(Mosti et al, 2011) .

Dogma 3: COMPRESSION DEVICES APPLIED TO THE LEG MUST PROVIDE A PRESSURE GRADIENT WITH DECREASING PRESSURES FROM DISTAL TO PROXIMAL?

- The enhanced venous flow that might be induced using reverse gradient stockings or bandages may be of relevance only for mobile patients;

- for the immobile, further investigation is required to rule out inadvertent adverse effects of applying high pressure at the calf and lower pressure at the ankle

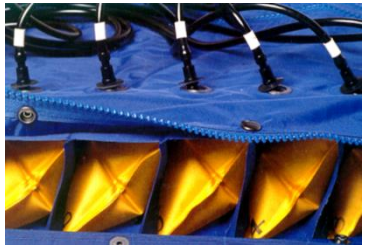
Dogma 4b: IMMOBILE PATIENTS NEED ELASTIC COMPRESSION?

Unfortunately, there is still some discrepancy between the high incidence of chronic oedema and few recommendations concerning an optimal management of immobile patients.

Such immobile patients may also benefit from multicomponent bandages which may be better tolerated during night time because of their low resting pressure/high stiffness as stated above.

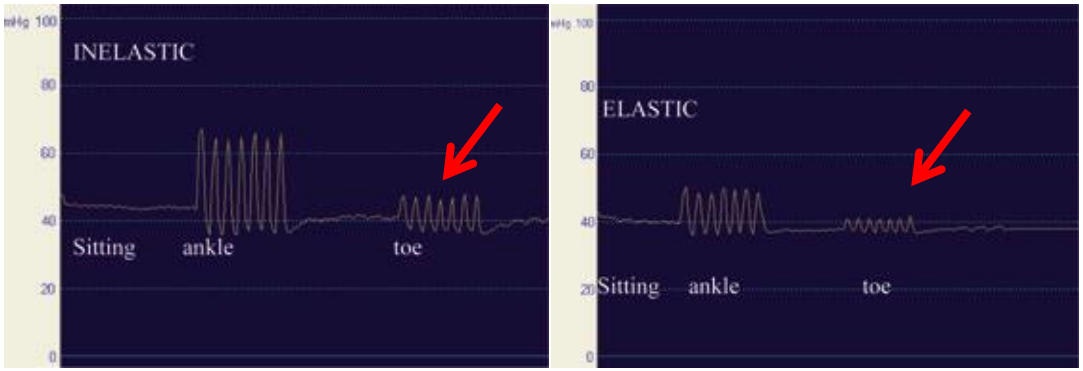
In addition, they can be ‘dismantled’ (removing components) at night.

Dogma 4b: IMMOBILE PATIENTS NEED ELASTIC COMPRESSION?



- A patient with swollen legs sitting in a wheelchair can tolerate very well compression pressures of up to 60 mmHg, applied by inelastic bandages or by intermittent pressure pumps (ICP)

- In addition, smallest active or passive movements even performed only with the toes will increase the pressure under inelastic material ('massaging effect') much more than under elastic, yielding material (Partsch et al.)



Dogma 11: COMPRESSION AND LYMPHOEDEMA: THE HIGHER PRESSURE THE BETTER?

- Up to now only few studies have studied a dose response relationship between compression pressure and oedema reduction.
- Some trials measuring oedema reduction in relationship to the exerted pressure of compression products have indicated that there is obviously an upper pressure limit beyond which further increase of pressure seems contra-productive.
- This upper limit is around 30-40 mm Hg of initial pressure exerted by inelastic bandages on the arm and around 50-60 mm Hg on the leg.

- Vanscheidt W, Ukat A, Partsch H. J Vasc Surg. 2009 Feb;49(2):395-402
- Damstra RJ, Partsch H. J Vasc Surg 2009 May; 49 (5): 1256-63
- Mosti G, Picerni P, Partsch H. P Mosti G, Picerni P, Partsch H. Phlebology, 2011

Dogma 11: COMPRESSION AND LYMPHOEDEMA: THE HIGHER PRESSURE THE BETTER?

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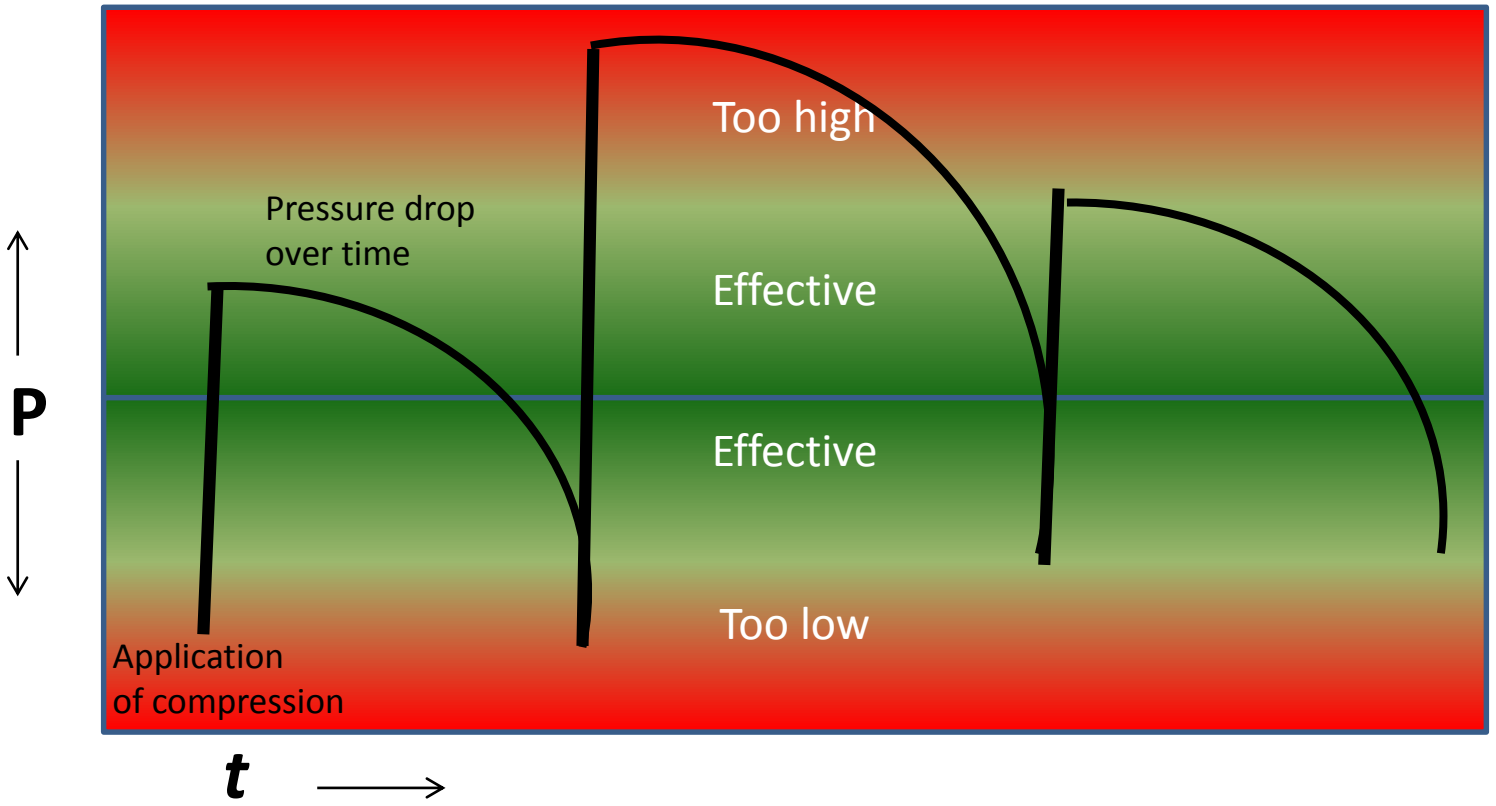
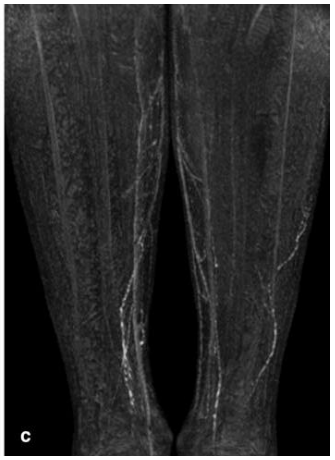


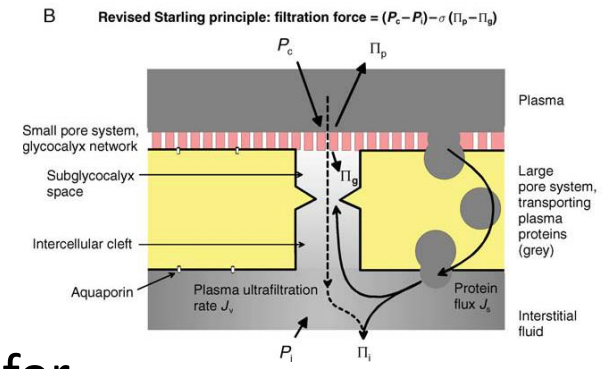
From Hugo Partsch

Dogma 11: COMPRESSION AND LYMPHOEDEMA: THE HIGHER PRESSURE THE BETTER?

- The explanation for these findings may be based on a different threshold of efficacy of compression on the two main mechanisms of oedema reduction, which are the reduction of capillary filtration and an improvement of the lymphatic drainage.

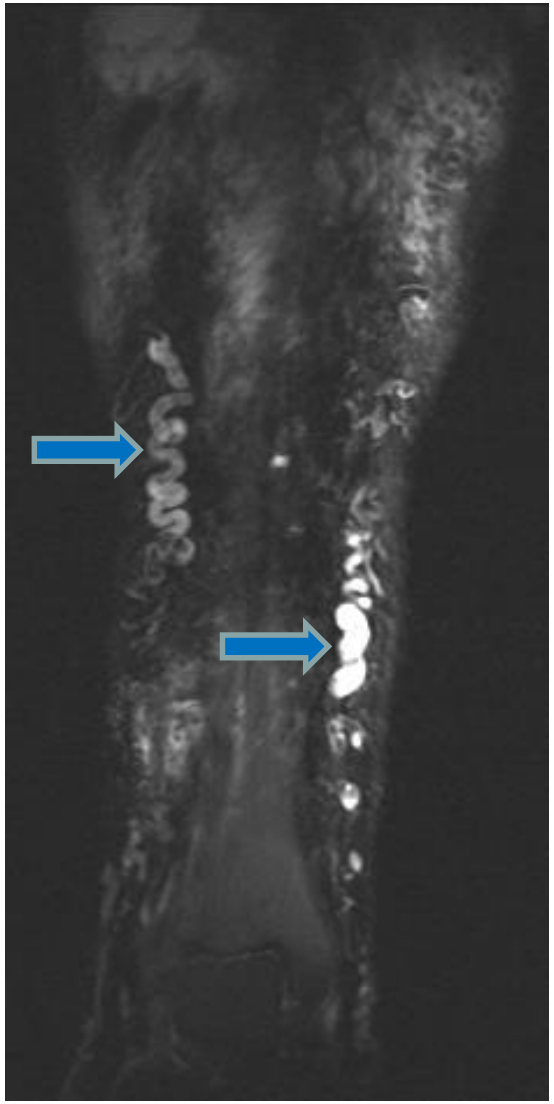
J. R. Levick and C. C. Michel. Cardiovascular Research March 24, 2010

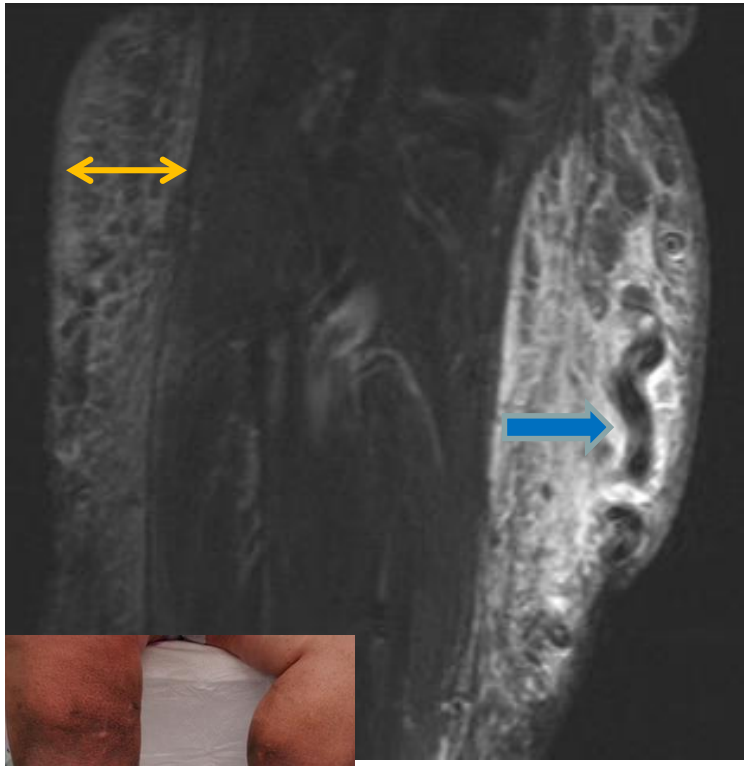




- In clinical practice comfort and ease of application, which have deciding importance for the compliance, will also favour lower compression pressures

Co-morbidity may aggravate edema, inflammation, and effectiveness of compression treatment ...





Infection, abcedation

Varicose veins

Hypertrophy of fat