Comparison of sub-bandage pressure Measurements of four compression systems from initial application to 24 hours.

Jeanette Muldoon PhD Student, Kings College London, Dr. Hildegard Charles, Tissue Viability Nurse Consultant, NHS Kensington & Chelsea PCT London

Aim: To show initial pressure and pressure losses after 24hrs for four (4) different compression bandage systems.

Background: There is a general belief that sub-bandage pressures are maintained for 5-7 days with certain systems only. All systems will lose pressure over time when swelling is reduced, and the following study showed pressure losses even in healthy volunteers with the systems that were tested (table 1)

Early statements by Stemmer have resulted in clinicians striving to achieve initial sub bandage ankle pressures of 40mmHg which they sometimes believe to be constant. This theory has been challenged by newer research based on fluctuations in sub bandage pressures and the effectiveness of higher intermittent pressures (Partsch 2006).

Rationale: Bandages are often applied with incorrect pressures, due to bandagers being overcautious and assuming that bandages would be too tight. All systems should be applied according to manufacturers' recommendations bearing in mind that compression bandages vary in their mode of action, and bandage characteristics may vary according to their construction.

Correct bandage application for effective compression is a skill that can be mastered with practice, and should rely on the expertise of the bandager. This is reinforced by the latest World Union of Wound Healing Societies consensus document on compression, which also cautions practitioners against relying on bandage markers which can lead to over extension, especially around the foot, leading to pain (Consensus document 2008).

Short stretch bandages are applied at full stretch with the roll held close to the limb, whilst elastic bandages are pulled out, held away from the limb and applied at mid stretch (see demonstration photos below).

Application of cohesive short stretch bandage

Application of long stretch bandage

It is well documented and researched that compression should deliver a high therapeutic working pressure to reduce oedema (Mortimer, Levick), prevent venous reflux (Mosti, Mattaliano, Partsch 2008) and a tolerable resting pressure to ensure patient comfort and concordance. This difference in working and resting pressures is termed "stiffness index".

Method: Four different compression bandage systems were applied by experienced bandagers according to manufacturers' instructions on 15 healthy volunteers. Measurements were taken after initial bandage application and 24 hours later using a new pressure monitor (PicoPress) with a sensor on the medial lower leg at B1 in the supine and standing position.

Markings were drawn on the legs to indicate bandage position on application in order to assess bandage slippage after 24 hours

Result: The results are summarised in Table 1 below:

Conclusion: The use of pressure monitors for training in bandage application can be misleading as they only measure pressures at the time of application without taking into account the therapeutic pressure losses that occur in practice.

Pressure loss should not be seen as a negative side effect of bandages, but rather as a therapeutic benefit as seen in effective oedema reduction (picture 2) and ulcer healing for successful compression management. Effectiveness and patient comfort should be the most important factors.

Discussion: Compression bandages applied following manufacturers' instruction had different pressures initially in all systems.

After 24 hours in both the supine and standing positions there were variations in pressure losses in all systems but due to the higher initial value, therapeutic pressures were maintained in the cohesive short stretch bandage system.

All volunteers found the short stretch bandage system to be most comfortable during the day and even at night with tolerable resting pressures.

Despite the pressure losses, no bandage slippage was observed and this could be attributed to the cohesive component of the bandage systems and correct application methods.

Footnote: Bandage application, testing and monitoring were supervised by Prof. Hugo Partsch. Data analysis was conducted by Prof. Hugo Partsch. Bandage pictures kindly supplied by Anne Clements and Hildegard Charles.

References: Partsch H (2006) Do we still need compression bandages? Haemodynamic effects of compression stockings and bandages Phlebology 21 (3): 132-138.
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Mortimer PS, Levick JR (2004) Chronic peripheral oedema; the critical role of the lymphatic system, Clinical Medicine, 4 (5); 448-453.
Mosti G, Mattaliano V, Partsch H (2008) Inelastic compression increases venous ejection fraction more than elastic bandages in patients with superficial venous reflux,
Phlebology, 23; 287-294.
World Union of Wound Healing Societies (WUWHS) Compression in venous leg ulcers.
A consensus document. London; MEP Ltd 2008.

Effects of compression with Actico® cohesive short stretch compression (A. Clements)

Picture 1

Picture 2

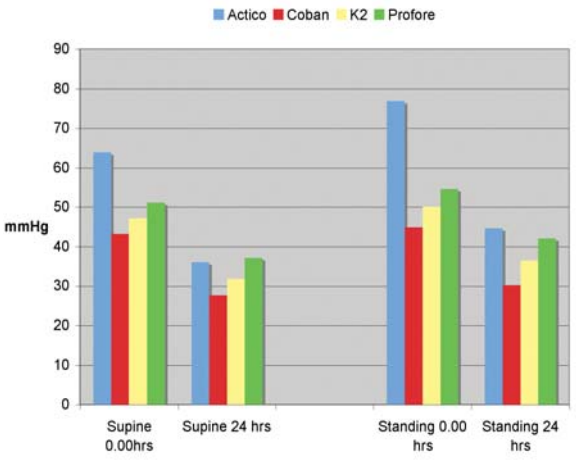
Table 1. Timed & position bandage pressures (mmHg).

	Supine 0.00hr	Supine 24 hrs	Pressure Loss (Δ)	Standing 0.00hr	Standing 24 hrs	Pressure Loss (Δ)	Stiffness Index at 24 hours
Actico cohesive 2 component short stretch compression (Activa Healthcare)	63.87	36.07	27.80Δ 43.5%	76.93	44.64	32.29Δ 41.9%	8.75
Coban 2 – 2 component compression (3M)	43.25	27.64	15.61Δ 36.1%	44.92	30.27	14.65Δ 32.6%	2.63
K2 – 2 component compression (Urgo)	47.25	31.89	15.36Δ 32.5%	50.08	36.56	13.52Δ 26.9%	4.67
Profore – 4 component compression (Smith & Nephew)	51.17	37.18	13.99Δ 27.3%	54.58	42.09	12.49Δ 22.9%	4.91

Pressure loss results (N=15)
The highest stiffness index was recorded with the cohesive short stretch bandage system

Sub bandage pressure loss is a positive result of effective compression for oedema reduction and venous return.

Reasons for sub bandage pressure loss	Benefits of pressure loss
Reduction of oedema	Therapeutic effect on limb size
Alteration of limb shape (pictures 1 & 2)	Improved limb shape & condition



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