Reproducibility of sub-bandage pressures in repeated applications of a new zinc impregnated 2 layer compression system

Introduction
The purpose of undertaking this experimental work was to establish if repeated applications of a new 2 layer compression system could deliver reproducible sub-bandage pressures. The aim was to establish if the margin differences in repeated applied sub-bandage pressures are sufficiently narrow to deliver consistent and safe applied pressure profiles.

15 'expert' bandagers within one Health & Care Trust were selected to conduct sub-bandage pressure monitoring arm of the evaluations. 'Expert' being defined as having undertaken a minimum degree level training in the field of leg ulcer management, is deemed competent in bandage application and applies bandage systems as part of their daily clinical practice.

Method
The same healthy volunteer limb was utilised for all measurements to reduce variability. Sub-bandage pressure monitoring international consensus guidelines were followed for sensor measurement and placement and room temperature monitoring due to air filled sensor use. The volunteer limb was measured and marked for sensor placement in line with consensus documentation and 3 pressure sensors were applied to the limb above the malleolus mid-calf and upper calf area. Three sessions were undertaken with 5 experts attending each session. Expert participants undertook a training session on the new system and demonstration of bandage application technique to include all 3 products in this new range.

Sub-bandage pressure monitors were placed onto the volunteer limb, calibrated and labelled 1, 2 and 3 and zeroed / recalibrated between applications. Room temperature was recorded at each application to assess potential variability of air in sensors.

Each expert was afforded the opportunity to apply as many pre bandages as required prior to measurement commencement, all 15 applied only one trial bandage and the went into the three consecutive bandage applications for evaluation measurement purposes.

Each application was observed for technique and variance in applications visually.

Pressures were recorded in a database sensor 1, sensor 2 and sensor 3 with room temperature also being documented.

Pressures were collated and analysed to establish maximum difference in pressure profile upon application per sensor. The results were then sub analysed by product group and consistency of pressure profiles were observed in applied pressures between product types.

Results
15 experts delivered 45 sub-bandage measurements in each sensor 1, 2 and 3. Sensor 1 produced pressure profile differences across all three products between 1mmHg and 5mmHg, Sensor 2 between 3mmHg and 6mmHg and Sensor 3 1mmHg and 6mmHg.

Product range one (15 measurements) delivered profiles as above between 1mmHg and 5mmHg, B2 between 3mmHg and 6mmHg and B3 1mmHg and 6mmHg.

Product range two (Light compression) Sensor 1 between 2mmHg and 5mmHg, Sensor 2 between 2mmHg and 5mmHg and Sensor 3 between 1mmHg and 6mmHg.

Product range three Sensor1 1-2mmHg, Sensor 2 2-4mmHg and Sensor 3 1-4mmHg

Interestingly the smallest variance between pressure profiles was seen in product group three which was the highest practiced product used as part of an on-going evaluation.

Discussion
In line with other studies in this area reverse gradient was seen with higher interface pressures noted at sensors 2 and 3 which is conducive to calf muscle support and activation and a good positive indicator of dynamic ability. There is relatively small variance in applied interface pressure profiles with no peaks noted during this work. Dynamic pressures peak to between 70-120 mmHg during exercise so the small numbers seen in the reproducibility highlight a very small window of variance upon application.

Conclusion:
Slight variation in application technique was also observed during the three consecutive applications for each expert and variation in some applied tensions however this did not result in a dramatic difference in applied pressures (essentially similar difference to those perceived to have consistency in the three consecutive applications) As such it is reassuring as an indicator that applied pressure 'window' is narrow to error therefore potentially increases the safety of application due to practitioner application variances. A training need has however been highlighted regarding consistent application technique and can be addressed through competency training and sign off documentation. Importantly, the sub–bandage pressures in repeated applications of a new zinc impregnated 2 layer compression bandage system demonstrate reproducibility.

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