

Measuring the interface pressure

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Introduction

Measuring and documenting the pressure beneath any multilayer compression system is now quick and easily obtained. Smart Sleeve® (Carolon, 601 Forum Parkway, Rural Hall North Carolina, 27045 USA) uses digital technology to measure the interface pressure, which is discussed below is important to standardize the therapy. Smart Sleeve® consists of a sleeve (for lower leg or the upper extremity), a piezoelectric pressure sensor and a digital reader which is connected to the sleeve by two electrical leads. The pressure is measured in mmHg. The smart sleeve is marketed independently and when placed as the first layer of any multi-layer wrap system measures the pressure delivered to the underlying skin surface. It is also marketed with a vascular wrap as a multilayer wrap with smart sleeve system. This two-layer system allows for fast and easy application. The Smart Sleeve® is very competitively priced compared to other multilayer wrap systems that do not have the ability to measure the sub bandage pressure. Decreasing the cost of treatment is further enhanced due to the fact that pending physician discretion the smart sleeve and Vascular wrap can be reapplied (or if soiled first washed and dried) three times; it is the one most cost effective multilayer wraps available.

Background

Multilayer wraps are a widely utilized therapy for venous ulcers, venous edema, lymphedema many related disorders. Compression therapy is the standard primary first-line of treatment for these conditions. However results vary pending on the compression systems used. A number of articles point to multilayer wraps having variable wound healing rates compared to compression hosiery. Dolibog¹ (2014) demonstrates this nicely reviewing five different compression therapies for treating venous leg ulcers. A major factor cited in literature regarding variability of wound healing with multilayer wraps is the inconsistency in which wraps deliver pressure compared to hosiery.

Human variability when wrapping a limb from one session to the next or from one provider to another provider at different treatment sessions provides a scenario in which it is difficult if not impossible for the applied compression to be consistent. Measuring the pressure with a multi-layer wrap system removes this inconsistency allowing improved performance similar to compression hosiery.

Methodology: introduction of a new device

The Smart Sleeve® is provided in three sizes with a terrycloth inner surface and a very smooth outer surface. The fabric contains copper ion, which is antimicrobial without any known resistance. The sleeve can wick fluid from an underlying saturated bandage to the outer surface of the sleeve. It provides a minimal amount of compression 5 mm HG. The Smart Sleeve® contains two silver fabric conducting electrodes that are woven into the sleeve and run from the proximal edge distally to the area of the ankle malleoli. It is packaged with a flat piezoelectric pressure sensor that is placed to contact both of the silver fabric electrodes. The proximal end of these electrodes are then connected by two leads to the digital reader which provides the mmHg on-screen.

If purchased as a multilayer system the second main component is a newly designed vascular elastic wrap. It is not adhesive so can be reapplied. The elastic vascular wrap is secured with and five fabric hook fasteners (similar to a Velcro product), two of which are placed just below knee and three which can be used at provider's discretion around the heel. The Vascular wrap also can wick fluid from the sleeve to the outer portion of the wrap to allow for evaporation and decrease maceration if an underlying wound dressing become saturated with drainage. Both the Smart Sleeve® and the Vascular Elastic Wrap can be removed and reapplied three times. Additionally both components can be hand washed and dried for reapplication as well if soiled with drainage.

Discussion

A poster abstract presented by Jobst Vascular Institute, during the 2017 Annual Meeting of the American College of Phlebology, states *Several consensus documents recommend 30 to 40 mm Hg interface pressure for compression therapy to be*

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*effective in VLU patients. However in the real world practice pressure ... is rarely measured and the pressure actually delivered is unknown.*²

This clinical trial utilized experienced nurses who had applied multilayer wraps for a number of years. During this study they applied multilayer wraps with the following three scenarios: i) the first three months nurses wrapped bandages blindly without known interface pressure measurement; ii) the following six months they applied multilayer wraps with the pressure measured known; and iii) the last three months the nurses applied wraps again blinded without knowing the pressure but the pressure being measured to see how accurate or inaccurate the application was.

The poster abstract concludes that *In real world practice the delivered interface pressure varied significantly. Pressure monitoring is needed to ensure that desirable dose of compression is delivered to the extremity with VLU.*

Measuring interface pressure has never been easier to obtain now that several devices are available and more will come to market at prices that are affordable. I therefore propose the following questions:

- *Should measuring interface pressure be recommended?*
- *Should it be the standard of care especially with nonresponsive patients and those with bordering ischemia?*
- *How can we possibly deliver consistent interface pressure from one treatment session to the next and especially with different providers are involved?*
- *Can you think of any other medical standard treatment where dosage is not measured, monitored and adjusted as per patient response?*

Additional information can be found in several recommended references.³⁻¹³

Concluding remarks

I agree with Dr. Trinh as presented in his poster abstract referenced above. New technologies are becoming increasingly available to measure interface pressure. Therefore for the reasons demonstrated in this document the medical community should consider going forward and recommend measuring interface pressure with any multilayer wrap system especially for those patients where nonresponsive to prior treatment or bordering on a level of ischemia.

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