

## [OP089] LAPLACE'S LAW AND ITS APPLICATION TO COMPRESSION TREATMENT

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Free Paper Session: Devices and Intervention 1

**Aim:** Compression treatment is, almost always, based on the process of applying a tension on a textile garment that is applied on a body part. That holds for both bandages and compression stockings. A force is applied to the garment to create this tension, which is then transformed into the body part, e.g. limb, as a sub bandage-pressure. Laplace's law describes this transformation using mathematical terms. Since the resulting compression pressure is the active agent in clinical compression treatment, it is of importance to understand the inner workings of this transformation of a stretching force applied on garment, via a tension in the material, to a compression on the skin of the limb.

**Method:** I will dissect Laplace's law into its inner components and display each part in three separate ways, mathematically, graphically and experimentally. I will also describe the how the pressure varies with respect to small changes in the parameters and input variables. Finally, we will discuss the limitations of Laplace's law and what happens beyond its domain of action.

**Results / Discussion:** By investigating the each factor in Laplace's law, we have gained insight in various questions regarding compression treatment, such as the role of overlap, the effect of different shapes of legs and the outcome of the use of paddings.

**Conclusion:** Getting a new mechanistic viewpoint on the underlying basis for the origins of the local pressure, give new and valuable insights on what pressure is applied where and when.

## [OP090] ELECTRICAL STIMULATION IN WOUND HEALING PROCESSES AND TISSUE REGENERATION

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**Aim:** Electrical stimulation (ES) is known to accelerate the proliferation and migration of cells that are important for wound healing and reduce wound pain. The EPUAP/NPUAP treatment guideline for pressure ulcers (PUs) lists ES as the only treatment ranked with the highest possible level of recommendation. Contemporary clinical data to show how ES compares with negative pressure wound therapy (NPWT) at the tissue level are missing. To demonstrate the clinical outcome of the use of ES on PUs treated in homecare, in comparison to NPWT.

**Method:** 50 patients with PUs (stage 3-4) were treated with ES. Thereof 10 patients who had been treated with NPWT then received ES. The wound evolution was documented with qualitative controls. Outcome criteria were the quality of the wound bed preparation and healing progress, measuring pain level, wound size and granulation tissue. Wound biopsies were taken to evaluate the healing progress during treatment with ES. In defined cases, wounds treated with ES and NPWT were compared histologically.

**Results / Discussion:** Greater than 50% improvement of the wound bed was observed on 44 patients. Accelerated wound healing was observed in 90% of cases. While healing appeared to be stalled after 4 weeks of NPWT wound healing continued when treated with ES.

**Conclusion:** The results demonstrate that treatment of PUs stage 3-4 with ES is highly effective and can be successfully implemented in homecare settings.

## [OP091] ACCEPTABILITY AND TOLERANCE OF ELECTRIC STIMULATION THERAPY

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Free Paper Session: Devices and Intervention 1

**Aim:** This trial examined whether clients who have been unable to tolerate moderate/ high compression therapy found electric stimulation therapy (EST) acceptable and were able to adhere to this treatment.

**Method:** A pilot single blinded randomised controlled trial (RCT) commenced in June 2014 in multiple wound clinics in Victoria, Australia. Participants (n=30) include people with a venous leg ulcer who have been unable to tolerate moderate / high compression therapy. Participants were randomised (2:1) to the intervention group or a control group where the EST or sham device is used 4 times daily for 20 minutes per session. Participants were monitored for 8 weeks during which time concordance with the treatment and perceptions of the treatment were assessed.

**Results / Discussion:** For the 11 participants to date, average age was 61.45 years (SD=14.79), 54.5% were female, and two thirds wore no compression (63.6%). The majority of participants regarded EST as a completely acceptable treatment (77.8%) and most stated they would use this treatment again (80.0%). All found EST easier to use than compression therapy (100%). Use of the device ranged between 21% to 98% of the recommended usage (M=80, SD=27) with no significant differences detected between the intervention and control groups [t(7)=. 213, P=.837]. Results will be updated with the sample available in May 2015.

**Conclusion:** EST is acceptable and tolerated by people who have been unable to tolerate moderate/ high compression therapy.

**[OP092] THE COMPARISON OF ABI MEASURED WITH AUTOMATED SYSTEMS AND CONVENTIONAL DOPPLER FOR IDENTIFYING PAD**

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Free Paper Session: Devices and Intervention 1

**Aim:** To compare two automated ankle-brachial index (ABI) systems with the conventional Doppler technique for identifying peripheral arterial disease.

**Method:** 49 patients that were referred for lower limb arterial assessment at a London vascular laboratory underwent an ABI measured with an automated system based on Volume Plethysmography (ABlvp) and an automated system based on oscillometric (ABlo). A standard ABI using a handheld Doppler was then taken on fully rested patients and used as the 'gold standard'. The analysis methods used were Bland Altman limits of agreement, equality plots and Pearson's correlation.

**Results / Discussion:** The results showed good correlation between patients with the ABlvp device and Doppler ( $r=0.86$ ,  $p<0.05$ ) and 95% limits of agreement were  $\pm 0.24$  with a bias of  $-0.02$ . The results showed poor correlation between patients with the ABlo device and Doppler ( $r=0.38$ ,  $p<0.05$ ) and 95% limits of agreement were  $\pm 0.43$  with a bias of  $-0.05$ .

**Conclusion:** These results show that the ABlvp device has comparable results with Doppler and a considerable reduction in time to perform the tests. However, the ABlo device had difficulty in measuring ABIs below 0.8 and could not be used to reliably provide an ABI prior to compression bandaging and treatment planning.

Both systems are fast and easy to use but the accuracy of the ABlvp device gives it the potential to be used in the measurement of ABI in place of Doppler prior to compression bandaging.

References:

ABlvp – Dopplex Ability, Huntleigh.

ABlo – ABPIMD, MESI.

**[OP093] ULTRASONIC ASSISTED WOUND DEBRIDEMENT (UAWD) SYSTEM - REAL VALUE OR JUST ANOTHER GIMMICK ?**

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Free Paper Session: Devices and Intervention 1

**Aim:** To assess whether Ultrasonic assisted wound debridement\* (UAWD) system is actually an important tool of the many newer tools that are available in the armamentarium of foot care specialist around the world - is it of real value or just another gimmick?

**Method:** We studied the rates of wound healing in diabetic foot ulcers of 46 patients that underwent surgical debridement (using curettage debridement) and those that underwent ultrasonic debridement\* alternatively. UAWD\* applies a low frequency power ultrasound (22 kHz to 35 kHz) in conjunction with an irrigation solution via a moving receptacle applied directly to the wound tissue.

**Results / Discussion:** On an average, we found that wounds that underwent UAWD\* healed at a faster rate. The ulcer healing time decreased from 6 weeks to 3.5 weeks. All patients received standard wound care with normal saline and a non-adhesive foam dressing\*\*.

We found that the effects of UAWD\* lasted significantly longer. In a 12-week period, we recorded performing an average of 4 debridements per patient with the ultrasonic debrider in comparison to an average of 7 sharp debridements per patient.

In comparison with sharp debridement, bleeding is less with UAWD\*. In most cases, one can easily achieve haemostasis with elevation and compression without the need of cautery

**Conclusion:** UAWD\* system has found a home in wound care. This technology has a number of benefits and appears very promising. It certainly has the real value to be present in our diabetic foot care centre and we have found it useful in a variety of wounds.

\*Ultrasound assisted wound debridement system used is from Söring GmbH

\*\*Biatin-Ag by Coloplast

