KerraPro™ in Pressure Ulcer Prevention: Determining a Mode of Action

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Introduction

The role of skin microclimate in pressure ulcer formation was identified 40 years ago.¹ This study assessed the effects of skin temperature, pH, and hydration underneath KerraPro compared with a self-adhesive foam dressing (Mepilex Border, Mönlycke Health Care), and a dermal gel pad (Aderma, Smith & Nephew). The study also assessed the ability of KerraPro in preventing damage to the skin due to mechanical loading and whether repeated mechanical loading affected the pads structural integrity, elastomeric and pressure redistribution abilities.

Method

Skin temperature was measured using 4 fine wire thermocouple probes secured to the inner forearm and connected to a digital thermometer, with 1 probe left uncovered as a control (Figure 1). Readings were taken at 5 minute intervals over 14 hours (n=3).

Skin hydration was measured by using a moisture meter (Figure 2). Readings were taken across the surface of the inner forearm before the 3 test devices and control area (no device) in the same positions. Skin pH measurements were taken after 7 and 14 hours (n=3).

Results

Pressure (15 kilopascals) was applied to human skin explants (6mm biopsies of living tissue from its natural site of growth) using a pressure device for 24 hours (Figure 2). Half the explants had KerraPro applied between the pressure device and the explant biopsies, the other half acted as a control with no KerraPro. Each biopsy was bisected, half the sample was used to extract RNA for analysis of cytokines, the other half was processed for histology. The wear time of KerraPro was assessed compared with Aderma by repeatedly subjecting 12 millimetre thick pads to a compression force of 375 newtons applied through a rounded striker 30 times per minute for 10,000 cycles.

There was a reduction in TNF alpha RNA levels in KerraPro-treated human skin biopsies compared to untreated controls after application of 15 kilopascal of pressure for 24 hours (data not shown). Other cytokines were unchanged between treated and untreated biopsies. This suggests that the pressure relieving qualities of Kerrapro prevents up-regulation of TNF alpha compared with the untreated control upon application of pressure.

Discussion

Silicone devices used for scar prevention and treatment has been shown to reduce epidermal water loss and increase tissue water content.² The data reported here on epidermal rehydration by KerraPro supports this.

Figure 1 Thermocouple probe placement

Figure 2 Custom-built loading device used to apply sustained pressures (Brommelberg et al, 2007)

Figure 3 Percentage change in epidermal rehydration over base line at time points 7 and 14h

Figure 4 Histology of untreated control subject to pressure

Figure 5 Histology showing separation between epidermis and dermis in pressure treated skin which is minimal with KerraPro treatment

Conclusion

Kerrapro has a positive effect on epidermal rehydration, physical protection of the skin by pressure redistribution and a possible down regulation of inflammatory cytokines as well as being cost effective in terms of wear time compared with similar devices.

References


4. Aderma™ is a trade mark of Smith & Nephew

5. Mepilex® is a trade mark of Molnlycke Health Care AB

Acknowledgements


Mepilex® is a trade mark of Molnlycke Health Care AB

Aderma™ is a trade mark of Smith & Nephew