Evaluation of the Mode of Action of a New Gel Wound Dressing: A Pilot Study

Nicola Ivins
Clinical Trials Manager, Institute for Translation, Innovation, Methodology and Engagement (TIME), Cardiff University, Heath Park, Cardiff

Introduction
New local treatments for chronic wounds need to interact or modify local conditions so moving wounds to a stage where healing occurs. KerraLite Cool (Crawford Healthcare) consists of a patented pro-ionic® copolymer hydrogel matrix with a high MVTR PU film barrier. It has been formulated and designed specifically to encourage wound bed preparation, granulation and subsequent epithelialisation of chronic wounds, while minimising pain levels and the risk of infection.

The aim of this study was to evaluate protease inhibition in vivo and in vitro by KerraLite Cool, to evaluate the wound environment during treatment with KerraLite Cool and to relate the ability of the wound dressing to both debride the leg ulcer and to promote healing of the wound. The secondary outcomes of this investigation relate to the ability of the wound dressing to both debride the leg ulcer and to promote healing of the wound.

Method
Protease inhibition by KerraLite Cool was tested in vitro using gelatin zymography. The effect of KerraLite Cool on the wound environment was evaluated in a pilot study involving eleven patients with venous or mixed aetiology leg ulcers who presented at the Wound Healing Research Unit (WHRU) in Cardiff. Changes in wound fluid composition, microbiological burden and wound healing over 14 days were recorded when the wounds were dressed with KerraLite Cool.

Results
KerraLite Cool inhibited the pro- and activated forms of both MMP-2 and MMP-9 in vitro. In the pilot study, problems with the analysis of the wound fluid collected during this study reduced confidence in the quantitative electrolyte level data however it was observed that there was an apparent increase in the ratio of total protein to sodium within the first day of exposure to the KerraLite Cool dressing. There were no clear trends in the microbiological contamination of the wounds under the KerraLite Cool dressing over the 14 days of treatment. No wound healed during the short evaluation period with only minor changes in wound surface area reported as would be expected given that the study period was 14 days. However both the wound edge and the wound bed appeared to improve over the course of treatment with the KerraLite Cool dressing. Maceration of the surrounding skin was observed in a minority of subjects following use of the KerraLite Cool dressing (n=3). The clinicians involved in this study offered several relevant observations upon the KerraLite Cool wound dressing: the dressing was easy to apply with no apparent discomfort or stinging upon application; it was easy to remove with irrigation; while in use the dressing was conformable and well tolerated beneath compression garments. A reduction in the intake of analgesics was noted among several subjects recruited to the study.

Discussion
MMPs are clearly important in many biological processes in wound healing, hence are critical to consider when developing improved therapies to enhance both wound healing times and wound healing outcomes. This initial study has demonstrated that KerraLite Cool may act in vitro to inactivate the proteolytic activity of MMP-2 and MMP-9 by two mechanisms: calcium depletion and protease binding.

In leg ulcer patients, KerraLite Cool facilitated the painless debridement of the wound bed through a combination of autolytic and osmotic debridement. The strong osmotic nature of the gel created a chemical pull that enabled the necrotic tissue to be lifted from the wound bed. Further, this strong osmotic pull helped to draw fluid into the wound bed from the underlying tissues.

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Conclusion
KerraLite Cool exerts a marked protease inhibitory activity that may be effective under physiological conditions. The mechanism of inhibition appears to be a combination of modifying the ionic environment and selective depletion of proteases. Clinical work with KerraLite Cool points consistently to a significant reduction in wound pain in painful wounds, and the stimulation of stalled wounds.

Given that positive signs of wound improvement were seen during this short duration evaluation there would be a benefit from a formal longer-term observation of wound healing under the KerraLite Cool dressing given that rapid changes were seen in a population of wounds that had not previously responded to treatment.