CLINICAL OBSERVATION OF THE THERAPEUTIC EFFECTS OF KERRABOOT® IN TREATMENT OF DIABETIC FOOT ULCERS

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Introduction
A number of new dressings exist for treating problematic diabetic foot ulcers. However, their use within Chinese hospitals has been limited due to poor understanding of the associated clinical benefits, high product cost, high medical expenses and an absence of medical insurance. Therefore, traditional methods and dressings persist and treatment continues to be expensive and time-consuming for patients and physicians alike.

Kerraboot® is a new wound management system for diabetic foot ulcers which differs from existing dressings. Kerraboot® is a non-contact and pressure-free boot-shape device composed of a 5-layer transparent film with a highly absorbent pad at the base of the boot. By increasing warmth and humidity and allowing excessive chronic wound fluid to run off the wound bed where it is locked away in the super absorbent pad, Kerraboot® creates a favourable healing environment surrounding chronic wounds on the lower limbs.

Method
Three patients (Patient 1, 2 and 3) with superficial diabetic foot ulcers indicated for moist wound dressings had their wounds dressed with Kerraboot® for a fixed period of 4 weeks. Wounds were cleaned with saline or debrided and Kerraboot® applied according to the package insert guidelines. Replacement frequency was determined by level of exudate; initially every 12-24 hours and then 24-48 hours, once the super absorbent pad was saturated. Wounds were evaluated weekly, visual records made, wound surface area measured and observations noted. If the wound had not healed within the 4-week test period, traditional dressings were used.

Results
Duration of the diabetic foot ulcer prior to this study was 9, 5 and 1 months for the 3 patients respectively. Wound measurements decreased in all 3 patients at each visit (Table 1). Growth of granulation and epithelial tissues at the wound surface was observed in each wound by the end of the first week in this study. This is seen as a decrease in the wound surface area (Figure 1). Mean healing rates were 4.39 mm²/day, 11.51 mm²/day and 40.34 mm²/day for the three patients, respectively, during treatment with Kerraboot®, reflecting 1.33~1.58 times faster healing rate when compared to treatment using traditional dressings. Kerraboot® was considered to be comfortable and easy to use. It alleviated pain and reduced embarrassing odours. Skin maceration, heat rash, and wound odour at dressing change were all noted, however wound odour decreased as wound healing progressed. Microbiology confirmed the presence of Staph. haemolyticus, Micrococcus roseus, Staph. epidermidis, MRSA, coagulase-negative Staphylococci and Providencia rettgeri.

Table 1. Pre-and post-therapeutic changes of the wound surfaces of the three patients

<table>
<thead>
<tr>
<th>Patient</th>
<th>Week 0</th>
<th>End of week 1</th>
<th>End of week 2</th>
<th>End of week 3</th>
<th>End of week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>wound surface</td>
<td>longitudinal diameter</td>
<td>transverse diameter</td>
<td>wound surface area</td>
<td>wound surface</td>
</tr>
<tr>
<td>No 1</td>
<td>78.5</td>
<td>68.5</td>
<td>61.8</td>
<td>57.0</td>
<td>50.0</td>
</tr>
<tr>
<td>No 2</td>
<td>108.22</td>
<td>146.14</td>
<td>141.53</td>
<td>105.90</td>
<td>65.22</td>
</tr>
<tr>
<td>No 3</td>
<td>188.22</td>
<td>146.14</td>
<td>141.53</td>
<td>105.90</td>
<td>65.22</td>
</tr>
</tbody>
</table>

Discussion
Diabetic foot ulcers require a favourable environment for granulation tissue growth and, therefore, wound healing. With its unique design, Kerraboot® provides a warm and moist healing environment, by removing excess chronic wound fluid. Chronic wound fluid has been shown to inhibit cell proliferation which can delay healing. This can intensify activities of growth factors, and accelerate the healing process.

Our observations suggest that Kerraboot® inititated beneficial wound healing and encouraged healthy growth of granulation tissue at the wound surface. Although wounds of Patients 1 and 2 had not healed completely after four weeks of treatment, use of Kerraboot® in these patients ensured that wound healing was achievable. In both these patients, wound healing would have been achieved faster by continuing treatment with Kerraboot®, assuming that healing was maintained at a constant rate (14 days vs 24 and 17 days vs 22 days for Patient 1 and 2 respectively).

Skin maceration was observed in all three cases and could be alleviated by more frequent changes of dressings. Scattered red papules were observed on the skin covered by the boots in two cases, presumably resulting from heat accumulated in the warm and moist environment inside Kerraboot®. Papules subsided naturally when patients were instructed to take off boots at treatment intervals. Neither side-effect prevented patients from continuing the Kerraboot® regime. We believe that Kerraboot® has provided a moist environment for wound healing. Qualitative analysis confirmed the presence of multiple bacterial strains, however, the wound surface healed significantly without systemic application of antibiotics throughout this study, suggesting that all the bacteria identified colonized rather than infected the wound.

Conclusion
Our experience has shown that Kerraboot® is suitable for the management of diabetic foot ulcers. However, it may not be suitable for every wound nor for every stage of healing. Therefore, a selection of the most effective therapeutic methods is necessary for treatment of diabetic foot ulcer at different therapeutic stages depending upon the patient and the wound to ensure the ulcer heals promptly and economically.

Reference List