

SHORT REPORT

Use of a keratin-based hydrogel in the management of recessive dystrophic epidermolysis bullosa

MARTIN P. THAN¹, ROBERT ALLEN SMITH², SHARON CASSIDY¹, ROBERT KELLY³, CLIVE MARSH³, ANDREA MADERAL⁴ & ROBERT S. KIRSNER⁴

¹Christchurch Hospital, Christchurch, New Zealand, ²The Clinic of Plastic Surgery, Jackson, Mississippi, USA, ³Keraplast Technologies, LLC, San Antonio, Texas, USA and ⁴Department of Dermatology and Cutaneous Surgery, University of Miami Miller School of Medicine, Miami, Florida, USA

Abstract

A new keratin-based hydrogel wound dressing was applied to the neck of a patient who was suffering from recessive dystrophic epidermolysis bullosa. A significant improvement was observed in the robustness of skin in this area: reduced propensity to blister and improved healing of blisters. The improvement allowed the cessation of use of secondary dressings for this area. The factors gave a significant improvement in quality of life for the patient.

Key words: keratin-based dressing, hydrogel, wound care

Wound care for patients with recessive dystrophic epidermolysis bullosa (RDEB) represents a therapeutic challenge. We report the case of an 11-year-old girl with RDEB confirmed by histology and electron microscopy, who was successfully treated with a novel keratin-based dressing. She had required extensive wound dressing treatment daily since birth. We focus on the back of her neck where the skin was fragile (Figure 1) and protective dressings were required. These dressings caused significant discomfort, overheating and loss of quality of life.

Recent advances have been made in the understanding of the role of keratin in wound healing. For example, when skin is wounded keratin 17 is upregulated and in keratin 17 knock-out mice, poor healing is observed (1). *In-vivo* keratin-based products can stimulate cellular migration into a wound and speed up the wound-healing process. Recent technological developments have led to the creation of intact keratin (non-hydrolysed) products suitable for topical application (2,3), for example, keratin-based hydrogels. These products stimulate wound

healing by the activation of keratinocytes (4). In porcine partial thickness wound-healing models, keratin-based dressings speed up healing compared with both air-exposed wounds and those treated with polyurethane film dressings (5). Molecular analyses suggest keratin formulations influence epidermal migration by upregulating keratin gene expression (4).

In our patient, the back of the neck was treated daily with 20 g of Keragel (Keraplast Technologies, LLC, San Antonio, TX, USA), a keratin-based hydrogel. After 3 months, a significant improvement was observed in the skin: the skin was much more robust and the incidence of blistering was much lower and the wound had effectively healed. The use of secondary dressings was discontinued at this time. This effectively eliminated the patient's perception of feeling very hot and significantly improved her comfort, overall appearance and quality of life. A progressive, sustained improvement continued for the 12-month duration of the study; Figure 2 illustrates progress after 9 months.

Correspondence: Robert S. Kirsner, MD, PhD, Department of Dermatology and Cutaneous Surgery, University of Miami Miller School of Medicine, 1600 NW 10th Avenue, RMSB, Room 2023-A, Miami, FL 33136, USA. Tel: +305 243 4472. Fax: +305 243 6191. E-mail: rkirsner@med.miami.edu

(Received 1 November 2011; accepted 1 December 2011)

ISSN 0954-6634 print/ISSN 1471-1753 online © 2012 Informa Healthcare USA on behalf of Informa UK Ltd.
DOI: 10.3109/09546634.2011.654108



Figure 1. The fragile, blistered skin on the back of the neck which necessitated the use of protective dressing prior to treatment with a keratin-based hydrogel.

Dramatic improvement, despite a lack of control site, suggests the keratin dressing was causal in improvement; however, the exact mechanism for the improvement is not fully understood. While use of keratin-based dressings is a treatment option for refractory wounds due to epidermolysis bullosa, it warrants further study.



Figure 2. More robust, healed skin after 9 months of treatment with a keratin-based hydrogel including 6 months without protective dressing.

Acknowledgements

To the patients and families suffering from epidermolysis bullosa and to the New Zealand EB community and DEBRA, a New Zealand organisation for their support and involvement in this study. Funding Sources: This study was funded by Keraplast Technologies, LLC. Prior presentation: Some of this material was verbally presented at a meeting of NZBIO who gave permission for the material to be submitted for publication elsewhere.

Declaration of interest: Clive Marsh and Robert Kelly are employees of Keraplast Technologies, LLC. Martin Than has received consultancy fees from Keraplast Technologies. Robert Smith has an equity interest in Keraplast Technologies. Sharon Cassidy is receiving consultancy fees from Keraplast Technologies, though she was not at the time of the study.

References

1. Kim S, Wong P, Coulombe PA. A keratin cytoskeletal protein regulates protein synthesis and epithelial cell growth. *Nature* 2006;441(7091):362–365.
2. Blanchard CR, Inventor; Timmons SF, Inventor; Smith RA, Inventor; KMS Ventures, Inc., assignee. Keratin-based hydrogel for biomedical applications and method of production. US5932552;1999.
3. Kelly RJ, Inventor; Roddick-Lanzilotta AD, Inventor; Ali MA, Inventor; KMS Ventures, Inc., assignee. Wound care products containing keratin. US7732574;2010.
4. Perez R, Kirsner R, Gil J, Valdes J, Davis S. Evaluation of the effects of two keratin formulations on wound healing and keratin gene expression in a porcine model. Proceedings of Symposium on Advanced Wound Care; 2009 Apr; Dallas, TX, United States.
5. Davis SC, Perez R, Rivas Y, Gil J, Valdes J, Kirsner R. The effect of a keratin based dressing on the epithelialization of deep partial thickness wounds. Proceedings of American Academy of Dermatology meeting; 2009 Mar; San Francisco, CA, United States.