The Effect of a Hydrocolloid Occlusive Dressing (DuoDERM E) on Keratinization in Psoriasis Vulgaris

Sir,

Previous studies have reported on a beneficial effect of occlusion therapy in the treatment of psoriasis. Friedman reported that the efficacy of an occlusive hydrocolloid dressing was comparable to topical fluocinolone acetonide in a 10-week clinical trial. Also at the cellular level a reduction of the abnormalities has been documented (1). Baxter et al. observed a decrease of the mitotic index in the psoriatic lesion after a 4 days' treatment with an occlusive dressing (2). Fry et al. also noted lowered epidermal mitotic counts in psoriatic plaques treated for 2 weeks with an occlusive dressing (3). Gottlieb et al. investigated the efficacy of Actiderm alone in the treatment of psoriatic plaques. Their results suggest that the dermatological patch is effective in treating psoriatic plaques but does not affect underlying immunopathological mechanisms after 2 weeks of treatment (4).

The purpose of the present study was to evaluate the effect of the hydrocolloid occlusive dressing DuoDERM E (Convatec®) on markers for keratinization (anti-filaggrin and anti-involucrin).

Nine patients suffering from psoriasis vulgaris were included in this study. DuoDERM E was applied on one psoriatic lesion and was renewed every 7 days. Clinical improvement was assessed using severity scores for erythema, induration and scaling. Before treatment and after 3 weeks of treatment with DuoDERM E, punch biopsies (3 mm) were taken from the psoriatic lesions.

An indirect immunoperoxidase technique with a monoclonal antibody against filaggrin (1:500, antifilaggrin, BTI, BT576) and a monoclonal antibody against involucrin (MON-150, 1:25, monoclonal antibody against involucrin) was employed (5).

All patients showed an improvement of the psoriatic plaques. After one week of treatment, we observed a statistically significant reduction with respect to desquamation ($p \leq 0.02$) and induration ($p \leq 0.02$). After 3 weeks of treatment erythema showed a considerable decrease ($p = 0.07$).

In normal healthy skin filaggrin staining is observed as a continuously intense staining pattern of the stratum corneum and stratum granulosum (6). In the biopsies of the psoriatic lesions before treatment filaggrin expression was absent or showed a discontinuous pattern in the stratum corneum and granulosum. After 3 weeks of treatment with DuoDERM E we noted a statistically significant increase with respect to the filaggrin expression in the granular layer ($p \leq 0.01$), while the expression in the stratum corneum showed a borderline significant increase ($p \leq 0.06$). Involucrin expression in normal human skin can be observed in the granular layer and the upper third of the stratum spinosum (6). Before treatment the involucrin expression in the psoriatic lesions extended to the deeper cell layers of the stratum spinosum. After treatment with DuoDERM E the interpapillar involucrin expression showed an almost statistically significant improvement ($p \leq 0.07$). The involucrin expression observed above the dermal papillae did show a minimal decrease ($p = 0.5$).

Our results confirm the antipsoriatic potential of hydrocolloid dressing (DuoDERM E) as monotherapy.

Previous studies have already revealed that occlusion by prolonged application of tape or an occlusive dressing is effective in the treatment of plaque psoriasis (1–4, 7, 8). The mechanisms of the effects of occlusion, however, have not been elucidated. Psoriatic epidermis is characterized by an absent or only partially formed stratum granulosum, a feature we also observed in the biopsies taken before treatment. After 3 weeks of treatment we observed a re-establishing of the granular layer in most of the biopsies. This observation is in agreement with the finding of Fry et al. who also noted a reappearance of the granular layer in psoriatic epidermis after occlusive therapy with plastic film (3). Moreover, we also noted a statistically significant increase of the filaggrin expression in the granular layer after 3 weeks of treatment. Besides the capacity of aggregating keratin filaments, filaggrin also has a major function in maintaining a normal hydrating state of the stratum corneum. After having fullfilled its role in aggregating keratin fibres and catalysing the formation of disulphide bonds between these fibres, filaggrin becomes enzymatically modified. An increasing acidity of the filaggrins loosens the keratin/filaggrin complex, allowing proteolytic attack on the filaggrins, which leads to the complete proteolytic destruction of these proteins. The free amino acids, resulting from the proteolysis of filaggrin, are retained within the corneocytes. Their role is in maintaining a normal hydration state of the stratum corneum despite increasing dryness of the environment (9). Hydration increases the permeability of the stratum corneum (10). The increase of filaggrin expression, as observed in the present investigation after 3 weeks of treatment with hydrocolloid dressing, resulting in a normalization of the hydration state of the stratum corneum with an increased permeability, could explain the pronounced antipsoriatic effect of corticosteroids applied under plastic occlusion, reported by other investigators (2, 11).

In the biopsies taken before treatment involucrin expression was extended to the lower cell layers of the stratum spinosum. After 3 weeks of treatment with DuoDERM E the interpapillar involucrin expression showed an almost statistically significant improvement. Several studies showing an increased expression of involucrin are characterized by an accelerated epidermal turnover (12–14). Taking these hypotheses into account, our observation that involucrin expression in psoriatic epidermis is decreased after 3 weeks' occlusion therapy with hydrocolloid dressing is in agreement with the findings of Baxter et al. and Fry et al. who noted a decrease of the mitotic index in psoriatic plaques after occlusion therapy (2, 3).

The present study shows that abnormalities with respect to epidermal differentiation are reduced during hydrocolloid dressing treatment. As immunological parameters remain unaffected during hydrocolloid dressing treatment (4), it is feasible that this mode of occlusion directly interferes with epidermal growth and differentiation.

REFERENCES

1. Friedman SJ. Management of psoriasis vulgaris with a hydrocolloid occlusive dressing. Arch Dermatol 1987; 123: 1046–1052.
2. Baxter DL, Stoughton RB. Mitotic index of psoriatic lesions treated with anthralin, glucocorticosteroid and occlusion only. J Invest Dermatol 1970; 54: 410–412.
3. Fry I, Almeyda J, McMinn RMH. Effect of plastic occlusive dressings on psoriatic epidermis. Br J Dermatol 1970; 82: 458–462.
4. Gottlieb AB, Cohen SR, Carter DM. Efficacy of actiderm in the treatment of psoriasis. In: Ryan TJ, ed. Beyond occlusion: dermatology proceedings. Royal Society of Medicine Services International Congress and Symposium Series No. 137, 1988.
5. Duijnhoven HLP van, Schalkwijk J, Kranenborgh MHGC, et al. MON-150, a versatile monoclonal antibody against involucrin; characterization and application. Arch Dermatol Res 1992; 284: 167–172.
6. Watanabe S, Wagatsuma K, Ichikawa E, Takahashi H. Abnormal distribution of epidermal protein antigens in psoriatic epidermis. J Dermatol 1991; 18: 143–151.
7. Shore RN. Clearing of psoriatic lesions after the application of tape. N Engl J Med 1985; 312: 246.
8. Telfer NR, Ryan TJ, Blanc D, et al. Results of a multicentre trial of actiderm in the treatment of plaque psoriasis. In: Ryan TJ, ed. Beyond occlusion: dermatology proceedings. Royal Society of Medicine Services limited, London, New York 1988: 53–56.
9. Scott IR, Harding CR, Barret JG. Histidine-rich protein of the keratohyalin granules. Source of the free amino acids, urocanic acid and pyrrolidone carboxylic acid in the stratum corneum. Biochim Biophys Acta 1982; 719: 110–117.
10. Ebling FGJ. The skin as a barrier. In: Champion RH, Burton JL, Ebling FGJ, eds. Rook/Wilkinson/Ebling. Textbook of dermatology. Oxford: Blackwell Scientific Publications, 1992: 129.
11. Juhlin L. Treatment of psoriasis and other dermatoses with a single application of a corticosteroid left under a hydrocolloid occlusive dressing for one week. Acta Derm Venereol (Stockh) 1989; 69: 355–357.
12. Banks-Schlegel S, Green H. Involucrin synthesis and tissue assembly by keratinocytes in natural and cultured human epithelia. J Cell Biol 1981; 90: 732–737.
13. Kanitakis J, Zambruno G, Viac J, Thivolet J. Involucrin expression in keratinization disorders of the skin – a preliminary study. Br J Dermatol 1987; 117: 479–486.
14. Frost P. Ichthyosiform dermatoses. J Invest Dermatol 1973; 60: 541.

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