

Functional and Morphological Analysis of the Horny Layer of Pityriasis alba

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The affected skin of pityriasis alba showed functional defects in both hygroscopicity and water-holding capacity detectable by water sorption-desorption test. Furthermore using skin surface biopsy technique in 5 patients, we noted that the mean area of corneocyte obtained from the affected skin of pityriasis alba was smaller and that the surface of that area showed a more prominent villous pattern than the adjacent normal skin in scanning electron microscopical observation. In this study we demonstrated the abnormalities of the horny layer in pityriasis alba, which suggest that the condition is similar to a dermatitic change and that its hypopigmentation may be due to postinflammatory mechanisms. *Key words: Water sorption-desorption test; Skin surface biopsy.* (Received September 19, 1984.)

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Pityriasis alba has been considered a non-specific dermatitis of unknown origin, possibly related to dryness of the skin (1). Its hypopigmentation has been attributed to postinflammatory changes, i.e. ultraviolet screening effects of the hyperkeratotic and parakeratotic epidermis and possibly to a reduced capacity of hypermetabolic epidermal cells to take in melanin granules (2, 3).

Recently there was a histochemical and ultrastructural study demonstrating that in extensive pityriasis alba in adults, hyperkeratosis and parakeratosis were not consistently present and that hyperpigmentation may thus be primarily due to the reduced numbers of active melanocytes and a decrease in number and size of melanosomes in affected skin (4). However, no detailed histochemical and ultrastructural study of classical pityriasis alba has been performed because of the facial localization of lesions predominantly in children. Therefore, we have tried to elucidate whether or not the hypopigmentation of classical pityriasis alba on the face in young patients is attributable to postinflammatory changes by functional and morphological analysis of its horny layer in 20 outpatients.

MATERIALS AND METHODS

20 outpatients with pityriasis alba who visited Enshu General Hospital served as subjects for this study. All were children (ages 4 to 14 years) consisting of 12 boys and 8 girls. A history of atopy was found in 12 patients. The lesions were asymptomatic and were distributed only over face. They consisted of dry hypopigmented macules. The surface of the lesions was not rough and there was no

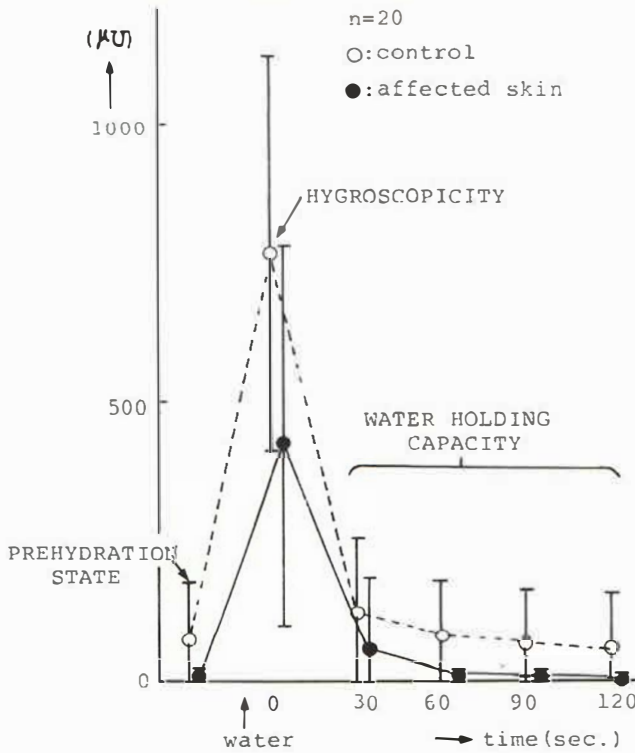


Fig. 1. Water sorption-desorption test performed in 20 patients with pityriasis alba.

erythema, atrophy or scaling. There was no special season in onset of the change, although many of the patients found worsening of the condition during summer.

Water sorption-desorption test

Instrument. A detailed description of the measuring principle was made previously (5). A new model of the instrument, made by IBS Inc., was used.

Test procedure. All the measurements were done on both affected skin and adjacent normal skin. At first a conductance value of the test area was measured to obtain a prehydration level. Then, a drop of distilled water was placed over the test area for 10 sec. Immediately after blotting the site with a pad of gauze, a measurement was made and was repeated at an interval of 30 sec for 2 min (6).

Scanning electron microscopy (SEM) of the stratum corneum

Skin surface biopsies (7) were taken as follows: a drop of cyanoacrylate adhesive was placed on the area of the skin under study. A clear glass slide was placed on the drop and pressure applied. The clear glass slide was removed after 20 sec taking with it an attached sheet of stratum corneum.

Skin surface biopsies were taken from the affected skin and adjacent normal skin in 5 patients described above (ages 4 to 6, 2 boys and 3 girls).

Table I. Mean area of corneocyte (μ^2)

Patient no.	Affected skin	Control
1	465±125	528±101
2	430±259	576±119
3	366±156	499±123
4	355±106	508±105
5	433±120	515±111
Mean	407±153	522±112

The glass slide with attached biopsies were mounted on scanning electron microscope "stubs". Alternatively the biopsies were carefully separated from the slides with a razor blade and fixed in 2% glutaraldehyde before mounting. The specimens were coated with a layer of gold and then transferred to the microscope for viewing and photography.

We observed the surface morphology of individual squamous cells at a magnification of $\times 4\,000$. We also measured a mean area of corneocytes using three photographs for each material taken at a magnification of $\times 1\,000$ by computerized image analysis system (Videoplan, Kontron Co.).

RESULTS

Water sorption-desorption test

Fig. 1. shows the summarized results of the test performed in 20 patients. As illustratively shown in Fig. 1, all the functional parameters measured on affected skin were lower than those on the adjacent normal skin (prehydration state and hygroscopicity, $p < 0.01$; water holding capacity, $p < 0.05$).

Scanning electron microscopy of the stratum corneum

Observation of corneocyte surface pattern. Villous structures were visible on the corneocyte in the affected skin of pityriasis alba. On the other hand, most corneocytes showed the smooth featureless surface pattern in the control skin and there were only a few corneocytes that have villous structure.

Measurement of area of corneocyte. Table I shows that the mean area of corneocyte obtained from the affected skin is significantly smaller than that of the normal skin ($p < 0.001$).

DISCUSSION

The horny layer of the affected skin showed functional defects in both hygroscopicity and water-holding capacity detectable by water sorption-desorption test. As a result the hydration state of the skin surface on the lesions of pityriasis alba was lower than that of the surrounding control skin. These functional defects are the same as those obtained from grossly scaly lesions. The pattern is particularly similar to that of partially scaly lesions of eczematous dermatitis reported by Tagami et al. (6).

The nature of the microvillous structure observed in SEM study is still unknown. It is most clearly seen in psoriasis and seborrheic dermatitis. Although the microvillous pattern in the affected skin of pityriasis alba is not so prominent as that seen in psoriasis, it is obvious when compared to that of the control skin. In addition to this morphological surface change of corneocyte observed in SEM, the finding that mean areas of the corneocyte in the affected skin are smaller than in the control skin suggests the presence of abnormality of the keratinization and probably increased turnover of the epidermis, which could not be clearly detected by previous histological observation.

In this study, we can demonstrate the functional as well as morphological abnormalities of the horny layer in pityriasis alba which further suggest the presence of an inflammatory process involving the epidermis and that its hypopigmentation may be due to a reduced capacity of hypermetabolic epidermal cells to take in melanin granules in an inflammatory process.

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