

KERATOSIS PUNCTATA PALMARIS ET PLANTARIS

A Morphological Study on the Relation to the Epidermal Sweat Duct Unit

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Abstract. The palmar and plantar pits of keratosis punctata palmaris et plantaris were examined histologically in both vertical and horizontal sections. Pits were located in the crista superficialis epidermis, especially in the orifice of the sweat duct, but no iodine-starch reaction was detected in pits by perspiration testing. In the center of a pit was a parakeratotic wedge, deflecting the squamous cell layers downwards. The sweat duct was found in this parakeratotic wedge, and was occasionally obstructed.

Key words: Keratosis punctata palmaris et plantaris; Punctate keratoderma; Keratotic pits; Parakeratotic column

Punctate keratosis of the palms and soles is a relatively rare condition. The clinical and histological features of this disorder have been described adequately (1, 6, 8). The ailment has been described under many titles such as keratosis punctata palmaris et plantaris (3), keratoderma dissipatum hereditarium palmare et plantare (1), punctate keratoderma (2), keratoderma disseminatum (5) and keratosis palmoplantaris papulosa (9), and two different histological findings have been discussed since Brauer (1) made his first report. The keratotic horny mass of this lesion has been identified as being either orthokeratotic or as parakeratotic. Whether the keratosis primarily involves the sweat duct orifice is still in dispute (4, 6, 7, 8). The purpose of this paper is to emphasize the histopathological aspects of this distinct affliction.

CASE REPORT

A 72-year-old man was first seen on May 9, 1973, with the complaint of rough soles and erythematous scaly lesions of the knees, elbows, forearms and fingers. His soles had been rough since 1970, and the erythematous skin eruptions became apparent one year after he noticed the roughness of his soles. Recently the palms

became involved. Occasionally he experienced pain in his soles, especially after walking. He was not a manual laborer. His general health was good. He had never taken

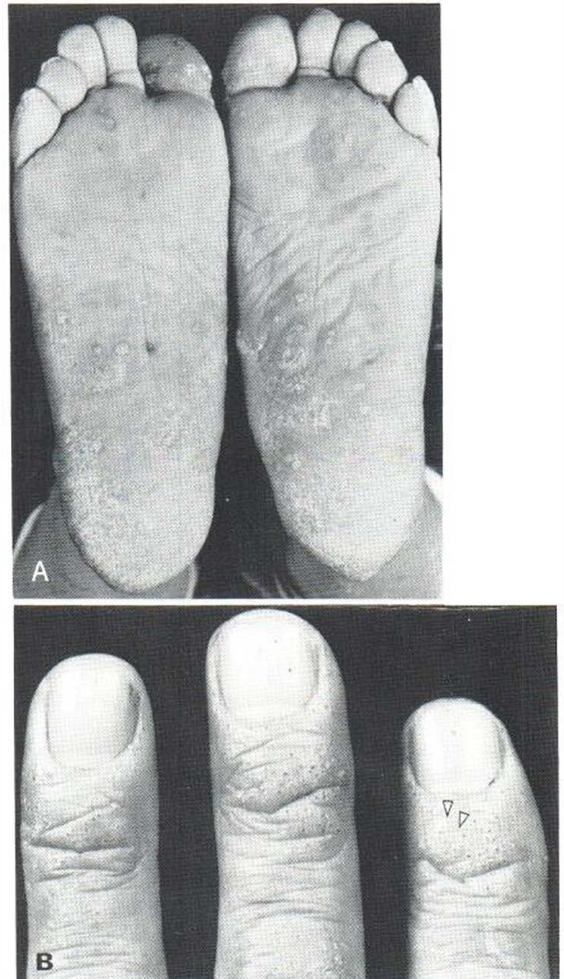


Fig. 1. (A) View of foot sole showing plugs of punctate keratoderma; (B) view of para-ungual area of fingers, showing several pits. Δ, a papular lesion.

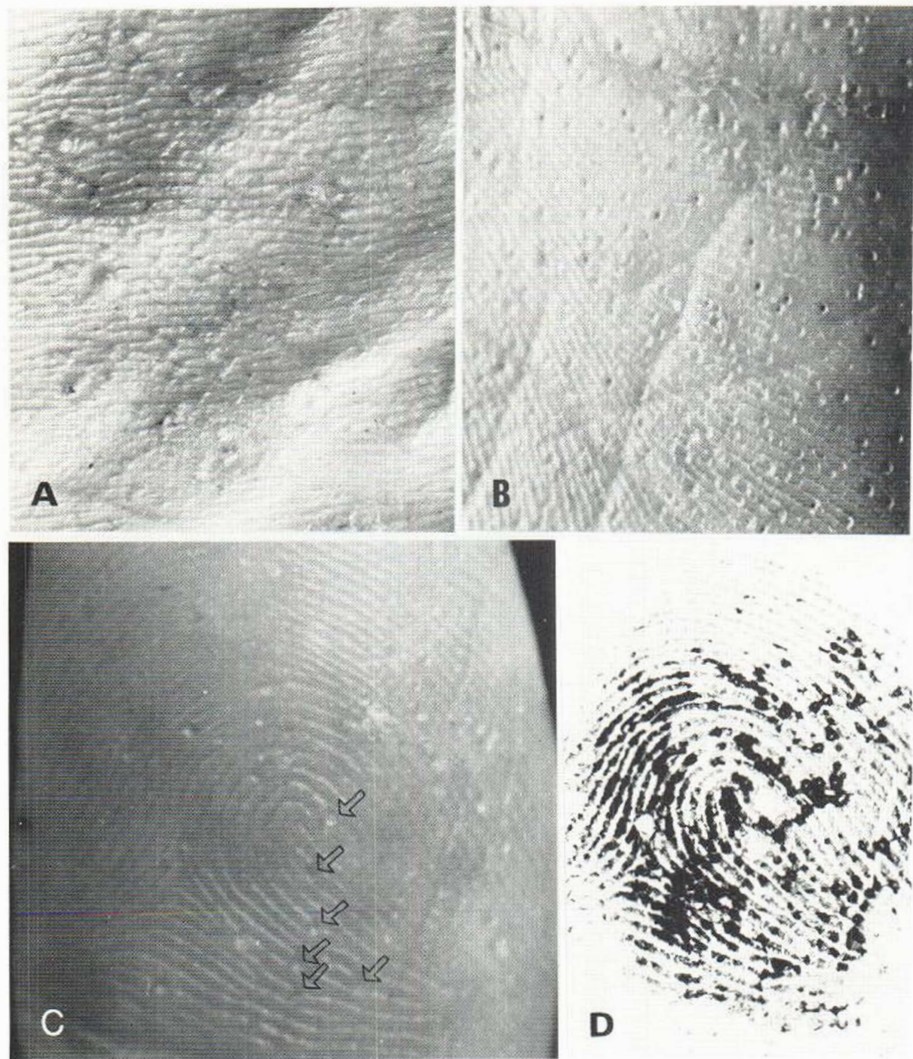


Fig. 2. (A and B) View of foot sole (A) and palm (B) showing numerous pits, which are located in the crista superficialis epidermis; (C) pits on the 5th finger; (D)

the result of the perspiration test on the same portion. Arrows indicate pits. No iodine-starch reaction is observed in any pit.

arsenic. He had seven sisters and brothers, and three children, none of whom was affected.

Physical examination showed the patient to be normal in every respect except for the palmar and plantar lesions, and the erythematous lesions on both knees, elbows, forearms and fingers. The erythematous lesions were histopathologically proved to be psoriasis, which disappeared after occlusive dressing therapy with corticosteroid. There was neither hyperhidrosis nor erythema of the palms and soles. A chest roentgenogram was normal and no abnormality was present in the gastrointestinal tract. α -fetoprotein and serologic test for syphilis were negative.

On both soles there were several discrete, warty nodules, varying in size from 1 to 3 mm in diameter

(Fig. 1 A), and on both palms and the palmar and parungual aspects of the fingers, plus the soles, there were numerous small pits, around 0.4 mm in diameter, which were located in the crista superficialis epidermis (Figs. 1 B, and 2 A, B, C). The nodules were firmly attached at their base and could not be easily removed, but when they were picked off, shallow cup-like depressions remained, being surrounded by the hyperkeratotic horny layers.

The perspiration test was carried out according to the modified method of Wada & Takagaki (11), but no iodine-starch reaction was observed in any pit (Fig. 2 C, D).

Microscopic Examination: Four specimens were taken for light microscopic examination; one from the plantar, nodular lesion, two from the palmar pits, and the last from a papular lesion of the para-ungual area of a

forefinger. Tissues were fixed with 5% formaldehyde, embedded in paraffin, and sectioned at 4 μ m. An attempt was made to demonstrate a central sweat duct by serially sectioning the biopsy specimens both vertically and horizontally (Figs. 4 and 5). Blood was put into a pit as a marker in order to identify the center of the pit.

Biopsies of all areas revealed parakeratosis, column shaped, in sharply delimited areas, extending below the general epidermal level of the malpighian layer. The papular lesion of a finger (Fig. 3B) and of a foot (Fig. 3A-a) revealed a rhomboid or columnar parakeratotic mass which raised the orthokeratotic horny layers and depressed the squamous cell layer. The sweat duct was observed in the orthokeratotic horny layers and the uppermost layer of the squamous cell layers (Fig. 3B). The papular lesions possibly represent the early stage of pits, into which they eventually develop. The parakeratotic change seen in Fig. 3A-a seemed to be the early stage of a nodular lesion on a foot. In the plantar nodular lesions, the parakeratotic column was located in the upper part of the horny layers and the orthokeratotic horny layers existed beneath the parakeratotic column, with granular cells present. Sweat ducts were located in both orthokeratotic and parakeratotic horny layers (Fig. 3A-a).

The vertical sections revealed ortho-hyperkeratosis, depressing the malpighian layer at the periphery of the pits (Fig. 4A). In the center of the pits, a wedge of parakeratosis was found in the hyperkeratosis (Fig. 4B, C). The sweat duct was located in the dermis (Fig. 4C), in both the squamous and the orthokeratotic horny layer (Fig. 4A, D), and in the parakeratotic column (Figs. 4B, E). Moderate acanthosis was present in the peripheral region of the pits, and the rete ridges beneath the edges of the pits revealed a slight degree of bending toward the center, giving the crab's claw appearance described by Coupe (4) (Fig. 4A). An eosinophilic, amorphous material was observed in the cytoplasm of the squamous cells beneath the parakeratotic horny layers. This proved negative with PAS staining following amylase digestion (Fig. 4F). The parakeratotic column was also negative with PAS staining following amylase digestion, but positive with Feulgen stain, which proved it to consist of parakeratotic nuclei.

The horizontal sections are shown in Fig. 5. The upper section reveals four pits (1-4) in the same section, corresponding to the sweat ducts (Fig. 5A). In lower sections, there are sharply defined, circular, onion-skin formed parakeratotic masses filling the pits (Fig. 5B, C, E, F, G). Small tubular structures found near the center of these parakeratotic masses were occasionally pressed and obstructed (Fig. 5E, F). It was not clear whether the sweat duct was orthokeratotic or parakeratotic, though it seemed to be the latter (Fig. 5E, F, G). In the lowermost section, the normal structure of the sweat duct was revealed in portions of the pits (Fig. 5D).

DISCUSSION

According to the descriptions given in several papers (1, 4, 6, 8), this case fits the clinical criteria

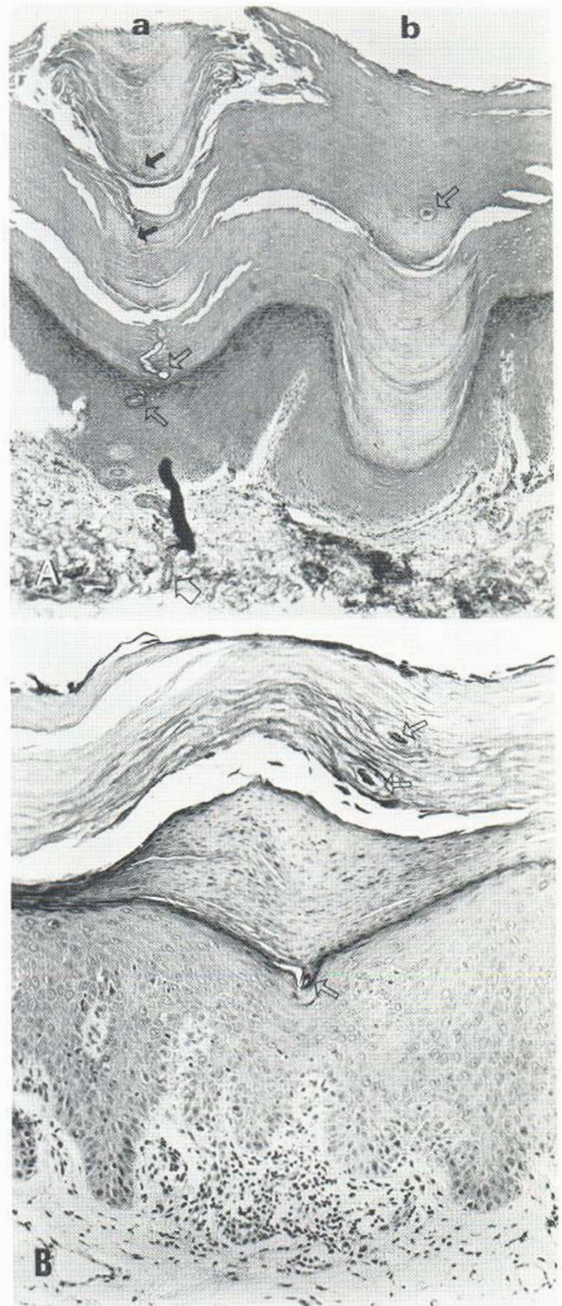


Fig. 3. Lower view of biopsies showing column of parakeratotic material, (A) A biopsy specimen taken from foot sole; (B) a biopsy specimen of a papular lesion from the para-ungual area of a finger. A rhomboid parakeratotic mass elevated the orthokeratotic horny layers and depressed the squamous cell layers. ♂, Sweat duct; ♀, depressed sweat duct. (A) $\times 50$. (B) $\times 150$.

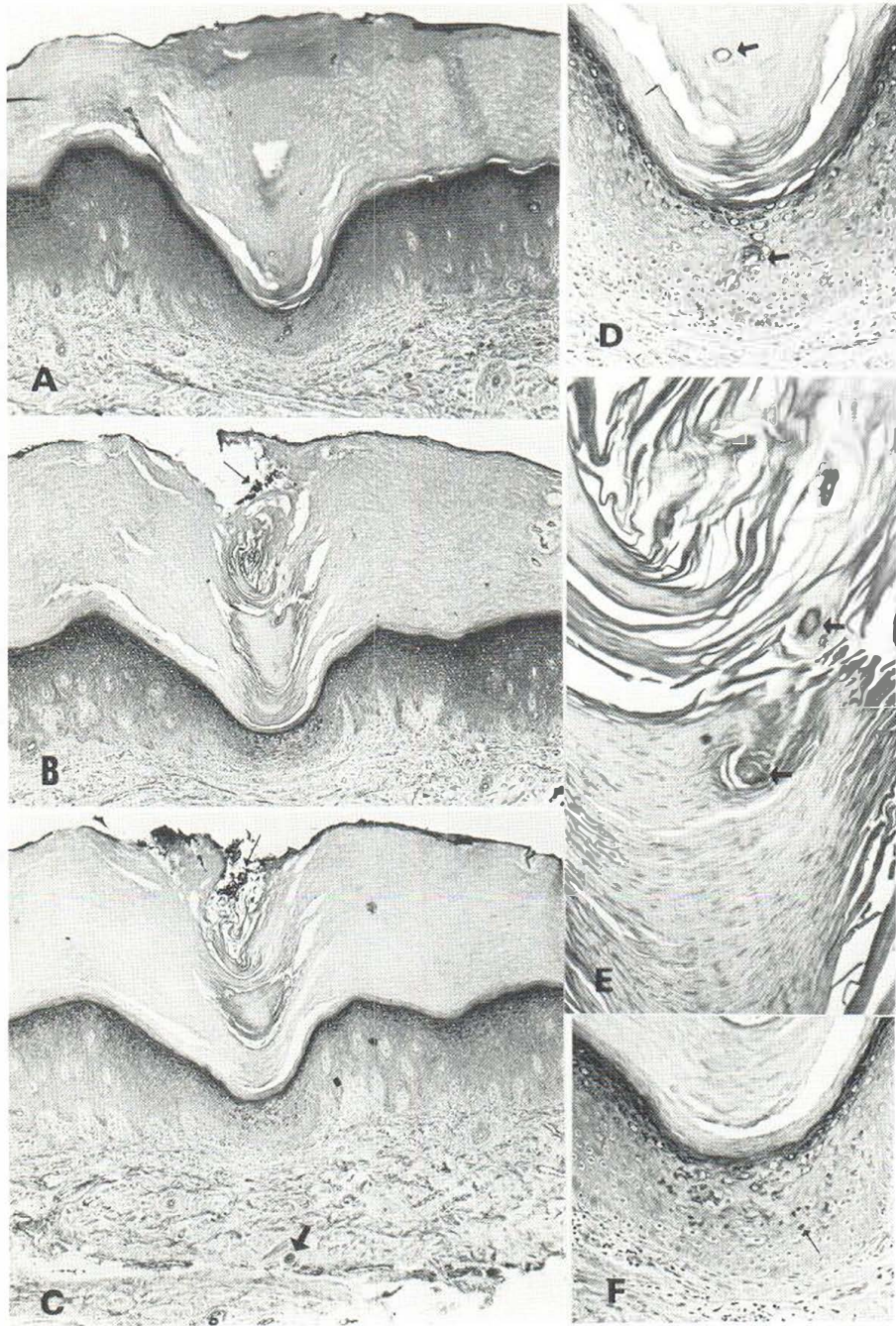


Fig. 4. Vertical sections of a pit, taken from the palm. (A) At the periphery of a pit; (B and C) in the center of a pit; (D, E and F) magnified pictures of A, B and C respectively. (A) $\times 45$, (B) $\times 45$, (C) $\times 45$.

(D) $\times 120$, (E) $\times 300$, (F) $\times 120$. Arrow in B and C: red blood cells, indicating the center of a pit. Arrow in D and E: the sweat duct. Arrow in F: the eosinophilic material in the squamous cells.

of keratosis punctata palmaris et plantaris, except for the absence of the inheritance. although Heierli-Forrer reported (6) that an extensive examination

of all relatives failed to reveal any keratotic skin lesion. However, there have been many other cases without apparent inheritance (4, 8, 10). The

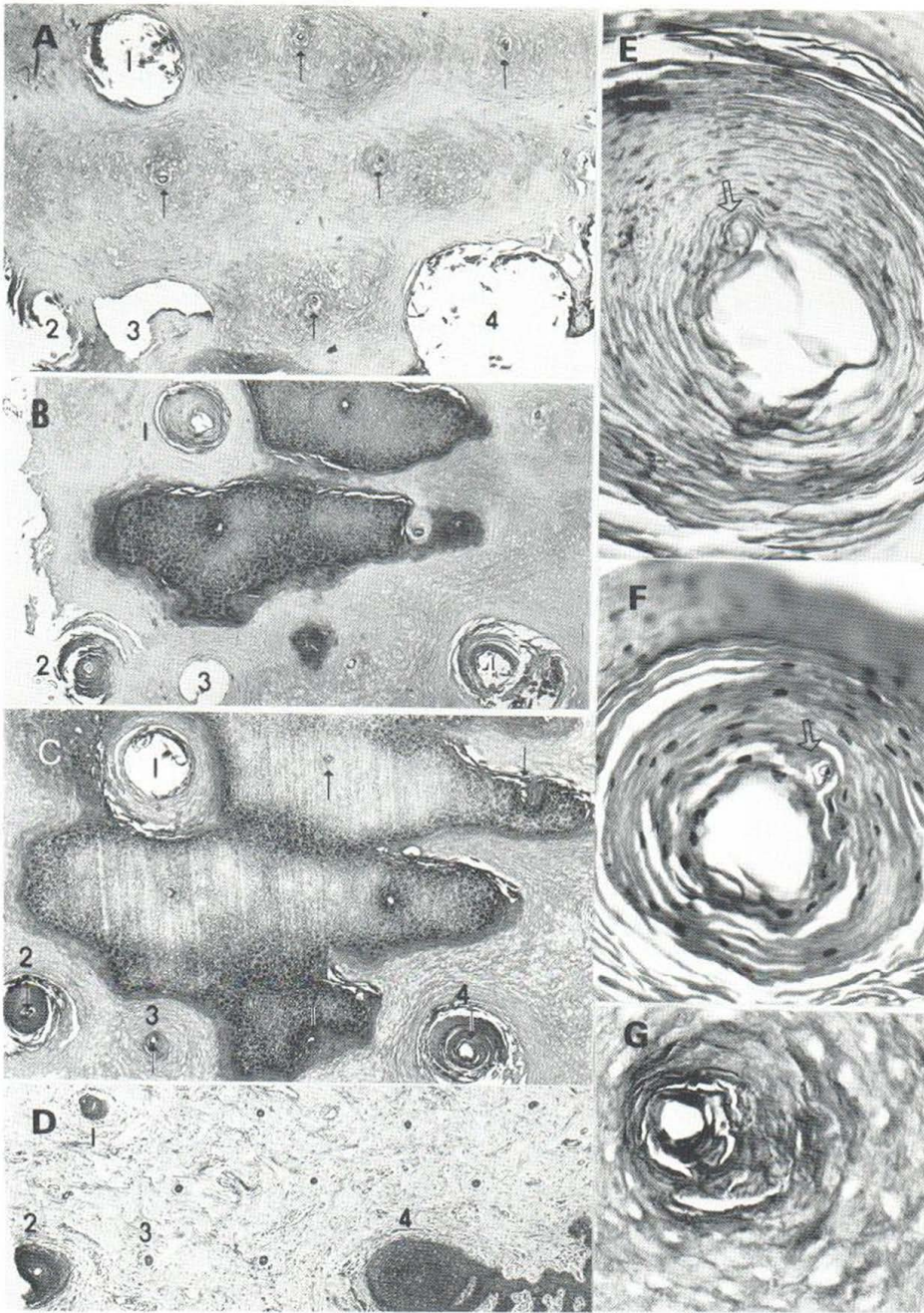


Fig. 5. Horizontal sections of pits from the palm. (A) A section on a level with the top of the horny layer. Four pits were seen. (B) On a level with the lowermost layer of the stratum corneum. The onion-skin formed parakeratotic masses were filled in pits. (C) A level with the squamous cell layer. (D) A level with the upper

dermis. (E, F and G) Magnified pictures of pits (B-1, C-4 and C-3 respectively). Sweat duct is observed in the onion-skin formed parakeratotic mass. Arrow: the sweat duct. (A) $\times 50$, (B) $\times 50$, (C) $\times 50$, (D) $\times 50$, (E) $\times 300$, (F) $\times 300$, (G) $\times 300$.

present case may be either a first generation mutation or a non-hereditary form of punctate keratosis.

Brauer reported nine cases of keratoma dissipatum hereditarium palmare and plantare and observed histologically that the wedge of parakeratotic horny layers displaced the epidermis downwards in the center of the pits. Identical histological findings could be found described in only a few other papers (2, 7). Brown (2) presented a case, demonstrating a sharply defined projection of parakeratosis originating directly from the malpighian layer without an intervening granular layer. In Brown's case, the histological findings are identical to those of Brauer; that is, the horny layer at the periphery of the keratotic pit was hyperkeratotic, but in the center was the wedge of parakeratosis, in which the epidermis was deflected downwards and which consisted of a few squamous cell layers without any granular cells. The column usually consisted of parakeratotic horny layers, since it was positively stained by Feulgen reagent, but not with PAS stain, though Herman (7) noted that the parakeratotic column was positive with PAS stain following amylase digestion.

As Heierli-Forrer described, the clinical features of keratosis punctata palmaris et plantaris were quite different from porokeratosis of Mantoux (5). In our case, there was no hemorrhage, no dark comedo-like punctum and the keratotic lesion was not transient, but progressive. Arsenic and syphilis have been indicated as causes of keratoses localized on the palms and soles. Despite careful questioning about possible exposure to arsenic, the author was unable to find such history. Histologically, there was no evidence of arsenical dyskeratosis or vacuolization in any portion of the malpighian cell layers. A serologic test for syphilis was negative.

The relation of keratosis punctata palmaris et plantaris to the epidermal sweat duct unit has been shown in several papers (2, 4, 7), but not in others (3, 6, 10). In our case, the abnormally keratinized squamous cells were shown located close to the epidermal sweat duct, involving the latter in the parakeratotic horny layers and causing obstruction of the duct, which may explain the failure to demonstrate sweat excretion from the pits. It is evident that the pits were located in the orifices of sweat ducts of the crista superficialis epidermis, and the parakeratotic change of the keratinization of the squamous cells was located close to the

epidermal sweat duct. This propensity of the skin lesion indicates a possible causal relation between the sweat duct unit and a disorder of the keratinization, but no evidence was obtained to prove this.

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