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We hope that making available the relevant information on Pachyonychia Congenita will be a means of furthering research to find effective therapies and a cure for PC.
PACHYONYCHIA CONGENITA JADASSOHN–LEWANDOWSKY: A DISORDER OF KERATINIZATION

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Abstract. A 15-month-old boy with pachyonychia congenita is described. The patient also had follicular keratosis, leukokeratosis of the tongue, and blisters on the soles. Histopathological examination of the follicular keratosis showed hyperkeratosis and acanthosis. Horny plugs were located in sweat pores. By electron microscopy abnormal keratinization was demonstrated.

Keywords: Pachyonychia congenita; Genodermatoses; Sweat pore; Abnormal keratinization

Pachyonychia congenita is characterized by remarkable nail changes, especially thickening of nails and especially at the edges and base of nails, and intrafollicular keratosis. The disease is inherited as an autosomal recessive trait. The nails are thickened and sometimes distorted. The skin is often affected, with dryness, scaling, and hyperkeratosis. The disease is usually diagnosed in early childhood, and the prognosis is generally good. Although there is no specific treatment, symptomatic management can be provided for the various symptoms.

CASE REPORT

The patient is a 15-month-old boy. The family history is entirely negative. He was born with brownish-yellow nails. A few weeks after his birth, the mother noticed that all the nails were thickening in the upward and outward directions. At the age of 8 months some of the nails became inflamed and dropped off. Horny spines developed on his knees, elbows, and abdomen. A clinical examination showed normal growth and normal mental as well as somatic condition. All nails (Fig. 1) showed marked thickening, some of them measuring 0.6 mm. Some of the nail beds showed inflammatory changes. On the extensor surfaces of the knees (Fig. 2) and elbows, follicular keratosis was found. On the abdomen and buttocks, discrete follicular horny spines appeared. In the right-hand corner of the mouth, a keratotic fissure was found, from which candida albicans was cultivated. The centre of the dorsum of the tongue was smooth and covered by a thin greyish keratotic film. The development of the teeth was normal for the age of the patient. The eyes were normal. At a follow-up examination, at the age of 18 months, large tense bullae had developed on the soles of the feet.

Fig. 1. Typical thickened nail of pachyonychia congenita.
Light microscopy
Skin biopsies were removed from the involved areas of the knees, fixed in neutral formal, and serial paraffin sections were prepared. The sections were stained with hematoxylin-eosin, a 0.1% aqueous solution of toluidine blue and the van Gieson-Hansen method. A thick horny layer covered the epidermal surface and the walls of funnel-shaped sweat pores, the cavities of which were filled with horny masses. No hair follicles were seen in the sections. No retention cysts were found and neither was there any parakeratosis. The stratum granulosum was thickened. Wide elongated ridges invaded the upper corium, separated by thin papillae. Squamous and basal epidermal cells appeared normal. The lower parts of the intradermal sweat ducts were normal. The ducts showed a minimum of cell infiltration (Figs. 3).

Electron microscopy
Skin specimens removed from the same areas as for light microscopy were fixed in 6% glutaraldehyde in Veronal acetate buffer, pH 7.2, with 7% sucrose. The specimens were osmicated, hydrated and embedded in Epon 812. Ultrathin sections were stained with uranyl acetate and lead.
Like sweat pore with thick stratum granulosum horn plug. The opening of the duct is blocked.

The epidermal surface and the walls of functional sweat pores, the cavities of which were filled with many masses. No hair follicles were seen in the specimen. No retention cysts were found anywhere in the specimen. The stratum corneum was thickened. Wide elongated rete ridges were seen in the upper corium, separated by large spaces. The epidermal cells were flattened, and the basal epidermal cells were normal. The lower parts of the intradermal eccrine sweat ducts were normal. The dense infiltration of cell infiltration (Figs. 3, 4, 5).

Histology

Tissue samples removed from the same area as from the previous section were fixed in 6% glutaraldehyde in a cacodylate buffer, pH 7.2, with 7.5% sucrose. The tissue specimens were osmicated, stained in uranyl acetate, dehydrated, and embedded in Epon 812. Ultrathin sections were stained with uranyl acetate and lead citrate and observed in a Philips 400 electron microscope.

Like sweat pore with a horny plug. Horn plug is covered by keratohyalin granules under the luminal cells (L). Thick keratohyalin granules (arrows) surround the perinuclear area, and the core of the sweat duct is preserved. x4,000.

The upper part of the funnel-like sweat pore can be seen. The thin wall shows normal structures, while horn plug is completely surrounded by keratohyalin granules (asterisk) apposed to the inner side. Keratinosomes (arrows). x40,000.
citrate and observed in a Siemens electron microscope (Elmiskop IA) at 80 kV.

Several layers of dense horny cells with lacunae covered the outer surface of the epidermis. The intercellular spaces of the horny layer were filled with lucent homogeneous material, remnants of keratinosomes and dense homogeneous desmosomes. Stratum granulosum cells in 3-4 layers contained thick tonofilament bundles with irregular masses of keratohyalin and numerous keratinosomes. The keratinosomes had a homogeneous content with indistinct transverse stripes. The cells lay closely packed and were connected by interdigitations and distinct desmosomes. Epidermal cells in the lower Malpighian and basal layers were connected by desmosomes crossing more or less dilated intercellular spaces. The cells contained thick bundles of tonofilaments in the periphery of the cytoplasm and mitochondria and ribosomes in the perinuclear areas. Glycogen particles were occasionally found among the cell organelles.

Fig. 7. Luminal cells (L) with round particles and filament bundles. Duct (D). Horny cells (H). Keratohyalin granule (asterisk). Keratinosomes (arrows). X40000.

The walls of the funnel-like sweat pores show normal luminal cells (Fig. 5) surrounded by several layers of horny cells (Fig. 6). The individual horny cells and intercellular spaces were identical with those of the surrounding epidermis. Below the horny cells, the stratum grano- lusomum shows large keratohyalin granules and keratinosomes with indistinct inner structures, quite similar to those of the surrounding epidermal cells. The horny plugs of the sweat pores consisted of several dense horny cells. Luminal cells were seen in a cleft in the center of the plug. The sweat pores were not closed by a plug (Fig. 7). These luminal cells contained horny masses, filamentous masses and keratinosome-like particles in their cytoplasm.

DISCUSSION

According to Moldenhauer & Ernst (8), palmar and plantar hyperkeratosis, follicular keratosis, leuko- keratosis of the tongue and blister formation on the
soles were the most common symptoms accompanying pachyonychia congenita. Pachyonychia and leukokeratosis of the tongue are often noted in affected newborn babies. Later on, follicular keratosis starts on the elbows and knees and spreads to other parts of the body (8, 13). Histopathological examination reveals hyperkeratosis, acanthosis and horny plugs in follicular orifices (1, 13). Andrews (1) described horny plugs in sweat pores. The tortuous part of the epidermal sweat duct in normal skin does not contain horny cells under the luminal cells (4, 14). Keratin masses in luminal cells first appear in the horny layer. Compared with the structural aspects of the normal sweat duct, the present findings indicate that keratinization takes place in the outer part of the epidermal sweat duct. The detailed structure of keratinizing cells of the epidermal surface as well as in sweat pores is similar, though in the sweat pore, lacunae of horny cells and keratohyalin granules dominate. The other skin manifestations of the disease, viz. plantar hyperkeratosis and ichthyosis, show similar structures by electron microscopy (10). However, these changes of keratinization are different from those seen in normal keratinization, particularly the lacunae in the horny cells and the lack of separation of desmosomes between horny cells, the large indistinct keratinosomes, the increased numbers of keratohyalin granules, and the thick tonofilament bundles. In such horny cells, keratohyalin granules and tonofilament bundles resemble those of ichthyosis congenita (2, 9) and ichthyosis hystrix (3). However, distinct keratinosomes are not seen in this disease. Congenital ichthyosiform erythroderma shows tumps of tonofilaments around the nucleus (11). In hyperkeratotic skin, after ultraviolet irradiation, the horny cells show round lacunae (9), which are not seen in this disease.

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