Short report

MYCOLOGICAL EXAMINATION IN PACHYONYCHIA CONGENITA

A. Kansky, M. Dolenc-Voljč, P.E. Bowden and M. Belič

ABSTRACT

Introduction. Pachyonychia congenita (PC) is a hereditary disorder of keratinization characterized by extremely thickened nails, follicular hyperkeratosis, insular palmoplantar keratoderma and thickened, whitish lingual and buccal mucosa sometimes involving also gingivae. It was established during the last few years that this disorder is due to mutations of keratin genes. The additional role of yeasts in the pathogenesis of PC was sometimes questioned, however no systemic study could be traced in the literature.

Methods. Mycologic investigations of nails and insular keratoses were carried out in eight Slovenian patients with PC-1: direct microscopy and cultivation on Sabouraud's dextrose agar. In all these patients the keratin mutations had been defined.

Results. Candida species (Cand sp) were isolated from fingernails in two and *Aspergillus sp* in another patient. From toenails *Cand sp* was isolated in 2 and *Rodotorula sp* in another patient. From the keratinous material from the soles *Trichophyton mentagrophytes* was isolated in two patients and *Cand sp* in another.

Conclusion. Detection of *Cand sp, Aspergillus sp* or *Rodotorula sp,* spores in just a few patients is considered to be an accompanying phenomenon.

KEY WORDS

mycological examination, nails, pachyonychia congenita, PC-1, yeasts

INTRODUCTION

Pachyonychia congenita (PC) is a well-defined entity within the broad group of hereditary palmoplantar keratodermas (HPPK). According to McKusick (1) two broad phenotypic variants of PC are recognized: type Jadassohn-Lewandowsky or PC-1 (MIM 167200) and type Jackson-Lawler or PC-2 (MIM 167210). PC-1 is characterized by a thickened, brownish nail plate with a rough surface, insular hyperkeratoses of palms and soles, follicular hyperkeratosis affecting

Table 1. Mycological investigations of fingernails in 8 patients with pachyonychia congenita – type 1.

Investigation	Negative	Positive	No.	Patients
direct microscopy	5	3 (yeasts)		
culture	4	4: *Candida sp, Rhodotorula sp.*	1	L
		Aspergillus sp	1	A II/2
		Candida sp	2	P I/1, P II/2

specially the temples, nose and extensor surfaces of the arms, as well as by thickened, whitish mucosa of the tongue and cheeks (leukokeratosis) (2,3). In PC-2 additionally to thickened nails, sebaceous cysts and sometimes teeth at birth (neonatal teeth) are expressed, while the other above listed symptoms may be less prominent or absent. The thickened nails are in the majority of patients present at birth, but they may appear within the first 6 months.

The genetic deficiencies in PC have been extensively studied by a few groups of authors. In PC-2 the disorder was linked to mutations in keratin K17 and in PC-1 to K16 (4). In the eight Slovenian patients who have been investigated, K6a was affected by mutations (5). In five of these patients identical mutations in the central Rod Domain (helix) of K6a were identified: removal of one of the two adjacent asparagines N170/171 (families A and O); in two patients (family P) a F174S mutation, phenyl-alanin to serin, and in one patient (family L) a N171K (asparagine to lysine) mutations were detected (5).

PC is generally a rare disorder, however in the Slovenian and Croatian populations its appearance is not unusual (6,7). The fact that the symptoms are expressed already in babies has led to the misinterpretation of this condition as candidiosis, so that certain patients have been unnecessarily exposed to systemic antimycotic treatment.

As such erroneous view still exists we decided to investigate our PC-1 patients mycologically.

Table 2. Mycological investigations of toenails in 8 patients with pachyonychia congenita – type 1.

Investigation	Negative	Positive	No.	Patients
direct microscopy	5	3 (yeasts)		
culture	5	3: *Rhodotorula sp*	1	L
		Candida sp	2	P I/1, P II/2

MATERIALS AND METHODS

The investigation focused on eight patients with clear-cut symptoms of PC-1, in whom the mutations of the keratin gene (KRT6a) were proved at the molecular level. All these Slovenian patients with PC-1 were available for mycological investigations. Their ages ranged at the time of this investigation from 9 years (SP) to 69 years (LD). Scrapings were taken by the usual procedure from finger- and toenails, as well as from hyperkeratotic lesions of the soles and palms. Direct microscopic investigation was done after the digestion of the hyperkeratotic material with 10% KOH. The culture was performed on Petri dishes on Sabouraud's dextrose agar (Difco).

RESULTS

Only a few spores and no hyphae were detected, except in patient LD, in whom a larger number of spores was found on toenails. *Cand sp* were isolated from the fingernails of two patients, *Cand sp* together with *Rhodotorula sp* in one and *Aspergillus sp* in one. From the toenails *Cand sp* were isolated in two and *Rodotorula sp* in one patient. Details are given in Tables 1 and 2.

From the keratinous material on soles *Trichophyton mentagrophytes* was isolated in two patients and *Cand sp* in one patient. Scrapings from palms were negative in 4 patients. Table 3.

DISCUSSION

No systematic mycologic investigation of the affected nails in PC patients could be detected in the literature and only a few sporadic observations were found. Forslind et al (8) mentioned that colonies of *Candida albicans* were detected in leukokeratotic lesions of oral mucosa in one, while the other patient under their observation was suffering from

Table 3. Mycological investigations of the keratinous material from the soles in 7 patients with pachyonychia congenita – type 1.

Investigation	Negative	Positive	No.	Patients
direct microscopy	6	1 (mycelium)		
culture	4	3: *Tr. mentagrophytes*	2	A I/1, P I/1
		Candida sp	1	P II/2

paronychia probably caused by *Candida albicans.* Mawhinney et al (9) as well as Sivasundram et al (10) mentioned chronic candidosis in the mouth, only Paller et al (11) mentioned concomitant candidal organisms of the nails in one out of their five patients. In certain publications mycologic investigations of the nails are not mentioned at all (12).

A limited number of skin disorders may cause differential diagnostic difficulties. It is known that skin and mucosal symptoms in mucocutaneous candidosis, in immunologically handicapped children, can be to some extent similar to PC. However in such cases mycology is helpful by finding hyphae and numerous spores, thus indicating a pathogenic role of yeasts, mostly *Cand sp.*

Another diagnostic pitfall is the rare dominant form of epidermolysis bullosa dystrophica (EBD), as it was correctly mentioned by Moldenauer and Ernst in 1968 (13). Such diagnostic problem may arise when there are present only a few thickened nails and a history of blistering and extensive scars. Some cases described in the literature as PC, are most probably cases of the dominant EBD (6,14). Other rare confusing disorders, which have also to be taken into consideration, are various hereditary and nonhereditary dystrophies of the nails.

Molecular DNA investigation, which enables the detection of keratine gene mutations KRT6a, KRT16, KRT17 or KRT6b, permits nowadays a definite genetic confirmation of PC.

Finding dermatophytes on the soles of PC patients is not surprising as hyperhydrosis is a frequent accompanying symptom in HPPKs. Detection of dermatophytes in patients with the diffuse HPPK of the Unna-Thost type was reported by Gamborg-Nielsen in 33 out of 91 (36.2%) Swedish patients (15).

CONCLUSIONS

It has been proven unequivocally that PC is a hereditary disorder of keratinization. A number of mutations have been identified. Detection of a few spores of *Candida sp, Aspergillus sp* or *Rhodotorula sp* in some of our patients should be considered only an accompanying and not an etiological phenomenon.

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