SHORT COMMUNICATION

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Is *Staphylococcus epidermidis* Involved in the Etiopathogenesis of Pitted Keratolysis?

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Pitted keratolysis (PK) is a superficial bacterial infection involving almost exclusively the soles. It is more common in tropical and subtropical countries, and in subjects who wear occlusive shoes for long periods. The most important risk factor is hyperhidrosis. PK is characterized by small, isolated or confluent, crateriform, noninflammatory pits. Maceration and bad smell are common (1). We recently published the case of a 37-year-old Caucasian man with PK in whom, for the first time, bacteriological examinations were positive for *Staphylococcus aureus* and *S. epidermidis* (1). After this case, we observed another patient with the same bacteriological results.

CASE REPORT

A 46-year-old Caucasian man was admitted with a clinical diagnosis of PK. The patient stated that he was in good general health and that he was not in therapy with systemic drugs. He worked as a mason and wore occlusive shoes for 8 h a day. He also stated that the dermatitis appeared 8 months before and that it was unsuccessfully treated with antiperspirants, zinc oxide, amikacin and gentamicin. Dermatological examination showed the presence of numerous confluent, crateriform, noninflammatory, macerated and malodorous pits located on the forefeet (**Fig. 1**). General physical examination was normal. Laboratory tests were within normal limits. Cytological examinations revealed the presence of numerous Gram-positive, coccoid-shaped bacteria. Swabs (flocked Copan, with eSwab technology) of some lesions were made. Transport swabs (in eSwab liquid medium, with 1 mL Amies liquid transport medium and probe with flocked nylon fibre tip) were used. Culture media used were 5% sheep blood agar (incubation for 24–48 h), MacConkey agar (incubation at 35–37°C for 24 h), mannitol salt agar (incubation at 35–37°C for 24 h) and Sabouraud dextrose agar (incubation at 32°C for 5 days). Bacteriological cultures were positive for *S. aureus* and *S. epidermidis*. A semi-quantitative assessment of bacterial load was used. *S. epidermidis* and *S. aureus* were identified by mass spectrometry (matrix assisted laser desorption ionization timer-of-flight [MALDI-TOF]), performed on samples obtained from cultures. No other Gram-positive or Gram-negative bacteria were detected. Mycological examinations were negative. The patient was successfully treated with 1% polyhexamethylene biguanide cream (1 application/day) and a cream containing the anticholinergic glycopyrronium bromide (1 application/day), in order to reduce hyperhidrosis and maceration, for 6 weeks. No side effects were reported or observed. A clinical cure was observed at a 4-month follow-up.

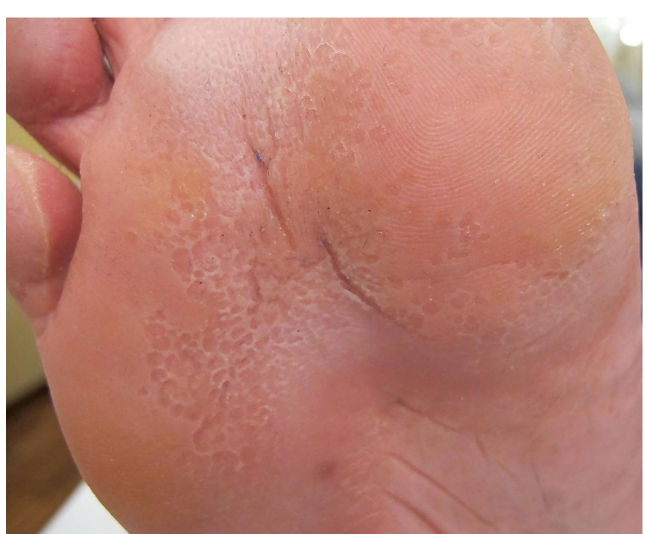

Fig. 1. Confluent, crateriform, noninflammatory, macerated pits located on a forefoot: pitted keratolysis.

DISCUSSION

Several bacteria were considered as possible aetiological agents of PK. *Dermatophilus congolensis* releases keratinases which are able to degrade keratin (2–6). Other possible involved bacteria are *Micrococcus sedentarius* (PK was produced experimentally in a volunteer by applying this bacterium under occlusive dressing on a heel) (7), *Kytococcus sedentarius* (the novel name of *M. sedentarius*), which produces two proteases, P1 and P2 (8), and *Bacillus thuringiensis* (9). Coccoid and diphtheroid bacteria (10, 11) and *Corynebacterium* sp. (12–15) were also isolated. These bacteria are both inter- and intracellular (10, 11). In summary, most authors observed the growth of Gram-positive, pleomorphic, aerobic bacteria (12). However, in the study by Nordstrom et al., bacteriological examinations were positive for

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Gram-negative bacteria, diphtheroids, *Corynebacterium minutissimum, Brevibacterium* sp., *S. aureus* and coagulase-negative staphylococci (7). In our patient, and in the patient we previously reported (1), bacteriological examinations, including culture and MALDI-TOF, were positive for *S. aureus* and *S. epidermidis,* i.e., two Gram-positive, catalase-positive, coagulase-negative bacteria. As *S. epidermidis* is a ubiquitous commensal on the skin, it is difficult to explain its potential etiopathogenetic role in PK. Further studies are therefore necessary. However, our results and literature review confirm that PK can be caused by different bacteria.

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Ethics committee: Written informed consent was obtained from the patient included in the study, regarding also the publication of the photos.

The authors have no conflicts of interest to declare.

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