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Case Report

Cratered soles and malodor in a teenager: A case of pitted keratolysis

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Abstract

Pitted keratolysis is a superficial bacterial infection commonly affecting individuals exposed to prolonged occlusion and hyperhidrosis. Adolescents are often underdiagnosed, particularly in shared living environments. A 16-year-old male presented with a 6-month history of pruritus and excessive moisture on both soles. He lived in a boarding school environment with prolonged footwear use. The patient denied any prior treatments or known allergies. Physical examination revealed clusters of shallow, punched-out pits on the pressure-bearing areas of the plantar surface, accompanied by maceration, malodor, and mild erythema. No signs of fungal infection were noted. Diagnosis of pitted keratolysis was established clinically. The patient was treated with topical fusidic acid applied twice daily for 14 days, along with recommendations to maintain dry feet, use absorbent socks, and alternate footwear. Two weeks later, the lesions had considerably improved, and there was a noticeable decrease in itching and odour. No recurrence was observed after four weeks.

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Introduction

Pitted keratolysis is a superficial bacterial infection of the plantar stratum corneum, marked by numerous small crater-like depressions on weight-bearing regions of the soles and often accompanied by a pronounced odour. The prevalence ranging from approximately 1.5 to 10% in general population and higher rates have been documented in high-risk groups such as military personnel, athletes, and adolescents that live in communal environment. The condition is closely linked to plantar hyperhidrosis, extended use of occlusive footwear, and humid environments conducive to bacterial proliferation; clinical severity varies from a mere cosmetic concern to symptomatic lesions that induce discomfort and social anxiety, especially in adolescents and athletes.[1,2] Pathogenesis generally entails Gram-positive organisms proficient in keratin degradation, notably Kytococcus sedentarius and Corynebacterium *spp*., which generate proteolytic enzymes and sulfur compounds that contribute to the "sour" or sulfurous stench. Diagnosis is primarily clinical, augmented as required by basic bedside tests or dermoscopy to differentiate pitting keratolysis from fungal or other erosive plantar disorders.[2,3] Management focuses on eradication of the causative bacteria and modification of predisposing factors. First-line therapy is topical, a range of topical antibiotics and topical antibacterials or keratolytics such as benzoyl peroxide have demonstrated effectiveness. Randomized data exist supporting benzoyl peroxide regimens and combination of topical preparations such as clindamycin 1% with benzoyl peroxide 5% have been reported as useful options in refractory or recurrent cases.[4,5]

Enhanced foot hygiene, effective drying methods, breathable footwear, frequent sock changes, and

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management of hyperhidrosis also crucial to minimize recurrence. Pitted keratolysis can significantly affect the psychological well-being of adolescents due to issues such as odour, embarrassment, and obstacles to sports or social engagement thus, precise clinical descriptions of effective and low-risk of topical treatments are clinically important.[1,2] This case report a teenager who presented with cratered soles and significant malodour and who experienced clinical resolution with a topical antibiotic regimen. The prevalence of pitted keratolysis varies depending on population characteristics, environmental conditions, and occupational exposure. Previous studies reported prevalences of 1.5% among industrial workers in Korea, 2.25% among randomly evaluated individuals in New Zealand, and 2.6% among male boarding school students in Turkey. In tropical countries such as Indonesia, factors including high humidity, warm climate, excessive sweating, and the use of occlusive footwear may increase the risk, particularly in high-exposure populations where prevalence may exceed 20–40%.[1,2] However, epidemiological data from Indonesia remain very limited. Based on our clinical experience, pitted keratolysis is likely underreported rather than truly rare, as many cases are treated empirically without further documentation. Therefore, this case report aims to highlight its clinical features and increase clinician awareness. Our report contributes to the limited literature from Indonesia and emphasizes that early recognition is important because the condition is readily treatable. This report highlights key diagnostic clues, evidence-based treatment options, and preventive strategies to reduce recurrence.

Case Report

A 16-year-old guy reported to the dermatology clinic with a 6-month history of chronic plantar pruritus, hyperhidrosis, and gradually increasing odour. The symptoms were bilateral and disrupted his daily activities, especially during athletics and social living at his boarding school. The patient expressed shame regarding the odour, prompting him to often refrain from removing his shoes in communal spaces **(Figure 1)**.

Figure 1 Multiple shallow, punched-out pits with surrounding maceration on the pressure-bearing areas of the plantar surface, characteristic of pitted keratolysis.

He had no significant medical history, took no medications, and denied a family history of hyperhidrosis or dermatologic disease. He reported wearing closed shoes for more than 10–12 hours daily and frequently reused the same footwear on consecutive days. He denied prior use of topical or systemic treatments and reported no known allergies.

On physical examination, both soles exhibited clusters of shallow, punched-out pits ranging from 1–3 mm in diameter, predominantly located on the pressure-bearing regions including the anterior plantar surface and heels. The surrounding skin showed maceration, mild erythema, and a soft, soggy texture consistent with prolonged moisture exposure. A distinct sulphurous malodour was present. No fissures, vesicles, or scaling were observed. The interdigital spaces were intact without maceration or scaling, and no signs of tinea pedis or erythrasma were identified. Toenails were normal, and there were no signs of onychomycosis. No bacterial culture or KOH examination was deemed necessary.

A clinical diagnosis of pitted keratolysis was established. The patient was prescribed topical fusidic acid 2% cream to be applied twice daily for 14 days. He was instructed to keep his feet dry, change socks twice daily, rotate footwear, use absorbent cotton or moisture-wicking socks, and

Figure 2 The pits were significantly reduced in number and depth, maceration had resolved.

avoid occlusive shoes outside school hours. Education was provided about the role of hyperhidrosis and prolonged occlusion in disease recurrence.

At the 2-week follow-up, the patient demonstrated a clinical improvement. The pits were significantly reduced in number and depth, maceration had resolved, and the malodor disappeared. The patient reported substantial reduction in pruritus and improved confidence in school activities. A 4-week telephone follow-up indicated sustained improvement with no recurrence after adopting the recommended lifestyle modifications **(Figure 2)**.

Discussion

Pitted keratolysis (PK) is a superficial bacterial infection of the stratum corneum characterized by multiple crateriform pits on the plantar surface, typically accompanied by malodour and hyperhidrosis. It predominantly affects individuals whose lifestyle promotes prolonged moisture retention. A higher prevalence was reported among adolescents, military personnel, athletes, and individuals wearing occlusive footwear for extended periods.[6] It is as an uncommon conditions and many experts believe that it is mostly under recognized and underreported. The patient in this report exhibited several classical risk factors, including living in a boarding school environment, engaging in daily sports activities, and using closed footwear for more than 10 hours per day.

The condition is caused by Gram-positive bacteria most commonly Kytococcus sedentarius, Corynebacterium *spp*. and Dermatophilus congolensis which thrive in humid and occluded environments.[9,10] These organisms produce keratinolytic serine proteases and sulfur-containing compounds that create the characteristic punched-out pits and distinctive odor.[1,2] Adolescents may be particularly vulnerable due to increased sweat gland activity and limited awareness of preventive foot hygiene.[3,4]

The diagnosis of PK is largely clinical. Typical findings include shallow pits on weight-bearing regions, maceration, and malodor, all of which were evident in this patient. The differential diagnosis of this condition could be tinea pedis and erythrasma. The absence of interdigital maceration, vesicles, and scaling helped distinguish PK from tinea pedis, while the lack of coral-red fluorescence on Wood's lamp examination excluded erythrasma.[4-6] Bacterial cultures and dermatoscopy may be helpful, but they are not mandatory in cases with classic clinical features.[1]

Topical antibiotics remain the first-line therapy. Agents such as fusidic acid, clindamycin, erythromycin, and mupirocin have demonstrated excellent efficacy, often producing rapid improvement within 1-2 weeks.[1,2,8,9] Fusidic acid was chosen for this patient due to its strong activity against Gram-positive bacteria, ease of application, and favorable safety profile in adolescents. Adjunctive measures including moisture control, frequent sock changes, rotation of footwear, and the use of absorbent or moisture-wicking materials are essential to prevent recurrence, as untreated hyperhidrosis is a major predisposing factor.[2,3,5] In some patients with persistent hyperhidrosis, aluminum chloride antiperspirants or iontophoresis may be beneficial though this patient responded adequately to lifestyle modification alone.[1,8]

The patient showed significant clinical improvement consistent with previously reported outcomes for topical fusidic acid and hygiene optimization.[1-3] At

four weeks, he remained symptom-free, highlighting the effectiveness of combining antimicrobial therapy with behavioral and environmental interventions. Pitted keratolysis can impact psychosocial well-being through malodor and cosmetic concerns, therefore timely recognition is especially important in adolescent populations.[1,2,10]

This case underscores the importance of considering pitted keratolysis in adolescents with plantar odor, hyperhidrosis, and crateriform lesions, particularly in institutional or communal living settings. The uniqueness of this case report lies in the combination of typical clinical findings, identifiable environmental risk factors, and the psychosocial impact experienced by the adolescent patient. Early diagnosis and simple therapeutic measures can rapidly restore function and quality of life.

Conclusion

Pitted keratolysis is a superficial bacterial infection commonly affecting individuals exposed to prolonged occlusion and hyperhidrosis. It is not necessarily a rare condition but is often underdiagnosed. Early diagnosis, topical antibiotics along with the foot hygiene can make a rapid improvement and increase the quality of life of the patient.

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Author's contribution

AWKD: Contribution to identification, diagnosis and management of the case. Manuscript writing and critical review of the manuscript.

Has given final approval of the version to be published

Author agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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