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CASE REPORT

Granular Parakeratosis in an HIV-Infected Patient Exposed to Benzalkonium Chloride: A Case Report

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Abstract: Granular parakeratosis (GP) is a rare dermatosis characterized by intertriginous erythematosquamous lesions and parchment-like desquamation, often linked to benzalkonium chloride exposure. We report a 32-year-old male with well-controlled HIV who developed pruritic plaques in the groin and thighs, progressing to pustules and erosions. Diagnosis was confirmed histologically as GP with concurrent *Candida albicans* infection. The cutaneous lesions resolved completely following an 8-day course of intravenous compound glycyrrhizin (60 mL once daily) combined with cessation of benzalkonium chloride exposure. This article describes the first documented case of HIV-associated GP and details its distinctive clinical features and therapeutic approach.

Keywords: granular parakeratosis, benzalkonium chloride, HIV, *Candida albicans*

Introduction

GP is an erythematous, scaly dermatosis frequently occurring in intertriginous areas. It is often associated with exposure to disinfectants or detergents containing benzalkonium chloride.[1–4] Prior literature indicates an estimated incidence rate for GP of 0.005%.[5] GP typically manifests in intertriginous areas such as the axillae and inguinal folds, presenting with erythema and scaling—features that are largely nonspecific. Consequently, it is commonly misdiagnosed as intertrigo, tinea corporis, or tinea cruris.[6] Lesions localized to intertriginous sites are particularly prone to misdiagnosis. HIV infection can exacerbate numerous dermatological conditions or induce atypical presentations. We report a case of GP affecting the scrotum, groin, and thighs in a young male with HIV infection. Concomitant *Candida albicans* infection on the thighs contributed to increased symptom severity. This report provides comprehensive documentation of the disease progression and healing process, aiming to enhance clinical recognition of GP complicated by *Candida albicans* infection in the context of HIV.

Case Presentation

A 32-year-old male with HIV presented with a 1-month history of pruritic erythematous scaly patches on the scrotum, groin, and thighs, progressing to painful pustules and erosions in the preceding 4 days. The patient was 174 cm in height and weighed 68 kg. Previous mycological examinations of the scrotum and inguinal regions, conducted at multiple healthcare facilities, consistently yielded negative results. History revealed routine use of "Huoli 28 Disinfectant" (containing benzalkonium chloride) for soaking flat-angle underwear due to HIV-related hygiene practices. Laboratory investigations revealed an HIV viral load below the lower limit of quantification (<1.0E+2 IU/mL). The patient is currently maintained on oral lopinavir/ritonavir and zidovudine/lamivudine combination therapy.Initial misdiagnosis as

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eczema showed partial response to corticosteroids but rebounded severely upon discontinuation. Dermatological examination revealed symmetrically distributed dull-red patches, erosions, and pustules involving the scrotum, inguinal regions, and thighs (Figure 1a). A close-up view of the eruption on the right thigh is shown in Figure 1b. Histopathology of thigh lesions revealed hyperkeratosis, granular parakeratosis, granular basophilic keratohyalin granules, intra-corneal pustules, and mild dermal lymphocytic infiltration (Figure 2a). Dermoscopy of the thigh revealed a faint reddish background with relatively uniform dotted and globular vessels, accompanied by mild scaling (Figure 2b). Mycological examination of the scrotum and inguinal region was negative, while direct microscopy of the thigh lesion was positive for fungal elements; culture subsequently identified *Candida albicans* (Figure 2c). Concurrent CD4+ lymphopenia was observed (CD4+ count: 320 cells/μL; CD4+/CD8+ ratio: 0.58). The present case exhibited the following features: prior exposure to benzalkonium chloride, involvement of intertriginous areas, peripheral parchment-like desquamation, histopathological findings of keratohyalin granules within the stratum corneum, and Candida species isolation on fungal culture. Based on these collective findings, the patient was diagnosed with GP with concomitant candidiasis. Tinea corporis and tinea cruris are common dermatoses in people living with HIV and were therefore key differential diagnoses in this case. The patient was not diagnosed solely with these conditions for the following reasons: repeated mycological examinations of the scrotum and inguinal regions—conducted at multiple hospitals including our institution—were negative; Candida species were only isolated from a culture of the thigh lesion during the current presentation. Notably, the most severely affected area was the medial thigh, a site consistently in close contact with the patient's boxer shorts, which likely led to increased and prolonged exposure to benzalkonium chloride residues. The

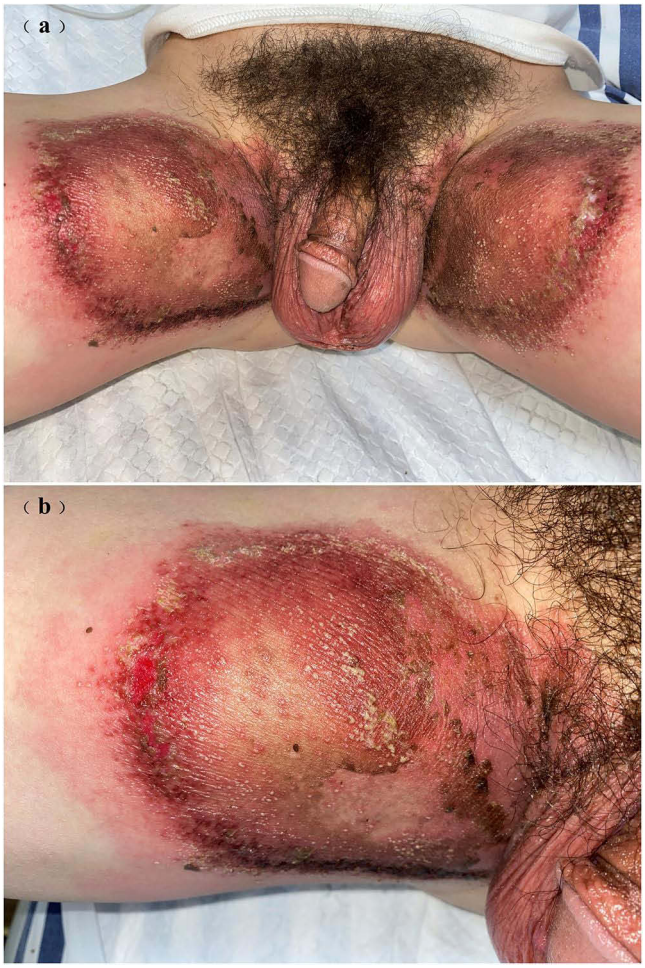

Figure 1 Clinical Photographs of Bilateral Thighs, Inguinal Regions, and Scrotum Pretreatment. (**a**) Overview of Thighs, Inguinal Areas and Scrotum in Supine Position; (**b**) Close-up View of Right Thigh Eruption.

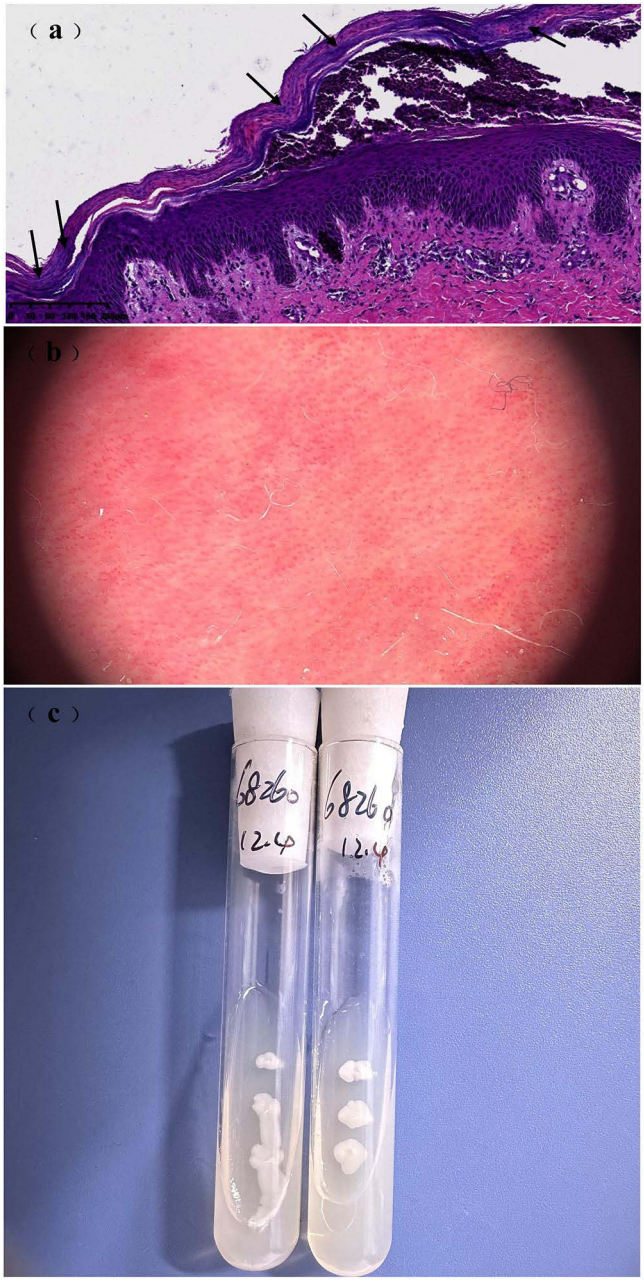

Figure 2 Representative Images of Histopathology, Dermoscopy, and Fungal Culture. (**a**) The arrows indicate the retention of basophilic granules within the stratum corneum (HE×100); (**b**) Uniform dotted and globular vessels on dermoscopy; (**c**) Fungal culture positive for *Candida albicans*.

medial thigh, subjected to the most intense and prolonged exposure to benzalkonium chloride, consequently sustained the greatest compromise to its skin barrier function. This local vulnerability, compounded by the systemic immunosuppression associated with HIV infection, created a permissive environment for secondary candidal infection at this specific site.The cutaneous lesions resolved completely following an 8-day course of intravenous compound glycyrrhizin (60 mL once daily) combined with cessation of benzalkonium chloride exposure.The healing process was documented with serial clinical photographs capturing the daily progression of the cutaneous lesions from days 1 to 8 (Figure 3a–h), along with the follow-up assessment on day 27 (Figure 3i). To allow for more detailed observation, close-up views of the right thigh were obtained, documenting the daily evolution of the skin lesions from days 1 to 8 post-treatment (Figure 4a–h), as well as the follow-up assessment on day 27 (Figure 4i). Notably, on day 2, after fungal microscopy returned positive, topical naphthifine and ketoconazole cream was applied but subsequently discontinued due to reported stinging sensation.

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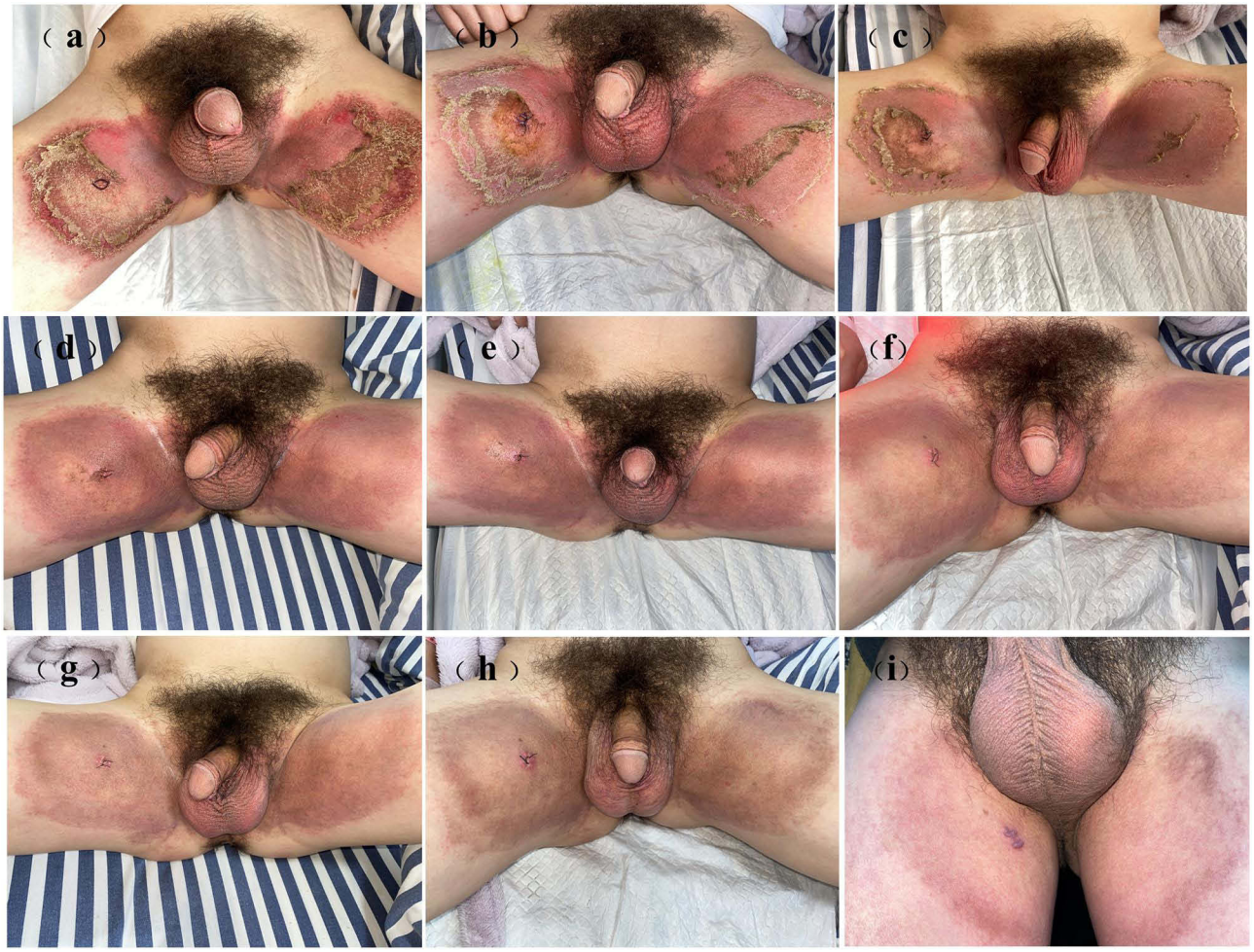

Figure 3 Post-treatment Overview of Thighs Inguinal Areas and Scrotum in Supine Position. (**a–h**) Posttreatment Overview Thighs Inguinal Areas Scrotum Supine Position Days 1–8; (**i**) Overview Thighs Inguinal Areas Scrotum Supine Position Day 27 Posttreatment.

Discussion

GP, first described by Northcutt et al in 1991 and initially termed "axillary granular parakeratosis," (lowercase g and p unless starting a sentence) remains an entity with an incompletely understood etiology. While contact exposure is a prominent theory, with numerous reports linking it to benzalkonium chloride-containing disinfectants or laundry detergents,[1–4] not all individuals exposed develop GP. This suggests a potential role for impaired skin barrier function as a predisposing factor, as epidermal barrier defects can underlie the development of inflammatory dermatoses.[7] Supporting this, deficiency in caspase-14 (lowercase c), a key protease for barrier maintenance, has been associated with increased parakeratosis rates.[8] Furthermore, in HIV infection, significant depletion of CD4+ T cells triggers a shift towards a Th2 immune response. This shift not only increases atopic disease risk but also impairs skin barrier integrity, leading to reduced epidermal lipid content and xerosis.[9] Studies have indicated that the use of indinavir is associated with an increased incidence of xerosis in individuals living with HIV.[9] Indinavir exerts its effect by displacing vitamin A from cytoplasmic retinoic acid-binding proteins, thereby potentiating its interaction with retinoic acid receptors.[10] The protease inhibitor lopinavir/ritonavir, which shares the same drug class as indinavir, may similarly induce xerosis, thereby compromising skin barrier function and potentially predisposing patients to GP. Collectively, these findings suggest GP may preferentially occur in individuals with compromised barrier function. Beyond benzalkonium chloride, other potential triggers include local occlusion (fever, sweating, friction, diapers, obesity) and chemotherapeutic agents like pegylated liposomal doxorubicin.[6,11]

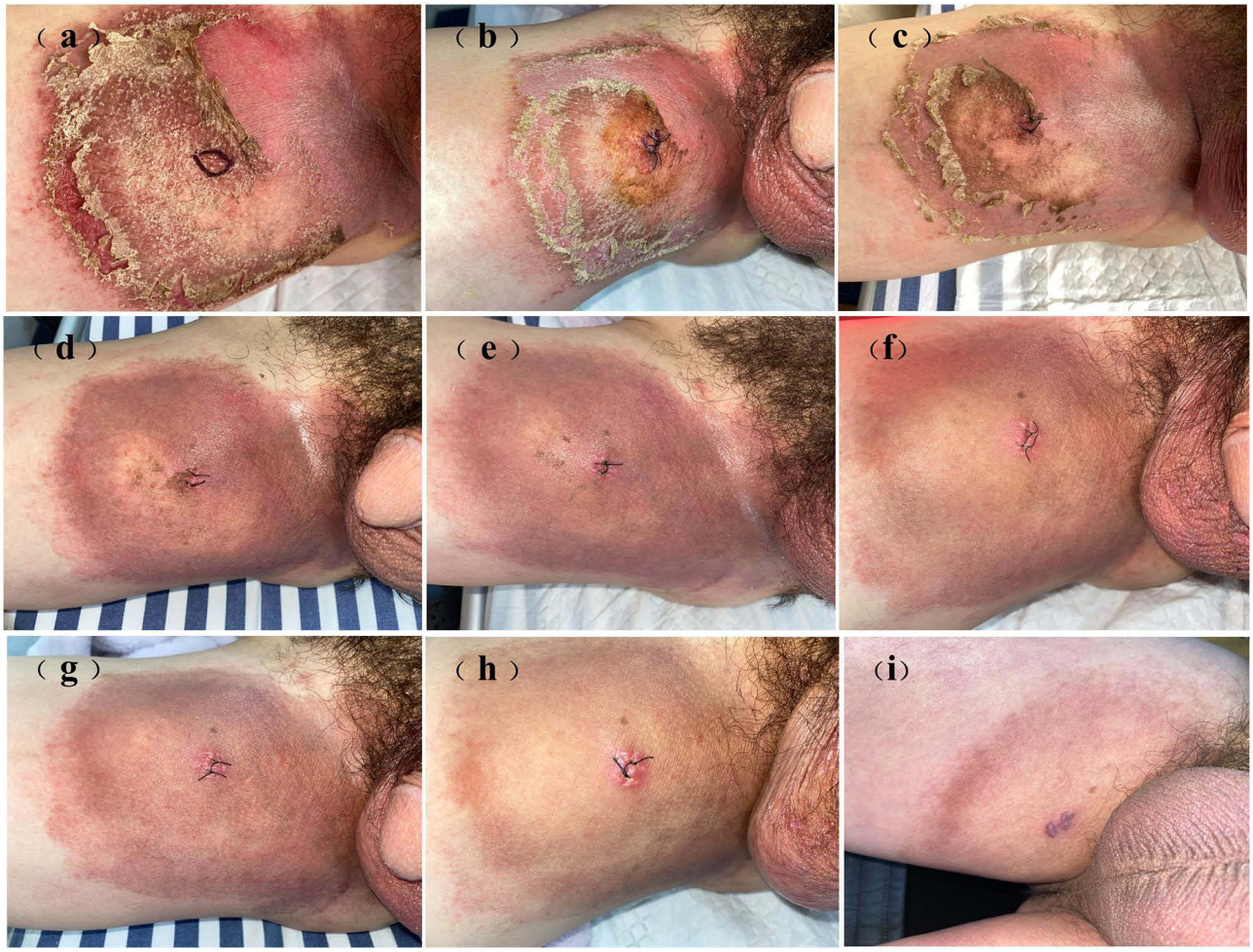

Figure 4 Posttreatment Close-up Right Thigh. (**a–h**) Close-up Right Thigh Days 1–8 Treatment Evolution; (**i**) Close-up Right Thigh Day 27 Posttreatment.

Epidemiologically, the mean age at GP diagnosis is 37.8 years, with a female predominance (69.0%), though cases in infants and children are also documented.[6,12] Commonly reported comorbidities include eczema (6.2%) and obesity (3.9%).[6] Clinically, GP presents as hyperkeratotic erythematous patches or plaques, with verrucous variants also described.[13] Erythema may be less conspicuous in individuals with darker skin tones, potentially leading to misdiagnosis.[14] Pruritus is the most frequent symptom, although many patients are asymptomatic; a minority report burning pain.[6] The axillae are the most commonly affected sites, followed by the groin, inframammary folds, anogenital region, and buttocks.[6,12,14] Lesions in the groin are particularly prone to misdiagnosis as tinea cruris or Hailey-Hailey disease. Notably, in the present case, significant involvement extended to the thighs, a finding potentially linked to the patient's habitual use of boxer shorts. This underscores the importance of detailed history-taking regarding lifestyle factors for accurate diagnosis. GP typically exhibits a bilateral distribution, though unilateral cases occur.

Treatment primarily involves topical agents such as keratolytics, corticosteroids, and vitamin D analogues.[15] Systemic therapies reported include doxycycline, amoxicillin-clavulanate, isotretinoin, and antifungals, alongside other modalities like photodynamic therapy.[16–20] Spontaneous resolution has also been documented.[21]

The concomitant *Candida albicans* infection on the patient's thighs presented a diagnostic challenge: was this the primary pathology? While C. albicans is an opportunistic pathogen potentially more virulent in individuals with HIV, we considered it a secondary infection. Topical antifungal therapy (naftifine-ketoconazole) was initiated but discontinued after a single application due to significant irritation. Crucially, despite cessation of targeted antifungal treatment, the

lesions resolved completely. This favorable outcome supports our initial hypothesis that the candidiasis was secondary, resolving as the underlying GP healed and local barrier function was restored.

Compared to HIV-negative individuals with granular parakeratosis (GP), our patient exhibited several distinct characteristics: (1) He is male, whereas GP typically predominates in females among HIV-negative populations; (2) Based on his height (174 cm) and weight (68 kg), he is not obese, a common comorbidity in HIV-negative GP; (3) His clinical presentation included not only erythema and hyperkeratosis but also numerous pustules, which are less frequently reported in HIV-negative GP; (4) While the scrotum, inguinal areas, and thighs were involved, the medial thighs were most severely affected, contrasting with the primary intertriginous (eg, axillary, inguinal) distribution typical of HIV-negative GP; (5) Regarding treatment response, no marked difference was observed. Our patient showed significant improvement after 8 days of intravenous compound glycyrrhizin combined with cessation of benzalkonium chloride exposure. The resolution of candidal infection following skin barrier repair suggests a similar favorable therapeutic outcome.

This case is significant as, to our knowledge, GP has not been previously reported in patients with HIV/AIDS. Furthermore, it provides the first documented, longitudinal observation of the healing process for GP complicated by candidiasis in an HIV-infected individual. The detailed timeline offers valuable clinical insights into the resolution dynamics of GP in this specific immunocompromised context. The generalizability of our findings is limited by the nature of a single case report. Further studies with larger cohorts are warranted to fully characterize the clinical spectrum of this condition.

Conclusion

In summary, GP represents a condition with a significant propensity for misdiagnosis. This risk is particularly heightened when lesions involve the scrotum, groin, or thighs, and is further compounded in the context of HIV infection. HIV-associated immunodeficiency inherently increases susceptibility to opportunistic infections. In the present case, the concomitant fungal infection served as an additional confounding factor, escalating the diagnostic challenge. The vast majority of reported GP cases are associated with exposure to benzalkonium chloride, a link robustly corroborated by the history and clinical course in this patient. Crucially, cessation of exposure to the implicated benzalkonium chloride-containing disinfectant, coupled with anti-inflammatory treatment, resulted in a dramatic and significant clinical response, underscoring exposure avoidance as a critical therapeutic intervention.

Abbreviations

GP, Granular Parakeratosis; HIV, human immunodeficiency virus.

Ethics Statement

The patient provided written informed consent for publication of this report and accompanying images. The Ethics Committee of Jiangxi Provincial Dermatology Hospital, has approved the publication of the case details.

Consent Statement

The patient provided informed consent for the publication of the case.

Acknowledgments

These authors contributed equally to this work. Linyan Ye, Xinze Li and Bei Liao are the first co-authors of this study.

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Disclosure

The authors report no conflicts of interest in this work.

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