DERMATOLOGICA SINICA xxx (2017) 1–4

Contents lists available at ScienceDirect

Dermatologica Sinica

journal homepage: http://www.derm-sinica.com

CASE REPORT

Cutaneous protothecosis reminiscent of unilateral solar elastotic bands of forearm in an immunocompromised patient☆

Yi-Hsin Ho [a, b], Yun-Wen Chiu [a, b], Chen-Yi Wu [a, d], Han-Nan Liu [a, b, c, *]

[a] Department of Dermatology, Taipei Veterans General Hospital, Taipei, Taiwan
[b] Department of Dermatology, National Yang-Ming University, Taipei, Taiwan
[c] Department of Dermatology, National Defense Medical Center, Taipei, Taiwan
[d] Institute of Public Health National Yang-Ming University, Taipei, Taiwan

ARTICLE INFO

Article history:
Received: Feb 8, 2017
Revised: Aug 17, 2017
Accepted: Sep 2, 2017

Keywords:
Immunocompromise
Protothecosis
Prototheca wickerhamii
Solar elastotic bands of forearm

ABSTRACT

We report a case of cutaneous protothecosis due to *Prototheca wickerhamii* in an elderly male with hepatocellular carcinoma (HCC), decompensated liver cirrhosis, diabetes mellitus, hypertension and coronary artery disease, who presented with a large dull erythematous plaque over right upper limb stretching from the lower third of the distal upper arm to near the wrist. A biopsy revealed marked, band-like solar elastosis in the upper dermis, a pathologic pattern that resembles solar elastotic bands of forearm. However, the following Periodic acid–Schiff stain and fungal culture confirmed the diagnosis of protothecosis. Our finding added a new pattern to the list of the highly variable cutaneous manifestations of protothecosis.

Introduction

Prototheca is found worldwide in sewage and soil.[1–4] Human protothecosis is a rare, chronic infection caused by achlorophyllous algae of the *Prototheca* genus, which are ubiquitous in nature.[3,5–7] They have also been found to colonize human skin, nails, the digestive system and respiratory tract but seem to have little ability to infect human.[8,9] However, primary inoculation may occur as a direct introduction of *Prototheca* into the skin of a susceptible individual, mostly immunocompromised patient, caused by trauma or injury.[2,10]

Solar elastotic bands of forearm (SEB) are a very rare clinical variant of severe solar elastosis and were first described by Raimer et al., in 1986.[11] The lesions are clinically characterized by cord-like plaques on the bilateral forearms that extend from dorsal regions of actinic damage areas to greatest prominence in flexural regions with less solar damage.[11,12]

We herein describe a case of cutaneous protothecosis in an elderly male with multiple comorbidities, who developed a skin lesion reminiscent of SEB.

Case report

This 83-year-old male, a military veteran, had hepatocellular carcinoma (HCC), decompensated liver cirrhosis related to hepatitis C virus (HCV) infection together with diabetes mellitus, hypertension and coronary artery disease. Seven years before he had an operation followed by chemotherapy against adenocarcinoma of transverse colon with omentum metastasis.

The patient sought dermatologic advice for a large area of itchy and dull reddish plaque over right upper limb. According to patient's statement, the skin lesions started with several red excoriated papules that gradually enlarged into a large plaque in 4 weeks. Physical examination revealed a non-tender, mildly scaly, erythematous plaque over right upper limb stretching from the lower third of the distal upper arm to near the wrist (Fig. 1A). Some smooth, flesh-colored to erythematous nodules that tended to merge into a cordlike band at the periphery of the large plaque were also noted (Fig. 1B).

The clinical picture initially suggested a diagnosis of granulomatous dermatitis or metabolite deposits such as cutaneous amyloidosis. A skin biopsy was performed and fungal, bacterial and acid-fast bacilli cultures were also done. The histology showed marked, band-like nodular collections of elastotic amorphous material in the upper dermis with a moderate perivascular and interstitial infiltrate of lymphohistocytes, neutrophils, nuclear dusts and a few epithelioid and multinucleated giant cells in the

☆ This report funded by Ministry of Science and Technology, Taiwan (MOST-104-2314-B-075-044-MY2-2).
* Corresponding author. Department of Dermatology, Taipei Veterans General Hospital, Taipei, Taiwan.
E-mail address: hnliu@vghtpe.gov.tw (H.-N. Liu).

https://doi.org/10.1016/j.dsi.2017.09.004

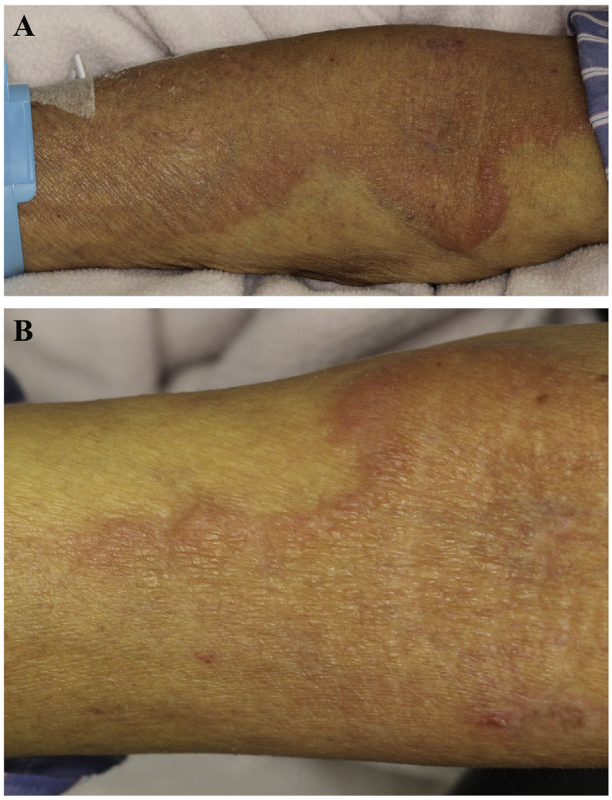

Fig. 1 (A) A mildly scaly, erythematous plaque over right upper limb stretching from the lower third of the distal upper arm to near the wrist. (B) The close view of 1(A) showed smooth, flesh-colored to erythematous nodules that tended to merge into a cordlike band at the periphery of the plaque.

dermis (Fig. 2A). The giant cells did not show elastoclasis (Fig. 2A). Verhoeff's elastic stain (VEG) demonstrated diffuse elastic fibers in the upper dermis (Fig. 2B). Then a diagnosis of unilateral solar elastotic band of forearm was initially made.

However, the preliminary report of fungal culture showed the growth of certain microorganism. It prompted us to re-evaluate the paraffin section by reviewing the hematoxylin-eosin (H&E) stain and performing periodic acid–Schiff-diastase (PASD) stain that disclosed non-budding spherical organisms with sporangia containing multiple endospores of characteristic morula- or cartwheel-like appearance embedded in the elastotic band (Fig. 2C and D). The subsequent tissue fungal culture on brain heart Infusion (BHI) agar (Creative Micro, Ltd, Taiwan) and BHI agar with 5% sheep blood and antibiotics (gentamicin plus chloramphenicol) grew white, creamy colonies at 35 °C for 2–3 days (Fig. 2E). For species identification, a suspension of the culture was submitted to the carbohydrate assimilation test by the Vitek 2 automated system (bioMerieux, Taiwan), indicating *Prototheca wickerhamii* as the causative species.

We did not put the patient on systemic azole antifungal agents or amphotericin B, for fear that might further exacerbate his underlying liver failure. Instead, we prescribed topical clotrimazole cream twice a day to combine with local thermal therapy, performed once a day by covering the skin lesions with a hot towel at a temperature as high as the patient could tolerate, presumably around 42–45 °C. After two weeks of treatment, the patient showed no improvement in the diseased lesions, neither any evidence of disease progression. Unfortunately, he died of the underlying HCC complicated with refractory liver failure one month later.

Discussion

Human protothecosis, first described by Davies et al., in 1964, is a rare disease[4] more commonly reported in patients who are immunosuppressed.[2,13] While healthy individuals can get infected, the organism has low virulence.[2,13] Human protothecosis is only caused by *P. wickerhamii* and *Prototheca zopfii*,[1,4,9,10,13] with the former being the more common pathogen.[4]

In severely immunocompromised patients, the infection is typically classified into three clinical forms: (1) cutaneous infection, (2) olecranon bursitis and (3) disseminated systemic disease.[2–4,8,9] Cutaneous protothecosis is the most common clinical presentation[8] and usually manifests as an erythematous plaque that may accompany with papules, nodules, blisters, erosions, ulcerations, pus or crusting on the surface.[2–4,8,10] Although rare, there have been several reports of patients with granulomatous, verrucous and herpetiform lesions.[2,3] The lesions usually present on the exposed area, such as extremities or face.[2] The distal parts of upper extremities are the most common involved site.[13]

The diagnosis of cutaneous protothecosis is made by histopathology and/or culture.[3,7] The histopathologic examination typically reveals a granulomatous infiltration of neutrophils, eosinophils, plasma cells and/or some giant cells aggregation in the dermis with the presence of spore-like microorganism.[2,7]

The *Prototheca* species, varying from 3 to 30 um in size, are spherical, unicellular, non-budding organisms and consist of sporangia with thick, double-layer walls filled with multiple endospores that are characterized by internal septation with a cartwheel-like or flower-like ("floret") structure on a special stain such as periodic acid-Schiff (PAS) or Gomori methenamine-silver (GMS) stains.[1,2,4] "Morula-like" appearance is characteristic of *P. wickerhamii.*[1,2,7] The specific diagnosis of cutaneous protothecosis could be confirmed by culture of skin tissue. *Prototheca* forms white, creamy colonies on Sabouraud's medium when grown between 25 and 37 °C for 3–5 days.[2,7]

The more common predisposing factors of protothecosis are chronic steroid use, diabetes mellitus and malignancy.[2,8–10] Other risks may include chemotherapy or radiotherapy, kidney transplantation, acquired immunodeficiency syndrome and severe comorbidity such as chronic obstructive pulmonary disease and congestive heart failure.[4,7,10]

Our patient was immunocompromised and had multiple comorbidities. Hepatic itching had rendered him impossible to break the itch–scratch cycle, and the impaired skin barrier then served as a port of entry for infection. On the other hand, in 2002, Chao et al. described five cases of cutaneous protothecosis in Taiwan, four of whom were farmers and most of their lesions occurred on unilateral forearm or lower leg. The authors speculated that farmers would have greater chances of exposure to *Prototheca*.[3] The same hypothesis may apply to our patient who regularly did some gardening after retirement. Constant scratching plus incidental inoculation of *Prototheca* in soil may have led to his skin disease.

Kiyohara et al. in 2003 described a case of SEBs with band-like nodules at the periphery of red plaque across the flexor surfaces of the forearm.[12] This was very similar to our case except that our patient's skin lesions were unilateral. There have also been reports on unilateral dermatoheliosis attributable to prolonged sun exposure for decades on the left side of the face of trunk drivers.[14,15] Our patient, a military veteran, did not carry such a history of unilateral localization of sun exposure, thus made a precise pathogenesis and the relationship between SEBs and protothecosis unclear to us. Perhaps protothecosis-induced inflammation may have speed up the formation of solar elastotic bands of forearm. Neutrophils, as found in our patient's skin biopsy, contain an arsenal of potent

Please cite this article in press as: Ho Y-H, et al., Cutaneous protothecosis reminiscent of unilateral solar elastotic bands of forearm in an immunocompromised patient, Dermatologica Sinica (2017), https://doi.org/10.1016/j.dsi.2017.09.004