A Case of Cutaneous Protothecosis

Jong Kyu Yang, M.D., In Gang Jang, M.D., Young Min Park, M.D.,
Tae Yoon Kim, M.D., Hyung Ok Kim, M.D., Chung Won Kim, M.D.

Department of Dermatology, Catholic University Medical College,
Seoul, Korea

Protothecosis is a rare cutaneous soft tissue infection caused by the genus prototheca, most commonly Prototheca wickerhamii.

An 80-year-old woman has had a painful or tender, non-healing, eczematous plaque on the extensor surface of the left forearm for 4 years. A biopsy specimen revealed the characteristic thick-walled morulalike sporangia in the dermis. P. wickerhamii was isolated in the culture and the biochemical studies. Electron microscopic examination showed the thick-walled spores containing dark dense bodies and amyloplasts. Oral itraconazole therapy for 4 weeks resulted in a marked improvement of the skin lesion.

Key Words : Cutaneous protothecosis, Prototheca wickerhamii

Protothecosis is a rare cutaneous soft tissue infection caused by the genus prototheca, most commonly Prototheca wickerhamii. This a chlorophyllic algae can cause a disease in both immuno-compromised patients and healthy persons. In healthy persons infected with these organisms, a stationary cutaneous plaque is a common symptom.

We report an elderly woman who has suffered from cutaneous protothecosis with a stationary erythematous plaque and responded well to oral itraconazole treatment.

REPORT OF A CASE

An 80-year-old woman has been suffering from a painful or tender, diffuse, erythematous plaque on the extensor surface of the left forearm for 4 years(Fig. 1-A). The plaque was eczematous and had multiple foci of superficial ulcers on its surface. At first this lesion had appeared as a pruritic patch. But it gradually enlarged and became ulcerated, finally to form a large painful plaque. No regional lymphadenopathy was found. She was a rural inhabitant and has worked on the farm. She showed no response to any previous treatment. She had no evidence of underlying diseases such as diabetes mellitus, malignancy or tuberculosis.

Routine laboratory examinations(complete blood count, ESR, urinalysis, renal and liver function) and chest X-ray studies were within normal limits.

A biopsy specimen of the plaque revealed mixed inflammatory infiltrate and many round spores in the dermis. The inflammatory infiltrate was composed of neutrophils, histiocytes, lymphocytes and eosinophils(Fig. 2-A). The spores were present in the mid to upper dermis and they varied in size ranging from 4 to 15 µm. They stained remarkably by Gomori methenamine-silver and Periodic acid-Schiff(PAS) stain. On the PAS staining, the spores had multiple internal septations and formed the characteristic morulalike sporangia containing many endospores(Fig. 2-B).

A tissue culture performed on Sabouraud's dextrose agar at room temperature disclosed a

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Reprint request to: Jong Kyu Yang, M.D., Department of Dermatology, Catholic University Medical College, Seoul, Korea

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Fig. 1A. Diffuse, erythematous, eczematous plaque on the extensor surface of the left forearm (before treatment).

Fig. 1B. After oral itraconazole treatment all skin lesions resolved.

Fig. 2A. The granulomatous response with mixed inflammatory infiltrates composed of lymphocytes, plasma cells, eosinophils and spores varying in size ranging from 4 to 15μm are seen in the upper and mid dermis (×100, PAS stain).

Fig. 2B. The characteristic monolike sporangia containing multiple endospores have internal septations resembling cartwheel appearance (arrows), (×400, PAS stain).

Fig. 3. Creamy, yeast-like, whitish colony on Sabouraud dextrose agar at room temperature after 3 days.

creamy, yeast-like, whitish colony within 48 hours (Fig. 3). However no growth was noted on the cycloheximide-containing culture media. KOH examination of the creamy colony showed a number of lipid droplet-like spores. Lactophenol cotton blue stain of the organisms revealed characteristic sporangia containing numerous endospores (Fig. 4).

The organism was identified as Prototheca wickerhamii by The VITEK® YEAST BIO-
CHEMICAL CARD (Manufactured by Fabricar par bioM rieux Vitex, Inc., France).

Electron microscopic examination revealed that the spores had thick walls and dark dense bodies and amyloplasts which were starch deposits (Fig. 5).

Oral itraconazole therapy (200mg/day) for 4 weeks with wet dressing resulted in a marked improvement of the skin lesion (Fig. 1-B). For the following 3 months, there was no evidence of recurrence.

DISCUSSION

Protothecosis is a rare infection of human and animals caused by genus prototheca. These microbes were first discovered by Krüger in 1894 and the first case of cutaneous protothecosis in a human was reported by Davies et al in 1964. This genus consists of four species of non-pigmented algae and belongs to the family chlorellaceae. These organisms are micrscopic, unicellular, aerobic or microaerophilic, and achlorophyllous algae. Some investigators classified them as fungi but they are different from fungi as they lack glucosamine and muramic acid in their cell walls. They are propagated by asexual reproduction by multiple fission. Currently only four species are recognized. They are P. wickerhamii, P. zoofii, P. filamenta, and P. stagnora. P. wickerhamii and P. zoofii are the two species known to infect man and P. wickerhamii is a more common pathogen than P. zoofii.

They were originally isolated from the slim flux of trees and insect vectors in the mucous flux may spread these algae to the environment. These algae may be found in beef, pork, clams, crabs and water environs including tap-water, fresh water stream, swimming pool, and street water runoff.

The pathogenic mechanisms of human cutaneous infection by prototheca species are unclear but infection may be accomplished by contact with various potential sources of the algae or traumatic inoculation of the algae. Many patients have had an exposure history to fresh water environs or other potential source of these algae. This cutaneous infection is not believed to be transmissible from person to person.

Cutaneous infection may occur in both healthy persons and patients with the underlying diseases or immunosuppression such as malignancy, diabetes mellitus, organ transplantation, and long-term use of steroids. Postoperative wound infections such as synovitis and tenosynovitis may also occur after an orthopedic procedure. At least 50% of patients show some degree of immunosuppression. Our case was a healthy, elderly woman who had no evidences of any underlying diseases or immunosuppression. She had no history of trauma. However, we cannot absolutely exclude the possibility of inoculation of the infectious organisms through minor trauma, because she has...
worked daily on a farm. So far mainly systemic, cutaneous and olecranon bursal infection have been reported. Most of the reported cutaneous involvements occurred on the extremities, head and neck. The clinical features of human protothecosis are quite variable. There may be scaly erythematous, indurated plaques or superficial ulcerated, erythematous plaques or patches, or erythematous papules or eczematous and cellulitis-like lesions, or vesicobullous and ulcerative plaques or nodular lesions with an apple jelly hue. In healthy persons with no underlying diseases, the disease tend to be mild and persistent or slowly enlarging. Our patient noticed a pruritic patch on the left forearm initially, but it became a painful eczematous plaque over 4 years.

The diagnosis can be achieved by identification of the organism on the histological, the cultural and the biochemical examinations of the lesional tissue. Electron microscopic examination and immunofluorescence method with fluorescein-conjugated species-specific antibodies are also of much help to confirm the diagnosis of this infection. In the tissue section, the granulomatous response with mixed inflammatory infiltrates composed of lymphocytes, plasma cells and eosinophils, and characteristic morulike sporangia containing multiple endospores are seen in the upper and mid dermis. The spores are 1.3 to 16.1 μm in diameter and have internal septation resembling a cartwheel appearance. These findings can be clearly demonstrated on Gomori methenamine-silver, PAS and Griedly fungus stain. The histologic differential diagnoses include coccidioidomycosis and rhinosporidiosis. However, in both diseases the sporangia are larger and contain more endospores. In our case a biopsy specimen revealed the characteristic thick-walled morulike sporangiospores which show typical morphology of P. wickerhamii.

Prototheca can grow as smooth, creamy-white, yeast-like colonies on Sabouraud dextrose agar at 30°C to 37°C within 48 hours. On the KOH examination of a culture specimen, many lipid droplet-like structures are seen. Lactophenol cotton blue preparation from the colony shows characteristic endospore-containing spores. Sugar assimilation test from the colony can also confirm the prototheca species. In our case the findings of the cultural, the biochemical and electron microscopic examination were consistent with those of P. wickerhamii.

It is a laborious problem to treat cutaneous protothecosis. Extensive antimicrobial therapy is generally unsuccessful. Surgical intervention can be used if the lesions are localized. A combination of tetracyclin and intravenous amphotericin B has been successful in some cases. Amphotericin B has been used most frequently, but its use is limited due to various side effects. Recently, the imidazole antifungal agents such as ketoconazole and itraconazole have been introduced. Itraconazole is preferred because ketoconazole has a higher risk of hepatotoxicity. In our case all skin lesions resolved after oral itraconazole therapy (200 mg/day) for 4 weeks.

In conclusion, we report a case of cutaneous protothecosis which appeared as a stationary erythematous eczematous plaque and improved with oral itraconazole treatment.

REFERENCES