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CASE REPORT

Electric Heating Pad as an Adjuvant Treatment of Extensive Chromoblastomycosis in Immunocompetent Patient: A Case Report

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Abstract: Chromoblastomycosis is a chronic fungal infection of the skin and subcutaneous tissues, caused by melanized fungi. In cases with extensive cutaneous lesions, heat therapy can be used as an adjuvant to systemic antifungal therapy. This case report aimed to demonstrate the efficacy of heat therapy using an electric heating pad as an adjuvant to itraconazole in the treatment of extensive chromoblastomycosis. A 60-year-old immunocompetent male presented with ten-year history of extensive verrucous erythematous plaques with atrophic central lesions located in the right arm. Histology and mycological examination from a direct smear and skin biopsy revealed muriform cells and pathognomonic chromoblastomycosis. Cultures grew dark-pigmented colonies, yielding *Fonsecaea spp*. A combination therapy of itraconazole 400 mg daily and topical heat therapy using an electric heating pad resulted in clinical improvement during the first month of treatment. Heat therapy can be administered as an adjuvant to systemic antifungal therapy because of its fungistatic and fungicidal effects, and its ability to enhance the patient's immune response. The selection of a suitable heat therapy device is crucial for improving the success of therapy. In this case, the patient demonstrated significant improvement in cutaneous lesions after one month of combination therapy with itraconazole and heat therapy. Electric heating pads are a good choice for topical heat therapy because of their stable temperature, availability, affordability, and ease of use. Heat therapy using electric heating pads is an effective adjuvant to systemic antifungal therapy in the treatment of extensive chromoblastomycosis.
Keywords: chromoblastomycosis, *Fonsecaea pedrosoi*, itraconazole, heat therapy

Background

Chromoblastomycosis is a implantation mycosis of the skin caused by traumatic inoculation of various dematiaceous fungi, including *Fonsecaea spp., Cladophialophora spp*., and *Phialophora spp*.,[1] with the commonest species is *Fonsecaea pedrosoi* (*F. pedrosoi)*.[2] Additionally, other genera, such as *Exophiala spp*. and *Rhinocladiella spp*., can occasionally be associated with chromoblastomycosis. These fungi can be found soil detritus, vegetation, and decomposing wood, and are prevalent in tropical and subtropical zones worldwide.[1] This occupational disease mostly affects male individuals who work with soil or plants, such as farmers, gardeners, and woodcutters, aged between 30 and 50 years, who lack protective gloves, shoes, and clothing during work.[3] Clinically, the disease presents as an oligosymptomatic or asymptomatic chronic subtle infection, usually on exposed areas, starting as a papule which then progresses to one of several clinical forms.[1,4] Severe manifestation and extensive involvement of the skin areas due to lymphatic, hematogenous, or autoinoculation are rare incidents.[5] Combination therapy of antifungal and physical therapy are common part of regimen in such cases.[6] In general, treatment of this deep fungal infection comprises a therapeutic challenge for clinicians.[7]

Several therapeutic modalities can be used, including systemic antifungals, cryotherapy, heat therapy, surgical intervention, and combination therapy.[8] Topical heat therapy with various heating devices as a single therapy has been

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reported to provide clinical improvement or even cure in 23 out of 27 cases of chromoblastomycosis.[9] In addition to inhibiting and halting fungal growth, heat therapy can also enhance the patient's immune response. As an adjuvant therapy, heat therapy has been reported to help reduce lesion size and inhibit fungal growth, allowing for eradication by systemic antifungals or surgery.[10] The selection of the appropriate device, both in terms of temperature and size, determines the success of heat therapy.[9]

This case report aimed to demonstrate the success of heat therapy using an electric heating pad as an adjuvant to itraconazole in the treatment of extensive chromoblastomycosis in an immunocompetent patient. This case report sheds light on the advantages of topical heat therapy as adjuvant treatment for chromoblastomycosis.

Case Presentation

A 60-year-old male former gardener presented with ten-year history of multiple itchy hyperkeratotic verrucous plaques with an atrophic center located in the right arm. The skin lesions initially developed as pea-sized erythematous papules on the right wrist. It gradually increased in size to involve the flexor side of the forearm and dorsal side of the hand, covered with scales, and then extended slowly over the upper arm (Figure 1A–C). The lesions were mildly itchy, and some healed spontaneously with scars. Two months before admission, the right arm was bulgy and painful. The patient remained afebrile during this period and no other systemic complaints were reported. The patient had a history of frequent work in the garden without gloves or hand cover, with no history of malignancy, lung disease, or chronic cough.

On physical examination, the patient's general condition and vital signs were within the normal limits. Multiple verrucous and erythematous plaques with scales, black dots, and central atrophic scars fully covering the right forearm. The skin lesions extended to the dorsal side of the right hand with some satellite lesions in the upper arm. Edema was found in the right hand and forearm, with decreased range of movement in the right wrist joint. Direct microscopic examination of the skin scraps with 10% potassium hydroxide showed muriform cells and hyphae (Figure 2A). Histopathological examination of the upper dermis revealed lymphocytic inflammatory infiltrates and polymorphonuclear cells (PMN). At the one-third lower dermal level, granulomas with multinucleated giant cells, thick walls, and brown-colored muriform bodies were observed. Tissue culture on Sabouraud dextrose agar (SDA) employed by potato dextrose

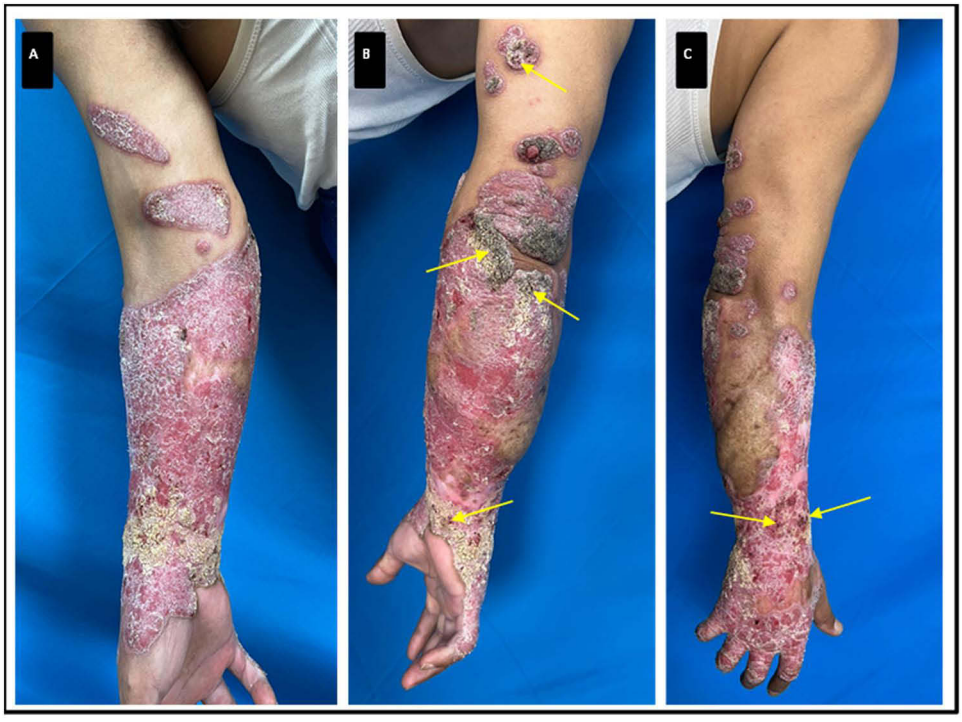

Figure 1 (**A**–**C**) Multiple verrucous and erythematous plaques with scales, black dot (yellow arrows), and central atrophic scars.

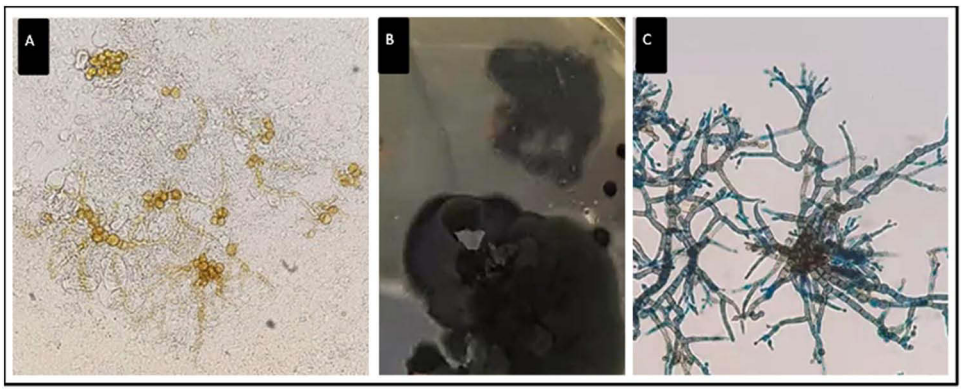

Figure 2 Muriform bodies and hyphae on potassium hydroxide 10% microscopic examination (**A**), dark green to black colony on Sabouraud's dextrose agar (SDA) culture (**B**), Cladosporium-type conidia, single phialides, and asterisk-like projections on microscopic examination of fungal culture (**C**).

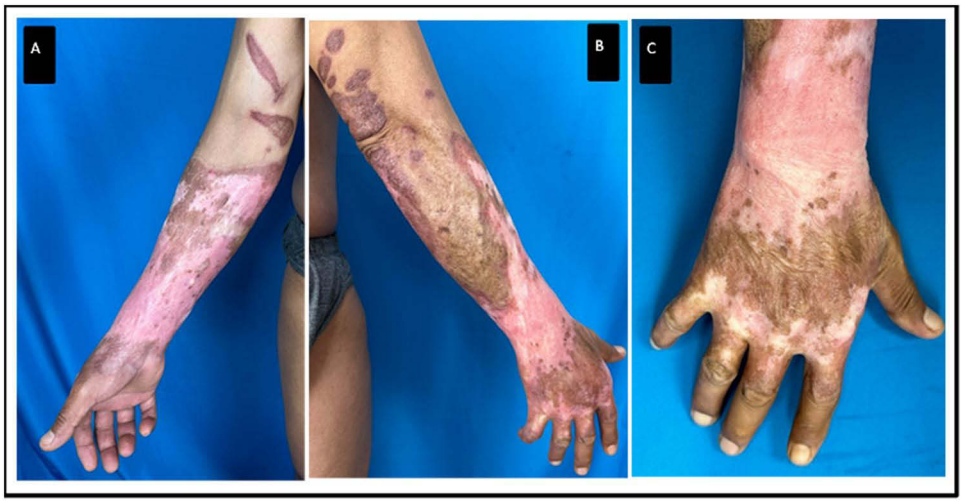

Figure 3 (**A**–**C**) Clinical improvement after the 3rd month of systemic antifungal and heat therapy.

agar (PDA) medium grew slow-growing, dark-green, velvety colonies (Figure 2B). Microscopic examination with lactophenol cotton blue (LPCB) staining revealed a cladosporium-type conidiation, single phialides, and an asterisk-like projection identified as *Fonsecaea spp*. (Figure 2C). These results support a diagnosis of chromoblastomycosis. The complete blood cell count revealed a total white blood cell count of 8270 cells/μL, with other parameters within normal limits. The CD4 count was 661 cells/μL, and the CD8 count was 435 cells/μL, both within the normal limits. Liver function tests showed AST at 19 U/L and ALT at 20 U/L, both within normal ranges. Treatment was initiated with 400 mg oral itraconazole daily in two divided doses. Heat therapy was added as an adjuvant after one month along with oral antifungal therapy, using an electric heat pad at a temperature of 40 °C for 15 minutes, three times daily. Clinical improvement occurred one month after treatment, marked by thinning of the skin lesions and reduced edema. After three months of follow-up, most of the skin lesions had transformed into normal skin, while some had become scar tissue (Figure 3A–C), and the mycological examination results were negative.

Discussion

Chromoblastomycosis skin lesions have a very slow progression,[11] lasting for months or years,[8] with initial lesions as solitary verrucous papules or nodules, not itchy, and within years spreading to surrounding areas in various forms such as nodules, tumors, verrucous, cicatricial, or plaques.[12] Chromoblastomycosis can be classified according to its severity: mild, moderate, and severe. Mild lesions were defined as solitary plaques or nodules with a diameter of less than 5 cm in

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diameter. Moderate lesions were solitary or multiple confluent tumors, verrucous, or plaque lesions covering one or two body parts with a length of less than 15 cm. Severe lesions are solitary or multiple lesions that cover a large area of the body.[8] The patient described in this case report had clinical symptoms of erythematous plaques with scales, some verrucous, along with black spots and atrophic lesions in the center, covering a significant portion of the body. Thus, the lesions were classified as severe and involved extensive adjacent cutaneous regions.

The definitive diagnosis of this disease depends on potassium hydroxide skin smear or skin biopsy, which shows thick-walled, brown round or chestnut-shaped bodies, called muriform cells, also known as sclerotic bodies or copper pennies.[13] Fungi that underwent transepidermal elimination appeared as black dots on the lesion surface; hence, this finding may guide sample collection.[1,3] Histopathology findings of biopsied specimens include hyperkeratosis, pseudoepitheliomatous hyperplasia, granulomas with Langerhans giant cells, and sclerotic bodies.[12,13] SDA was used for initial fungal isolation, while PDA was employed to stimulate sporulation and facilitate presumptive genus identification. *Fonsecaea spp*. produces velvety dark brown, olive-green, or black colonies,[1] as found in this case. Micromorphological characteristics were observed using the classic Ridell technique of microcultivation on a slide. Microculture presents three types of sporulation: *Cladosporium* type–acrogenous catenulate sporulation, elliptical spores in chains; *Phialophora* type–conidiophore (phialide), flower vase-shaped with spores around the phialide; *Rhinocladiella* type–conidiophores formed along the hyphae and oval spores on the upper extremity (acrotheca) and along the conidiophore.[1] Patient in this case report revealed cladosporium type conidiation, single phialides, and asterisk-like projection concluded as *Fonsecaea spp*.

Chromoblastomycosis is associated with low cure and high relapse rates, especially in chronic and extensive disease,[5] thus combination therapy is needed in such cases. Treatment choice and outcome depend on its severity.[2,13] Management consists of long courses of antifungal combined with physical therapy such as surgery, cryotherapy, and thermotherapy.[5] The antifungals that have shown the greatest efficacy are itraconazole (200–400 mg/day) and terbinafine (500–1000 mg/day) for 8–36 months, with cure rates ranging from 15% to 80%.[13,14] The patient in this case report was orally administered itraconazole 2×200 mg because of extensive skin lesions and normal liver function. Routine liver function tests were performed during the treatment.

Chromoblastomycosis caused by *Fonsecaea spp*. is difficult to treat and no single antifungal agent has consistently demonstrated good results. Treatment of extensive chromoblastomycosis with antifungal agents alone may require long periods of drug consumption, and the long-term use of antifungal agents may increase its adverse effects.[1,13] Adjuvant therapy is expected to shorten the duration of treatment. Heat therapy is an effective physical therapy option for chromoblastomycosis, as it can stimulate the patient's immune response, contributing to the resolution of the infection.[10] A fungistatic effect on *Fonsecaea spp*. is achieved at 39°C, while a fungicidal effect is obtained at 42°C for 18 days.[9] Local application of heat at a temperature ranging from 40 to 45°C using various devices is a therapeutic option with a low risk of side effects and is relatively affordable.[1] Hiruma et al[9] reported a one-month application of a disposable chemical pocket warmer occluded with a bandage over the lesions 24 hours per day resulted in an enhancement of lesions and negative microscopic examination and culture results. Flattening of lesions can be followed within four days, while complete resolution is achieved around two months.[9] Lusiana et al[14] reported a case of severe chromoblastomycosis that had a combination treatment of heat therapy using a hot water rubber pocket with a temperature of approximately 50–60°C for 30–60 seconds, 3 times daily, and 200 mg daily itraconazole showed a favorable outcome. Clinical improvement was observed within 1 month of therapy.[14] Hira et al[10] reported that the use of heat therapy as a single therapy for the treatment of chromoblastomycosis was not sufficient to achieve a complete cure, but it could minimize the fungus and lesion size, making it beneficial as an adjuvant therapy to systemic antifungal agents or surgery. Combination therapy with itraconazole and heat therapy using an electric heating pad at 40°C for 15 minutes three times a day, showed clinical improvement after one month of treatment. An electric heating pad was selected because of its relatively stable temperature. The size of the device was also suitable for the patient's needs, thereby increasing the effectiveness of therapy. Electric heating pads are readily available, affordable, and easy-to-use. After three months of observation, most skin lesions returned to normal, and no muriform bodies were found on mycological examination. Combination therapy could double the rate of healing compared with monotherapy.[14] This study has several limitations, including the lack of molecular confirmation for species identification, which could affect the interpretation of the results. Further research with molecular techniques is needed to confirm the identification and better understand the mechanisms of treatment.

This case highlights the potential of topical heat therapy as an effective adjuvant treatment for chromoblastomycosis in immunocompetent patients. It underscores the importance of accurate laboratory diagnosis and species identification to tailor treatment approaches. Future studies should focus on expanding the evidence base for combined therapies and exploring molecular diagnostic methods to improve the management of this neglected tropical disease.

Conclusion

Heat therapy is effective as an adjuvant to systemic antifungal agents for the treatment of extensive chromoblastomycosis because of its fungistatic and fungicidal effects and its ability to enhance the patient's immune response. Electric heating pads are a suitable choice for heat therapy as adjuvants in chromoblastomycosis because of their relatively stable temperature. In this case report, a combination of itraconazole and heat therapy using an electric heating pad demonstrated clinical improvement after one month of therapy.

Data Sharing Statement

Data supporting the findings of this study are available from the corresponding author upon reasonable request.

Ethics Approval

Institutional approval was obtained for the study and for the publication of the case details. The approval was granted by Research Ethics Committee of the Dr. Hasan Sadikin Hospital, Bandung, West Java, Indonesia (Approval Number: [DP.04.03/D.XIV.6.5/436/2024], Registration Number: [10.24.436], Date: [02/10/2024]).

Consent to Participate

The patient had signed informed consent.

Consent to Publication

The patient had signed informed consent.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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