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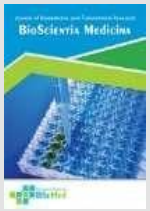

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Beyond the Usual Suspects: *Phialophora verrucosa* Chromoblastomycosis in a Swimming Pool Attendant and Gardener

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A B S T R A C T

Background: Chromoblastomycosis (CBM) is a chronic, debilitating subcutaneous mycosis caused by traumatic inoculation of dematiaceous fungi. As a Neglected Tropical Disease, it poses significant diagnostic and therapeutic challenges, particularly in the endemic tropical and subtropical regions where it is most prevalent. While *Fonsecaea pedrosoi* is the most common etiologic agent, infections by other species are crucial to document for accurate epidemiological surveillance. **Case presentation:** A 26-year-old immunocompetent male presented with a four-year history of a slowly progressive, verrucous plaque on his right hand, initiated by minor trauma. His history was notable for regular gardening without protective gear. A comprehensive diagnostic workup was performed. Dermoscopy revealed features characteristic of CBM, including reddish-black dots and yellowish-orange areas. While direct microscopy of skin scrapings was negative, histopathology of a skin biopsy confirmed a suppurative granulomatous reaction with pathognomonic muriform cells. Fungal culture on Sabouraud's dextrose agar definitively identified the causative agent as *Phialophora verrucosa*. The patient showed marked clinical improvement after three months of treatment with oral itraconazole (200 mg/day). **Conclusion:** This case highlights the successful diagnosis of a rare CBM pathogen in Indonesia through a systematic, multimodal approach. It reinforces the need for a high index of suspicion for this mycosis in patients from endemic areas with chronic verrucous lesions and a history of cutaneous trauma. The essential role of mycology culture for definitive species identification is underscored, a critical step for guiding therapy and informing public health strategies.

1. Introduction

Chromoblastomycosis (CBM) is a chronic, localized infection of the skin and subcutaneous tissues caused by a group of melanized, or dematiaceous, fungi.[1] It is a formidable clinical entity, characterized by a course of relentless, slow progression that, if left untreated, can lead to severe disfigurement, functional disability, and significant social stigmatization. In recognition of its impact on impoverished rural populations and the systemic challenges in its management, the World Health Organization (WHO) has classified CBM as a neglected tropical disease (NTD). The disease is geographically concentrated in tropical and subtropical climates, with hyperendemic areas identified in Latin America (notably Brazil, Mexico, and Venezuela), Africa (particularly Madagascar), and parts of Asia.[2] Its epidemiology is inextricably tied to the land; the causative fungi are environmental

saprophytes, thriving in soil, decaying wood, and decomposing plant matter. Consequently, CBM is overwhelmingly an occupational disease, disproportionately affecting male agricultural laborers, farmers, and other outdoor workers who sustain minor, often unnoticed, penetrating injuries from thorns or splinters, which serve as the portal of entry for the fungal elements.[3] The etiological agents of CBM form a specific clade of fungi within the order Chaetothyriales. Globally, *Fonsecaea pedrosoi* is the undisputed predominant species, responsible for the vast majority of cases, particularly in the humid environs of the Amazon basin, where it accounts for over 90% of isolates.[4] However, the etiological spectrum is diverse and includes several other key pathogens. In order of decreasing global frequency, these are *Phialophora verrucosa*, *Cladophialophora carrionii*, *Fonsecaea compacta*, and *Rhinocladiella aquaspersa*. The relative prevalence of these agents varies geographically; for instance, *C. carrionii* is more common in arid and semi-arid regions. *Phialophora verrucosa*, the pathogen at the center of this report, is a cosmopolitan species but shows a higher relative frequency as a cause of CBM in specific locales, including Japan and parts of South America.[5] The precise identification of the causative species is of paramount importance, as it informs epidemiological mapping and may have therapeutic implications, given that in vitro susceptibility to antifungal agents can vary between species.

The pathogenesis of CBM is a fascinating and complex interplay between fungal virulence and host immunity.[6] Following traumatic inoculation, the fungus undergoes a critical morphological shift within the host tissue, transforming from its environmental filamentous (hyphal) form into the pathognomonic structure of the disease: the muriform cell. Also known as a Medlar body or sclerotic body, this is a thick-walled, pigmented, multicellular structure that divides by internal septation. This form is a key adaptation for survival, as its robust structure and melanized cell wall render it highly resistant to host phagocytic killing mechanisms. The host mounts a vigorous but ultimately ineffective immune response, characterized by the formation of suppurative granulomas. This chronic inflammatory process stimulates a massive reactive proliferation of the overlying epidermis, known as pseudoepitheliomatous hyperplasia, which is responsible for the classic verrucous (wart-like) clinical appearance of the lesions. The immune response is a complex mixture of T-helper (Th) cell subsets.[7] While an effective Th1 response, characterized by interferon-gamma (IFN-γ), is required for fungal clearance, patients with chronic CBM often exhibit a mixed or Th2-dominant response. The Th2 cytokine profile (IL-4, IL-10) is less effective and can promote fibrosis, while the Th17 axis (IL-17) contributes to the intense neutrophilic infiltration seen in the granulomas.[8] This dysregulated immune stalemate allows the fungus to persist for decades, leading to the chronic, smoldering nature of the infection. Diagnosing and managing CBM presents substantial challenges, especially in resource-limited settings where it is most common. Patients often present late in the disease course, after years or even decades, by which time lesions can be extensive and more difficult to treat. The clinical differential diagnosis is broad, and a lack of access to specialized mycology laboratories with the expertise to perform direct microscopy and fungal culture can lead to misdiagnosis and inappropriate treatment.[9] Furthermore, the required antifungal therapies are expensive and must be administered for a prolonged duration (often a year or more), leading to issues with adherence and potential drug toxicity. A severe, long-standing complication, though rare, is the malignant transformation of chronic CBM lesions into squamous cell carcinoma, reported in a small fraction of cases with decades-long duration.[10]

The novelty of this report is multifold. Firstly, it documents a confirmed case of CBM caused by *Phialophora verrucosa* in Indonesia, a region where the disease is known to be endemic but where species-level epidemiological data are scarce. Secondly, it provides a model for the systematic diagnostic process, demonstrating the pivotal role of non-invasive

tools like dermoscopy in the clinical reasoning pathway and reinforcing the indispensable value of histopathology and mycology culture. Clinicians in endemic regions often face a wide array of chronic verrucous skin diseases, and they may anchor on more common diagnoses like tuberculosis, potentially delaying the correct diagnosis of CBM. Therefore, the aim of this study is to address this potential diagnostic gap by meticulously documenting the clinical presentation, the step-by-step diagnostic odyssey, and the successful management of this case. By doing so, we aim to contribute to the regional epidemiological knowledge base and provide a clear, educational framework for clinicians encountering this challenging, neglected tropical disease.

2. Case Presentation

A 26-year-old immunocompetent male of Javanese ethnicity was referred to the mycology subdivision of our dermatology clinic in February 2025. He was referred from a regional hospital with a working diagnosis of suspected deep mycosis for a lesion on his right hand that had been present for four years. The patient provided a clear history, recalling that the lesion began at the site of a minor abrasion on the dorsum of his hand sustained from a scrape against a door. He did not seek medical care for the initial injury. Over the subsequent weeks, as the abrasion healed, he noted the appearance of a small, firm papule. This papule embarked on a course of extremely slow but relentless growth over the ensuing four years, progressively expanding in surface area and becoming more raised and wart-like in texture. The lesion was largely asymptomatic, causing no pain unless directly traumatized, though he did report occasional, mild pruritus. His medical history was otherwise unremarkable, with no chronic conditions or known immunodeficiencies. His socio-occupational history was explored in detail and was considered highly relevant. His primary occupation was as a swimming pool attendant, a role that involved daily, prolonged contact with water and moist surfaces. More significantly, he was a passionate hobbyist gardener, tending to a home garden several times a week. He confirmed that he never used protective gloves during his gardening activities, which involved direct and frequent handling of soil, plants, and organic mulch. A summary of the patient's demographic and historical data is provided in Figure 1. Written informed consent was obtained from the patient for the publication of this case report and any accompanying images.

Figure 2 provides a comprehensive and methodical summary of the clinical and dermatological findings observed during the patient's initial examination. It effectively combines a macroscopic clinical photograph with a detailed, structured breakdown of the lesion's key morphological features, collectively building a compelling case for a specific diagnosis. The figure serves as a visual narrative of the physical examination, guiding the observer from a general overview to the specific, diagnostically crucial details. The central component of the figure is the clinical photograph, which shows a solitary, well-demarcated plaque on the dorsum of the patient's right hand. This visual evidence is supported by the detailed description of the lesion morphology, which characterizes the lesion as an indurated (firm to the touch) plaque measuring 4 x 1.5 cm. Its polycyclic (irregular, scalloped) border and erythematous-to-violaceous (reddish-purple) color are clearly noted, painting a picture of a chronic, well-established inflammatory process within the skin. Moving beyond the basic shape and size, Figure 2 delves into the lesion's texture and surface qualities. The Surface Characteristics are described as markedly verrucous (wart-like) and hyperkeratotic, giving the plaque a rough, cauliflower-like appearance with fine, whitish scales. This distinct texture is not merely a superficial quality; it is a direct result of the underlying pathology, where chronic inflammation in the dermis stimulates the overlying epidermis to thicken dramatically, a process known as pseudoepitheliomatous hyperplasia.

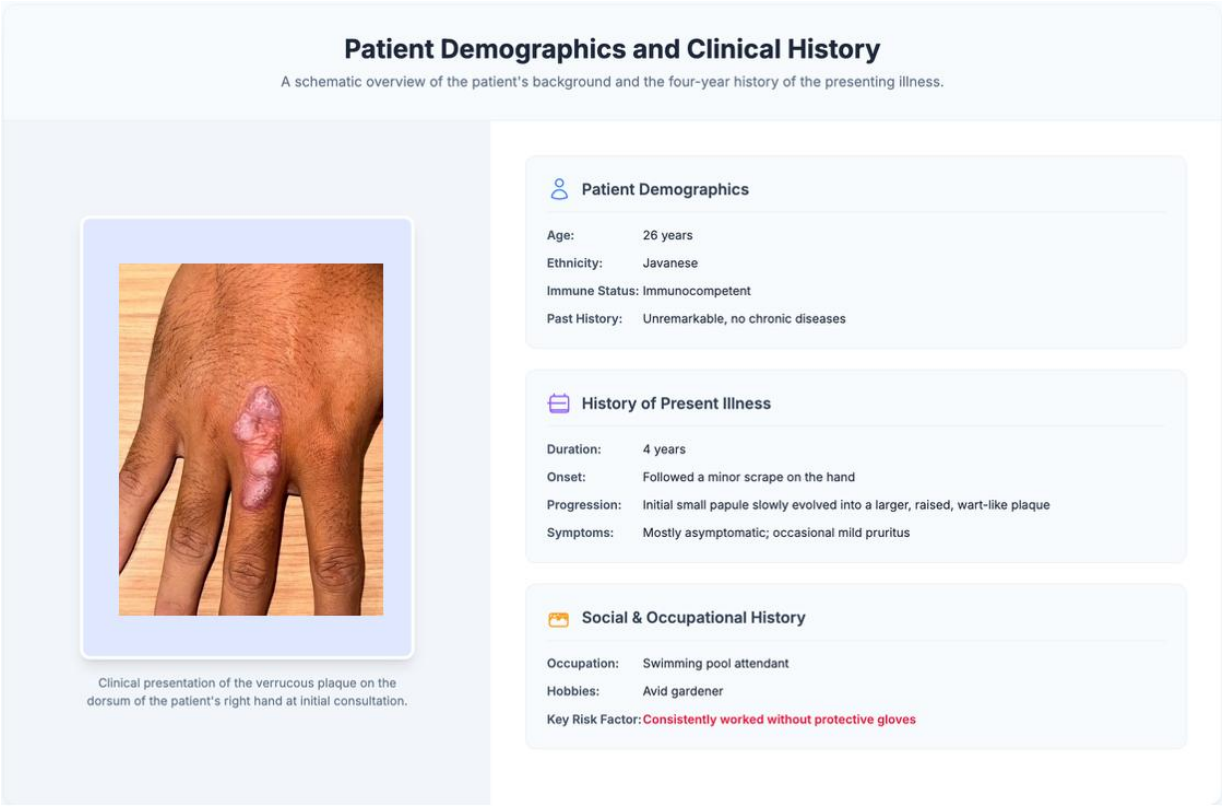


Figure 1. Patient demographics and clinical history.

This finding immediately signals a long-standing condition and narrows the differential diagnosis to diseases known for inducing such a profound epidermal reaction. The most critical diagnostic information is presented under Pathognomonic Signs. The figure highlights the presence of numerous, minute, punctate "black dots" scattered across the verrucous surface. This is emphasized as a key clinical clue for chromoblastomycosis. These black dots are of paramount importance; they are the clinical manifestation of the transepidermal elimination of pigmented fungal elements, known as muriform cells. Their presence is a highly specific sign that allows a clinician to distinguish chromoblastomycosis from its many clinical mimics, such as tuberculosis verrucosa cutis or squamous cell carcinoma. This single finding dramatically increases the probability of a correct diagnosis based on visual inspection alone. Finally, the Systemic Examination provides crucial context regarding the extent of the disease. The report that the infection appeared strictly localized to the skin, with no regional or generalized lymphadenopathy, is a significant finding. It indicates that, despite its four-year duration, the infection had not spread via the lymphatic system, which has important positive implications for the patient's prognosis and treatment plan. Figure 2 expertly deconstructs the clinical examination, narrating a process that moves from general morphology to the identification of a pathognomonic sign, ultimately culminating in a complete clinical picture of a localized, chronic, verrucous plaque highly characteristic of chromoblastomycosis.

The diagnostic odyssey begins with dermoscopy, a non-invasive technique that offers a window into the structures beneath the skin's surface. The key findings listed in Figure 3—irregular reddish-black dots, yellowish-orange ovoid areas, and a diffuse milky-red background—are not random observations; they are classic dermoscopic signs highly suggestive of chromoblastomycosis.

Figure 2. Clinical and dermatological examination findings.

These patterns correspond directly to the underlying pathophysiology: the black dots represent the transepidermal elimination of pigmented fungal elements (the muriform cells), while the orange areas are the clinical correlate of the deep dermal granulomas formed by the host's immune system. This initial step was crucial, as it elevated a broad differential diagnosis to a highly focused clinical suspicion, providing the necessary justification to proceed with more invasive testing. The second step, Direct Microscopy using a potassium hydroxide (KOH) preparation, yielded a negative result. Far from being a contradiction, this finding is a critical clinical pearl illustrated in Figure 3. In chromoblastomycosis, the fungal organisms are located deep within the dermis, entrapped within fibrotic and granulomatous tissue. A superficial skin scraping, as used for a KOH test, often fails to retrieve these deep-seated elements. This negative result powerfully demonstrates a common diagnostic pitfall where a clinician might prematurely exclude a fungal etiology. It underscores the principle that in suspected subcutaneous mycoses, a negative superficial test should never override strong clinical and dermoscopic suspicion. The investigation then pivots to Histopathology, the definitive method for confirming the disease process. The findings presented in Figure 3 are a textbook representation of chromoblastomycosis. The marked pseudoepitheliomatous hyperplasia is the skin's dramatic, proliferative reaction to the chronic underlying inflammation. The presence of suppurative granulomas reveals the host's intense but ultimately failed attempt to contain the infection. The most crucial finding, however, is the identification of pathognomonic muriform cells. These thick-walled, septate, chestnut-brown structures are the unique form the fungus adopts to survive within tissue and are the absolute hallmark of the disease, confirming the diagnosis of chromoblastomycosis with certainty. Finally, while histopathology confirmed the disease, Mycology Culture on Sabouraud's Dextrose Agar (SDA) provided the ultimate etiological answer. This final step, as shown in Figure 3, identified the specific culprit. The growth of slow-growing, velvety,

olivaceous-black colonies, combined with the microscopic identification of characteristic flask-shaped phialides with collarettes, allowed for the definitive speciation of the pathogen as *Phialophora verrucosa*. This is not merely an academic detail; identifying the precise species is paramount for understanding regional epidemiology, tracking potential differences in virulence, and ensuring optimal therapeutic management. In conclusion, the four panels of Figure 3 expertly narrate a complete diagnostic investigation, showcasing a gold-standard approach that moves logically from suspicion to confirmation and, finally, to precise etiological identification.

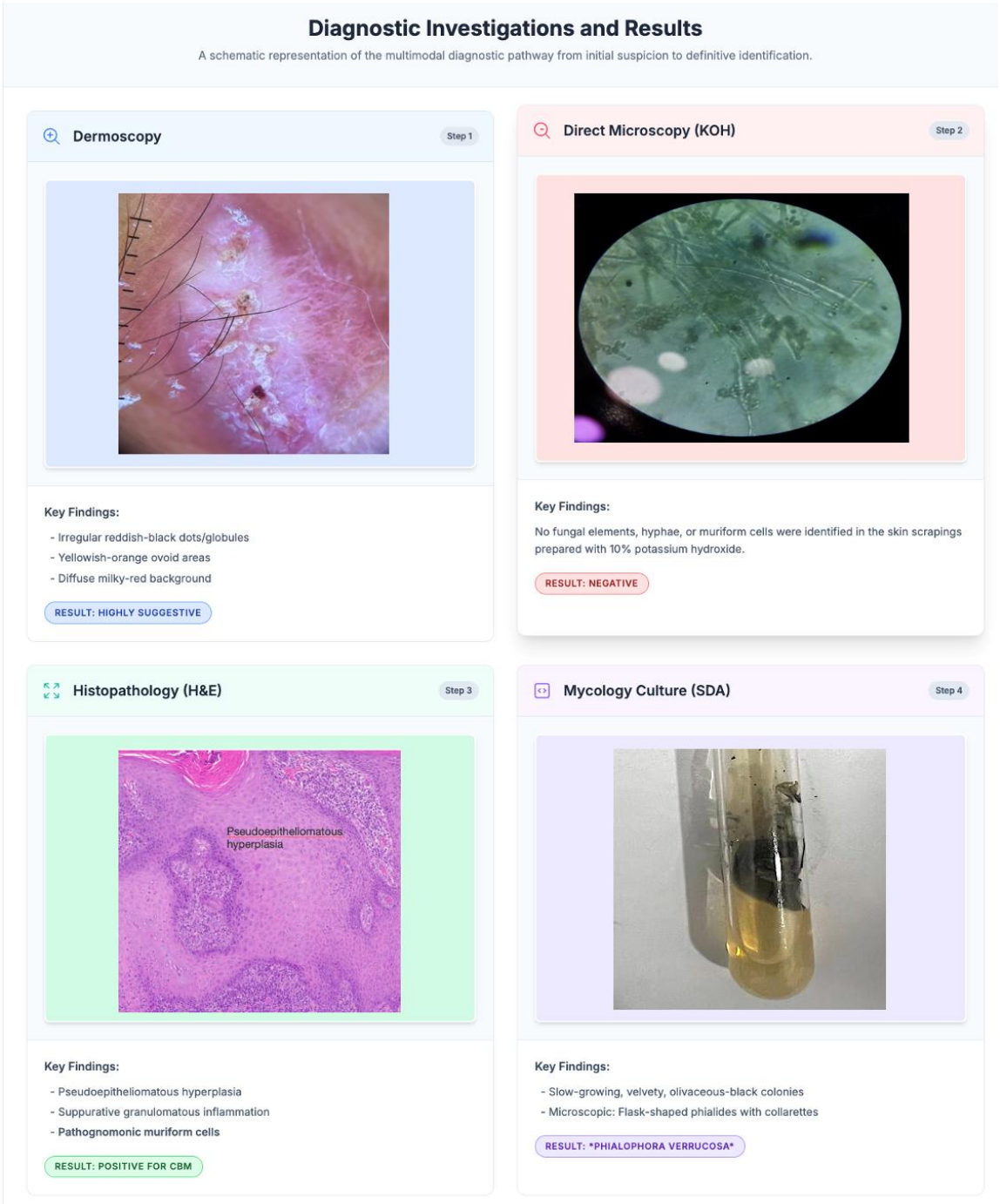


Figure 3. Diagnostic investigation and results.

The therapeutic strategy was built on a foundation of three key components. First, systemic therapy was initiated with oral Itraconazole at a dose of 200 mg per day. This potent antifungal agent was planned for a long-term duration of 8-10 months, reflecting the chronic and recalcitrant nature of chromoblastomycosis. Second, this was supplemented with topical therapy, consisting of Miconazole 2% cream applied directly to the lesion twice daily. This dual-front pharmacological approach aims to control the infection from both inside and out. The third and equally critical pillar of the strategy was patient education & prevention. As detailed in Figure 4, the patient received extensive counseling on the importance of treatment adherence and was advised on the mandatory use of protective gloves during all future high-risk activities to prevent reinoculation, addressing the root cause of the initial infection. The effectiveness of this comprehensive plan is vividly demonstrated in the clinical response over time. At Baseline, the lesion was a prominent, verrucous plaque measuring 4 x 1.5 cm with significant erythema. After just one month of treatment, the 1-month follow-up revealed a noticeable reduction in inflammation and induration, with the lesion size decreasing to 3 x 1.5 cm. By the 3-month follow-up, the patient showed significant clinical improvement. As Figure 4 reports, the plaque had flattened considerably, with an estimated ~75% resolution of its verrucosity, and its size had further reduced to 2 x 1.5 cm. The accompanying comparative clinical photographs provide powerful visual evidence of this progress, clearly showing the transition from a raised, inflamed, and wart-like lesion at baseline to a much smoother, flatter, and less erythematous area after three months of consistent therapy. Figure 4 masterfully documents a successful therapeutic intervention. It narrates a story of a well-designed, multimodal treatment plan leading to a rapid and significant positive clinical outcome, underscoring the efficacy of the chosen regimen for this patient's condition.

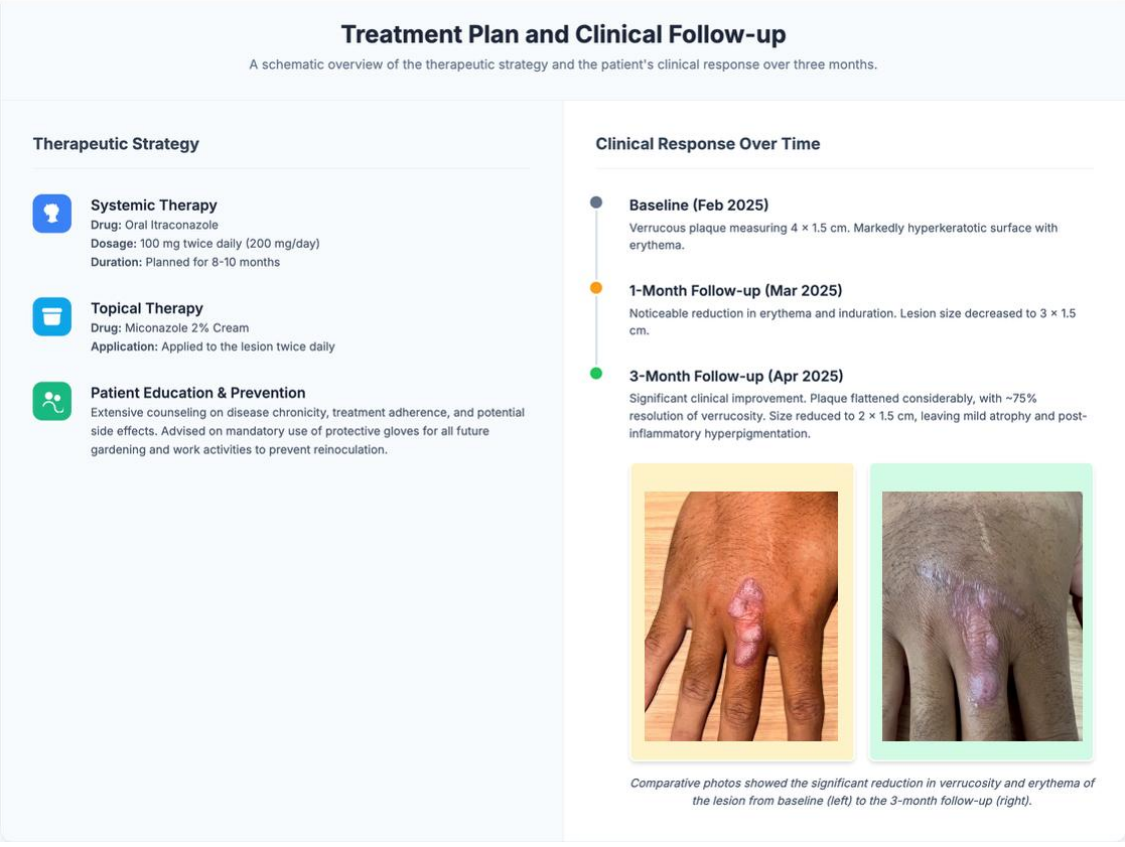
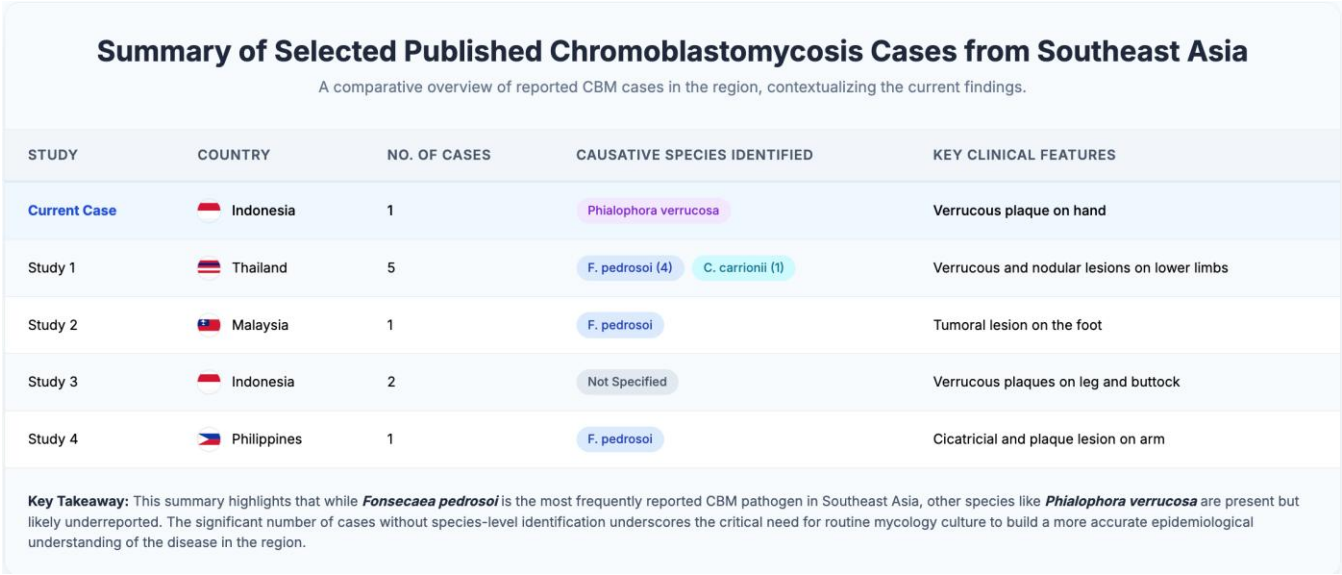


Figure 4. Treatment plan and clinical follow-up.

3. Discussion

This case of chromoblastomycosis provides a rich basis for a detailed discussion of the disease, moving from the specific findings in our patient to broader implications for clinical practice and public health, particularly within the context of Southeast Asia. A significant contribution of any case report from an endemic area is its ability to add a data point to a poorly defined map. CBM is known to occur in Southeast Asia, but its true prevalence and the relative distribution of its causative agents are largely unknown due to a scarcity of published, culture-confirmed case series.[11] To contextualize our findings, we conducted a literature review of CBM cases reported from Indonesia and neighboring countries. Figure 5 presents a crucial comparative summary of selected published chromoblastomycosis (CBM) cases from Southeast Asia, serving to contextualize the current findings within the broader regional landscape. This table is not merely a collection of data; it is a narrative that highlights significant trends and, more importantly, reveals critical gaps in our understanding of this neglected tropical disease in a key endemic zone. By juxtaposing the current case with previous reports, the figure provides a powerful tool for understanding the regional epidemiology and underscores the scientific importance of the present study. The summary begins by highlighting the Current Case from Indonesia. This entry serves as the anchor point for the entire comparison, documenting a single case of CBM caused by the specific pathogen *Phialophora verrucosa*, which manifested as a verrucous plaque on the hand. Placing this case at the forefront immediately establishes its uniqueness, as subsequent entries reveal a different epidemiological pattern. This case acts as a benchmark against which the rest of the regional data can be measured, immediately prompting questions about the prevalence and significance of this less common pathogen. The subsequent entries in Figure 5 paint a picture of the regional status quo. Study 1, conducted in Thailand, documented five cases, revealing a mix of causative agents: four were identified as *Fonsecaea pedrosoi* and one as *Cladophialophora carrionii*. This finding is significant as it aligns with global trends, where *F. pedrosoi* is the dominant pathogen and *C. carrionii* is a known, albeit less frequent, agent. Similarly, Study 2 from Malaysia and Study 4 from the Philippines each reported a single case, and both were caused by *F. pedrosoi*.[12] Collectively, these studies establish *F. pedrosoi* as the most frequently identified cause of CBM in Southeast Asia, responsible for tumoral lesions, cicatricial plaques, and verrucous nodules, primarily affecting the limbs.[13] This reinforces its position as the primary pathogen that clinicians in the region should consider. However, the most revealing entry in Figure 5 may be Study 3, another report from Indonesia. This study documented two cases of CBM, presenting as verrucous plaques on the leg and buttock. Critically, the causative species was not specified; the diagnosis was likely made on clinical and histopathological grounds (the presence of muriform cells) without proceeding to mycology culture for definitive identification. This is an incredibly important piece of data. It represents a significant knowledge gap and highlights a common challenge in resource-limited settings.[14] Without species-level identification, these cases remain epidemiological enigmas. It is impossible to know if they were caused by the common *F. pedrosoi* or a rarer species like *P. verrucosa*. The Key Takeaway presented at the bottom of Figure 5 synthesizes this narrative perfectly. It concludes that while *Fonsecaea pedrosoi* is the most frequently reported pathogen, other species like *Phialophora verrucosa* are present but likely underreported.[15] The "Not Specified" cases are the strongest evidence for this assertion. The figure makes a powerful argument that the perceived rarity of species like *P. verrucosa* in the region may be an artifact of incomplete diagnostic workups rather than true absence. This underscores the critical need for routine mycology culture in all suspected cases of CBM. In conclusion, Figure 5 does more than just present data; it tells a compelling scientific story. It confirms the dominance of one pathogen, highlights the presence of another, and uses the absence of data

in other cases to issue a clear call to action for more rigorous, complete diagnostics to build a more accurate and useful understanding of this debilitating disease in Southeast Asia.



Summary of Selected Published Chromoblastomycosis Cases from Southeast Asia

A comparative overview of reported CBM cases in the region, contextualizing the current findings.

STUDY	COUNTRY	NO. OF CASES	CAUSATIVE SPECIES IDENTIFIED	KEY CLINICAL FEATURES
Current Case	Indonesia	1	Phialophora verrucosa	Verrucous plaque on hand
Study 1	Thailand	5	F. pedrosoi (4), C. carrionii (1)	Verrucous and nodular lesions on lower limbs
Study 2	Malaysia	1	F. pedrosoi	Tumoral lesion on the foot
Study 3	Indonesia	2	Not Specified	Verrucous plaques on leg and buttock
Study 4	Philippines	1	F. pedrosoi	Cicatricial and plaque lesion on arm

Key Takeaway: This summary highlights that while ***Fonsecaea pedrosoi*** is the most frequently reported CBM pathogen in Southeast Asia, other species like ***Phialophora verrucosa*** are present but likely underreported. The significant number of cases without species-level identification underscores the critical need for routine mycology culture to build a more accurate epidemiological understanding of the disease in the region.

Figure 5. Summary of selected published chromoblastomycosis cases from Southeast Asia.

This case serves as an excellent model for the clinical decision-making process in diagnosing a chronic verrucous lesion in an endemic setting. Upon encountering a patient with a four-year history of a solitary, slowly progressive, verrucous plaque on an exposed extremity, a specific differential diagnosis of chronic granulomatous diseases should immediately come to mind. In our region (Indonesia), the primary considerations were chromoblastomycosis and tuberculosis verrucosa cutis (TBVC). Other possibilities included deep fungal infections like sporotrichosis (atypical fixed cutaneous form), leishmaniasis (though less common in this morphology), and non-infectious mimics like hypertrophic lichen planus or even squamous cell carcinoma. Several "red flags" in the history and physical exam pushed CBM to the top of our list. The extremely indolent course over four years is classic for CBM. The well-demarcated nature of the plaque and the presence of the punctate black dots are highly characteristic visual cues. TBVC can appear identical, but it is often associated with a history of direct inoculation from a source of *M. tuberculosis* and may sometimes show more central scarring or a more active, inflammatory border.[16] The patient's history of gardening without gloves provided a perfect inoculation scenario for an environmental fungus. Dermoscopy was not merely a confirmatory test; it was a critical decision-making tool. In a busy clinic, faced with a verrucous plaque, one might consider a trial of topical keratolytics or even antibacterial agents. However, the dermoscopic findings in this case—the specific combination of reddish-black dots (transepidermal elimination of muriform cells), yellowish-orange ovoid areas (dermal granulomas), and a milky-red background (inflammation and vascularity)—dramatically increased the post-test probability of CBM. This finding provided a strong, evidence-based justification to bypass conservative measures and proceed directly to a skin biopsy, thereby significantly shortening the "diagnostic odyssey" for the patient.[17] This case champions the integration of dermoscopy as a standard tool in the evaluation of any chronic verrucous lesion in endemic areas. A crucial teaching point from this case is the negative result of the direct microscopy (KOH prep).

For a junior clinician, this might be falsely reassuring and could lead to the premature exclusion of a fungal etiology. It is essential to understand the pathophysiology: in CBM, the fungal elements (muriform cells) are located deep within dermal granulomas, not colonizing the superficial stratum corneum. A superficial scraping often fails to retrieve these elements.[18] This case perfectly illustrates the low negative predictive value of a KOH prep in suspected subcutaneous mycoses. The clinical pearl here is unequivocal: if clinical and dermoscopic suspicion for CBM is high, a negative KOH should be ignored, and a biopsy for histopathology and culture must be performed. This case highlights the distinct but complementary roles of these two "gold standard" tests. Histopathology answers the question, "What is the disease process?" By identifying the pathognomonic muriform cells within suppurative granulomas, it definitively confirmed the diagnosis of chromoblastomycosis and crucially ruled out mimics like TBVC (no caseation, no acid-fast bacilli) and squamous cell carcinoma (no cellular atypia or invasion). However, histopathology cannot reliably identify the causative species. Culture answers the question, "What is the causative agent?" The isolation of *P. verrucosa* provided the final piece of the puzzle. This species-level identification is vital for accurate epidemiology, as discussed above, and it can have clinical relevance, as some studies suggest *P. verrucosa* may be slightly less susceptible to certain antifungals than *F. pedrosoi*, potentially requiring longer treatment courses.[18]

The chronicity of this infection is a testament to the sophisticated virulence mechanisms of *P. verrucosa*. Its primary weapon is the production of dihydroxynaphthalene (DHN)-melanin, which is enzymatically deposited in the cell wall. This melanin is a potent antioxidant, neutralizing the reactive oxygen species produced by phagocytes.[19] It also physically shields the fungal cell wall PAMPs (like β-glucans) from being recognized by host PRRs, thus dampening the initial innate immune response. Beyond melanin, these fungi produce a suite of extracellular enzymes, such as proteases and phospholipases, which may facilitate nutrient acquisition and local tissue invasion. The morphological shift to the muriform cell is the masterstroke of immune evasion, creating a structure that is physically and biochemically fortified against host attack.[20] The host response, while vigorous, is ultimately ineffective. The initial recognition of the fungus via TLRs and Dectin-1 triggers a pro-inflammatory cascade leading to the formation of granulomas. The intense neutrophilic component of these granulomas is driven by the Th17 pathway, mediated by the cytokine IL-17. While neutrophils are recruited, they are largely unable to kill the resilient muriform cells. The adaptive immune response is a battle between the Th1 and Th2 arms. An effective Th1 response, driven by IL-12 and producing IFN-γ, would activate macrophages to a state of enhanced fungicidal activity. However, in chronic CBM, there is often a strong Th2 component, characterized by IL-4 and IL-10. IL-10 is particularly detrimental, as it is a potent immunosuppressive cytokine that deactivates macrophages and downregulates the Th1 response. This creates a local environment of immune dysregulation where the fungus can persist indefinitely, walled off but not eliminated, leading to the slow, destructive expansion of the granulomatous lesion. The choice of itraconazole as first-line therapy is based on extensive clinical experience and its favorable efficacy/safety profile for CBM. Itraconazole's mechanism of inhibiting fungal ergosterol synthesis effectively halts fungal replication. The excellent response in our patient confirms the in vivo susceptibility of this particular isolate. However, a comprehensive therapeutic discussion must include other options. Terbinafine, which inhibits an earlier step in the ergosterol pathway (squalene epoxidase), is another first-line agent and is sometimes preferred for infections caused by *C. carrionii*. In severe, extensive, or refractory cases, combination therapy (itraconazole plus terbinafine) or the use of intravenous amphotericin B may be necessary. It is also critical to consider drug

interactions when prescribing itraconazole, a potent inhibitor of the cytochrome P450 3A4 enzyme, which can affect the metabolism of many other medications. Physical modalities, such as surgical excision for small, early lesions, cryotherapy, and local thermotherapy, can be valuable adjuncts to systemic antifungal treatment.

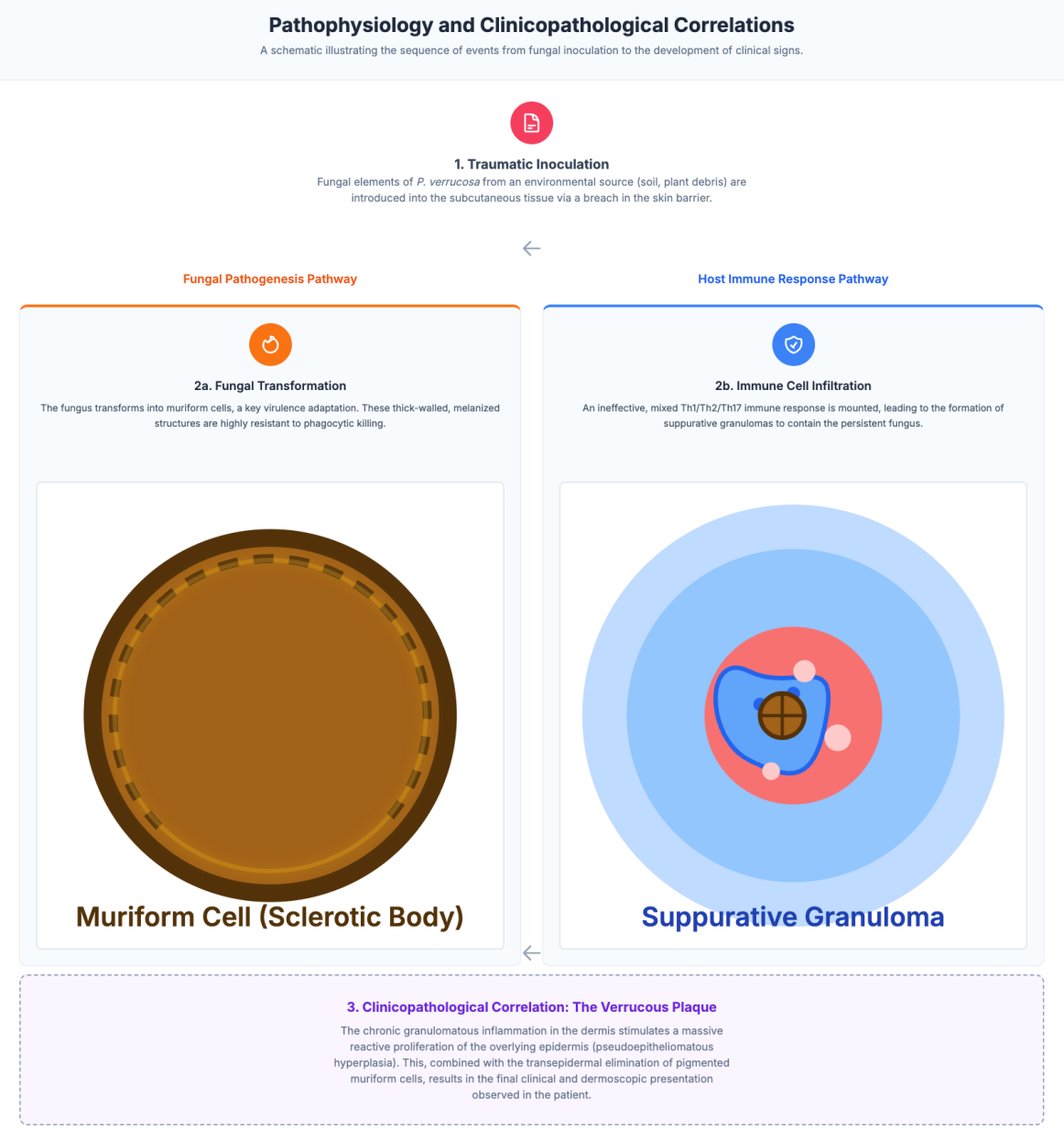


Figure 6. Pathophysiology and clinicopathological correlations.

The entire pathogenic process, as depicted in Figure 6, begins with traumatic inoculation. This is the critical initiating event where fungal elements of *Phialophora verrucosa*, residing as saprophytes in the environment on soil or plant debris, are physically introduced into the deep layers of the skin through a puncture, scrape, or other form of trauma. This step is foundational, as it explains why chromoblastomycosis is overwhelmingly a disease of exposed body parts in individuals who perform

manual labor outdoors, perfectly aligning with the patient's history of gardening without protective gloves. Without this breach of the epidermal barrier, the infection cannot be established. Following inoculation, Figure 6 brilliantly bifurcates the narrative into two parallel but interconnected pathways: the fungal pathogenesis pathway and the host immune response pathway. This dual-pathway model is a sophisticated and accurate representation of the dynamic conflict that unfolds within the host's tissue. On one side, the fungal pathogenesis pathway details the actions of the invading organism. The key event is fungal transformation. The figure explains that the fungus undergoes a remarkable morphological shift, converting from its environmental hyphal form into the pathognomonic muriform cells, also known as sclerotic bodies. The provided schematic of a muriform cell visually represents this structure as a thick-walled, septate, and pigmented entity. This transformation is not incidental; it is a crucial virulence adaptation. The thick cell wall provides physical resilience, while the melanin pigment acts as a biochemical shield, neutralizing the oxidative stress from phagocytes and protecting the fungus from the host's primary killing mechanisms. The figure correctly notes that these structures are highly resistant to phagocytic killing, which is the central reason the infection becomes chronic. Simultaneously, the host immune response pathway illustrates the body's reaction to the fungal invader. This process is detailed as immune cell infiltration. The host mounts an intense inflammatory response, but as the figure notes, it is an ineffective, mixed Th1/Th2/Th17 immune response. This leads to the formation of suppurative granulomas, which are organized collections of immune cells attempting to "wall off" the persistent fungus. The detailed diagram of a suppurative granuloma in Figure 6 visually deconstructs this process. It shows a central core of neutrophils (suppuration) surrounded by layers of macrophages and giant cells, all enveloped by a cuff of lymphocytes. The diagram even depicts a muriform cell being engulfed by a giant cell, perfectly illustrating the host's attempt at containment and the fungus's resistance to it. The formation of these granulomas is the hallmark of the body's chronic, frustrated attempt to clear the infection. Finally, Figure 6 demonstrates how these two parallel pathways converge to produce the final outcome in the stage of Clinicopathological Correlation, resulting in the formation of the verrucous plaque. The figure explains that the chronic granulomatous inflammation (from the host pathway) acts as a powerful stimulant to the overlying epidermis, causing a massive reactive proliferation known as pseudoepitheliomatous hyperplasia. This epidermal thickening is what creates the rough, wart-like (verrucous) surface of the clinical lesion. This process is combined with the transepidermal elimination of pigmented muriform cells (from the fungal pathway), where the body attempts to expel the fungal elements through the thickened epidermis, resulting in the "black dots" seen on clinical and dermoscopic examination. This final stage brilliantly synthesizes the information, explaining that the lesion observed in the patient is not just the fungus itself, but a complex structure created by the prolonged, dynamic interplay between the resilient pathogen and the host's chronic, non-resolving inflammatory response. Figure 6 provides an exceptionally informative and scientifically sound narrative. It moves beyond a simple description of findings to explain the "why" behind the clinical presentation, masterfully linking the environmental trigger to the microscopic host-pathogen battle, and finally to the macroscopic lesion that brings the patient to the clinic.

4. Conclusion

This report documents a case of chromoblastomycosis caused by the rare agent *Phialophora verrucosa* in Indonesia, contributing a vital data point to the sparse epidemiological landscape of subcutaneous mycoses in Southeast Asia. The patient's journey underscores the typically indolent nature of the disease and the potential for significant diagnostic delays. The successful outcome

was predicated on a methodical diagnostic process that moved from high clinical suspicion to a definitive, species-level diagnosis. This case champions the integration of non-invasive tools like dermoscopy into routine clinical practice in endemic areas, as it can provide crucial early clues and guide the clinician towards a timely biopsy, which remains the cornerstone of diagnosis. Ultimately, this report underscores the urgent need for enhanced surveillance of subcutaneous mycoses in Southeast Asia to better understand regional epidemiology and guide public health interventions. It serves as a powerful call to action for clinicians in endemic regions to maintain a high index of suspicion for CBM, to utilize all available diagnostic tools, and to strive for a definitive mycological diagnosis. By doing so, we can improve outcomes for patients suffering from this debilitating, disfiguring, and truly neglected tropical disease.

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