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Case report

The first case of *Trichophyton* spp. pneumonia reported in Vietnam

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ABSTRACT

A respiratory fungal infection is a severe clinical problem caused by endemic or opportunistic fungi. Although pulmonary fungal infections may be associated with no symptoms, the patient may also present with cough, fever, chest pain, and hemoptysis. *Trichophyton* spp., a dermatophyte fungus, is a dermatologic pathogen and can cause a deep, sometimes fatal infection. Here, we report the first case of a deep *Trichophyton* spp. Infection in Vietnam and possibly the first case of *Trichophyton* spp. pneumonia in the literature, which responded completely to medical therapy. This article highlights the epidemiology of fungal lung infections and describes the clinical approach for when to suspect and how to diagnose this disease.

1. Introduction

Recent years have witnessed an escalation in the incidence of fungal infections worldwide [1]. Pulmonary fungal infections, primarily due to *Aspergillus* spp., *Cryptococcus* spp., and *Pneumocystis* spp., can cause life-threatening disease that is rarely found in healthy people [2]. In addition to these common pathogens, non-*Aspergillus* mold pathogens, such as *Mucor* spp. and *Fusarium* spp., have emerged during the past three decades and have been associated with many deaths in hematologic patients [3]. However, based on a literature search performed using the PubMed database, *Trichophyton* spp. pulmonary infections have never been documented. In this article, we present a case of *Trichophyton* spp. pulmonary infections associated with skin lesions and discuss the related literature.

2. Case report

A 55-year-old man was admitted to a tertiary hospital due to fever and hemoptysis. The patient had well-controlled diabetes and hypertension, and regular medications included metformin and amlodipine/telmisartan. The patient smoked for approximately 30 years before quitting 10 years ago and described drinking alcohol occasionally. Multiple purplish, soft, subcutaneous nodules were identified on the elbow and scalp. Three weeks before admission, the patient described experiencing a sharp, left-localized, non-radiating, non-breathing-related chest pain. No additional symptoms were present. The patient was admitted to the local hospital and, after 3 days of hospitalization, was discharged with a non-cardiac chest pain diagnosis, treated with analgesics. The pain was reduced following discharge. Subsequently, a chest computed tomography (CT) scan revealed a ground-glass opacity area in the right lung and a 3-cm lesion in the left lung, with ill-defined borders (Fig. 1). The patient refused any further management. Five days later, the patient began to cough up fresh blood (20 mL), with no additional symptoms. The patient was readmitted to the local hospital and transferred to Cho Ray Hospital Department of Respirology. The patient appeared well overall, with stable vital signs and symmetrically equal lung sounds. Other clinical examinations remained normal. The primary diagnosis was tuberculosis, with differential diagnose of lung cancer and atypical pneumonia. The patient was treated supportively, and no antibiotics were initially prescribed. Blood and biochemistry profiles were normal. Bronchoscopy was performed, revealing white, foamy sputum in both main bronchial lumens (Fig. 2). No signs of ongoing bleeding were observed. Due to the smoking history, the clinical presentation, and the initial results, positron emission tomography and

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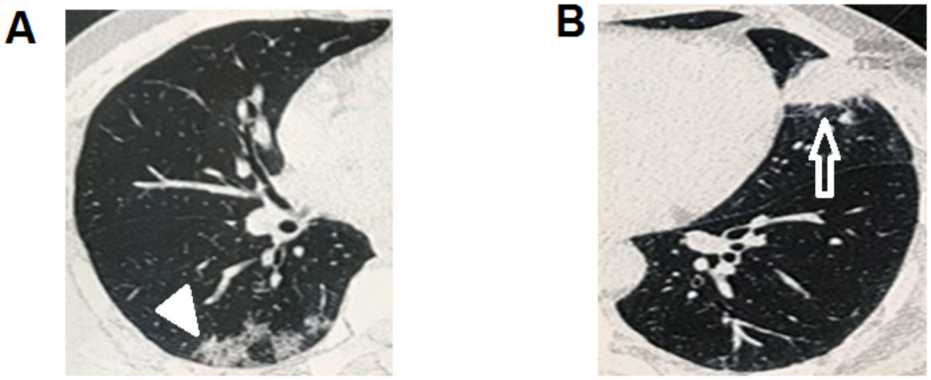

Fig. 1. Chest CT images revealed ground-glass opacity areas in the right lung (A, arrowhead) and a 3-cm lesion in the left lung, with ill-defined borders (B, arrow).

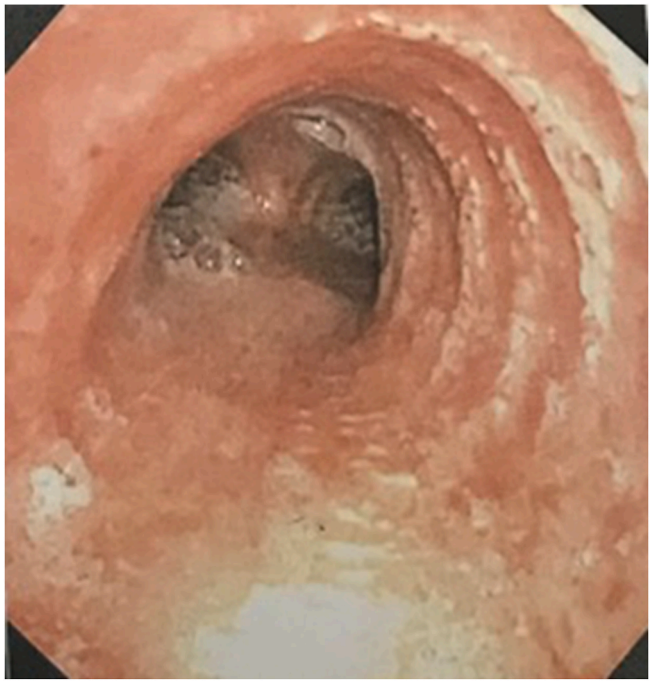

Fig. 2. Bronchoscopy revealed white, foamy sputum in both main bronchial lumens.

computed tomography (PET-CT) was performed, which showed a nodule in the lingula of the left lung, and the maximum standardized uptake value (SUV) was 4.81 (Fig. 3). The lower right lobe also revealed a ground-glass opacity area, with a maximum SUV at 10.12 (Fig. 3). The PET-CT result suggested the presence of an inflammatory process in the lung, which was consistent with the pathology report. Imipenem and cilastatin (500 mg every 6 hours) and levofloxacin (750 mg every 24 hours) were initiated, with a presumed bacterial pneumonia diagnosis. On the third day of antibiotic treatment, a fungal sputum culture revealed the presence of *Trichophyton* spp., which was susceptible to all popular antifungal agents. Because of this unusual presentation of *Trichophyton* spp., both microbiology and infectious disease experts were consulted. Sample contamination was excluded, and fluconazole was initiated at 150 mg every 12 hours. The patient improved clinically and was discharged 10 days later. Follow-up chest CT and bronchoscopy were performed 2 months after fluconazole treatment. The bronchoscopy images showed no abnormalities (Fig. 4), and the chest CT findings revealed the complete elimination of lesions (Fig. 5). The subcutaneous nodules also disappeared. The following chest CT performed at 6-months post-treatment was normal (Fig. 5).

3. Discussion

Trichophyton spp. commonly is commonly associated with dermatophyte infections in human patients [4]. Currently, approximately 16 species of *Trichophyton* are known to infect humans [5]. Among *Trichophyton* spp., the most prevalent species are *Trichophyton mentegrophyte* and *Trichophyton rubrum* [4]. The distribution of species and the sites of infection differ according to geographical location [5]. To date, no epidemiological research has been reported regarding *Trichophyton* spp. In Vietnam. *Trichophyton* spp. has been described as causing deep or invasive disease, but infections are typically limited to the extremities without involving the internal organs [6]. Pneumonia due to *Trichophyton* spp. has not been previously reported, based on a literature search performed using the PubMed database. A report by Rosenthal et al. [7] described the presence of *Trichophyton* spp. In sputum samples obtained from a patient diagnosed with *Pneumocystis carinii* pneumonia. Patients with chronic lung diseases, smoking histories, past history of long-term, high-dose glucocorticoid treatment, bone marrow transplants, or prolonged neutropenia are at risk for fungal pneumonia [8,9]. Patients with other conditions, such as cancer, organ transplantations, cirrhosis, diabetes, and leukemia, are also at risk for fungal lung infections [8,10]. Most cases of fungal pneumonia are acquired through the inhalation of spores; however, they may access the bloodstream if other parts of the body become infected [11]. A patient with fungal lung infections often presents with respiratory symptoms, such as cough, dyspnea, and hemoptysis [12]. Fever and chest pain may occur, and skin manifestations of fungal infection may suggest the cause of pulmonary infection [13]. The clinician must consider the possibility of fungal infection when evaluating lung infiltration in patients who are at high risk of fungal infections and are unresponsive to typical antibacterial treatments [13]. In general, the chest CT images of patients with fungal pulmonary infections may present with features such as ground-glass opacities, consolidation, or nodules, with a surrounding area of ground-glass opacity [12]. The findings associated with vascular invasion include cavitation and infarction peripheral to the nodules [14]. Other features, including tree-in-bud nodules, air crescent signs, and pleural effusions, may also be present [14]. Imaging findings associated with pulmonary fungal infections are often nonspecific and can be

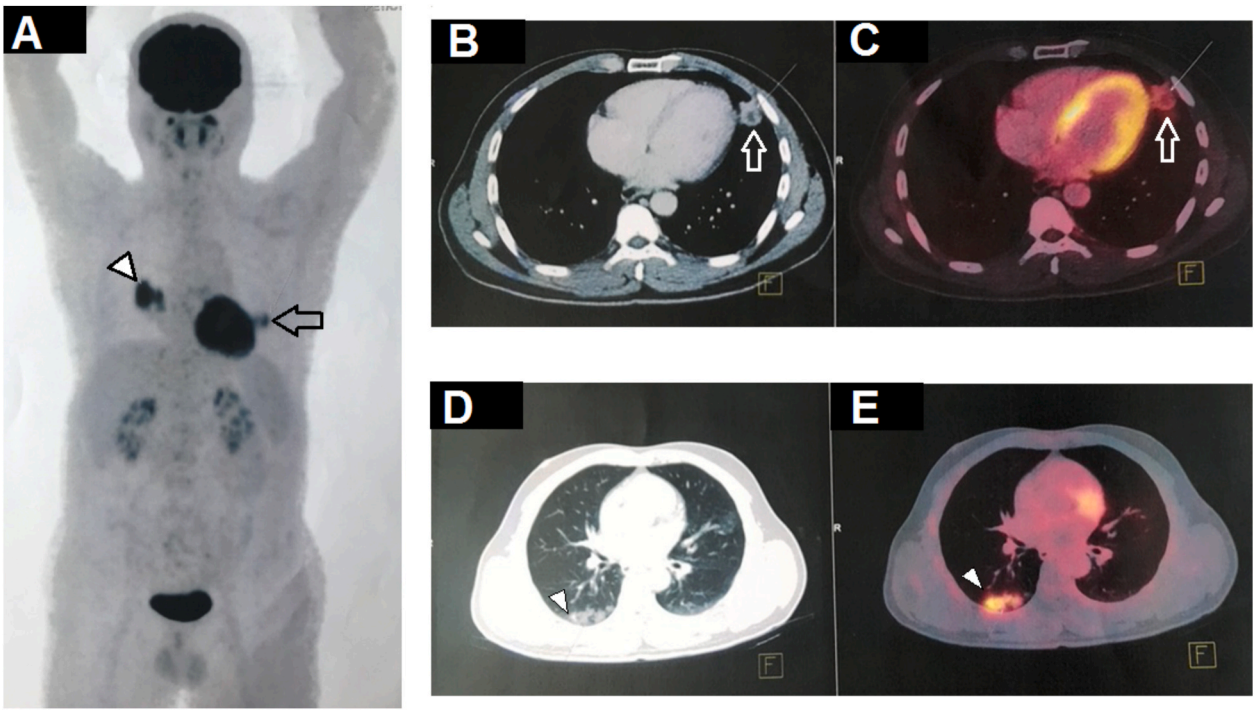

Fig. 3. (A) PET-CT maximum intensity projection (MIP) image showed lessons in the left chest (arrow) and right chest (arrowhead). (B) Chest CT image and (C) fluorodeoxyglucose (FDG) PET image showed a nodule in the left lung, with a maximum SUV of 4.81 (arrow). (C) Chest CT image and (D) FDG-PET image showed ground-glass opacity area in the right lung with a maximum SUV of 10.12 (arrowhead).

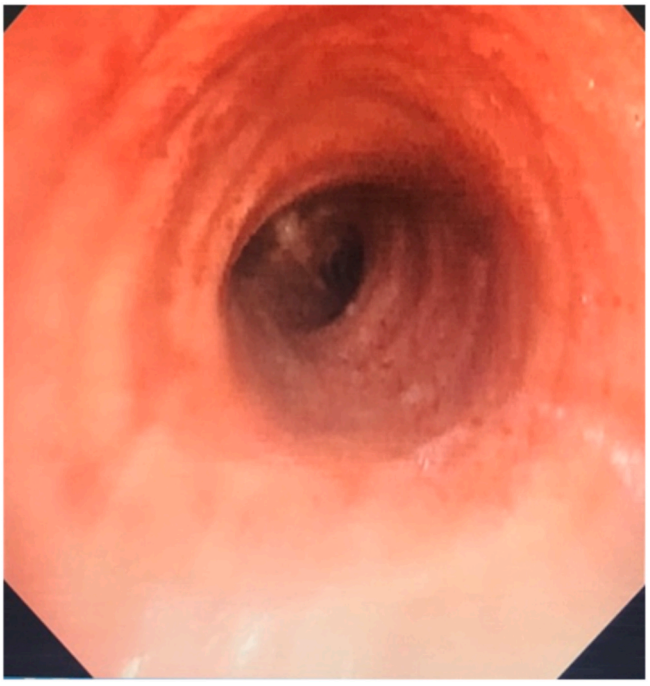

Fig. 4. The bronchoscopy two months after fluconazole treatment was normal.

misdiagnosed as other infections [15]. Direct microscopy and the culture of respiratory specimens are the mainstays of successful diagnosis [16]. However, other advanced laboratory tools should be employed to diagnose fungal respiratory diseases, such as histopathological diagnostics, immunological and biochemical diagnostics, and molecular diagnostics [16]. Patients with deep infections caused by *Trichophyton* spp. can be treated with oral terbinafine or fluconazole [17].

The clinical symptoms and imaging features that were observed in CT and PET-CT scans in this patient were suggestive of pneumonia. However, the hemoptysis was inexplicable, and the patient was unresponsive to typical antibiotic therapy. The diagnosis of fungal pneumonia was based on the culture results. Some important information that was dismissed during diagnoses included skin nodules and factors associated with increased fungal infection risk, such as smoking and diabetes. Although *Trichophyton* spp. pneumonia typically causes dermatophyte infections, the combination of the sputum culture results, and the complete response to fluconazole treatment indicated a diagnosis of fungal pneumonia in this patient.

4. Conclusion

To our knowledge, this is the first case of deep *Trichophyton* spp. Infection that has been documented in Vietnam, and this case likely represents the first documented case of the pulmonary involvement of *Trichophyton* spp. globally. This infection may reflect an underlying immune deficit, either locally in the lung or systematically. In an ideal setting, additional workups should be performed to better understanding the pathogenesis of this case.

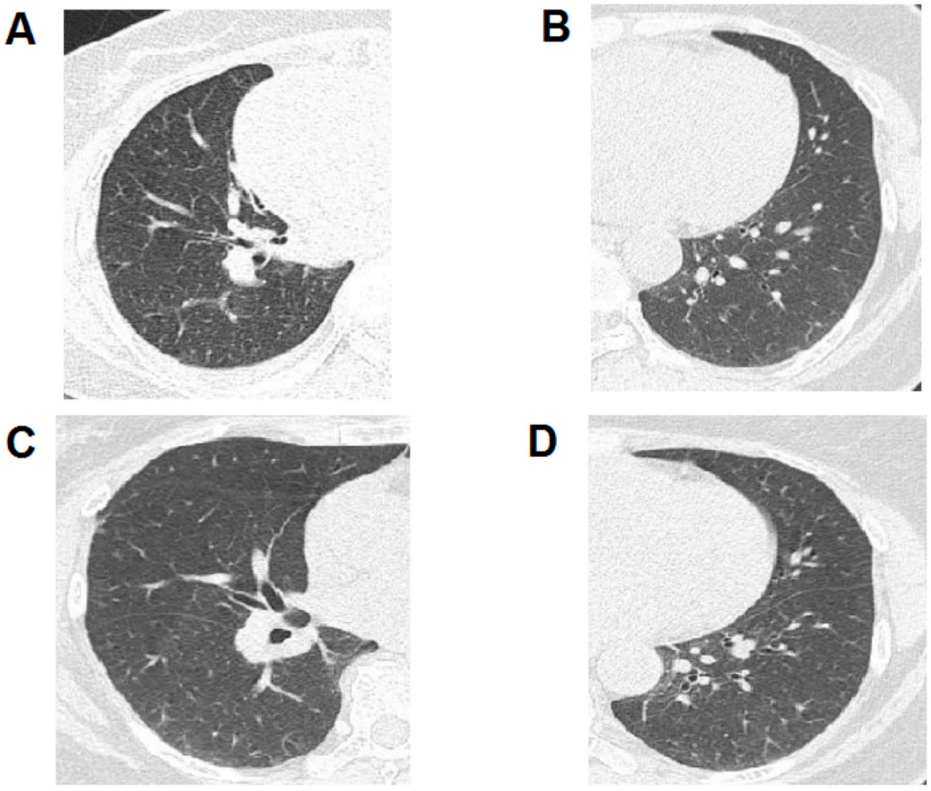

Fig. 5. Chest CT, two (A and B) and six months after treatment (C and D), showed that the lesions had disappeared.

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Author contribution

Le TV and Nguyen MD contributed to this article as co-first authors. All authors have read the manuscript and agree to the content.

Declaration of competing interest

Authors do not have any conflict of interests.

References

[1] F. Bongomin, S. Gago, R.O. Oladele, D.W. Denning, Global and multi-national prevalence of fungal diseases-estimate precision, J. Fungi. (Basel). 3 (2017) 57, https://doi.org/10.3390/jof3040057.
[2] Z. Li, G. Lu, G. Meng, Pathogenic fungal infection in the lung, Front. Immunol. 10 (2019) 1524, https://doi.org/10.3389/fimmu.2019.01524.
[3] M.S. Lionakis, R.E. Lewis, D.P. Kontoyiannis, Breakthrough invasive mold infections in the hematology patient: current concepts and future directions, Clin. Infect. Dis. Off. Publ. Infect. Dis. Soc. Am. 67 (10) (2018) 1621–1630, https://doi.org/10.1093/cid/ciy473.
[4] V.K. Bhatia, P.C. Sharma, Epidemiological studies on Dermatophytosis in human patients in Himachal Pradesh, India, SpringerPlus 3 (2014) 134, https://doi.org/10.1186/2193-1801-3-134.
[5] S. Araya, B. Tesfaye, D. Fente, Epidemiology of dermatophyte and non-dermatophyte fungi infection in Ethiopia, Clin. Cosmet. Invest. Dermatol. 13 (2020) 291–297, https://doi.org/10.2147/CCID.S246183.
[6] R. Nir-Paz, H. Elinav, G.E. Pierard, D. Walker, A. Maly, M. Shapiro, R.C. Barton, I. Polacheck, Deep infection by Trichophyton rubrum in an immunocompromised patient, J. Clin. Microbiol. 41 (11) (2003) 5298–5301, https://doi.org/10.1128/JCM.41.11.5298-5301.2003.
[7] S.A. Rosenthal, J.S. Scott, R.C. Summerbell, J. Kane, First isolation of Trichophyton fischeri in the United States, J. Clin. Microbiol. 36 (11) (1998) 3389–3391, https://doi.org/10.1128/JCM.36.11.3389-3391.1998.
[8] C. Agustí, A. Rañó, I. Aldabó, A. Torres, Fungal pneumonia, chronic respiratory diseases and glucocorticoids, Med. Mycol. 44 (Supplement_1) (2006) S207–S211, https://doi.org/10.1080/13693780600857348.
[9] C. Jiang, Q. Chen, M. Xie, Smoking increases the risk of infectious diseases: a narrative review, Tob. Induc. Dis. 18 (2020) 60, https://doi.org/10.18332/tid/123845.
[10] P.R. Kale, V. Khillan, S. Sarin, Study of Molecular epidemiology, risk factor analysis and comparison of diagnostic methods for rapid diagnosis of fungal pneumonia in critically ill cirrhotics, 2047, Open. Forum. Infect. Dis. 5 (2018) S597, https://doi.org/10.1093/ofid/ofy210.1703. Suppl 1.
[11] A.H. Limper, K.S. Knox, G.A. Sarosi, N.M. Ampel, J.E. Bennett, A. Catanzaro, S. F. Davies, W.E. Dismukes, C.A. Hage, K.A. Marr, C.H. Mody, J.R. Perfect, D. A. Stevens, An official American Thoracic Society statement: treatment of fungal infections in adult pulmonary and critical care patients, Am. J. Respir. Crit. Care Med. 183 (1) (2011) 96–128, https://doi.org/10.1164/rccm.2008-740ST.
[12] J. Guarner, M.E. Brandt, Histopathologic diagnosis of fungal infections in the 21st century, Clin. Microbiol. Rev. 24 (2) (2011) 247–280, https://doi.org/10.1128/CMR.00053-10.
[13] A.H. Limper, The changing spectrum of fungal infections in pulmonary and critical care practice: clinical approach to diagnosis, Proc. Am. Thorac. Soc. 7 (3) (2010) 163–168, https://doi.org/10.1513/pats.200906-049AL.
[14] H.L.P. Orlowski, S. McWilliams, V.M. Mellnick, S. Bhalla, M.G. Lubner, P. J. Pickhardt, C.O. Menias, Imaging spectrum of invasive fungal and fungal-like infections, Radiographics 37 (4) (2017) 1119–1134, https://doi.org/10.1148/rg.2017160110.
[15] N. Tanaka, Y. Kunihiro, N. Matsunaga, Chest HRCT Findings in Patients with Fungal Infection: Characteristic Findings and Pitfalls, EPOS, 2012, https://doi.org/10.1594/ESTI2012/E−0122.
[16] E.D. Lease, B.D. Alexander, Fungal diagnostics in pneumonia, Semin. Respir. Crit. Care Med. 32 (6) (2011) 663–672, https://doi.org/10.1055/s-0031-1295714.
[17] R. Kershenovich, S. Sherman, O. Reiter, S.R. Huss, E. Didkovsky, D. Mimouni, E. Hodak, R. Segal, A unique clinicopathological manifestation of fungal infection: a case series of deep dermatophytosis in immunosuppressed patients, Am. J. Clin. Dermatol. 18 (5) (2017) 697–704, https://doi.org/10.1007/s40257-017-0276-y.