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Case report

Paecilomyces in an immune competent host

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ABSTRACT

Paecilomyces species was first recognized to cause human disease in 1963. It is a rare cause of invasive fungal infection, with cases sporadically reported in immunocompromised patients. Here we report the first case of pulmonary *Paecilomyces* in an immunocompetent patient that was successfully treated with amphotericin B and posaconazole.

Case presentation

A 54-year-old nonsmoker male presented with 3 weeks of cough productive of small amounts of clear to yellow-colored phlegm, fatigue and malaise. He reported persistent fever with temperature up to 102 °F and weight loss of 20 pounds over 2 weeks. He was repeatedly evaluated for these symptoms and multiple courses of outpatient antibacterials failed to improve his symptoms. He worked as a truck driver in a dumpster yard, had not traveled out of the state of West Virginia, and denied sick or animal contact or recent hospitalization. Physical examination and basic lab workup including complete blood count, chemistry panel, sputum culture, viral respiratory panel by PCR, HIV screen, *Streptococcus pneumoniae* and *Legionella* urine antigens, Histoplasma antibody panel and serum QuantiFERON TB Gold all within normal. Chest x-ray showed mild interstitial prominence and CT chest showed multiple subpleural nodular opacifications involving all lobes bilateral (Fig. 1A).

The differential diagnosis included chronic infection, connective tissue disease or interstitial lung disease. Serologic evaluation for connective tissue etiologies showed no evidence of systemic lupus erythematosus, scleroderma, mixed connective tissue disease or vasculitis. Bronchoscopic sampling with lavage was nonrevealing. Video assisted thoracoscopic biopsies from the three right lobes were then obtained. Tissue samples cultured showed growth of *Paecilomyces* species in all three wedge biopsies and pathology consistent with organizing pneumonia and emphysematous changes (Fig. 1 B). Specialty lab identified *Paecilomyces formosus* infection sensitive to amphotericin B and posaconazole Due to the unusual presentation, immune deficiency as a contributing factor was sought and ruled out (Table 1). The patient completed a 2-week course of intravenous amphotericin B followed by 6 weeks of oral posaconazole, with resolution of symptoms. 3 months after, symptoms completely abated, and dyspnea resolved. Chest CT revealed marked improvement.

Discussion

Paecilomyces is an asexual fungus related to *Penicillium* and *Aspergillus* that is found universally in decaying vegetable and soil (Fig. 1C) [1,2]. It is notoriously known to be a contaminant of sterile solutions and resistant to most commercial sterilization techniques [3]. *Paecilomyces* was first described as a genus by Baine in 1907 [4]. *Paecilomyces varioti* and *Paecilomyces lilacinus* are the two most common species reported to cause infection [3]. *Paecilomyces* species are rare causes of invasive fungal infections, with cases sporadically reported in immuno- compromised patients including those with organ transplants, hematologic malignancies or on dialysis [5]. Almost all cases were associated with an immunocompromised situation except for a single case with associated pulmonary mycetoma [6] and another with maxillary sinus infection [4]. Route of infection in immunocompetent patients is through foreign bodies or implanted devices including prosthetic heart valves, dialysis catheters and intraocular lens implants.

Paecilomyces was first recognized to cause human disease in 1963, when a case of fatal endocarditis following mitral valve

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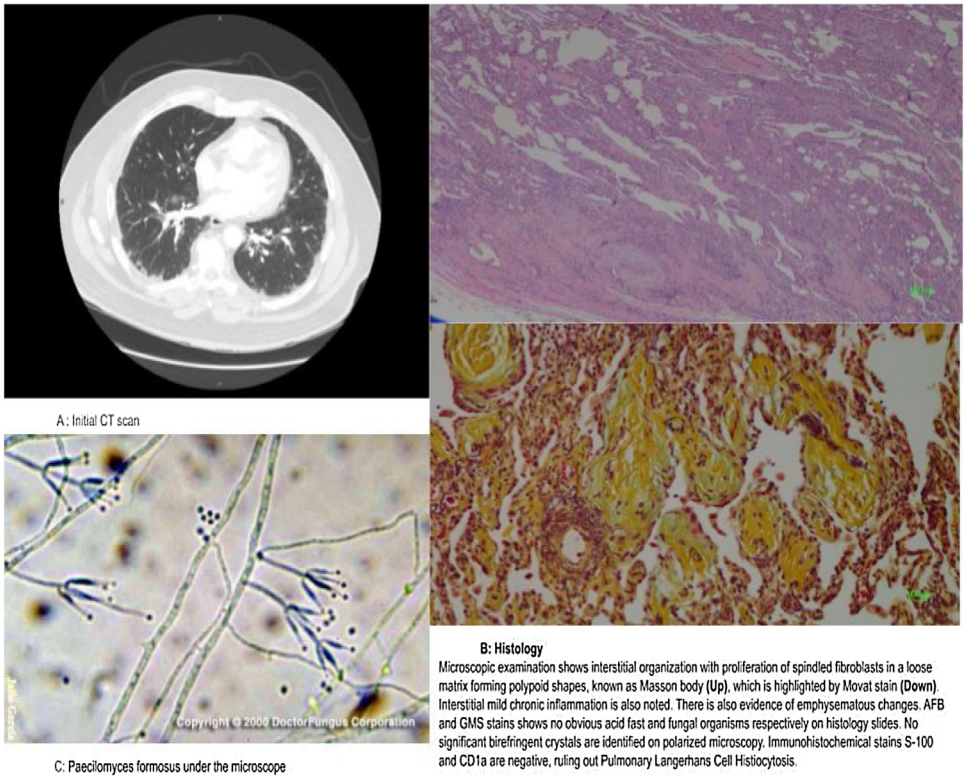

Fig. 1. A: Initial CT scan. B: Histology.
Microscopic examination shows interstitial organization with proliferation of spindled fibroblasts in a loose matrix forming polypoid shapes, known as Masson body, which is highlighted by Movat stain. Interstitial mild chronic inflammation is also noted. There is also evidence of emphysematous changes. AFB and GMS stains shows no obvious acid fast and fungal organisms respectively on histology slides. No significant birefringent crystals are identified on polarized microscopy. Immunohistochemical stains S-100 and CD1a are negative, ruling out Pulmonary Langerhans Cell Histiocytosis. C: *Paecliomyces formosus* under the microscope

Table 1
Immune Workup.

Marker	Result	Reference
C3	123	90–180 mg/dL
C4	26	10–40 mg/dL
IgG	840	553 - 1360 mg/dL
IgA	208	83–407 mg/dL
IgM	84	34–2014 mg/dL
CD3 %	79.3	49–85
CD3A %	1085/cmm	411–2061
CD4 %	46.1	29.7–63.3
ABS CD4 Helper	631/cmm	216–1664
CD8 %	27.2 %	5.5–41.5
ABS CD8 Suppressor	372/ cmm	217–749
CD19 ABS	174/ cmm	32–341
CD19 %	12.7 %	4–17
CD56 ABS	117	150–440
CD56 %	8.6 %	5–28

replacement was reported [7–10]. Only two cases of clinically significant illness due to *Paecilomyces formosus* have been reported in immunocompromised host [11]. No cases have been reported in immunocompetent hosts [12]. Diagnosis is based on microscopic analysis. The predominant microscopic characteristic that describes the genus is phialides which are swollen near the base but taper toward the apex with long chains of ovoid conidia branching freely into a brush-like structure [5]. *Paecilomyces* may be confused with *Fusarium*, *Pseudallescheria*, or even *Aspergillus* on histologic sections [13]. Differentiation between *Paecilomyces* spp. is clinically important since they have different susceptibilities to antifungal agents [14]. Voriconazole was recently shown to have fungicidal activity against *P. lilacinus*, a finding that is in contrast to the fungistatic effect of amphotericin B and itraconazole [6]. In contrast, *P. varioti* is universally susceptible, both in vitro and in vivo, to amphotericin B and it is therefore the agent of choice [14]. In addition, with the sole exception of fluconazole, *P. varioti* is susceptible in vitro to most of the azoles [15].

There is much less knowledge of the best treatment for *Paecilomyces formosus*. Looking at the only two cases available in literature, liposomal amphotericin B with caspofungin were used in one case [11], and micafungin with lanoconazole ointment were used in the other [12].

Organizing pneumonia pattern is seen in multiple infectious and noninfectious pathologies. It is thought to be merely a way of the lung to respond to various injuries. That said, the association of *Paecilomyces* with this pattern has never been reported in the literature but this does not come as a surprise given the nature of this pattern which is very nonspecific. Other fungal elements like *Aspergillus* and *Pneumocystis* species are described to elicit this pattern. Because *Paecilomyces* is well known to be a contaminant in the lab, growth in one culture sample is not sufficient to prove clinical disease [9]. In this case, tissue specimens were obtained from different locations and all grew *Paecilomyces*. We believe the patient had a unique situation that allows him to acquire the infection. As a truck driver for a dumpster company, he is heavily exposed to dust from loading and unloading his truck multiple times daily. We believe he had a large inoculum of the fungus inhaled, and probably multiple times giving the fungus the chance to overcome his immune system. We have ruled out any apparent immunodeficiency with normal immunoglobulin levels during and after the illness resolved. In addition, a T cell enumeration study revealed normal lymphocyte counts. The patient has been seen by an immunologist with no apparent sign of immunodeficiency.

Conclusion

This case confirms that *Paecilomyces* species can cause clinically significant pulmonary infections. Although this presentation appears to be unusual, this case highlights the importance to consider *Paecilomyces* species among the etiological agents of organizing pneumonia. We still believe that multiple cultures, and other etiologies need be ruled out to affirm the diagnosis with close follow up for response to treatment.

CRediT authorship contribution statement

Rami Y. Batarseh: Writing - original draft, Visulaization, Writing - review & editing. **Mena Shehata:** Writing - original draft. **Melinda Diane Becker:** Writing - original draft, Writing - review & editing. **Saroj Sigdel:** Writing - original draft, Writing - review & editing. **Peimei He:** Writing - review & editing. **Yousef R. Shweihat:** Conceptualization, Investigation, Methodology, Supervision, Writing - review & editing.

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