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Paratracheal abscess by plant fungus *Chondrostereum purpureum*- first case report of human infection

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ABSTRACT

Chondrostereum purpureum, is a plant fungus causing silver leaf disease of plants, particularly of the rose family. Here we report a case of paratracheal abscess caused by *C. purpureum.* This is a first of its kind of a case wherein this plant fungus caused disease in a human. Conventional techniques (microscopy and culture) failed to identify the fungus. Only by sequencing, the identity of this unusual pathogen could be revealed. This case highlights the potential of environmental plant fungi to cause disease in humans and stresses the importance of molecular techniques to identify the causative fungal species.

1. Introduction

Silver leaf is a fungal disease of trees caused by the fungal plant pathogen *Chondrostereum purpureum*. It attacks mostly species of the rose family. The disease is progressive and often fatal. The common name is taken from the progressive silvering of leaves on affected branches. It is spread by airborne spores landing on freshly exposed sapwood. For this reason plants are pruned in summer, when spores are least likely to be present [1].

Hosts with compromised immune system are most vulnerable to fungal infection but healthy and immunecompetent individuals are also frequently reported to have fungal infections. In this situation the infections may be associated with exposure to a large inoculum. Structural and systemic differences between plants and animals provide various challenges for microbial invasion. At the cellular level, plant and animals cells are structurally similar. [2] Few among the millions of fungal species fulfil four basic conditions that are necessary to infect and invade human or animal hosts: (1). High temperature tolerance, (2). Ability to invade the human host, (3). Ability to lysis and absorption of human tissue, and (4). Resistance to the human immune system [3].

Although different evolutionary pathways of plant and animal pathogens exist, evidence of animal or human infection by phytopathogens, has recently emerged. Global warming, alteration of ecosystem, international travel and commerce, and unplanned urbanization may be responsible for emergence of not only newer fungal infection but also various zoonotic viral and bacterial diseases [4]. Phytopathogens are generally considered to be opportunistic pathogens for immunologically weakened population that lack specificity for humans and animals [2].

2. Case report

A 61 year old male patient from the eastern region of India presented to the outpatient department (D0) with hoarseness of voice, cough, recurrent pharyngitis, fatigue, difficulty in swallowing and anorexia for the last 3 months. He had no history of diabetes, HIV infection, renal or any chronic disease, immunosuppressive drug intake, or trauma. The patient, a plant mycologist by profession was working with decaying material, mushrooms and various plant fungi for a long time as part of his research activities.

CT scan of the neck demonstrated the presence of a right paratracheal abscess (Fig. 1). CT guided aspiration of the abscess was performed. X-chest was normal. (D0).

The aspirated pus was sent for relevant investigations. Gram stain and acid fast stain did not reveal anything. Fungal stain by Gomori's Methenamine Silver (GMS) showed septate hyphae. Bacterial and Mycobacterial growth was negative. CBNAAT (Cepheid Sunnyvale, CA, United States) was performed to detect presence of mycobacteria, but was negative (D1). The pus culture on Sabouraud dextrose agar (SDA) grew creamy pasty colony with buff coloured pigmentation on reverse side after 4–5 days of incubation at both 25 °C and 37 °C (D5) (Fig. 2). Both Gram stain and LCB (Lacto phenol cotton blue) mount preparation was performed and round and tubular fungal elements were observed (Fig. 3). The fungus could not be identified phenotypically, so it was sent to the "WHO collaborating Centre for Reference & Research on Fungi of

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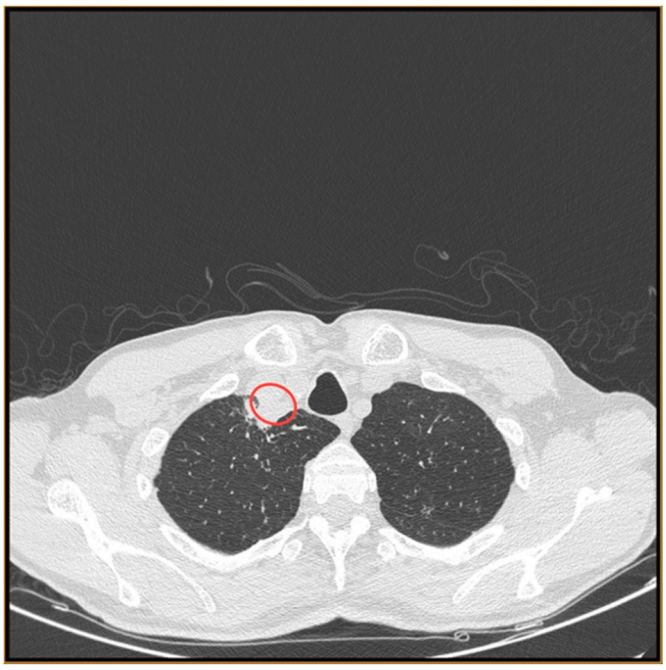

Fig:1. CT scan demonstrated the presence of a right paratracheal abscess.

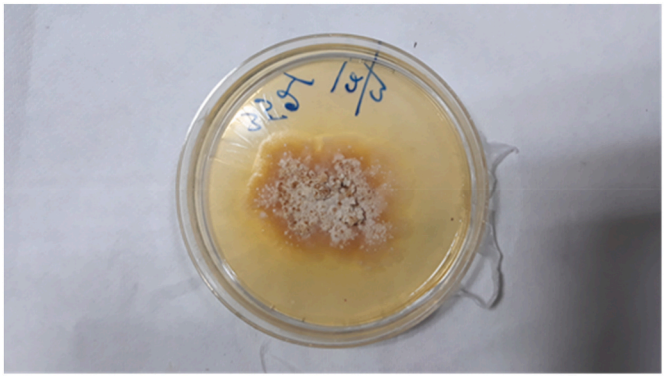

Fig:2. Sabouraud dextrose agar showed growth of creamy pasty colony with buff coloured pigmentation on reverse side after 4–5 days.

Medical importance" in India. It was identified as *Chondrostereum purpureum* by DNA sequencing. (D+28).

Histopathological examination of the aspiration material revealed mixed inflammatory cells, neutrophils, and a few endobronchial cells on a necrohemorrhagic background. The patient denied having worked with such a plant pathogen but he confirmed that he was working with decaying material and other plant fungi for a long time as part of his research activities. The infection was treated with complete drainage of the pus followed by oral voriconazole 400 mg twice daily on day 1 followed by 200 mg twice daily for total 60 days (D+30). After two years of follow-up, the patient was absolutely fine and there is no evidence of recurrence. (D+745).

3. Discussion

Among the millions of fungi present in the environment only a few hundreds of fungi are able to infect human and animals [5]. That animal and human diseases can be caused by plant pathogens is a new concept that raises serious questions regarding the propensity of such infection to occur in healthy as well as immunocompromised individuals [6]. If the fungi can escape the phagocytosis pathway and is able to evade the host immune system, then they can establish themselves as human pathogens. Those fungal species that are able to grow at 35–37 °C can become a human pathogen or commensal flora [2]. The pathogen enters the human body through damaged skin and the respiratory tract and can causes infection mostly in immunocompromised individuals.

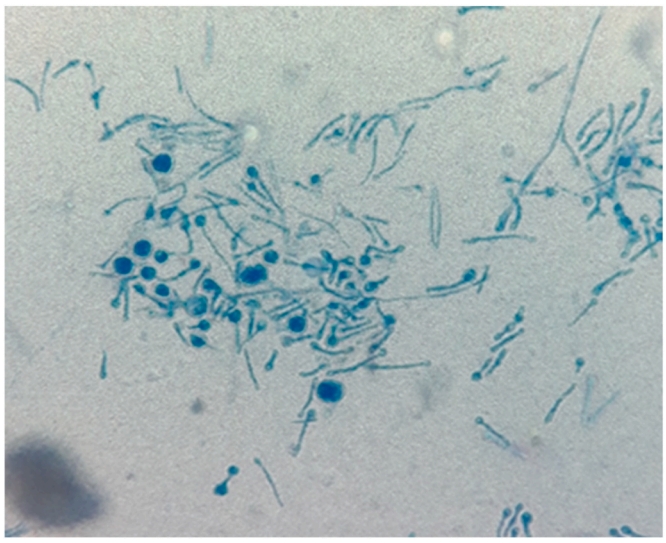

Fig:3. Lactophenol Cotton Blue mount preparation showed round and tubular fungal elements.

Cross-kingdom human pathogens, and their potential plant reservoirs, have important implications for the emergence of infectious diseases [7]. Fungi are also responsible for various infections in plants cause destruction of millions of plants and crops. It also produces toxins that contaminate food causes acute toxicity. In chronic cases it may be act as carcinogens [6,8].

Over the past several decades multiple new pathogenic fungi have emerged. A notable emergence of the multidrug resistant fungus *Candida auris* has spread all over the world and has become a significant threat. The worsening of global warming and other civilization activities opens Pandora's Box for newer fungal diseases. According to the theory of Garcia-Solache and Casadevall [4], few thermally intolerant fungi with pathogenic potential can able acquire the ability to survive at body temperatures. This threat is magnified as some fungi can take the benefit of a natural selection-adaptation strategy, and therefore to adapt to higher temperature by thermal selection [9].

For the diagnosis of fungal infection, conventional methods such as direct microscopic detection, culture and histopathological examination are very important but molecular techniques are helpful in rapid detection and identification of unusual organisms, especially when morphological examination is not possible for fungal pathogens that are not recovered in cultures or when morphological data are inconclusive. Proper identification is important for targeted therapy. As many of the fungal pathogens are intrinsically resistant to various antifungals and recommendation should be made on the basis of individual clinical case experience [6].

In this report we have described a plant fungal pathogen causing a paratracheal abscess in an immunocompetent host. Recurrent exposure to the decaying material may be the cause of this rare infection. This fungal infection was evident from macroscopic and microscopic morphology but the nature of infection, potentiality to disseminate etc. could not be ascertained. Even when the sequencing report identified it as a plant fungus few weeks later but still literature search failed to reveal any reports of such infection in human subjects.

Treatment of fungal infection is multimodal, along with the proper antifungal therapy surgical removal of the pus is also very important and also prevention of exposure and reversal of risk factors are also

recommended. Keeping in mind the rarity of this fungus, chances of recurrence and potential morbidity, we treated this patient with surgical drainage of the abscess and long term oral antifungal therapy and regular follow up to detect any sign of recurrence. As we did not had any idea regarding the choice of antifungal against this rare fungi, we decided to choose a safe, oral broad spectrum antifungal which can be easily tolerated by the patient.

This case report demonstrates the crossover of plant pathogen into humans when working in close contact with plant fungi. The cross-kingdom pathogenicity demands much work to be done in order to explore insights of the mechanisms involved, thus leading to possible recommendations to control and contain these infections.

Declaration of competing interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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