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Case report

First reported case of *Cladosporium* para-aortic abscess

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ABSTRACT

Cladosporium species are ubiquitous dematiaceous fungi, widely found in the indoor and outdoor environments. They are considered a frequent source of contamination in laboratory settings. In human pathology, *Cladosporium* is a main agent of phaeohyphomycosis, known to cause subcutaneous and brain abscess, especially in immunocompromised hosts. The route of disseminated infections is mainly hematogenous after inhalation of the spores. However, a direct inoculation could be possible. We report the first case of a para-aortic abscess with thrombus formation, caused by *Cladosporium spp.*, after a valvular replacement surgery, in an immunocompetent patient. This raises the alarm about the rapid identification of the source of contamination in the operating room, in order to prevent the emergence of further fatal infections.

Introduction

Cladosporium species are ubiquitous fungi, usually isolated from the nature as saprobes and endophytes growing on plant materials and in soil, known for their pathogenicity for animals and plants. They could also be found in the indoor environment [1]. Although rarely implicated in human pathologies, *Cladosporium* spp. is the main cause of phaeohyphomycosis, a subcutaneous or systemic abscess formation, described among immunocompromised hosts, including organ transplant recipients [2].

Cladosporium spp. is known for its neurotropism, thus, many cases of brain abscess formation were reported in the literature, caused by different species: *Cladosporium sphaerospermum* [3] *C. macrocarpum* [4], and *C. bantiana* [5]. A recent literature review has identified a total of 25 cases of *Cladosporium*-related infections with the most frequent localizations being subcutaneous abscess, followed by brain abscess and keratitis [3].

We present here the first case report of a para-aortic abscess caused by *Cladosporium* spp., in an immunocompetent patient, several months after an aortic valve replacement surgery.

Case presentation

Our case is an 81-year-old male patient, smoker, suffering from coronary artery disease and chronic ischemic heart failure with reduced ejection fraction (LVEF=35%). In January 2021, he underwent a bioprosthetic aortic valve replacement surgery in a tertiary care hospital, for severe aortic stenosis with one coronary artery bypass graft. Cross clamping time was 85 min and cardio-pulmonary bypass time was 106 min. Five days following the surgery, a dual chamber defibrillator was implanted for recurrent ventricular tachycardia and Type 1 atrio-ventricular block.

Three months later, the patient started presenting recurrent episodes of fever with no other symptoms. Investigations were done, including a thoracic CT-Scanner showing no evidence of pulmonary infection. A Trans-Esophageal-Echocardiography (TTE) done in July 2021, showed a retro-aortic mass of 21 × 30 mm, iso-echoic, encapsulated, suggestive of an abscess, or a benign neoplasm. Blood cultures were taken and came back all negative. The patient was admitted to the hospital and was treated with 2 g of Vancomycin continuous infusion and one gram of inta-venous Imipenem-cilastatin every 8 h, for a total of 6 weeks. Initial improvement was noticed without any surgical intervention. The fever relapsed after his discharge.

A follow-up TEE was done in September 2021, showing a dissecting hematoma of the aortic wall, at the level of the annulus, with a mobile thrombus that causing aneurysmal dilatation of the aorta,

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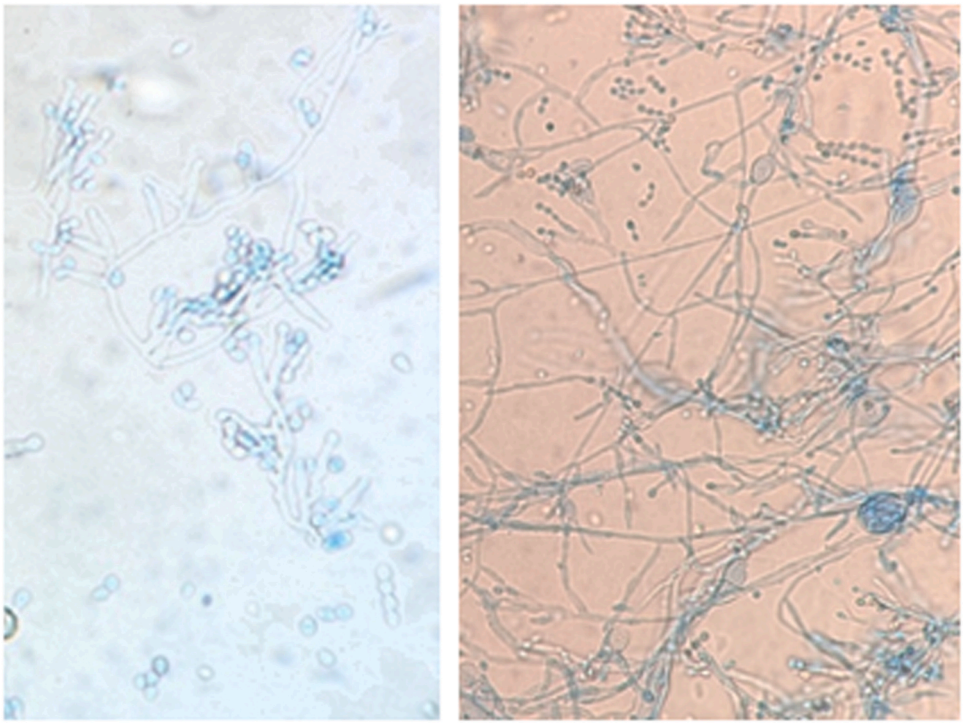

Fig. 1. Septate hyphae, conidiophores and chains of oval conidia (Lactophenol preparation, x40).

all suggested an abscess formation. However, the aortic prothesis was normally functioning with no vegetations seen. A PET-Scan was then performed, revealing the presence of a hypermetabolic oval-shaped mass extending over approximately 22 × 13 mm in diameter around the aortic wall, suggestive of a para-aortic abscess. No other infectious sites were identified. Hence, the patient was treated by Doxycycline 200 mg once daily and oral Voriconazole.

On the 12th of September, the patient presented for the first time to the emergency department of our hospital for vertigo and difficulty in walking. The diagnosis of an ischemic stroke was made upon a brain CT-scan with contrast, showing a hypodense area of the periventricular white matter and, to a lesser extent, in the right precentral frontal lobe, with no enhancement, associated with another small right post-central parietal and subcortical hypodensity of ischemic nature. A 24-hour Holter monitor showed no dysrhythmias. Thus, the embolic event was attributed to the aortic thrombus and a surgical intervention was programmed despite its high risk. Six blood cultures were done prior to IV antibiotic treatment with Vancomycin 2 g in continuous infusion, 1 g IV amikacin daily, and 1 g of IV imipenem-cilastatin every 8 h. No pathogen grew on the blood cultures.

During the surgery, a complete sternotomy with cardiopulmonary bypass were performed. The para-aortic abscess removed at the level of the previous aortotomy site facing the right atrium, formed an intra-luminal thrombus of 8 × 2 cm. The dissected aorta was replaced with Dacron graft. All infected tissues were removed and sent for culture and histopathologic study. The surgery was complex and long, with a total bypass time of 254 min. The prosthetic valve situated at few centimeters from the abscess showed no macroscopic signs of infection, so it was not removed. The patient presented signs of sepsis post operatively nonresponsive despite heavy resuscitation and died on the next day.

Five different aortic biopsy fragments were sent to the clinical microbiology laboratory of our hospital. All cultures on blood agar revealed the presence of a fast-growing dome-shaped dusty green colonies, after 48 h of incubation at 37 °C, while no bacterial growth was detected. The microscopic examination of these colonies, using a lactophenol cotton blue adhesive tape preparation, revealed a pigmented septate hypha with branching conidiophores from which oval-shaped conidia are released by budding, typical form of the genus *Cladosporium* (Fig. 1). In order to exclude the possibility of an environmental contamination, the inoculation of biopsy fragments was repeated on Sabouraud's dextrose agar and incubated at both 25 and 37 °C. The mycology cultures came back all positive in 6 days, showing the same dome-shaped colonies, characteristic of the fungal genus *Cladosporium*: velvet-like, brown-green colonies of black reverse (Fig. 2). In parallel, the histopathological examination showed filamentous, swollen, septate hyphae with conidial budding amongst a granulomatous reaction with giant cells (Fig. 3).

Considering the positive cultures of the biopsy fragments, confirmed by the histopathological examination, a diagnosis of para-aortic infection with *Cladosporium spp* was made.

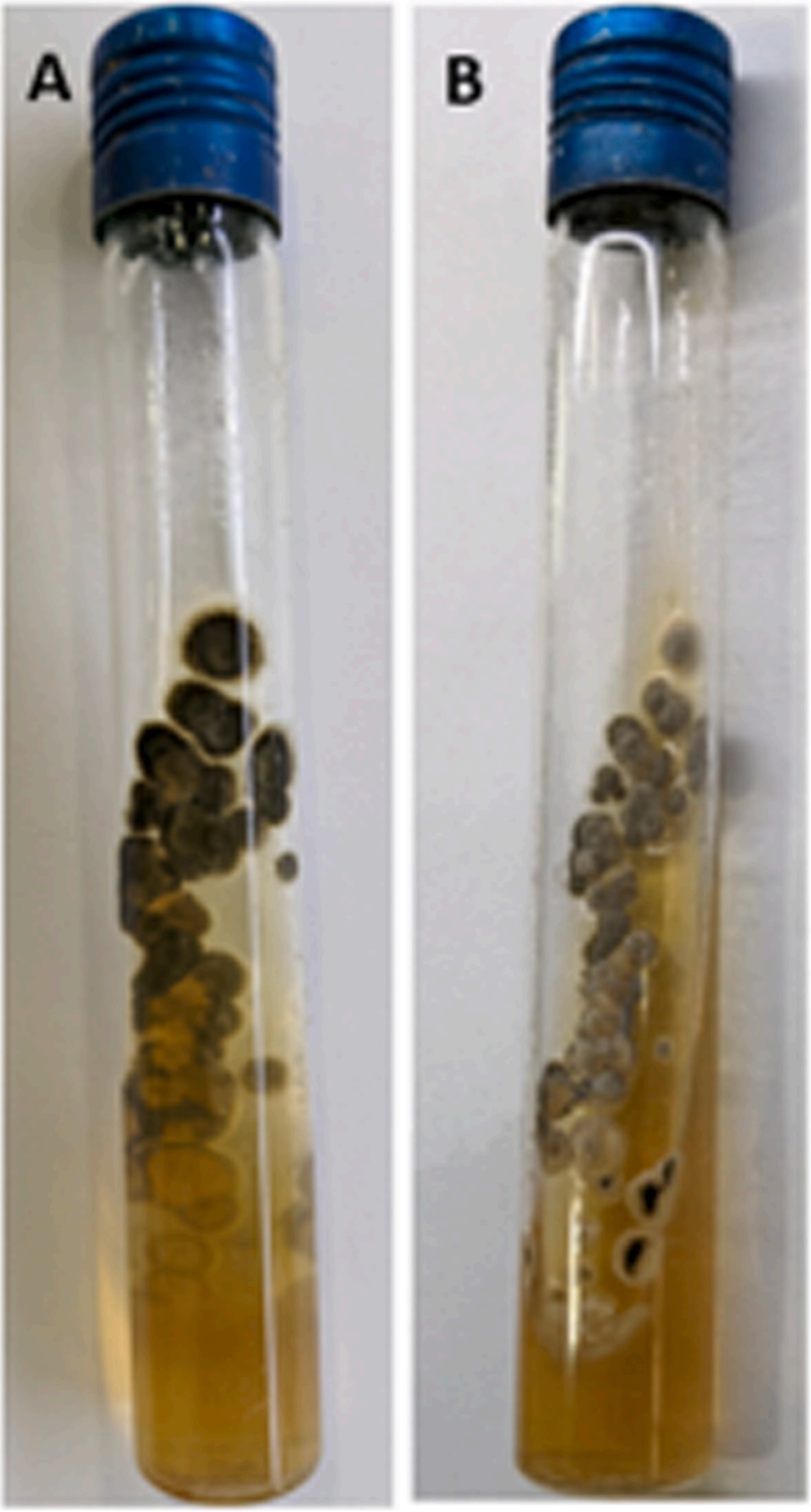

Fig. 2. (A): Six-day-old brown-green colonies of Cladosporium spp. on Sabouraud's dextrose agar (B): Black reverse side of the colonies.

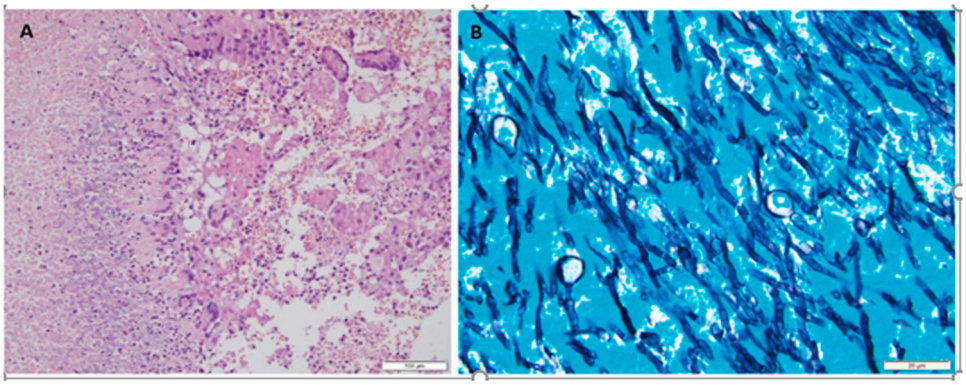

Fig. 3. (A): Granulomatous reaction with giant cells (Hematoxylin and Eosin, x 40). (B): Fungal septate hyphae with oval-shaped conidia (Grocott Methenamine Silver, x40).

Discussion

Cladosporium spp. are dematiaceous molds, widely spread in outdoor and indoor environments, isolated on the surface of glass fibers and wood, in foods and in water pipes. They have the property to adapt to many conditions like xerosis and low temperatures. Thus, they are considered a major source of contamination especially in laboratory settings [6]. In our case, the *Cladosporium spp*. was first identified on blood agar media considered as a possible contaminant. However, the culture of the abscess repeated on Sabouraud-agar media confirmed its growth. The histopathological morphology also supported the fungal nature of the para-aortic abscess.

Invasive Cladosporium infections have a predilection for the central nervous system with brain.

abscess formation, most probably through hematogenous spread, since no direct inoculation was.

described in those cases [3]. However, post-surgical inoculation was described in few cases.

Singh et al. reported the case of an esophageal infection following a small bowel transplant [7]. Only one case of endocarditis due to *Cladosporium* spp. (formerly named *Hormodendrum dermatitidis*) occurring after an aortic and mitral prosthetic valve replacement surgery, was reported in the literature [8]. Similarly, to our case, the fever has developed two months after the surgery in a sub-acute evolution. However, our patient has developed the abscess in the para-aortic region at few centimeters from the prosthetic valve, which remained intact. All imaging studies, including a PET scan and a brain CT showed no evidence of cerebral, sinus nor pulmonary localization. This raises the flag of a possible direct contamination occurring in the operating room. Several hypotheses could be relevant in this case. First, the damages to hospitals infrastructures following the Beirut blast in August 2020 and the subsequent renovation process, could be a possible source of environmental contamination of this fungus. In fact, Cheng et al. reported a case of keratitis caused by *Cladosporium* spp. in a construction worker [9]. Second, the cardiopulmonary bypass circuit could be a possible source of fungal contamination. A study conducted by Sartori et al. in 2007 showed that *Cladosporium* spp. accounted for 25% of all filamented fungi isolated in the water of the hemodialysis system [10].

These findings suggest that it is essential to investigate the sources of contamination and implement mold remediation strategies to prevent the future emergence of such fatal infections.

CRediT authorship contribution statement

R.I and Z.BC wrote the article, with support from R.S, J.C, R.E and M.SK. R.S and R.E provided the microbiologic data. V.J and M.SK provided the surgical details. All authors approved the final manuscript.

Ethical approval

There was no study requiring ethical approval in this case.

Consent

The patient has died and there is no personal data included in the manuscript.

Declaration of interest

The authors declare no conflict of interest.

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