Abstract. Arthrocladium fulminans is the only species in the Arthrocladium genus that has been involved in a previous human infection. To date, only one case of A. fulminans infection in a patient with GATA-2 immunodeficiency has been reported. We here report the second human case and the first case of septic arthritis and osteomyelitis due to A. fulminans in an immunocompetent patient, living in Mayotte, a French island in western Indian Ocean. He was successfully treated with surgical debridement and 6 months of antifungal treatment. This second observation of human invasive disease caused by A. fulminans is an additional argument for the pathogenicity of this rare species.

INTRODUCTION

We report the first case of septic arthritis and osteomyelitis due to Arthrocladium fulminans in a previously healthy man. Arthrocladium fulminans is the only species in the Arthrocladium genus that has been involved in a previous human infection. One case of A. fulminans infection in a patient with GATA-2 immunodeficiency has been reported.1

CASE PRESENTATION

A 64-year-old man living in Mayotte was admitted to the hospital center in Mayotte, France, for right shoulder joint pain that had lasted 2 months. He had experienced no trauma and his medical history was unremarkable. He is a farmer and bricklayer’s assistant, and often carries fair-sized strips of wood on his shoulder. Upon arrival in our center, he did not have a fever and presented an indurated mass with purulent discharge on the right shoulder joint (Figure 1) and enlarged right cervical lymph nodes. The limit of normal anteflexion was approximately 45°. Laboratory tests revealed a normal leukocyte count of 4.2 × 10⁹/L and a normal C-reactive protein level of 6 mg/L. The patient was treated with oral terbinafine (6 mg/L). The patient was treated with oral terbinafine (6 mg/L) and gentamicin medium yielded a pure culture of a dematiaceous mold. Microscopic features showed irregular melanized hyphae, but no characteristic fruiting bodies (Figure 4A and B).² Arthrocladium fulminans was identified by analyzing the internal transcribed spacer 2 (ITS2) regions and the D1-D2 variable regions of the large subunit of the rRNA gene sequence, as previously described.³ The isolate shared 100% and 99% identity with the gb|KT337439.1 and gb|KT337444.1I sequences of the A. fulminans CBS 136243 strain, respectively. Antifungal susceptibility testing using the E-test assay for this A. fulminans isolate showed low minimum inhibitory concentrations (MICs) for itraconazole (0.19 mg/L), voriconazole (0.094 mg/L), and posaconazole (0.032 mg/L), and a relatively higher MIC for amphotericin B (6 mg/L). The patient was treated with oral terbinafine (500 mg/day) combined with itraconazole (200 mg/day) for 6 months. He recovered, the purulent drainage stopped at 7 days, and the skin fistula healed at 4 weeks from the beginning of antifungal treatment. The patient was treated for 6 months and he recovered fully, with normal mobility of the right shoulder without sequelae at the 6-month follow-up.

DISCUSSION AND CONCLUSION

This article presents the first case of osteoarticular chromoblastomycosis caused by A. fulminans in a man living in the French overseas region and department of Mayotte, located in the Comoros Islands and situated in the Indian Ocean off the coast of southeast Africa, between northwestern Madagascar and northeastern Mozambique. Chromoblastomycosis is a subcutaneous mycosis due to pigmented (black) fungi in the dematiaceous group, which is common in tropical climates in different regions of Africa and in the western tropical Indian Ocean.⁴ ⁵ These fungi are natural saprophytes and are filamentous, and they can be isolated from dead wood, thorns, and soil. Transmission is direct, usually after trauma from wood debris or plants. It is a disease of adult humans, often arising in farmers or loggers who walk barefoot, and three-quarters of cases occur in the feet and legs.⁴ ⁵ The route of transmission of osteoarticular chromoblastomycosis in our case may be direct inoculation, because the patient often carries fair-sized strips of wood on his shoulder. He is a farmer and bricklayer’s assistant, and often carries fair-sized strips of wood on his shoulder. Upon arrival in our center, he did not have a fever and presented an indurated mass with purulent discharge on the right shoulder joint (Figure 1) and enlarged right cervical lymph nodes. The limit of normal anteflexion was approximately 45°. Laboratory tests revealed a normal leukocyte count of 4.2 × 10⁹/L and a normal C-reactive protein level of 6 mg/L. The patient was treated with oral terbinafine (6 mg/L). The patient was treated with oral terbinafine (6 mg/L) and gentamicin medium yielded a pure culture of a dematiaceous mold. Microscopic features showed irregular melanized hyphae, but no characteristic fruiting bodies (Figure 4A and B).² Arthrocladium fulminans was identified by analyzing the internal transcribed spacer 2 (ITS2) regions and the D1-D2 variable regions of the large subunit of the rRNA gene sequence, as previously described.³ The isolate shared 100% and 99% identity with the gb|KT337439.1 and gb|KT337444.1I sequences of the A. fulminans CBS 136243 strain, respectively. Antifungal susceptibility testing using the E-test assay for this A. fulminans isolate showed low minimum inhibitory concentrations (MICs) for itraconazole (0.19 mg/L), voriconazole (0.094 mg/L), and posaconazole (0.032 mg/L), and a relatively higher MIC for amphotericin B (6 mg/L). The patient was treated with oral terbinafine (500 mg/day) combined with itraconazole (200 mg/day) for 6 months. He recovered, the purulent drainage stopped at 7 days, and the skin fistula healed at 4 weeks from the beginning of antifungal treatment. The patient was treated for 6 months and he recovered fully, with normal mobility of the right shoulder without sequelae at the 6-month follow-up.
strips of wood on his shoulder. No bacteremia, no secondary or concomitant infected site was found in our case.

The diagnosis of chromoblastomycosis is based on direct examination, culture, and histopathology. Three infectious agents that are often involved in chromoblastomycosis are *Fonsecaea pedrosoi*, *Phialophora verrucosa*, and *Cladophialophora carrioni*. Identification of etiological agents of chromoblastomycosis from culture of surgical bone biopsies with antifungal susceptibility testing is crucial.

**Figure 1.** An indurated mass with purulent discharge next to the right shoulder joint.

**Figure 2.** A computed tomography scan of the shoulder showing a purulent mass in contact with the acromioclavicular joint, with an osteolytic lesion of the right acromioclavicular articulation.

**Figure 3.** Pathological features revealed a significant inflammatory infiltrate with numerous macrophages and multinucleated giant cells. Note *Arthrocladium fulminans* within giant cells of the lesion (hematoxylin–eosin, original magnification ×200).

**Figure 4.** (A) Relatively restricted olivaceous colonies on Sabouraud medium. (B) Septate melanized hyphae (Mycetblue™ stain [SRB, Paris, France], original magnification ×400).
to cure these infections, which are difficult to cure and have a high relapse rate.\textsuperscript{4} We believe that precise identification of fungi species using molecular identification such as the ITS regions in fungal DNA analysis is necessary for epidemiological purposes and to identify strains with significant virulence to humans.

To our knowledge, few cases of ostearticular chromoblastomycosis have been reported in the literature, including two cases of arthritis and osteomyelitis caused by \textit{F. pedrosoi}.\textsuperscript{6,7} Two cases of foot osteomyelitis caused by \textit{P. verrucosa},\textsuperscript{8,9} and one case of nasal osteomyelitis.\textsuperscript{10} The combination of surgical debridement and itraconazole therapy has been used to treat cases of \textit{F. pedrosoi} osteomyelitis.\textsuperscript{6,7} In a few reported cases, terbinafine was used at high dosage or combined with itraconazole to treat cases of chromoblastomycosis refractory to antifungal treatment.\textsuperscript{11} The combination of terbinafine and voriconazole was synergistic in vitro on the \textit{Fonsecaea monophora} strain of refractory chromoblastomycosis.\textsuperscript{12}

The genus \textit{Arthrocladium} refers to nonsporulating dematiaceous (black) fungi of the Trichomeriaceae (Chaetothyriales) family. It includes four species: \textit{Arthrocladium caudatum}, \textit{Arthrocladium tropicale}, and \textit{Arthrocladium tardum}, which are rotten wood saprophytes, and the single known strain of the \textit{A. fulminans} species, which was involved in a fatal infection in an immunocompromised patient.\textsuperscript{1} We here report the second human case and the first case of septic arthritis and osteomyelitis due to \textit{A. fulminans} in an immunocompetent patient, successfully treated with surgical debridement and 6 months of antifungal treatment. This second observation of human invasive disease caused by \textit{A. fulminans} is an additional argument in favor of the particular pathogenicity of this relatively rare species.

CONSENT

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the editor-in-chief of this journal.

Received March 8, 2016. Accepted for publication October 18, 2016. Published online January 9, 2017.

Acknowledgment: We thank Livia Klembarova for his assistance with patient management.

Authors’ addresses: Abdoulaye Diallo, Céline Michaud, and Souandou Tabibou, Service de Médecine Polyvalente, Centre Hospitalier de Mayotte, Mamoudzou, Mayotte, E-mails: am.diallo@chmayotte.fr, celine.michaud@chmayotte.fr, and souandou.tabibou@chmayotte.fr. Maxime Raz, Laboratoire de Biologie Médicale, Centre Hospitalier de Mayotte, Mamoudzou, Mayotte, E-mail: maxime.raz@chmayotte.fr. Carla Fernandez, Service d’Anatomie Pathologique, Centre Hospitalier Universitaire de la Réunion, Saint-Denis, Réunion, E-mail: carla.fernandez@chu-reunion.fr. Hubert Lepidi and Pierre-Edouard Fournier, Aix Marseille Université, INSERM 1095, CNRS 7278, IRD 198, URMITE, Marseille, France, E-mails: hubert.lepidi@ap-hm.fr and pierre-edouard.fournier@univ-amu.fr. Andreas Stein and Piseth Seng, Aix Marseille Université, INSERM 1095, CNRS 7278, IRD 198, URMITE, Marseille, France, Assistance Publique–Hôpitaux de Marseille, Service de Maladies Infectieuses, Centre Hospitalier Universitaire de la Conception, Marseille, France, and Centre de Référence des Infections Ostéo-Articulaires (CRIOA) Intérrégional Sud-Méditerranée, Hôpital de la Conception, Marseille, France, E-mails: andreas.stein@ap-hm.fr and sengpiseth@yahoo.fr. Stéphane Ranque, IP–TPT UMR MDS, Aix Marseille Université, Marseille, France, E-mail: stephane.ranque@ap-hm.fr.

REFERENCES