CASE REPORT

Aspergillus ochraceus: A Rare Cause of Paranasal Fungal Ball

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ABSTRACT

Infection of paranasal sinuses is not uncommon. Fungal ball of the paranasal sinuses is a non-invasive form of paranasal sinus infection that has been documented to be more frequently caused by *Aspergillus fumigatus* than by other *Aspergillus* species and typically affects immunocompetent individuals more than those who are immunocompromised. Here, we report the first case of *Aspergillus ochraceus* (*A. ochraceus*) in an immunocompromised patient with post-trauma maxillary implant who presented with transient ischemic attack and incidental findings of fungal ball within the right maxillary sinus from the Computed Tomography (CT) scan. *A. ochraceus* is a species under the *Aspergillus* section *Circumdati,* a widely distributed fungus which is pathogenic to humans that can lead to various clinical implications. *A. ochraceus* was detected from paranasal tissue sent for culture. The laboratory culture findings were further supported by histopathological evidence of fungal hyphae and matrix-assisted laser desorption ionization time-of-flight mass spectrometry (MALDI-TOF) identification.

INTRODUCTION

Paranasal fungal ball (FB) is categorized under non-invasive fungal rhinosinusitis (FRS) and is chronic in nature.[1] FB is the most common type of non-invasive FRS, and its incidence has increased in recent years. The infection is caused mainly by *Aspergillus* species with *Aspergillus fumigatus* being the most common cause of sinus fungal balls. Other causative agents, including *Mucor sp*, *Bipolaris sp*, and *Alternaria sp,* have been reported.[2,3] *A. ochraceus* has previously been reported as the cause of osteomyelitis, chronic granulomatous disease, and invasive pulmonary aspergillosis.[4,5,6] However, there is a lack of data documenting *A. ochraceus* as the agent in non-invasive FRS. Here, we report a case of *A. ochraceus,* a rare species of *Aspergillus* causing paranasal fungal ball post-surgical maxillary implant.

CASE REPORT

Mr. AK, a 70 year-old gentleman with underlying diabetes mellitus, hypertension, and ischemic heart disease, also had a history of motor vehicle accidents in 2009 and sustained bilateral maxillary bone fractures, which required screw implants in both maxillae. He presented with numbness and weakness of the right side of his body and subsequently had a fall. Upon examination, he was stable, with reduced power and sensation noted over the right upper limb with no other significant neurological deficit. He was treated as transient ischemic attack, as CT brain reported no intracranial bleeding, however, an incidental finding of mucosal thickening was noted in the right maxillary sinus along with calcification. He was referred to the Otorhinolaryngology team for suspicion of right maxillary fungal sinusitis. Otherwise, he was asymptomatic, except for mild allergic rhinitis symptoms precipitated by cold environments. Nasoendoscopy showed no evidence of fungal material or necrotic mucosa at the osteomeatal complex area. Subsequently, he underwent Functional Endoscopic Sinus Surgery with the removal of bilateral infected maxillary implants. Intraoperative findings showed a blackish fungal ball within the right maxillary sinus

with healthy surrounding sinus mucosa. No evidence of invasive fungal sinusitis was seen.

The tissue from the paranasal sinus was sent for fungal culture. It was inoculated on Sabouraud Dextrose Agar (SDA) and incubated at 20-25°C. After 4 days of incubation, small mould colonies, which became more prominent by Day 10, were noted on the SDA. Initially, the colonies appeared irregular; they appeared velvety, then fluffy to cottony. The colonies were creamy to yellowish orange and appeared white at the reverse plate. (see Figure 1). Microscopically, the hyphae are long, septate hyaline with smooth conidiophores. There is a presence of vesicles, biseriate, and radiates covering most of the vesicle. The conidia are spherical with rough surfaces. (see Figure 2). Based on these findings, it was identified as *Aspergillus* species. The isolate was sent for further identification using Vitek® MS Flexprep and identified as *Aspergillus ochraceus* (99.6%). The tissues were also sent for histopathological examination, which was reported as necrotic tissue debris with residual intact fungal hyphae seen.

Mr. AK continued postoperative six-monthly follow-ups under the Otorhinolaryngology Clinic. Nasoendoscopic findings revealed minimal granulation tissue and crusting over the right osteomeatal complex, resolved with frequent nasal irrigation. No major postoperative complications were observed, and no recurrence of the fungal ball was seen upon the visit.

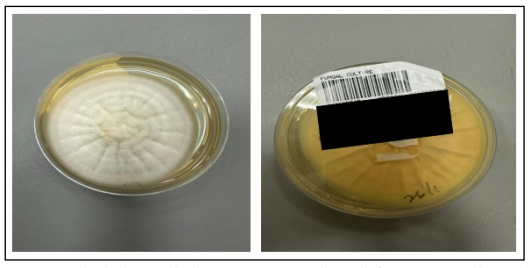

Figure 1: Colonial morphology on SDA plate (left), reverse plate (right)

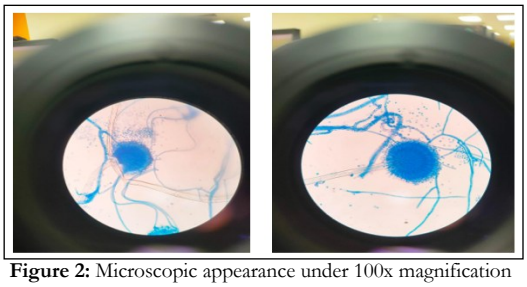

Figure 2: Microscopic appearance under 100x magnification

DISCUSSION

Fungal ball (FB), also known as a mycetoma, is a non-invasive fungal growth occurring in the paranasal sinuses, commonly in the maxillary sinus.[2,3] This condition typically affects immunocompetent individuals and remains localized within the sinus without invading the mucosa, bone, or blood vessels.[1,2,3,7] However, deterioration of host immunity not only increases susceptibility to FB but also raises the risk of progression to invasive fungal sinusitis.[7,8] *Aspergillus fumigatus* has been implicated as the primary causative agent in many studies; in this case, we highlight the first case of *Aspergillus ochraceus* as a rare cause of non-invasive FB in a diabetic patient post maxillary implant. Although *A. ochraceus* is less common in clinical infection compared to *A. fumigatus*, it has been proven recently to cause severe disease that can lead to fatality in immunosuppressed state.[6]

Aspergillus ochraceus, a species under the *Aspergillus* section *Circumdati*, is known to produce ochratoxin (mycotoxin), a widely distributed fungus that is typically found in soil, decaying organic matter, and various food products.[9] Ochratoxin is associated with nephrotoxicity in humans,[9] in FRS the direct effect of the toxin is still unknown. This fungus is pathogenic to humans by evidence from several studies causing various clinical infections.[4,5,6] Hakamikard et al. reported dissemination of *A. ochraceus* infection from the pulmonary to the brain in a patient with an underlying immunosuppressed state due to SARS-CoV-2 infection, which implied that the fungus not only causes invasive diseases but also has the propensity to disseminate to other organs.

Paranasal FB is caused by either colonization of inhaled spores through a sinus ostium or is often associated with orthodontics procedures.[2] Foreign body introduction during orthodontic procedures, such as wires or brackets, has been implicated as a source for fungal colonization.[2] In our patient, maxillary implant placed due to a fracture could be the nidus for fungal colonisation and growth. However, inhalation of spores could also be a source of transmission in this case since the fungus is ubiquitous. When the spores are inoculated into anaerobic sinuses

through inhalation or a foreign body, they then germinate and lead to the growth of hyphae in the sinus cavities. In an immunocompetent individual, a robust local immune response, particularly macrophage and neutrophil activation, is observed to control the infection and prevent further spread.[3] It does not usually invade mucosa, bone, or blood vessels; however, in an immunocompromised host, FB can progress to a more invasive form, which involves the invasion of hyphae into blood vessels that can lead to vasculitis with thrombosis, haemorrhage, and tissue infarction.[1,2,3] Studies have shown that diabetes is one of the indicators for patients to develop invasive FRS.[2,3,7] Diabetes, especially when poorly controlled, impairs immune function that disrupts both innate and adaptive immunity, making individuals unable to mount effective responses to fungal invasion. Therefore, they are not only vulnerable to infections but also at risk of aggressive disease progression.[2,3,7] In this case, the patient was asymptomatic which is common in cases of maxillary FB,[2] however, the fact that he is diabetic increases the risk of progression to invasive FRS should warrant careful consideration. Furthermore *A. ochraceus* itself has proven to be pathogenic causing severe clinical implications.

The diagnosis of FB relied on a combination of imaging, histopathology, and mycology studies. CT scans most often reveal heterogeneous opacities in the sinus, containing calcification or metallic densities,[2,3] which is consistent with our patient's findings. Specimens from the affected tissues should be biopsied and sent to the laboratory for further identification. FB was observed intraoperatively during the right middle meatal antrostomy with the removal of bilateral impacted maxillary implant surgery, and the specimen was sent to the lab for further identification and confirmation. Several studies mentioned that histopathological examination is more sensitive than fungal culture; this is attributed to the poor viability of fungi.[1,2,7] Histopathology distinguishes acute fulminant (invasive) sinusitis from chronic forms based on the presence of direct tissue or vascular invasion by fungi. It assists in clinical decisions based on the nature and fungal involvement.[10] In our patient, the histology result was consistent with the findings of FB, which showed fungal hyphae without tissue invasion. Culture is to complement the histological findings and further confirm the causative fungal agent. In this case, we managed to grow a mould typical of *Aspergillus* species under the microscope. However, the colony was atypical in terms of its unique colour. Morphologically, *A. ochraceus* is described as a species with rough-walled stipes, biseriate conidial heads with yellow to ochre conidia, and sclerotia that do not turn black.[9] Microscopically, it appears as globose vesicles, biseriate conidiophores with ampulliform phialides.[9] In this case, conventional methods such as observing the colony morphology and microscopy are insufficient to identify the species of *Aspergillus*. Therefore, further identification was carried out by using mass spectrometry (VITEKMS FLEXPREP), an automated mass spectrometry microbial identification system that uses Matrix-Assisted Laser Desorption Ionization Time-of-Flight (MALDI-TOF) technology. It is a preferred method of choice due to its rapid results and accurate identification of organisms at species and genus levels.

In terms of therapeutic management, the main highly effective treatment is to perform directed endoscopic surgery to correct the obstruction and to extract the fungus ball.[2,3,7] The fact that this is non-invasive means that the use of antifungals has shown no apparent benefit. However, glucocorticoids are commonly used during the perioperative period to reduce inflammation.[2,3]

CONCLUSION

FB is considered a benign condition; however, with waning immunity and due to the pathogenic nature of *A. ochraceus*, the condition may progress to an invasive form, which could lead to serious complications. Therefore, early detection and management can improve patient care and outcomes. We highlight the use of additional modalities laboratory methods such as MALDI-TOF is necessary to aid in the identification of the species of Aspergillus genus.

REFERENCES

1. Chakrabarti A, Denning DW et al. Fungal rhinosinusitis: a categorization and definitional schema addressing current controversies.

Laryngoscope. 2009;119(9):1809-18.
2. Dufour X, Kauffmann-Lacroix C et al. Paranasal sinus fungus ball: epidemiology, clinical features and diagnosis. A retrospective analysis of 173 cases from a single medical center in France, 1989–2002. Medical Mycology. 2006;44(1):61-7.
3. Jiang RS, Huang WC, Liang KL. Characteristics of Sinus Fungus Ball: A Unique Form of Rhinosinusitis. Clin Med Insights Ear Nose Throat. 2018;11:1-12.
4. Moazam S, Denning DW. Aspergillus nodules in chronic granulomatous disease attributable to Aspergillus ochraceus. Medical Mycology Case Reports. 2017;17:31-3.
5. Babamahmoodi F, Shokohi T, Ahangarkani F et al. Rare case of aspergillus ochraceus osteomyelitis of calcaneus bone in a patient with diabetic foot ulcers. Case Reports in Medicine. 2015;2015(1):509827.
6. Hakamifard A, Hashemi M, Fakhim H et al. Fatal disseminated aspergillosis in an immunocompetent patient with COVID-19 due to Aspergillus ochraceus. J Mycol Med. 2021 Jun;31(2):101124.
7. Taghian E, Abtahi SH, Mohammadi A et al. A study on the fungal rhinosinusitis: Causative agents, symptoms, and predisposing factors. J Res Med Sci. 2023 Mar 16(28):12
8. Ferguson BJ. Fungus balls of the paranasal sinuses. Otolaryngol Clin North Am. 2000;33(2):389-98.
9. Visagie CM, Varga J, Houbraken J et al. Ochratoxin production and taxonomy of the yellow aspergilli (Aspergillus section Circumdati). Stud Mycol. 2014;78:1-61.
10. Taxy JB. Paranasal fungal sinusitis: contributions of histopathology to diagnosis: a report of 60 cases and literature review. Am J Surg Pathol. 2006 Jun;30 (6):713-20.