Case Report

Aspergillosis of Maxillary Sinus in an Uncontrolled Diabetic Patient: A Case Report

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Abstract

Fungal infections affecting the paranasal sinuses are common. They can affect normal as well as immunocompromised individuals. Aspergillosis and mucormycoses are the most common fungal infections involving maxillary sinus. They can manifest in two forms – noninvasive or invasive infection. These infections when properly diagnosed can be treated at the earliest without causing much tissue damage. Here, a noninvasive form of aspergillosis in an uncontrolled diabetic, elderly female patient is presented. This article also explains the etiopathogenesis, clinical and radiological features, as well as the management of aspergillosis.

Keywords: Aspergillosis, diabetes, immunocompromised, maxillary sinus

INTRODUCTION

Several authors have suggested that mycotic infections of the paranasal cavities are found more commonly in apparently healthy individuals.[¹] Aspergillosis affecting the paranasal sinuses is present in a majority of cases and are classified as “unspecified sinusitis.”[²] Sixteen percent of chronic sinusitis are produced by mycosis (particularly aspergillosis). The infection may be limited to the affected sinus (noninvasive forms) or may destroy the sinus wall without tissue invasion (semi-invasive forms) or with tissue invasion (invasive forms).[³]

In medically compromised patients normal flora is commonly altered leading to fungal infections. These patients include, chronic diabetics, those on long-term treatments (antibiotics and cortisones), radio- and chemotherapy patients, those on immunosuppressive treatments, immunodeficient patients, those with nasal obstructions, and patients having endosinal penetrations at the time of a dental procedure, due to root canal complications or dental extractions.[¹,²,⁴]

It is important to diagnose this infection and intervene at the earliest as delay in initiation of treatment can be life threatening as the fungi may invade adjacent blood vessels and connective tissue producing thrombosis and ultimately necrosis of hard and soft tissues.[⁵]

CASE REPORT

A 63-year-old female patient reported to the clinic on September 2011 with a complaint of occasional purulent discharge from the mouth as well as foul odor since 20 days. The patient gave a history of intraoral swelling 3 months back due to pain in the upper left back decayed tooth, and had undergone extraction 2 months back followed by suitable antibiotics and analgesics. She had no relief and developed dry socket and pain in the upper left teeth region. She also complained of a feeling of hollowness in the region of extraction when she felt that area with her tongue. Medical history revealed that the patient was an uncontrolled diabetic on irregular medication since 5 years. She also had arthritis but was not under medication for the same. Physical examination revealed a moderately built and nourished patient with no signs of pallor, icterus, clubbing, or any cervicofacial lymphadenopathy. No signs of extraoral swelling was seen. Intraoral examination revealed missing first and second molars.

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in the upper second quadrant and a big oval oroantral fistula measuring 3 × 2 cm on the alveolar ridge in the region of the missing teeth. Necrotic areas and slough was visible on the walls of the fistula with severe halitosis. The surrounding tissues were normal. On palpation, the base of the fistula could not be felt, the walls were rough, bony, nontender, and scraps of necrotic slough could be scraped off. Nasal examination revealed no abnormality. A differential diagnosis of chronic suppurative osteomyelitis, malignancy of maxillary sinus, and fungal infection (Mucormycosis or Aspergillosis) was listed. The patient was advised an orthopantomogram (OPG) and computed tomography (CT) scan.

OPG showed missing upper first and second molars, radiolucency extending from alveolar bone in the region of missing teeth superiorly to the maxillary sinus floor indicating an oroantral communication, and a radiopaque mass in the sinus masking its boundaries [Figure 1]. Axial sections of CT scan showed opacified left maxillary sinus with some dense opaque metal spots scattered in few areas [Figure 2]. Radiographic diagnosis was suggestive of a noninvasive fungal infection.

A part of necrotic bone and associated necrotic soft tissue from palatal mucosa was incised under local anesthesia and sent for histopathology. The clinical and radiological diagnosis was noninvasive fungal infection, and the same was confirmed as Aspergillosis on histology. The sections were stained with H and E, and PAS stain, and showed necrotic tissue densely infiltrated with fungal hyphae which were septate and branching at acute degree angles. The hyphae walls were smooth and parallel. Next to the necrotic areas, granulomatous inflammatory response was evident [Figure 3]. The histopathological picture was confirmatory for aspergillosis.

Patient’s diabetic status was controlled and she underwent an operative procedure where thorough surgical debridement and curettage of necrotic bone was carried out [Figure 4]. The operated area was irrigated with combination of Amphotericin powder and normal saline. Patient was also given tablet Fluconazole 200 mg OD for 7 days and recalled for check-up. But the patient did not return and was lost to follow-up.

**Discussion**

Aspergillosis is a saprophytic fungus belonging to the class of ascomycetes. *A. flavus* commonly affects paranasal sinuses in humans.\(^{[6]}\) Two hypothesis have been suggested in its etiopathogenesis. First, anglophone hypothesis is based on the inhalation of spores. Second is the “French” model based on the industrialized environments which explains the vast number of cases having an orosinusal fistula and/or the perforation of the maxillary sinus by root canal-filling material. None of these theories is substantial. The disease most commonly presents as a chronic bacterial sinusitis. It can become invasive, resembling malignancy, with life-threatening complications.\(^{[2]}\)

\[\text{Mucormycosis or Aspergillosis}\]

\[\text{Figure 1: OPG showing oroantral communication and radiopaque mass in sinus}\]

\[\text{Figure 2: Axial CT shows opacity in left maxillary sinus and arrowhead showing metal dense spots}\]

\[\text{Figure 3: Necrotic tissue densely infiltrated with fungal hyphae which are septate and branching at acute degree angles. The hyphae walls were smooth and parallel. Granulomatous inflammation can be seen}\]

\[\text{A. mycetoma of the maxillary sinus (fungus ball) is a noninvasive or extramucosal mycotic infection. It mostly}\]
The clinical support the odontogenic theory of Aspergillus hyphae have the propensity Radiographically, it mimics a foreign body as the centre of the mass contains calcium phosphate. The noninvasive form of Aspergillus of the sinus shows a radiodense foci with homogenous opacity. Dense opacity of the sinus with or without destruction may be a sign of the invasive form. In our case, dense radiopaque mass was evident in radiographs. The characteristic CT scan presentation includes typically heterogeneous opacities associated with a metal dense spot in the involved maxillary sinus.

Figure 4: Necrotic areas of curretted bone and soft tissue specimen

Aspergillus growth is due to inhalation of high quantities of spores over extended periods of time. It is also called semi-invasive form of fungal sinusitis, according to varying degrees of disruption of normal sinus bony architecture observed on CT scans.

The third theory of mixed origin is based on the ubiquitous nature of Aspergillus spores. The spores can be inhaled at any moment and are normally present as saprophytes in the maxillary sinus. Aspergillus growth can be due to poorly ventilated sinus, a pre-existing sinusitis, or foreign bodies in the sinus. For the ostium to be ventilated and drained, it must be unobstructed. If the ostium is blocked, the mucociliary clearance system favors the growth of the fungus.

Beck-Mannagetta et al. support the odontogenic theory of aspergillus sinusitis that an iatrogenic material mostly zinc oxide from root canal fillings initiates the infection. The fungus itself does not contain any chlorophyll, and therefore, does not require any light for growth. However, it needs a host supplying it with nutrient such as glucose, nitrogen, sulphur, phosphorous, potassium, calcium, magnesium, and iron. The fungal hyphae grow in a circular pattern in a culture medium because of centrifugal linear growth unless it is inhibited by natural or artificial barriers. Thus, Aspergillus in the paranasal sinus develops into a ball-shaped mass.

Immunocompromised patients, especially long standing, uncontrolled diabetics, are more prone for this infection. Our patient was also suffering from diabetes mellitus for a long period. Uncontrolled diabetes mellitus can alter the normal immunologic response of patients to infections as they have decreased granulocyte phagocytic ability with altered polymorphonuclear leucocyte response. The clinical symptoms can vary from nasal obstruction to purulent nasal discharge, facial pain, or chronic cough. Radiographically, it mimics a foreign body as the centre of the mass contains calcium phosphate. The noninvasive form of Aspergillus of the sinus shows a radiodense foci with homogenous opacity. Dense opacity of the sinus with or without destruction may be a sign of the invasive form. In our case, dense radiopaque mass was evident in radiographs. The characteristic CT scan presentation includes typically heterogeneous opacities associated with a metal dense spot in the involved maxillary sinus.

Diagnosis is made after histologic examination because cultural examination are often negative. Special histological stains such as Grocott or PAS stain the hyphae and are helpful in the diagnosis. Fungal cultures on Saboraud’s dextrose agar are needed to confirm the diagnosis. Microscopically, Aspergillus can be identified as a filamentous structure with a diameter of 3–6 μm and with septate hyphae branching at an acute (45°) angle. Regarding the treatment of A. mycetoma, it is necessary to surgically remove the fungal masses and ensure the establishment of adequate sinus drainage and aeration via the Caldwell–Luc (CL) procedure or endoscopic sinus surgery (ESS). Aspergillus hyphae have the propensity to penetrate mucous membranes to invade and grow in the walls of small-to-medium-sized arteries or veins producing thrombosis, infarction, and necrosis.

Shoham and Levitz stated the importance of innate and adaptive immunity to common or emerging fungal pathogens in deciding new treatment protocols. The immune response varies depending on fungal species and the morphotype encountered. The risk for particular infections differs depending upon which aspect of immunity is impaired. The complete management of paranasal sinus fungal infection requires early diagnosis, histological typing, appropriate antifungal therapy, and surgery. Treatment in case of invasive fungal sinusitis requires radical surgery along with intravenous amphotericin B/lipid complex of liposomal amphotericin B with or without flucytosine. Endoscopic surgery has been found to give excellent results in local control of the fungus and low morbidity rates than traditional treatment. Sinus surgery must be performed when required. The prognosis is directly related to the severity of the underlying disease, the extent of the disease when treatment begins, and the aggressiveness of the treatment.

**Conclusion**

Fungal infections of the paranasal sinuses, though seen in normal individuals, can show signs of aggressiveness and tissue destruction in immunocompromised individuals; hence, clinicians should be aware that chronic sinusitis unresponsive to usual management can be suggestive of mycoses of the
paranasal sinuses and should be included as one of the differential diagnosis. Treatment and prognosis depends on early diagnosis. Culture and histopathological examination identify the fungal species involved. Appropriate treatment and control of any associated systemic factors reduces the high morbidity and mortality associated with this destructive disease.

Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

REFERENCES
1. Costa F, Polini F, Zerman N, Rohiony M, Toro C. Surgical treatment of Aspergillus mycetomas of the maxillary sinus: Review of the literature. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2007;103:e23-9.
2. De Foer C, Fossion E, Vaillant JM. Sinus aspergillosis. J Craniomaxillofac Surg 1990;18:33-40.
3. Aranzábal ML, Salas AR, García LR, Olano MA. Aspergillosis of maxillary sinus: A case report. Acta Otorrinolaringol Espanola 1996;47:321-4.
4. Rudagi BM, Halli R, Kalburge J, Joshi M, Munde A, Saluja H. Management of maxillary aspergillosis in a patient with diabetic mellitus followed by prosthetic rehabilitation. J Maxillofac Oral Surg 2010;9:297-301.
5. Taneja T, Saxena S, Aggarwal P, Reddy V. Fungal infections involving maxillary sinus – A difficult diagnostic task. J Clin Exp Dent 2011;3:e172-6.
6. Singhal SK, Dass A, Singh GB, Punia RP, Nagarkar NM. Destructive aspergillosis. Ind J Otolaryngol Head Neck Surg 2005;57:244-6.
7. Bertrand B, Rombaix P, Eloy P, Reyehler H. Sinusitis of dental origin. Acta Otorhinolaryngol Belg 1997;51:315-22.
8. de Shazo RD, O’Brien M, Chapin K, Soto-Aguilar M, Swain R, Lyons M, et al. Criteria for the diagnosis of sinus mycetoma. J Allergy Clin Immunol 1997;99:475-85.
9. Rossouw DP, Swart JG. Aspergillus fumigatus infection of the maxillary sinus. S Afr Med J 1988;73:47-78.
10. Sharda DM, Arunkumar G, Vandana KE, Rao PS. Sino-orbital aspergillosis in a diabetic patient. Indian J Med Microbiol 2006;24:138.
11. Auluck A. Maxillary necrosis by mucormycosis. A case report and literature review. Med Oral Patol Oral Cir Bucal 2012;17:e360-4.
12. Ferrero JA, Carlton BA, Cody DT. Paranasal sinus fungus balls. Head Neck 1997;19:481-6.
13. Klokkse JM, Serrano E, Peloquin L, Percodani J, Fontanel JP, Pessey JY. Functional endoscopic sinus surgery and 109 mycetomas of paranasal sinuses. Laryngoscope 1997;107:112-7.
14. Ogata Y, Okinaka Y, Takahashi M. Antrolith associated with aspergillosis of the maxillary sinus: Report of a case. J Maxillofac Surg. 1997;55:1339-41.
15. Dhand PJ, Jung JY, Park JH. Am J. Diagnostic accuracy in sinus fungus balls: CT scan and operative findings. Rhinology 2000;14:227-31.
16. Ferguson BJ. Fungus balls of the paranasal sinuses. Otolaryngol Clin North Am 2000;33:389-98.
17. de Shazo RD, Chapin K, Swain RE. Fungal sinusitis. N Engl J Med 1997;337:254-9.
18. Falworth MS, Herold J. Aspergillosis of the paranasal sinuses. A case report and radiographic review. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1996;81:255-60.
19. Martins WD, Ribeiro Rosa EA. Aspergillosis of the maxillary sinus: Review and case report. Scand J Infect Dis 2004;36:758-61.
20. Dufour X, Kauffmann-Lacroix C, Ferrie JC, Goujon JM, Rodier MH, Karkas A, et al. Paranasal sinus fungus ball and surgery: A review of 175 cases. Rhinology 2005;43:34-9.
21. Dreizen S, Bodey GP. Orofacial aspergillosis in acute leukemia. Oral Surg Oral Med Oral Pathol 1985;59:499-504.
22. Shoham S, Levis SM. The immune response to fungal infections. Br J Haematol 2005;129:569-82.
23. Mylona S, Tzavara V, Ntaf S, Pomoni M, Thanos L. Chronic invasive sinus aspergillus in an immunocompetent patient: A case report. Dentomaxillofac Radiol 2007;36:102-4.
24. Eliashar R, Resnick IB, Goldfarb A, Wohlgelernter J, Gross M. Endoscopic surgery for sinonasal invasive aspergillosis in bone marrow transplantation patients. Laryngoscope 2007;117:1-4.
25. Snyderman CH, Pant H, Carrau RL, Pervedello D, Gardner P, Kassam AB. What are the limits of endoscopic sinus surgery? The expanded endonasal approach to skull base. Keio J Med 2009;58:152-60.