



**ORIGINAL RESEARCH PAPER**

**Microbiology**

**RHIZOPUS HOMOTHALLICUS CAUSING RHINO-ORBITAL MUCORMYCOSIS:A CASE REPORT**

**KEY WORDS:** Rhino-orbital mucormycosis, *Rhizopus homothallicus*

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**ABSTRACT**

We report a case of rhino-orbital mucormycosis due to *Rhizopus homothallicus* in a diabetic patient. *Rhizopus homothallicus* is a rare cause of mucormycosis as compared to other species of *zygomycetes* and if not timely detected can cause serious life-threatening infection. The organism was isolated from soft tissue of nasal cavity and orbital tissue and identified by direct microscopic examination in 20% KOH (potassium hydroxide), culture and histopathological examination.

**INTRODUCTION**

Mucormycosis is an infection caused by fungi belonging to the order Mucorales.<sup>1</sup> Various risk factors for mucormycosis include uncontrolled diabetes mellitus in ketoacidosis, other forms of metabolic acidosis, organ or bone marrow transplantation, treatment with corticosteroids, trauma and burns, neutropenia, malignant hematologic disorders, and desferoxamine therapy in patients undergoing hemodialysis.<sup>2,3,4</sup> *Rhizopus spp* are most commonly isolated agents in a clinical setting with *Rhizopus arrhizus* being the most frequent.<sup>5</sup> We, however encountered a case of rhino-orbital mucormycosis due to *Rhizopus homothallicus* which is a very rare cause of infection as compared to other species of *zygomycetes*.

**Case report**

A 43 year old male presented to the outpatient department at S.N. Medical College and hospital, Agra with left sided facial swelling and pain in left eye since 6 days along with history of type 2 diabetes mellitus for more than 10 years. On physical examination, he could not open the left eye and could perceive only bright lights with the left eye. The extraocular muscles of the left eye were restricted in all directions of gaze. The pupil of the left eye was dilated and non-reactive to direct and indirect light. He also had splenomegaly with moderate ascites. The patient was treated with oral antibiotics but did not show any clinical or radiological improvement. On routine investigation, uncontrolled blood sugar levels (range, 234 to 366 mg/dl) were noted. Laboratory investigations showed a hemoglobin of 11 gm/dl, total WBC count of 20,500 cells/cumm, and platelets 4.01 lakhs/cumm. Biochemical investigations revealed a BUN of 5.62 mmol/l and creatinine  $\mu$ mol/l. Radiological findings on contrast MRI (Figure 3) indicated left sided rhinosinusitis predominantly involving the left maxillary, frontal and ethmoidal air cells with evidence of diffusion restriction and necrotic mucosa along with heterogenous bony destruction.

There was also destruction of left inferior orbital wall and left sided laminae papyraceae with extension of the peripherally enhancing abscesses in left superomedial and inferior extraconal fat causing significant indentation over the muscle cone, thickened enhancing muscles including the superior, medial and inferior recti and superior and inferior obliques with left sided ptosis. Destruction of the superior wall of the left frontal sinus was seen with evidence of peripherally enhancing abscess measuring approximately 18 x 17 mm in left basifrontal region with moderate surrounding edema. The patient underwent left orbital decompression and functional

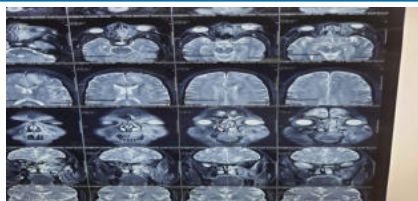
endoscopic sinus surgery. Direct microscopic examination with 20% KOH of soft tissue from nasal cavity and orbital tissue revealed ribbon-like broad, aseptate hyphae with branching at right angles, suggestive of rhino-orbital mucormycosis. Histopathological examination showed pseudostratified epithelium with underlying dense inflammatory infiltrate, necrotic debris with numerous broad, aseptate, branching hyphae, morphologically consistent with mucormycosis. Culture of the samples was done on SDA (Sabouraud dextrose agar) and incubated at 25°C and 37°C. On macroscopic examination cottony white colonies were observed which later turned grey after prolonged incubation (Figure 1). In lactophenol cotton blue preparation, poorly developed rhizoid tufts were seen from where arose few sporangiophores measuring 100-150  $\mu$ m in length which bore few globose sporangia with scanty globose sporangiospores. A large number of golden brown globose zygosporos measuring 60-100  $\mu$ m in diameter with stellate spines were seen (Figure 2). The isolate was identified as *Rhizopus homothallicus* on the basis of these characteristics. The patient was treated with injectable insulin for glycemic control and intravenous conventional amphotericin B therapy was started.



**Figure 1:- SDA showing grey-white cotton candy colonies.**



**Figure 2:- Lactophenol cotton blue mount of *R. homothallicus* showing golden brown, globose zygosporos with stellate spines**



**Figure 3: Magnetic Resonance Investigation (MRI)**

**DISCUSSION**

*R.homothallicus* was earlier considered an environmental isolate, but now is increasingly being reported to cause invasive infections. It has been reported to cause invasive pulmonary mucormycosis, rhino-orbitocerebral and cutaneous mucormycosis in six patients in India.<sup>6,7,8</sup> Rhino-orbital infection begins after inhalation of fungal spores which invade the nasal mucosa, and then spread to the paranasal sinuses causing sinusitis. The infection then invades the orbital wall leading to orbital involvement.<sup>9</sup> Several predisposing conditions have been reported in the literature but diabetes with ketoacidosis is the most common condition as diabetic patients are predisposed to the mucormycosis because of the decreased ability of their neutrophils to phagocytise and adhere to endothelial walls. Also the acidosis and hyperglycemia provide an excellent environment for fungus to grow. Ability of the serum to bind iron is also reduced at low pH which acts as the basic defect in the body defence system. The high iron, glucose-rich, acid milieu facilitates fungal growth. The ability to restrict the availability of iron to the invading fungus by binding it to proteins such as apotransferrin provides human resistance to fungal infection. Rhizoferrin, a substance produced by fungal hyphae binds iron avidly and this iron- rhizoferrin complex is taken up by the fungus which then becomes available for vital intracellular processes.<sup>10</sup> In a study by Yohai et al.<sup>11</sup> including 145 cases, the most common predisposing factor was diabetes mellitus (60%). Similarly, Ferry et al.<sup>12</sup> found diabetes mellitus to be the greatest predisposing factor in their study. Invasive zygomycosis invariably proves fatal without prompt therapeutic management, hence aggressive surgical treatment, appropriate medical therapy, and control of predisposing factors are of vital importance in the treatment of such cases. Amphotericin B is the first-line drug of choice for most of the cases of zygomycosis. Surgical debridement reduces the fungal load as well as enables tissue diagnosis.

**CONCLUSION**

Rhino-orbital mucormycosis is an angioinvasive disease with high morbidity and mortality despite treatment; hence its diagnosis is a medical as well as surgical emergency. A high index of suspicion among clinicians, multi-disciplinary approach, and early initiation of amphotericin B and surgical debridement in all suspected cases are must for improved outcomes.

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