

## Necrotizing Fasciitis Due to *Rhizopus* in Blast Injury Wound - An Unusual Life Threatening Situation

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### Abstract

Zygomycosis or mucormycosis is an extremely uncommon infection with a high mortality rate. The rate of zygomycosis over the last decade has increased tremendously, specifically in health care facilities for immunocompromised patients. Mucormycosis is an atypical but fatal fungal infection that may lead to death in those who do not receive timely treatment. Wound contamination with organic matter can lead to skin and soft tissue fungal infections, notably mucormycosis. We report a case who presented with post-surgical wound infection of *Rhizopus arrhizus* after suffering a blast injury.

**Keywords:** *Rhizopus arrhizus*; Zygomycosis; Skin infections

### Introduction

Zygomycosis or mucormycosis is an extremely uncommon infection with a high mortality rate. It is caused most often by organisms from the order Mucorales of the class Zygomycetes and includes a variety of species like *Rhizopus*, *Mucor* and *Absidia* that frequently originate in organic matter like soil, decaying foodstuff and animal excreta [1]. These organisms have the capability to grow fast and release spores in enormous amount that become airborne and gain access to the human body via inhalation or ingestion. However, individuals with an intact immune system rarely suffer from these infections [2]. In patients suffering from mucormycosis, the mortality rate has been very high for the immune compromised especially those with disseminated disease [3]. The prevalence of mucormycosis has increased over the last decades mostly in facilities for patients with immune compromised states [4]. The most common clinical manifestations are pulmonary and rhino cerebral infection; however, patients may present with skin infections also. Epidemics of cutaneous *Rhizopus* infection have been associated with contaminated wooden tongue depressors and elasticized adhesive bandages. We report a case who presented with post-surgical wound infection of *Rhizopus arrhizus* after suffering a blast injury [5].

### Case Report

A 46-years-old male suffered blast injury on 3 October 2016, which resulted in a deep splinter injury on the left thigh. He was brought to emergency department where he received first aid. The wound was 12 × 6 cm wide. There was partial muscle loss without bone exposure. His vitals revealed blood pressure of 120/80 mm Hg; pulse 80/min; temperature 98°F and respiratory rate 18/min. He was a known case of hypertension, diabetes mellitus and ischemic heart disease. His laboratory investigations revealed, total leucocyte count of  $6.7 \times 10^9/l$ , haemoglobin of 11.9 gram/dl, differential leukocyte count (DLC) neutrophils 76%. His C-reactive protein (CRP) was 32 IU/l and ESR 36 mm at 1st hour. Fasting plasma glucose was 8.6 mmol/l and creatinine kinase 649 U/l. Echocardiographic finding showed 60% left ventricular ejection fraction with normal size of cardiac chambers, normal valves and with no pericardial effusion. Surgery was done the following day after which he was shifted to plastic surgery unit for further follow up. On fourteenth postop day purulent blackish discharge from wound site was noted. Surgical debridement was done and tissue was sent for culture and sensitivity. Postoperatively patient was started on piperacillin/tazobactam but there was not much of improvement. On Direct smear examination of tissue in KOH, the sample revealed

non-septate fungal hyphae. Sample was inoculated on Sabouraud's dextrose agar (SDA) (Oxoid UK), SDA with chloramphenicol (Oxoid UK) and SDA with cycloheximide (Oxoid UK). Plates were incubated at 22°C, growth started appearing on 9<sup>th</sup> day. Individual colony was 90 mm in diameter, with abundant aerial growth to the lid of petri dish. Texture was floccose and greyish brown with brown sporangia near the edge of the plate. On reverse colony was colorless. Lactophenol cotton blue staining of colony revealed wide nonseptate colorless hyphae, brownish rhizoids and spherical sporangia with large collumella. Sporangiochore stalks were in groups arising from rhizoids with large collumellae collapse giving appearance of mushrooms. Sporangiospores were greyish green, variable in shape having angular with longitudinal striations. Diagnosis of *Rhizopus arrhizus* was made. Patient was put on amphotericin B intravenously and then undergone aggressive surgery. The patient was treated and followed up for a week. After that the patient underwent successful surgery skin grafting. The patient was discharged after 10 days of surgical intervention. Patient presented again to the opd after a week. Wound was clean, and he had improved.

### Discussion

Mucormycosis are caused by fungal pathogens belonging to class zygomycetes and order of mucorales. The most commonly isolated agent in mucormycosis is *Rhizopus* species. These are classified as species of *Mucor*, *Rhizomucor* species, *Absidia corymbifera*, *Cunninghamella bertholletiae*, *Apophysomyces selegans* and *Saksenaea* spp. [1]. Mucormycosis is an exceptional but yet serious fungal infection that may lead to death in those who do not receive timely treatment. Wound contamination with organic matter can lead to skin and soft tissue fungal infections, notably mucormycosis. It usually affects the immuno-compromised. These include people with poorly controlled diabetics mellitus, hematological malignancies, renal failure, organ transplant recipients and those on chelating therapy.

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It's also due to reduced ability of phagocytosis by neutrophils and its decreased adherence to endothelial walls. High blood sugar level has also the ability to modify function of macrophages, our case was diabetic. Sometimes, individuals with no apparent predisposition develop this infection [3]. The most frequent areas affected in human body are the paranasal sinuses. Other cases have been reported of the infection involving the brain, lung, skin, subcutaneous tissue, kidney, gastrointestinal tract and blood stream. Skin infections may be classified separately, as 'entomophthoromycosis'. Cutaneous infection in zygomycosis usually starts as erythematous induration at a puncture site in the skin that leads to necrosis. Subcutaneous tissue extension or bone involvement is common in patients who don't receive treatment of cutaneous zygomycosis [6]. In our case it affected the tissue but fortunately bone was spared. It is a rapidly growing organism. On microscopy, pauciseptate wide hyphae having right angle dichotomous branching were seen [7]. Diagnosis needs direct microscopy of samples, followed by culture, allowing species identification and differentiation from aspergillosis [8] In this case colonies on culture plates appeared on ninth day with abundant aerial growth to the lid of petri dish. In the last two decades, few cases of postoperative mucormycosis in immunocompetent patients were reported. The first case reported was a lady with caesarean section wound infected with mucormycosis. She was managed with anti-fungal medicine and surgical debridement [9]. Another study reported two cases of cutaneous *R. arrhizus* infection in which exposure to a karaya ostomy bag was determined to be the source of *R. arrhizus* infection in susceptible hosts. The most likely factors that contributed to the infections were prolonged exposure of cutaneous tissue to the karaya ostomy bag and acute immunosuppression during the week preceding the infection. *Rhizopus arrhizus* is the most common cause of mucormycosis [10]. Management of zygomycosis mainly relies on timely diagnosis, reversal of predisposing factors, premature surgical debridement and effective anti-fungal therapy.9 Mainstay of treatment, is surgically resecting the lesion, which may employ disfiguring surgery. Others suggest frozen sections at some stage in surgery for resection margins [11]. Hyperbaric oxygen therapy (HBOT) has been appreciated and has direct antifungal activity due to increased supply of oxygen-based free radicals, reversing fungal growth, enhances lactic acidosis, restitution of phagocytosis, oxidative burst of polymorphonuclear leukocytes and enhancement of healing. 94% survival of patients has been described in patients suffering from diabetes mellitus with HBOT management [12].

## Conclusion

Intravenous amphotericin B is the drug of choice and timely treatment is always beneficial. There is a strong recommendation of reversal of predisposing factors, i.e. use of granulocyte colony-stimulating factor in patients with neutropenia, control of hyperglycemic state and ketoacidosis in diabetics, and restraining gluco corticosteroids to the minimal dosage.

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