



Case Report

Mucormycosis: A case series and review of the literature

Suvetha Rajasekaran¹, A. Annamalai Thangavelu²

¹BDS Intern, Department of Oral and Maxillofacial Surgery, Rajah Muthiah Dental College and Hospital, Cuddalore, Tamil Nadu, India, ²Professor, Department of Oral and Maxillofacial Surgery, Rajah Muthiah Dental College and Hospital, Cuddalore, Tamil Nadu, India.

***Corresponding author:**

Suvetha Rajasekaran,
BDS Intern, Department of
Oral and Maxillofacial Surgery,
Rajah Muthiah Dental College
and Hospital, Cuddalore,
Tamil Nadu, India.

suveth.rajasekaran@gmail.com

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ABSTRACT

Mucormycosis is an opportunistic, invasive fungal disease, which is most commonly found in patients with preexisting morbidity such as diabetes mellitus and prolonged steroidal therapy. During this COVID-19 pandemic, diabetic patient's food and their lifestyle, as well as their access to medicine and regular medical care becomes disrupted. This could result in metabolic decompensation, resulting in hyperglycemia, and causes secondary bacterial and fungal infections such as Rhinocerebral mucormycosis and *Staphylococcus* sepsis. The most common cause of this condition is the extraction of maxillary posterior tooth, which accounts for more than 80% of all cases. In this article, five cases of mucormycosis have been documented after dental extractions in maxilla. Importance of understanding this disease, early diagnosis and appropriate aggressive treatment is emphasized in this article for a successful outcome modality associated with the surgeries are explained.

Keywords: Mucormycosis, Fungal infection, Dental extraction, Necrosed tissue

INTRODUCTION

Mucormycosis is an opportunistic, invasive fungal disease, which is most commonly found in patients with preexisting morbidity.^[1] Novel coronavirus (COVID-19) may serve as a risk factor for secondary fungal infections, which may or may not be associated with the preexisting morbidity conditions such as Diabetes Mellitus, HIV associated malignancy, Hematological disorders, Prolonged steroid, and Antibiotic therapy.^[2] Even if diabetic patient is not COVID infected, suboptimal healthcare delivery system put them at risk of uncontrolled hyperglycemic condition. Fungal osteomyelitis was frequently found in the individuals above 40 years of age and is more common in male population.^[3]

Rhino-cerebral Mucormycosis is the most frequent form of this disease in the craniofacial area, which involves the oral cavity, maxilla, palate, zygomatic arch, pterygoid plates, paranasal sinuses, orbital region, and brain. This article presents five cases of Mucormycosis, which were diagnosed in our institute, following dental extractions done at various private clinics during the year 2020.

CASE SERIES

Case 1

A 45-year-old male patient presented with the complaint of pain in his right upper jaw region for past 3 days, with a history of uncontrolled diabetic condition of RBS - 440 mg/dl and under medication. There has been no evidence of Coronavirus disease in the preceding days. On extraoral examination, periorbital edema was evident in right side; blurring of vision; restricted

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eye movement; and proptosis was evident [Figure 1a]. On intraoral examination, necrotic tissue was evident in right side of palatal region; with silvery white margin was evident [Figure 1b]. On CT examination, obliteration of maxillary sinus and thickening of right maxillary sinus wall was evident [Figure 1c].

Case 2

A 46-year-old male patient presented with the complaint of pain in his right upper jaw region for the past 2 days, with a history of uncontrolled diabetic condition of RBS - 380 mg/dl and under medication. There has been no evidence of Coronavirus disease in the preceding days. On extraoral examination, no orbital involvement was present [Figure 2a]. On intraoral examination, necrotic tissue and non-healing socket with silvery white margin were evident over right palatal region [Figure 2b]. On CT examination, obliteration and collapse of hard palatal region and thickening of right maxillary sinus wall were evident [Figure 2c].

Case 3

A patient of 60-year-old male, came with chief complaint of pain, restricted eye movement in his right eyes for 3 days with a history of uncontrolled diabetic condition of RBS - 450 mg/dl and under medication. There has been no evidence of Coronavirus disease in the preceding days. On

extraoral examination, periorbital swelling of right eye was evident [Figure 3a] Due to paresthesia of the right lower lips, drooping of the mouth toward the left side was observed, when the mouth was opened [Figure 3b]; blurred vision and restricted eye movement in the right eye for the past 3 days were observed. On intraoral examination, blackish discoloration of right palatal region with silvery white margin was evident [Figure 3c].

Case 4

A 45-year-old male patient presented with the complaint of vision loss and restricted eye movement in his left eye for the past 2 days with a history of uncontrolled diabetic condition of RBS - 430 mg/dl and under medication. There has been no evidence of Coronavirus disease in the preceding days. On extraoral examination, periorbital swelling in left eye with restricted eye movement and proptosis was evident [Figure 4a]. On intraoral examination, necrotic ulcer in the left alveolus region was evident [Figure 4b]. On CT examination, thickening of left maxillary sinus wall was evident with zygoma involvement [Figure 4c].

Case 5

A 53-year-old, male patient presented with the complaint of pain and mobility in his right upper jaw region for the past 10 days, with a history of uncontrolled diabetic condition



Figure 1: (a) Extraoral view, (b) Intraoral view, (c) CT view.



Figure 2: (a) Extraoral view, (b) Intraoral view, (c) CT view.



Figure 3: (a) Extraoral view, (b) drooping of mouth toward the left side on mouth opening is evident, (c) Intraoral view.



Figure 4: (a) Extraoral view, (b) Intraoral view, (c) CT view.

of RBS - 380 mg/dl and under medication. There has been no evidence of Coronavirus disease in the preceding days. Patient had a history of operated case of the left maxillectomy due to rhino orbital Mucormycosis of the left maxilla and left orbital region before 2 months [Figure 5a]. On extraoral examination, periorbital swelling and restricted eye movement with limited eye opening were evident; diplopia was present; and proptosis was evident over the left eye [Figure 5b]. On Intraoral examination, left partial maxillectomy operated site, with necrotic ulcer and silvery white margin were evident; anterior maxillary segmental mobility was observed [Figure 5c]. The clinical findings of these case series are summarized in the Table 1.

DISCUSSION

Mucormycosis, also known as zygomycosis is a rapidly spreading, life-threatening fungal infection caused



Figure 5: (a) Extraoral view, (b) proptosis of the left eye and restricted eye movement is evident, (c) Intraoral view.

by Mucorales, which primarily affects the patients who are immunocompromised. Infection enters the human body through inhalation, ingestion, and opens wounds.^[4] Rhinocerebral mucormycosis is the most frequent form of this disease in the craniofacial area. Other forms of Mucormycosis include Cutaneous, Gastrointestinal, Pulmonary, and Disseminated Mucormycosis.^[5,6] The prognosis of Mucormycosis is poor with the fatality rate of 17–54%.^[7]

The most common cause of this condition is the extraction of maxillary posterior tooth, which accounts for more than 80% of all the cases. The pathogenesis of Mucorales is complicated, when Mucorales and its spores invade blood vessels, leads to the thrombus formation, which causes gradual necrosis of surrounding hard and soft tissues.^[8] Fungal acquisition of free irons also supports the growth of hyphal forms. Mucormycosis is more likely to occur in immunocompromised patients after dental extraction, in a localized form, that is described in this article. These patients were referred to higher center for further evaluation and management.

Due to the enormous load of infected cases brought on by COVID-19, health-care systems are overburdened. This could have an impact on diabetic patient's food, their lifestyle, and even their ability to obtain medicine and regular medical care.^[9] Due to self-isolation, diabetic patients with insufficient medical surveillance may have metabolic decompensation, resulting in unmonitored hyperglycemia, which can lead to complications such as diabetic retinopathy, neuropathy, cardiovascular disease, and secondary bacterial and fungal infections such as Rhinocerebral mucormycosis and staphylococcus sepsis etc.^[10] Diabetes mellitus is a key risk factor for Mucormycosis in India, accounting for around 73% of all cases.^[4]

The clinical manifestations of Rhinomaxillary Mucormycosis include fever, headache, nasal or sinus

Table 1: The clinical findings of these case series are summarized in this table.

CASE SERIES	AGE/SEX	RBS LEVEL	Past COVID-19 infection	INFECTION LOCALIZATION	CLINICAL SIGNS
Case 1	45/Male	440mg/dl	Absent	Rhinoorbital Mucormycosis	Periorbital edema; diplopia; Necrotic black eschar tissue in right side.
Case 2	46/Male	380mg/dl	Absent	Rhinomaxillary Mucormycosis	Necrotic tissue and non-healing socket with silvery white margin in right side.
Case 3	60/Male	450mg/dl	Absent	Rhinoorbital Mucormycosis	Periorbital edema; paresthesia of right lower lip; Blackish discoloration with silvery white margin on right side.
Case 4	45/Male	430mg/dl	Absent	Rhinoorbital Mucormycosis	Periorbital edema; diplopia; Necrotic ulcer in left alveolus region.
Case 5	53/Male	380mg/dl	Absent	Recurrent Rhinoorbital Mucormycosis	Periorbital edema; proptosis; Left partial maxillectomy operated site, with necrotic ulcer.

congestion, swelling in one side of the face, black lesions on the nasal bridge, and/or upper hard palate inside the mouth. Failure to get appropriate medical and surgical treatment may result in orbital involvement through ethmoidal air sinuses and nasolacrimal duct and causes Rhino orbital Mucormycosis, which may lead to cerebral spread through central retinal artery and may cause Rhino-cerebral Mucormycosis, cavernous sinus thrombosis, sepsis and multisystem organ failure, all of which causes substantial morbidity and fatality.^[11]

Radiographically, Rhinomaxillary Mucormycosis is characterized by paranasal sinus obliteration, erosion, and mucosal thickening of sinuses.^[12] Mucormycosis is diagnosed definitively through tissue biopsy, which reveals the hyphae of large size (5–30 microns), non-septate, thin wall, branched at right angles which have the appearance of ribbon and there is presence of extensive necrosis of tissues.^[13,14]

According to Ahamed and Al Thobaiti, multimodal treatment includes the alleviation of preexisting morbidity conditions, intensive antifungal therapy and most importantly, and surgical care.^[15] Amphotericin B has been widely used in the treatment of Mucormycosis. Based on the recently published article, Muthu *et al.* emphasized the importance of liposomal Amp-B given at 3 mg/kg/day has similar efficacious and safer than 10 mg/kg/day dose of Amphotericin-B drug as it is vasoocclusive in nature.^[16,17] At present, novel drug regimen consists of liposomal Amphotericin B in combination with either an Itraconazole or Echinocandin.

Surgical care is critical and should include debridement of all diseased and necrotic tissues as soon as possible, depending on disease progression. Combinations of procedures such as partial or total maxillectomy, functional sinus endoscopic surgery, and curettage are used in surgical management.^[18,19] If the orbital region is infected with fungal infection, orbital exenteration will be a life-saving treatment. Hyperbaric oxygen therapy and iron chelating agents have also been

reported for treatment of Mucormycosis which aids in the granulation tissue formation and bone healing.^[20-22]

CONCLUSION

In comparison with other form of Mucormycosis, Rhino-orbital Mucormycosis has a better prognosis, since intervention in this area occurs early. Although the prevalence of Mucormycosis caused by dental extraction is relatively rare, it's on the rise in this COVID era and may cause severe morbidity and mortality.

Hence, dental surgeons should be aware of the likelihood of this significant complication to avoid an unsatisfactory clinical outcome. As a result, early diagnosis and adequate aggressive treatment, such as surgical debridement, can minimize the spread of infection and lowers the mortality rate.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

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