

# An Insight into Covid-19 and Mucormycosis Linkage: A Case Series

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## ABSTRACT

**Introduction:** Mucormycosis, a rare fungal disease caused by fungus mucormycetes has high morbidity and mortality mostly due to its delayed diagnosis and management. It is a life-threatening disease that has a high tendency for angio-invasion and can cause necrosis of the head and neck region especially of paranasal sinuses, orbits and facial bones. This disease has come out as widespread sequelae of COVID-19 patients in the recent pandemic situation.

**Case report:** This article discusses the findings of cases encountered in department of Oral Medicine and Radiology with various clinical pictures and later diagnosed as post-COVID-19 - mucormycosis with their clinical, radiological and histopathological features.

**Keywords:** Covid-19, Mucormycosis, Immune-Suppression, Steroids

## INTRODUCTION

Mucormycosis is a highly deadly infection caused by a group of fungi called mucormycetes of order mucorales. It was previously known as zygomycosis and is now commonly known as black fungus.

Mucormycosis mainly affects immune-compromised people who are unable to fight this opportunistic fungus. It most commonly affects the sinuses or the lungs after inhaling fungal spores from the air. It can also occur on the skin after a cut, burn, or other types of skin injury.<sup>1</sup>

This condition can be classified into six forms namely rhino-orbital cerebral mucormycosis (ROCM), pulmonary, cutaneous, gastrointestinal, disseminated and uncommon sites based on the location of their occurrence. Among them, ROCM is the most commonly occurring one.<sup>2</sup>

It is a potentially fatal disease that has a high propensity for angio-invasion especially in patients predisposed to diabetes mellitus, immunosuppressive drugs, haematological drugs, voriconazole therapy, corticosteroids, solid organ transplantation, etc.<sup>3</sup> Management of these underlying conditions is a requisite for control of this infection from further spreading.

In this article, we are discussing various patients that came to our Department of Oral Medicine and Radiology and were diagnosed with post-COVID-19 mucormycosis and referred to Oral and Maxillofacial Surgery (OMFS) and ENT department for further treatment.

## CASE SERIES

In the present case series, all the 20 cases were recorded between July 2021 to October 2021 which reported to the Department of Oral Medicine and Radiology with the various chief complaints like facial swelling, tooth mobility

and pus discharge. Out of 20 cases, 16 cases tested positive for Covid-19 and 4 cases had tested negative (chart 1).

All the 20 cases included in the case series were primarily ROCM type of mucormycosis. All cases had relevant clinical (figure 1A & B), radiological (figure 2) and histopathological data (figure 3).

Biopsied specimens were stained with potassium hydroxide stain for microbiological confirmation. The most often treatment modality adopted was partial maxillectomy of the affected side followed by antifungal treatment.

## DISCUSSION

Mucormycosis being an alarming disease to the present world mostly affects immune-compromised patients. First described in 1885 by Paltauf, it has a great affinity to arterial blood vessels and attaches to the internal elastic lamina of vessel walls leading to thrombosis, ischemia and necrosis of the surrounding tissues.

The rhino-maxillary form of the disease, a subdivision of the rhino-cerebral form, begins with the inhalation of the fungus by a susceptible individual.<sup>4</sup>

Fungal invasion of the oro-nasal cavity or paranasal sinuses of susceptible host causes consistent symptoms, sinusitis or periorbital cellulitis, and facial numbness, followed by the onset of conjunctival suffusion, blurry vision, and soft tissue swelling followed by eschar formation and necrosis of nasofacial region.<sup>5-6</sup>

In our case series all the cases had sino-nasal involvement with most commonly presenting feature being swelling associated with tenderness over sinus region, mobility of teeth and multiple gingival abscesses intra-orally.

COVID-19 infection results in dysregulation of immune system with reduction of T lymphocytes, CD4 + T and CD8 + T cells.<sup>7</sup> A multi-factorial picture of pre-existing Diabetes mellitus and systemic immune changes due to COVID-19

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Sr no	Age/gender	Covid status	Medical history	Clinical symptoms	Radiographic findings	Histopathology	Treatment
01	67/M	R	FESS	FS, GA, TM, SM, PS	CT- Bilateral mild sphenoid sinusitis, right maxillary polyps	KOH mount - non-septate hyphae	Partial maxillectomy, antifungals
02	48/M	-	DM, FESS	GA, MM, PN	CT - Pansinusitis	KOH mount - aseptate hyphae	Partial maxillectomy, antifungals
03	42/M	R	Systemic steroids, oxygen support	FS, GA, TM,PS,SM	CT- right maxillary sinusitis with the erosion of alveolar bone and antrum of the maxilla	KOH mount - non-septate hyphae	Partial maxillectomy, antifungals
04	50/M	-	Systemic steroids	GA, TM, PS	CT - left maxillary sinusitis	KOH mount - non-septate hyphae	Partial maxillectomy, antifungals
05	44/M	R	Systemic steroids	GA, TM, SM, OS	CT - Pansinusitis with inferior orbital space involvement	KOH mount - non-septate hyphae	Partial maxillectomy, antifungals
06	52/M	R	Systemic steroids	GA, TM	CT - Pansinusitis	KOH mount - aseptate hyphae	FESS with alveolectomy, Antifungal
07	25/M	R	Systemic Steroids, oxygen support	FS, GA, SM, TM	CT - Pansinusitis	KOH mount - non-septate hyphae	Antifungal therapy
08	32/M	R	Systemic steroids, oxygen support	FS, GA, TM	MRI and CT - sinusitis	KOH mount - non-septate hyphae	Partial maxillectomy, Antifungals
09	40/M	R	FESS was done, antifungal medication	FS, PS, TM	MRI - Pansinusitis	KOH mount - non-septate hyphae	Partial maxillectomy, Antifungals
10	60/M	R	Systemic steroids	FS, GA, TM	MRI - mucosal invasive right maxillary fungal sinusitis.	KOH mount - non-septate hyphae	FESS with alveolectomy, Antifungals
11	48/M	R	FESS	GA, MM, PN	CT - Pansinusitis	KOH mount - non-septate hyphae	Partial maxillectomy, Antifungals
12	29/M	R	Systemic steroids, Chronic sinusitis	Blackish discolouration of the anterior palate, orbital pain, nasal obstruction	MRI Brain and PNS - fungal sinusitis	KOH mount - non-septate hyphae	FESS with partial maxillectomy
13	42/M	R	DM, Systemic steroids, oxygen support	FS, OS, TM	MRI PNS with orbits - mild pansinusitis, mild features of extraconal orbital cellulitis	KOH mount - non-septate hyphae	FESS, Antifungal therapy
14	39/F	R	DM, Systemic Steroids	GA, SM, PN	CT - Pansinusitis	KOH mount - non-septate hyphae	FESS, Surgical debridement, Antifungals
15	59/M	-	DM, Systemic Steroids	FS, OS, GA, TM	MRI brain - maxillary sinusitis	KOH mount revealed non-septate hyphae	Partial maxillectomy, orbital exenteration, Antifungals

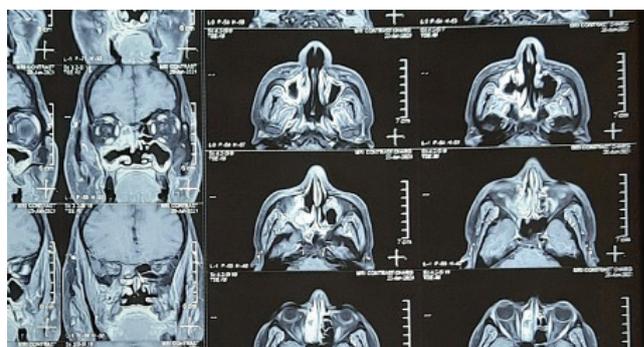
16	45/M	R	DM, Systemic Steroids	FS, GA, TM	MRI - maxillary sinusitis	KOH mount - non-septate hyphae	FESS, Maxillectomy, Antifungals
17	68/M	-	HTN	Nasal discharge, headache, FS, PS, SM, TM, unhealed socket	MRI PNS - pansinusitis sparing frontal sinuses	KOH mount - non-septate hyphae	FESS, Uncinectomy, Ethmoidectomy, Antifungals
18	45/M	R	Systemic Steroids	FS, OS, GA, TM	CT PNS - sinonasal and orbital mucormycosis.	KOH mount - non-septate hyphae	FESS, Antifungals
19	46/M	R	DM, Systemic Steroids	FS, GS, TM, PA	MRI - left maxillary sinusitis	KOH mount - non-septate hyphae	FESS, Surgical debridement, Antifungals
20	40/M	R	Systemic Steroids	GA, TM	CT - Pansinusitis	KOH mount - aseptate hyphae	FESS with alveolectomy, Antifungal

R: recovered FS: facial swelling; OS: orbital swelling; GA: gingival abscess; TM: tooth mobility; SM: segmental mobility; PS: palatal swelling; MM: maxillary mobility; PN: palatal necrosis; DM: diabetes mellitus; HTN: hypertension; CT: computed tomography; MRI: magnetic resonance imaging; KOH: potassium hydroxide; FESS: functional endoscopic sinus surgery

**Table-1:** Illustrates the clinical, radiological, histopathological and treatment data



**Figure-1A:** case 8 clinical picture showing multiple gingival abscesses in left buccal vestibule. 1B- case 17 showing palatal swelling



**Figure-2:** MRI PNS of case 9 depicting T2 hyperintense mucosal edema involving bilateral maxillary and bilateral frontal, ethmoidal, right sphenoidal sinuses.

infection which further leading to secondary infections thereby increasing mortality and morbidity.

In present study, case # 2, 13, 14, 15 & 19 had uncontrolled diabetes, hypertension was found in case # 17, chronic sinusitis in case # 19.

Even though these factors such as uncontrolled diabetes, organ transplantation and hematological factors are often associated with mucormycosis, it is quite apparent that covid-19 infection also acts as a trigger in these conditions.

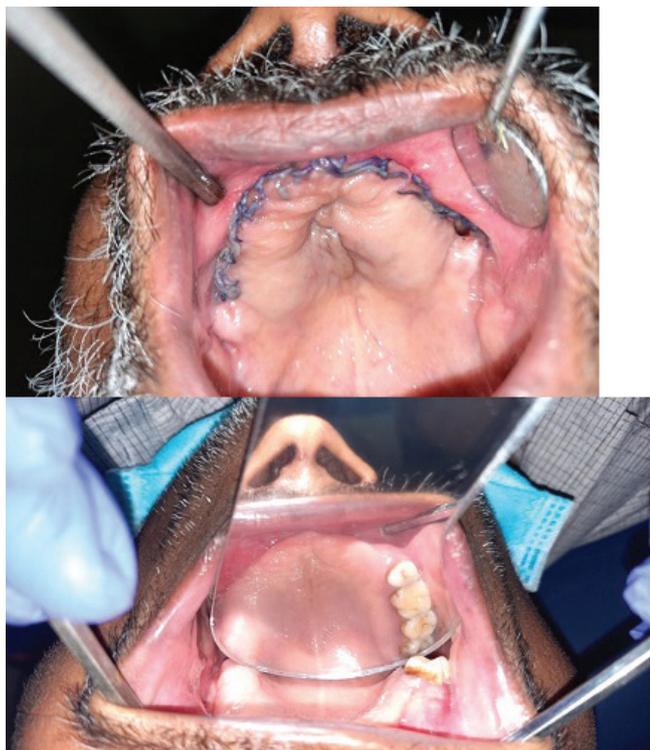
Furthermore, mucormycosis can also be seen in people without any underlying conditions as in the present study 65% of the people were without any underlying conditions. Moreover, patients with severe COVID-19 also require a prolonged hospital stay and mechanical ventilation<sup>8</sup>; the occurrence of fungal spores in this equipment could also contribute to mucormycosis in these individuals.<sup>9</sup>

The immunosuppressants and corticosteroid medications that are warranted in COVID-19 can contribute significantly to the occurrence of mucormycosis.<sup>9</sup>

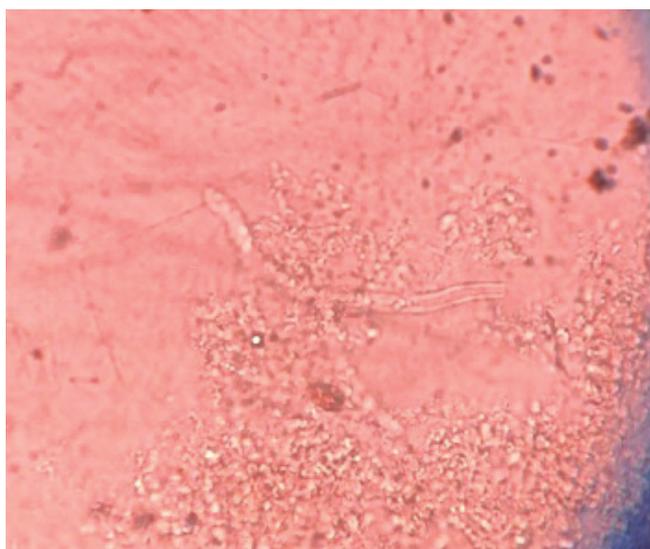
In the present study, oedema and thickening of sinus mucosa, which is consistent with mucormycosis, was detected in all of 20 cases (100%) that underwent paranasal sinus CT scanning.

The diagnosis was confirmed by histopathological examination which showed foci of nonseptate fungal hyphae in all the cases.

All of the present cases underwent surgical debridement procedure via FESS followed by partial maxillectomy in 10 cases (figure 4A & B). In case # 18 entire sinus tissue removal was done along with orbital exenteration as a life



**Figure-4a:** Case 11 post partial maxillectomy with sutures placed.  
**4B:** Case 15 post partial maxillectomy with healed alveolar ridge



**Figure-3:** Potassium hydroxide (KOH) smears shows fungal hyphae which are broad, aseptate with acute branching suggestive of mucormycosis.

saving option (FIGURE 5).

It was determined that liposomal amphotericin b (lamb) 1mg/kg/day in 5% dextrose solution was the first choice for systemic antifungal treatment with oral posaconazole 300mg being given for the maintenance therapy for at least 90 days(12 weeks).

## CONCLUSION

Covid-19 patients with history of co-morbidities and its consequential immunosuppression make the patient more susceptible to secondary fungal infections like mucormycosis.



**Figure-5:** Case 15 post orbital exenteration

In the present case series, the most common type observed was rhino-orbital cerebral mucormycosis. Treatment comprised of surgical debridement and liposomal amphotericin B in all of the cases with subsequent posaconazole therapy. Post covid-19 mucormycosis needs a multidisciplinary approach in its diagnosis and management to improve the prognosis particularly management of underlying risk factors leading to lesser mortality and morbidity rates.

## CONSENT

All authors declare that ‘written informed consent was obtained from the patient (or other approved parties) for publication of this case report and accompanying images

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