

Rhino-sino Mucormycosis with Post-COVID-19: A Case Report

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ABSTRACT

COVID-19 or SARS-CoV-2 infection is known to have an association with a myriad of viral, fungal, and bacterial co-infections. Mucormycosis is a rare angio-invasive fungal infection that has shown a rising trend during COVID-19 infection in India. Mucormycosis is a rapidly progressing fungal infection caused by filamentous fungi in the Mucoraceae family and is frequently seen in diabetic and immune-compromised patients. Mucormycosis is a condition with a fulminant course and a high mortality risk. The early diagnosis and treatment of mucormycosis is very important in terms of prognosis.

Keywords: Amphotericin B, COVID-19, Fungal infection, Mucormycosis, Rhino-orbital mucormycosis, Rhino-sino mucormycosis.

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BACKGROUND

Mucormycosis, an angio-invasive disease,¹⁻³ is caused by a group of molds called Mucormycetes. These molds live throughout the environment, and it is a rare fungal infection potentially fatal if inadequately treated.⁴ It is often referred to as a black fungus. The estimated prevalence of black fungus is around 70 times higher in India compared with global data.⁵ The incidence of mucormycosis has risen more rapidly in India with COVID-19 second wave compared with the first wave. It was reported as 14,872 cases as of May 28, 2021.⁶

CASE DESCRIPTION

Patient History

Mr X, 48-years-old male, came with complaints of fever, cough, shortness of breath, myalgia, and tiredness for 4 days. On June 2, 2021, the patient was tested for RT-PCR, the result showed COVID-positive, and the computed tomography (CT) severity score was 8 of 25 and identified as diabetic during that time. He got admitted and treated with Inj. Remdesivir, Inj. Pan 40 mg, Inj. Lupenox 40 mg, Inj. Piptaz 4.5 mg, Inj. Methylprednisolone, and Tab. Ivermectin 12 mg. Then, Mr X got discharged on June 8, 2021, from the hospital and advised for home quarantine. Meanwhile, since June 7, 2021, he developed on and off nasal obstruction, headache, left-facial pain numbness, and left-tooth numbness for 1 week. On June 14, 2021, with the physical examination in OPD, it was advised to do investigations, like CT sinus scan, biopsy, and other blood investigations. With the help of all diagnostic reports, it was diagnosed as Rhino-sino mucormycosis.

RESULTS OF PHYSICAL EXAMINATION AND LABORATORY TESTS DURING ADMISSION

Mr X was conscious and oriented. Oral hygiene was good. Vital signs were stable. Pulse was 84 per minute, and blood pressure was 110 per 70 mm Hg. Normal vesicular breath sounds heard and no palpable lymph nodes. No other abnormalities were found except left sinus tenderness. The complete blood count was normal

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with the red blood cells (5.20 million cells per cmm), hemoglobin (15.5 g per dL), total count (11900 cells per mm³), and platelet count (356000 per mL). There was a moderate elevation of erythrocyte sedimentation rate, that is, 30 mm per hour, PT 14 seconds (INR: 1.2), activated partial thromboplastin time 29 seconds, plasma glucose 102 mg per dL, blood urea 28 mg per dL, and creatinine 0.9 mg per dL.

The CT paranasal sinus scan reported acute sinusitis with subtle left retromaxillary fat stranding. Then, he was taken for functional endoscopic sinus surgery (FESS) under general anesthesia on June 15, 2021. KOH mount shows no fungal elements seen. Fungal culture shows *Rhizopus* species grown in culture. Biopsy (medium) reported sinonasal mucosa lined by ciliated pseudo-stratified columnar epithelium with ulceration. Underlying lamina propria shows vague granuloma formation with necrosis comprised of multinucleated giant cells, histiocytes, lymphocytes, and neutrophilic exudates. Amidst few clusters of broad nonseptate fungal hyphae, morphologically suggestive of mucormycosis are seen. Few blood vessels show angio-invasion by fungal hyphae. And, the impression was invasive fungal sinusitis, morphologically suggestive of mucormycosis with angio-invasion and granuloma formation—mucosa from maxillary and ethmoid sinuses.

Course of Treatment in the Hospital

On June 16, 2021, after the admission, the patient was treated with a general medicine opinion for glycemic control, and orders were followed. Mr X was treated with Inj. Amphotericin B (AmB) (cumulative dose: 2.30 mg) along with IV antibiotics, IV anti-fungal, anti-diabetics, and other supportive measures. Constant monitoring of parameters, like urea, creatinine, and electrolytes, were done. During the treatment, the patient developed few side effects, like chills and decreased appetite, and gastrointestinal symptoms and all were symptomatically managed.

On June 22, 2021, left Caldwell-Luc operation was done. And, the biopsy (medium) report of mucosa from the left maxillary sinus showed fungal sinusitis morphologically consistent with mucormycosis. No conclusive evidence of any osteo-invasion/angio-invasion in the sections was studied. Fungal culture report shows *Rhizopus* species grown in culture. KOH mount shows Aseptate hyaline fungal hyphae seen. Then, the treatment was continued. After June 22, 2021, there was an elevation of urea and creatinine value, and protein was low in the liver function test (Tables 1 and 2). Patient got discharged when symptoms, like nasal obstruction, headache, left-facial pain and numbness, and left-tooth numbness, improved. The follow-up medications (Table 3) were advised for 7 days.

DISCUSSION

Mucormycosis is an acute and aggressive fungal infection.⁷ The clinical presentations of mucormycosis are classified based on anatomic localization, such as rhino-orbital-cerebral, pulmonary, gastrointestinal, cutaneous, renal, and disseminated mucormycoses.^{8,9} Diabetes mellitus is the most common risk factor for mucormycosis, along with hematological malignancy, chronic kidney disease, solid-organ transplant, postpulmonary tuberculosis, immunosuppressive therapy like steroids, and extensive skin injury.⁵ The occurrence of mucormycosis is variable but usually occurs around third week of onset of symptoms of COVID-19.¹⁰ Infection portal of entry included surgery and the presence of medical devices, such as catheters or adhesive tapes in healthcare-associated mucormycosis. *Rhizopus* was the most frequent gene.¹¹ Amphotericin B (AmB) is a crucial agent in the management of serious systemic fungal infections. It has side effects, like nausea, vomiting, rigors, fever, hypertension or hypotension, and nephrotoxicity.¹² Patients begin treatment within 5 days of diagnosis of mucormycosis, and survival was markedly improved compared to initiation of anti-fungal ≥ 6 days after diagnosis (83 vs. 49% survival).¹³

In the present case, the patient was a diabetic, but blood glucose was under control. He got admitted for COVID-19 treatment and received immune suppressive therapy for 6 days during admission and continued during quarantine also. He developed

Table 1: Blood biochemistry

Component	June 20, 2021	June 23, 2021	June 24, 2021	June 25, 2021	June 27, 2021	June 28, 2021
Urea (mg/dL)	17	35	51	67	81	73
Creatinine (mg/dL)	0.8	1.4	2	3.4	4	3.8
Sodium (mmol/L)	139	139	134	128	126	135
Potassium (mmol/L)	3.8	2.7	4.2	3.7	3.1	3.7
Calcium (mg/dL)	8.9	8.6	8.4	8.9	8.5	8.3
Magnesium (mg/dL)	2.4	1.6	1.4	1.5	2	1.8

Table 2: Liver function test

Date	Total bilirubin (mg/dL)	Direct bilirubin (mg/dL)	Indirect bilirubin (mg/dL)	Total protein (g/dL)	Albumin (g/dL)	Globulin (g/dL)	AST (SGOT) (U/L)	ALT (SGPT) (U/L)	ALP (U/L)
June 27, 2021	0.65	0.24	0.41	5	3.4	1.6	16	23	66
June 28, 2021	0.69	0.17	0.52	4.7	3.2	1.5	14	18	61

Table 3: Medications

Sl. No.	Form of medication	Drug name	Dose	Frequency
1	Tablet	Faropenem	200 mg	1-0-1
2	Tablet	Posaconazole	300 mg	1-0-0
3	Tablet	Pan	40 mg	1-0-0 (BF)
4	Capsule	Vizylac		1-0-0
5	Tablet	Cetirizine	10 mg	0-0-1
6	Spray	Solspre Nasal	2 Puff	1-1-1
7	Tablet	Nexpro-RD		1-0-0 (30 minutes BF)
8	Tablet	Amino rich		1-1-1
9	Tablet	Prohance-HP		1-1-1 (2 tsp in 1 glass of milk)
10	Syrup	Gaviscon	10 mL	1-1-1 SOS

the symptoms of mucormycosis around third week with COVID-19. Rhizopus was found with a fungal culture. Mr X was treated for mucormycosis within 10 days of symptom development, which gave a better prognosis. The antifungal agent AmB was initiated based on his tolerance. He had an elevation of blood urea and creatinine, which may be a sign of nephro toxicity.

Hence, early diagnosis and timely intervention are essential to improve the quality of life of a patient with mucormycosis.

Nursing Management of Mr X with Mucormycosis

- Provided an atmosphere of respect, openness, trust, and collaboration.
- Mr X was very anxious about his condition and prognosis during a pandemic. He was not willing to talk to people and showed crying spells, irritability, etc. Assessed the patient's health perceptions, knowledge, and counseled him to overcome the anxiety.
- Explained the condition of the patient and the needed treatment, like FESS and Caldwell-Luc procedure. Slowly gained the confidence of the patient with rapport, and he cooperated for further treatment.
- Family members were very anxious; with the detailed explanation and proper communication, they could also developed family coping.
- He had insidious onset of dull-aching left-sided pain with a score of 5 of 10. Fowler's position was maintained with the help of the backrest. He was comfortable in the right lateral position with the help of pillows.
- Obtained a strict glycemic control of patient.
- Assessed the patient's intake and output, creatinine levels, and serum potassium levels, since Inj. AmB causes hypokalemia. During the treatment regimen, potassium and creatinine levels were monitored every day. The lowest potassium level during his hospital stay was 2.7 mmol per L, and the highest creatinine level was 4 mg per dL.
- Potassium supplements were given.
- Encouraged Mr X to take adequate fluids orally.
- Adequate hydration was maintained with antifungal treatment.
- Discharge advice was given to the patient. Suggested to do few blood investigations by the seventh day of follow-up.

CONCLUSION

Mucormycosis is an aggressive opportunistic fungal infection that has a high incidence in India compared to the world during

COVID-19 pandemic. As the prognosis varies from poor to fair, aggressive medical and surgical management is critical. Excellent communication and an in-depth discussion with the patient and family regarding prognosis are fundamental in caring for these patients.

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