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Renal mucormycosis following COVID-19 treatment with immune modulators: a case report

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Abstract: Mucormycosis is an opportunistic fungal infection that occurs primarily in immunocompromised individuals, usually affecting the rhino-orbital areas followed by the lungs. This case report presents renal mucormycosis in a young man after COVID-19 pneumonia that escalates the need for regular follow-up of COVID-19 patients. Post-COVID-19 fungal infections are on a steep rise, and the increased use of steroids and immune modulators for COVID-19-associated immune dysregulation and cytokine syndrome increases the risk among patients treated for COVID-19.

Keywords: Case Reports; COVID-19; Immunosuppression; Mucormycosis; Renal Insufficiency

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1. Introduction

Mucormycosis is an opportunistic fungal infection that occurs primarily in immunocompromised individuals, usually affecting the rhino-orbital areas followed by the lungs (1). The management of COVID-19 also requires the use of multiple immunosuppressants and immunomodulatory medications, which puts the patients at risk of such infections (2). This case report presents renal mucormycosis in a young man with COVID-19 treated with immune modulators, and escalates the need for regular follow-up of COVID-19 patients.

2. Case presentation

A 21-year-old male with no history of any comorbidities like diabetes, asthma, and no history of addiction/substance abuse presented with continuous fever (103°F/39.4°C) and breathlessness [Medical Research Council dyspnoea (MRC) Grade-4] and tested positive on COVID-19 reverse transcription polymerase chain reaction (RT-PCR) test. He was managed initially with intravenous dexamethasone (6mg/day), remdesivir (200mg loading dose on day 1 and 100mg daily in next 9 days), oxygen supplementation, and non-invasive mechanical ventilation support at a COVID-19 care center. He had also received bevacizumab and adalimumab due to non-resolving viral pneumonia with no improvement in the oxygen saturation.

On presenting to our medical emergency center, three weeks after being symptomatic, the patient's pulmonary function had improved over time as he required oxygen support through nasal prongs and maintained saturation of 96%. The high-resolution computed tomography (HRCT) scan of the lungs had evidence of COVID-19 reporting and data system (CO-RADS) grade 5 (Figure 1). Still, the details of the course of events during his admission at the COVID care center were not available, which warranted the addition of bevacizumab and adalimumab. However, he had a recent history of recurrence of high-grade continuous fever (104°F/40°C) with chills and rigor along with left-sided flank pain. Repeated COVID-19 RT-PCR was negative, and investigations revealed haemoglobin of 11.6 gm/dl, total leucocyte count of 9600/mm^3 (neutrophil=76%, lymphocyte=14%, eosinophil=10%, monocyte=0%) and platelet count of 260 x 10^9 per litre. His D-dimer was elevated (940 ng/ml), and C reactive protein (CRP) was also high (84.6mg/L). He had acute kidney injury of urea=52mg/dl and creatinine=2.1mg/dl with urine analysis showing 1+ proteinuria, 30-40 pus cells/high-power field (HPF), and 8-10 red blood cells (RBCs)/HPF. His fasting blood glucose was 76 mg/dl, and HbA1c of 5.6%; HIV-1/2, and HBsAg/anti HCV serology was non-reactive, and body mass index (BMI)=21 ruled out any chronic immunocompromised status for the patient. Urine culture had growth of Klebsiella pneumonia but no fungal growth. Antibiotics were changed according to the available antibiogram. On ultrasonography of the abdomen, there was a left ureteric calculus of 7mm in the upper ureter, causing hydronephrosis. Contrast-enhanced CT scan of kidneys revealed bilaterally enlarged kidneys and dilated pelvis with fat stranding of the left kidney (Figure 2). A double-J stent was placed on the left side under ureteroscopy guidance, and the pus obtained was sent for analysis. It came positive for broad aseptate fungal hyphae suggestive of mucormycosis (Figure 3). Diagnosis of left renal mucormycosis was made and the patient was treated with liposomal amphotericin B and his renal function test and serum electrolytes were closely monitored. The galactomannan test index levels were 1.0, which was high, and so was the serum ferritin level of 862ng/ml.

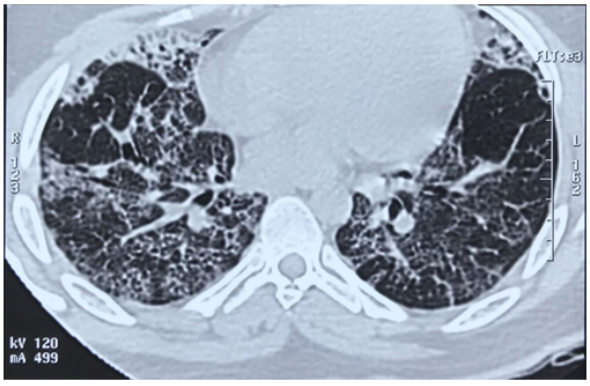

Figure 1 Axial view of the patient's high-resolution computed tomography scan of the lungs revealed COVID-19 reporting and data system grade 5

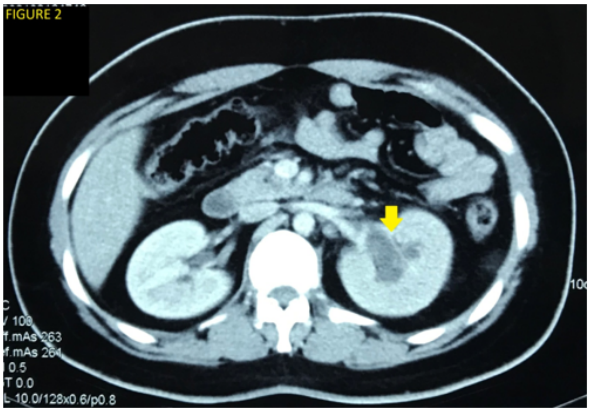

Figure 2 Axial view of the patient's contrast enhanced computed tomography scan of the abdomen showing evidence of hydronephrosis in left kidney

The patient's renal parameters improved after administration of two 21-day courses of amphotericin-B (creatinine=1.2 mg/dl), and the patient was requested to follow up after two weeks for the resolution of hydronephrosis.

3. Discussion

Post-COVID-19 fungal infections are on a steep rise, especially in developing countries like India, due to socio-demographic factors. Patients with diabetes mellitus and immunocompromised states are at higher risk, and the increased use of steroids and immune modulators for COVID-19-associated immune dysregulation and cytokine syndrome increases the risk among patients treated for COVID-19 (3-7). There is a high predisposition for mucormycosis in an iron overload state. There is an elevated ferritin level (as observed in our index case) associated with COVID-19 infection, which could be one of the reasons for post-COVID fungal infections (8). Mucormycosis primarily affects nasal-sinuses followed by rhino-orbital and pulmonary regions in most cases, and isolated renal involvement is rare (5). Renal mucormycosis has been seen in 0.5-9% of the total cases of mucormycosis in Indian studies (7,9).

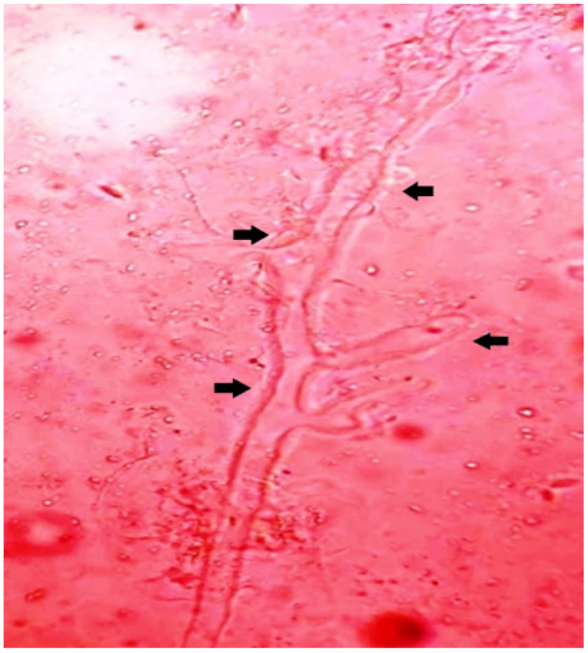

Figure 3 KOH mount showing the aseptate hyphae of mucormycosis

Isolated renal mucormycosis is rare, although renal involvement has been seen in 22% of cases of disseminated mucormycosis (10). It is not completely clear how the fungus reaches the kidney, but the most probable entry point is the lungs from which the fungus can enter the bloodstream via lung lesions and reach the kidney; another route of entry can be the lesions in the urinary tract. After the fungi gain vascular access to the kidney, they may present with renal impairment due to cortical or medullary infraction of the kidney (10). Management of mucormycosis includes liposomal amphotericin as a first-line agent, with or without combination with echinocandins. Salvage therapy, including caspofungin, posaconazole, deferasirox, and hyperbaric oxygen, has also been tried but without much promise. The cornerstone of treatment is early diagnosis, debridement of necrotic tissue, and early initiation of antifungal treatment (11). However, despite the treatment options, the prognosis remains grave, with mortality ranging from 28-52% in the Indian scenario (1,12). Being in a resource-limited setting, high treatment expenses, prolonged hospitalization after surgery, and high probability of poor prognosis often cause patients to leave treatment pre-emptively (12).

4. Conclusion

Post-COVID-19 fungal infections are on a steep rise, and the increased use of steroids and immune modulators for COVID-19-associated immune dysregulation and cytokine syndrome increases the risk among patients treated for COVID-19.

5. Declarations

5.1. Acknowledgment

None.

5.2. Authors' contribution

All the authors met the standards of authorship based on the recommendations of the International Committee of Medical Journal Editors.

5.3. Conflict of interest

None declared.

5.4. Funding

None declared.

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