



## Medium Vessel Fungal Vasculitis after SARS-CoV-2 Infection

Kritika Sharma, Rajaram Sharma\*, Sunil Kast, Tapendra Nath Tiwari, Saurabh Goyal

Department of Radio Diagnosis, Pacific Institute of Medical Sciences, Udaipur, India

### ABSTRACT

This case report presents the possible association between invasive fungal sinusitis (mucormycosis) and coronavirus disease. Rhino-Orbito-Cerebral Mucormycosis (ROCM) is the lethal fungal infection in post-COVID-19 patients. Contrast-Enhanced Magnetic Resonance Imaging (CEMRI) was done to evaluate the extension. MRI is beneficial in delineating the spread and helps in deciding further treatment. Here is a case with having COVID-19 infection history with the intracranial extension of mucormycosis affecting the internal carotid artery.

**Keywords:** Mucormycosis; Post COVID-19; Intracranial extension

**Abbreviations:** ROCM: Rhino-Orbito-Cerebral Mucormycosis; CEMRI: Contrast-Enhanced Magnetic Resonance Imaging; KOH: Potassium Hydroxide

### INTRODUCTION

COVID-19 infection caused by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) had hit India in February 2019; since then, there have been massive twists and turns observed in its pathophysiology, management, and complication. It is a febrile viral illness; initially affecting sinus mucosa, then spreads to the lungs and causes respiratory distress or failure. A wide range of non-respiratory complications due to organ-wise involvement secondary to COVID-19 virus infection was also documented [1,2]. Post-COVID complications affected the population on a large scale. Rhino-Orbito-Cerebral Mucormycosis (ROCM) is a lethal complication in post-COVID-19-affected patients due to prolonged hospital stays. Clinically, rhino cerebral mucormycosis can present atypical signs and symptoms similar to complicated sinusitis, such as nasal blockage, crusting, proptosis, facial pain and edema, ptosis, chemosis, and even ophthalmoplegia, with headache and fever and various neurological signs and symptoms of intracranial extension are present.

### CASE PRESENTATION

A 40-year-old female came to our hospital with facial pain, right-

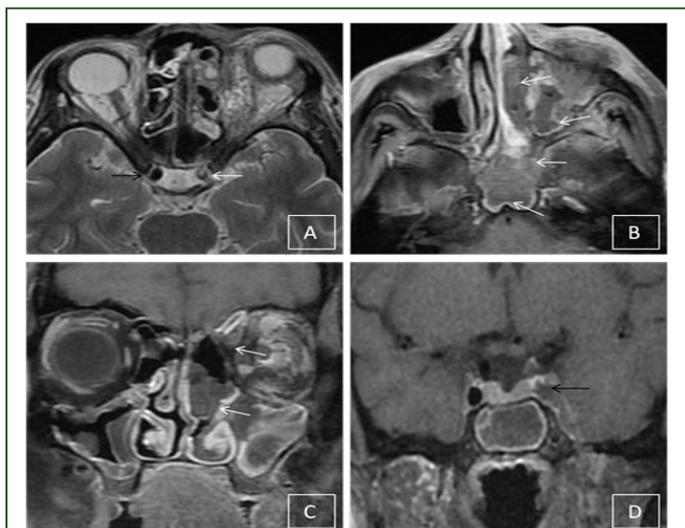
sided paralysis, and high-grade fever. On physical examination, the patient had facial erythema and swelling, discoloration of the inferior turbinates, and signs pertaining to pansinusitis. The patient had a history of COVID-19 infection and steroid administration in the recent past. Therefore, considering post-COVID-19 complications, CEMRI of paranasal sinuses and brain was advised, revealing heterogeneous enhancement of left ethmoid and sphenoidal sinuses with bilateral inferior turbinates with irregular nodular surfaces. The left cavernous sinus did not show regular post-contrast enhancement representing thrombosis along with loss of flow void of the internal carotid artery and restricted diffusion (Figures 1A, 1B and 1C). The supra-clinoid segment of the right internal carotid artery showed wall thickening and hyper-enhancement, representing arteritis (Figure 1D). The patient also had restricted diffusion in the left frontal and parietal lobes representing infarcts and restricted diffusion in the left cavernous sinus (Figures 2A and 2B). The imaging diagnosis of invasive ROCM was suggested. KOH-smear from the nasal mucosa confirmed the presence of a fungal pathogen with aseptate hyphae. The patient is being treated in our hospital, and she is making a gradual recovery.

**Correspondence to:** Rajaram Sharma, Department of Radio Diagnosis, Pacific Institute of Medical Sciences, Udaipur, India; E-mail: hemantgalaria13@gmail.com

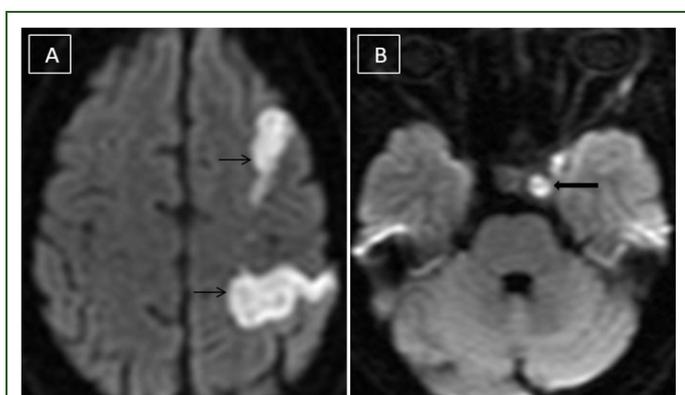
**Received:** 26-Jun-2022, Manuscript No. JVMS-22-17245; **Editor assigned:** 29-Jun-2022, Pre QC No. JVMS-22-17245 (PQ); **Reviewed:** 18-Jul-2022, QC No. JVMS-22-17245; **Revised:** 25-Jul-2022, Manuscript No. JVMS-22-17245 (R); **Published:** 01-Aug-2022, DOI: 10.35248/2329-6925.22.10.466

**Citation:** Sharma K, Sharma R, Kast S, Tiwari TN, Goyal S (2022) Medium Vessel Fungal Vasculitis after SARS-CoV-2 Infection. J Vasc Surg. 10:466.

**Copyright:** © 2022 Sharma K, et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.



**Figure 1:** Magnetic resonance images (A) T2 weighted axial plane image shows the absence of a regular flow void in the left Internal Carotid Artery (ICA) (⇔) White arrow versus the normal flow void depicted on the right side (←) Black arrow. Post-contrast fat-saturated T1 weighted (B) Axial plane (C) Coronal image demonstrates heterogeneous enhancement in left ethmoidal sinus and sphenoidal sinus with the extension of the disease in left peri-orbital tissue (⇔) White arrows. (D) Post-contrast fat-saturated T1 weighted coronal plane image shows enhancement and thickening of left walls of left ICA with non-enhancing hypo intense material in the ICA lumen representing thrombosis with inflammatory changes in the wall.



**Figure 2:** Magnetic resonance diffusion-weighted images in the axial plane illustrates (A) restricted diffusion in the left frontal and parietal lobe, suggesting infarcts (←) Black arrow. (B) Diffusion restriction in left cavernous sinus representing thrombosis with collection (←) Thick black arrow.

## DISCUSSION

Mucormycosis or zygomycosis, also called phycomycosis, initially described in 1885 by Paltauf, is a rare and very aggressive fungal infection that usually affects patients with alteration in their immune status. Furthermore, as we have seen, COVID-19 is a life-threatening, infectious disease; it alters the patient's immune systems with overuse of steroids in their treatment, indicating more prone to fungal co-infections, especially those patients who

got admitted to intensive care units and those who required mechanical ventilation or who had a longer duration of hospital stays. Hence, it is essential to be aware that COVID-19 patients can develop further fungal infections.

During the later stage of the disease; one of the critical complications is Rhino-Orbito-Cerebral Mucormycosis (ROCM), also known as "black fungus," causing life-threatening invasive fungal sinusitis leading to various extra sinus as well as intra and extra cranial complications, i.e., orbital cellulitis, cavernous sinus thrombosis, cranial nerve abscess, large vessel vasculitis, and Kawasaki disease [3,4]. In majority of the cases, this infectious vasculitis is the resultant of direct invasion or extension of infectious foci of this virus to the endothelial cells and vascular wall which is usually accompanied by intense inflammatory response to the vessel wall and other symptoms related to the main infection and rarely confused with bona fide vasculitis.

Due to the high prevalence of diabetes mellitus and steroid use in the treatment, it became endemic in India in post-COVID-19 infected patients [3]. A compound interaction between diabetes mellitus, immunosuppressive therapy, nosocomial infection, and systemic immune alterations of COVID-19 infection itself results in high morbidity and mortality secondary infections.

In teenage patients, who are presented with fever and signs of sinusitis with elevated inflammatory markers and manifested major organ involvement as well as a positive serology test for COVID-19 infection, meeting the definition of MIS-C (Multisystem Inflammatory Syndrome in Children) [5]. The absence of mucocutaneous symptoms and coronary artery abnormalities on echocardiography, contrast MRI makes Kawasaki disease a less likely diagnosis. In addition, Kawasaki disease typically affects children at a younger age [6]. The elevation of pro coagulant and inflammatory markers including pro-thrombin time, fibrinogen, D-dimer, troponin, pro-BNP, ferritin and CRP (C-Reactive Protein) were relevant laboratory abnormalities in such patients.

Radiological modalities play an essential role in evaluating infection's spread and complications related to COVID-19 infection. Deadly vascular complications such as arthritis, thrombosis, and mycotic aneurysms are challenging to treat; therefore, early diagnosis and careful monitoring are essential. The imaging helps in the assessment of these complications as well as in planning for surgical interventions. Doppler studies and peripheral angiography of extremities are ideal for detecting and assessing the extension of acute arterial/venous thrombosis, which has helped us diagnose and follow up with these patients. Contrast-enhanced Magnetic Resonance Imaging (MRI) plays a vital role in diagnosing the angio-invasive nature of the COVID-19-related rhino-orbito-cerebral mucormycosis and related intracranial complications [3]. Histological features include mycotic infiltration of blood vessels (causing vasculitis) with thrombosis, hemorrhage, tissue infarction, and acute neutrophilic infiltrate.

Even with a confirmed diagnosis, and treatment of underlying diseases like aggressive medical and surgical intervention, the management is not so practical, resulting in extension of the

infection and ultimately death. Here, we present our recent and still ongoing experience of post-COVID mucormycosis-related vascular complications.

## CONCLUSION

Post-COVID-19 patients who present with stroke and sinusitis-like symptoms, mucormycosis-related vasculitis should be considered. MRI is the modality of choice for assessing post-COVID-19 intracranial vascular complications; especially its extension and follow-up. Judicial use of the steroid and control of blood sugar levels should be kept in mind in COVID-19 patients to avoid opportunistic infections.

## REFERENCES

1. Tang N, Bai H, Chen X, Gong J, Li D, Sun Z. Anticoagulant treatment is associated with decreased mortality in severe coronavirus disease 2019 patients with coagulopathy. *J Thromb Haemost.* 2020;18(5):1094-1099.
2. Wang T, Chen R, Liu C, Liang W, Guan W, Tang R, et al. Attention should be paid to venous thromboembolism prophylaxis in the management of COVID-19. *Lancet Haematol.* 2020 ; 7(5):e362-363.
3. Sharma K, Tiwari T, Goyal S, Sharma R. Rhino-orbito-cerebral mucormycosis causing cranial nerve abscess in post-COVID-19 status. *BMJ Case Reports CP.* 2021;14(9):e245756.
4. Jones VG, Mills M, Suarez D, Hogan CA, Yeh D, Segal JB, et al. COVID-19 and Kawasaki disease: Novel virus and novel case. *HospPediatr.* 2020;10(6):537-540.
5. Whittaker E, Bamford A, Kenny J, Kaforou M, Jones CE, Shah P, et al. Clinical characteristics of 58 children with a pediatric inflammatory multisystem syndrome temporally associated with SARS-CoV-2. *Jama.* 2020;324(3):259-269.
6. Capone CA, Subramony A, Sweberg T, Schneider J, Shah S, Rubin L, et al. Northwell Health COVID-19 Research Consortium: Characteristics, cardiac involvement, and outcomes of multisystem inflammatory syndrome of childhood associated with severe acute respiratory syndrome coronavirus 2 infection. *J Pediatr.* 2020;224(141-145):10-16.