Fungal brain abscess in a post COVID-19 patient

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DESCRIPTION
A 62-year-old man presented with chief complaints of altered behaviour, slurring of speech and left-side weakness for 6 days. The neurological examination also revealed left-sided weakness. He had a history of hospitalisation for COVID-19 pneumonia with moderate severity of disease (CT severity score of 15/25). He stayed in the hospital for 30 days with an initial 10 days of intensive care unit admission. He was kept on supplemental oxygen and received methylprednisolone 20 mg intravenous twice a day (BD) for 6 days. He recovered from the disease and was discharged from the hospital only 10 days ago with SpO2 of 92% on room air. Now he presented with neurological complaints. The patient had controlled diabetes for which he was on oral hypoglycaemic drugs. His routine blood tests were normal except for mildly raised alkaline phosphatase and D-dimer levels.

For further evaluation, MRI of the brain (figure 1) was done, which revealed a thick-walled peripherally enhancing lesion of size ~45×43×37 mm in the right parietal lobe in the peritrigonal location. The lesion wall had crenulated margins with intracavitary projections, which showed blooming on susceptibility-weighted imaging (SWI) and diffusion restriction on diffusion-weighted imaging (DWI). The core of the lesion was hyperintense, which was suppressed on a fluid-attenuated inversion recovery (FLAIR) sequence. Marked perilesional oedema was also seen on T2-weighted/FLAIR imaging with surrounding mass effect. On magnetic resonance spectroscopy (MRS), raised lipid lactates and trehalose were seen. Based on imaging findings, a diagnosis of the fungal abscess was made. Contrast-enhanced CT of the thorax was also done, which showed few peripheral pulmonary cavities, segmental right pulmonary artery thrombus and diffuse parenchymal fibrosis (figure 2). Biopsy from cavitary lung lesion was positive for Aspergillus infection.

He was started on intravenous antibiotics, vancomycin, voriconazole and subcutaneous enoxaparin 60 mg BD. His neurological symptoms deteriorated despite antifungal treatment; therefore, craniotomy with excision of the brain abscess was done. The culture of the pus had grown Aspergillus organism.

The complex interplay of immune system modulation by COVID-19, comorbidities, use of steroids and hospital-acquired infections is considered to be responsible for the rising incidence of fungal infection associated with COVID-19 pneumonia.1 There are multiple reports of invasive rhino-orbital–cerebral mucormycosis in a patient with COVID-19.2 However, the formation of fungal brain abscess following COVID-19 without contiguous sinusoidal and orbital diseases is uncommon. Aspergillus can cause various diseases in a host, depending on its immune status, ranging from allergic reactions, invasive lung infections and other organ diseases.3

Figure 1 Brain MRI axial images: (A) T2 weighted, (B) FLAIR, (C) SWI, (D) DWI and (E) postcontrast T1-weighted images showing a well-defined lesion in the right peritrigonal location showing T2/FLAIR hypointense crenulated wall with iso-low-signal intensity intracavitary projections (white arrows) and T2 hyperintense/FLAIR hypointense core (red arrows). Marked perilesional oedema and mass effect are seen. The wall of the fungal cavity shows peripheral blooming on the SWI image (black arrow) with rim enhancement on the postcontrast image (yellow arrow) and diffusion restriction in the wall and intracavitary projections on DWI (blue arrow). (F) MRS image at Time to echo (TE) 35 ms shows elevated lipid lactate at 1.2–1.4 PPM and trehalose peak at 3.6–3.8 PPM (white arrows). DWI, diffusion-weighted imaging; FLAIR, fluid-attenuated inversion recovery; MRS, magnetic resonance spectroscopy; SWI, susceptibility-weighted imaging.

Figure 2 HRCT (A) coronal and (B) axial images showing thick-walled cavitating lesions (blue arrows) in the posterior basal segment of bilateral lungs. (C) HRCT coronal image shows fibrotic opacities, parenchymal bands and reticulation with peripheral predominance in bilateral lungs suggestive of resolution phase of COVID-19 pneumonia. (D) Contrast-enhanced CT image of the thorax shows a thrombus in the right lower lobe pulmonary artery (white arrow). HRCT, high-resolution CT.
The primary site of infection is usually the lungs and paranasal sinuses, with brain involvement seen either with direct involvement of the skull base or the haematogenous route. Direct damage of the respiratory epithelium by COVID-19 virus associated with anoxia induced by pneumonia and pulmonary thromboembolism predisposes the lung to invasive Aspergillus infection. Although a direct causation cannot be established in this case, immune modulation by COVID-19 infection, coexisting comorbidities and steroid use are considered to be responsible for spread of fungal infection to the brain. Thus, a high degree of suspicion of fungal brain infection should be kept in patients who recovered from COVID-19 presenting solely with neurological symptoms. On MRI, fungal brain abscess characteristically has crenulated enhancing margins showing diffusion restriction on DWI, haemorrhage on SWI images and trehalose peak on MRS.

**Patient’s perspective**

I was very happy when I recovered from COVID-19, but unfortunately, after few days, I contracted a fungal infection in the brain. I am very thankful to the doctors for giving me the proper treatment at the right time. I am gradually improving and hopefully will regain my previous strength within a few days.

**Learning points**

- Immune modulation by COVID-19 infection, comorbidities, use of steroids and hospital-acquired infections collectively predispose patients with COVID-19 to various opportunistic fungal infections.
- Fungal brain abscess following COVID-19 without contiguous rhino-orbital disease is rare but can occur by haematogenous spread from the lung.
- Brain MRI should be done in patients with COVID-19 as well as in recovered patients presenting with neurological symptoms to rule out fungal brain abscess, even though there is no evidence of rhino-orbital involvement.

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