Case Report

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Bilateral Basal Ganglia Haemorrhage in a COVID-19 Positive Patient- Rare and Unusual Imaging Findings

Radiology Section

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ABSTRACT

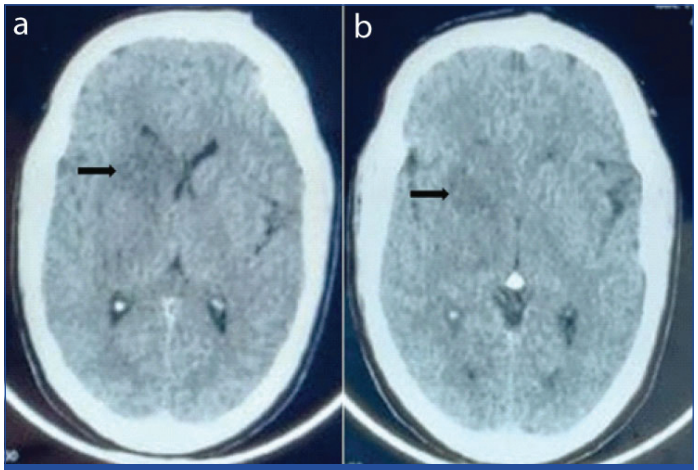
Coronavirus Disease 2019 (COVID-19) is the most challenging problem for the world today. The disease is caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), leading to high morbidity and mortality worldwide. Numerous pathways are involved in the neurological manifestation of the disease. The imaging findings are not limited to encephalopathy, encephalitis, acute disseminated encephalomyelitis, meningitis, ischaemic stroke, and intracerebral haemorrhage. Bilateral basal ganglia haemorrhages as manifestations are exceedingly rare. A 42-year-old male normotensive patient with no co-morbidities presented to the hospital with left hemiparesis. Magnetic Resonance Imaging (MRI) brain revealed haemorrhagic lesions in bilateral basal ganglia. No associated abnormalities were found in vasculature of brain. Hereby, authors report this rare and unusual case of COVID-19 infected patient presenting as bilateral basal ganglia haemorrhage.

Keywords: Coronavirus disease 2019, Hemiparesis, White matter

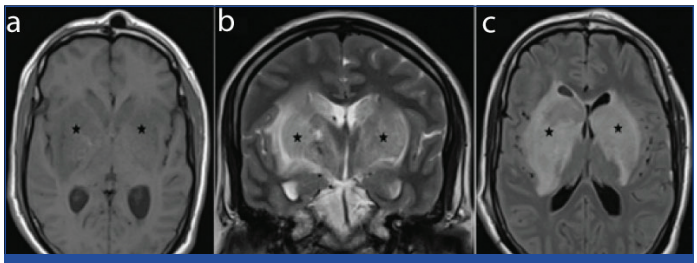
CASE REPORT

A 42-year-old male having no co-morbidities, presented with cough and shortness of breath to a local hospital. On investigations, his Reverse Transcription Polymerase Chain (RT-PCR) for coronavirus came out to be positive. High Resolution Computed Tomography (HRCT) of chest revealed findings typical for Coronavirus Disease 2019 (COVID-19) infection. Four days later, patient also started having left side upper and lower limbs weakness. He underwent Non Contrast Computerised Tomography (NCCT) of head the next day, which showed a right-sided basal ganglia infarct [Table/Fig-1]. Eventually, the patient presented to our hospital nine days from the onset of illness with an altered sensorium.

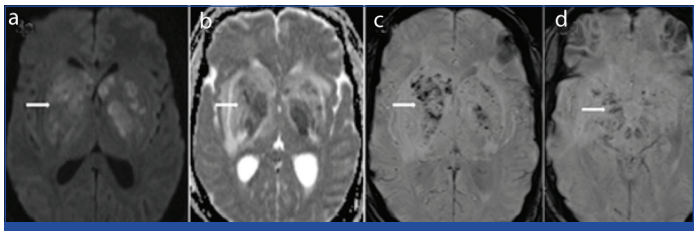
Within 24 hours of admission patient's Glasgow Coma Scale (GCS) dropped below eight and he was intubated for airway protection. Magnetic Resonance Imaging (MRI) brain with angiography was done thereafter, which revealed bilateral basal ganglia isointense to hyperintense lesions on T1, with a corresponding hyperintense signal on T2 and Fluid Attenuated Inversion Recovery (FLAIR) images [Table/Fig-2], diffusion restriction and susceptibility artefacts suggesting haemorrhagic transformation [Table/Fig-3]. T2 and FLAIR hyperintense signal and susceptibility artefacts were also seen in bilateral thalami, right side of midbrain and pons [Table/Fig-3,4]. Magnetic Resonance Angiography (MRA) and Magnetic Resonance Venography (MRV) revealed normal flow-related signals with no arterial stenosis or venous thrombosis [Table/Fig-5]. Two days later the patient further deteriorated and passed away due to cardiorespiratory failure.



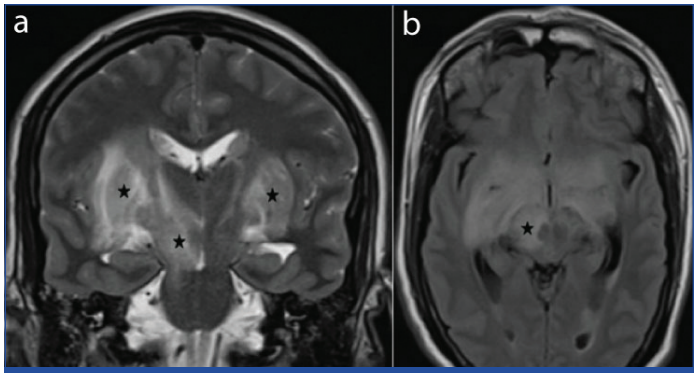
[Table/Fig-1a,b]: Non Contrast Computerised Tomography (NCCT) head axial image done at initial presentation depicts hypodensity in right basal ganglia with no associated haemorrhage.



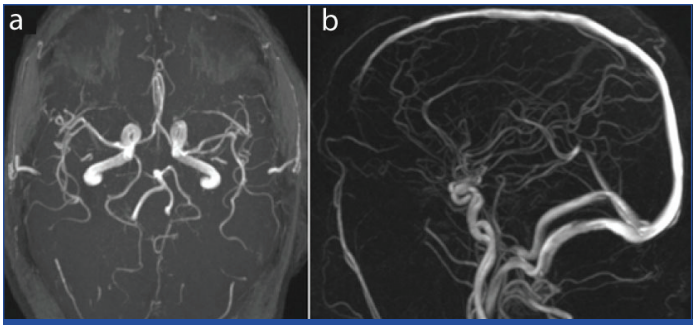
[Table/Fig-2]: Axial images of MRI Brain show a) T1 hypointensity in basal ganglia with areas of hyperintensity, b) Corresponding hyperintense signal on coronal T2 and c) Axial FLAIR images.



[Table/Fig-3]: a,b) DWI images with corresponding ADC map show diffusion restriction in bilateral basal ganglia (arrows) and c) with areas of blooming suggesting haemorrhage (arrow);d) Additional areas of blooming were also seen on the right side of the midbrain and pons were seen on SWI images (arrow).



[Table/Fig-4]: a) Coronal T2 and b) Axial FLAIR images also manifest hyperintense signal in thalami, right side of midbrain and pons.
(asteric * represents the concerned area)



[Table/Fig-5]: Maximum Intensity Projection (MIP) images of a) Magnetic Resonance Angiography (MRA) in axial and b) Magnetic Resonance Venography (MRV) in the sagittal plane show no arterial stenosis or dural venous sinus thrombosis.

DISCUSSION

Coronavirus Disease 2019 (COVID-19) is caused by SARS-CoV-2 which has emerged as a global pandemic. Till now, it has been proven that multiple organ system are involved in COVID-19 [1]. Pulmonary involvement is by far the most common, however, involvement of other organs like the brain, kidneys, liver, have also been seen. Numerous pathophysiological pathways are forming the basis for neurological involvement which can be explained by the following mechanisms: 1) Direct viral invasion; 2) Immune response to the virus in the form of coagulopathy or cytokine storm; 3) Delayed type of immune response; 4) Complications related to prolonged illness or hospitalisation [2].

In studies conducted so far, MRI findings in patients with COVID-19 have been classified into eight groups which included: 1) Hyperintense signal on FLAIR/ DWI in the medial temporal lobe; 2) Hyperintense signal on FLAIR/DWI in the splenium; 3) Non confluent multifocal White Matter (WM) variable intensity signal on FLAIR/DWI; 4) Type 3 lesion with haemorrhagic lesions; 5) Acute necrotising encephalopathy with thalamic lesions and variable involvement of the brainstem, internal capsule, putamen, cerebral, and cerebellar WM; 6) Extensive and isolated WM microhaemorrhages; 7) Extensive and confluent supratentorial WM hyperintensities on FLAIR images; and 8) Hyperintense signal on FLAIR images involving both middle cerebellar peduncles [3].

Patients with COVID-19 can present with one or more patterns of above mentioned MRI Brain findings. Out of these eight patterns, three patterns were seen more frequently, namely type 1, type 4 and type 6 patterns. The presence of haemorrhage as seen in the type 4 pattern is clinically important as it is associated with worse respiratory and neurological status, and overall prognosis.

The basal ganglia and thalami are metabolically active structures, which makes them more susceptible to insults like hypoxic-ischaemic injury, poisoning, metabolic abnormalities, and neurodegeneration as well as neoplasms like lymphoma [4]. In our case, it manifested as a bilateral basal ganglia haemorrhage. The same imaging scenario was cited in a diabetic patient showing bilateral basal ganglia subacute haemorrhage in a bilateral asymmetrical distribution [5]. The same patient also had lung findings characteristic of COVID-19.

The most common differential for basal ganglia haemorrhage is long-standing poorly controlled hypertension. However, basal ganglia haemorrhage in hypertensive disease is unilateral in the vast majority of cases. Our patient was normotensive on presentation, making hypertensive haemorrhage less likely. Another differential diagnosis to be considered is great cerebral vein thrombosis. The venous drainage of the bilateral basal ganglia is into the great cerebral vein, which could theoretically support the findings in present case case. A case of cerebral venous thrombosis in patients with COVID-19 is reported in the literature [6]. In the present case report, MRV also turned out to be unremarkable, same as MRA. Thus, there is a possibility that the patient developed a cerebral venous thrombosis and had spontaneous lysis of the clot before imaging.

Among the infectious causes toxoplasmosis and flavivirus infections are to be considered [5,7]. Traumatic bilateral basal ganglia haemorrhage is another differentials, however, history of cranial trauma is required for the same [7]. At our healthcare facility bilateral basal ganglia haemorrhage in a COVID-19 positive patient is a rare finding. The underlying mechanism is still uncertain with direct viral invasion, secondary systemic inflammation and associated hypercoagulable state being the main postulates contributing to haemorrhagic nature of the lesion [4].

CONCLUSION(S)

Multiple patterns of brain imaging findings are seen in patients infected with COVID-19, cerebral infarction being the most prevalent neuroimaging finding. The presence of associated haemorrhage is a clinically important finding, as it is associated with a poor prognosis.

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