INVOLVEMENT OF MIDBRAIN TRACTS PRESENTING WITH STROKE-LIKE CLINIC AFTER COVID-19 INFECTION

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ABSTRACT

Introduction: Neurological symptoms related to COVID-19 may occur in the acute phase of the infection or the following days. The virus has neuroinvasive and neurotrophic properties. In this way, the cerebral, spinal and peripheral nervous systems may be affected. These neurological findings can mimic stroke clinically. Therefore, neuroradiological imaging is very substantial for diagnosis. This case report presents a patient with pons and midbrain tract involvement who evaluated the emergency room with typical stroke symptoms. Case: 43-year-old female patient with severe symptoms of COVID-19. She was evaluated due to the sudden onset of neurological findings on the 9th day of infection. Neurological examination disclosed right hemihypoesthesia and hemiparesis. Atypical images were observed in diffusion MRI taken due to the preliminary diagnosis of acute cerebrovascular disease. The brain MRI showed T2 and FLAIR hyperintensity in midbrain pons. In the same areas, slightly hyperintensity was observed in T1. The patient was diagnosed with post-viral central nervous system involvement. She was discharged after methylprednisolone treatment. Conclusion: This case demonstrates the importance of neuroimaging in managing patients with neurological signs associated with COVID-19.

KEYWORDS Neuroradiology, COVID-19, Midbrain Tracts, Pons

Introduction

Coronavirus disease 2019 (COVID-19) is principally known as a respiratory disease; however, neurologic reactions to this infection have been progressively described, including infectious white matter involvement, meningoencephalitis and stroke [1]. Stroke is one of the most common causes of disability in older ages. Pneumonia commonly presents in the post-stroke subacute period [2]. However, this situation has changed after COVID-19. I mean, neuroradiological involvements are detected in some patients after viral pneumonia. Extrapulmonary symptoms are common, especially in severe viral infections [3]. Sometimes, it's not possible to diagnose by looking at the neurological symptoms that develop after COVID-19. In these cases, radiological imaging greatly facilitates the clinician's approach. Any neurologic symptoms at post-viral period, may mimic stroke. In this case, we discussed a patient with brainstem tract involvement. The significance of radiological methods in differential diagnosis was emphasized.

Case report

A 43-year-old woman without prior neurologic disease presented 9 days after a COVID-19 diagnosis with hypoesthesia and weakness in the right lower and upper extremities. She previously experienced severe COVID-19 symptoms, including fever, cough and dyspnea. Her examination findings were notable for hemi-hypoesthesia, decreased motor strength about 3/5 and extensor Babinski sign. Laboratory findings were unremarkable except for a slight increase in C-Reactive Protein (CRP: 1.9 mg/L) in the plasma. Cerebrospinal fluid studies showed a normal white blood cell count and protein and glucose levels. In neuroradiographic studies, brain CT was normal. Diffusion-weighted image (DWI) showed hyperintensity in the midbrain and pons. But no hypointensity was observed in the apparent diffusion coefficient (ADC) image of the same areas. After this neuroimaging in the emergency room, detailed brain magnetic resonance imaging (MRI) was taken. MRI showed T2 and Fluid-attenuated
Discussion

COVID-19 central nervous system (CNS) involvement was presented in this case. Encephalopathies or CNS tract involvements may present with stroke-like symptoms [4]. Therefore, the differential diagnosis may be delayed, especially in elderly individuals with risk factors for stroke—hypertension, hyperglycemia, smoking, and hyperlipidemia [5]. In young patients without risk factors, stroke may not be instantly considered. Therefore, this kind of patient, the history of COVID-19, should be questioned. Hypothesized mechanisms for neurologic findings of COVID-19 have been ascribed to a systemic inflammatory response or sequela of critical illness [6]. However, neurological involvements can be encountered in a wide spectrum, such as acute disseminated encephalomyelitis (ADEM) and myelitis involving the dorsal and lateral white matter tracts.

Minutes from the onset of neurologic symptoms and presumably ischemic insult, MRI will display new ischemic lesions as hyperintensities on DWI and corresponding ADC hypointensity. Diffusion MR images of this patient were not compatible with typical acute ischemic infarction.

Typical MR signs of ADEM include multiple hyperintense bilateral, asymmetric patchy lesions with poorly marginated borders on T2-weighted and FLAIR images [7]. The topography of these lesions includes the subcortical and central grey matter, the cortical grey-white matter junction, thalami, basal ganglia, cerebellum and brainstem [8]. MRI findings of a male patient diagnosed with ADEM after COVID-19 infection were examined. He was presented with diffuse demyelinating subcortical lesions typically involving several regions in a bilateral asymmetric distribution. In addition to the above, we noted cerebellar and brainstem involvement in patients without spinal cord lesions [7]. While contrast enhancement is usually observed in ADEM, enhancement was not observed in our case.

The leukoencephalopathy identified in severely ill patients is characterized by symmetric and confluent T2/FLAIR hyperintense signal in the deep white matter with sparing of the juxta-cortical white matter [9]. However, we did not encounter a symmetrical involvement in this case. In a retrospective study, Rapalino et al. evaluated COVID-19–related leukoencephalopathy with and without diffusion restriction in 27 ICU patients, 26 of whom were intubated on admission. Seven patients (26%) had diffuse, symmetric T2/FLAIR hyperintensity in the deep white matter and middle cerebellar peduncle with faint diffusion restriction, greater than non-restricting patients [10].

The typical MRI appearance in transverse myelitis is a central T2 hyperintense spinal cord lesion extending over more than two segments, involving more than two-thirds of the cross-sectional area of the cord [11]. Some different findings were observed in a case series published on COVID-19-associated myelitis. None of the patient’s COVID-19-associated cases of myelitis was diagnosed and demonstrated the predominantly central expansile T2-signal hyperintensity reported most commonly throughout the literature [4]. The authors interpreted it as follows; This finding may be related to regional differences in viral strains or environmental factors. Additionally, it may be that this tract-specific appearance, only rarely described in the literature, is not always clinically attributed to the patient’s COVID-19 status [4]. In the case we presented, no spinal involvement was observed in MRI.

Conclusion

Much neurological involvement associated with COVID-19 can appear. Like these severe patients, radiological methods are frequently performed for diagnosis. MRI is exceptionally rewarding, especially in terms of cranial and spinal involvement. In this manuscript, aimed take attention to the involvement of the midbrain and pons tract, which can be confused with stroke. In the future, we will be able to get more decisive data by publishing case reports like this.

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Conflict of interest

There are no conflicts of interest to declare by any of the authors of this study.

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