Reversible Lesion of the Corpus Callosum Associated With COVID-19: A Case Report and Review of Literature

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Case Report

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Abstract

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) may affect the central nervous system (CNS) and peripheral nervous system (PNS). Major CNS manifestations of SARS-CoV-2 include seizures, meningitis, meningoencephalitis, ischemic stroke, hemorrhagic stroke, anosmia, hypogeusia, acute disseminated encephalomyelitis, hemorrhagic necrotizing encephalopathy, and nonfocal phenomena including lethargy, agitation, confusion, headache, and ataxia. The reversible splenial lesion syndrome (MERS) was first described in 2004. Although MERS was initially recognized as a benign phenomenon, a second type of MERS was identified in later years, which has a poor prognosis and potentially serious sequela. MERS can be caused by numerous etiologies including viruses. In this report, we present a patient with SARS-CoV-2 who presented with ataxia and dizziness as the clinical symptoms of MERS, which is a rare clinical phenomenon and can be caused by numerous etiologies.

Introduction

SARS-CoV-2 is a member of the coronaviridae family, responsible for a spectrum of respiratory and gastrointestinal diseases but with occasional neurotropism (1). Major CNS manifestations of SARS-CoV-2 include many symptoms from headache to stroke (2). Expectedly, there have been numerous studies and case reports published in line with the latest developments. However, there are insufficient analyses due to the difficulty of examining such diseases. Common causes of nonspecific neurological complications include direct effects of the virus, para-infectious and post-infectious encephalitis of SARS-CoV-2 (3).

The corpus callosum is the main commissural area of the brain that connect the left and right cerebral hemispheres (4). A reversible lesion in the splenium of the corpus callosum (SOCC) was first reported by Tada et al. in 2004 in a patient that presented with mild encephalitis (5). Since then, this phenomenon has been described more broadly as a clinical and radiological spectrum disorder termed “reversible splenial lesion syndrome” (MERS) (4).

In this report, we present a patient with SARS-CoV-2 who presented with ataxia and dizziness as the clinical symptoms of MERS, which is a rare clinical phenomenon and can be caused by numerous etiologies.

Case Presentation

A 61-year-old male patient presented to our clinic with ataxia and dizziness. The patient had no history of underlying neurological diseases but had fever, cough, and shivering. The only pathological finding in neurological examination was tandem walk abnormality. Diffusion-weighted magnetic resonance imaging (DW-MRI) indicated a bilateral symmetrical hyperintense lesion in the SOCC (Figure 1). The patient had no history of risk factors for stroke. On physical examination, the temperature was 38.5 °C and the breath sounds were coarse in the right lung field. Laboratory parameters were remarkable for

elevated C-reactive protein (CRP) (137.5 mg/L), lymphopenia (8.8%), and elevated lactate dehydrogenase (LDH) (476 U/L). The patient was suspected as having COVID-19 due to the widespread COVID-19 pandemic and thus a chest computed tomography (CT) scan was performed, which demonstrated ground-glass opacity with consolidation in the right lung (Figure 2). Additionally, the patient was found positive for SARS-CoV-2 on the polymerase chain reaction (PCR) test. Contrast-enhanced cranial MRI, cerebral MRI angiography, carotid doppler ultrasonography, and electrocardiography were performed for differential diagnosis all of which were found to be normal. A COVID-19 therapy was initiated with oseltamivir 150 mg/day, hydroxychloroquine sulfate 400 mg/day, favipiravir 400 mg/day, and azithromycin 250 mg/day. All the neurological symptoms of the patient were resolved after the treatment. On day 14, control diffusion and cranial MRI indicated normal findings (Figure 3). Based on these signs and symptoms, the patient was diagnosed as having MERS associated with SARS-CoV-2.

Discussion

SARS-CoV-2 has been shown to attack the lower respiratory tract after binding to the enzyme 2 receptor (ACE2R). ACE2R is found in lung alveolar epithelium and on the surface of CNS neurons. An axodendritic transsynaptic route has been suggested as a potential mechanism for CNS dissemination, which could explain potential neurotropism of SARS-CoV-2. (1).

Reversible lesions in the the SOCC have been associated with numerous etiologies including (i) viral etiologies, (ii) bacterial etiologies and (iii) infectious and non-infectious etiologies. Additionally, cerebral infarction has been shown to be the most common etiology (4).

Common clinical features of MERS include CNS disturbances such as seizure, confusion, encephalitis and delirium. Accumulating evidence has indicated that the isolated reversible lesions in the splenium are not always a good prognostic marker for a benign disease course and can be permanent in some cases (4).

The most characteristic MRI finding of MERS in the period when it was considered to have a benign nature was a lesion disappearing within approximately two weeks (4,5). However, in line with the increasing number of newly diagnosed cases and based on the MRI patterns, MERS is classified into two forms: Type I is confined to the SOCC and Type II involves the SOCC as well as subcortical or deep white matter (6).

Radiological features of reversible lesions in the SOCC suggest that these lesions are mostly caused by cytotoxic edema (7). Meaningfully, the cytotoxic edema caused by the cytokine storm in the neurons, astrocytes, and oligodendrocytes could be the best explanation (4). In cytotoxic edema, astrocytes release glutamate and block reuptake of glutamate, thus increasing extracellular glutamate and an excitotoxic action ultimately leading to an influx of water into both astrocytes and neurons. Moreover, splenium is considered to be susceptible to cytokine-induced damage due to the excessive presence of cytokines, glutamate, and other receptors (8). In recent reports, these lesions have been termed "cytotoxic lesions of the corpus callosum (CLOCC)" (4,7).

Hayashi et al. reported the first patient with COVID-19 developing encephalitis with a reversible lesion of SOCC and presenting with reversible confusion, ataxia, and dysmetria (9). Similarly, Rasmussen et al. reported on a 66-year-old woman presented to the emergency department with a history of multiple organ failure and was detected with reduced consciousness and hemiparesis. Cranial MRI showed multiple areas of diffusion restriction and microhemorrhage within the corpus callosum, which were consistent with CLOCC (8).

Our patient diagnosed COVID-19 pneumonia and PCR test positivity enabled us to make definitive diagnosis. Subsequently, a DW-MRI scan was performed to clarify the neurological symptoms. The MRI showed a bilateral symmetrical hyperintense lesion in the splenium. All the neurological symptoms of the patient were resolved after the antiviral treatment and a control MRI indicated normal findings. Based on these findings, ischemic stroke was ruled out due to the absence of risk factors for stroke and to the detection of normal findings in the examinations. Moreover, due to the absence of contrast enhancement on MRI, inflammatory etiological causes were also ruled out and the patient was diagnosed as having Type I MERS associated with SARS-CoV-2. To our knowledge, the presented case is the third case of CLOCC associated with SARS-CoV-2 in the literature.

We believe that the current case report and further studies will shed light for the identification of neurological complications of SARS-CoV-2 and for the facilitation of the prevention or management of neurological conditions.

An informed consent was obtained from the patient.

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Figures

Figure 1

Bilateral symmetrical hyperintense lesion in the splenium of the corpus callosum on the ADC map in the diffusion sequence (admission MRI)

Figure 2

Ground-glass opacity with consolidation in the right lung (admission chest CT)

Figure 3

No sequela were detected in the ADC and FLAIR sequences (repeat diffusion-weighted MRI)