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Case report

A first presentation of multiple sclerosis with concurrent COVID-19 infection

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A B S T R A C T

Infection from SARS-CoV-2 virus has developed into a worldwide pandemic. Potential neurological complications include meningitis, encephalitis, Guillain-Barre syndrome, cerebrovascular disease, seizures, and demyelinating disease. In this paper, we describe a case of newly diagnosed multiple sclerosis co-occurring with active COVID-19 infection.

1. Introduction

The current COVID-19 pandemic continues to affect populations worldwide. Typical symptoms include fever, cough, dyspnea, and anosmia [1,2]. Growing evidence suggests that COVID-19 can increase the risk of central nervous system (CNS) demyelinating lesions, such as multiple sclerosis and acute disseminated encephalomyelitis (ADEM) in humans.

2. Case presentation

A 28-year-old man presented with a two-day history of binocular diplopia. His other medical comorbidities included glaucoma and right retinal hole treated with laser ablation two months prior to presentation. Two weeks prior to presentation, he developed anosmia, sore throat, cough, myalgias, and headache concerning for viral illness. Polymerase chain reaction (PCR) testing of nasopharyngeal sample for COVID-19, obtained five days prior to presentation, was negative. Upon improvement of his generalized malaise, he noted new right oral numbness when brushing his teeth, which slightly improved but did not completely resolve. Three days prior to presentation, he developed vertigo exacerbated by head movements and walking around his home. Two days prior to presentation, he noticed that he could not watch TV, or read the entire row of a spreadsheet while working on his computer, due to involuntary eye movements causing oscillopsia. This symptom worsened over the next two days, prompting his presentation to our emergency department. He denied any prior episodes of neurological dysfunction, such as visual loss, weakness, ataxia, paroxysmal sensory or motor symptoms.

On presentation, the patient endorsed continued anosmia. Neurological exam was notable for vertical non-fatigable nystagmus in all directions of gaze. He displayed right internuclear ophthalmoplegia. Otherwise his neurological examination was unremarkable. MRI demonstrated both contrast-enhancing and non-enhancing white matter lesions in juxtacortical, periventricular and infratentorial (right paramedian pons) locations (Fig. 1). Cervical and thoracic spine MRI were unremarkable.

Patient was admitted to hospital for further care. Laboratory studies were notable for D-dimer elevation (685 ng/mL, normal 0–229 ng/mL). COVID-19 nasopharyngeal PCR and serum antibody tests (antibody index 35.70, normal $\leq$ 1.00) obtained upon admission were positive. Lumbar puncture demonstrated 5 unique oligoclonal bands in the cerebrospinal fluid (CSF) not present in the serum. There was mild pleocytosis of 10 cells (68% lymphocytes). CSF protein and glucose levels were normal. CSF SARS-CoV-2, herpes simplex virus (HSV), varicella zoster virus (VZV) and John Cunningham virus (JCV) PCR were all negative. CSF cytology and flow cytometry were also negative. Serum aquaporin-4 and myelin oligodendrocyte glycoprotein were not detected. Serum antinuclear antibody (ANA), antineutrophil cytoplasmic autoantibody (ANCA), anti-Ro, anti-La antibodies, HIV and syphilis serologies were negative. C3 and C4 levels, ESR and CRP were within normal limits.

The patient was treated with 1 g of intravenous methylprednisolone daily for three days. This resulted in improvement in his vertical nystagmus and double vision. He was discharged on an oral 9-day prednisone taper (80 mg for 3 days, then 40 mg for 3 days, then 20 mg for 3 days).

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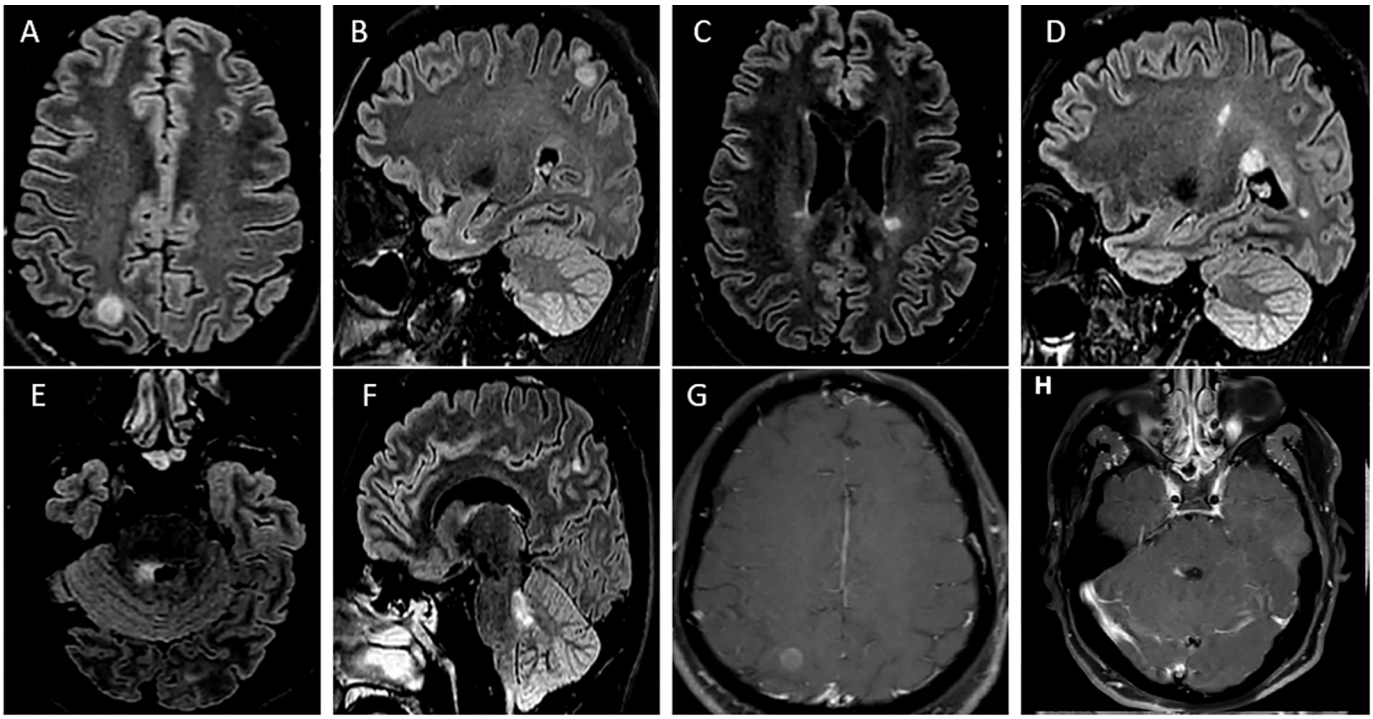

Fig. 1. There is scattered enhancing T2 hyperintense lesions predominantly involving the right posterior parietal lobe (A, B, G), and superior and middle right cerebellar peduncles (E, F, H). Additional abnormal T2 signals without enhancement in the periventricular white matter (C, D) and in the body and splenium of the corpus callosum and callososeptal interface (not shown on the figure).

3. Discussion

Our patient meets the revised 2017 McDonald criteria of dissemination in space and time, required for the diagnosis of multiple sclerosis [3], and his first attack coincided with active COVID-19 infection. The clinical manifestation of multiple sclerosis developed during the patient's recovery from COVID-19-related symptoms. Infections in general are known precipitants of clinical relapses in multiple sclerosis [4]. More specifically, different strains of coronaviruses have been linked to development of demyelinating lesions in mouse models, including the murine coronavirus JHM, described 70 years ago [5], JHM causes demyelination largely via cytopathic effect on oligodendrocytes [6]. Subsequently, numerous studies demonstrated the presence of nucleic acids of coronaviruses [7,8], or ultrastructural evidence of viral particles [9,10] in active demyelinating plaques found on autopsies of multiple sclerosis (MS) patients, as well as autoreactive T cells able to recognize myelin antigens [11].

Several case reports suggest that other demyelinating pathologies like acute disseminated encephalomyelitis (ADEM) in humans, may be related to coronavirus infections, specifically, HCoV-OC43 in a child [12], MERS-CoV [13], and, more recently, SARS-CoV-2 [14–17]. The recently reported cluster of 9 cases of ADEM over 5 weeks [17] is alarming, given the rarity of ADEM in adults. Two more studies describe atypical/unclassified demyelinating events associated with COVID-19 in a woman [18], and a young man with both intracranial and longitudinally extensive spinal demyelinating lesions two weeks after COVID-19 infection [19]. A case of clinically isolated syndrome, manifesting with an incomplete cervical spinal cord syndrome, without evidence of lesion dissemination in space or time was recently reported [20], as was a first presentation of MS in an individual with prior COVID-19 infection [21]. That patient presented with optic neuritis and there was prior evidence of COVID-19 infection as evidenced by positive serum antibody testing with negative PCR. Our case is unique in that our patient presented with active infection as evidenced by nasopharyngeal PCR findings and typical COVID-19 symptoms; this temporal relationship between the viral infection and the onset of the demyelinating episodes favors a para-infectious, as opposed to post-infectious, mechanism. It should be emphasized that in all but one [20] of the aforementioned cases, SARS-CoV-2 PCR was not detected in the CSF, suggesting against direct viral invasion causing those syndromes.

While the existing clinical data and literature are not sufficient to establish a causal association between the SARS-CoV-2 infection and the diagnosis of multiple sclerosis, our case suggests that the former may unmask or trigger the latter, even during the acute phase of the infection. We would encourage our readers to include this possibility in the differential diagnosis of patients presenting with focal neurological deficits and concurrent COVID-19 infection.

Competing interests

The authors declare that they have no competing interests.

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Authors contributions

Dr. Moore and Dr. Ghannam were responsible for drafting and editing of the manuscript. Dr. Manousakis participated in critical revision of the manuscript for intellectual content. All authors read and approved the final manuscript.

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Ethical Approval Information.

There was no ethics committee approval as the data has been analyzed in a retrospective manner and has no effect on treatment of the patient.

Data Sharing Statement.

All the data supporting our findings is contained within manuscript.

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