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Opsoclonus-Myoclonus-Ataxia Syndrome Related to the Novel Coronavirus (COVID-19)

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Opsoclonus-myoclonus-ataxia syndrome (OMAS) is a rare neurological syndrome characterized by saccadomania or spontaneous conjugate multidirectional eye movements, myoclonus in the limbs, and ataxia. Oftentimes, the primary cause in adults is idiopathic, but immune-mediated paraneoplastic and infectious etiologies have also been associated with this syndrome (1). We present the first reported case, to the best of our knowledge, of opsoclonus-myoclonus-ataxia in the setting of COVID-19 infection.

CASE

A 57-year-old man with a past medical history of type II diabetes, hypertension, and hyperlipidemia initially presented with nausea, fever, diarrhea, and myalgias to his primary care provider. He tested positive for COVID-19 and subsequently completed a 5-day course hydroxychloroquine and azithromycin with complete resolution of the aforementioned constitutional symptoms. After 5 days of being asymptomatic, he started to experience tremors in his hands, difficulty drinking from a cup, and trouble writing legibly. He felt shaky and unsteady when standing or walking.

His neuro-ophthalmological examination demonstrated spontaneous horizontal and vertical oscillations that did not seem to have an intersaccadic interval, consistent with opsoclonus. He had arrhythmic myoclonic jerks in his hands that were action induced. When standing, there were frequent myoclonic jerks in his legs that did not abate with ambulation. His gait was broad based and unsteady, especially during circumduction. (See **Supplemental Digital Content**, Video E1, http://links.lww.com/WNO/A446).

Treatment with low-dose clonazepam tempered his myoclonus; however, he continued to decline functionally and was hospitalized 18 days from onset of his infection. His SARS-CoV-2 polymerase chain reaction remained positive, whereas a brain magnetic resonance image with contrast did not reveal any lesion or abnormality. A computed tomography (CT) of the chest, abdomen, and pelvis demonstrated bilateral ground glass opacities in his lungs—characteristic of COVID 19—with no occult masses. A cerebrospinal fluid analysis was not conducted. He was afebrile and had mild dyspnea on exertion during his inpatient course but did not require supplemental oxygen. He was treated with 400 mg/kg/day intravenous immunoglobulin for 5 days and low-dose intravenous methylprednisolone 40 mg twice per day due to his diabetes. His clinical condition improved markedly over the course of the hospitalization, including disappearance of his opsoclonus and ocular flutter, reduction of his myoclonus, and improved gait.

DISCUSSION

This is the first described case of opsoclonus-myoclonus syndrome associated with COVID-19 infection. This novel coronavirus started to infect humans in Wuhan, China, in late 2019 and quickly spread throughout the world with the primary symptoms being dry cough, fever, and myalgias with more serious symptoms related to acute respiratory distress syndrome and sepsis. Neurological complications are estimated to be around 36% and include encephalopathy, seizure, stroke, myositis, and Guillain–Barré syndrome (2,3). The presence of SARS-CoV-2 polymerase chain reaction in the serum along with pulmonary findings on CT underscores the likelihood of a COVID-19 parainfectious etiology in this patient. Although the patient completed a course of hydroxychloroquine and azithromycin for his non-neurological symptoms, the possibility of either of the drugs inducing this neurological syndrome cannot be excluded. However, azithromycin has played a role in treating mycoplasma-induced OMAS (4), and there are no known reported cases of hydroxychloroquine-induced OMAS.

Although the pathophysiology of this syndrome remains unclear, it is postulated that opsoclonus and ocular flutter share a common pathway with impaired inhibition of saccadic burst neurons in the paramedian reticular formation and interstitial nucleus of Cajal (5). Although a variety of infections such as HIV, West Nile virus, epstein barr virus, and enterovirus (1) have been associated with OMAS, there have been no known reports of COVID-19 or other coronavirus subtypes being triggers of it. The pathogenesis of parainfectious etiologies is believed to either be directly related to tissue invasion or the postinfectious immune response. Brain MRIs usually do not demonstrate an

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anatomic lesion in these parainfectious cases. COVID-19 gains entry into a cell through angiotensin-converting enzyme 2 receptors, which are not only expressed in the lungs but are also present in glial cells and neurons (6). Therefore, it stands to reason that either a direct neural invasion of the brainstem and cerebellar outflow tracts including deep cerebellar nuclei or susceptibility of these regions to the hyperinflammation ("cytokine storm") (7) associated with COVID-19 is plausible mechanisms for its pathogenicity in this syndrome.

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