Acta Neurologica Belgica
https://doi.org/10.1007/s13760-022-02029-5

LETTER TO THE EDITOR

Opsoclonus myoclonus ataxia syndrome following COVID-19 infection

Ismail Ibrahim Ismail[1] · **Walaa A. Kamel**[1,2] · **Ayman Kilany**[3]

Received: 7 May 2022 / Accepted: 7 July 2022

Keywords COVID-19 · SARS-CoV-2 · Opsoclonus myoclonus syndrome · Ataxia · OMAS

Introduction

Opsoclonus myoclonus ataxia syndrome (OMAS) is a rare neuroinflammatory disease of paraneoplastic, parainfectious, toxic/metabolic or idiopathic etiology, characterized by subacute onset of opsoclonus, myoclonus, ataxia, behavioral and sleep disturbance [1]. The most common underlying malignancy associated with OMAS in children is neuroblastoma, and a thorough diagnostic workup, including imaging, serum, urine, and cerebrospinal fluid studies, is essential in all cases [2].

Post-infectious or para-infectious OMAS can develop after various viral, bacterial, and parasitic infections. Following the emergence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and the declaration of coronavirus disease 2019 (COVID-19) pandemic, a variety of neurological disorders have been reported in association with this infection, including OMAS [3]. Herein, we present a case of OMAS following COVID-19 infection in pediatric age group.

Case report

A 5-year-old Egyptian boy with normal developmental milestones and no relevant medical history presented with subacute onset of ataxia and abnormal eye movements. His symptoms began one month following mild COVID-19 infection with fever and cough, and confirmed with positive nasopharyngeal swab reverse transcription- polymerase chain reaction (RT-PCR) for SARS-CoV-2.

On examination, he had chaotic, involuntary, saccadic, multidirectional conjugate eye movements in the horizontal and vertical planes (opsoclonus), marked limb and truncal ataxia, in addition to myoclonic jerks **(Video S1)**. The patient was unable to stand or walk without support due to ataxia. Other findings of his neurological examination were normal. He had no sleep or behavioral disturbances.

His baseline investigations including complete blood count, urine routine examination, thyroid profile were within normal limits. Magnetic resonance imaging of the brain, computed tomography of chest, abdomen, and pelvis was negative. Positron emission tomography (PET) scan of the whole body was also negative. Cerebrospinal fluid tests for cells, protein, and glucose were normal. PCR screening for neurotropic viruses (HSV, VZV, EBV, CMV, and EV) was negative. Testing for SARS-CoV-2 in CSF was not performed due to delayed presentation of the patient. A comprehensive work-up for vasculitis [erythrocyte sedimentation rate (ESR), C-reactive protein, rheumatoid factor (RF), antinuclear antibody (ANA), anti-double stranded DNA antibody (anti-dsDNA), extractable nuclear antigen (ENA) and antineutrophil cytoplasmic antibodies (ANCA), complement level, protein electrophoresis, immunoglobulin essay], and auto-immune encephalitis [anti-N-methyl-D-aspartate (NMDA) receptor, α-amino-3- hydroxy-5-methyl-4-isoxazolepropionic acid (AMPA) receptor, voltage-gated potassium channels (VGKC), leucine-rich glioma-inactivated-1 (LGI-1), contactin-associated protein-like 2 (CASPR2), gamma-aminobutyric acid-B (GABA-B), glutamic acid decarboxylase (GAD), antithyroid autoantibodies] was negative. Serology testing for viruses (HSV, CMV, EBV, VZV, EV, HIV, HBV, and HCV) was negative. A repeat nasopharyngeal COVID-19 swab was negative, and COVID-19 IgG antibody test was positive. He was treated

✉ Ismail Ibrahim Ismail
dr.ismail.ibrahim2012@gmail.com

[1] Department of Neurology, Ibn Sina Hospital, Gamal Abdel Nasser Street, Sabah Medical Area, Kuwait City, Kuwait

[2] Department of Neurology, Beni-Suef University, Beni-Suef, Egypt

[3] National Research Centre, Children With Special Needs, Cairo, Egypt

Published online: 14 July 2022

with intravenous immunoglobulins (IVIg); 2 gm/kg body weight in five divided doses, following 5 days of intravenous methylprednisolone (30 mg/kg/dose as a single dose), with full resolution of the symptoms within 4 weeks.

Discussion

Herein, we report a case of OMAS in the setting of COVID-19 infection in a child. OMAS in children is commonly seen as a paraneoplastic phenomenon following neuroblastoma, followed by post-infectious etiology. Following SARS-CoV-2 infection, several cases of OMAS have been reported, mostly in adults. A 2021 systematic review [4] reported 51 cases of myoclonus or ataxia associated with COVID-19, with most cases being males (79.4%) with a mean age of 59.6 years. Myoclonus occurred in isolation (46.7%), with ataxia (40.0%) or with cognitive changes (30.0%), within 1 month of COVID-19 symptoms. Interestingly, most of the cases followed mild/moderate COVID-19 infection, with a favorable prognosis in the majority within 2 months, either spontaneously or with treatment with immunotherapy and/or anti-epileptic medications [4]. The prognosis of OMAS depends on the cause, being worse with paraneoplastic etiology, and favorable in para/post infectious or idiopathic OMAS, with good response to immunotherapy (mainly IVIg or corticosteroids) [5].

The pathophysiology of OMAS is still poorly understood; however, an autoimmune etiology has been proposed in such patients [6]. Autoantibodies are produced against cerebellar neurons and Purkinje cells due to molecular mimicry between tumors or infectious agents and the brain cells. The finding of oligoclonal bands, BAFF (*B*-cell activating factor), quantitative abnormalities of IgG, and altered cytokine profile in CSF are all suggestive of autoimmunity [7]. Furthermore, mild cellular loss along with inflammatory changes in Purkinje cell layer, inferior olives, and brainstem have been described in the literature [8].

Conclusions

Our case expands the list of novel and rare neurologic manifestations in association with COVID-19 infection. Although causality cannot readily be inferred, our case might suggest a probable causal relationship between the development of OMAS and mild SARS-CoV-2 infection in children. Further research is needed to better understand the underlying pathophysiological mechanisms in association with COVID-19-induced neurological disorders.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s13760-022-02029-5.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from the family of the patient included in the study.

References

1. Bhatia P, Heim J, Cornejo P et al (2022) Opsoclonus–myoclonus–ataxia syndrome in children. J Neurol 269:750–757. https://doi.org/10.1007/s00415-021-10536-3
2. Pang KK, de Sousa C, Lang B, Pike MG, Pang KK et al (2010) A prospective study of the presentation and management of dancing eye syndrome/opsoclonus-myoclonus syndrome in the United Kingdom. Eur J PaediatrNeurol 14(2):156–161
3. Emamikhah M, Babadi M, Mehrabani M, Jalili M, Pouranian M, Daraie P, Mohaghegh F, Aghavali S, Zaribafian M, Rohani M (2021) Opsoclonus-myoclonus syndrome, a post-infectious neurologic complication of COVID-19: case series and review of literature. J Neurovirol 27(1):26–34
4. Chan JL, Murphy KA, Sarna JR (2021) Myoclonus and cerebellar ataxia associated with COVID-19: a case report and systematic review. J Neurol 268(10):3517–3548
5. Glatz K, Meinck H-M, Wildemann B (2003) Parainfectious opsoclonus-myoclonus syndrome: high dose intravenous immunoglobulins are effective. J Neurol 74:279–280. https://doi.org/10.1136/jnnp.74.2.279
6. Oh SY, Kim JS, Dieterich M (2019) Update on opsoclonus–myoclonus syndrome in adults. J Neurol 266(6):1541–1548
7. Armangué T, Sabater L, Torres-Vega E, Martínez-Hernández E, Ariño H, Petit-Pedrol M, Planagumà J, Bataller L, Dalmau J, Graus F (2016) Clinical and immunological features of opsoclonus-myoclonus syndrome in the era of neuronal cell surface antibodies. JAMA Neurol 73(4):417–424. https://doi.org/10.1001/jamaneurol.2015.4607.PMID:26856612;PMCID:PMC5823978
8. Connolly AM, Pestronk A, Mehta S, Pranzatelli MR, Noetzel JM (1997) Serum autoantibodies in childhood opsoclonus-myoclonus syndrome: an analysis of antigenic targets in neural tissues. J Pediatr 130:878–884. https://doi.org/10.1016/S0022-3476(97)70272-5