Case Report

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MOG-IgG positive optic neuritis after SARS-CoV-2 infection

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Abstract

Background: Many neurologic complications have been described after severe acute respiratory syndrome Coronavirus-2 (SARS-CoV-2) including atypical cases of optic neuritis (ON), positive to myelin oligodendrocyte glycoprotein (MOG) IgG.

Objective: To report a case of MOG-IgG-associated ON and discuss why SARS-CoV-2 infection could be a potential trigger.

Methods: Retrospective single case report.

Results: We report a case of ON with positive MOG-IgG developed 15 days after presentation of SARS-CoV-2 infection.

Conclusion: This report suggests that SARS-CoV-2 infection may have triggered autoantibodies production against MOG leading to ON.

Keywords

optic neuritis < NEURO OPHTHALMOLOGY, neuro imaging < NEURO OPHTHALMOLOGY, immunology < IMMUNOLOGY, infections disease/aids < NEURO OPHTHALMOLOGY, optic neuropathy < NEURO OPHTHALMOLOGY

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Introduction

Severe acute respiratory syndrome Coronavirus-2 (SARS-CoV-2) is usually characterized by influenza-like symptoms and respiratory illness of variable severity;[1] however many neurologic complications have been described including Guillain-Barré syndrome, encephalitis, cerebrovascular disease and optic neuritis (ON).[2]

Atypical cases of ON, that were previously unclassifiable, have now been associated with two recently identified autoantibodies biomarkers: aquaporin-4 (AQP4) immunoglobulin G (IgG), a globulin binding to water channel of astrocytes, and myelin oligodendrocyte glycoprotein (MOG) IgG, a glycoprotein uniquely expressed in oligodendrocytes of central nervous system.[3]

We report a case of ON with positive MOG-IgG 15 days after presentation of SARS-CoV-2 infection.

Case description

A 56-year-old Caucasian man presented to the emergency complaining of one-week periocular pain increased with eye movements and blurred vision in left eye (LE). The patient did not report any previous systemic and ocular pathologies and he did not take any medications. Optic disc edema was found in LE and the patient was urgently referred to our neuro-ophthalmology unit for further evaluation. Two weeks before the onset of eye symptoms, he developed fever and myalgia and he tested positive for SARS-CoV-2 by nasopharyngeal swab. He did not require hospitalization and he was treated symptomatically with resolution of symptoms after a few days.

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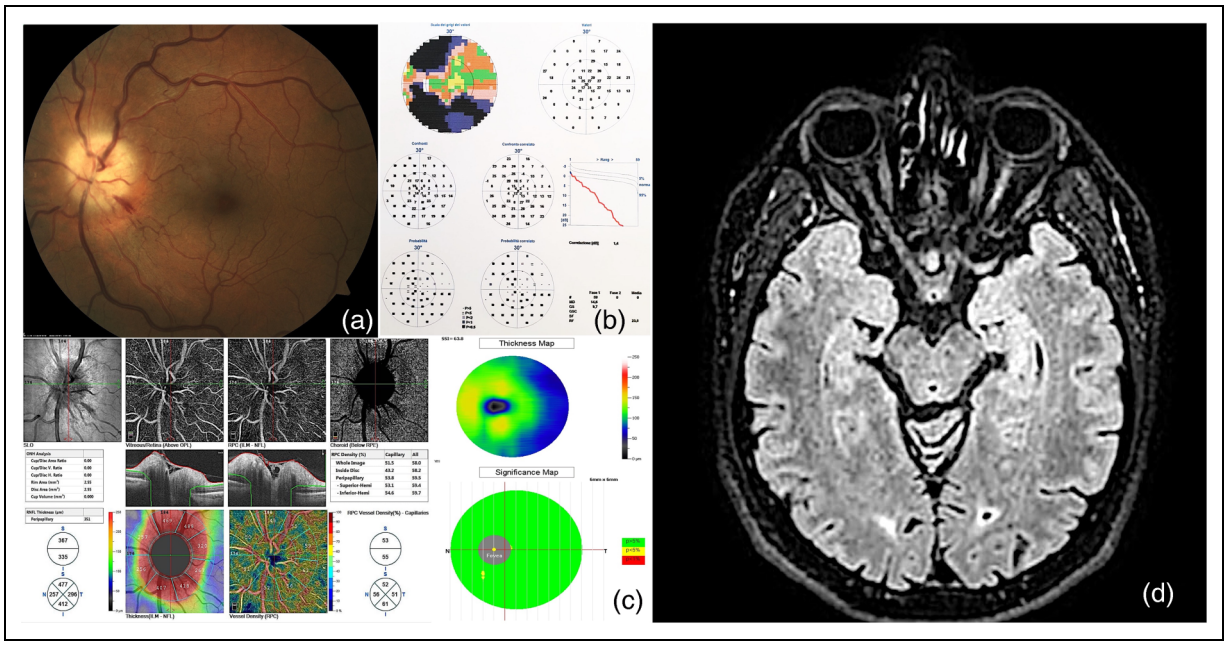

Figure 1. (a) Fundus color photograph of left eye shows optic disc swelling with peripapillary flame hemorrhages. (b) Visual field reveals diffuse peripheral depression and relative central sparing in left eye. (c) Optical coherence tomography angiography images demonstrate optic disc edema with Ganglion Cell Complex and Retinal Nerve Fiber Layer thickening and hyperdensity of perioptic radial peripapillary complex with increased flow density and a poorly defined deep capillary complex. (d) Brain nuclear magnetic resonance imaging shows diffuse left optic nerve hyperintensity in T2/flair without gadolinium enhancement.

On examination, best-corrected visual acuity was 0 logMAR in right eye (RE) and 0.3 logMAR in LE with a left relative afferent pupil defect. Ishihara test was 17/17 tables in RE and 5/17 tables in LE. No anterior chamber or vitreous inflammation were detected in both eyes. Fundus examination revealed no alteration in RE and optic disc swelling with peripapillary flame hemorrhages in LE (Figure 1(a)). Visual field defect with diffuse peripheral depression and relative central sparing was found in LE (Figure 1(b)). Visual evoked potentials showed P100 increased latency in LE.

Optical coherence tomography (OCT) showed optic disc edema with Ganglion Cell Complex and Retinal Nerve Fiber Layer thickening; OCT angiography demonstrated hyperdensity of perioptic radial peripapillary complex with increased flow density and a poorly defined deep capillary complex for superficial layers thickening, indicating a probable inflammatory edema of the optic disc (Figure 1(c)).

Brain nuclear magnetic resonance imaging (MRI) with and without contrast showed diffuse left optic nerve hyperintensity in T2/flair without gadolinium enhancement suggestive of ON, no other abnormalities were found in brain and spine (Figure 1(d)).

Laboratory findings including complete blood count, metabolic panel, erythrocyte sedimentation rate, C-reactive protein, immunoglobulins (IgG, IgA, IgM), vitamin B12 level, thrombophilia panel including antiphospholipid antibodies, Rheumatoid factor, ANA, anti-dsDNA, ENA, ANCA, VDRL, TPHA, angiotensin-converting enzyme and Quantiferon-TB test were negative. Viral panel including Epstein-Barr virus, HIV and Cytomegalovirus was negative. Lyme disease PCR was not detected. Serum AQP4 antibodies were not detected, however, MOG-IgG was positive at a titer of 1:160 (<1:10). COVID-19 IgG antibodies were found with negative nasopharyngeal swab.

Lumbar puncture showed nonspecific findings of colorless cerebrospinal fluid, white blood cell count of 4 cells/μL (0–4 cells μ/L), albumin 21,8 mg/dL (0–35 mg/dL), glucose of 66 mg/dL (50–80 mg/dL), IgG 1,91 mg/dl (0–3,4), IgA 0,23 mg/dl (0–0,5), IgM 0,015 (0–0,13), IgG/albumin ratio 0,453 (0,3–0,7) and total protein 30 mg/dL (30–50 mg/dL) with negative gram stain. No oligoclonal bands were found. Colorless cerebrospinal fluid cytology showed lymphocytes 90%.

Diagnosis of ON related to MOG disease was made and treatment with intravenous methylprednisolone (1 g/day for 3 days) was immediately started followed by oral prednisone (1 mg/kg/day) and subsequent tapering with significant improvement from the second day. Ten days after starting therapy, the patient was symptom-free including complete visual recovery and the optic disc edema was reduced. After 2 months optic disc, OCT and visual field were normal without GCL loss.

The patient did not receive SARS-CoV-2 vaccination before the infection and no recurrences of ON has occurred after the administration of the vaccine doses.

Conclusions

MOG-IgG is a novel biomarker for a distinct demyelinating disorder, MOG-IgG-associated disease (MOGAD), which is different from multiple sclerosis (MS) and AQP4-IgG-positive neuromyelitis optica spectrum disorders (NMSOD), although they share many similarities.[2,3]

MOGAD may have several clinical presentations; one of the most common is, similarly to NMSOD, ON, transverse myelitis or both. Other possible presentations include acute disseminated encephalomyelitis (ADEM), brainstem syndromes and short segment transverse myelitis. Typical features of MOG-IgG-positive ON include optic disc edema, that can be severe and associated with peripapillary hemorrhages, bilateral involvement and frequent recurrence.[4] Vision loss is typically severe at the onset, but recovery is usually better than AQP4-IgG-positive ON with good response to corticosteroid treatment.[3,5]

Brain MRI in MOG-IgG-positive ON, shows longitudinally extensive lesions of the orbital and intracranial optic nerve in up to 80% of cases; involved segments are longer than in MS but shorter than in NMSOD and without chiasmal involvement.[3] Perineural optic nerve enhancement occurs in up to 50% of patients, sometimes extending to the surrounding orbital fat, which is atypical for other forms of demyelinating ON.[5] However, in our patient, there was not optic nerve enhancement on brain MRI and this represents a rare event in MOG-IgG-positive ON, especially in the acute phase.

In present case the disc edema with periocular pain combined with the OCTA and MRI findings were all suggestive of MOGAD that was indeed confirmed by detection of the specific autoantibodies.

Numerous SARS-COV-2 related syndromes as Miller Fisher syndrome, Guillain–Barré syndrome, Kawasaki syndrome, antiphospholipid antibody syndrome and acute disseminated encephalomyelitis were described and offer specific examples of this virus's ability to dysregulate the immune system causing an autoimmune response.[2,5]

MOG antibodies can circulate freely without cause pathologic consequences, except if they can access to the central nervous system through the blood-brain barrier disruption, typically as a result of inflammation or infection, inducing T cells and complement-fixing antibodies mediated pathology.[6]

It has been speculated that SARS-CoV-2 can directly access the central nervous system through a trans-synaptic route[7] and could disrupt blood brain barrier, allowing the anti-MOG antibodies entrance and starting the disease process that can lead to MOGAD.[8]

Several authors described MOGAD after SARS-CoV-2 infection.[9–12] Sawalha et al.[13] report a case of a 44-year-old Hispanic male patient presented with bilateral eye pain and vision loss. Two weeks prior the onset of symptoms, he had tested positive for SARS-CoV-2 disease. Radiological testing showed findings suspicious for acute bilateral optic neuritis and the anti-MOG antibodies were detected.

Zhou et al.[14] describe a case of young Hispanic man with bilateral severe optic neuritis and myelitis, determined to be simultaneously COVID-19 and MOG-IgG antibody positive.

Woodhall et al.[15] presented a 39-year-old lady with relapsing MOG-IgG associated disease who developed optic neuritis six days later COVID-19 diagnosis.

In the above reports[13–15] as for present case, it is tempting to speculate that SARS-CoV-2 infection may have triggered autoantibodies production against MOG leading to ON. MOGAD indeed is frequently preceded by a viral infection.[16,17]

A direct viral infection of the optic nerve is on the other hand quite unlikely because of negative nasopharyngeal scrub at the presentation of ON and for the very good response to steroidal treatment alone.

Our case offers further evidence that MOGAD-ON should be added to the growing list of neurological complications of SARS-CoV-2 infection and that, at the present time, COVID-19 exposure has to be ruled out in patients with ON.

Statement of consent

A specific statement of consent to publish this case report with related images was gathered from the patient.

Declaration of conflicting interests

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