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COVID-19

Myelin oligodendrocyte glycoprotein antibody-associated optic neuritis following third dose of BNT162b2 COVID-19 vaccine in a patient with systemic lupus erythematosus

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Dear Editor,

A few cases of new-onset neuromyelitis optica spectrum disorder (NMOSD) occurring after coronavirus disease 2019 (COVID-19) vaccination in patients with systemic lupus erythematosus (SLE) have been reported [1, 2]. However, no cases of myelin oligodendrocyte glycoprotein antibody-associated disease (MOGAD) have been reported in SLE patients after COVID-19 vaccination. Here, we present a case of MOGAD manifesting as optic neuritis 1 week after the third inoculation of the BNT162b2 COVID-19 (Pfizer-BioNTech) vaccine in a patient with SLE.

A 42-year-old woman presented ocular pain and visual impairment on her left side that had persisted for 3 weeks. She received a third dose of the BNT162b2 COVID-19 vaccine one week before the onset of symptoms. No side effects were observed with the first or second doses of the same vaccine. She was diagnosed with SLE 3 years prior and was successfully treated with hydroxychloroquine at 200 mg once daily, mycophenolate mofetil at 1000 mg twice daily, and tacrolimus at 2 mg twice daily. However, she voluntarily discontinued her medication two months prior because her condition was stable. The neurological examination revealed reduced visual acuity (right eye, 20/20; left eye, 20/200) and a relative afferent pupillary defect in the left eye. The deep tendon reflexes were normal, and there were no motor, sensory, or cerebellar abnormalities. The only abnormal finding of her routine laboratory tests was thrombocytopenia (platelet count: 29,000/μL), reflecting SLE flare-up. A cerebrospinal fluid examination was not performed because of thrombocytopenia. The full-field pattern reversal visual evoked potentials showed delayed P100 latency of 142.5 ms on the left side. Orbit magnetic resonance imaging (MRI) showed slight enlargement and T2 high signal intensities with contrast enhancement in the left optic nerve (Fig. 1A–C). There were no brain parenchymal lesions on brain MRI. Spine MRI revealed an asymptomatic, short-segment, non-enhancing T2 hyperintense lesion in the spinal cord at the C6 level (Fig. 1D, E). In serum rheumatologic tests, anti-Ro and antinuclear antibodies (1:160 titer, speckled pattern) were positive; however, other antibodies were negative. C3 and C4 levels were low (63.9 mg/dL and 4.1 mg/dL, respectively). The anti-aquaporin-4 antibody was negative, whereas the anti-MOG antibody tested by a fluorescence-activated cell-sorting assay was positive with an increase in titer with a ratio of positive cells of 0.9 (negative, < 0.141; borderline, 0.141–0.254; positive, > 0.254) and a mean fluorescence intensity ratio of 5.74 (negative, < 2.60; borderline, 2.60–3.65; positive, > 3.65). The patient was diagnosed with MOGAD presenting with optic neuritis and was treated with intravenous methylprednisolone (1 g daily) for 5 days. After 1 month of treatment, her visual acuity in the left eye improved from 20/200 to 20/25.

A recent case series of MOGAD onset after COVID-19 vaccination found that MOGAD post COVID-19 vaccination was most often observed after vaccination specifically with ChAdOx1 nCoV-19 (AstraZeneca), a viral vector vaccine [3]. Relative to viral vector vaccines, messenger RNA (mRNA) vaccines such as BNT162b2 or mRNA-1273 have been rarely reported as an antecedent of MOGAD onset [3]. In our case, the patient's preexisting SLE with B

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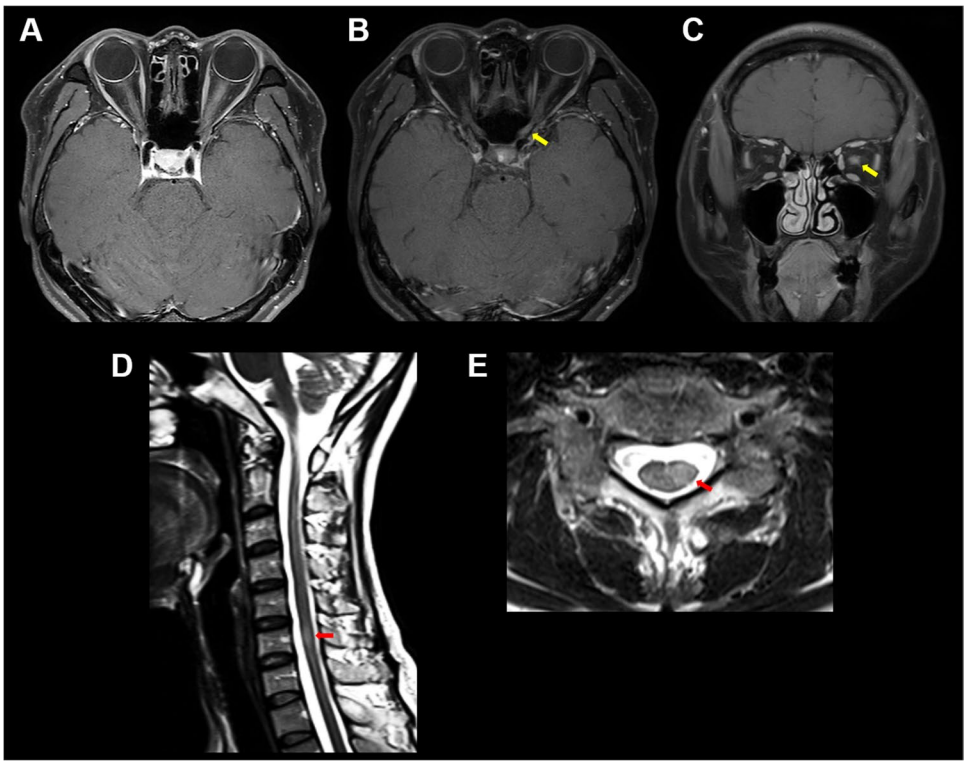

Fig. 1 Orbit and cervical spine magnetic resonance images of the patient. **A** An axial T2-weighted image shows slight enlargement and high signal intensities in the left optic nerve. **B**, **C** Axial and coronal contrast-enhanced T1-weighted images show enhancement of the left optic nerve in the retrobulbar portion (yellow arrow). **D**, **E** Sagittal and axial T2-weighted images show hyperintense spinal cord lesion at C6 level (red arrow)

cell hyperactivity may have affected MOGAD onset after BNT162b2 mRNA vaccination.

It remains unclear whether COVID-19 vaccines trigger additional neurological autoimmune responses in patients with preexisting systemic autoimmune diseases. Interestingly, in a recent systematic review of reported cases of CNS demyelination after COVID-19 vaccination, 17/32 (53.1%) of the cases had a history of previously diagnosed autoimmune disease [4]. The authors of the study suggested that preexisting autoimmune diseases may increase the risk of developing other immune-mediated diseases, such as multiple sclerosis, NMOSD, or acute disseminated encephalomyelitis after COVID-19 vaccination [4]. Furthermore, two cases of NMOSD presenting as optic neuritis or area postrema syndrome that developed after COVID-19 vaccination in SLE patients were recently reported, suggesting that the COVID-19 vaccine may trigger occult autoimmune diseases such as NMOSD in patients with SLE [1, 2]. To the best of our knowledge, our case report is the first to describe the occurrence of MOGAD following COVID-19 vaccination in patients with SLE. This finding made us consider the potential role of SLE in the development of MOGAD after COVID-19 vaccination.

A recent study found that SLE was significantly associated with aquaporin-4 antibody-positive NMOSD, but not with MOGAD [5]. Inconsistent with this previous study, another study showed that 13.2% of SLE patients had antibodies to the nervous system, of which anti-MOG antibodies were found more frequently than anti-aquaporin-4 antibodies [6]. Accordingly, one systematic review suggested that there is slight agreement regarding the relationship between MOGAD and SLE due to inconsistent results or limited data in previous studies [7]. Therefore, future studies on the relationship between MOGAD and SLE should be well-designed and include larger sample sizes.

Although mRNA vaccines are reportedly less related to MOGAD than viral vector vaccines, preexisting SLE may affect the onset of MOGAD through B cell hyperactivity after mRNA vaccination. Clinicians should consider MOGAD as a differential diagnosis when neuroinflammatory diseases, including optic neuritis, develop after COVID-19 vaccination in SLE patients.

Declarations

Conflict of interest The authors have no conflicts of interest to declare.

Ethical approval None.

Informed consent Informed consent for publication was obtained from the patient.

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