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Transient optic neuritis and perineuritis associated with anti-MOG antibody after SARS-CoV-2 mRNA vaccination

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ABSTRACT

Backgrounds: To report the first case of left optic neuritis and perineuritis associated with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) BNT162b2 mRNA vaccination.

Case presentation: A 39-year-old woman was referred and admitted to our hospital due to transient left visual field abnormality with left ophthalmalgia and headache 12 days after the first vaccination dose of SARS-CoV-2 (BNT162b2). On admission (Day 2), she presented with left ophthalmalgia and headache without any other neurological deficits including the movement of eyeballs, visual field, visual acuity, or nystagmus. MRI on Day 2 suggested slight left optic neural swelling; Gadolinium-enhanced MRI on Day 4 revealed left optic perineuritis. Test for serum anti-aquaporin 4 antibody was negative, whereas anti-myelin oligodendrocyte glycoprotein (MOG) antibody was positive. She was diagnosed with left optic perineuritis after SARS-CoV-2 mRNA vaccination. Her visual disturbance never recurred and her ophthalmalgia and headache subsided only with anti-inflammatory agents.

Discussion: Many cases of optic neuritis associated with vaccinations have been reported except for SARS-CoV-2 BNT162b2 mRNA. To our knowledge, only one neuromyelitis optica case was associated with anti-MOG antibody. Therefore, we propose that SARS-CoV-2 mRNA vaccination may induce transient optic neuritis and perineuritis, associated with anti-MOG antibody in the present case.

Conclusion: This is the first case of left optic neuritis and perineuritis associated with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) BNT162b2 mRNA vaccination.

A 39-year-old woman with a history of single caesarian resection got her first dose of severe acute respiratory syndrome coronavirus2 (SARS-CoV-2) BNT162b2 mRNA vaccine. Seven days after the vaccination, she experienced a sore throat, and bilateral parotid gland pain after further 10 days. These symptoms subsided within a few days of onset. Thirteen days after the vaccination (Day 0), she developed left ophthalmalgia and slight headache in the left side of the head. On Day 1, she developed visual disturbance; a star-like misty area emerged on her left visual field. This symptom lasted for only a few minutes. On Day 2, the same visual symptom recurred and subsided within a few minutes. She visited an ophthalmologist, but ophthalmologic examination revealed no specific findings. Nevertheless, she again developed visual disturbance like white-out on her left visual field. This symptom lasted 30 min and gradually subsided within 10 min. She visited a clinic and was referred to our hospital due to suspected transient amaurosis.

On admission, she presented with only left ophthalmalgia and headache without any other neurological deficits including the movement of eyeballs, visual field, visual acuity, or nystagmus. The blood examination revealed no significant abnormality as follows: total protein, 7.3 g/dL; albumin, 4.3 g/mL; sodium/ potassium/ chloride, 139/ 4.0/ 106 mmol/L; blood urea nitrogen, 16.0 mg/dL; creatinine, 0.58 mg/dL; antinuclear antibody, 1:2.9; anti-double strand deoxyribonucleic acid, <1.2 IU/mL; anti SS-A antibody, <1.0 U/mL; anti SS-B antibody, <1.0 U/mL; myeloperoxidase antineurtrophil cytoplasmic antibody, <0.5 IU/mL; cytoplasmic antineurtrophil cytoplasmic antibody,<0.5 IU/mL; soluble interleukin 2 receptor, 235 U/mL; white blood cell count, 5.4×10^3 /μL; hemoglobin, 10.8 g/dL; hematocrit, 33.0%; platelet count, 221×10^3 /μL; PT-INR, 0.93; aPTT, 29.7 s.; and D-dimer level, <0.3 μg/mL. Cerebrospinal fluid (CSF) was waterly clear with normal opening pressure. On CSF analyses, total protein was 18.8 mg/dL and cell count was <1.0 /μL.

MRI on admission (Day 2) suggested slight left optic neural swelling; Gadolinium-enhanced MRI on Day 4 revealed left optic neuritis and perineuritis (Fig. A, C). Serum anti-aquaporin 4 antibody was negative,

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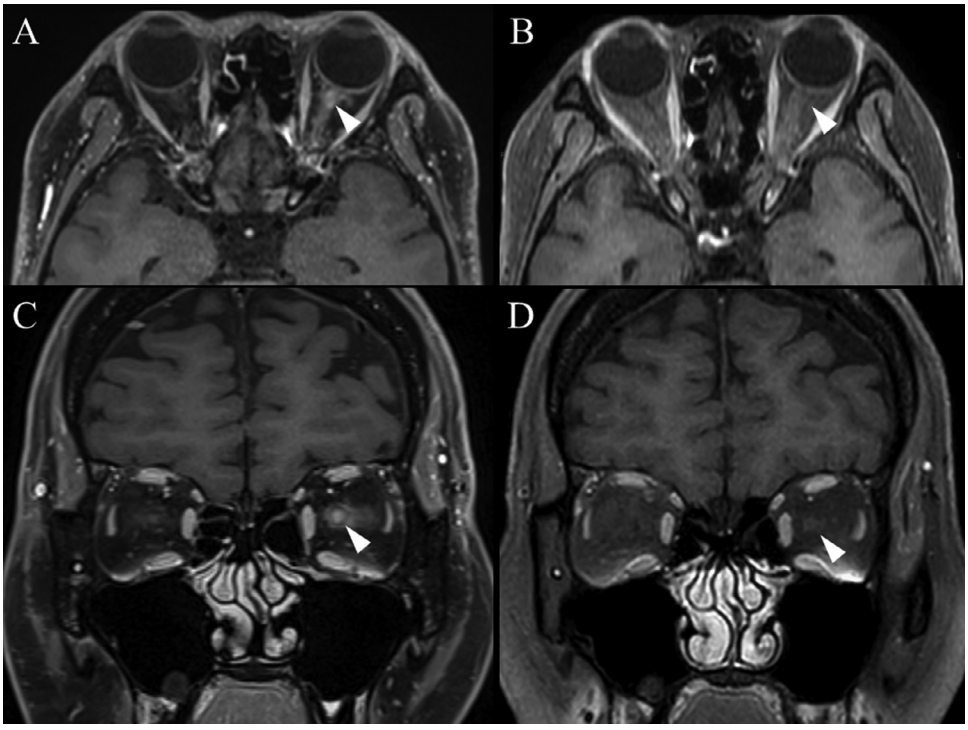

Fig. 1. Gadolinium-enhanced T1 fat-suppressed (FS) three-dimensional turbo spin-echo (3D-TSE) images A, C: Axial (A) and coronal (C) images at admission demonstrated significant enhancement of left anterior optic nerve and perineural sheath (arrowhead). B, D: Axial (B) and coronal (D) images on Day 58 revealed significant resolution of enhancement (arrowhead).

whereas anti-myelin oligodendrocyte glycoprotein (MOG) antibody was positive. She was diagnosed with left optic neuritis and perineuritis associated with SARS-CoV-2 mRNA vaccination. Her visual disturbance never recurred and her ophthalmalgia and headache subsided only with anti-inflammatory agents. She was discharged on Day16 and was followed up at outpatient of our hospital. Gadolinium-enhanced MRI on Day 58 demonstrated significant effacement of the enhancement in the optic nerve and perineural sheath(Fig. 1B, D).

In general, vaccinations are associated with central nervous demyelinating diseases including optic neuritis, acute disseminated encephalomyelopathy, myelitis, and encephalopathy (Dimitrios et al., 2014; Kumar et al., 2020), which are overlapped each other (Kumar et al., 2020). One of the most frequent demyelinating diseases associated with vaccinations is optic neuritis (Kumar et al., 2020). Furthermore, among post-vaccination central nerve demyelinating diseases, optic neuritis alone without overlapping with others was relatively common compared to other syndromes (Dimitrios et al., 2014). Patients with demyelinating disease in the central nervous system associated with vaccination are treated with mainly steroids (Dimitrios et al., 2014; Kumar et al., 2020). Other options are plasmapheresis, intravenous immunoglobulin, and other immunosuppressants such as rituximab (Dimitrios et al., 2014; Kumar et al., 2020). Most patients with central demyelinating diseases associated with vaccination achieve almost complete recovery or remission (Dimitrios et al., 2014; Kumar et al., 2020), and the prognosis is generally good.

Focused on neuromyelitis optica spectrum disorder, and acute disseminated encephalomyelopathy, recent studies have revealed that the diseases are related to anti-MOG antibody. However, the relationship between vaccinations and anti-MOG antibody is rarely reported (Kumar et al., 2020; Yaïci et al., 2021; Azumagawa et al., 2016). To our knowledge, only three cases were reported with other non- SARS-CoV-2 vaccines. Among the three, only one patient who received Diphtheria, Tetanus, and Poliovirus vaccine developed bilateral optic neuritis associated with anti-MOG antibody (Yaïci et al., 2021). Therefore, we speculate that SARS-CoV-2 mRNA vaccination may have induced transient optic perineuritis, associated with anti-MOG antibody in the present case.

Declarations of Competing Interest

None.

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