Transient Oculomotor Palsy Following the Administration of the Messenger RNA-1273 Vaccine for SARS-CoV-2

Diplopia Following the COVID-19 Vaccine

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The first two vaccines approved by the United States Food and Drug Administration for emergency use during the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic were the BNT162b2 vaccine and the messenger RNA-1273 (mRNA-1273) vaccine. Adverse effects reported after the administration of the mRNA-1273 vaccine have been mild to moderate in severity and of short duration; these included fever, fatigue, headache, myalgia, and nausea, among others.

We report a case of binocular diplopia following the first dose of the mRNA-1273 SARS-CoV-2 vaccine. To our knowledge, this is the first report of this kind following any SARS-CoV-2 vaccine administration.

On February 8, 2021, an 81-year-old man presented for evaluation complaining of binocular oblique diplopia. He had suffered a severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection in September of 2020, which symptoms included fever, myalgia, general malaise, and mild respiratory symptoms, as well as lower extremity weakness and gait instability. He denied headache, neck stiffness, double vision, eyelid droop, nausea, vomiting, or upper extremity weakness due to the infection. On February 4, 2021, he received the first dose of the mRNA-1273 SARS-CoV-2 vaccine. Upon waking up the following day, he felt dizzy and noticed that he had ptosis of his left upper eyelid, along with binocular diplopia. He had no pain with ocular movements. His medical history included hypertension, hypercholesterolemia, and uncontrolled diabetes mellitus.

Upon examination, his visual acuity was 20/40 OD and 20/30 +2 OS. He had limited adduction and infraduction of his left eye and full motility of his right eye. His pupils were round and equally responsive to light, without evidence of an afferent pupillary defect or of anisocoria. A sensorimotor evaluation revealed an exotropia of 3 prism diopters (PD) in the primary position. The deviation decreased to an exotropia of 2 PD on the right gaze and increased to an exotropia of 10 PD on the left gaze, combined with a left hyperopia of 5 PD. Remarkably, there was no evidence of the left upper eyelid ptosis, which the
patient had noticed several days earlier. A slit-lamp examination was normal bilaterally. There were no retinal lesions or any optic nerve swelling. The patient was diagnosed with partial oculomotor nerve palsy of the left eye. A brain magnetic resonance image scan and magnetic resonance angiography, ordered to rule-out ischemia or aneurysmal compression, showed no pathology to explain the patient's complaints. Specifically, there was no contrast enhancement along the course of the left oculomotor nerve. There were no ischemic changes at the level of the left oculomotor nucleus in the midbrain, nor evidence of a mass effect on the nerve as it entered or left the cavernous sinus. No abnormalities were identified within the cavernous sinus or the superior orbital fissure. He had a normal erythrocyte sedimentation rate and an elevated C-reactive protein (CRP) level.

The patient returned for a follow-up visit on February 19, 2021. He had full extraocular motility OU and minimal residual exodeviation in the primary position, indicating a spontaneous near-total resolution of his cranial neuropathy.

SARS-CoV-2 has been known to have manifestations outside the respiratory system². Neurological manifestations, which can occur independently from the respiratory symptoms, include headache, dizziness, consciousness impairment, and anosmia².

There have been previous reports of patients exhibiting binocular diplopia after coronavirus infection²³. Adverse reactions to vaccines due to immuno-mediation to a given vaccine's excipient, to the active components of that vaccine, or to an individual host's immunodeficiency are rare⁴. As SARS-CoV-2 may produce neurological manifestations, we hypothesize that the oculomotor palsy occurred because of a reactivation of a SARS-CoV2–associated, immune-mediated mechanism taking place after the vaccine's administration.

Oculomotor nerve palsies are known to occur in patients with diabetes mellitus or giant cell arteritis and are linked to microvascular ischemia⁵. Even though the patient had uncontrolled glycemia
and an elevated CRP, his condition’s speedy and spontaneous resolution is uncharacteristic of a vasculopathic cranial neuropathy.

Our case suggests that oculomotor nerve palsy may occur as an adverse effect after the administration of the mRNA-1273 vaccine. Its etiology may be the reactivation (or vaccine-induced mimicry) of the immune phenomena that may occur following a SARS-CoV-2 infection. A post-vaccination etiology for an oculomotor palsy is a diagnosis of exclusion and should only be considered once other potential etiologies have been ruled out.

Patient Consent
Written informed consent to publish this case report was obtained from the patient.

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References
1. Anderson EJ, Rouphael NG, Widge AT, Evan J Anderson 1, Nadine G Rouphael 1, Alicia T Widge 1, Lisa A Jackson 1, Paul C Roberts 1, Mamodikoe Makhene 1, James D Chappell 1, Mark R Denison 1, Laura J Stevens 1, Andrea J Pruijssers 1, Adrian B McDermott 1, Britta Flach 1, Bob C Lin 1, Nicole A Doria-Rose 1, Sijy O’Dell 1, Stephen D Schmidt 1, Kizzmekia S Corbett 1, Phillip A Swanson 2nd 1, Marcelino Padilla 1, Kathy M Neuzil 1, Hamilton Bennett 1, Brett Leav 1, Mat Makowski 1, Jim Albert 1, Kaitlyn Cross 1, Venkata Viswanadh Edara 1, Katharine Floyd 1, Mehul S Suthar 1, David R Martinez 1, Ralph Baric 1, Wendy Buchanan 1, Catherine J Luke 1, Varun K Phadke 1, Christina A Rostad 1, Julie E Ledgerwood 1, Barney S Graham 1, John H Beigel 1, mRNA-1273 Study Group. Safety and Immunogenicity of SARS-CoV-2 mRNA-1273 Vaccine in Older Adults. *N Engl J Med*. 2020;383(25):2427-2438. doi:10.1056/NEJMoa2028436


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