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Case Report
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Bilateral Anterior Ischemic Optic Neuropathy Following COVID-19 Vaccination in a Healthy Young Patient

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Abstract

Background: Nonarteritic Anterior Ischemic Optic Neuropathy (NAION) is the most common cause of unilateral optic neuropathy in older individuals with cardiovascular risk factors. However, we report a case of bilateral NAION in a young, healthy patient following COVID-19 vaccination.

Case Report: A 32-year-old man visited the neuro-ophthalmologic clinic with a headache and decreased vision in both eyes for a week. He received a secondary dose of the Moderna COVID-19 vaccination, and thereafter experienced severe headache and blurred vision for one week. Ophthalmologic examination revealed optic nerve swelling and inferior nasal visual field defect in both eyes. The right eye is more prominent than the left eye. The work-up tests to exclude thromboembolic side effects, increased intracranial pressure associated with the side effects of COVID-19 vaccination, and optic neuritis were all non-remarkable. He is diagnosed with NAION. After 3 months, disc swelling decreased, but macular optical coherence tomography demonstrated thinning of the superior ganglion cell-inner plexiform layer in the right eye. The patient's visual symptoms and visual field defects also improved in both eyes.

Conclusion: This case supports the theory that NAION can occur as a post-vaccine reaction, rather than as a coincidence, and the COVID-19 vaccine may play an important role in the development of NAION.

Keywords: COVID-19 vaccination; Nonarteritic ischemic optic neuropathy; MRI

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Introduction

Nonarteritic Anterior Ischemic Optic Neuropathy (NAION) is the most common cause of unilateral optic neuropathy in adults aged >50 years [1]. NAION is less common in individuals <50 years [1]. Additionally, there is an increased risk of diabetes mellitus, hypertension, hypercholesterolemia, ischemic heart disease, and disc at risk. Recently, there have been reports of NAION following Coronavirus Disease 2019 (COVID-19) vaccination [2-4]; vaccinations have been conducted worldwide due to the COVID-19 pandemic. However, the causal relationship between NAION and COVID-19 vaccinations remains unclear. Here, we report a case of bilateral NAION in a young, healthy patient following COVID-19 vaccination.

Case Presentation

A 32-year-old man visited the neuro-ophthalmologic clinic with a headache and decreased vision in both eyes for a week. He received a secondary dose of the Moderna COVID-19 vaccination, and thereafter experienced severe headache and blurred vision for one week. His visual acuity was 20/20 in both eyes. The intraocular pressure was 15 mmHg in the right eye and 17 mmHg in the left eye. Anterior segment examination was normal; however, the optic disc was severely swollen in both eyes on fundus examination and the right eye is more severe than the left eye (Figure 1). However, the Ishihara's color test results were normal. There was no ocular pain, with or without ocular movement. The blood pressure was 132 mmHg (systolic) and 83 mmHg (diastolic). Visual field examination revealed an inferior nasal visual field defect in both eyes that was more severe in the right eye (Figure 2). There were no other preceding events, such as upper respiratory or gastrointestinal infections. We performed gadolinium-enhanced magnetic resonance imaging with angiography (MRI with MRA) and laboratory tests to exclude thromboembolic side effects, increased intracranial pressure associated with the side effects of COVID-19 vaccination, and optic neuritis. Complete blood cell counts, erythrocyte sedimentation rate, electrolyte level, blood urea nitrogen,

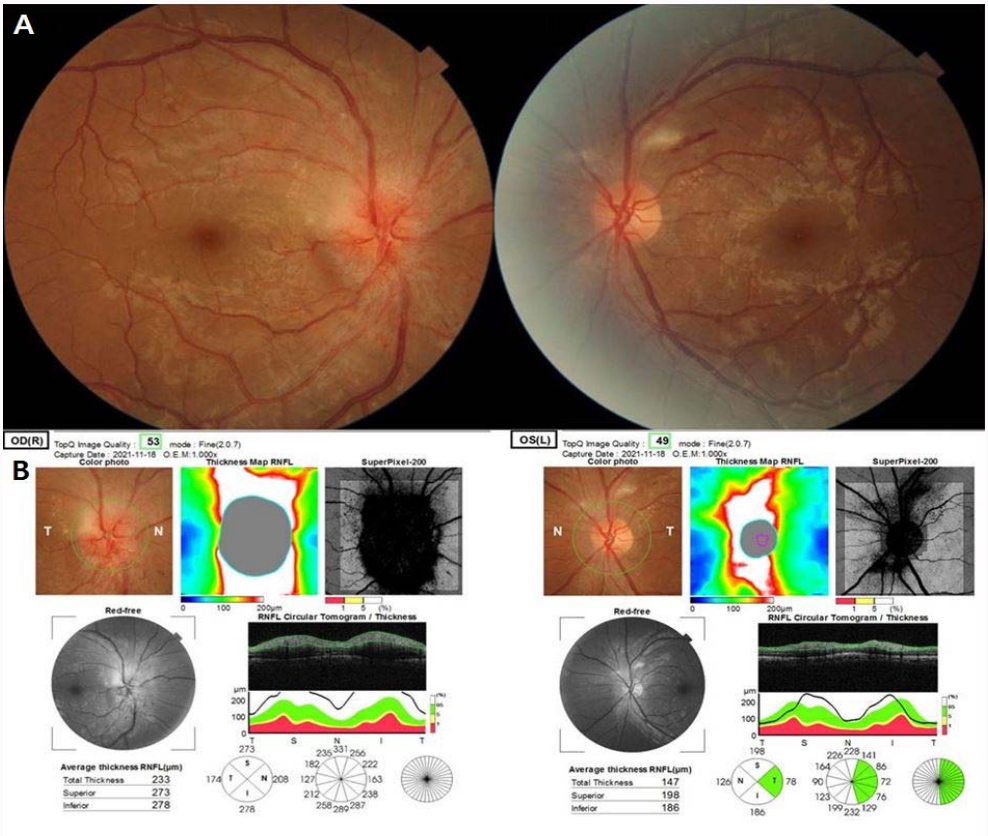

Figure 1: Fundus imaging of the patient at the first visit. Color fundus photographs (A) and disc optical coherent tomography (B) showing severe optic nerve swelling in both eyes, which was more severe in the right eye.

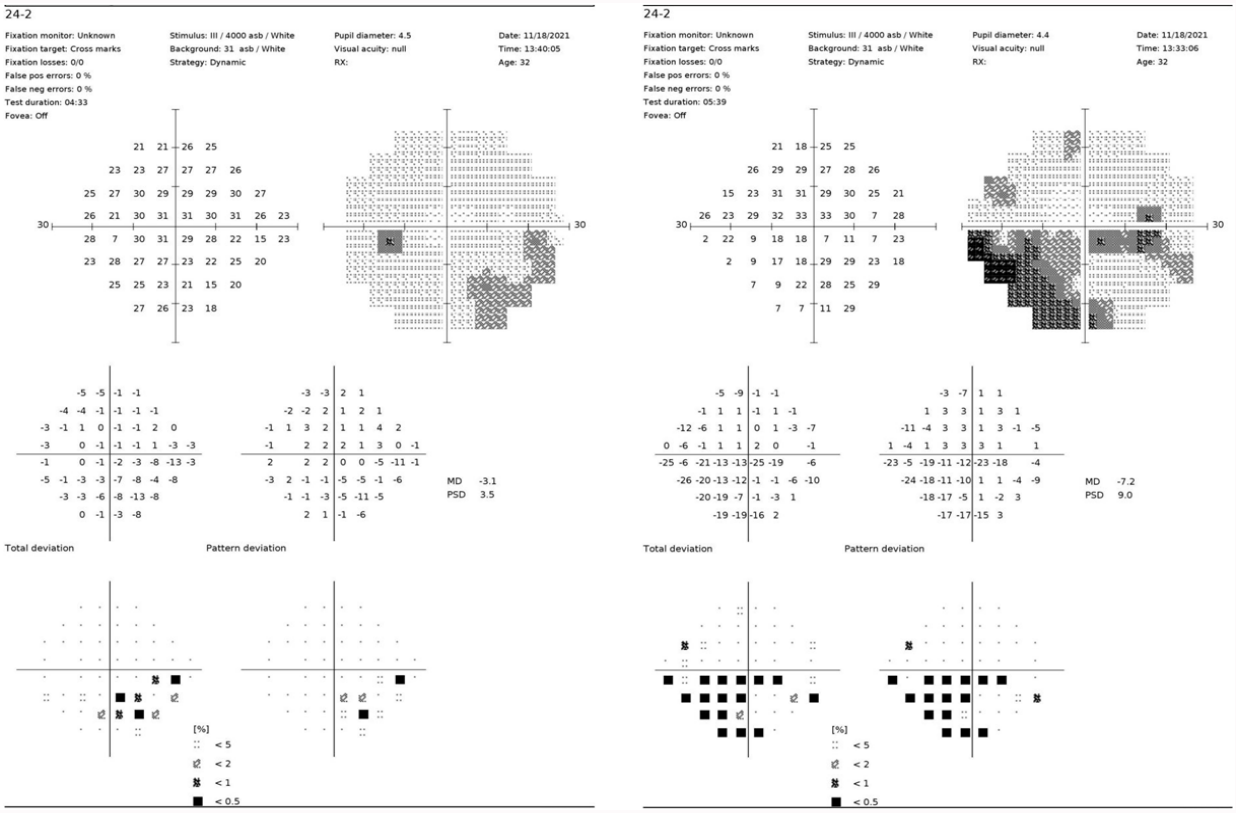

Figure 2: Visual field examination revealed inferior nasal visual field defect in both eyes, which was more severe on the right eye.

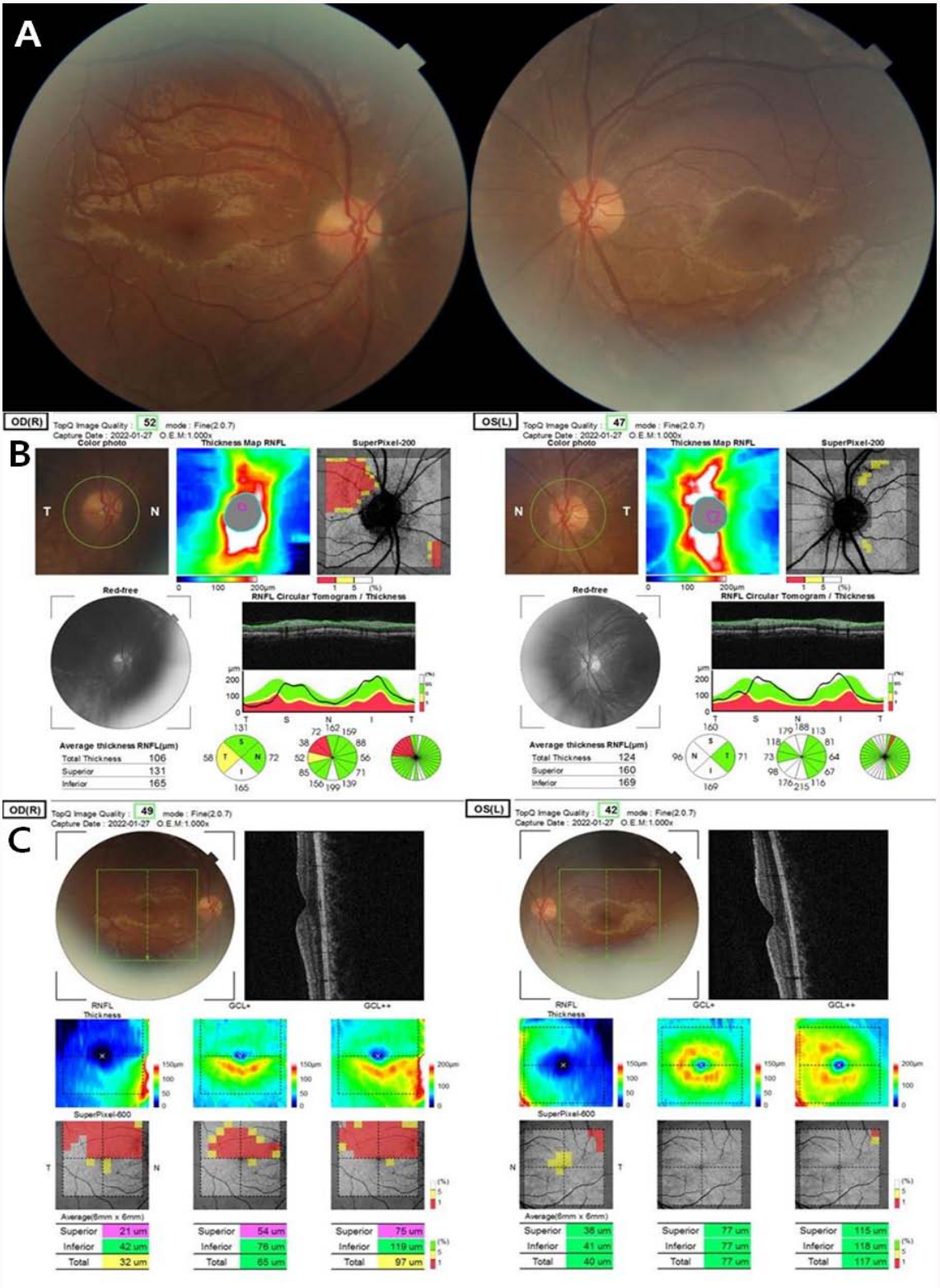

Figure 3: Fundus imaging after 3 months. Color fundus photographs (A) and disc optical coherent tomography (B) showing improvement of optic nerve swelling in both eyes. Macular Superior optical coherence tomography (C) demonstrated ganglion cell-inner plexiform layer thinning in right eye.

creatinine, liver function test, coagulation test, fibrinogen, and D-dimer levels were all within the normal range. Anti-aquaporine-4 antibody, other infections, and autoimmune disease antibodies were also nonspecific. Brain MRI with MRA demonstrated no remarkable findings with normal brain parenchyma, ventricles, and optic nerves. Therefore, the patient was diagnosed with NAION. After 3 months, disc swelling decreased, but macular optical coherence tomography demonstrated thinning of the superior ganglion cell-inner plexiform layer in the right eye (Figure 3). The patient's visual symptoms and visual field defects also improved in both eyes (Figure 4).

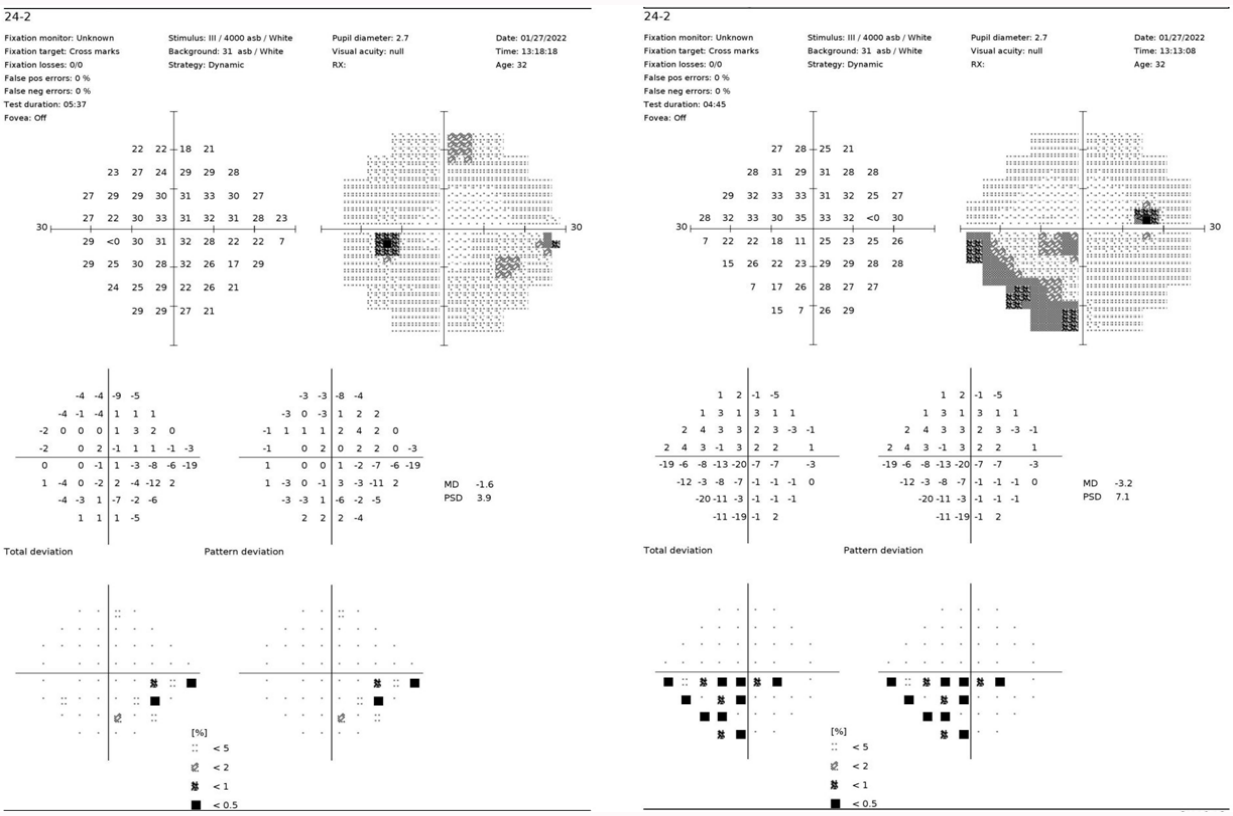

Figure 4: Visual field defect was partially improved after 3 months.

Discussion

COVID-19 causes various symptoms, ranging from sore throat or mild cough to severe respiratory and systemic diseases caused by Severe Acute Respiratory Syndrome Coronavirus-2 infection [5]. Vaccinations have been conducted worldwide due to the ongoing COVID-19 pandemic [6,7]. COVID-19 vaccines include different platforms, such as nucleic acid-based or live attenuated viruses, protein subunits, and viral vectors [7]. Post-vaccine reactions are mostly localized and include pain, redness, and swelling at the injection site [8]. However, rare serious side effects have also been reported [9]. Several ocular complications may occur after vaccinations, including anterior ischemic optic neuropathy [2-4,10-14]. These were uveitis, central serous chorioretinopathy, corneal graft rejection, macular neuroretinopathy with paracentral scotoma, acute zonal occult outer retinopathy, central retinal vascular occlusion, optic neuritis, and cranial nerve palsies [11,13,15]. NAION has also been reported following COVID-9 vaccination, although whether these diseases are complications related to COVID-19 vaccinations or whether it is an accidental coincidence remains controversial [2-4]. However, we report a case of NAION in a 30-year-old healthy young patient without any risk factors. This supports the theory that NAION can occur as a post-vaccine reaction, rather than as a coincidence, and the COVID-19 vaccine may play an important role in the development of NAION.

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