

# Optic Neuritis Associated with SARS-CoV-2 B.1.1.7 Variant of Concern

Jonathan A. Micieli , Caberry W. Yu

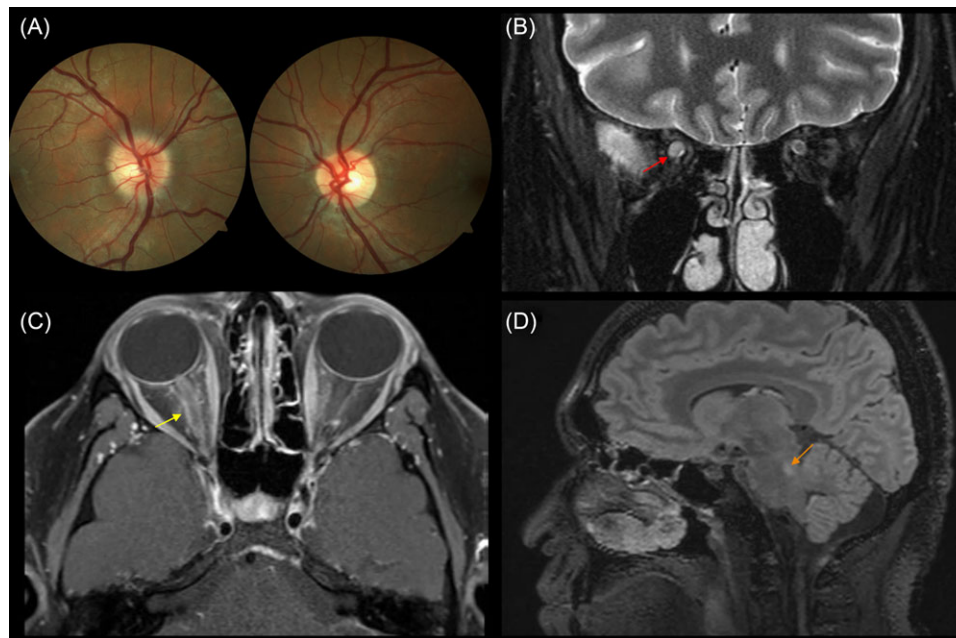
**Keywords:** Optic neuritis, COVID-19, SARS-CoV-2, Vision loss

doi:[10.1017/cjn.2021.183](https://doi.org/10.1017/cjn.2021.183)

Can J Neurol Sci. 2022; 00: 1–2

A 31-year-old otherwise healthy man was referred for right eye vision loss. Twelve days prior to presentation, he developed a new fever and 10 days prior to presentation, he developed shortness of breath, right eye pain that worsened with eye movements, and blurred vision. He presented to the emergency room and chest X-ray showed ground-glass opacity in the right lung base. A nasopharyngeal swab reverse transcription polymerase chain reaction test was positive for SARS-CoV-2 (N501YS gene mutation associated with B.1.1.7 (alpha) variant was detected). The shortness of breath resolved 2 days later, but his vision did not improve. He was referred to neuro-ophthalmology.

His visual acuity was found to be counting fingers at 4 feet OD and 20/20 OS. There was a right relative afferent pupillary defect. Dilated fundus examination showed mild right optic disc edema (Figure 1A). Magnetic resonance imaging (MRI) of the brain/orbits with contrast showed increase T2-weighted signal intensity, enlargement, and enhancement of the intraorbital/intracanalicular segments of the right optic nerve and sheath (Figure 1B and C). There was also high T2/FLAIR signal intensity along the lateral margin of the pons without enhancement (Figure 1D). Serum aquaporin-4-IgG (AQP4-IgG) and myelin oligodendrocyte glycoprotein (MOG-IgG) were tested with cell-based assays and were negative. His 25-OH-Vitamin D level was found to be



**Figure 1:** (A) Fundus photos of the right and left eye showing mild optic disc edema in the right eye at presentation. Magnetic resonance imaging (MRI) of the orbits demonstrating increased T2 signal in the right optic nerve (B), enhancement of the right optic nerve and optic nerve sheath (C), and FLAIR MRI showing signal intensity along the lateral margin of the pons without enhancement (D).

From the Department of Ophthalmology and Vision Sciences, University of Toronto, Toronto, Ontario, Canada (JAM); Kensington Vision and Research Centre, Toronto, Ontario, Canada (JAM); and Department of Surgery, McMaster University, Hamilton, Ontario, Canada (CWY)

RECEIVED JUNE 26, 2021. DATE OF ACCEPTANCE JULY 13, 2021.

Correspondence to: Jonathan A. Micieli, Kensington Vision and Research Centre, 340 College Street, Suite 501, Toronto, Ontario M5T 3A9, Canada. Email: [jmiceli@kensingtonhealth.org](mailto:jmiceli@kensingtonhealth.org)

insufficient at 27 nmol/L. He was treated with intravenous methylprednisolone 1 g daily for 5 days followed by prednisone 1 mg/kg daily. At follow-up 10 days later, he had improved visual acuity to 20/50 OD and 20/20 OS and no optic disc edema. Humphrey 24-2 SITA-Fast visual fields showed a central scotoma with a mean deviation of -4.24dB OD. Follow-up 3 months after onset revealed a visual acuity of 20/20 with a normal Humphrey 24-2 SITA-Fast visual field (MD-1.56dB).

Since its first reported case in December 2019, SARS-CoV-2 has been linked with a broad range of ocular manifestations.<sup>1</sup> This is a rare case of optic neuritis associated with a SARS-CoV-2 variant of concern (alpha), which became prevalent in Ontario, Canada at the time of this patient's presentation. Previous cases of optic neuritis related to SARS-CoV-2 occurred in patients who also had uveitis, associated neurological symptoms, or MOG-IgG or AQP4-IgG.<sup>2-4</sup> We are unaware of a previous case of optic neuritis associated with the alpha variant of concern.

SARS-CoV-2 is hypothesized to be a neurotropic virus that enters the cell through ACE2 receptors, which are expressed in the brain and retina.<sup>5</sup> SARS-CoV-2 has been previously associated with central nervous system involvement, including in exacerbations of multiple sclerosis, and to MOG-IgG and AQP4-IgG-positive optic neuritis.<sup>3</sup> While our patient presented with typical features of optic neuritis, additional work-up did not reveal serological evidence of neuromyelitis optica spectrum disorder, MOG-IgG, or brain lesions diagnostic of multiple sclerosis. Thus, the optic neuritis in this patient may represent a separate parainfectious process caused by the viral illness, either through direct viral injury or an unrecognized autoantibody response. Animal models have shown that other

coronaviruses can cause optic neuritis<sup>1</sup> and in humans, SARS-CoV-2 RNA has been detected in retinal and optic nerve biopsies.<sup>5</sup> The close temporal relationship between SARS-CoV-2 infection and symptom onset supports possible causation.

#### DISCLOSURES

There are no conflicts of interest.

#### STATEMENT OF AUTHORSHIP

Conception and design (JAM), data collection (CY), drafting of manuscript (CY and JAM), critical revision (CY and JAM), and final approval (JAM).

#### REFERENCES

1. Seah I, Agrawal R. Can the coronavirus disease 2019 (COVID-19) affect the eyes? A review of coronaviruses and ocular implications in humans and animals. *Ocul Immunol Inflamm*. 2020;28:391-5.
2. Shaw VC, Chander G, Puttanna A. Neuromyelitis optica spectrum disorder secondary to COVID-19. *Br J Hosp Med*. 2020;81:1-3.
3. Gold DM, Galetta SL. Neuro-ophthalmologic complications of coronavirus disease 2019 (COVID-19). *Neurosci Lett*. 2021;742:135531.
4. Zhou S, Jones-Lopez EC, Soneji DJ, et al. Myelin oligodendrocyte glycoprotein antibody-associated optic neuritis and myelitis in COVID-19. *J Neuroophthalmol*. 2020;40:398-402.
5. Casagrande M, Fitzek A, Spitzer M, et al. Detection of SARS-CoV-2 genomic and subgenomic RNA in retina and optic nerve of patients with COVID-19. *Br J Ophthalmol*. 2021. doi: [10.1136/bjophthalmol-2020-318618](https://doi.org/10.1136/bjophthalmol-2020-318618).