Acute bilateral retrobulbar optic neuritis - An atypical sequela of COVID-19

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Coronavirus disease 19 (COVID-19) and its ophthalmic manifestations have been variably portrayed. We report a case of a 56-year-old female presenting with sudden-onset vision loss associated with painful extraocular muscle movements in both eyes following COVID-19. Visual acuity was counting fingers close to face. Color perception tested was inaccurate. Ocular examination revealed sluggishly reacting pupils and an otherwise unremarkable fundus picture in both eyes, giving us an impression of bilateral retrobulbar neuritis. Magnetic resonance imaging of the brain and orbit were unremarkable, while blood investigations revealed nothing suggestive. The patient dramatically improved with steroid therapy with full visual recovery and a color vision defect. This presentation of bilateral retrobulbar neuritis as a sequela of COVID-19 is presented for its rarity.

Key words: Coronavirus, COVID-19, optic neuritis

A wide range of ophthalmic manifestations has been reported in conjunction with the coronavirus disease (COVID-19).[1-3]

Access this article online	
Quick Response Code:	Website: www.ijo.in
	DOI: 10.4103/ijo.IJO_2155_21

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Received: 17-Aug-2021 Revision: 16-Oct-2021
Accepted: 27-Oct-2021 Published: 26-Nov-2021

Bilateral acute optic neuritis, in the absence of any systemic infective, inflammatory, or autoimmune disorder has been sparsely reported.[4] The diagnosis is primarily clinical with blood and neuroimaging being adjuncts. We report a case of acute bilateral retrobulbar neuritis manifested in a post-COVID-19 female not associated with any demyelinating disease recovering promptly with intravenous steroids.

Case Report

A 56-year-old female with no known comorbidities presented to our ophthalmic emergency services with sudden-onset bilateral loss of vision accompanied with headache for 2 days. Two weeks prior to the onset of visual symptoms, she had tested positive via nasopharyngeal swab for COVID-19 following fever and dry cough for 4 days. She was home-quarantined for the same with symptomatic management and vitamin supplementations during that period. She gave no family history of any neurological or immunological diseases.

On ocular examination, her visual acuity in both eyes were counting fingers close to face. Color perception was tested with red and green filters from the trial set under torchlight and it

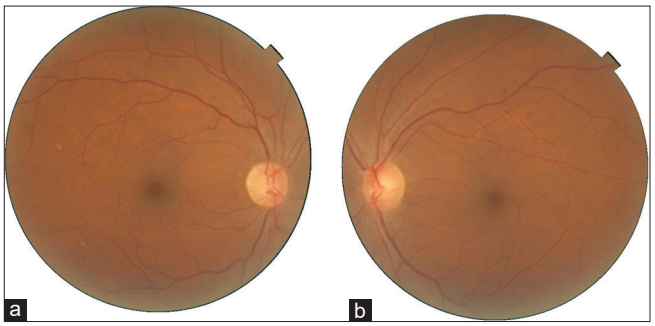

Figure 1: (a) Color fundus photo of the right eye showing normal fundus. (b) Color fundus photo of the left eye showing normal fundus

Cite this article as: Sainath D, Paul A, Krishnagopal S, Kumar A. Acute bilateral retrobulbar optic neuritis - An atypical sequela of COVID-19. Indian J Ophthalmol 2021;69:3761-4.

Figure 2: Blood investigations and cerebrospinal fluid analysis on presentation represented in tabular form

INVESTIGATION	RESULT
Hemoglobin g/dl	12.4 g/dl
Platelet/cu mm	1,55,000/cu mm
RBC/cu mm	2.56 million/cu mm
WBC cells/cu mm	5600 cells/cu mm
Eosinophils	0.3%
Mantoux test	Negative
Urine routine	No pus cells, albumin, sugars
RFT – Renal Function Test	36 mg/dl
Blood Urea	
Serum Creatine	1.0 mg/dl
Liver Function Test	
ALT	27 IU/L
Total Bilirubin	0.3 mg
C-Reactive Protein	0.36 mg/dL
Peripheral smear	Normocytic normochromic
CSF Analysis	14 cm H_2O
Pressure cmH_2O	Normal
Appearance	0.12 g/L
Protein g/L	2.2 mmol/L
Glucose mmol/L	Normal
Gram stain	0.6
Glucose – CSF: Serum ratio	NIL
Pus cells	
Blood culture	Negative
Procalcitonin ng/ml	0.04 ng/ml
D-dimer	163 ng/ml
Ferritin	119 ng/ml
Lactate dehydrogenase	117 IU/L
Anti-myelin oligodendrocyte glycoprotein antibodies	Negative
Aquaporin-4 antibodies	Negative
Myelin-associated glycoprotein antibodies	Negative

was defective. Extraocular muscle movements were full but painful in superior and lateral gaze in both eyes. Both anterior and posterior segment examinations were unremarkable [Fig. 1]. Intraocular pressure measured with Goldmann applanation tonometry was 18 mm Hg in the right eye and 16 mm Hg in the left eye. The remaining systemic and neurological examinations were normal.

Chest X-ray and Mantoux skin test were negative. Blood inflammatory markers, including C-reactive protein, procalcitonin, D-dimer, ferritin, and lactate dehydrogenase, were within reference limits, and blood analysis was negative for infectious pathology. She was screened for autoimmune optic neuritis, but the results from all investigations were unremarkable, including screens for anti-myelin oligodendrocyte glycoprotein antibodies, aquaporin-4 antibodies, and myelin-associated glycoprotein antibodies. Her basic metabolic and immunologic work-ups as well as her cerebrospinal fluid studies revealed nothing remarkable [Fig. 2].

Magnetic resonance imaging (MRI) of the brain and orbit revealed swelling of the right retrobulbar intraorbital segment of the optic nerve with a high T2 signal [Fig. 3]. Brain parenchyma was normal. A diagnosis of bilateral retrobulbar optic neuritis was made. She was started on intravenous pulsed methylprednisolone 250 mg every 6 hourly/day × 3 days, followed with an oral dose of methylprednisolone 1 mg/kg/weight once daily × 11 days as per Optic Neuritis Treatment Trial (ONTT) under glycemic check.[5] The patient improved dramatically within 1 week, with Snellen visual acuity 6/9 in both eyes and a defective color vision. Visual fields (30-2) on recovery showed a paracentral scotoma in both eyes. Optical coherence tomography (OCT) showed healthy retinal nerve fiber layers (RNFL) with an average thickness of 111 μm and 114 μm, respectively [Fig. 4].

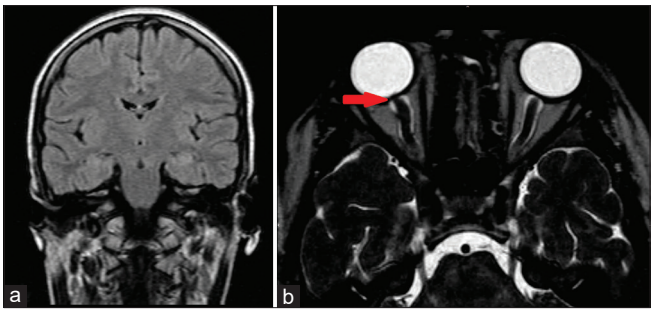

Figure 3: (a) T2 fluid-attenuated inversion recovery (FLAIR) image showing no periventricular plaques suggesting no changes of multiple sclerosis. (b) T2 DRIVE image showing retrobulbar thickening and tortuosity of the optic nerve, which is more on the right side (red arrow)

Discussion

The coronavirus disease, though primarily a disease of the respiratory system with life-threatening complications, has now been well reported to have ophthalmic associations and complications.[1,3] Though neuro-ophthalmic manifestations in concurrence with COVID-19 have been sparsely reported, they cannot be overlooked.[1] Ocular transmission is postulated to use the angiotensin-converting enzyme-2 receptor (ACE2) expressed in the central nervous system, including retinal vessels to enter the cell.[2,6,7] Another speculation includes direct neuronal entry by the virus, leading to endothelial cell dysfunction causing ischemia and coagulopathy.[6] Neuronal involvement also occurs due to viremia traversing the blood–brain barrier or via infected leukocytes.[2]

Optic neuritis, an inflammation of the optic nerve head, presents as papillitis, retrobulbar neuritis, or neuroretinitis.[5,8] It is primarily a clinical diagnosis based on history and examination findings. Funduscopic features aid in differentiating typical from atypical cases.[4,8] In adults, optic neuritis is usually unilateral and commonly linked to multiple sclerosis (MS).[3,5,8]

It has been speculated that the SARS-CoV-2 virus may cause relative hypoxia leading to neuroinvasion of the virus progressing to optic neuropathy.[2,6] Laterality of optic neuropathy remains significant as the occurrence is usually unilateral. Bilateral acute optic neuritis is a rare manifestation, particularly in the absence of systemic inflammatory or autoimmune disorders.[2,5,8] A study reported increased ganglion cell layer thickness (GCL) in multiple quadrants in

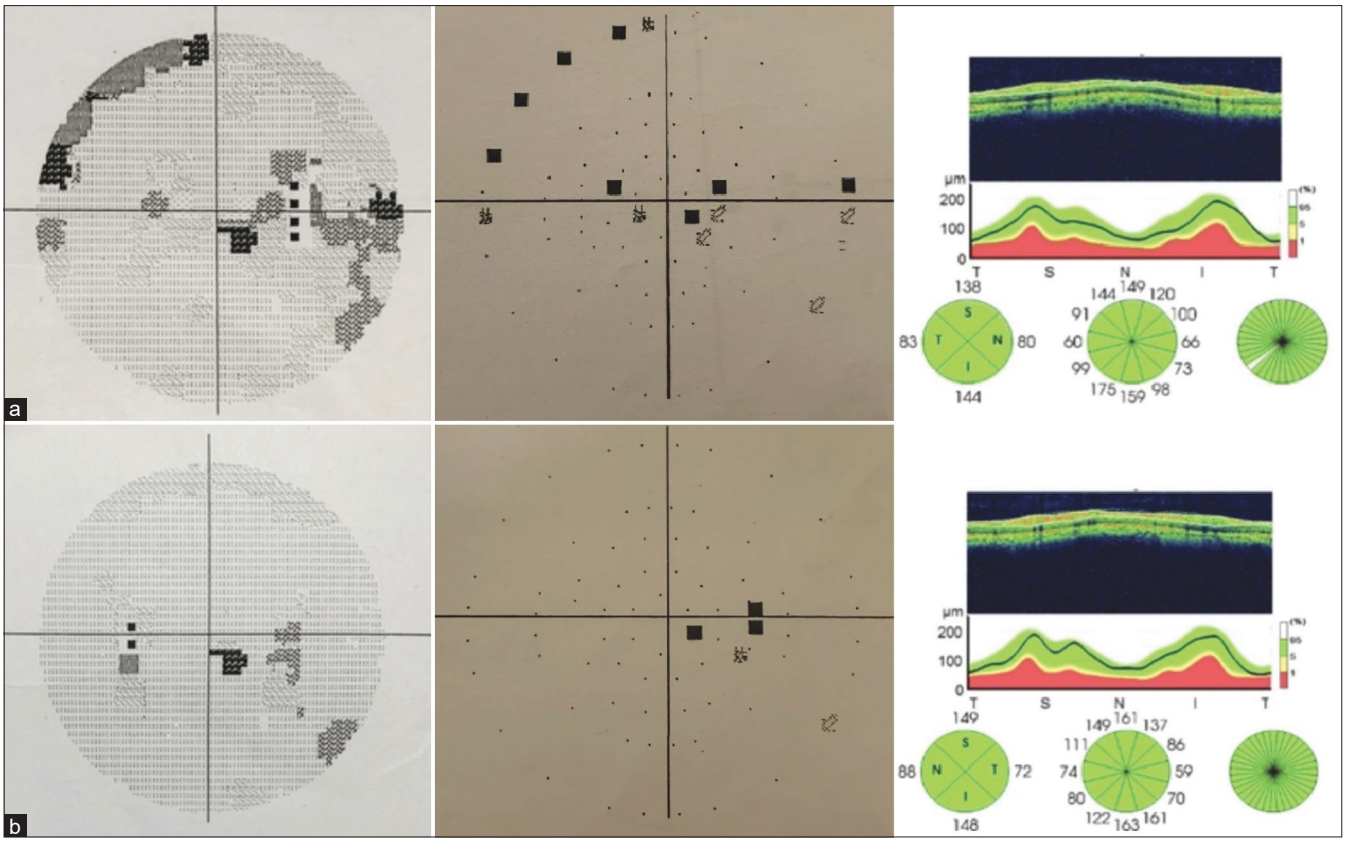

Figure 4: (a) Visual fields and optical coherence tomography images of the patient on recovery for the right eye revealing paracentral scotoma and average RNFL thickness of 111 µm. (b) Visual fields and optical coherence tomography images of the patient on recovery for the left eye revealing paracentral scotoma and average RNFL thickness of 114 µm

individuals who had recovered from COVID-19; however, optical coherence tomography performed in our patient showed healthy ganglion cell complex.[6]

Though extensive differential diagnostic testing is warranted to treat the underlying cause, in our patient, blood and neuroimaging revealed nothing noteworthy.[5] Studies have reported the aggravation of MS as well as recurrence of optic neuritis in the setting of COVID-19.[1,8,9] Sardar *et al*.[10] reported a case of optic neuritis and idiopathic intracranial hypertension in coexistence with COVID-19. A meta-analysis on post-COVID-19 optic neuritis revealed a female preponderance, with preference of left eye and no significant correlation between recovery and treatment.[11] However, there have been no reported cases to the best of our knowledge that describe bilateral retrobulbar neuritis post COVID-19 without any triggering factor and with prompt recovery on initiation of steroids. Thus, we report this case for its rarity.

Conclusion

Acute bilateral sudden loss of vision as a post-COVID-19 sequela should be promptly managed and extensively evaluated. Ruling out an infective, inflammatory, or autoimmune history is prudent to the management of such a case and a diagnosis of bilateral retrobulbar neuritis should be kept in mind while evaluating such a case.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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