Case Reports in Ophthalmology

Case Rep Ophthalmol 2023;14:405–410
DOI: 10.1159/000532108
Received: May 31, 2023
Accepted: June 27, 2023
Published online: August 30, 2023

© 2023 The Author(s).
Published by S. Karger AG, Basel
www.karger.com/cop

OPEN ACCESS

This article is licensed under the Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC) (http://www.karger.com/Services/OpenAccessLicense). Usage and distribution for commercial purposes requires written permission.

Case Report

Atypical Central Retinal Artery Occlusion following COVID-19 Infection: A Case Report

Hamid Reza Heidarzadeh[a] Mojtaba Abrishami[a, b]
Mehrdad Motamed Shariati[a] Seyed Hossein Ghavami Shahri[a]
Mohammad Reza Ansari Astaneh[a]

[a]Eye Research Center, Mashhad University of Medical Sciences, Mashhad, Iran; [b]Department of Ophthalmology and Visual Sciences, Ocular Oncology Service, University of Toronto, Toronto, Canada

Keywords
Severe acute respiratory syndrome coronavirus 2 · Coronavirus disease 2019 · Central retinal artery occlusion

Abstract
Herein, we report a patient with atypical central retinal artery occlusion (CRAO) following COVID-19 recovery. A 44-year-old male was referred to the emergency room with a history of diplopia and sudden-onset painless visual loss in his left eye. He had a history of 1-week hospitalization for severe COVID-19 infection with pneumonia 3 weeks before, with positive real-time reverse transcription polymerase chain reaction result for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in a nasopharyngeal sample. His visual acuity in the left eye was light perception which became no light perception later. Relative afferent pupillary defect was positive in the left eye. He had anterior chamber and anterior vitreous cells due to spillover and white cotton-wool-like patches in the left eye. He was diagnosed with atypical CRAO with uveitis-like features. After 3 weeks, he developed neovascular glaucoma and was treated with panretinal photocoagulation. In conclusion, SARS-CoV-2-induced vasculopathy and hypercoagulopathy conditions may be involved in the progression of CRAO in our patient. COVID-19 could be a considerable predisposing factor for CRAO.

© 2023 The Author(s).
Published by S. Karger AG, Basel

Correspondence to:
Mohammad Reza Ansari Astaneh, m_ansariastaneh@yahoo.com

Case Rep Ophthalmol 2023;14:405–410
DOI: 10.1159/000532108
© 2023 The Author(s). Published by S. Karger AG, Basel
www.karger.com/cop

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) caused an outbreak of unusual viral pneumonia with multi-organ involvement worldwide [1]. Accumulating evidence has clarified the picture of Coronavirus Disease 2019 (COVID-19) as a multifaceted viral vasculopathy syndrome. SARS-CoV-2 uses the angiotensin-converting enzyme 2 (ACE2) for entry into target cells, and endothelial cells express abundant ACE2 [2]. The expression of ACE2 has been detected in human aqueous humor and in retinal tissue (pigmented epithelial cells, photoreceptors, and Müller cells) [3]. SARS-CoV-2 infection activates renin-angiotensin-aldosterone system (RAAS), and this potentiates the innate immune stimulation, oxidative stress, and pro-thrombotic states which result in endothelial dysfunction [2]. These pathophysiological backgrounds prone the retinal microvasculature to vascular density changes or retinal and ophthalmic vascular occlusive disorders [4].

COVID-19 has various ophthalmic manifestations and retinal vascular occlusive disorders, like central retinal vein occlusion, central retinal artery occlusion (CRAO), paracentral acute middle maculopathy, and acute macular neuroretinopathy, which have been described before [4]. The inflammatory and procoagulant states due to the COVID-19 infection may be associated with vascular occlusions in the retina. Here we report a patient, with a history of severe COVID-19 infection, presented with diplopia which proceeding CRAO with atypical uveitis features.

Case Presentation

A 44-year-old male referred with sudden-onset painless decreased visual acuity of the left eye since the day before examination. He stated a history of binocular diplopia 1 week before visual symptoms. A brain magnetic resonance imaging (MRI) was performed by his neurologist, and it had no pathologic findings. He had no past medical history except for COVID-19 infection with 1-week hospitalization, 3 weeks before referral to the emergency room. He had a history of fever, dry cough, and progressive dyspnea that needed to be admitted to hospital with 81% oxygen saturation (O_2Sat). COVID-19 was confirmed by a positive nasopharyngeal swab test reverse transcription (RT) polymerase chain reaction (PCR) test for SARS-CoV-2. Computed tomography of the chest showed ground-glass opacities with involvement of 50% of pulmonary parenchyma. He was treated with favipiravir, remdesivir, non-steroidal anti-inflammatory drugs and discharged after 1 week with 92% O_2Sat. He did not receive systemic corticosteroids.

At the time of the first ophthalmic examination, visual acuity was 20/20 in the right eye and light perception in the left eye, which gradually decreased to no light perception (NLP) in 4 days. Relative afferent pupillary defect was positive in the left eye. Intraocular pressure (IOP) was 12 mm Hg in both eyes. Anterior segment examination in the left eye revealed 1–2+ cells in the anterior chamber and 2+ cells in the anterior vitreous due to spillover. Fundus exam of the right eye was normal, but in the left eye, we noticed cotton-wool-like geographic white patches in posterior pole and equatorial area of the retina (Fig. 1). In fluorescein angiography, delayed retinal arterial filling (after 40 s) and vascular filling defect in the regions of white patches were obvious (Fig. 2a–d). Optical coherence tomography demonstrated increased reflectivity and thickness of the retinal inner layers of the left eye (Fig. 2e, f). Vitreous sample with suspicion of atypical acute retinal herpetic lesions and SARS-CoV-2 was acquired. Vitreous sample PCR result was negative for SARS-CoV-2, varicella zoster virus (VZV), herpes simplex virus, cytomegalovirus, and Toxoplasma gondii. Serum biochemistry

Case Rep Ophthalmol 2023;14:405–410
DOI: 10.1159/000532108
© 2023 The Author(s). Published by S. Karger AG, Basel
www.karger.com/cop

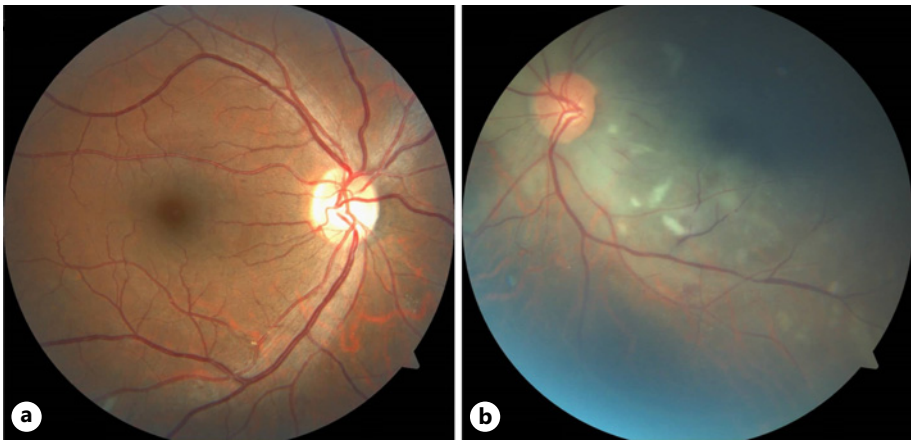

Fig. 1. Fundus photography of the right eye (**a**) and left eye (**b**). There are multiple cotton-wool spots and significant arterial narrowing with posterior pole edema in the left eye. The right eye is normal.

evaluation was within normal limits except for the erythrocyte sedimentation rate of 60 mm/h and 2+ C-reactive protein (CRP).

We asked for a neurology and cardiology consultation to evaluate the carotid arteries and heart as a source of embolic accident, which were normal. We started 75 mg oral prednisolone orally which tapered slowly. He is under observation, and visual acuity of the left eye did not improve, and no right eye involvement was observed, but the ocular inflammation suppressed. After 3 weeks from presentation, he came to the emergency room with ocular pain. The left eye IOP was 48 mm Hg, and iris neovascularization was obvious. With diagnosis of neovascular glaucoma and after controlling IOP with topical anti-glaucoma drops, full panretinal photocoagulation treatment was done for the left eye. Patient final vision was NLP. The CARE Checklist has been completed by the authors for this case report, attached as online supplementary material (for all online suppl. material, see https://doi.org/10.1159/000532108).

Discussion

Here, we reported a case of atypical CRAO with diplopia and uveitis features and severe visual deterioration which occurred 3 weeks after discharge from the hospital for severe COVID-19 infection with pneumonia and a positive nasopharyngeal swab test by RT-PCR. In this case, although the vitreous sample RT-PCR result was negative for SARS-CoV-2, we believe that CRAO in a relatively young and healthy patient and a history of COVID-19 are associated with the hypercoagulopathy or vasculopathy state induced by SARS-CoV-2 infection.

Ophthalmic manifestations may be the presenting feature of COVID-19 infection, and these are more common in patients with severe systemic disease. The prevalence of ophthalmic manifestations ranges from 2% to 32% [4]. ACE2 deficit results in an upregulation of pro-inflammatory factors and atherogenesis mediators in animal models, suggesting a key role for ACE2 in blocking vascular inflammation and atherosclerosis [3]. In a cohort study on hospitalized COVID-19 patients, the rate of venous and arterial thromboembolic complications was 8% despite the use of anticoagulant prophylaxis [5]. The inflammatory and procoagulant states due to the COVID-19 infection are triggers for venous and arterial thromboembolism.

Case Rep Ophthalmol 2023;14:405–410
DOI: 10.1159/000532108
© 2023 The Author(s). Published by S. Karger AG, Basel
www.karger.com/cop

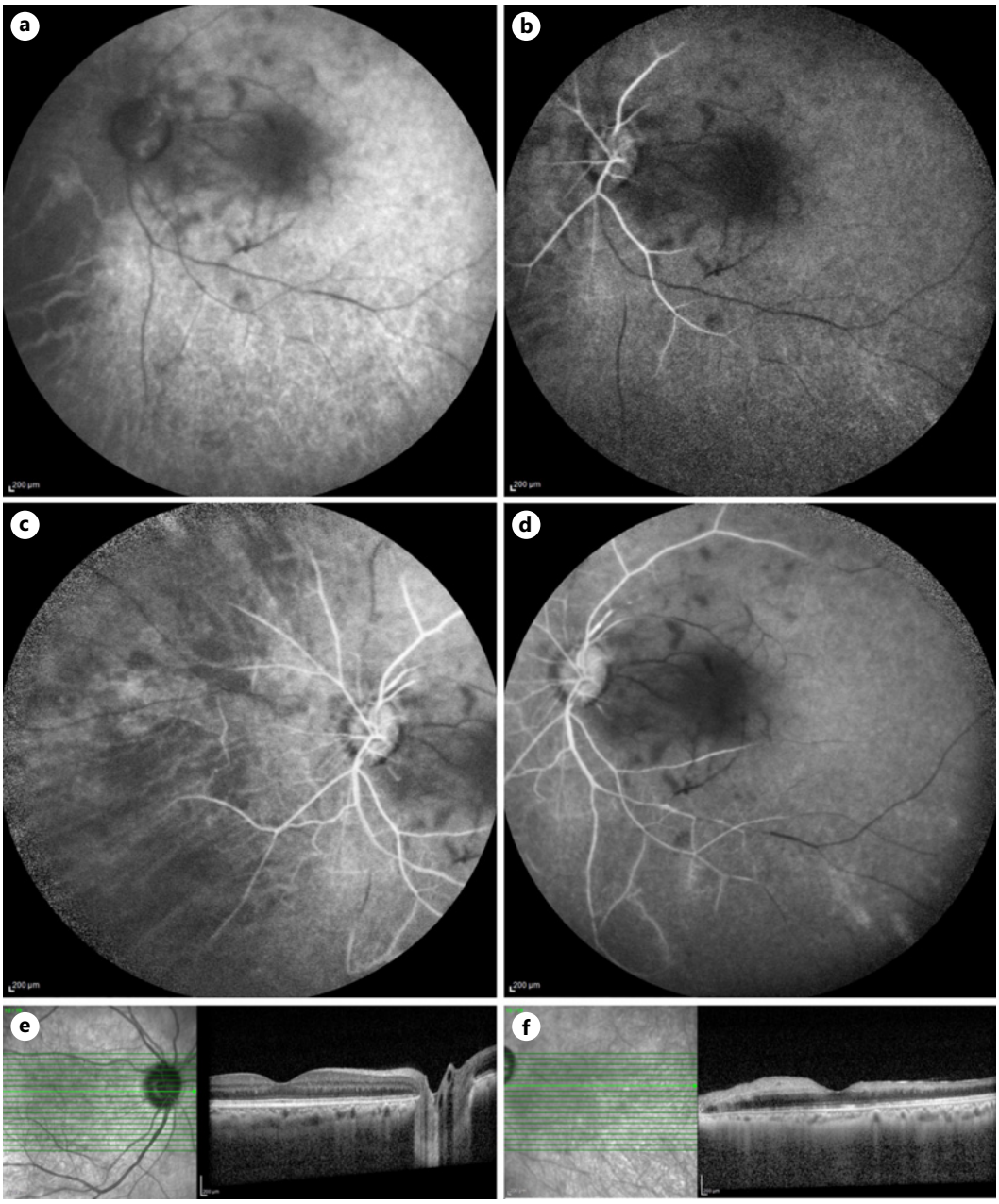

Fig. 2. Fluorescein angiography and optical coherent tomography of the left eye. There is choroidal and arterial filling delay in the arterial and venous (**a**, **b**) and late (**c**, **d**) phases of FAG. Some arteries are not filled to the end of FAG. OCT of the left eye (**f**) shows hyperreflecting thickened inner retinal layer due to ischemic edema, and the right eye (**e**) is normal.

CRAO is the sudden blockage of the central retinal artery; usually, an embolus is the cause of RAO, but in-situ thrombosis also may cause RAO. Another etiology for CRAO is arteritic processes, usually giant cell arteritis, which needs rapid discrimination from thromboembolic causes by checking erythrocyte sedimentation rate and CRP as screening tests and temporal artery biopsy for definitive diagnosis, optimal therapy and rapid administration of steroids [6].

Case Rep Ophthalmol 2023;14:405–410
DOI: 10.1159/000532108
© 2023 The Author(s). Published by S. Karger AG, Basel
www.karger.com/cop

There are few reports on retinal vascular occlusions in patients with COVID-19. Turedi et al. [7] reported a 54-year-old male with mild COVID-19 disease who developed paracentral acute middle maculopathy and CRAO. Montesel et al. [8] reported a 59-year-old male with CRAO and a history of severe COVID-19 disease who noticed the vision loss 1 week after discharge from the hospital. Bapaye et al. [9] reported a 42-year-old male with simultaneous bilateral CRAO following a minimally symptomatic infection with a positive nasopharyngeal swab RT-PCR result for SARS-CoV-2. Murchison et al. [10] reported a patient in his fifth decade who had an asymptomatic COVID-19 infection with positive quantitative SARS-CoV-2 RNA testing based on hospital policies, with CRAO secondary to occlusion of the internal carotid artery extending into the skull base. Sanjay et al. [11] reported a 66-year-old male with a diagnosis of bilateral panuveitis and papillitis with CRAO in the right eye following COVID-19 disease.

Here, we report a patient with CRAO that occurred following severe COVID-19 infection, who was hospitalized for a week and 3 weeks after recovery. We believe that the site of occlusion in our patient has been the ophthalmic artery because of being NLP and accompanying diplopia. In all of previous reports, visual acuity was better than light perception; however, our case had NLP visual acuity. Giant cell arteritis (GCA) is one of the important differential diagnoses in our case. In the era of COVID-19, there is some diagnostic confusion because of overlapping features of GCA and COVID-19 including headache, fever, elevated CRP; nonetheless, jaw claudication and visual loss are more characteristic features of GCA. Although our patient had some similarities with GCA in terms of vision and CRP elevation, the age of our patient and absence of other symptoms like temporal tenderness or jaw claudication were excluding factors.

In differential diagnosis of a patient with an acute decrease in vision with white retinal patches and vitritis, herpetic retinal involvements are common [12]. However, our patient had no vitritis. There has been a case report of atypical bilateral ARN in a COVID-19-positive immunosuppressed patient who had a positive vitreous sample PCR test for VZV and was negative for SARS-CoV-2 [13]. In our patient, vitreous sample PCR was negative for SARS-CoV-2, VZV, herpes simplex virus, and cytomegalovirus.

In conclusion, the COVID-19 infection can cause vascular damage and one of its manifestations could be CRAO with atypical presentations, like this case. Hence, paying attention to these vascular injuries and also making proper use of different diagnostic procedures like FAG are necessary during evaluation of COVID-19 patients with visual loss complaint.

Acknowledgment

This is a pleasure for us to also acknowledge the kind support of Ms. E. Eslami.

Statement of Ethics

Ethical approval is not required for this study in accordance with local guidelines. Written informed consent was obtained from the patient for publication of the details of their medical case and any accompanying images.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Funding Sources

The authors received no funding. It is the authors' work, not funded by the government or academic institutes.

Author Contributions

Data collection and writing the manuscript were done by Dr. Ansari Astaneh, Dr. Heidarzadeh, and Dr. Motamed Shariati. Dr. Abrishami and Dr. Ghavami Shahri revised the manuscript. The manuscript was submitted by Dr. Heidarzadeh. We approve the final version of the manuscript. All authors attest that they meet the current ICMJE criteria for Authorship.

Data Availability Statement

All data generated or analyzed during this study are included in this article and its online supplementary material. Further inquiries can be directed to the corresponding author.

References

1 Hu B, Guo H, Zhou P, Shi ZL. Characteristics of SARS-CoV-2 and COVID-19. Nat Rev Microbiol. 2021 Mar;19(3):141–54.
2 Siddiqi HK, Libby P, Ridker PM. COVID-19: a vascular disease. Trends Cardiovasc Med. 2021 Jan;31(1):1–5.
3 Gheblawi M, Wang K, Viveiros A, Nguyen Q, Zhong J-C, Turner AJ, et al. Angiotensin-converting enzyme 2: SARS-CoV-2 receptor and regulator of the renin-angiotensin system – celebrating the 20th anniversary of the discovery of ACE2. Circ Res. 2020;126(10):1456–74.
4 Sen M, Honavar SG, Sharma N1, Sachdev MS. COVID-19 and eye: a review of ophthalmic manifestations of COVID-19. Indian J Ophthalmol. 2021;69:488–509.
5 Lodigiani C, Iapichino G, Carenzo L, Cecconi M, Ferrazzi P, Sebastian T, et al. Venous and arterial thromboembolic complications in COVID-19 patients admitted to an academic hospital in Milan, Italy. Thromb Res. 2020;191:9–14.
6 Farris W, Waymack JR. Central retinal artery occlusion. Treasure Island (FL): StatPearls Publishing; 2021.
7 Turedi N, Onal Gunay B. Paracentral acute middle maculopathy in the setting of central retinal artery occlusion following COVID-19 diagnosis. Eur J Ophthalmol. 2022;32(3):NP62–6.
8 Montesel A, Bucolo C, Mouvet V, Moret E, Eandi CM. Case report: central retinal artery occlusion in a COVID-19 patient. Front Pharmacol. 2020 Dec 23;11:588384.
9 Bapaye MM, Nair AG, Bapaye CM, Bapaye MM, Shukla JJ. Simultaneous bilateral central retinal artery occlusion following COVID-19 infection. Ocul Immunol Inflamm. 2021 Apr 15;29:671–4.
10 Murchison AP, Sweid A, Dharia R, Theofanis TN, Tjoumakaris SI, Jabbour PM, Bilyk JR. Monocular visual loss as the presenting symptom of COVID-19 infection. Clin Neurol Neurosurg. 2021;201:106440.
11 Sanjay S, Srinivasan P, Jayadev C, Mahendradas P, Gupta A, Kawali A, et al. Post COVID-19 ophthalmic manifestations in an asian Indian male. Ocul Immunol Inflamm. 2021 Mar 18;29(4):656–61.
12 Bergstrom R, Tripathy K. Acute retinal necrosis. Treasure Island (FL): StatPearls Publishing; 2021.
13 Gupta A, Dixit B, Stamoulas K, Akshikar R. Atypical bilateral acute retinal necrosis in a coronavirus disease 2019 positive immunosuppressed patient. Eur J Ophthalmol. 2022;32(1):NP94–6.