



COVID-19 Related Retinal Vasculitis: A Case Report

John J. Williams, Jared S. Fredrickson, MD, Erin Gaff, COA, OSC, Amirfarbod Yazdanyar, MD, PhD

Introduction

The COVID-19 pandemic is caused by a novel enveloped RNA beta-coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).¹ Histologic examination of patients who died from COVID-19 demonstrate diffuse vascular damage including endothelial injury, microangiopathy and thrombosis.² The presence of viral particles and inflammatory cells has been detected within the vascular endothelium of the lung, heart, small bowel and kidney implicating tissue tropism. Direct vascular inflammation due to secondary immune reaction and cytokine storm causes multiorgan involvement and failure.³

Ocular involvement of COVID-19 is plausible and there are reported cases of anterior and posterior segment involvements.^{4,5} In this report, we described a patient who presented with scotoma in one eye several days after she was tested positive for symptomatic COVID-19 infection and diagnosed with retinal vasculitis and retinal ischemia without vitritis or neuroretinitis.

Case Report

A 49-year-old white female presented with scintillating prism-like scotoma located inferior temporally in the right eye. The ocular symptoms began several days after contracting COVID-19.

The patient's best-corrected visual acuity was 20/20 in each eye. Anterior segment examination was normal in both eyes. Posterior segment examination of the right eye revealed a small cotton-wool spot in inferior nasal macula, marked inflammation of arteries superior nasally as well as mild phlebitis (Figure 1A). No vitritis was present. Posterior segment examination of the left eye was unremarkable (Figure 1B).

Fluorescein angiography (FA) of the right eye demonstrated mild capillary non-perfusion present in the area of cotton-wool spot. Mild staining was present superior to the nerve. Peripheral vasculopathy with capillary non-perfusion and mild vascular leakage was noted nasally and superior temporally (Figure 2A). FA of the left eye showed mild capillary non-perfusion with vascular leakage present in the inferior temporal midperiphery (Figure 2B).

The initial clinical diagnosis was vasculitis associated with recent COVID-19 illness. Other infectious, inflammatory, and infiltrative diseases were considered, and a workup was initiated. Hematologic inflammatory workup, including angiotensin converting enzyme, serum lysozyme, antinuclear antibodies, rheumatoid factor, and human leukocyte antigen serotyping, was normal. Infectious disease workup, including rapid plasma reagin, *Treponema pallidum*, Lyme with line blot, QuantIFERON-TB Gold Plus, *Bartonella* antibody panel, *Toxoplasma gondii*, *Toxocara canis*, herpes simplex virus 1 and 2, varicella zoster virus and cytomegalovirus was unrevealing. The patient was monitored closely with repeat fundus examinations and by week six, the cotton-wool spot had resolved (Figure 3).

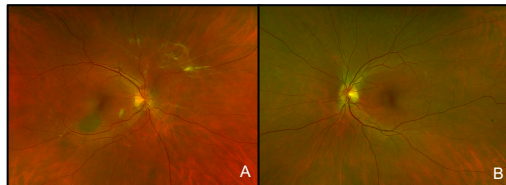


Figure 1
A. Fundus photo of the right eye taken at initial visit. Marked vasculitis of the arteries could be seen superior nasally. A small cotton-wool spot was present within the inferior nasal macula. A small flat nevus was also noted within the macula.
B. Fundus photo of the left eye appeared essentially normal.



Figure 2
A. Fluorescein angiogram of the right eye showed hyperfluorescence with vascular leakage superior to the optic nerve. Capillary nonperfusion was present associated with the cotton-wool spot. Peripheral vasculopathy with nonperfusion and vascular leakage was seen superior temporally.
B. Fluorescein angiogram of the left eye showed mild capillary non-perfusion with vascular leakage present in the inferior temporal midperiphery.

Discussion

Retinal vasculitis is a clinical condition in which the retinal vessels are inflamed and perivascular sheathing and vascular occlusion occur.⁶ Commonly known systemic inflammatory causes are sarcoidosis, Wegener's granulomatosis and Behcet's disease.⁶ Infectious agents including syphilis, Lyme, toxoplasmosis, herpes simplex virus and varicella zoster virus may be implicated.⁶ Occasionally neoplastic disorders such as leukemia and lymphoma are causative.⁶ Ocular disorders such as pars planitis, birdshot chorioretinopathy and Eales disease are also associated with retinal vasculitis.⁶

Our patient demonstrated marked vasculitis, predominately arteritis with associated phlebitis involving the posterior pole of the right eye. Peripheral occlusive vasculopathy without vasculitis was present bilaterally, though may represent an incidental finding. Notably, no other signs of ocular inflammation or infection were present. The ocular symptoms started three days after testing positive for COVID-19. There was a cotton-wool spot confirming the acute timing of the disease. The patient was tested for other inflammatory, infectious, and neoplastic diseases but the work up was unrevealing.

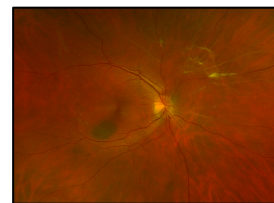


Figure 3
Fundus photo taken six-weeks following initial diagnosis of COVID-19 related retinal vasculitis. The cotton-wool spot was no longer present, though the vasculitis remained.

Conclusion

COVID-19 is caused by a novel coronavirus. Most patients develop mild upper respiratory tract infection. Virus induced vasculopathy and vasculitis contributes to multiorgan involvement, especially in severe cases. Vascular damage is caused by immune cells attaching small vessels cytokine storm, leukocytic debris or RNA particle deposition.² Furthermore, thrombosis from a hypercoagulable state with elevated D-dimer, von Willebrand factor and factor VIII have been described.³

This case demonstrates posterior pole vasculitis with mild secondary retinal ischemia associated with acute COVID-19 infection. Peripheral occlusive vasculopathy was present bilaterally. No other evidence of ocular tissue infection was present. Notably, no conjunctivitis, uveitis, vitritis, neuritis or retinitis occurred. The cotton-wool spot resolved within six weeks, although the vascular sheathing persisted. Given the absence of local infection, a remote inflammatory and/or hypercoagulable condition due to COVID-19 is the likely causative. COVID-19 is a respiratory virus that causes microvascular disease which may affect many organs. Although the plausibility of retinal vasculopathy due to this virus has been disputed in a small Italian prospective cross-sectional study, that showed no or minimal retinal vascular involvement on OCT angiography, COVID-19 should be considered in differential diagnosis of retinal vasculopathy in a symptomatic patient after excluding more common culprits.

References

- Huang X, Wei F, Hu L, Wen L, Chen K. Epidemiology and Clinical Characteristics of COVID-19. *Arch Iran Med*. 2020;23(4):268-271. Published 2020 Apr 1. doi:10.34172/aim.2020.09
- Lowenstein CJ, Solomon SD. Severe COVID-19 Is a Microvascular Disease. *Circulation*. 2020;142(17):1609-1611. doi:10.1161/CIRCULATIONAHA.120.050354
- Becker RC. COVID-19-associated vasculitis and vasculopathy. *J Thromb Thrombolysis*. 2020;50(3):499-511. doi:10.1007/s11239-020-02230-4
- Hu K, Patel J, Swiston C, Patel BC. Ophthalmic Manifestations Of Coronavirus (COVID-19). In: *StatPearls*. Treasure Island (FL): StatPearls Publishing; February 26, 2021.
- Marinho PM, Marcos AAA, Romano AC, Nascimento H, Belfort R Jr. Retinal findings in patients with COVID-19. *Lancet*. 2020;395(10237):1610. doi:10.1016/S0140-6736(20)31014-X
- Rosenbaum JT, Sibley CH, Lin P. Retinal vasculitis. *Curr Opin Rheumatol*. 2016;28(3):228-235. doi:10.1097/BOR.0000000000000271