

Ocular occlusions in two cases of COVID-19

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In late 2019, we saw the emergence of a new coronavirus, the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), which rapidly evolved into a global pandemic. We report two cases of ocular vascular occlusion related to coronavirus disease 2019 (COVID-19) disease. The first case is of choroidal artery occlusion, while the second case is of combined central retinal artery and vein occlusion (CRAO and CRVO). We performed a thorough literature search and to the best of our knowledge, neither any of the above said has been reported in COVID-19-positive patients.

Key words: Choroidal Occlusion, combined central retinal artery and vein occlusion (CRAO and CRVO), COVID-19

Retinal findings following infection with SARS-CoV-2 virus occur due to complement activated thrombotic microangiopathy and hypercoagulable state. This can lead to retinal artery and venous occlusions. We report two cases of ocular vascular occlusion related to coronavirus disease 2019 (COVID-19) disease. The first case is of choroidal artery occlusion, while the second case is of combined central retinal artery and vein occlusion (CRAO and CRVO).

Case Reports

Case 1

A 49-year-old gentleman presented to the vitreoretinal services with complaints of floaters in the left eye (OS) for the past 2 days. He had active coronavirus disease 2019 (COVID-19) disease 2 weeks earlier, for which he was treated and was systemically well. During his previous hospital stay, the patient was started on oral systemic steroids and aspirin (150 mg).

His vitals were stable, and best-corrected visual acuity (BCVA) was 6/6 in the right eye (OD) and counting finger half meter in the left eye (OS). Intraocular pressure was 9 mmHg in both eyes (OU). Examination of anterior

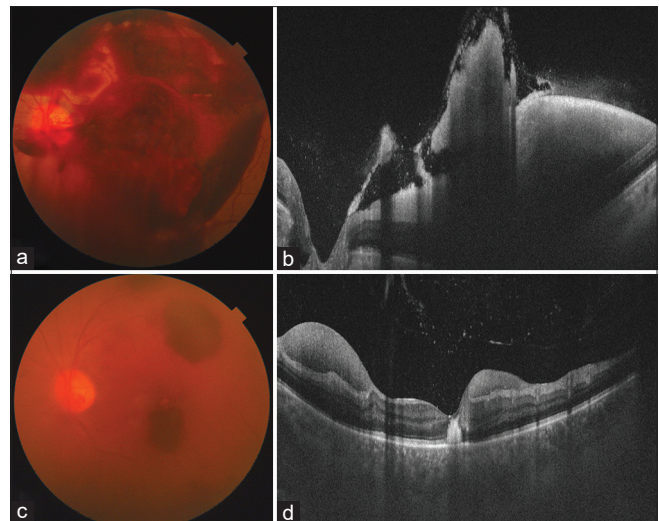


Figure 1: (a) The fundus picture at presentation showing dense vitreous hemorrhage with subhyaloid hemorrhage, with the (b) corresponding OCT showing the same. (c) Fundus picture after 10 days of the initial presentation showing resolution of vitreous and subhyaloid hemorrhage with sub-internal limiting membrane bleeding. (d) OCT showing sub-internal limiting membrane bleeding and subfoveal gliotic scarring

segment showed a relative afferent pupillary defect in OS with the rest of the findings within normal limits in OU. Indirect ophthalmoscopy in OD was normal, while OS showed vitreous hemorrhage (VH) with subhyaloid hemorrhage (SHH) clinically as well as on Optical Coherence Tomography (OCT) [Fig. 1a and b]. Review after 10 days showed resolution of VH and SHH with sub-internal limiting membrane (sub-ILM) bleed [Fig. 1c] and subfoveal gliotic scarring, which was noted on OCT [Fig. 1d]. Patient underwent pars plana vitrectomy along with ILM peeling. Intraoperatively, there was no evidence of any neovascularization at the disk (NVD) or elsewhere (Neovascularization elsewhere [NVE]). Post-surgery, 1 week media was clear [Fig. 2a] and OCT showed persistent subfoveal gliotic scarring [Fig. 2b] with BCVA of 6/36. Six weeks postoperatively, fundus showed Retinal Pigment Epithelium (RPE) alterations at the fovea [Fig. 2c] and the corresponding OCT showed minimal subfoveal scarring with disruption of the ellipsoid zone [Fig. 2d] with BCVA of 6/18. The patient underwent Fundus Fluorescein Angiography (FFA) and Indocyanine green angiography (ICGA) post-surgery, which showed focal subfoveal choroidal hypoperfusion. FFA in the early phase showed slightly enlarged Foveal Avascular Zone (FAZ) [Fig. 3a], which persisted into the late phases [Fig. 3b], while ICGA revealed non-perfusion of subfoveal choroidal area in the early and late phases [Fig. 3c and d]. These were suggestive of sclerosed choroidal blood vessel, confirming

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choroidal infarct with secondary subretinal bleed. This would have subsequently entered into vitreous cavity through a retinal breakthrough at the fovea.

Case 2

The second case is of combined central retinal artery and vein occlusion (CRAO and CRVO). A 20-year-old gentleman who was diagnosed COVID-19 positive had systemic issues, for which he was hospitalized for 2 weeks. He had complained of floaters and presented to us nearly 4 weeks after the discharge from hospital. His BCVA at presentation in the right eye was 6/6, N6, and in the left eye was perception of light

with inaccurate projection of rays. Examination of anterior segment showed a relative afferent pupillary defect in OS. Fundus examination of the right eye was normal. Left eye fundus examination demonstrated dense VH with suspected CRVO [Fig. 4]. All other blood investigations were within normal limits, except raised D-dimer (321 µg/mL), C-reactive protein (CRP; 2.44 mg/dL), and lactate dehydrogenase (LDH; 414 IU/L). The patient underwent vitrectomy with endolaser and anti-vascular endothelial growth factor (anti-VEGF)

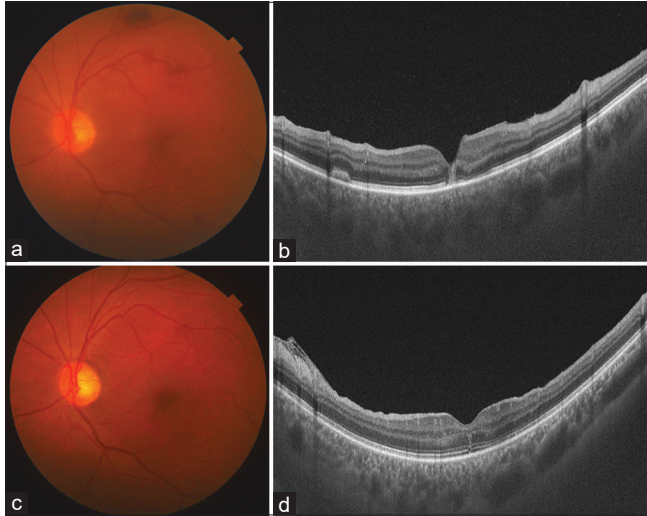


Figure 2: (a) Post-surgery 1 week media was clear and (b) the corresponding OCT showed persistent subfoveal gliotic scarring. (c) Post-surgery 6-week fundus showed RPE alterations at fovea and (d) the corresponding OCT showed minimal subfoveal scarring with disruption of the ellipsoid zone

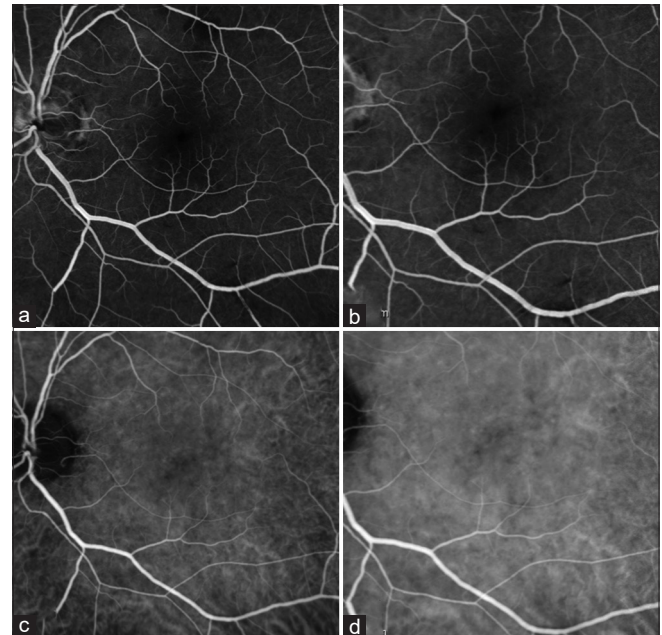


Figure 3: FFA in (a) early phase (45 s) showed slightly enlarged FAZ, which persisted into (b) late phase (4 min 51 s). (c and d) ICGA revealed non-perfusion of the subfoveal choroidal area in the early and late phases, indicating ischemia

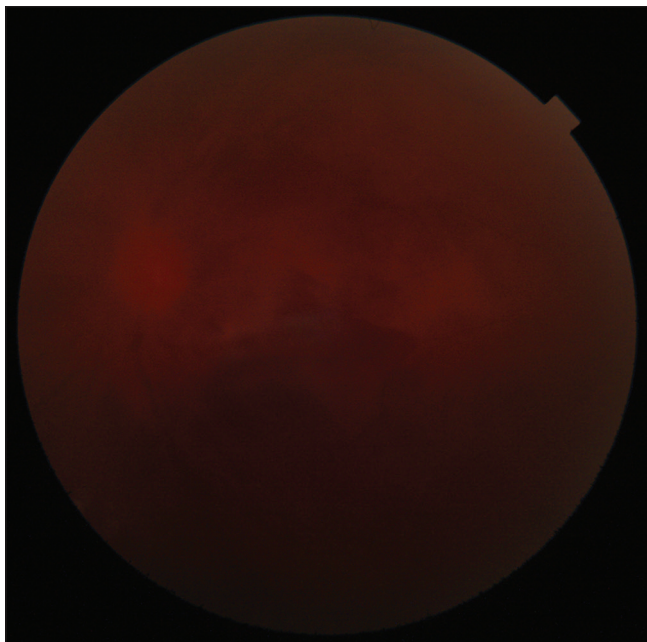


Figure 4: The left eye showed dense vitreous hemorrhage at presentation

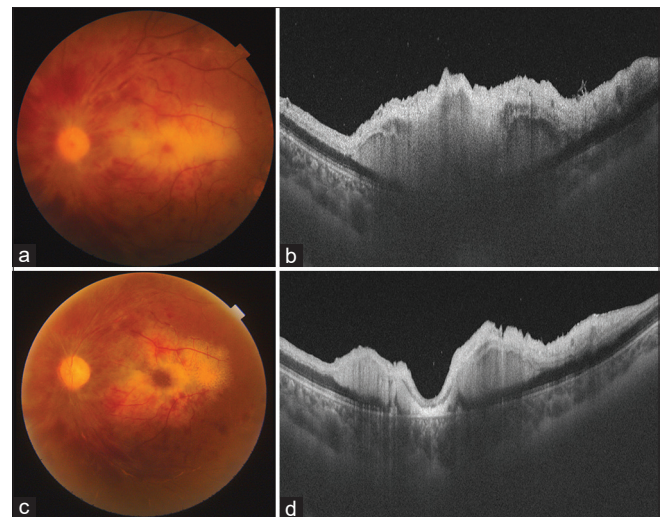


Figure 5: (a) Post-surgery day 7 fundus showed pale optic disk, multiple flame-shaped hemorrhages, and retinal whitening with cherry-red spot. (b) OCT showed hyperreflective and distorted inner retinal layers with back shadowing. (c) Post-surgery day 30 fundus showed pale gradual resolution of flame-shaped hemorrhages and retinal edema clinically (d) as well as on OCT

for VH. After clearing the hemorrhage during surgery, we noted splinter hemorrhages and multiple flame-shaped and blot intraretinal hemorrhages in all quadrants of the retina with multiple NVEs. The retinal veins appeared dilated and tortuous, while the arteries were severely attenuated. There were also areas of retinal whitening with a faint cherry-red spot, and diagnosis of CRAO and CRVO was done.

Post-surgery day 7 vision was the same with fundus showing pale optic disk, multiple flame-shaped hemorrhages, and retinal whitening with cherry-red spot [Fig. 5a]. OCT showed hyperreflective and distorted inner retinal layers with back shadowing [Fig. 5b]. On day 30 post-surgery, there was gradual resolution of superficial hemorrhages and inner retinal edema clinically [Fig. 5c] as well as on OCT [Fig. 5d], with BCVA counting finger close to face. Eventually, he developed florid neovascularization of iris and neovascular glaucoma and unfortunately, he lost the left eye.

Discussion

Literature on intraocular manifestations of COVID-19 is rapidly increasing, but most of the literature comprises conjunctivitis and ocular surface disease.^[1] Increasingly, there have been reports of thromboembolic phenomena associated with COVID-19.^[2] The retinal circulation, being an end arterial system, has potentially blinding consequences due to vascular occlusions. In patients with SARS-CoV-2, there is an increased propensity for thromboembolic complications, including both arterial and venous thrombotic events.^[3] Individuals with SARS-CoV-2 infection may have a number of coagulation abnormalities suggesting a hypercoagulable state, which has been called COVID-19-associated coagulopathy.^[4]

Sheth *et al.*^[5] reported a case of vasculitic retinal vein occlusion secondary to COVID-19 in a 52-year-old patient who presented with the diminution of vision in the left eye 10 days after he tested positive for SARS-CoV-2. Their case supports the mechanism of thromboinflammatory state secondary to the “cytokine storm” as the pathogenesis for systemic manifestations of COVID-19. COVID-19 is now also being understood as a thromboembolic disease affecting multiple organs.^[6] D-dimer has been observed to be very high in patients with COVID-19 compared to interleukin-6, as seen in one of our cases, reflecting true thrombotic disease. Many different studies have shown a strong association between elevated D-dimer levels *vis-a-vis* severity and prognosis of disease with thrombotic complications of COVID-19.^[7] To the best of our knowledge, there has been no reported case of choroidal occlusion or combined retinal vascular occlusion in a patient who recovered from COVID-19. We present this as a first case report of choroidal occlusion and combined retinal vascular

occlusion in a case of COVID-19 infection with no other known possible etiology.

Conclusion

Though we acknowledge the increasing prevalence of SARS-CoV-2 infection, and while a causal relationship cannot be established, it is plausible that ocular occlusions may be a manifestation of a thromboinflammatory state associated with SARS-CoV-2 infection. We highlight these two cases, so that patients with visual symptoms may be properly evaluated and our knowledge about the various ocular manifestations improves, and thus, we will remain vigilant about this vision-threatening ocular disease.

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.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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