



Ophthalmological Post-Acute-COVID-19-Illness Sequelae

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Ophthalmic-related COVID-19 illness can be presented in acute COVID-19 illness phase or post-acute-COVID-19-illness phase [1]. A previous study on ocular findings in 64 COVID-19 survivors (128 eyes, 7-mild-to-moderate, 33-severe, 24-critical disease) were evaluated 82 +/- 36.4 days after the onset of COVID-19 symptoms [2]. Approximately, 15.6 % of them demonstrated diabetic retinopathy, and two patients revealed discrete white-yellowish dots in the posterior pole with hyperreflective changes at ellipsoid layers, outer segment, and retinal pigment epithelium level [2, Figure 1]. Approximately, 10.9 % of them had dry eye disease [2]. In critical group, the mean +/- standard deviation of intraocular pressure was 14.16 +/- 1.88 mmHg, whereas the severe group revealed 12.51 +/- 2.40 mmHg, both in left eyes (p = 0.038) and right eyes (p = 0.02) [2]. There was no sign of uveitis. The median interquartile range of the visual acuity and distant best-corrected visual acuity were 0.1 (0-0.2) and 0 (0.0.1), respectively [2]. The SARS-CoV-2 (COVID-19) RNA has been isolated from ocular tissues [1]. The COVID-19 manifestations of the eyelids, ocular surface and anterior segment of the eyes include follicular conjunctivitis (7.7 %-8.6 % of

incidence) [1, 3-6, Figure 2], viral keratoconjunctivitis, hemorrhagic and pseudomembranous conjunctivitis, childhood conjunctivitis, episcleritis, dryness (6.9 %-37 % of incidence) [3-6], eye pain (10.3 %-31.2 % of incidence) [3-6], eye discharge (6.9 %-29.6 % of incidence) [3-6], eye redness (10.8 %-24.1 % of incidence) [3-6], eye tearing (9.7 %-22.2 % of incidence) [3-6], foreign body sensation in the eyes (6.0 %-18.5 % of incidence) [3-6], photophobia (2.6 %-16.1 % of incidence) [3-6], eye itchiness (9.6 %-15.7 % of incidence) [3-6], blurred vision (4.8 %-12.8 % of incidence) [3-6], burning sensation of the eyes (8.4 % of incidence) [3-6], eyelid margin hyperemia (34.5 % of incidence) [3-6], crusted eyelashes (24.1 % of incidence) [3-6], Meibomian orifices abnormality (20.7 % of incidence) [3-6], eye chemosis (3.4 % of incidence) [3-6], and episcleritis (2.2 % of incidence) [3-6]. COVID-19 manifestations of the posterior segment of the eyes include central retinal vein occlusion [1, Figure 3], central retinal artery occlusion [1, Figure 4], acute macular neuroretinopathy and paracentral acute middle maculopathy [1, Figure 5]. COVID-19 manifestations of the retina include vitritis and outer retinal abnormalities and acute retinal necrosis [1]. COVID-19 manifestation of the uvea includes serpiginous choroiditis [1]. COVID-19 manifestations of neuro-ophthalmic lesions include papillophlebitis, optic neuritis [1, Figure 6], Adie's tonic pupil, Miller-Fisher syndrome and cranial nerve palsy, cerebrovascular accident with vision loss, and neurogenic ptosis [1]. COVID-19 manifestations of the orbits include dacryoadenitis, retino-orbital pain, orbital cellulitis and sinusitis, orbital mucormycosis, and orbital histiocytic lesion [1].

In conclusion, transmission of SARS-CoV-2 (COVID-19) through eye secretions is currently investigated, whereas the SARS-CoV-2 (COVID-19) RNA has been isolated from different parts of the eyes. The causal relation of these ophthalmic conditions with SARS-CoV-2 (COVID-19) is to be answered.

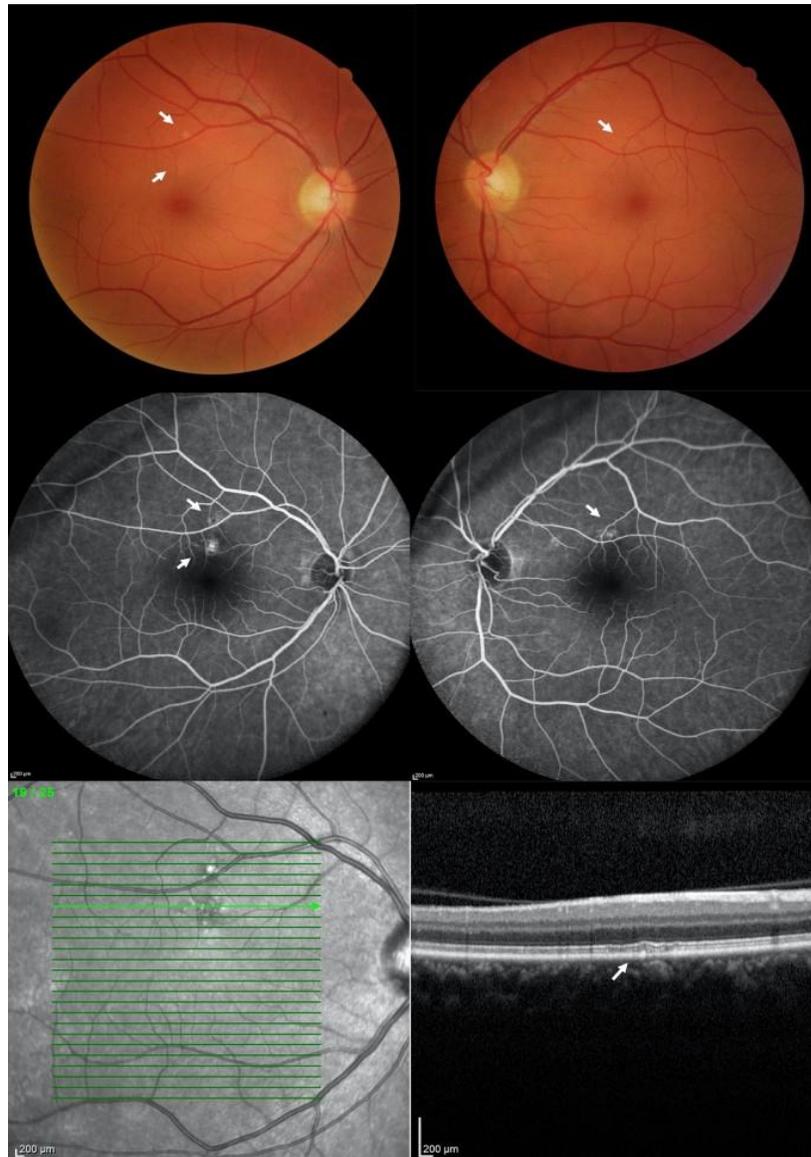


Figure 1 : Demonstrating ocular fundus multimodal imaging of a 48-year-old man (critical case) 128 days after first symptoms of COVID-19. Color fundus pictures of both eyes showing white-yellowish dots (arrows). Midphase fluorescein angiography pictures of the RE (middle left) and LE (middle right) showing transmission hyperfluorescence in the retina lesions 195 days after first symptoms of COVID-19. Optical coherence tomography (OCT) of the right eye shows hyporeflectivity in the retinal pigment epithelium and ellipsoid layers, and discontinuation of photoreceptors' outer segments (arrow).

(Source : Sen M, Honavar SG, Sharma N, Sachdev MS. COVID-19 and eye: a review of ophthalmic manifestations of COVID-19. Indian Journal of Ophthalmology 2021; 6 : 488-509)



Figure 2 : Demonstrating follicular conjunctivitis following COVID-19: A 30-year-old man developed bilateral follicular conjunctivitis 13 days after mild COVID-19 infection. Slit lamp examinations showed evidence of acute viral conjunctivitis. (a and d)The examination on illness day 13 showed moderate conjunctival injection and inferior palpebral conjunctival follicles. (b and e) Examinations on illness day 17 and (c and f) illness on day 19 demonstrated that treatment with ribavirin eye-drops gradually improved the patient's symptoms. (Reproduced with permission from Chen L, Liu M, Zhang Z, Qiao K, Huang T, Chen M, Xin N, Huang Z, Liu L, Zhang G, Wang J. Ocular manifestations of a hospitalised patient with confirmed 2019 novel coronavirus disease. Br J Ophthalmol. 2020;104:748-51)

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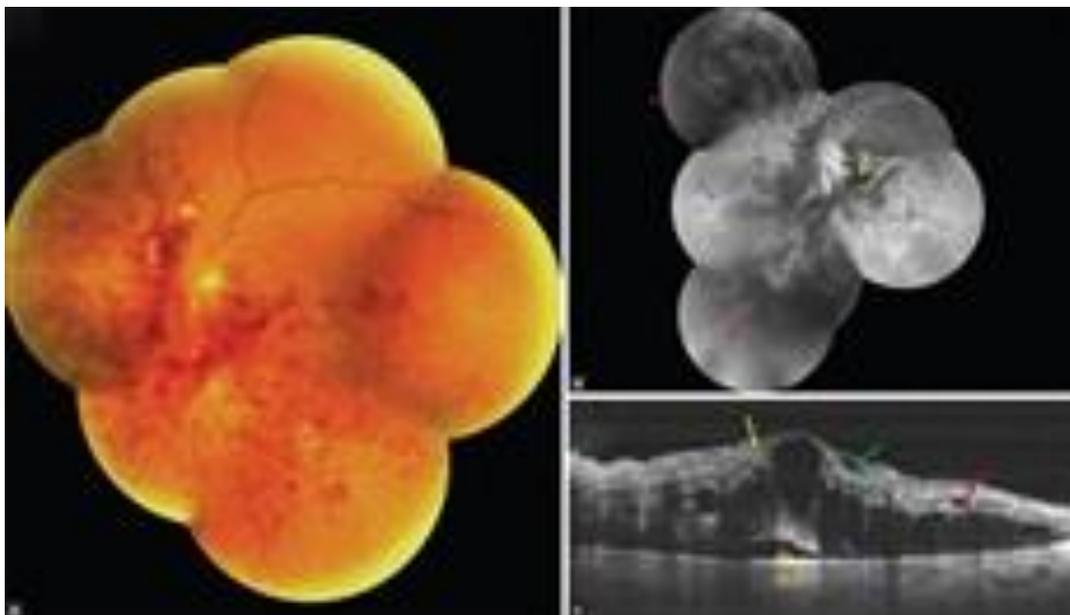


Figure 3 : Vasculitic retinal vein occlusion as a manifestation of COVID-19: A 52-year-old patient presented with the diminution of vision in the left eye 10 days after he tested positive for SARS-CoV-2. (a) Fundus photograph demonstrating inferior hemiretinal vein occlusion with superonasal branch retinal vein occlusion. (b) Fundus fluorescein angiogram showing the presence of dilated tortuous vein in inferior and superonasal quadrants with late phases showing staining and leakage from the vessel walls (Blue arrow), multiple areas of hypofluorescence corresponding to retinal hemorrhages clinically, suggestive of blocked fluorescence (Yellow arrow) and areas of hypofluorescence suggestive of capillary nonperfusion (Blue arrow) in involved quadrants. The macular region and optic disc also showed hyperfluorescence in late phases suggestive of leakage. (c) Spectral domain optical coherence tomography illustrating the presence of serous macular detachment (Orange arrow), cystoid macular edema, cysts located in outer nuclear layer (Blue arrow), inner nuclear layer (Red arrow) and ganglion cell layer (Green arrow) and disorganization of retinal inner layers (Yellow arrow) (Reproduced with permission from Sheth JU, Narayanan R, Goyal J, Goyal V. Retinal vein occlusion in COVID-19: A novel entity. *Ind J Ophthalmol* 2020;68:2291-3).

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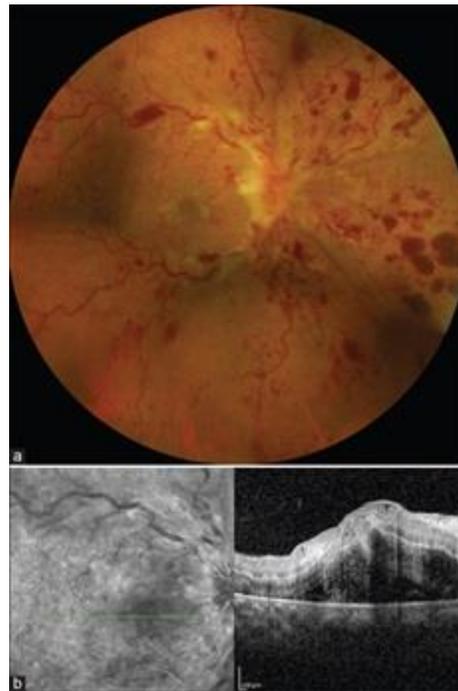


Figure 4 : Combined central retinal artery and vein occlusion following COVID-19: A 32-year-old lady, known hypertensive with past history of COVID-19, presented with sudden onset, painless diminution of vision in the right eye. Examination showed right eye visual acuity of finger counting at 50cm and RAPD. (a) Fundus photograph showing retinal hemorrhages in all quadrants, dilated tortuous vessels

and optic disc edema. (b) SD-OCT showing neurosensory detachment with intraretinal fluid and hyper-reflectivity of inner retinal layers. (Contributed by Rajashree Salvi and Shrinivas Joshi, M M Joshi Eye Institute, Hubli, India)

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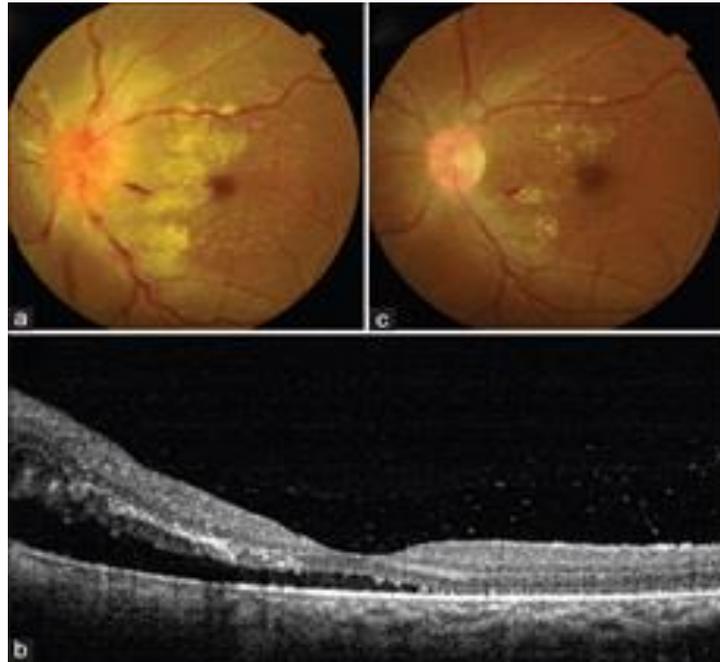


Figure 5: Demonstrating acute macular neuroretinopathy following COVID-19: A 28-year-old woman presented with diminution of vision in left eye seven days after recovering from a mild COVID-19 infection. Vision was 6/36 in left eye with RAPD. (a) Fundus examination showed vitritis 1+, blurred disc margins, hard exudates over macular area and internal limiting membrane folds. (b) SD-OCT showed neurosensory detachment and outer retinal hyperreflective foci. She was managed with tapering doses of oral steroids and topical steroid and homatropine. (c) After 1 month, vision had recovered, disc edema had subsided with resolving exudates. (Contributed by Debdulal Chakraborty, Vitreoretina Services, Disha Eye Hospitals, Kolkata, India)

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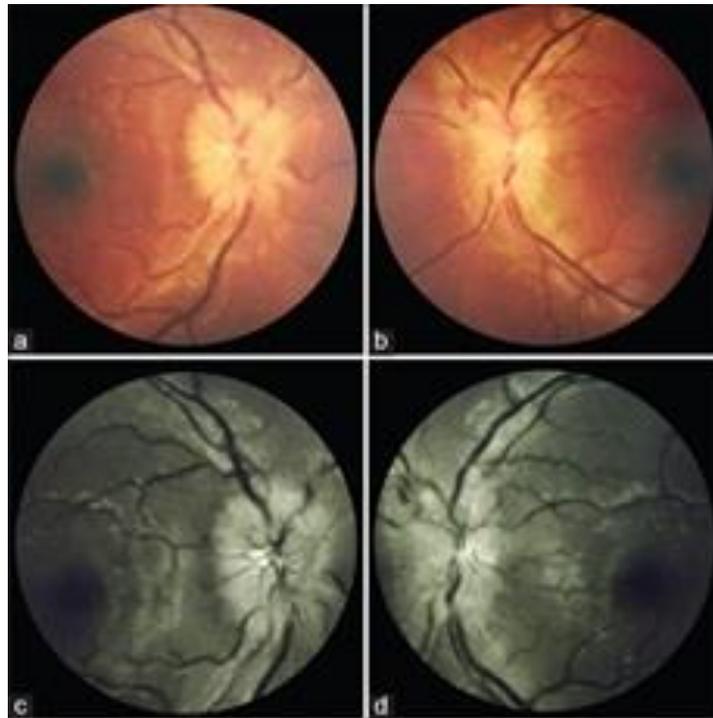


Figure 6 : Bilateral atypical optic neuritis after a mild COVID-19 infection: A 34-year-old female presented with complaints of gradual blurring of vision in right eye with pain on eye movements since 1 week and history of a similar episode 3 weeks back in left eye, which improved spontaneously. She had recovered from a mild COVID-19 infection 2 weeks before the onset of ocular symptoms. On examination, her uncorrected visual acuity was 20/200, N24 in right eye, and 20/25, N6 in left eye. Pupil examination revealed a Grade III RAPD in right eye. (a and b) Fundus photograph and (c and d) red-free imaging showing bilateral disc oedema, more in the right eye. (Contributed by Rachna Vinaya Kumar, Paediatric ophthalmology, Neuro ophthalmology and Adult Strabismus Services, Apollo Eye Institute, Apollo Hospitals, Hyderabad, India)

(Source : Sen M, Honavar SG, Sharma N, Sachdev MS. COVID-19 and eye : a review of ophthalmic manifestations of COVID-19. Indian Journal of Ophthalmology 2021; 69 : 488-509)

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