Does ocular tissue contain SARS CoV-2?

First human infection of SARS CoV-2 was reported in Wuhan, China in December 2019. Dr. Li Wenliang was the first ophthalmologist to succumb to the novel severe acute respiratory syndrome coronavirus 2 (SARS CoV-2; now termed as COVID-19).[1]

According to WHO, as of July 16, 2021, 18.86 crore people were infected with SARS Co-V-2 and 40.67 lakhs deaths were reported.[2] Many ophthalmologists succumbed to SARS Co-V-2 infection till now while treating patients.

The currently known pathology of SARS CoV-2 is that it is transmitted via aerosols. The virus binds to angiotensin-converting-enzyme-2 to enter host cells. Direct contact with mucous membranes is suspected to be the route of transmission. Along with the respiratory system, the ocular surface is known to be involved by SARS CoV-2. Ocular tissues may get inoculated from aerosolized virus particles, migration from the nasopharynx through the nasolacrimal duct and hematogenous spread through the lacrimal gland.[3]

In the SARS CoV-2 infection, virus shedding is highest in the earliest stage. Asymptomatic carriers of SARS CoV-2 are of particular risk to ophthalmologists during examination. Specialists are at higher risk of infection, particularly anesthesiologist and otorhinolaryngologist, who are routinely exposed to aerosolized respiratory secretions and nasopharyngeal procedures.[1]

The ocular findings of SARS CoV-2 infection described so far include conjunctivitis, episcleritis, anterior uveitis, panuveitis, flame-shaped retinal hemorrhage, cotton wool spots, COVID-19-associated retinopathy, retinal vascular occlusions, papillophlebitis, and panuveitis.[4]

Recent studies have shown that viral RNA has been isolated from conjunctiva, tear film in <1% cases in patients who had conjunctivitis. Viral RNA has not been identified in the tear film of COVID-19 patients without conjunctivitis till date, but data representing sampling performed early in the disease course when viral load is highest are lacking.[1]

List *et al*.[3] in their study included 16 aqueous samples and 16 vitreous samples for PCR testing form individuals who were previously positive in nasopharyngeal swabbing, and the cause of death was respiratory failure due to SARS CoV-2 infection. All the samples were negative for SARS CoV-2.

Saiegh *et al*.[5] in their short report of two patients who tested positive for COVID-19 on nasal swab with central nervous system involvement were negative for cerebrospinal fluid RT-PCR for COVID-19. One patient had subarachnoid hemorrhage and the second patient had an ischemic stroke with massive hemorrhagic conversion. The authors concluded that the underlying inflammatory and hypercoagulable state might incite cerebrovascular disease without disruption of blood brain barrier.

Koo *et al*.[6] found SARS CoV-2 viral RNA in aqueous despite negative nasal swab testing. This showed the presence of SARS CoV-2 virus beyond the blood-ocular barrier in asymptomatic individuals. So, the possibility of the virus persisting in immunoprivileged spaces despite absence of symptoms cannot be denied.

In a study conducted by Sawant *et al*.[7] on postmortem ocular tissues, there was 13% positivity rate for SARS CoV-2 in 132 ocular tissues included in this study. The highest prevalence of SARS CoV-2 RNA was noted in the posterior corneal endothelial surface as compared to any other ocular tissue swabs. They found that none of the iris sample showed SARS CoV-2 RNA on RTPCR. They also detected SARS CoV-2 RNA in 2 of the 20 vitreous swabs. They recommended postmortem PCR testing in donors, 5% povidone iodine disinfection protocol, and thorough donor screening to prevent the potential risk of transplanting a tissue with SARS CoV-2 particles. A study by Casagrande *et al*.[8] showed 21% prevalence rate of SARS CoV-2 RNA in retinal biopsy from 14 eyes of 14 deceased COVID-19 patients. Araujo-Silva CA et al in a recent paper published in July 2021 showed presumed SARS-CoV-2 viral particles in various layers of the human retina, suggesting that they may be involved in some of the infection's ocular clinical manifestations.[9] There are conflicting reports of isolation of SARS CoV-2 RNA from various ocular tissues. Therefore, the role of the eye as a route of infection is yet to be proved.

Authors in the present study did not find SARS CoV-2 RNA in the aqueous fluid and vitreous aspirate who had undergone surgery following trauma. Although it is a key finding, the number of cases is less and the patients had mild to asymptomatic presentation. So, a study with a larger sample size is important.[10]

At the present scenario, consensus guidelines for various aerosol-generating ocular procedures like phacoemulsification, glaucoma surgeries, vitreoretinal surgeries, and periocular procedures to prevent COVID-19 have been described in the literature and should be continued to be followed in the future to minimize the risk of transmission of SARS CoV-2 virus.[11-15]

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