Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Does COVID-19 infection leave a mark on the retinal vasculature?

The coronavirus disease 2019 (COVID-19), caused by the highly transmissible severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was declared a pandemic in March 2020.[1] To date, there are more than 60 million confirmed COVID-19 cases globally and over 1.4 million deaths. In addition to respiratory manifestation, infection may also manifest in the cardiac, immunological, neurological and ophthalmic systems.[2]

In the eyes, viral RNA has been detected in infected patients' tears as well as in conjunctival tissue.[3–5] In contrast, few studies have reported its manifestations in the posterior segment. It has been proposed that the retina and choroid could be targets of infection, as the SARS-CoV-2 transmission involves the binding of the virus to angiotensin converting enzyme 2 (ACE2) receptor, which are richly expressed in the retina and choroid.[6,7] Retinal lesions that have been described in SARS-CoV-2 infected individuals include cotton wool spots and microhemorrhages.[8] As these observed retinal lesions are non-specific findings, whether they reflect cardiovascular or thrombotic alterations associated with COVID-19, or that they are part of common systemic vascular diseases such as diabetes mellitus, hypertension, and chronic kidney disease remains unclear.

In this issue, an observational study by Abrishami and colleagues utilized optical coherence tomography angiography (OCTA) to evaluate the retinal microvasculature in patients who recovered from COVID-19 and compared them to a normal age-matched control group. All subjects had COVID-19 confirmed by a positive reverse transcription-polymerase chain reaction nasopharyngeal swab and had a recovery from the systemic symptoms of at least 2 weeks. The majority of subjects in this study had mild systemic symptoms and did not require hospitalization. At the time of the eye examination, all subjects had 20/20 vision and had no symptoms of visual loss. However, on OCTA, significant changes indicating impaired retinal vascular circulation was demonstrated in subjects who had recovered from COVID-19 infection compared to the control group. These changes affected both individuals with mild infection as well as those who required hospitalization. While these microvascular changes are non-specific and may also result from common systemic vascular diseases, the subjects in this study were young and were without preexisting systemic disorders, except for 2 subjects who had a history of medically controlled hypertension.

Despite the relatively small sample size of over 30 subjects, this work presented is important as it raises the possibility of subclinical vascular deficit in individuals who have apparently recovered from COVID-19 infection. Some of the examples in the article could be compared to the retinal vascular bed of a poorly controlled diabetic. It is therefore important to monitor these changes to ascertain whether their longitudinal course. Other studies will be needed to validate these changes in other population, and if these are confirmed, a larger scale surveillance may be recommended to identify the prevalence rates as well as risk factors. Considering the vast number of people infected worldwide, even if only a small proportion of infected individuals develop these retinal vasculopathy, there would still be a sizable population globally with subclinical retinal vasculopathy.

We are still in the midst of the coronavirus outbreak, and its long-term sequelae on the various systems in the body remains unclear. For example, COVID-19 related cardiovascular manifestations are increasingly recognized, some examples include myopericarditis and cardiogenic shock. Longitudinal data is required to evaluate the long-term sequelae of COVID-19 infection, and whether subclinical deficit remain in apparently recovered individuals.

Shaun Sebastian Sim,[†,‡]
Chui Ming Gemmy Cheung[*,†,‡]
*Section Editor, Retina and Vitreous, Canadian Journal of Ophthalmology; [†]Ophthalmology and Visual Sciences Academic Clinical Program, Duke-NUS Medical School, National University of Singapore, Singapore, Singapore; [‡]Singapore Eye Research Institute, Singapore National Eye Centre, 11 Third Hospital Avenue, Singapore 168751, Singapore.

Correspondence to:
Professor Gemmy CM Cheung, Singapore National Eye Centre, 11 Third Hospital Avenue, Singapore 168751, T: +65 6322 8335 / F: +65 62263395.; gemmy.cheung.c.m@snec.com.sg.

References

1. Ahn DG, et al. Current Status of Epidemiology, Diagnosis, Therapeutics, and Vaccines for Novel Coronavirus Disease 2019 (COVID-19). J Microbiol Biotechnol 2020;30(3):313–24.
2. Huang C, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan. China. Lancet 2020;395 (10223):497–506.
3. Abrishami M, et al. Ocular Manifestations of Hospitalized Patients with COVID-19 in Northeast of Iran. Ocul Immunol Inflamm 2020;28(5):739–44.
4. Wu P, et al. Characteristics of Ocular Findings of Patients With Coronavirus Disease 2019 (COVID-19) in Hubei Province, China. JAMA Ophthalmol 2020;138(5):575–8.
5. Lu CW, Liu XF, Jia ZF. 2019-nCoV transmission through the ocular surface must not be ignored. Lancet 2020;395(10224): e39.
6. Choudhary R, et al. Therapeutic targets of renin-angiotensin system in ocular disorders. J Curr Ophthalmol 2017;29(1): 7–16.

https://doi.org/10.1016/j.jcjo.2020.12.013
ISSN 0008-4182

7. Wan Y, et al. Receptor Recognition by the Novel Coronavirus from Wuhan: an Analysis Based on Decade-Long Structural Studies of SARS Coronavirus. J Virol 2020(7):94.
8. Marinho PM, et al. Retinal findings in patients with COVID-19. Lancet 2020;395(10237):1610.

Footnotes and Disclosure

Financial Support: Professor Gemmy Cheung is supported by National Medical Research Council Singapore Open Fund Large Collaborative Grant: NMRC/LCG/004/2018.