

# The ocular manifestations of COVID-19: an overview of current literature

BY AMAL MINOCHA

Although respiratory symptoms are the most frequent manifestation of COVID-19, multi-organ involvement has been demonstrated, including ocular manifestations. The author investigates how the eye can be affected.

The SARS-CoV-2 virus responsible for the COVID-19 pandemic has presented a significant public health challenge globally. As of 11 January 2021, it has resulted in over 80 million cases and 1.8 million deaths globally [1]. Common clinical manifestations of COVID-19 include fever, cough, fatigue and sore throat but in severe cases can progress to acute respiratory distress syndrome, which often requires ventilatory support and intensive care [2]. Although lung involvement is the most serious manifestation of COVID-19, the disease can lead to multi-organ dysfunction, including hypercoagulability, cortisol insufficiency, acute kidney injury, liver dysfunction, acute myocardial infarction, cerebrovascular disease and ocular complications [3]. This article will outline some of the commonly reported ocular manifestations of COVID-19.

## Conjunctivitis

Conjunctivitis is one of the most commonly reported ocular manifestations of COVID-19. Wu et al. presented a case series from the Hubei province, China, of 38 patients with COVID-19, 12 of whom had ocular symptoms consistent with conjunctivitis including chemosis, conjunctival hyperaemia and epiphora. Two of these patients were reverse transcriptase polymerase chain reaction (RT-PCR) positive for SARS-CoV from both conjunctival and nasopharyngeal swabs. The authors also showed that patients with ocular symptoms were more likely to have severe COVID-19 infection as shown from laboratory investigations [4]. These findings were corroborated by Aggarwal et al. in a meta-analysis of the ocular surface manifestations of COVID-19. They analysed 16 studies with 2347 confirmed COVID-19 cases and reported that 11.6% of these patients had ocular surface manifestations, namely ocular pain, discharge, redness and follicular conjunctivitis. Some studies report follicular conjunctivitis as the first and sole manifestation of the disease

[5]. Others have shown evidence of viral SARs-CoV-2 RNA in ocular samples [4,6,7,8] but the infectious potential of this and whether disease has resulted from ocular transmission remains unclear [9].

## Retinal pathologies

COVID-19 has been implicated in the development of retinal microangiopathy. In a study of 27 asymptomatic individuals following COVID-19 pneumonia, Landecho et al. report retinal microangiopathy as cotton wool spots developing in 22% of individuals. Asymptomatic ocular microangiopathy is commonly seen in other vascular diseases such as diabetes and hypertension. It is theorised that SARS CoV-2 can cause ACE-2 downregulation leading to endothelial cell dysfunction and thus microvascular damage [10]. In another study, patients with severe COVID-19 infection were found to have acute vascular lesions of the inner retina, including cotton wool spots and flame shaped haemorrhages, however, these findings were not adjusted for co-morbidities [11].

Yahalomi et al. report a case of central retinal vein occlusion (CRVO) in a 33-year-old healthy male which occurred two weeks after his symptoms of COVID-19 infection resolved [12]. The pathogenesis of CRVO is multifactorial and risk factors include age, hyperlipidaemia and hypercoagulable states. We now know that COVID-19 is strongly associated with an increased risk of thromboembolic events [13]. Cases of paracentral acute middle maculopathy and acute macular neuroretinopathy have also been described in young individuals, which are thought to represent post-infectious complications of COVID-19 [14].

## Neuro-ophthalmic manifestations

Optic neuritis in patients with COVID-19 infection is described in the literature [15], including a case of bilateral optic neuritis with myelin oligodendrocyte glycoprotein (MOG) antibodies whose

production may have been triggered by the virus [16]. Guillain Barre Syndrome (GBS), an immune-mediated disorder, has been described in patients following COVID-19 infection and is hypothesised to occur secondary to molecular mimicry [17,18]. Miller Fisher syndrome, a variant of GBS, has been described in a 50-year-old COVID-19 patient who presented with vertical diplopia and ataxia, postulated to result from immune-mediated injury [19]. Cranial nerve palsies including third nerve palsies have notably been described by Belghmaidi et al., who report a pupil-sparing third nerve palsy in a 24-year-old patient with concurrent COVID-19 infection. Laboratory investigations and imaging revealed no underlying structural cause for the oculomotor nerve injury. One hypothesis is that the expression of ACE-2 receptors in nerve cells can explain the neurotropic effect of the virus, which may enter the nervous system through the cribriform lamina [20].

## Conclusion

The most common ocular complications observed with COVID-19 are eye pain, redness and conjunctivitis. Although there is evidence of SARS-CoV-2 viral RNA in ocular fluid, the infectious potential and risk of transmission remain uncertain. Retinal and neuro-ophthalmic disease have also been reported in numerous case studies. However, it is unclear in many of these studies whether the SARS CoV-2 virus is responsible for these ocular manifestations. Further studies to explore the underlying pathological processes are required.

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## TAKE HOME MESSAGE

- Most common ocular manifestations of COVID-19 are eye pain, redness, conjunctivitis.
- SARS CoV-2 viral RNA has been found in ocular fluid but infectious potential is uncertain.
- Retinal microangiopathy has been observed in some patients following COVID-19 infection.
- Neuro-ophthalmic manifestations such as optic neuritis and cranial nerve palsies have been reported but underlying pathogenesis is unknown.

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