

# **The Novel Coronavirus: Implications of a Global Pandemic on the Practice of Ophthalmology**

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The year 2020 has thus far been dominated by the meteoric rise of the novel coronavirus, COVID-19. Multiple lifestyle changes including work from home orders and social distancing have become the new normal as the world attempts to grapple with the uncertainty resulting from this pandemic. COVID-19's impact has been far reaching, disrupting many facets of daily life for people all across the world. Nearly every industry has been required to modify its practice by adopting stricter safety recommendations. Providing quality healthcare in concordance with these guidelines has proved to be a challenge. Ophthalmology has faced unique barriers resulting from COVID-19 due to the **proximity and duration of the exam required, diversity and volume of patient encounters, as well as unclear ocular manifestations of the virus**. This review article aims to summarize recent literature pertaining to the epidemiology of COVID-19, ocular manifestations of the virus, and information on continued safe practice.

## **Epidemiology**

According to data collected by the CDC, as of **December 2020 there have been over 16 million cases of coronavirus in the United States alone, resulting in over 300,000 reported deaths. Worldwide case numbers stand at a staggering 70 million with over 1.5 million documented deaths (CDC, 2020)**. During these uncertain times, hospitals and private practices alike are innovating new methods to keep both employees and patients safe. Ophthalmology finds itself in a unique occupational hazard due to the proximity of its exams (Seah, et al. 2020). Dr. Li Wenliang, an ophthalmologist practicing in China, was one of the first providers to alert Chinese government officials to the dangers of COVID-19 before tragically contracting and succumbing to the illness in March of 2020 (Kuo, et al. 2020). It remains paramount that ophthalmologists stay up to date with the most current safety recommendations as well as heed the appropriate precautionary measures.

## **Ocular Manifestations**

Despite the severe pulmonary manifestations of the novel coronavirus, studies on ocular involvement demonstrate limited disease burden at this time. Research performed in the Hubei Province of China illustrated that approximately one third of confirmed positive COVID-19 patients show ocular symptoms, these including conjunctivitis, hyperemia, chemosis, epiphora, and increased secretions (Wu, et al. 2020). Few case reports in the literature have demonstrated ocular findings such as conjunctivitis as the presenting symptom of COVID-19, causing concern due to the non-specific nature of the presentation (Ozturker, et al. 2020). Per the most recent reviews, there have been no reports of severe ophthalmic manifestations such as corneal scarring, viral keratitis, or conjunctivitis resulting in pseudo-membrane formation associated with COVID-19 infection (Hu, et al. 2020). More visually threatening conditions including retinitis, anterior uveitis, and optic neuritis have been observed in animal models causing speculation regarding the virus' pathogenic mechanisms (Seah and Agrawal 2020). **Although preliminary**

human studies do not demonstrate severe ophthalmological sequelae upon initial infection, long-term effects remain to be seen. Patients may require long term monitoring for inflammatory conditions that have not been identified in the acute setting of the disease.

Potential routes of viral transmission continue to be a cause of concern for both patients and providers alike. Well-studied routes of transmission include respiratory droplets and indirect contact. A study performed in South Korea showed that surfaces contaminated with MERS-CoV tested positive via PCR even 5 days after contact with a virus positive patient (Bin et al.) Current data remains unclear as to the prevalence of coronavirus positive PCR within ocular secretions and the rate of ocular transmission in documented COVID-19 positive patients. Xia et al. reported a case series of 30 patients with confirmed positive coronavirus in which conjunctival secretions were collected for reverse-transcription PCR (RT-PCR) assay. Results demonstrated that the tears and ocular secretions of COVID positive patients showing symptoms of conjunctivitis were also PCR assay positive. Conversely, the study confirmed COVID positive patients without findings of conjunctivitis did not show evidence of viral shedding within their ocular secretions (Xia, J et al. 2020). Seah et al. discussed the potential mechanism of ocular involvement including routes such as direct inoculation via aerosolized droplets, hematogenous spread via the lacrimal gland, and migration from the nasopharynx (Seah and Agrawal 2020). Due to the unclear rate of ocular transmission, strict adherence to safe practice guidelines remains essential.

### **Clinical and Surgical Practice Management**

While some degree of human contact is inevitable, there are many precautionary measures clinics can take to reduce the risk of viral transmission. First, triaging for symptoms of COVID-19 prior to the visit is critical and should be applied to every patient in anticipation of their arrival (Borrelli, et al. 2020; Lai, et al. 2020; Yu, et al. 2020). Body-temperature measurement has also been recommended as an objective screening tool in addition to the patient history (Romano, et al. 2020). Entrances to the clinic must be minimized, and triage of patients should take place prior to their entry. During the triage process, patients should be asked about contacts with people positive for COVID-19, recent travel outside the country, and symptoms including fever, dry cough, dyspnea, sore throat, runny nose, myalgia, fatigue, headache, diarrhea, loss of smell, loss of taste, and nausea (Cao, et al. 2020; Hopkins, et al. 2020; Mao, et al. 2020; Walker, et al. 2020). Some practices have additionally reduced the number of in-clinic visits with adherence to strict timelines in order to prevent multiple patients accumulating in the waiting room (Lai et al. 2020).

## **Personal Protective Equipment (PPE)**

Ophthalmic professionals come in contact with many patients each day and their effort toward reducing the spread of the virus remains essential. Surgical facemasks should be mandatory for physicians, staff members, and patients in all ophthalmologic clinics (Gharebaghi, et al. 2020). Frequent hand washing with alcohol-based hand rubs or with soap and water for at least 20 seconds should also be practiced (CDC 2019). Furthermore, full PPE including caps, gowns, N95 respirators, and eye goggles should be worn when seeing confirmed COVID patients, seeing persons under investigation (PUIs) or performing any surgical procedure (Gharebaghi, et al. 2020). Protective breath shields attached to slit lamps have also been shown to offer some preventative benefit (Wan, et al. 2020). Various slit lamp companies carry such attachments or alternatively, comprehensive instructions can be found online enabling providers to make their own shields (Wan, et al. 2020). **In addition to standard PPE, many ophthalmologists regularly perform aerosolizing procedures, which may warrant a higher level of protection than merely droplet precaution (Koshy and Dickie 2020; Wong et al. 2020). Droplets are classically defined as aqueous bodies larger than 5 microns and are a common mode for transmission of viruses. Aerosols by contrast are much smaller and can travel on air currents for hours causing them to be far more infectious.**

## **Ophthalmic Instrument and Environment Disinfection**

Many ophthalmic instruments either come in close proximity to or directly contact the eye. Instruments that directly contact the patients' conjunctival mucosal surface include the eye-lid speculum, tonometers, and ultrasound probes. Instruments that come in close proximity include optical coherence tomography scanners, slit-lamps, direct ophthalmoscopes, fundus cameras and corneal topographers. Disinfection of these instruments can be achieved with 75% ethanol or hydrogen peroxide immersion or wipes (Chan, et al. 2006; Rutala 1996). Any device that comes in contact with mucosal membranes should be disinfected after every use while the rest should be disinfected at least daily (Chan, et al. 2006; Rutala 1996). Routine thorough cleaning of waiting rooms and patient gatherings should be advised. **Attention should also be paid to proper ventilation of patient areas with adequate air filtration and turnover directed at minimizing respiratory transmission (Nazarenko et al. 2020).**

**As a last measure, tele-health should be considered whenever feasible and reasonable. Many ophthalmology practices have had great success implementing virtual visits, and using telehealth**

devices and smartphone applications easily accessible to patients (Ansell, et al. 2020; Fatehi, et al. 2020; Ghazala, et al. 2020; Kalavar, et al. 2020; Saleem, et al. 2020). Despite recent advances, this technology has proven of limited benefit in older population particularly those who suffer from poor vision (Fatehi, et al. 2020).

### **Treatment Recommendations**

Currently, there are no compelling studies that show that COVID-19 associated conjunctivitis should be treated differently than the most common type of adenoviral conjunctivitis. Standard treatments are supportive, addressing patient comfort measures with lubricants and cold compresses. A vast majority of cases will resolve without any treatment, although in refractory circumstances topical antibiotics can be considered to prevent secondary bacterial infection. Certain antivirals such as umefenovir, lopenavir, and ritonavir have been investigated during the pandemic but show no clear benefit in reducing ocular symptoms (Tsai et al. 2020). As with anyone experiencing symptoms due to COVID-19, the patient should be asked to quarantine prior to arranging a visit with their ophthalmologist. Telephone screening can be a useful tool for differentiating between an urgent and a non-urgent issue.

### **Conclusions**

From an ophthalmology perspective, the disease burden of the novel coronavirus appears to be mild in comparison with other organ systems. Relatively few patients with confirmed COVID-19 positive status demonstrate ocular symptoms, and in such cases the manifestations have not thus far been visually significant. Conjunctivitis remains the primary finding associated with infection but in rare cases symptoms may include hyperemia, chemosis, and increased tearing. Current data is not conclusive in determining levels of infectivity and rates of transmission via ocular secretions. Due to the uncertain nature of ocular transmission, strict adherence to safety guidelines should be followed in all circumstances. Safe practice guidelines include proper donning of personal protective equipment, proper cleaning of ophthalmic equipment, and thorough screening and triage prior to appointment times. Treatment of ocular symptoms related to COVID-19 has mostly been supportive in nature, trying to address patient comfort. Few antivirals and antibiotics have been investigated without clear benefit in relieving the most frequent manifestation of conjunctivitis. Safety guidelines pertaining to clinical practice continue to evolve as practitioners adapt to the new normal of providing healthcare under the burden of a global pandemic. With continued efforts focusing on reduction of transmission, we strive toward the goal of offering safe quality ophthalmological care.

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