

Perspective on Intraocular Surgeries in the Era of Coronavirus Disease-19

The era of Coronavirus disease-19 (COVID-19) has introduced unique challenges for surgical ophthalmic intervention in minimizing infection risk, yet still identifying patients who are at high risk of losing vision. Unquestionably, reducing the risk of exposure by postponing critical vision-saving procedures is not an option as such practice might pose patients to irreversible loss of vision.^[1-9]

Undeniably, protecting surgeon's and scrub nurse personal occupational safety while bearing the responsibility of providing optimal surgical eye care services, although challenging, it should not be bargained neither compromised as it is their basic right as health-care providers as well as it limits the spread of hospital-acquired viral transmission and outbreak.^[10-13]

To address these challenges, it seems logical to first address the question of whether viral infection can be transmitted in the setting of ophthalmic surgeries, what substantial changes were made by prominent societal ophthalmology groups, and what the future might hold for us in terms of surgical practice and new technology.

The virus is mainly transmitted human-to-human through direct contact with secretions from an infected person or inhalation of droplets containing severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) produced by cough, sneeze, or breath.^[14-16]

Currently, it seems that the virus infectivity and pathogenicity in ocular tissue is uncertain. Yu Jun *et al.* reported failure in identifying the virus in confirmed COVID-19 patient's tears in repeated culture or polymerase chain reaction testing over 7–20 days after the initial onset of symptoms.^[17] On the other hand, Chen *et al.* reported that SARS-CoV-2 can cause follicular conjunctivitis 13 days' postonset of infection and they speculate that conjunctivitis might have a short clinical course in comparison to systemic illness as their finding showed that the viral load decrease over the 5-day course of conjunctivitis accompanied by improvement of ocular symptoms.^[18] The previously claimed possibility of systemic infection through ocular tissues seems extremely uncertain, because SARS-Cov2 needs two epithelial receptors, which cannot be found in the conjunctiva but only in the cornea.^[19] Therefore, the virus has only been rarely isolated in the tear fluid from

symptomatic patients (5.2%).^[20,21] Besides, conjunctivitis can be the only presenting sign and symptom of COVID-19.^[22] Moreover, severe manifestations where a high infectious load may be prevalent, are rare.^[23,24] Likewise, intraocular involvement seems to be extremely rare.^[25] All these facts would emphasize the very low probability of infectious agents being spread from the eye itself during any type of ophthalmic surgery.

Although predominantly droplet and direct contact are identified as the main route of transmission, aerosols, tiny droplets with <10 µm size, can carry a possible risk of transmission if inhaled deeply in the respiratory system as they can travel a longer distance and suspend longer time in the air in comparison to typical droplets.^[16,26]

This has urged researches to investigate whether aerosol-generating procedures (AGP) are safe and which procedure carries the most risk.

Harding *et al.* reviewed several articles on that matter and concluded that there is a significant knowledge gap in evidence of SARS-CoV-2 mode of transmission in relation to AGP use safety. Several procedures were considered as high-risk such as cardiopulmonary resuscitation, preintubation ventilation, tracheostomy, and bronchoscopy. However, none of these procedures have strong evidence to support an association with increased SARS-CoV-2 transmission. Only previous viruses, such as SARS and H1N1, have been associated with the risk of infection with endotracheal intubation. With this uncertainty, it is crucial to educate healthcare workers about the knowledge gap and increase their awareness about this novel virus to ensure their safety and provide proper personal protective equipment (PPE).^[27]

When it comes to ophthalmic procedure, there is no concrete evidence on whether phacoemulsification and pars plana vitrectomy (PPV) can generate aerosols, neither its role on SARS-CoV-2 transmission and pathogenicity. However, instead, published simulations with an attempt to model aerosol generation during phacoemulsification and vitrectomy probe observing ultrasound energy and tip oscillation using video recording. For example, Bristol Eye Hospital showed a series of experiments describing the aerosol produced during phacoemulsification and concluded that aerosols formation is possible and may be produced from the

anterior chamber. They followed that by suggestions to make phacoemulsification safe during COVID-19 that included using 2.2 mm or smaller corneal incisions.^[28] Other authors described their simulation finding and reported that a 23 g vitrectomy probe at 6000 cpm did not show droplet or visible aerosol generation.^[29]

Thus, despite the lack of substantial evidence, several prominent global societal ophthalmic groups and researches have voiced their outlook on possible ophthalmic AGP to err on the side of caution during ambiguity.

These groups, including the Royal College of Ophthalmologists, the British and Eire Association of Vitreoretinal Surgeons, the European Society of Retina Specialists, the American Society of Retinal Specialist, and the American Academy of Ophthalmology, are in consensus in terms of surgical precautions and specific recommendations specific pertaining to ophthalmic procedures. These guidelines are outlined in their respective official websites. They comprise; reducing surgical volume, prioritizing and limiting surgical intervention to emergency cases that might affect vision irreversibly, avoiding general anesthesia and intubation, minimizing staff presence, and potential use of additional surgical drapes to minimize aerosol transmission. Proper PPE to protect surgeons and scrub nurses includes; filtering face piece-3 or N95 masks, face shield protection (preferably partial face shield or swim/chemistry goggles to facilitate better closer binocular vision to surgeons), gloves and gowns, and feet protection. Finally, if feasible, some institutes would do preadmission swabbing and temperature check to avoid costly preventive measures in low-incidence areas.^[30-32]

Furthermore, this pandemic has changed our ophthalmic practice in many ways. Despite the barriers, the current trend has made telemedicine the new norm. We believe, by limiting in-person visits to investigations (orthoptic assessment, biometry, optical coherence tomography retinal scan, and visual field) and combining it with video-based presurgery consultation to discuss the results and surgical plan and booking with the patient will help in reducing the number of contacts for clinician and patient – and the time spent in clinic waiting areas.^[33,34]

Other changes in practice worth considering include exploring other less used surgical options such as pneumatic retinopexy. This procedure limits the duration of contact with patients and eliminates the need for admission, thus offering a safer and effective option. In our experience, we performed pneumatic retinopexy successfully on two confirmed COVID-19 cases needing only two encounters, which lasted <20 min compared to

significantly longer encounters required in a typical PPV or scleral buckle procedure.

Additional measures to deem, such as utilizing three-dimensional (3D) heads up display viewing system, will be of value as it compromises longer working distance compared to an average optical microscope. However, using a standard face shield prevents the formation of a 3D image. Therefore, we suggest the use of smaller protective goggles with an anti-fog film that can be worn under the 3D glasses as this will allow the surgeon to work at a safer distance from the surgical field without the restrictions of the face shield.^[35,36]

To conclude, the era of COVID-19 is an overwhelming, challenging period of uncertainty for ophthalmic surgeons. Although equipment supply might be limited according to different institutes and countries and PPE use is required to be rationalized appropriately to allow limited resources to be channeled to necessary high-risk areas of work. Furthermore, despite the lack of evidence on whether or not ophthalmic procedures should be considered AGP. It does not alter the fact that these procedures still carry a risk of transmission from aerosol generation involving the nasopharyngeal mucosa, such as coughing, sneezing, talking, and intubation. Thus, it became essential to modify PPE priorities, in no overwhelming approach, to ensure that proper PPE is provided to surgeons and scrub nurses to protect their safety and rights and limit the spread of hospital-acquired outbreaks. Consequently, robust precautionary practice will alleviate surgeons' anxiety, prevent any possible future psychological impact during this pandemic, and subsequently reflect on surgeons' performance, and warrant optimal eye care services. Finally, since our practice involves nonstop evolving technology, it is worth looking into their role during such challenging times, such as the implementation of telemedicine, such as presurgery consultation, in the patient's journey, and the use of 3D heads up display systems. Overall, these challenges that we were subjected to should prepare us better for future pandemics.

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