



Review Article

Ophthalmological practices in COVID times

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ABSTRACT

The COVID 19 pandemic has brought about a change in the lifestyle of one and all with the healthcare workers being no exception. The objective of this review is to discuss the problems faced during the COVID19 pandemic especially by the ophthalmological community owing to the close contact with the patient during examination which is inevitable. The text has been written after a thorough literature search of articles on Pubmed using relevant keywords. It discusses and brings forth the ways of ophthalmological practices to minimize the risk of exposure being followed across the world as laid down by the ophthalmological societies of various countries and regions. The importance of social distancing and the role of tele-ophthalmology which formed the cornerstone of treatment during this hour of crisis has also been discussed.

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1. Introduction

A recent change in the way of living of the human race has been witnessed with the emergence of the global outbreak of influenza-like illness caused by the novel Coronavirus. It was first isolated and identified in patients who were exposed to a seafood market in Wuhan City, Hubei Province, China in December 2019. The Coronavirus disease (COVID 19) was declared a public health emergency by the World Health Organisation on 30th January 2020.

This disease is caused by highly contagious ribonucleic acid (RNA) viruses termed Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV 2) with the tremendous capability of survival, attributed to its rapid mutation rates as compared to deoxyribonucleic acid (DNA) viruses. The genome codes for at least four main structural proteins; spike (S), membrane (M), envelope (E), nucleocapsid (N), and other proteins that aid the replicative process and facilitates entry into cells.^{1,2}

Patients carrying the virus could be asymptomatic or show flu-like symptoms after an average incubation of 5 days. Manifestation includes high fever, dry cough, anosmia, ageusia, and shortness of breath before advancing to serious pneumonia where 15 to 20% of patients require hospitalization and up to 5% necessitate ICU admission. Apart from the respiratory tract, the Coronavirus seems to affect the gastrointestinal tract and ocular tissues. Reports of red-eye, eyelid erythema, foreign body sensation, and conjunctivitis have been there. Of greater concern are reports of cases of CRAO and optics neuritis in some patients.

The overall case fatality rate (CFR) of COVID-19 is around 6.36%, which is less only than that of SARS (9.6%) and Middle East Respiratory Syndrome (MERS) (34.4%). Nonetheless, with a mean basic reproduction number (R₀), estimated to be approximately 2.35 (95% confidence interval: 1.15 – 4.77), it has higher infectivity and transmissibility than both Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV) (R₀¹ 0.95) and the Middle East Respiratory Syndrome Coronavirus (MERS-CoV) (R₀¹ 0.91). Droplets, close contact, and aerosols are

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the most common routes of COVID-19 transmission.^{3,4}

2. Lessons Learned from the Past

“Those who cannot remember the past are condemned to repeat it”. George Santayana (A famous philosopher)

The earliest record of an infectious ophthalmological disease (trachoma) dates back to 8000 BC in Australia. In the present context of the Coronavirus disease, scientists and researchers throughout the world are trying to leave no stone unturned to understand its implications, transmissibility, and management. The outbreak of SARS in 2003 in China and more recently Ebola virus epidemic between 2013 and 2016 in West Africa, provides insight into the importance of ophthalmological routes of transmission of such viral diseases and complications involved therein.

Loon et al had demonstrated the presence of viral RNA in tears of positive SARS patients during the early phase of the illness, raising concerns as a possible source of transmission. Conjunctival injection, subconjunctival hemorrhage, and vision loss of nuclear origin were seen in Ebola. Survivors are suffering from an entity known as “Post-Ebola Virus disease syndrome” and around 13 to 34% of the patients complained of visual symptoms. These observations have definitely laid emphasis on the ocular routes of transmission in such diseases.⁴

3. Covid and Ophthalmology

Dr. Wenliang Li, a Chinese Ophthalmologist who is considered to be the whistle-blower of the spread of Covid-19, died after contracting the disease while treating an infected glaucoma patient.⁵ His death raised major concerns about the risk of transmission to ophthalmologists. A recent report by Lu and colleagues suggested that ocular surfaces may be a potential source of SARS-CoV-2 induced disease transmissions and that ophthalmologists are highly prone to get infected. Several factors which predispose ophthalmologist to a higher risk than other healthcare workers in OPD (Outpatient Department) settings include:

1. COVID-19 is mainly transmitted via droplets or aerosolized particles. Droplets from a cough or sneeze can be propelled to 6 meters.
2. Distance between the doctor and patient during slit-lamp examination is between 20 to 30 cm.
3. Formation of aerosolized particles has been observed by some with the use of a non-contact air puff tonometer which is routinely used in ophthalmic OPD.
4. The anatomical vicinity of the eye and respiratory tract is also responsible for increased risk of exposure more so in procedures like syringing and nasal endoscopy.
5. ACE-2 (Angiotensin Converting Enzyme) receptors facilitate entry of the coronavirus into the host cell. In eyes, it is expressed in aqueous humor, cornea, and conjunctiva.

6. Patients might be presenting with deceiving symptoms. In a prospective contact tracing study in China, the first symptom of a 22-year old index patient of COVID-19 was itchy eyes. In another study, which included 534 Covid-19 confirmed patients 25 (4.68%) had conjunctival congestion and among them, 3 patients had it as the first symptom.^{1,5}

4. Adapting to the Change and Optimizing Eye Care

4.1. Personal level

The proximity between doctor and patient during an ophthalmological examination mandates the use of Personal Protective Equipment (PPE) for all cases regardless of COVID 19 status. Hand hygiene measures and the use of gloves, N95 masks, goggles, and gowns are of utmost importance for personal safety. Patients should be requested to refrain from talking during the slit lamp examination and efforts should be made to reduce the time spent in each examination.

4.2. Environment control

Various ophthalmological societies of the world have recommended the use of breath shields on slit lamp which is a plastic barrier between the doctor and patient during the examination. Disinfection of the slit lamp and other frequently touched objects in the OPD should be performed after each patient examination. The CDC (Centre for Disease Control and Prevention) recommends the use of alcohol solutions with at least 70% alcohol or freshly prepared 1% sodium hypochlorite solution as a disinfectant. The importance of air ventilation in waiting areas has also been stressed upon in a study by Lai et al.⁵ The waiting areas are being decongested and intercoms or call notifications on phones are being used to call each patient for examination.

4.3. Triaging

Children <10 years and elderly >65 years have been discouraged from visiting the hospital unless they are patients themselves. Telephonic triaging is being practiced, and only those patients who require emergent ophthalmic check-ups are being called to the hospital. Triaging should be able to segregate the patients into those who are suspects or positive cases and require urgent ophthalmological consultation or those who are not at risk of COVID 19 infection and require urgent attention. Cases that do not require urgent examination are being dealt with through telemedicine or deferred till the crisis resolves. If urgent then they should be examined in a separate room with PPE and the patient also wearing a mask.¹

4.4. Administrative front

Doctors and nurses are being divided into small fixed teams that work separately and in different shifts as much as possible. This measure was undertaken to prevent cases of infected coronavirus staff member exposing other colleagues to coronavirus and the need, as a result, for isolating large numbers of staff members. Academic and administrative meetings and lectures are being conducted by online applications. Face-to-face meetings or lectures stand cancelled.

4.5. Opting for tele-ophthalmology

The use of telemedicine in ophthalmology was first described in 1999 by HK Li, where he has elaborated how this new tool might profoundly alter the practice of ophthalmic telemedicine. Consultation through phone calls, messages, video calls, or e-mails are being encouraged for patients requiring or seeking ophthalmic advice. In this era, where social distancing has become a norm, many governments across various countries are encouraging telemedicine practices. The role of artificial intelligence is being explored continuously in various sub-specialties and is proving to be a boon today. The use of mobile apps for visual acuity and perimetry, home monitoring of intraocular pressure (IOP) using finger tension, and metamorphopsia using Amsler grid are being encouraged. Drug dosage modification can be done during teleconsultation. While going all technology-dependent, we must not forget the consent of the patient for receiving treatment through the same platform.¹

5. Recommendations for Patient Care in Outpatient Services

5.1. Pediatric ophthalmology

Wherever possible telemedicine has been used for general screening for amblyopia, refraction, and motility disorders. Web-based applications are being used for recording visual acuity at home. Parents are requested to make videos of basic eye movements at home for follow-up in post strabismus surgical patients. Patients under 8-years old who have cataract, premature babies for ROP screening, patients with active uveitis and glaucoma, as well as recent post-operative cases are being seen in the clinic. Urgent cataract surgeries in younger children, retinal procedures, and trauma-related surgeries are being performed with due support from an efficient anaesthesia team.

5.2. Neuro-ophthalmology

A recent study had demonstrated that an expert and experienced neuro-ophthalmologist could correctly diagnose 88% of new cases based on history alone. Many aspects of the physical examination of such cases can be

performed through photographs and videos that patients can take with their smartphones. Anisocoria can be assessed by asking the patient to photograph their eyes in dim and bright light. Strabismus and nystagmus can be assessed using videos. Digital fundus photography can help diagnose both optic disc oedema and optic atrophy tele-medically. Optical coherence tomography (OCT) can alternatively be for the imaging of optic disc and has even been shown to be more sensitive than direct ophthalmoscopy in the diagnosis of optic disc abnormalities. Any requirements of urgent hospital consultation can be judged during a tele-ophthalmology consultation and a patient can be advised accordingly.

5.3. Retina

The maximum number of patients in this sub-speciality are those who are considered to be high-risk cases for COVID 19 (elderly and patients with comorbidities). The advent of OCT has been a tremendous boon for this group of patients as contact can be minimized and yet the treatment and follow-up can be continued based on OCT findings especially in patient with diabetic retinopathy or other retinal vascular disorders. Anti-vascular endothelial growth factor (VEGF) therapy are being provided under a modified regimen.

5.4. Cornea

COVID 19 has been shown to cause ocular surface diseases like conjunctivitis and hence examination at the slit lamp of a patient with complaints of redness, watering, and discharge from the eyes must be carried out with utmost care. Teleconsultation using smartphone-based pictures of eyes wherever feasible should be done. Urgent cases that need to be examined in the clinic include active keratitis of any sort, corneal ulcers, corneal perforation or melt, corneal graft rejection, and foreign bodies that necessitate removal. Corneal infections are largely managed empirically; corneal scrapings are performed only in cases with atypical features and that too with utmost care.

5.5. Uvea

Deferring non-urgent conditions or if feasible giving telemedicine consultation should always be considered first as this group of patients are also mostly those with an immunocompromised status and hence at an increased risk for contracting the coronavirus disease. Urgent cases that require clinic visits are those having active posterior or panuveitis or active uveitic complications, such as an inflammatory choroidal neovascular membrane or cystoid macular edema. The aims of these visits are first to assess and treat the sight-threatening uveitic conditions or complications, and second to provide patients with a long-term treatment protocol.

5.6. Optometry

SARS-CoV-2 has been reported to be potentially transmitted through the mucous membranes of the eye and enters the tears through droplets, which may pass through the nasolacrimal ducts and into the respiratory tract. These facts raise concerns concerning fitting contact lenses and using trial sets particularly if the virus remains on the surface of the lens, even for several days. To minimize the risk of staff and patient infection, the contact lens and refraction clinics were kept to a minimum, like doing biometry tests for urgent surgeries.

5.7. Cataract

Due to the interruption of the surgical procedures to a great extent, the backlog of surgeries has increased. Wherever possible local anesthesia is being used for surgical procedures. Emergency cataract surgeries are indicated in cases of phacomorphic glaucoma, phacolytic glaucoma, and penetrating ocular trauma. Telemedicine may be used to follow up patients who underwent cataract surgery. Web-based applications can be used for visual acuity determination. This follow-up method enabled ophthalmologists to monitor postoperative recovery and identify complications as early as possible.

5.8. Glaucoma

Due to the potential risk of infection by using reusable eye equipment such as the Goldmann applanation tonometer, interventions were confined only to urgent and emergent cases, including primary and secondary acute angle-closure glaucoma, and primary and secondary open-angle glaucoma with uncontrolled IOP that is sight-threatening. Also various reports suggested that the use of non-contact tonometer or pneumotonometer lead to aerosol generation and had the potential for increased risk for infection hence should be used judiciously. For screening and monitoring purposes, parameters were taken into consideration in assessing glaucoma. To minimize interactions, parameters like IOP, corneal thickness, anterior chamber depth and morphology, optic disc appearance, retinal nerve fiber layer (RNFL) thickness, and the current visual field map, were measured remotely, by trained technicians, and sent to the treating physician, skipping patient-physician encounters. Recent introduction of the SITA Faster strategy for perimetry decreases the patient-examiner interaction time further as compared to previous strategies in use. Tele-glaucoma is used to follow up non-urgent cases with instructions about treatment, especially for IOP-lowering therapy.

5.9. Ocular oncology

Cortiula and colleagues stated that patients with advanced disease and no suggestive symptoms of COVID-19 should

keep receiving planned chemotherapy or radiotherapy treatment, without unnecessary delays. The operating room was open to treating these patients, and specifically for examinations under anesthesia and treatment of children with retinoblastoma. On the other hand, appointments of patients who were followed for nevi for an extended period can be postponed. Treatments of ocular malignancies do not affect patients' immune systems and should not put them at risk for COVID-19. The exception is children with active retinoblastoma requiring intra-arterial chemotherapy as it has been known to cause neutropenia in 1.2%–37.9% of patients.

5.10. Oculoplasty

After an initial triage by telephone, non-urgent cases are given the option to undergo a telemedicine consultation or to delay their visit. Patients are also given the option to email a preliminary photo of their eyelid lesion, blood test results, eyelid malposition, and all other relevant documentation before the consultation. Live video calls can also aid the practitioner as well as the patient. Consultations with other subspecialties as well as multidisciplinary clinics should be done using online applications.⁵

6. Recommendations for Patient Care in Surgical Procedures

Surgeries must be done in day-care unless the medical conditions or the Government of India (GoI) rules (e.g., for plaque brachytherapy) strictly mandate admission. All procedures and surgery on a COVID-19 positive patient are being deferred until the patient recovers unless deferral of treatment has a potential risk for loss of vision, eye, and life. If a procedure or a surgery is mandated, it is preferably being performed in a multispecialty hospital approved by the GoI for COVID-19 treatment and all the HCW involved in the procedure/surgery should have full PPE and possibly COVID vaccine prophylaxis. A dedicated COVID-19 operating room (OR) is being used to control the spread of the disease – all nonessential materials are removed, a negative pressure anteroom with separate access for donning/doffing of PPE is established; and a separate instrument trolley. Positive ventilation should be stopped at least during the surgical procedure as far as possible and for a minimum of 20 minutes after that. Air Handling Units (AHU) with increased fresh air exchange should be established. If a patient requires general anesthesia, a dedicated COVID-19 anesthetist team will perform the procedure. To avoid unnecessary delay in surgical time surgeries on such patients are being performed by experienced surgeons. As far as possible general anesthesia should be avoided as it has the risk of generating aerosols during extubation. Topical anesthesia should be preferred over local anesthesia wherever possible.

The shortest possible surgical procedure should be chosen for any particular indication. The number of staff in the OR should be kept at a minimum to reduce the risk of exposure. No two patients should be there in the OR at any single point of time and a minimum of a 20-minute gap should be ensured between the entry and exit of two patients. The standard protocol for the disinfection of or should be followed.⁶

7. The role of Testing Patients before any Surgical Procedure

The patients undergoing surgery may be pre-symptomatic or asymptomatic COVID-19 cases. The reported transmission efficiency of an asymptomatic carrier is one-third of that of symptomatic cases. Real-time reverse transcriptase-polymerase chain reaction (RT-PCR) of the nasopharyngeal swab is thus recommended before the intervention, especially in procedures involving aerosol generation. However, the probability of detection of SARS-CoV-2 nucleotide by RT-PCR peaks on day 3 of symptoms, and the sensitivity in asymptomatic cases is not known. An asymptomatic healthy patient undergoing elective ophthalmic surgery could be a source of COVID-19 transmission to the health care workers. Hence various studies in literature recommend that RT-PCR for COVID should form a part of the standard operating protocol, before all ophthalmic procedures.⁷

8. Conclusion

“Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so that we may fear less.”

The above statement by Madame Marie Curie makes the most sense in the current COVID 19 pandemic context. Ophthalmologists are definitely at greater risk when compared to other health care professionals owing to the close contact with patients during the examination. This being a fact, our responsibility for patient care should not be undermined. As a result of the relentless efforts of many scientists and research scholars across the globe, we have been making constant progress in our understanding of the virus, its transmissibility, manifestations, and treatment modalities. Various studies and research papers have elucidated the method of triaging and use of PPE and other protective measures which has helped the health care professionals fighting the virus upfront. With advent of vaccine prophylaxis against COVID 19, though we have

an armour to fight against it, but we still need to keep our guards on. Till the crisis is over, and we have a definite cure for the disease, we can continue to take the help of artificial intelligence and telemedicine along with face-to-face patient-doctor interaction, to continue our contribution towards patient care which is of utmost importance. Together, let us make a difference.

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10. Conflict of Interest

The authors declare that there is no conflict of interest.

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