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Editorial

Changes in the Clinical Practice of Ophthalmology during the Coronavirus Disease 2019 (COVID-19) Outbreak: an Experience from Daegu, Korea

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The world has been hit hard by the coronavirus disease 2019 (COVID-19) pandemic. Korea experienced a surge of patients because of a mass infection in an obscure religious group in Daegu. With our experience from hospitals in Daegu, the epicenter of the COVID-19 outbreak in Korea, we suggest the strategies that should be followed in order to reduce the transmission and assess the risk in the field of ophthalmology.

TRANSMISSION OF SEVERE ACUTE RESPIRATORY SYNDROME CORONAVIRUS 2 (SARS-CoV-2)

We are still learning about how SARS-CoV-2 spreads. The virus is mainly transmitted person-to-person, particularly among those who are in close contact with one another within approximately 6 feet. Moreover, it may be possible that a person contract COVID-19 by touching a surface that has the virus on it and then touching their own mouth, nose, or possibly their eyes.

Some evidence suggests transmission through the eyes. Dr. Guangfa Wang, a pneumonia expert, was infected by SARS-CoV-2 during inspection in Wuhan. Despite being fully equipped, except for goggles, he was infected by the virus and developed unilateral conjunctivitis as the first symptom [1]. Since his report, the possibility of infection through the eyes emerged, and healthcare workers have been urged to use eye protection.

The virus is known to bind to human angiotensin-enzyme II (ACE2) as a cell entry receptor to invade the respiratory and lung epithelium. ACE2 is mainly expressed in posterior tissues and aqueous humor of the eye, while its expression in the conjunctiva has not been established. However, in an experiment, monkeys were infected with SARS-CoV-2 via conjunctiva [2]. Seven days after inoculation, the virus was detected in the pharynx and lung. These results showed that the conjunctiva is a relatively independent transmission route. A possible transmission route includes the conjunctiva as a direct inoculation site, the migration of upper respiratory tract infection through the nasolacrimal duct, or even hematogenous infection of the lacrimal gland [3].

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EVIDENCE OF OCULAR MANIFESTATIONS

Recent studies reported that 12 of 38 patients with COVID-19 (31.6%) had ocular manifestations consistent with conjunctivitis, conjunctival hyperemia, chemosis, epiphora, and increased secretions [4]. Further, an additional study reported that blood–retinal barrier breakdown occurred after an intravitreal injection of CoV in mice [5]. It can produce a wide spectrum of ocular manifestations from anterior segment pathologies to sight-threatening conditions, such as retinitis and optic neuritis.

RISKS OF CoVID-19 TO OPHTHALMOLOGISTS AND PATIENTS

Due to close contact during examination, frequent exposure to tears and ocular discharge, and the inevitable sharing of equipment, ophthalmologists and patients are at a higher risk of SARS-CoV-2 infection. Furthermore, most ophthalmic clinics are crowded and have high patient volume, particularly for the elderly people. An outbreak in the ophthalmology department has been reported in Norway [6].

RECOMMENDED PROTOCOLS IN OUTPATIENT CLINIC

To prevent the transmission of COVID-19 in clinics, we follow steps based on three levels of control measures: administrative control, environmental control, and the use of personal protective equipment (PPE).

1. Administrative control

It is important to reduce the number of attendance to reduce the risk of exposure to COVID-19. We text people requesting delay of appointments and arrange drug-refill. Non-emergency operations are suspended, and only one entrance is opened. Triage processes are applied at the main entrance. To all visitors, the following questions are asked: (1) Have you travelled abroad in the last 14 days? (2) Have you had contact with someone diagnosed or suspected with COVID-19? (3) Do you have cough or shortness of breath? All visitors undergo temperature screening (suspect if >37.8°C). If any of the aforementioned conditions are met, the patient is masked, isolated, and instructed to visit the COVID-19 screening center for reverse transcription polymerase chain reaction. A triage station is also set up at the entrance of the eye clinic. All visitors including healthcare workers are screened using infra-red thermometers before entering the clinic. If a self-prepared mask is not sufficiently protective, we provide a suitable one. All patients with fever are advised to visit the screening center. If the test result is positive, the procedures vary depending on the urgency of the eye condition (**Table 1**). Patients with emergency eye conditions are evaluated under infection control team. If their eye conditions are non-urgent, we consult the infection control team and postpone the ophthalmic appointment. Patients who have fever but negative test results postpone the appointment or attend the clinic. Afebrile patients are asked to fill-out questionnaires for screening. If they meet any of the criteria, they are instructed to visit the screening center. Patients who do not meet any of them are recommended to postpone their appointment or attend the clinic as they want.

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Table 1. Outline of patient stratification based on risk assessment and disease severity

	Low risk	Medium risk	High risk
Retina			
Medical	• Mild to NPDR • Stable treated PDR • Stable RVO • Chronic CSC • Dry AMD	• New onset macular edema (diabetic macular edema, macular edema secondary to RVO, postoperative macular edema) • Stable uveitis with prolonged treatment	• Active PDR • New onset CRVO • Cases requiring continuous intravitreal injections (for Wet AMD, secondary CNV, diabetic macular edema, macular edema secondary to RVO) • Newly diagnosed uveitis
Surgery	• Routine surgery could be delayed based on risk assessment	• Routine postoperative follow up	• Acute Endophthalmitis • Retinal tear • Treatment of retinal detachment • IOFB • Penetrating injuries
Glaucoma			
Medical	• Routine IOP check • Routine visual field exam • Ocular hypertension • Stable glaucoma with no progression for 2 years	• Cases required to change medication for adequate IOP	• Acute angle closure glaucoma • IOP>30mmHg due to uveitis or neovascular glaucoma • High risk vision loss in last eye
Surgery	• Routine surgery could be delayed based on risk assessment	• Routine postoperative follow up	• Glaucoma surgery for medically uncontrolled IOP
Cornea			
Medical	• Blepharitis • Dry eye syndrome • Drug induced or metabolic keratopathies	• Abrasion • Foreign bodies • Recurrent erosion syndrome	• Corneal graft rejection • Corneal ulcer • Corneal trauma
Surgery	• Laser refractive surgery • Pterygium • Routine surgery could be delayed based on risk assessment	• Routine postoperative follow up	• Tectonic keratoplaty (for corneal perforation, thinning)
Oculoplastics			
Medical	• Mild to moderate TED • Benign periocular tumors • Eyelid malposition	• Moderate to severe TED • Recurrent dacryocystitis, canaliculitis	• Severe TED • Orbital inflammatory disease (cellulitis, abscess, dacryocystitis) • Orbital vascular abnormalities • Orbital trauma (eyelid or canalicular laceration, wall fracture)
Surgery	• Routine surgery could be delayed based on risk assessment	• Routine postoperative follow up	• Sight-threatening condition for the above
Strabismus Neuro-ophthalmology			
Medical	• Routine follow up	• Amblyopia	• Acute optic neuropathies • Acute onset diplopia
Surgery	• All strabismus surgery can be delayed	• Routine postoperative follow up	• Optic nerve sheath fenestration

NPDR, severe non-proliferative diabetic retinopathy; PDR, proliferative diabetic retinopathy; RVO, retinal vein occlusion; CSC, central serous chorioretinopathy; AMD, age-related macular degeneration; CRVO, central retinal vein occlusion; CNV, choroidal neovascularization; IOFB, intraocular foreign body; IOP, intraocular pressure; TED, thyroid eye disease.

2. Environmental control

Environmental control is important to prevent the spread through infectious droplets. Air ventilation and surface disinfection have been enhanced. Patients should stay at least 1.5 m apart from one another and wear their masks all the time. Keeping one doctor and one patient in one room is required, except for visually impaired patients, patients with communication or mobility difficulties, and parents of small children. Furthermore, the number of tests has been minimized. A recent study emphasized on the importance of surface disinfection, referring to the virus survival time depending on the surface material [7]. The estimated median half-life of SARS-CoV-2 is approximately 6 h on stainless steel and 7 h on plastic. Cleaning with sodium hypochlorite at 0.1% and 70% ethanol can be useful

[8]. Disinfection of shared equipment is also important. The best option is a non-contact tonometer to check pressure. We have installed protective shields on slit lamps. Other shared equipment, such as the B-scan probe and contact lenses for photocoagulation, are also sterilized. Inevitable surgeries should preferably be performed under local anesthesia and not general anesthesia, which has an aerosol-generating nature. All patients should undergo the COVID-19 rapid test 1 day before surgery or on the same day even if they are asymptomatic. Temperature measuring is repeated at the operation room entrance. To reduce the exposure time, all patients should wear a mask in the waiting room. When preparing for surgery, all patients are taped to the nose with surgical cloths to reduce the spread of droplets.

3. Use of personal protective equipment

The use of PPE could further reduce the risk of exposure of healthcare workers to infectious droplets. Gowns, gloves, masks, and eye protection are recommended if any triage questionnaires are met with a criterion. Strict hand hygiene and wearing an appropriate mask also contributes to reducing the spread of the virus. Our commonly used Korea filter (KF) 94 maskhas been tested to filter out 94% of 0.4 μm paraffin oil and 0.6 μm sodium chloride, so it has a relatively large effect of blocking liquid micro particles, including the virus [9]. It is recommended to use a mask rated higher than KF94 if a procedure is planned that will result in aerosolized virus.

We hope our experience with SARS-CoV-2 can contribute to protecting the lives of ophthalmologists and patients worldwide. Ophthalmic clinical and surgical activities should be reorganized into different levels of dedicated precautions based on risk assessment and disease severity. An evidence-based management protocol should be established according to clinical settings.

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