

Beware of 2019-nCoV Transmission through the Ocular Surface

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Abstract

Coronaviruses are a large family of viruses. Many of them infect animals, but some coronaviruses from animals can evolve (change) into a new human coronavirus that can spread from person-to-person [1]. The 2019-nCoV has sparked global concern. In the ophthalmology practice, healthcare workers may be particularly susceptible to these infections. Diseases from coronaviruses in people typically cause illness, like the common cold. Some, like the SARS or MERS viruses, cause serious infections like pneumonia such as fever, shortness of breath, cough and conjunctivitis. Numerous respiratory viruses, of both human and zoonotic origins, are capable of using the eye as both a site of virus replication as well as a portal of entry to mount a productive respiratory infection. In the ophthalmology practice, healthcare workers may be particularly susceptible to these infections for ophthalmologists are extremely reliant on physical examination during patient consultation. Of particular concern is the proximity between the patient and ophthalmologist during the slit lamp microscope examination. This represents a crucial need for further development of disinfection and personal protective equipment protocols for the ophthalmology clinic. All ophthalmologists examining suspected cases should wear protective eyewear.

Keywords: *Coronavirus; 2019-nCoV; Ocular Transmission; Ophthalmologists; Prevention*

Introduction

Coronaviruses are a large family of viruses. Many of them infect animals, but some coronaviruses from animals can evolve (change) into a new human coronavirus that can spread from person-to-person [1]. The 2019-nCoV has sparked global concern regarding the likelihood of the epidemic turning out like the 2003 Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV), where more than 8000 people were infected with high mortalities Healthcare workers represented 20% of the infected [2]. The origin of the virus is not clear yet. Physiologically, a recent study confirmed that Angiotensin Converting Enzyme 2 (ACE 2), a membrane exopeptidase, is the receptor used by 2019-nCoV for entry into the human cells [3].

These viruses transmit primarily through droplets and other bodily secretions. In the ophthalmology practice, healthcare workers may be particularly susceptible to these infections [4].

The objective of this review is to inform people especially colleagues about the ocular transmission of 2019-nCoV which is recently baptised Covid-19.

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Symptoms of infection by coronavirus

Diseases from coronaviruses in people typically cause mild to moderate illness, like the common cold. Some, like the SARS or MERS viruses, cause serious infections like pneumonia such as fever, shortness of breath, cough and conjunctivitis which can appear between 2 and 14 days after being exposed to the virus. In addition, according to a paper published in *The Lancet*, patients can transmit the virus even before experiencing symptoms [1,5].

How do coronaviruses contaminate the eye?

A review of ocular tropism of respiratory viruses concluded, "It is evident that numerous respiratory viruses, of both human and zoonotic origins, are capable of using the eye as both a site of virus replication as well as a portal of entry to mount a productive respiratory infection" [6]. This route of infection may occur when a respiratory virus contained in a droplet or smaller particle is deposited in the eye and the virus is introduced directly into respiratory tract via the nasolacrimal duct or after replication in the nasolacrimal sac, duct, and/or ocular tissues. Human and avian influenza viruses preferentially bind to alpha 2-3-linked and alpha 2-6-linked sialic acid receptors, respectively. Alpha 2-6-linked sialic acid receptors are predominant in the conjunctival and corneal epithelia, whereas the nasolacrimal system contains both alpha 2-3-linked and alpha 2-6-linked sialic acid receptors [7]. Loon., *et al.* highlighted that Tear samples from three probable SARS patients (37.5%) yielded positive PCR results. The majority of patients were healthcare workers and female nurses who had the virus detected only in her tears by current PCR kits [8].

Recently Wang., *et al.* underscored that sixteen healthcare workers are reported to have been infected in Wuhan in connection with this outbreak, many from the same healthcare facility [9]. They even assumed that these healthcare workers did not have other exposure and that these are cases of healthcare-associated infections Risk of infection for healthcare staff involved in aerosol-generating procedures without appropriate personal protection equipment (PPE) is considered high [10]. Infectious droplets and body fluids can easily contaminate the human conjunctival epithelium [11]. Respiratory viruses are capable of inducing ocular complications in infected patients, which then leads to respiratory infection [6]. Severe acute respiratory syndrome coronavirus (SARS-CoV) is predominantly transmitted through direct or indirect contact with mucous membranes in the eyes, mouth, or nose [12]. The fact that exposed mucous membranes and unprotected eyes increased the risk of SARS-CoV transmission suggests that exposure of unprotected eyes to 2019-nCoV could cause acute respiratory infection [6].

How ophthalmologists could be contaminated?

These viruses transmit primarily through droplets and other bodily secretions. In the ophthalmology practice, healthcare workers may be particularly susceptible to these infections. Firstly, ophthalmologists are extremely reliant on physical examination during patient consultation. Of particular concern is the proximity between the patient and ophthalmologist during the slit lamp microscope examination [13].

It has been found that droplets from a cough or sneeze can be propelled for up to 6m [4], a range that definitely encompasses the distance between the patient and ophthalmologist. Secondly, during the SARS-CoV epidemic, clinical reports have suggested tears as a medium of infection. In a case series by Loon., *et al.* it was shown that viral RNA of the SARS-CoV can be detected by reverse-transcription polymerase chain reaction (RT-PCR) from the tears of infected individuals [8]. To illustrate this, on January 22, 2020, Guangfa Wang, a member of the national expert panel on pneumonia, reported that he was infected by 2019-nCoV during the inspection. He wore an N95 mask but did not wear anything to protect his eyes. Several days before the onset of pneumonia, Wang complained of redness of the eyes. So, unprotected exposure of the eyes to 2019-nCoV in the Wuhan Fever Clinic might have allowed the virus to infect the body [14].

How do we prevent contamination?

While anecdotal in nature, such accounts highlight the possible infectivity of tears, a fluid which ophthalmologists and instruments come in contact on a daily basis. If true, this represents a crucial need for further development of disinfection and personal protective

equipment (PPE) protocols for the ophthalmology clinic. An emphasis on hand hygiene measures and stocking up of PPE such as N95 masks, gloves, gowns and goggles should also be considered while the mode of transmission is being identified. Decontamination and sterilisation protocols of clinical rooms and equipment should also be improved on as coronaviruses have been found to survive in environments outside the body for a long time [15]. Based on the evidence from the SARS and MERS outbreaks, the likelihood of healthcare-associated transmission following management of a confirmed case is considered low, provided that appropriate IPC measures are implemented for staff, patients and visitors [16]. Specialists must protect their mouth, nose and eyes adequately against the suspicion of a patient presenting this virus. To detect the virus, temperature check appears to be insufficient but conjunctival scrapings should be analysed because the respiratory tract is probably not the only transmission route for 2019-nCoV and all ophthalmologists examining suspected cases should wear protective eyewear [17].

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