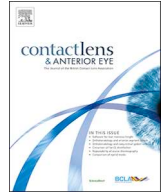




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Editorial

Contact lens practice in the time of COVID-19



It is unfortunately apparent that we are in the middle of an ongoing outbreak of the coronavirus disease that, according the World Health Organization, has now been characterised as a pandemic [1]. It appeared to have started in December 2019 when the first cases of pneumonia of an unknown cause were detected in Wuhan (Hubei, China) [2,3]. This led to a rapid outbreak due to a novel strain of the coronavirus called SARS-CoV-2, which stands for severe acute respiratory syndrome coronavirus 2. The associated disease, now referred as COVID-19, rapidly spread in mainland China and then in the rest of the world with some countries like South Korea, Iran and Italy particularly affected. According to the John Hopkins University dashboard, updated on 12th March 2020, there is an overall worldwide figure of 127748 total confirmed cases, 4717 total deaths and 68305 total recovered [3]. At the time of writing this editorial the figures suggest that COVID-19 infection causes mild disease (i.e. non-pneumonia or mild pneumonia) in about 80 % of cases and most cases recover, 14 % have more severe disease and 6% experience critical illness; the latter being more likely amongst high-risk groups such as the elderly and those with other chronic underlying conditions [4]. Authorities in many countries have improved health measures and in some cases restricted movement and large gatherings of people in order to limit the spread of the virus and prevent an overburdening of hospitals. Italy, was the first country in the world that adopted extraordinary measures on the entire national territory for a period of 2 weeks, such as closures of museums, schools, universities, sports centres and football matches [5]. On 11th March Italy underwent a complete closure of all commercial activities and shops, with some exceptions for goods of primary importance such as pharmacies, grocery stores etc. At the moment the Italian population is being asked to stay at home unless there are important reasons related to work or to make essential purchases such as food and medicines, and other urgent purposes.

Clearly, nosocomial transmission to other patients or hospital staff is an important concern [6]. However, evaluation of the coronavirus outbreak impact on other areas of clinical practice, not only hospital based, should be also addressed. Evaluation for specific health care professionals such as dentists, obstetricians, ophthalmologists have been published [7–10]. Similarly in contact lens (CL) practice, the impact of outbreak is massive because CL practitioners are exposed to the infection and need to consider how they can play a role in preventing the transmission.

According to the US Center for Disease Control and Prevention [11] and the European Centre for Disease Prevention and Control [12], the virus is thought to spread mainly from person-to-person via respiratory droplets transmission: an infected person produces droplets containing viable virus and relays them by sneezing, coughing, or exhaling. The droplets can make contact with the nose, mouth, eyes, or upper respiratory tract of another person through three main important routes

(see Fig. 1) [13]. The first is an airborne transmission in case of close contact between people (within about 6 feet, about 1.8 m). The second is a direct contact transmission as when two people shake their hands and the contaminated hand then touches a risk area on the second person. The last source is an indirect contact transmission where an infected person touches a surface that is then touched by the second person. This latter route is due to the fact that the SARS-CoV-2 (as other coronaviruses) can survive for several hours on inanimate environments (e.g. objects surfaces) [14]. Although this is not considered the main way the virus spreads, it may be possible that a person can get the virus by touching a surface that has the virus on it and then touching own mouth, nose or eyes.

It is currently thought that the virus can be transmitted when people who are infected are symptomatic, but sometimes symptoms are limited and a person may not realise they are infected, so some spreading of the virus might be possible before people show symptoms.

Additionally, of particular concern for ophthalmic practitioners, it should be noted that SARS-CoV-2 has been detected in the tears and conjunctival secretions in COVID-19 patients with conjunctivitis [15]. This cannot exclude transmission by aerosol contact with the conjunctiva.

Unfortunately, CL practice can be particularly exposed to these modalities of transmission. Indeed, CL practice involves face-to-face communication, close examination of the patient (distance between patient and CL practitioner during a slit lamp assessment is approximately 50 cm), need to directly touch patient's eyelids (for example during CL insertion/removal or push up test or lid eversion). Finally, some CL are still fitted using trial sets, which will need to be cleaned thoroughly between patients.

Looking at available evidence in research papers, from the largest authorities in disease control and prevention around the world and from professional associations, there are at least 5 main areas of actions applicable in CL practice to minimise the transmission of COVID-19: *patient management; personal protective equipment; disinfection of CL equipment and CL trial set; hands sanitisation; CL practitioner and staff monitoring.* [9,11,12,14,16–21].

In term of *patient management*, efforts should be made to lower patient attendance to CL practices [9]. Each patient should be contacted by phone or email to explore the possibility of rescheduling non-urgent appointments. In the case of a patient attending an appointment it is important to evaluate the risk that the patient may pose, such as patients who travelled to outbreak areas within 14 days, patients with upper respiratory tract infection (e.g. cough), and patients with conjunctivitis [9,19,21]. If patients are deemed to have increased risk factors then it is more important to postpone the CL appointments for at least 14 days, which is the current understanding of the incubation period of COVID-19 [9]. If someone presents with suspected COVID-19

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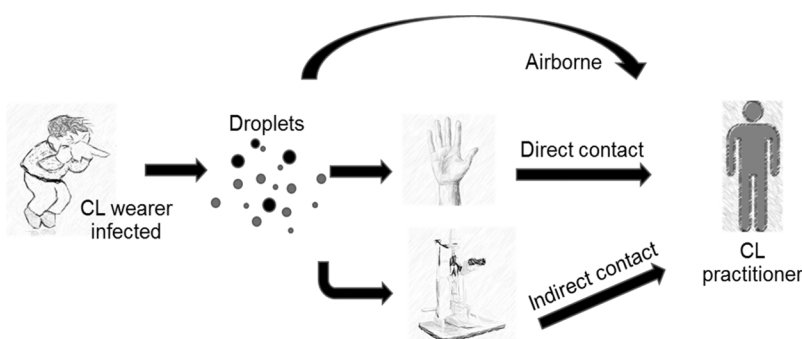


Fig. 1. Sketch of coronavirus transmission routes. There are several routes of transmission: airborne, direct contact, and indirect contact. (Adapted from Otter et al, 2015).

then they should be isolated and Local Health Services must be informed [21]. Consultancy room, waiting areas and shop-floor areas should be always thoroughly cleaned [16,20].

Finally, a safe distance between patients in the waiting room should be assured.

Personal protective equipment such as eye protection (goggles or safety spectacles), water-resistant gloves with long tight-fitting cuffs, and surgical-style face masks (such as an N95 mask) should be adopted to reduce the likelihood of infection via either airborne or direct transmission [13,16,17]. Lai et al. [9], have just published a paper sharing the experience in Hong Kong to minimize COVID-19 infection in Ophthalmology in which they suggest the installation of protective shields on slit lamps (see Fig. 2). Similar advice to this was made in the European Society for Cataract and Refractive Surgery (ESCRS) publication EuroTimes [10].

The third important area in CL practice to minimise the transmission of COVID-19 is the *disinfection of CL equipment and CL trial set*. A thorough cleaning of instruments used in CL practice such as trial frame and ophthalmic lenses, chin rest and head rest (slit lamp, keratometer etc.) can be performed effectively with water and detergent and applying commonly used hospital-level disinfectants (such as sodium hypochlorite, 70 % alcohol or an alternative disinfectant) [14,16]. This

should be done once the patient has left the room. In the case of specialty CL fitting such as RGP in keratoconus, OrthoK, and Scleral, where a trial set of CLs is used, it becomes very important to ensure that CL are disinfected well between patients. In these cases, rigorous infection control measures must be followed when trials lenses are reused [17].

Hand sanitisation must be performed through hand washing, before and after significant contact with any patient, even when gloves are worn [9,17,18]. Hand sanitisation includes cleansing hands with an alcohol-based hand rub or with soap and water or both [15,16,18]. It is important that during patient examination, CL practitioner must avoid touching their own face, nose, mouth and eyes [17]. The message around hygiene should be reinforced to CL patients and they should be reminded to wash hands thoroughly before touching their own eyes and their CLs. Patients should also be reminded to clean their CLs correctly, ensuring full disinfection between usage and not using disposable CLs longer than they are intended. Patients should seek advice if sick and discontinue CL use if they have any malaise.

CL practitioner and staff monitoring. CL practitioners and staff with potential condition of flu-like symptoms should not attending work [17].

This outbreak is evolving rapidly, the impact to the public health risks to be massive with huge economic and social disruption. In the



Fig. 2. A large clear plastic sheet, working as a protective shield, has been cut and placed between the ocular and slit lamp [9,10].

time of coronavirus CL practice may become more difficult. As CL practitioners we have the responsibility to minimise the transmission of COVID-19 in CL practice based on current scientific evidences.

The authors wish to point out that this information was correct at the time of going to press and the situation is likely to have changed when this Editorial is published.

References

- [1] World Health Organization, WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020, (2020) <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19-11-march-2020>.
- [2] World Health Organization, Coronavirus disease (COVID-19) outbreak statement regarding cluster of pneumonia cases in Wuhan, China, (2020) Jan 9. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019> [Accessed 10 March 2020].
- [3] John Hopkins University. Coronavirus COVID-19 Global Cases by the Center for Systems Science and Engineering (CSSE). <https://www.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6> [Accessed 12 March 2020].
- [4] European Centre for Disease Prevention and Control. Daily risk assessment on COVID-19, 9 March 2020. <https://www.ecdc.europa.eu/en/current-risk-assessment-novel-coronavirus-situation> [Accessed 10 March 2020].
- [5] Governo Italiano. Presidenza del Consiglio dei Ministri. Coronavirus, Conte firma il Dpcm 11 marzo 2020, <http://www.governo.it/it/articolo/coronavirus-conte-firma-il-dpcm-11-marzo-2020/14299>. [Accessed 12 March 2020].
- [6] Y.M. Arabi, S. Murthy, S. Webb, COVID-19: a novel coronavirus and a novel challenge for critical care, *Intensive Care Med* (March) (2020), <https://doi.org/10.1007/s00134-020-05955-1> [Epub ahead of print].
- [7] M.S.Q. Chua, J.C.S. Lee, S. Sulaiman, H.K. Tan, From the frontlines of COVID-19 - how prepared are we as obstetricians: a commentary, *BJOG* (March) (2020), <https://doi.org/10.1111/1471-0528.16192> [Epub ahead of print].
- [8] X. Peng, X. Xu, Y. Li, L. Cheng, X. Zhou, B. Ren, Transmission routes of 2019-nCoV and controls in dental practice, *Int J Oral Sci* 12 (March (1)) (2020) 9, <https://doi.org/10.1038/s41368-020-0075-9>.
- [9] T.H.T. Lai, E.W.H. Tang, S.K.Y. Chau, K.S.C. Fung, K.K.W. Li, Stepping up infection control measures in ophthalmology during the novel coronavirus outbreak: an experience from Hong Kong, *Graefes Arch Clin Exp Ophthalmol* (March) (2020), <https://doi.org/10.1007/s00417-020-04641-8> [Epub ahead of print].
- [10] EuroTimes, Coronavirus and ophthalmology: what can ophthalmologists do to protect themselves, staff and patients from COVID-19? (Priscilla Lynch), 11 March (2020) https://www.eurotimes.org/coronavirus-and-ophthalmology/?fbclid=IwAR1ATvYEIC_Tw-WU5PSEEw5ozBFKUQckH0weWtkI_FcuDEpME2yTBbGwfrU.
- [11] US Centre for Disease Control and Prevention. How COVID-19 Spreads. <https://www.cdc.gov/coronavirus/2019-ncov/about/transmission.html> [Accessed 10 March 2020].
- [12] European Centre for Disease Prevention and Control. Q & A on COVID-19. <https://www.ecdc.europa.eu/en/novel-coronavirus-china/questions-answers> [Accessed 10 March 2020].
- [13] J.A. Otter, C. Donskey, S. Yezli, S. Douthwaite, S.D. Goldenberg, D.J. Weber, Transmission of SARS and MERS coronaviruses and influenza virus in healthcare settings: the possible role of dry surface contamination, *J Hosp Infect* 92 (March (3)) (2016) 235–250.
- [14] World Health Organization. Infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected. [https://www.who.int/publications-detail/infection-prevention-and-control-during-health-care-when-novel-coronavirus-\(ncov\)-infection-is-suspected-20200125](https://www.who.int/publications-detail/infection-prevention-and-control-during-health-care-when-novel-coronavirus-(ncov)-infection-is-suspected-20200125) [Accessed 10 March 2020].
- [15] J. Xia, J. Tong, M. Liu, Y. Shen, D. Guo, Evaluation of coronavirus in tears and conjunctival secretions of patients with SARS-CoV-2 infection, *J Med Virol* (2020).
- [16] The Department of Health and Social Care (DHSC) and Public Health England (PHE). COVID-19: infection prevention and control guidance. <https://www.gov.uk/government/publications/wuhan-novelcoronavirus-infection-prevention-and-control> [Accessed 10 March 2020].
- [17] K.Y. Lian, G. Napper, F.J. Stapleton, P.M. Kiely, Infection control guidelines for optometrists 2016, *Clin Exp Optom* 100 (4) (2017) 341–356.
- [18] D. Fonn, L. Jones, Hand hygiene is linked to microbial keratitis and corneal inflammatory events, *Contact Lens Anterior Eye* 42 (2) (2019) 132–135.
- [19] S.S.Y. Tseng, SARS, avian flu, bioterror: infection control awareness for the optometrist, *Clin Exp Optom* 90 (1) (2007) 31–35.
- [20] American Academy of Ophthalmology. Alert: Important coronavirus updates for ophthalmologists. https://www.aao.org/headline/alert-important-coronavirus-context?fbclid=IwAR007nalqI2xEVcHmBo80vx7D30MZM2LFHbM_OZ2cz_DbYUwZHk24azGFII [Accessed 10 March 2020].
- [21] NHS. Novel coronavirus (COVID-19) standard operating procedure Primary care optical settings. <https://www.england.nhs.uk/wp-content/uploads/2020/02/20200305-COVID-19-PRIMARY-CARE-SOP-OPTICAL-PUBLICATION-V1.1.pdf> [Accessed 10 March 2020].

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