



Protection against infection in contact lens practice – preparation for the post-COVID-19 epidemic period

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ABSTRACT

The current state of the pandemic in the world related to COVID-19 disease and the epidemic state introduced in Poland has caused many contact lens practitioners to significantly reduce their clinical activity. We evaluated the risk of infection and analysed the ways of protection against infection in contact lens practice. The

publication presents the principles of protection against infection recommended for contact lens practices before the COVID-19 pandemic, the situation of practice during the pandemic and the ways of preparing for the times after the epidemic state in Poland.

KEY WORDS: infection prevention, COVID-19, contact lens practice.

INTRODUCTION

On March 11, 2020, the World Health Organization (WHO) announced a pandemic due to the spread of the SARS-CoV-2 virus worldwide, which could lead to the development of COVID-19 disease [1]. This disease can be severe, especially among those at risk (older, immunocompromised, with chronic diseases: hypertension, diabetes, cardiovascular diseases) [2].

On March 20, 2020, an epidemic was announced in the Republic of Poland in connection with SARS-CoV-2 virus infections [3]. The said ordinance of the Minister of Health significantly reduced both the movement of people and economic activity in many industries. Despite practices associated with application of contact lenses were not clearly prohibited, many Eye Care Practitioners (ECPs) specialising in contact lenses have decided to reduce the scope of their activities significantly. In making such decisions, they were guided by the recommendations contained in the position of National Consultant for Ophthalmology [4, 5] and in the recommendations of the Polish Ophthalmological Society [6].

The situation related to the spread of SARS-CoV-2 virus poses a significant challenge for the area of knowledge and practice related to contact lenses and requires appropriate preparation for the situation after cancellation of the epidemic and return to regular contact lenses fitting visits. For several months (until the moment immunity is acquired, or the vaccine is used in the majority of the population, or the invention

of an effective drug) [7] the work of a contact lenses specialist will probably require introduction of significant changes in contact with the patient.

EXISTING STANDARDS OF CONDUCT

Procedures developed in the United Kingdom are the role model for many practitioners contact lenses, due to both the extensive experience in contact lens fitting, and the existing detailed procedures (guidelines) in this field. Protection against infection in the contact lens practice is described in detail in “Infection Control” recommendations for specialists published by The College of Optometrist [8]. This publication describes four ways of transmitting microorganisms and the potential risk of infection associated with them in the office:

- direct physical contact – there is a significant risk of infection in the office through direct touch, skin infections or eye infections;
- droplet route (when coughing, sneezing, speaking in close proximity) – there is a significant risk of infection via this route in the office. Microorganism particles measuring 5 µm can travel to a distance of about 1 m – this is often a distance greater than the standard distance between a specialist and the patient while performing procedures in the office;
- contact with body fluids – although the risk of infection with viruses such as human immunodeficiency virus (HIV) or hepatitis C and B virus is low, it is worth remembering

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that tears may contain some more infectious viruses such as adenoviruses. Therefore, this way of transmission should not be overlooked in the procedures of protection against infection in the office;

- the use of sharp contaminated objects such as needles, scalpels, etc. – in the contact lenses fitting office, the risk of infection this way is very low.

Both people and the environment can be the source of infection in the office. All items in direct contact with a specialist or a patient should be disinfected before use or touch. These include an autorefractometer, a slit lamp, trial frames, a phoropter or other devices touched by the patient during a visit. Elements such as door handles, soap dispensers, chairs and other office or waiting room equipment should be disinfected at least once a day [9] (in the era of COVID-19 before and after each patient, at least 1 time per hour). Diagnostic contact lenses should be disinfected in accordance with their manufacturer's instructions.

A special aspect is the use of reusable diagnostic contact lenses, both soft and rigid. Soft contact lenses should be cleaned immediately after removing (20 s on each side) and then rinsed abundantly with saline. Then soft contact lenses should be thermally disinfected or autoclaved [10].

Rigid gas permeable (RGP) diagnostic contact lenses require a different approach. After removing RGP lenses from the eye, they should be immediately rinsed with sterile saline (30 s) and cleaned with the RGP lens cleaner (20 s on each side) and rinsed again in sterile saline (30 s). Then the lenses should be placed for at least 3 hours in a solution containing 3% hydrogen peroxide [10] or for 10 min in a solution containing 1% sodium hypochlorite [8]. Then RGP lenses should be stored dry after rinsing (10 min) and drying. For all reusable trial lenses, we should keep a register with data of the patient to whom the lenses were applied, the date of use and the method of disinfection, and a signed informed consent form [8, 10]. In addition, the manufacturer's recommendations regarding the maximum use of the diagnostic lens (the number of adjustments made with one lens) and expiration date from opening the package should be always followed [10].

The standard approach is based on the assumption that all employees and patients are a potential source of infection, therefore everyone should apply basic hygiene principles in the office.

The problem of hand hygiene is worth a closer discussion here, because, as current research among healthcare personnel indicates, this procedure is very often overlooked. On average only 38.7% of employees follow hand hygiene rules [11]. The answers most frequently cited by healthcare professionals to the question why do not they wash their hands before and after each procedure are: "it's not comfortable", "I don't have time for it", "I don't need to wash my hands" [12]. The problem related to improper hand hygiene in health care facilities is so important that every year on May 5th the day "SAVE LIVES: Clean Your Hands" is celebrated [13], on which promotional campaigns on hand hygiene are targeted at healthcare professionals. In addition, every year in October, "Global

Handwashing Day" is celebrated, to remind the whole society about the importance of washing hands [14].

WHO recommendations set out the indications and the correct way of both washing and disinfecting hands in healthcare [11]. Washing hands with soap and water should be carried out: in the event of visible dirt, staining (e.g. with body fluids), after using the toilet and after suspected or confirmed contact with sporulating organisms. In other cases, if your hands are not visibly dirty and alcohol-based rubbing preparations are available, they are recommended. Hand disinfection is recommended, among others, before and after contact with the patient, after contact with body fluids, secretions, mucous membranes, and after contact with surfaces from the patient's environment, as well as after taking off disposable protective gloves. In addition, using soap and alcohol-based disinfectants at the same time is not recommended. Washing hands with soap and water should take 40 to 60 s, during which all surfaces should be washed from the wrist to the metacarpus, between the fingers and fingertips. After washing, hands should be rinsed with water and dried with a disposable towel. It is worth recalling here that electric dryers (both those with hot and cold air blasts) are unsuitable in healthcare facilities. Studies have shown that electric dryers can be a source of microorganisms and disperse them over a distance of 1.5 m [15, 16]. The procedure for rubbing hands with an alcohol-based disinfectant should last between 20 and 30 s [11].

In addition, hands should be washed and dried before inserting and after removing contact lenses from the patient's eye [8]. Healthcare professionals should not have extended or excessively long fingernails [11].

PROCEDURES DURING THE SARS-CoV-2 EPIDEMIC

The SARS-CoV-2 virus particle is an about 70-90 nm particle [17]. It is present both in larger drops (> 5 µm) ejected, e.g. during coughing and probably in small particles (< 5 µm) of aerosol ejected when speaking or breathing [18]. Small aerosol particles can persist in the air for up to 3 hours [19]. Although the position of scientists regarding the possibility of SARS-CoV-2 infection through viral particles present in expired air is not clear, the potential risk of such transmission significantly affects the work of a contact lens practitioners [18].

Shortly after the announcement of the pandemic associated with the spread of SARS-CoV-2 coronavirus, scientific publications on contact lenses during the pandemic period appeared [20, 21]. Their authors identified both potential pathways for coronavirus transmission during the routine contact lens fitting process and ways to reduce the risk of infection. F. Zeri and S. Naroo identified three basic ways of infection in the contact lenses specialist's office and how to protect against infection (Table I) [13].

Tear film may be another potential route for coronavirus transmission. Three studies have been published so far. Their authors checked the presence of SARS-CoV-2 virus in the tear film. In the first study [22] tear film and conjunctival secre-

Table I. Basic routes of coronavirus infection transmission in the contact lenses fitting office and methods of protection against the infection

Infection routes	Means of protection
Direct contact (touching the patient's eyelids during examination and contact lens fitting)	– Use of disposable protective gloves, washing and disinfecting hands before and after each procedure (also before putting on and removing protective gloves)
Indirect contact (touching surfaces that the patient touches, e.g. slit lamp components)	– Surface disinfection after each patient visit – Avoid touching your face, eyes, nose or mouth during the examination – Contact with eyes and contact lenses by both the patient and the specialist only after washing and drying the hands with <u>disposable paper towel</u>
Contact through the air (when coughing, sneezing, speaking or breathing)	– Use of face masks – Use protective shields on slit lamps – Use of the breathing etiquette, including "cough hygiene" (by the patient and specialist)

tions were taken from 30 patients with COVID-19 (including 7 patients with severe disease). Only one of the examined patients had symptoms of conjunctivitis. A positive result for the presence of coronavirus was obtained only in samples from the patient with conjunctivitis. The authors of this study showed that it is possible to detect SARS-CoV-2 virus in the tear film and on the conjunctiva in patients with conjunctivitis. Another study [23], conducted on 17 patients with COVID-19 did not show the presence of SARS-CoV-2 virus in tear film samples. None of the patients studied had symptoms of conjunctivitis. On this basis, it can be concluded that the risk of SARS-CoV-2 coronavirus infection through a tear film is very low. Further research is required to determine the risk of coronavirus infection through a tear film (i.e., a pathway that is relevant when contact lens fitting or anterior segment examination). Special attention should be paid to patients with symptoms of conjunctivitis, which may be one of the symptoms of COVID-19, especially in patients with more severe disease [24].

Another aspect that should be considered when discussing the risk of SARS-CoV-2 infection is the recommendations of the European Centre for Disease Prevention and Control (ECDC). This is an independent agency of the European Union that has published recommendations for healthcare professionals on COVID-19 [25]. This document contains the definition of low risk exposure, defined, inter alia, as contact:

- direct (face-to-face), distance less than 2 m from a patient with COVID-19, for the time shorter than 15 min,
- in close distance to a patient with COVID-19 for the time shorter than 15 min,
- of a healthcare professional managing a COVID-19 patient and using Personal Protective Equipment (PPE).

During contact lens fitting, the ECP usually stays less than 2 m from the patient, so there is no way to eliminate the direct contact. The only modifiable risk factors are contact time and the use of appropriate PPE. It is worth emphasizing here that the low-risk exposure time (15 min) was chosen arbitrarily for practical purposes.

In addition, opinions of the Polish Ophthalmological Society and the National Consultant for Ophthalmology should also be taken into account. According to them, before the visit it is necessary to perform a triage procedure in order to de-

termine both the urgency of the visit, the risk of SARS-CoV-2 infection and the choice of procedure [4, 6]. The following PPE should be available: disposable apron, protective masks (surgical, FFP2, FFP3), goggles, visors and gloves. These measures should only be used at the place of performance of examination procedures and should be changed after each patient. In addition, it is extremely important to properly remove and use the PPE, and to wash and disinfect hands after taking it off [26].

PROCEDURES AFTER CANCELLATION OF THE SARS-CoV-2 EPIDEMIC

Numerous pandemic models presented by epidemiologists and other researchers show that we will probably have to consider the presence of SARS-CoV-2 virus in the population at least until 2022. Seasonal increases in the number of cases are also possible, until immunity is acquired by the majority of the population (e.g. by vaccinations) or until effective COVID-19 treatment is available [27]. It is therefore important to prepare the contact lenses practice for work after the epidemic is cancelled. We can divide these preparations into those regarding the personnel, the facility, the ECP and the patient. Table II presents basic recommendations for preparing the practice before the patient arrives in the contact lenses practice. Much of the recommendations are based on information from eye care organizations and ECPs from both the areas most affected by the COVID-19 epidemic, such as Italy [28], and those that have defended well against the epidemic (Hong Kong) [29].

Preparing the office for the reception of the patient is a very important element of the practice. Equally important are the rules of conduct for both the patient and the specialist during and after the visit. Examples of suggested recommendations based on available publications and guidelines [11, 20, 21, 30] are presented in Table III.

The above-described principles and recommendations constitute a proposal for contact lens practitioners. Individual modifications will often be necessary due to the specifics of the practice or patients (e.g. fitting contact lenses for infants would usually involve presence of 2 caregivers, as inserting and removing the lens in this group of patients will require active involvement of more than one caregiver).

Table II. Preparation of the personnel, the facility, the specialist and the patient before the visit in the contact lenses fitting office, considering the risk of SARS-CoV-2 coronavirus infection

Personnel	Facility	Specialist	Patient
– Education of the personnel (including the cleaning staff) on hand hygiene and the need for frequent surface disinfection	– Information at the entrance to the facility about the rules implemented in the facility – Information about not approaching the reception desk without being called – Maintaining a distance (preferably 2 m, not less than 1 m) from other people in the waiting room – proper arrangement of seating places in the waiting room can help	– Specialist education – The European Optometry and Optics Council encourages open video training available on the WHO website (www.openwho.org) – Continuous monitoring and compliance with the recommendations of professional organizations and governmental institutions is also recommended	– The patient should come to the appointment with a maximum of 1 accompanying person (if necessary) or guardian
– Education on infection prevention procedures in the facility	– Arrangements for washing and disinfecting hands for patients in the waiting room, access to disposable tissues and a waste bin – Maintenance of breathing etiquette	– Performing epidemiological and optometric/ophthalmological interviews remotely – Individual risk assessment – Patient appointment by age and/or risk group	– The patient should come to the facility on time (not well in advance)
– Self-monitoring, e.g. informing supervisors about flu-like symptoms or other infections	– Protection, e.g. in the form of acrylic glass panels for reception staff	– Use of disinfectants and PPE – gloves, masks, covers, disposable aprons, goggles	– The patient should take a seat in the waiting room within 2 m (or at least 1 m) of other people
– Staff turnover (2 shifts), no direct contact (even in private time) between employees working on different shifts	– Removing all unnecessary items from the waiting room, such as leaflets, newsletters, toys	– Organization of work – time for one patient in the office reduced to 15 min – Interval between visits at least 5 min (but it can be up to 15 min) – Interview and providing recommendations and results of the examination in a remote form (e-visits)	– The patient should be informed in advance about the necessity of conducting the examination within 15 min, with interview and recommendations provided remotely – The patient should be able to send information about the prior treatment/correction history in a secure manner (in relation to transfer and storage of data)
– Ensuring the availability of products for washing and disinfecting hands and other protective means (masks, disposable gloves)	– Instructions on the breathing etiquette (coughing or sneezing only into a disposable handkerchief, which must be immediately thrown into the trash) and on washing and disinfecting hands	– Self-monitoring – if a specialist has elevated temperature, flu-like symptoms should not be in direct contact with patients	– Before entering the office and after leaving it, the patient should wash and disinfect hands (also in gloves) in the waiting room/bathroom – The patient should enter the office in a mask (depending on recommendations)

In addition, the aforementioned distances of 2 m or 1 m between patients in the waiting room have their source in various recommendations for healthcare facilities (European Centre for Disease Prevention and Control – ECDC and WHO, respectively). Probably not in every waiting room the distance of 2 m between patients can be ensured, but if the housing conditions do not allow maintaining a distance of at least 1 m between patients, visits should be scheduled so there would be one patient in the waiting room. In addition, all documentation should be forwarded to the patient by e-mail or online consultation system and payments should be made in electronic form.

CONCLUSIONS

Patient triage before the visit, frequent hand washing, surface disinfection, keeping distance, refraining from speaking during the slit lamp examination, using a protective shield on a slit lamp and using appropriate PPE are now necessary procedures in the optometrist's office. It is extremely important to minimize the time of direct contact with the patient by reducing the time of visit and performing only those examination procedures that are necessary. The use of remote methods of communicating with the patient both before and after the examination may be helpful.

Table III. Rules of conduct in the contact lenses fitting office and after the patient leaves the office in connection with the risk of infection with SARS-CoV-2 coronavirus

	Specialist	Patient
In the office	<ul style="list-style-type: none"> – Washes hands and disinfects hands before and after each procedure (also before putting on and taking off protective gloves) – Disinfects all surfaces that the patient can touch – Procedures such as contactless tonometry are best replaced by other methods that do not generate air flow – Does not touch his face (eyes, mouth, nose) – Longer hair should be tied – Uses PPE (in accordance with current recommendations) and additional protective shields (e.g. for a slit lamp) – Reusable test contact lenses (e.g. RGP) should be disinfected in the office with peroxide solution without neutralization and then with neutralization, alternatively solutions based on sodium hypochlorite can be used 	<ul style="list-style-type: none"> – Washes hands before inserting and removing contact lenses – Does not touch the face (before washing hands) – Follows recommendations of a specialist – Adheres to the rules of the breathing etiquette – Does not speak (does not open mouth) during procedures performed at close range (up to 0.5 m)
After leaving the office	<ul style="list-style-type: none"> – Ventilates the room regularly (if possible) – Disinfects all surfaces touched by the patient – Remotely provides recommendations, informs about the results of the examination and educates the patient (e-visits) – Enables additional remote consultation – Commercial contact lenses are sent directly to the patient – Monitors and implements recommendations issued by state institutions and professional organizations 	<ul style="list-style-type: none"> – Always washes hands before inserting and removing contact lenses – Does not touch his/her face before washing your hands – Adheres to recommendations of the specialist and the manufacturer regarding the care, wearing and replacement of contact lenses – Does not use contact lenses during illness, active infection (both eyes and e.g. upper respiratory tract)

Many of the recommendations presented above are likely to become permanent elements of contact lenses practice. It is good to prepare well for work in changing circumstances, to educate the personnel and patients, and to keep self-educating.

It is possible that some of the recommendations will have to be modified if new scientific evidence regarding SARS-

CoV-2 infection or another unknown pathogen emerges. The experience of the current pandemic is likely to permanently change the way contact lenses specialists work, so that they can ensure top safety for both patients and themselves.

DISCLOSURE

The authors declare no conflict of interest.

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