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DENTAL PRACTICE DURING COVID-19 PANDEMIC: RISKS AND MEASURES

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Abstract

In December 2019, the novel coronavirus was discovered for the first time in Wuhan, China. On the 9th of January 2020, following a fast progression of the infection, the World Health Organization announced the finding to be a novel coronavirus that was named SARS-CoV-2.

Dentistry has a very special working environment that puts it on the top of the lists of hazardous professions. The inherent nature of dental procedures might represent a transmission path for the virus. The spread of the disease can be prevented by taking strict measures before, during and after each dental procedure.

The aim of this review is to shed a light on the possible modes of transmission of COVID-19 infection within the dental clinic. Additionally, the review highlights the necessary measures to keep the dental environment safe to dentists, patients and other personnel.

Keywords: COVID- 19 – SARS-CoV-2 - infection - infection control – disinfection – rubber dam – povidone iodine.

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PRATIQUE DENTAIRE PENDANT LA PANDÉMIE COVID-19 : RISQUES ET MESURES

Résumé

En décembre 2019, le nouveau coronavirus a été découvert pour la première fois à Wuhan, en Chine. Le 9 janvier 2020, à la suite d'une progression rapide de l'infection, l'Organisation mondiale de la santé a annoncé la découverte d'un nouveau coronavirus, nommé SARS-CoV-2.

La pratique de la dentisterie se fait dans un environnement de travail très particulier qui la place en tête des listes des professions dangereuses. La nature inhérente des procédures dentaires qui nécessite un contact étroit et direct entre le médecin, le patient et l'assistant dentaire en plus de la formidable diffusion d'aérosols/postillons alentours qui représente un vecteur véhiculaire de virus sont autant d'éléments contaminants.

La prévention de la propagation de la maladie peut être organisée en étapes séquentielles et qui sont considérées comme une responsabilité conjointe entre les médecins, le personnel dentaire, les responsables et le propriétaire du cabinet dentaire, sans négliger celle incontournable des patients eux-mêmes.

Le coronavirus (COVID 19), comme pour les autres virus, ne doit pas effrayer la communauté sanitaire si des mesures strictes sont prises avant, pendant et après chaque intervention dentaire. Par conséquent, le but de cette revue de la littérature est de faire la lumière sur les modes possibles de transmission de l'infection COVID-19 au sein du cabinet dentaire et d'identifier les mesures nécessaires pour assurer la sécurité de l'environnement dentaire pour le personnel soignant, les patients et toute personne présente à l'intérieur des centres de soins.

Mots-clés : coronavirus – infection – désinfection – povidone iodine.

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Introduction

Coronavirus encompasses a variety of respiratory viruses, which can appear with moderate to extreme symptoms and result in respiratory failure. The name recalls the virus' microscopic appearance, distinguished by the presence of pointy structures on the surface, which resemble a crown [1].

In December 2019, the novel coronavirus was detected in patients with pneumonia of unknown origin, in Wuhan, China. On 9thJanuary 2020, following a fast progression, the World Health Organization announced the finding to be a new coronavirus, first designated 2019-nCoV and then finally named SARS-CoV-2, that has never infected humans before [2].

Dentistry has a very special working environment with a high risk of nosocomial infections. The inherent nature of dental procedures that necessitates close and direct contact between doctor, patient and dental assistant may put all of them at risk of acquiring infections such as COVID- 19. In fact, dentists tend to be at the highest risk of infection due to exposure to saliva, blood and aerosol / droplet generated during most dental procedures, especially that microorganisms may possibly travel great distances from an affected human, with reports of up to 20 miles, and then cause secondary infections elsewhere in the environment [3].

COVID-19 transmission during dental procedures may thus occur by inhalation of aerosols / droplets from an infected person or by close contact with mucous membranes, oral fluids, infected instruments and surfaces. Given the risk of exposure to different working groups, dental professionals remain at the greatest risk for coronavirus disease [4]. Dental clinics that are non-compliant to safety procedures can carry a risk of transmitting infection because of the nature of dental work and close proximity of the operator, assistant and the patient (5).

Therefore, the aim of this review is to address the possible risks of transmission of COVID-19 in dental practice and to shed a light on certain prevention strategies that can be introduced in dental practice.

Modes of transmission of SARS-CoV-2virus

Modes of transmission of COVID-19 are a bit confusing and debatable. While many believe of the major role of the droplets, others thought of the logic explanation of the air borne route in transmitting the infection.

To elucidate the difference between different routes of transmission we should clarify the difference between droplet and aerosols [6].

Aerosols are believed to be a major source of infection transmission because they are actually liquid or solid particles suspended in the air and divided into small and large droplets. The latters are heavy, so they fail to be suspended in the air. They fall toward the floor before they evaporate leading to contamination of the surroundings fomites or inanimate and this leave all surfaces and local environment contaminated with the virus. They may be responsible for the so called droplet/ contact spread [6, 7].

Therefore droplet transmission happens while a person is in close contact with a patient with respiratory problems (e.g. coughing, sneezing or even talking). Thus, people in this environment are at risk of exposure to highly contagious respiratory droplets in their oral and nasal mucosa and eyes [4, 8].

Environmental contamination is due to the transfer of aerosols in a fairly closed area that has been subjected to elevated amounts of aerosols over a long period, as well as to other aerosol-generating situations [9].

The survival of COVID-19 in various areas takes different periods, for example; the virus is viable for up to 72 hours after deployment on plastic and stainless-steel surfaces, up to 24 hours on cardboard surfaces, up to nine hours on copper surfaces, and is viable in suspended aerosols up to three hours [8].

COVID-19 transmission risks in dental practice

Dental clinics represent a supreme environment where a risk of transmission of COVID- 19 infection may occur readily in the absence of meticulous infection control measures.

Aerosols are produced normally while a patient is talking and may increase during coughing and sneezing.

Dental work has a unique feature and many dental procedures may produce tremendous amounts of aerosols and are called aerosol generating procedures.

For an instance, operations on dental patients requiring the use of high-speed handpieces or ultrasonic devices in a dental system may allow their secretions, saliva or blood to disperse the virus in the atmosphere. Transmission can also occur by indirect contact with infected objects, such as handling instruments, accompanied by self-exposure to the eyes, nose, or mouth [10].

Traditional infection control measures that are normally practiced in routine clinical practice would however not be successful enough to avoid the spread of COVID-19, particularly where patients are asymptomatic or during the incubation period [11].

Infection control measures in the sense of patient care, specific safety precautions, and mouth rinses, rubber dam cover, using anti-retracting handpieces, disinfection and waste control should be utilized [12].

Measures for COVID-19 management adopted in dental practice

The WHO defined nosocomial infection "as an infection occurring in a patient during the process of care in a hospital or other healthcare facility, which was not present or incubating at the time of admission" [13].

Most of the studies on cross infection in dentistry focused on the common viral infection such as Herpes simplex virus (HSV), Varicella- Zona virus (VZV), Human immunodeficiency (HIV) and Hepatitis. Other viral cross infection studies are scarce [14].

Pathway of cross infection in dental clinic is multidirectional; the infection can be transmitted from dental personnel to the patient and vice versa. Other way is from contaminated instruments or any surface within the clinic. The last pathway is from patient directly to other patient within the premise [14].

These various methods of transmission of infection within dental setting warrant meticulous infection control measures at different level in clinic.

Accurate infection control measures have long been implemented in practice, including instrument sterilization, equipment disinfection and sterilization, barrier technique, aseptic technique and disinfection of surfaces and premises [15]. These infection control measures are updated regularly to cope with different types of infection.

COVID-19 is an infectious disease that drew great attention all over the world during the last 10 months and was categorized as pandemic in March 2020 [5]. The infection has an incubation period from 2-14 days after exposure to the virus. Unfortunately, some patients may have mild symptoms or may be completely asymptomatic but they still carry the virus. Others may clinically show features such as fever, dry cough, myalgia and other uncommon symptoms such as disturbed taste sensation and diminished magnitude of the smell sense [5].

For ease of understanding the preparedness and measures needed to control the spread of COVID-19, the management process can be divided into three key phases that includes, measures before admission to dental clinic, measures before the start of the procedures and measures regarding dental procedures [11].

Measures before admission to dental clinic

All instructions for infection control such as hand washing, social distancing, respiratory hygiene and cough etiquette should be displayed clearly in the dental clinic in order to enhance and promote infection control [3].

Screening/ pre-screening for COVID- 19 is a very crucial step that determines the following pathway for managing protocol. It is a checklist or questionnaire developed by health authorities specifically for the purpose of screening patients for COVID- 19. This stage can vary from area to area and may be splitted into pre-access and on-site questionnaires.

Pre-access or tele-screening questionnaire is a remote questionnaire with epidemiological questions about COVID-19. It is designed to have a clear response from the patient or the parent is case of children with regard to three pertinent areas: 1) recent history of travel to an area with high level of contamination with COVID- 19; 2) clinical symptoms that might suggest COVID-19; 3) in addition to close contact with a COVID- 19 positive patient. On site screening may involve measuring body temperature. All patients have the right to be treated with equity, justice and to respect their dignity [16].

Successful dental treatment can be postponed for at least two weeks and advice and/or prescription might be given to patients suspected of being positive for COVID- 19 and needing elective therapy.

Conversely, strict infection control measures should be taken for patients who are suspected of COVID- 19 and require immediate dental intervention.

On site screening may involve measuring body temperature using remote tool such as non-contact forehead thermometer or cameras with infra-red thermal sensors.

Other measures to reduce COVID-19 infection spreading include:

-Reducing waiting room crowding by telling people to sit outside (e.g. stay in their cars or in a designated outdoor waiting area). They are called for their appointment in the clinic and limit clinic visitors to only those necessary to the physical or mental well-being and treatment of the patient with the preservation of physical distance as much as possible [16].

-Frequent and proper hand washing using water and soap is the best way to sanitize hands. Availability of hand sanitizers should be a routine in dental clinic and would replace hand washing when there are no facilities for it. Hand sanitizers are of different types; they belong to two main categories: alcohol based and non-alcohol-based hand sensitizers. The first is the most effective and cheaper but carry a risk of skin irritation unlike the non-alcohol based hand sanitizers [17].

Measures before starting of the procedures at the dental clinic

Dental procedures are classified based on the tendency to produce aerosol. Aerosol generating procedures are more dangerous than non-generating ones due to the fact that aerosol droplets may retain the virus for hours inside the room [18].

A recent study collected nasopharyngeal swab and saliva samples simultaneously from patients suspected COVID-19 positive and others diagnosed COVID-19 positive, reported that viral loads in the nasopharyngeal swabs from the group of patients with severe COVID-19 were 60 times higher on average than the viral loads in the swabs of patients with a mild form of the disease [20]. These findings support the hypothesis that there may be a possible relationship between viral load contact and severity of the disease. Therefore, dental aerosolization may pose an additional threat to patients. A need to minimize this is mandatory. This can be done by rinsing with 1.5% peroxide for 60 seconds to reduce biofilm viral load in the mouth thereby reducing viral load and basically disinfecting the throat. Peroxide drops coronavirus replication by >4 logs [19].

Interestingly, recent in vitro studies conducted in Malaysia in 2020 reported that povidone iodine in both undiluted and diluted concentration is effective against SARS-COVID -2. Therefore it is recommended to rinse the mouth before dental procedure to

decrease the viral load by >4-5 log10 [20].

On the other hand, it is very crucial that all personnel within the clinic put on suitable personal protective equipment (PPE). The term PPE describes all protective equipment used to protect the healthcare workers or any other persons to get infected. Typically, this might include the following elements (Fig. 1):

-PPE for eyes: googles, visors.
-PPE for hands: sterile, single-use gloves.
-PPE for the face: masks and respirators.
-PPE for the body: aprons, gowns.

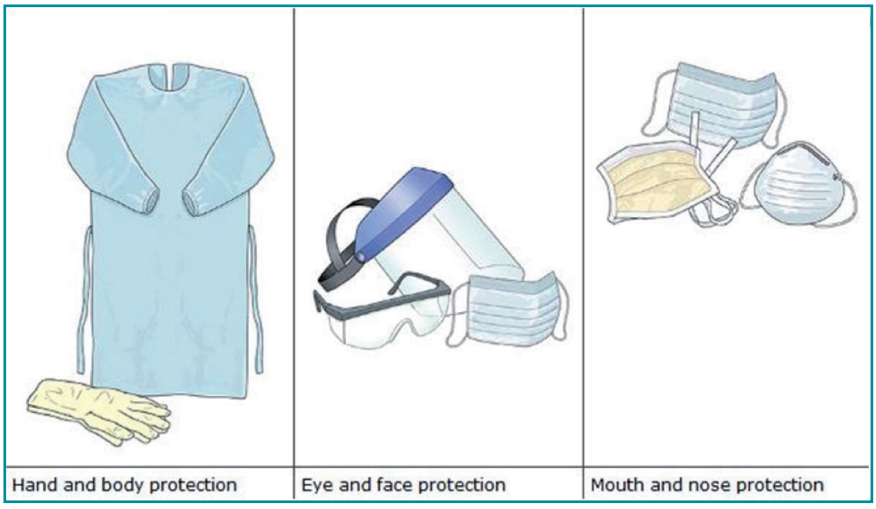

Fig. 1: Personal protective equipment (PPE) that a Healthcare worker use to prevent infection [21].

There are a variety of things to be aware of regarding PPE use. In order to prevent the spread of infection, putting on and removing PPE must be accomplished in a strict order. The following sequences are notified by the NHS England [22]:

*To put on PPE, the order is uniform, apron, mask, eye protection and gloves (Fig. 2).

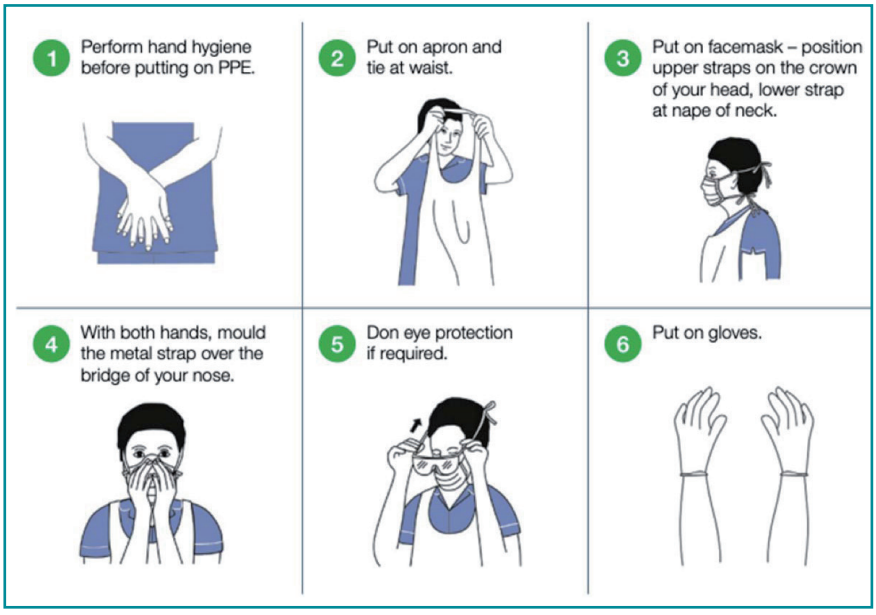

Fig. 2: Illustration for the order of putting on personal protective equipment (PPE). (Public Health England gateway [21]).

For removal of PPE, the order is gloves, apron, eye protection, mask and uniform (Fig. 3) [21].

Some PPEs are mandatory for any dental procedures while other equipment is only needed when performing certain procedures. For instance, all people must put on masks especially inside the clinic. However, selection of surgical mask or respirator depends on the status of the patient and the planned procedure.

Surgical mask usually worn by dental staff is believed to have a filtration rate of 80% while other respirators such as N95 offer approximately 99% filtering [22].

In other fields of medicine with risks of aerosol generation such as tracheal intubation, the WHO recommended the use of respirators such as certified N95 masks whenever possible. In dental procedures that emit aerosols it is also recommended to use high volume aspirator and rubber dam [23].

Eye goggles and face shields are essential for various procedures especially when working on suspected patients or patient who tested positive for COVID-19.

The use of gowns depends largely on the status of the patient and the procedure to be done.

Long sleeved disposable or reusable gown should be changed between patients [21].

However, for the suspected or COVID- 19 positive patients, the consultation should be redirected to teledentistry and elective procedures should be delayed for a period of two weeks. Teledentistry is an innovative approach that replaces direct face to face approach and has been used for a while even before the pandemic of COVID- 19. Although it does not replace the routine dental procedures, it can play a role in other domains. It includes four major sections: consultation, diagnosis, triage and monitoring [24].

In a multicenter study conducted in Germany and France it has been found that teledentistry showed accuracy of

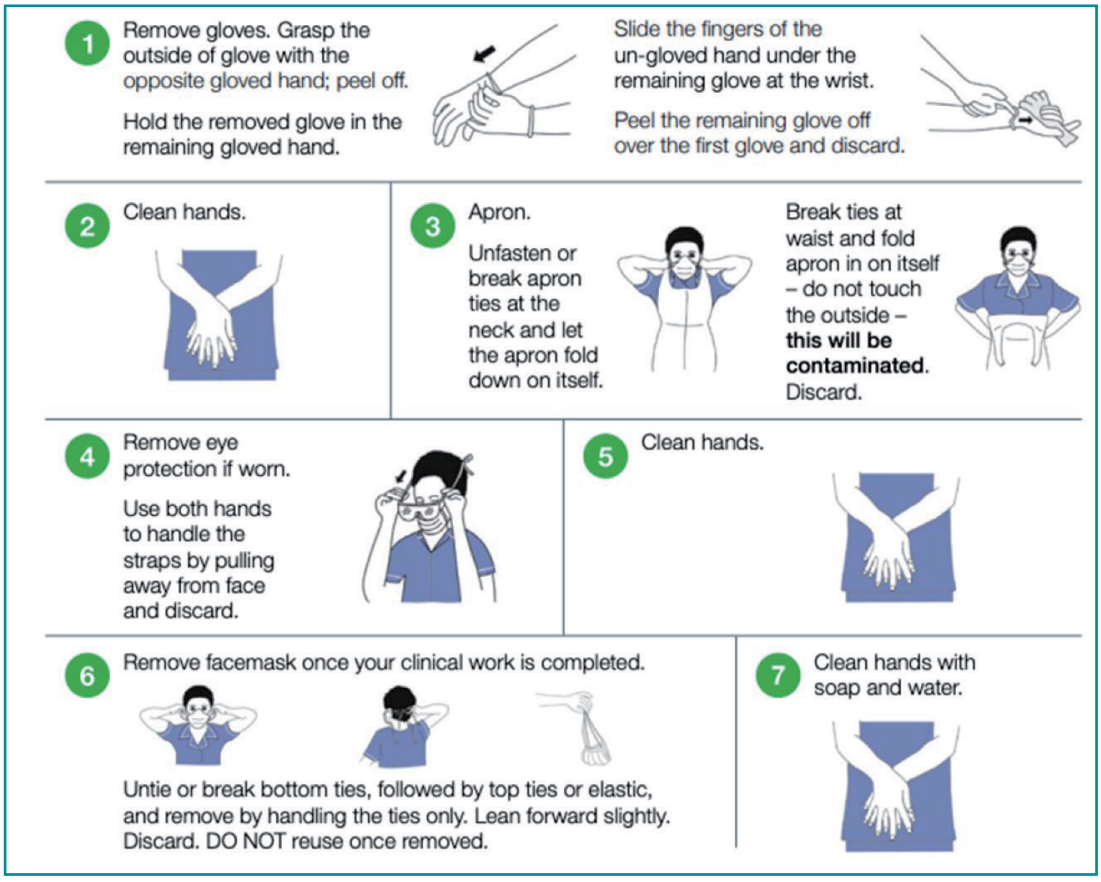

Fig. 3: Illustration for the order of removing of personal protective equipment (PPE). (Public Health England [21]).

diagnosing oral pathologies in older people living in nursing home [25].

Measures regarding dental procedures

Handpieces are often used in cavity preparation during restorative dental procedures. In context of the global situation, anti-retracting dental handpieces with specially designed anti-retracting valves or other anti-reflux designs are strongly recommended in effort to stop cross-contamination since they eliminate the reflux of oral bacteria in the handpiece and dental tubes [12].

For decades, rubber dam has been used to reduce percolation and cavity contamination during some dental procedures [26]. Rubber dam isolation of the operative field whenever possible should be used. It dramatically minimizes the output of polluted aerosol or avoids spills of infected saliva and blood, especially in cases where high-speed handpieces are needed. However, in cases where rubber dam isolation is not possible, one should opt for manual removal of carious tissue by using dentine excavators.

Dental x-rays

As intraoral x-rays induce salivation and coughing during image taking, panoramic radiographs or cone beam computed tomography will take priority. The risk of exposure to high radiation that accompanied these techniques should be out weighted with the benefits to the patient [12, 27].

Measures following dental procedure

Following each dental procedure, it is imperative to disinfect the surfaces, renew the disposable slings and allow for air exchange. Disinfection of all surfaces whether it is a part of dental unit or not is crucial [16].

Conclusion

Dental profession is a unique working environment. Despite the great risk of cross infection, the meticulous and strict infection control measures make it a safe profession.

COVID-19 as for other viruses should not frighten the health community if strict measures are taken before, during and after each dental procedure. Dentists should be aware of the latest approved knowledge of COVID-19 transmission mechanisms and of the recommended dental infection control strategies.

To provide dental treatment in a healthy environment, appropriate maintenance procedures should be enforced to control droplet and aerosol contamination in the dental clinic.

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