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Review Article

Essential Anti-Infective Measures for Periodontal Surgical Operatories during COVID-19 Pandemic: A Periodontist's Perspective

Sharayu R Dhande*

Department of Periodontics, Maharashtra University of Health Sciences, Nashik, Maharashtra, India

ABSTRACT

SARS-CoV-2 is known to cause severe life-threatening respiratory disease. The virus is known to reside in mucous membranes and it is transmitted through aerosols from saliva and the respiratory droplets. As a result, the elective care was deferred in most health care facilities and emergency care was continued vigilantly. Few stringent preventive measures undertaken for combating the brisking nature of coronavirus, have brought changes not only in the COVID outbreak but also the in the epidemiology of periodontal diseases, affecting the regular periodontal surgical practice. Many hospitals have been restructured to provide the best care to COVID patients, periodontists along with other healthcare professionals despite of their original specialties, have been serving COVID patients relentlessly on a regular basis. Therefore, a profound rearrangement of both in-patient and out-patient care. Advanced technologies in disinfection and newer disinfectants should be preferred in order to improve disinfection of surfaces in the dental operatories.

Keywords: Dental operatories; COVID; Periodontal diseases

INTRODUCTION

Coronavirus disease (COVID-19) is a novel severe acute respiratory syndrome. It was first identified in December 2019 in Wuhan, China and has spread to the rest of the world creating a global pandemic [1,2]. On 11th February 2020, the World Health Organization (WHO) Director-General, Dr. Tedros Adhanom Ghebreyesus, named the disease caused by the SARS-CoV-2 as COVID-19, and by March 11th, 2020 when the number of countries involved was 114, with more than 118,000 cases and over 4000 deaths, the WHO declared it as a pandemic. The outbreak was declared as public health emergency in late January [3-7]. Common symptoms at onset of illness were fever, cough, and myalgia; less common symptoms were sputum production, headache, haemoptysis, and diarrhoea, dyspnoea, lymphopenia, abnormal findings on chest CT [8-13].

The standard method of diagnosis is by real time Reverse Transcriptase Polymerase Chain Reaction (rRT-PCR) from a nasopharyngeal swab. Virus-specific nucleic acid sequences were detected in lung fluid, blood and throat swabs [14,15]. Since the emergence of the COVID-19, concerns over viral infection spreading through aerosols and droplets have been expressed in dentistry [16-19]. The infective, transmissible nature of COVID, deficit literature, lack of specific guidelines and the prevailing panic has created new hurdles for the periodontists in managing healthy as well as medically compromised patients [20].

Evidence based guidance can help periodontists to maintain vital functions during out-patient department, adopting to appropriate preventive measures like physical distancing, offering telemedicine to needy, wearing Personal Protective Equipment (PPE) kits during evaluation of each patient, paperless prescriptions, online radiographs and file sharing. Periodontal surgery selection should be prioritized according to the severity such as elective, urgent or emergency [21,22]. Modifying surgical prioritization is paramount to fulfil the needs of the entire healthcare system during the COVID outbreak [23].

The authors thus recommend commencement of periodontal surgical practice amidst the pandemic, and each periodontist to follow Centers for Disease and Prevention Control (CDPC) guidelines while evaluating each patient in out-patient department and also in the before periodontal surgeries. Also lastly, the healthcare workers should be encouraged to follow

Correspondence to: Sharayu R Dhande, Department of Periodontics, Maharashtra University of Health Sciences, Nashik, Maharashtra, India, E-mail: dhandesharn1234@gmail.com

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proper disinfection protocols in the dental operatories to help combat the spread of this life- threatening virus [24-26].

The current pandemic situation has exposed us to the situation, with limitations posed by the shortage of resources both personnel and equipment along with the need to manage periodontal surgeries in a safe manner whilst protecting patients and all other healthcare professionals.

LITERATURE REVIEW

Out-patient department practices amidst the pandemic

In Out-patient Department (OPD) waiting area hand hygiene station should be installed, television screens should be installed to educate the people regarding signs and symptoms of COVID-19, hand hygiene, how to wear mask, maintaining social distancing, prevention and treatment of coronavirus, do's and don'ts and other health education videos. The OPD waiting area should have minimum furniture and instruments and that too should be adequately spaced [27-29].

Stagnation of air should be avoided. It is necessary to convert OPD air conditioner into a non-circulatory system this can be done by blocking off the return air vents of the air conditioner; and placing HEPA Filters in the OPD section as well as in surgical operatories. Exhaust fans should be used everywhere if possible. Installation of separate ac units (window/split) in each room/chamber if possible. Central air conditioning to be avoided, ensure >12 air changes per hour if central air conditioning being used. High Efficiency Particulate Air (HEPA) filters should be installed everywhere in the dental operatories [30].

Patients are therefore requested to go to the appointment without ornaments. At the entrance of the operatory, the patients are advised to wear shoe covers, disinfect the hands with hydroalcoholic solution. If there are several patients in the waiting room, they must be at least two meters away from each other. The correct hand disinfection procedure with hydroalcoholic solution is as follows:

- Apply a squirt of sanitizer in the palm of hand.
- Rub hands palm against each other.
- Rub the back of each hand with the palm of the other hand.
- Rub palms together with your finger interlaced.
- Rub the back of fingers with the opposite palms.
- Rotate thumbs in the other hand.
- Do a circle on palm with finger clasped.
- Once dry, hands are safe.

The same procedure is performed for washing hands with soap and water [31-32].

The cloak rooms in the OPD waiting area should be properly sanitized with 1% hypochlorite solution after every patient visit, and so should the drinking water facility by maintaining adequate social distance. The PPE for sanitary cloak room cleaning preferred is disposable rubber boots, gloves (heavy duty), along with a triple layer mask [33].

The World Health Organization (WHO) defines telemedicine as the delivery of health-care services, where distance is a critical factor, by all health-care professionals using information and communications technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and the continuing education of health-care workers, with the aim of advancing the health of individuals and communities. A telemedicine visit has the advantage that it can be conducted without exposing the staff to COVID, and thus reducing the risks to both health care workers and patients [34-37].

Only 50% OPD rooms should be utilized in a day. Every day when OPD is finished the hall, toilets and rooms should be sanitized with 1:9 dilution of 5% concentrated liquid bleach [38], 1% hypochlorite solution and closed for the next day and the next set of OPD rooms are utilized for the next day. A thorough cleaning should be done twice a day. Fogging is no longer recommended. Gloves and face shields should be disposed of in a red bag and disposable masks, gown, gloves and respirators in a yellow bag after use [39,40].

Spread of COVID-19 infection

Coronavirus has striking feature of cross-species transmission through droplet nuclei, and hence proved hazardous to the mankind. It is presumed to spread directly *via* infectious respiratory droplets of the infected individual or even close contact. Direct or indirect transmission of infected droplet nuclei could pose the host to the risk of developing a viral disease [41-45].

The SARS-CoV-2 is not capable of causing any infection without a carrier [46]. Incubation period of COVID-19 is 2-14 days. Respiratory droplets are produced during coughs, sneezes, airway health procedures, laryngeal intubation, or even by talking. Droplets carry infectious particles directly from the respiratory tract of the infectious agent to host susceptible mucosal surfaces [47].

The size of the droplet has traditionally being defined as >5 μm. The sizes of the droplets determine the maximum distance reached; largest droplets, between 60 and 100 microns, totally evaporate before spontaneously falling 2 m away. For respiratory exhalation flows, the critical factor is the exhalation air velocity: these droplets are carried more than 6 m away by exhaled air at a velocity of 50 m/s (sneezing), more than 2 m away at a velocity of 10 m/s (coughing), and less than 1 m away at a velocity of 1 m/s (breathing) Varia et al. [48] found that with the SARS outbreak that occurred during 2003, the risk of acquiring the droplet-spread virus correlated with the distance to the patient [49].

As a result, viremia in patients with asymptomatic or confirmed positive COVID-19 patients could pose a risk of transmissibility to the entire team of periodontists during Aerosol Generating Procedures (AGP) [50-52].

Infection control measures: Personal protective equipment

Cleaning and disinfection is a critical component of any infection prevention program. Newer products and practices should be taken into consideration for surface disinfection in orthopaedic operatories like inactivation of emerging pathogens (e.g., CRE, C. *auris*), Technologies for terminal room decontamination (not including technologies with limited data), Ultraviolet light, Vaporized hydrogen peroxide, Continuous room decontamination technologies, Light disinfection, Low-concentration hydrogen peroxide, self-disinfecting surfaces. Touchless cleaning techniques provide an incremental benefit to manual practices by limiting cross-transmission of pathogens *via* environmental surfaces, though evidence of prevention of certain pathogens remains limited. These technologies include a variety of products including self-disinfecting surfaces along with few fumigation methods [53,54].

Given the plentitude of challenges for achieving and maintaining adequate cleaning and disinfection in healthcare facilities, there is a need to consider the use of modern technologies designed to improve disinfection of surfaces in hospitals. New technologies fall into several categories, including new liquid surface disinfectants, improved methods for applying disinfectants, self-disinfecting surfaces, light-activated photosensitizers and no-touch (automated) technologies.

These newer disinfectants have Environmental Protection Agency (EPA) safety rating of category IV (housekeepers do not need to wear any personal protective equipment while using these products).

Improved hydrogen peroxide-based liquid surface disinfectants and a combination product containing per acetic acid and hydrogen peroxide are effective alternatives to disinfectants currently in widespread use, and electrolyzed water (hypochlorous acid) and cold atmospheric pressure plasma show potential for use in hospitals. Newer no-touch (automated) decontamination technologies include aerosol and vaporized hydrogen peroxide, mobile devices that emit continuous ultraviolet (UV-C) light, a pulsed-xenon UV light system, and use of high-intensity narrow-spectrum (405 nm) light. These no-touch technologies have been shown to reduce bacterial contamination of surfaces. A micro-condensation hydrogen peroxide system has been associated in multiple studies with reductions in healthcare-associated colonization or infection, while there is more limited evidence of infection reduction by the pulsed-xenon system [54-60].

Touch (wiping) *vs.* no-touch (mechanical) disinfection

Reduction of microbial contamination is an important aspect of infection control program. The rate of hospital acquired infections is increasing dramatically in the past few years because multi-drug resistant strains of certain micro-organisms. Utilizing vapours for decontamination overcomes many limitations of traditional touch (wiping) method of disinfection. Vapours have high potential to permeate or penetrate complex surfaces, albeit varying levels of uniformity [61,62].

No-touch or touchless technologies encompass Ultraviolet light and pulsed xenon and are recent innovation in disinfection technologies. They encompass a broad range of self-disinfecting surfaces and fumigation methods. They limit cross contamination of pathogens and hence an effective method of disinfection. Humphreys recently reviewed Self-disinfecting surfaces, but enough literature is yet to be published for the same [63].

Personal protective equipment

A comprehensive program for the use of PPE should be enforced. All the healthcare personnels should be trained in the use of PPE. They should also taught how to clean, disinfect, store, and inspect their PPE for any damage. All staff should be strictly advised to use with the National Institute of Occupational Safety and Health (NIOSH)-certified N95 respirators. Personal goggles should be issued to every member of staff.

Hair covers or hoods should also be worn. Longer sleeved gloves are preferred to prevent exposure of the wrists with glove slippage. Alternately, vertical tape strips should be used to help keep gloves secured to the gown. Circumferential taping of gloves to the gown, such as used when wearing chemical PPE, is not necessary and makes gown and glove removal more challenging. Eye protection should include protection from side exposure with side shields or goggles. Full face shields advised since they help provide both eye protection and avoid facial and respirator contamination. Some disposable shoe covers may increase the risk of self-contamination during removal of protection clothing. Shoes worn should be impermeable to fluids and able to be decontaminated. Staff should wear operating room scrub suits or full coveralls under the PPE. Coveralls with an integrated hood may simplify the underlayer worn in conjunction with PPE, however the choice of product should be assessed for ease of removal to avoid contamination during removal. Hand hygiene must be performed after removing PPE, and in the event of inadvertent contamination of the hands by touching infected surfaces during PPE removal [64-68].

The buddy system (two-person assistance system) with mutual supervision should be adopted unlike other countries. In addition, the Sky Eye monitoring system should be installed in nurse stations, physicians' offices, PPE donning areas, and PPE-doffing areas to observe and monitor in real-time during arranging shifts of infection control teams on a 24 hour basis. The staff should be reminded in a timely manner for the precautions to be taken during donning and doffing of the PPE to ensure their utmost safety. During doffing, the PPE should be gently rolled on the body and any vigorous movements should be avoided, also thus the soiled outside surface of PPE should be rolled inwards. A proper distance should be maintained when spraying the chlorine-based disinfectant to allow for full atomization and to achieve effective sterilization. Moreover, the spraying of disinfectant should avoid the head and face to prevent the disinfectant from irritating the respiratory tract and mucous membranes of the person. Healthcare professionals should avoid touching the side edges or front surfaces of face

shield, eye-wear, headcaps, facemasks to prevent contamination. All healthcare professionals should strictly implement the seven-step handwashing technique for a minimum of 15 seconds [68-70].

DISCUSSION

The emergency response plan on exposure to contaminated PPE includes the following steps [71-74]:

- Immediately suspend the doffing procedures once exposure occurs. The exposed area should be immediately disinfected by the buddy in the doffing area.
- If exposure occurs to the face or other skin surfaces, immediately apply 75% alcohol or ethanol-containing quick-drying hand sanitizer to wipe the exposed skin on the face or other area for 2 min.
- If exposure occurs to ocular mucosa, repeatedly rinse with normal saline and apply anti-infective eye drops.
- If exposure occurs to the oral mucosa, gargle with 75% alcohol once for 2 min, followed by gargling with normal saline three times.
- Continue doffing other PPE according to the procedures.
- Shower and change clothes.
- Finally, report the relevant information to the infection control team.

Recommended practices for extending the use and/or re-using an N95 respirator mask:

- Avoid removing, adjusting, or touching the respirator (both outside and inside surfaces).
- Discard the respirator if it becomes grossly contaminated or damaged or if breathing through it becomes difficult.

Perform hand hygiene before and after handling/touching the respirator:

- Store the respirator in a clean, dry location to avoid contamination and maintain its integrity. It can be stored in a single-use breathable container, or hung in a designated area.
- Inspect the respirator and perform a seal check before each use.

There might be a risk of a shortage of N95 respirators during any pandemic, especially if it is extended for a prolonged period of time. In that case, alternatives such as Powered Air Purifying Respirator (PAPRs) may be used and practices may be introduced to extend the use of each N95 respirator [75,76].

CONCLUSION

SARS-CoV-2 caused COVID-19 is undoubtedly a life threatening virus affecting all parts of the world in less period of time. Extensive testing (Rt-PCR), a proactive tracing along with isolation of the affected patients may help diminish rate of spread of the virus. The main objective of this article was to summarize major breakthrough in infection control protocol to be followed in the periodontal surgical operatory in order to resume periodontal surgeries and prevent the further spread of this deadly virus.

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