

CHAPTER 12

THE CONTAMINATION RISKS AND PREVENTIVE PROTOCOLS DURING THE COVID-19 PANDEMIC IN DENTISTRY

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INTRODUCTION

At the late 2019, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), known as COVID-19 (novel coronavirus), which outbreak in Wuhan, China and formed severe pneumonia in patients, was declared as a “Public Health Emergency of International Concern” on January 31, 2020, and identified as pandemic on March 11, 2020 by World Health Organization (WHO). As of February 20, 2021 according to data from the worldometer 111,319,738 million people affected by COVID-19 in 221 countries, and 2,465,384 fatalities have been reported worldwide, with daily increasing case. Since the first reported case in Wuhan, despite all efforts by the various governments to stop

the novel coronavirus, the pandemic has not been prevented, and moreover the third wave continues to occur in many countries. Due to the increasing number of confirmed cases each day, the COVID-19 global pandemic continues to have impact on economic recession, social effects and even which greatly affects the of healthcare services.

TRANSMISSION ROUTE

Researchs conducted that the COVID-19 pandemic probably outbreak through animal-to-human transmission, followed by human-to-human diffusion. The novel coronavirus attaches to angiotensin-converting enzyme 2 (ACE-2) receptor through the receptor-binding domain (RBD) of the S1 and S2 domains of the spike protein, which is similar to the route of SARS-CoV that mainly spreads cause to the respiratory tract disease. According to our knowledge, the novel coronavirus is transmitted through aerosol and/ or droplets diffusion, which is the infection can be mainly occurs through coughing, sneezing, and saliva. When droplets and/ or aerosols of the different diameter are generated ($>5 \mu\text{m}$ large diameter, and $\leq 5 \mu\text{m}$ small diameter) usually unlike small particles larger droplets due to their weight fall to the ground quickly through gravity. However, small droplets may remain suspended in the air for the longer duration, and travel through air diffusion further which can enter the respiratory system or contact the different areas. Even without the clinical signs of COVID-19, infected droplets can be diffusion through air towards to the mouth, nose, and eyes by asymptomatic patients. Researchers conducted that SARS-CoV-2 pandemic infection can be accompany such as non-compliance with social distance for more than 15 minutes or after contact with contaminated surfaces or hands that come into contact with airborne particles.

COVID-19 TRANSMISSION RISKS IN DENTAL PRACTICE

According to our knowledge about transmission route for different contagious diseases such as SARS-CoV or Middle Eastern respiratory syndrome coronavirus (MERS-CoV), after pandemic outbreak many authorities suggested various warning about regarding possible hazardous activities or workplaces. Aerosol known as one of the transmission route is diffused through to respiratory tracts different ways of contamination especially in closed environment,

and constitute to high risk for the individuals. In dentistry during routine dental procedures, SARS-CoV-2 infection poses potential hazards to dentists, dental care personnel and patients due to exposure of saliva, blood, aerosol and/ or droplets or contaminated instruments and exposed surfaces. In particular, the use of high-speed drills during in general dental procedure may form aerosol that increase the possibility of infection and transmission risk of COVID-19. Oral cavity mucosa has a high expression of ACE-2 receptor which is responsible for the entry of the coronavirus into the cell and its infection. For all these reasons, dental services have been closed in various countries around the world since March, 2020 therefore, dentists, dental professionals or therapists and dental nurses all assigned to support healthcare delivery system during in this COVID-19 crisis.

COVID-19 pandemic is became a tremendous challenge for occupational health for especially healthcare employee. Considering the exposure jeopardy for different occupational categories, dental professionals are facing the greatest risk for COVID-19 infection. The very nature of the dentistry profession, it is impossible to maintain social distances from the patient, which makes the dentist potentially exposed to the risks of contagious disease. According to the ADA report recently published, it has been reported that the rate of COVID-19 transmission among dentists approximately 1% and the risk of dying from COVID-19 infection is 0.008%.

In the literature, though no reported cases coronavirus contamination and spread during the dentist examination, considering the high contagiousness of the disease, dentists should provide a wholesome surroundings for both patients and themselves, and some special measures should be taken in addition to basic precautions in this particular period.

PREVENTIVE PROTOCOLS TO LIMIT CONTAGION

Although dental practices are starting to re-open slowly and in a controlled manner, the recommendations published by WHO for dental profession have been interpreted differently by countries around the world, therefore considerable variation in the guidance on the safety procedures. Due to well known that widespread immunization with vaccination takes a long time, it is very important to implement preventive protocols during routine dental practices during the COVID-19 pandemic process. Dentists are often very familiar with universal Personal Protective Equipment (PPE), other cross-infection control measures, and risk assessment.

Reducing the Number of Patient

Reducing the patient number before their routine clinical visit can help to avoid cross-infections among the patients and dental practitioners.

Phone Triage

Before admitting any patient to the practice, triage is highly recommended to investigate risk factors posed by the current health status and/ or the COVID-19 symptom. Patients should be asked if there has been any recent contact with a coronavirus-positive person or they have traveled to outbreak areas. If the patient has positive contact history and / or symptoms, it is recommended to postpone dental treatments for 14 days at least. In addition, the patient must be notified to health authorities for rapid home or hospital quarantine depending on the severity of the COVID-19 infection. In the absence of contact and / or symptoms, a dental examination can be applied, provided that preventive measures are applied. Before each examination, body temperature should be recorded with a contact-free forehead thermometer and the presence of coughing or breathing difficulties symptoms should be supervised. These security preventions should be applied to attendants of the patient.

Waiting Area

By reducing the number of patients in the waiting room at the same time, the interdistance between people can be maintained at approximately at least 1 m. This may provide enough time for the disinfection of the examination area for both dentist and patient. In particular, for patients with that has severe chronic disease (i.e. immunosuppressed, or influenced with severe systemic diseases and comorbidities) can be on-site waiting time reduced. According to the American Society for Testing and Materials (ASTM) classification, basic recommendation for the prevention of a pandemic is use of the disinfection of the hands and surgical mask that meets at least protection level 1, as it can reduce the aerosols up to 97%.

Hand Sanitation

Hand hygiene is of crucial importance to decreasing SARS-CoV-2 contagious disease. As suggested by WHO (2009), in case of contact with patients and non-disinfected surroundings or instruments, it is advised to prevent touching eyes, mouth and nose in the absence of any cleaning or aseptic treatment.

Furthermore, WHO (2020c) reported that hand hygiene is equally effective to clean with either an alcohol-based hand rubs or soap and water.

Personal Protective Equipment (PPE)

Due to the fact that SARSCoV-2 transmission occurs through airborne droplets, particles mostly spread towards the dentist's facial area, such as the inner part of the eyes or surrounding of nose, during dental practices. For these purpose, the use of PPE can be necessity in healthcare employee. To maintain the eyes from aerosols generated treatment during the dental procedure, goggles and a face shield must be worn and disinfected between every patients. In addition to this, waterproof disposable gowns that covering the entire body, respirator/masks, gloves (two pair of disposable gloves), and headgear caps are extremely recommended. When aerosols occurred with using the high-speed handpiece, air-water syringe, and ultrasonic scaler during the dental treatment , professionist must use minimum as protective as a National Institute for Occupational Safety and Health (NIOSH)-certified N95, European Standard Filtering Face Piece 2 (EU FFP2), or coequal.

Preprocedural Mouth Rinse

As we know, mouth washes such as chlorhexidine (CHX), essential oils, and cetylpyridinium chloride (CPC) can be effective on herpes simple virus (HSV), human immunodeficiency virus (HIV), and hepatitis B virus (HBV). Although there is no evidence that mouthwashes could remarkably decreased the COVID-19 virus, their administering may be reduce the aerosol transmisson in oral tissue.

Use of Rubber Dam

During aerosol-generating dental procedures, the rubber dam can remove pathogens from respiratory tract. It has been observed that dam reduces the spread of microorganisms up to 90% during the preparation of the cavity. Although the rubber dam is required to be accommodated in the whole aerosol generating treatments, it cannot be used in subgingival operations, such as subgingival restoration, subgingival dental calculus removing and subgingival crown margin preparation.

Removal/Filter of Contaminated Air

Since it is known that SARS-CoV-2 can stay in the air for up to 3 hours, if high-speed hand-piece devices are used during the procedures, a complete air exchange in the clinical area is mandatory after every treatment to reduce the hazard of airborne contamination. With stationary devices with air suction, filtration and plasma cluster ion technology, UV lights, inexpensive high-volume evacuation device (HVE) and expensive high-efficiency particulate arrestor (HEPA) filters or special negative pressure chambers, a continuous air exchange can be achieved to remove / filter contamination in clinics. These devices as known reduce aerosol generation must be used in dental practices particularly those involving the use of an ultrasonic scaler. HEPA filter which is 0.3 μm in diameter can remove 99.97% of the particles, although microorganisms held in the filter can be dispersed back into the cleaned air if device care is not maintain regularly. Although the effects of air conditioner devices on the spread of COVID-19 particules in the air are still uncertain, in clinics where centralized air conditioning systems are used, devices should be maintained to prevent virus contamination. As a result, air exchange is recommended after each patient in clinics.

Limitation of Aerosol-Producing Procedures

According to the study, it has been reported that the use of hand tools and ultrasonic devices poses a risk in dental procedures. Dentists, dental personels and dental assistans must use protective glasses before in contact with the patient. Before the procedures, rubber dam is apply for every patient to reduce aerosols and droplets generation.

Cleaning of Potentially Contaminated Surfaces

After the dental procedure, the patient's disposable gown and other PPEs should be cautiously removed and disposed of it. After removing the first pair of gloves from the two used gloves, the dental personnel should gather entire contaminated instruments and place them in the disinfection and sterilization environment. Since the COVID-19 virus cannot survive for more than 30 minutes at temperatures above 56 °C, common autoclaves may be effective in preventing cross-infection in clinics. Complete sterilization must be perform on whole surroundings of the dental unit, particularly in the spittoon circumference. It is recommended to leave in a 1% hypochlorite or 70% alcohol solution for at least 1 minute and after then clean it carefully. In addition, the dental unit should be cleaned with 0.5% hypochlorite solution before each use.

In order to prevent SARS-CoV-2 cross infection, it is imperative that the areas touched by patients, dentists and personnels (door and/ or window handles, waiting room seats, PC keyboards, mouse etc.) are regularly disinfected.

RECOMMENDATIONS FOR FUTURE GENERAL TREATMENTS

Endodontics

According to the ADA COVID-19 Dental Emergency document, if endodontic treatment is necessary, manual instrumentation must be preferred to rotary systems. Rubber dam should be used every procedure. If it is possible, pulpotomy and pulpectomy or vital pulp therapy should be preferred to root canal treatment for patient with irreversible pulpitis.

Restorative Dentistry and Pediatric Dentistry

Hand instruments should be preferred instead of rotating systems during cavity preparation. Chemochemical caries removal methods or atraumatic restorative techniques should be applied during the caries removal process instead of high-speed handpiece.

Periodontics

During periodontal treatment, manual scaling and polishing are recommended instead of ultrasonic scalers for removing calculus and plaque.

Prosthodontics

In prosthodontic treatments, disinfection of materials and impressions is important in prosthodontic laboratories to minimize the risk of cross contamination. In patients with gag reflex, oral mucosa can be anesthetized with local anesthetic before impression. At the same time, saliva suction should be used and the trays should be selected in the right size to take measurements. To reduce aerosol formation, rubber dam application is recommended during the preparing of a fixed partial denture or single crown. After applying a soft lining to the removable prosthesis causing discomfort, it can be temporarily restored. After the patient has tried the removable partial denture or complete denture on the oral mucosa, the patient should avoid touching any environment due to saliva contact.

Oral and Maxillofacial Radiology

In the radiographs to be taken from the patient for diagnostic purposes, it is recommended to use extraoral radiographs such as Dental Panoramic Radiographs (DPR) or ConeBeam Computed Tomography (CBCT) instead of intraoral radiographs.

Oral and Maxillofacial Surgery

High volume saliva ejectors should be used during tooth extraction. Patient must lie in the supine position, and if suture is necessary, absorbable suture fiber should be preferred. When the patient is admitted to the clinic with excessive toothache, retraction of teeth may be considered instead of a conservative treatment to reduced the treatment period and the risk of infection. Antibiotic therapy is recommended in case of third molar abscess or pericoronitis.

ENVIRONMENTAL SANITATION

Aerosols, droplets containing infective pathogens, generated during dental procedures can accumulate on environmental surfaces. Due to the ability of SARS-CoV-2 to survive on surfaces some time, proper sanitation is required in the potentially contaminated environment. Infection due to contamination can be neutralized by disinfecting surfaces within a minute. Several surface disinfectants which usually use in dental profession are effective on virus (such as sodium hypochlorite 0.5%–5%, or Povidone-Iodine 10%). According to the European Center for Disease Prevention and Control (ECDC) recommendation, if these surface sanitation are not efficient, it can be use neutral soap or 70% alcohol solution.

CONCLUSION

Dentists, dental personnels, dental nurses and dental hygienists are at hazard of exposure to contagious diseases due to nature of the profession. Given the unstable propagation of the COVID-19 pandemic, which is not expected to dissipate in the near future, the risk of infection has increased even more, particularly for dentists. Dental procedures can be enforced within the framework of the above-mentioned rules without ruled out the cross contamination

risk. It should be avoided unnecessary aerosol-generation procedure. With the availability and widespread use of the vaccine in the future, protocols to prevent the spread of COVID-19 will definitely change. However, for now, we must conduct with our knowledge, and protect both dentists and patients against COVID-19 infection.

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