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A holistic strategy to prevent transmission of covid virus disease-19 in the dental office

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Abstract

Humanity was recently confronted with a highly contagious virus belonging to the group of coronaviruses. The presence of the virus has tested the resilience of the health systems in developed countries, often overcoming them, changing the way of life and the social interactions of people around the globe and adversely affecting the economies of even the most economically strong countries. Many studies have shown that coronavirus is found in the oral cavity in infected patients and saliva and blood may be contaminated with virus. For this reason, the dental profession is considered to be at high risk for virus transmission via droplets or aerosols produced during certain dental procedures. The screening procedure of patients should include questions by virtual/remote technology or over the phone. It can also be performed on site while maintaining physical distancing between the staff and the patients, wearing personal protective equipment and measuring body temperature. Patients without symptoms should be treated as potentially infected individuals with the application of all the protective for transmission measures. Measures related to corona virus are divided in general measures taken by all healthcare providers and specialized measures for the dental profession. According to the experts, the re-emergence of the pandemic is expected. Therefore, the appropriate preparation by taking the above measures and others that may be proposed in the future are

currently the only ways to prevent the transmission of the virus in the dental office.

Keywords: COVID-19, Corona virus, Corona virus variants, dental treatment, holistic, strategy.

Introduction:

In the beginning of the new decade of 2020, the widespread of a new virus evoked a serious pandemic all over the world[1]. The new virus belongs to the known family of coronavirus[2]. Characteristics of the new virus is the rapid spread in the community with increased mortality rate approaching 3.4%[3]. The virus escalated to human from horseshoe bats and pangolins and is believed to be zoonotic[4,5]. The virus is transmitted via small droplets from infected individuals causing symptoms mainly from the aerodigestive system. Fever, sore throat, fatigue, cough, abdominal pain and sometimes loss of smell and taste are symptoms related with corona virus disease-19 (COVID-19). Since its emergence in Wuhan of China in January 2020, the disease rapidly spread in almost all countries of the planet offending thousands of people[6,7]. More prone to serious complications or death from disease are the elderly population, compromised patients and people with serious underlying diseases[5,8]. The consequences for the health systems, the social and financial life are dramatic. Many health systems in a lot of countries were tested and some of them collapsed, as the number of patients was tremendously increased especially in intensive care units[9]. Many laboratory and clinical trials are in progress to discover an effective therapeutic agent or vaccine, however until know the only available protection against virus is the reduction of cross infection[2].

The dentists are at great risk from COVID-19 as they work in close proximity with the oral cavity and may be exposed to biologic fluids of infected patients through aerosols or droplets and prophylaxis from virus transmission is currently the only effective measure to minimize the cross infection[10,11]. For oral health care providers preventive measures are divided in three categories. The first includes screening measures to exclude patients suspect with Covid-19. These general measures are applied in many other professions and include screening and triaging the patients using virtual technology or over the phone. Otherwise, the patients' history of health status should be taken upon arrival to the health care facility taking all the appropriate protective measures. The second category includes general measures such as the compliance with safe distances between the patients and the air ventilation of all dental office areas, and the application of general and individual hygienic procedures[11]. The third category includes special arrangements adapted to the dental profession to avoid virus transmission. The latter is related with the elimination of the aerosol generated through the use of certain dental devices, the elimination of the infectiveness of the generated aerosol and the removal most of the generated aerosol from the dental office area[11,12].

First category of patients screening measures

Prophylaxis from Covid-19 in the dental office includes measures to dismiss patients infected with Covid-19 from the dental facility. Simple questions during the phone appointment or direct contact may exclude patients with symptoms related to Covid-19 infection or those in contact with individuals suspected with Covid-19 or individuals coming from high-risk countries[13]. Symptoms that arise the suspicion of Covid-19 infection are mainly fever, cough, sneezing, sore throat, fatigue, diarrhea and vomit[6,7]. Every individual entering the dental office needs to be thermometered with a contactless thermometer and a history of suspect

symptoms should be taken. Even when a patient is free of symptoms, this does not exclude the possibility for Covid-19 infection since the asymptomatic phase of the disease is 1-14 days with mean time 5-6 days[14,15]. In the dental office all patients should be treated as potentially infected with Covid-19[6,16.]

Second category of general hygienic measures in the dental office

These measures include general one for elimination of the possibility of transmission of the virus from the patient to the environment of dental office starting from the entrance to the waiting room until the patient is siting to the dental chair.

They are general measures that include general hygienic protective measures starting from the shoes of the patient. Simple disposable cover-shoes or special antiseptic carpets can be used at the entrance of the waiting room of dental office[17].

Every patient or any accompanying person should wear a protective face mask, to avoid possible transmission of the virus to the environment of dental office. In case of coughing or sneezing, patients are advised to cover the mouth and nose with a tissue and then discarding the tissue into a waste bin and immediate hand hygiene.

Cleaning of the patient hand and accompanying person with antiseptic solution is considered one of the most important measures to control the transmission of virus[18]. According to some authors the virus remains viable on external hard surfaces constructed from metal or plastic for up to 9 days[19]. Taking into account that people touch their face at least 23 times per hour and very often and the nose or mouth[20]. During the rising of pandemia hand hygiene with solutions containing alcohol o in concentration of 70-90% was suggested newer directive from WHO consider the washing of hands with soap and water of identical effectiveness[19].

Adequate ventilation of the waiting room is mandatory for natural ventilation and 60L/s per patient is considered adequate[21], as well as keeping safe distances between patients of at least 6 feet between them[17].

Third category of specific hygienic measures in the dental office

Before the patient enter from the waiting room to sit the dental chair, disinfection of all surfaces and especially around the dental chair must be performed[22].

Effective solutions for surface disinfection include 62-71% ethanol, 0.5% hydrogen peroxide or 0.1% sodium hypochlorite[23].

As the virus is found on the oral mucosa, it is high concentrated in saliva and dentist is prone to be infected from an asymptomatic patient[24,25]. So the prophylactic measures include elimination of the viral load into the oral cavity starting before dental treatment in order to eliminate the concentration of the virus into saliva[26]. The other prophylactic measures during dental work aid in elimination of the produced aerosol during dental work and finally the aspiration of the remaining one either with a surgical aspiration from the patient's mouth or/and with an external aspiration device.

Specific Measures to eliminate the viral load from the oral cavity before dental treatment

Mouth rinses with antiseptic solutions is a widely accepted and effective method to eliminate microorganisms load in droplets and oral aerosol[27]. Other investigators found that chlorhexidine and cetylpiridinium reduce at 68.4% microbial colonies. Even though the use of mouth rinses is effective against most microbes of the oral cavity and some viruses as simple herpes, human immunodeficiency virus and hepatitis B[28], even though their activity against COVID is unknown[22].

Specific Measures to eliminate the production of aerosol during dental treatment

In the past the generation of aerosol during dental treatment contaminated with bacteria, fungi and viruses, attracted the scientist's interest in relation to transmission of disease to the dentist or other personel or patients at dental office. Some investigators correlate the development of pneumonia from legionella or tuberculosis with a previous dental treatment[29,30], while others[31] in SARS patients found high percentage of SARS-CoV RNA into their saliva suggesting transmission of the virus through droplets from saliva. Chowell et al (2015) correlated the majority of SARS-CoV and MERS-CoV patients with nosocomial transmission resulting from aerosol production procedures[32]. These findings suggest adaptation of preventive measure taking by dentists against COVID during the current pandemia. Many dental or oral surgery procedures performed with high-speed handpieces under water coolant and generate aerosols in the dental environment. These aerosols are mixt with saliva or blood and bioaersols are generated and these products are contaminated with microbes or viruses from the patient[33]. These contaminated aerosols it is possible to play an important role in COVID transmission. Handpieces 5:1 have been proposed to eliminate the bioaerosol production during dental treatment.

Ultrasonic instruments may also play an important role in generation of bioaerosol contaminated with virus[34]

and in the same way air-water syringe may act with the same mechanism[22].

Another source of transmission of COVID are the droplets that expelled during coughing, sneezing, talking or laughing from patient's mouth. Large droplets (>5μm in diameter) fall quickly down while smaller (<5μm in diameter) may remain in the air for a longer period of time and can enter to the respiratory tract[35] and may related with transmission of viral disease. Some dental procedures such as the taking of intraoral radiographs may are responsible for droplet or bioaerosol production as some patients have intense reflexes when the dental film placed into the mouth and especially in the posterior area of the upper or lower jaw. Panoramic X-ray or CBCT proposed as an alternative option instead of intraoral X-rays and in case of sensors a double barrier is proposed to avoid perforation and cross-contamination.

In dental treatments where the application of rubber dam can be applied as in procedures affecting only the crown of the teeth, offers a protection from contaminated saliva and the only source of contamination are the dental tissue of the tooth that is subjected to treatment[36]. The use of rubber dam can eliminate the spread of microorganisms in a high percentage of 90%[37]. Interventions affecting only the crown such as tooth fillings or endodontic treatment can be performed with the application of the rubber dam, while in operations below of the cementum-enamel junction as periodontal interventions or oral surgery operation is not feasible to apply.

Specific Measures to absorb or inactivate bioaerosol contaminated after its production

As aerosol production is inextricably connected with many dental procedures, the ideal situation would be the use of negative pressure rooms to remove bioaerosols produced during dental operations. However, a practical solution instead would be the use of strong surgical aspiration and external air purifying with special cleaning filters (HEPA). Surgical aspirators may help to eliminate the dissemination of aerosol to the environment of dental office. External powerful suction systems next to the patient that absorb aerosols and droplets and this is associated with the elimination of the

aerosol that produced and removing of the minimum produced aerosol with powerful suction systems that inactivate the virus through ultraviolet rains into the apparatus.

External powerful aspiration systems near the patient have been proposed to eliminate the aerosol that escape from the previous systems.

UV-light systems have been proposed for disinfection of the dental room after integration of a dental cycle as the room must be empty when the apparatus is activated.

Protective measures of the dentist

Face mask and protective eye glasses/or protective shield, dental scrub cap, combined to non-woven gowns and disposable cover-shoes for the dentist and the assistants are mandatory to avoid transmission of the virus.

Disinfection of all instruments and all surfaces that probably are infected from the patient immediately after dental treatment

Before the patient enter from the waiting room to sit the dental chair, disinfection of all surfaces and especially around the dental chair must be performed[22]. Effective solutions for surface disinfection include 62-71% ethanol, 0.5% hydrogen peroxide or 0.1% sodium hypochlorite[23].

Conclusions

As long as pandemia exists health care providers and especially dentists are at greater risk for contagion and infection from COVID-19. Therefore, the aforementioned measures should be followed by the clinicians aiming at minimizing the spreading of the infection.

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