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COVID-19: Is it possible to define the aerosol clearance time after dental health care?

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Dear Editor,

The World Health Organization (WHO) recognizes that aerosol-generating procedures represent an increased hazard of transmitting the new coronavirus to healthcare professionals.[1] In dentistry, the frequent use of aerosol-generating devices such as three-way syringe, high-speed dental drill, and ultrasound associated with close contact with the patient, represent a potential risk to occupational health.[2] As a result, several publications have recommended the postponement of elective dental procedures during the outbreak of COVID-19 in order to reduce the chance of contamination.[3-6] In several locations, the epidemic has reached a level of greater control of contamination, which has enabled the gradual return of elective dental care.

Because of this, we have seen an effort by the academic community to orient dental surgeons on the new biosafety guidelines during care, however, a gap remains to be filled about the care for handling the aerosol produced.[7] Considering that the time for the purification of aerosols, its impacts the risk of cross-infection and the organization of dental appointments, we intend to analyze some aspects that directly interfere in the definition of the time necessary for the aerosol cleaerance.

van Doremalen *et al*. (2020)[8] in experimental conditions found the presence of SARS-CoV-2 in aerosols for up to 2.64 hours and on surfaces for up to up to 72 hours, which raised a series of questions about the respiratory protection of the health team, the care in disinfecting surfaces and the safe time interval between dental care. As for respiratory protection during the performance of aerosol-generating procedures and cleaning of surfaces, there was a consensus among publications on the indication of use of N95, FFP2 or equivalent respirators and the sanitation of work area surfaces with soap and water followed by disinfection with 70% ethanol (hydrous ethyl alcohol [70% w/w] or 77° G.L. [77% v/v]) and 0.1% sodium hypochlorite or quaternary ammonium.[2-5,7,9,10-13] However, the time interval required for the clearance of aerosols produced in dental care remains one of the most polemic topics in dentistry in the days of COVID-19.

The first controversial aspect of this discussion rests on the particle diameter of the aerosol produced in the experiment by van Doremalen *et al*. (2020).[8] One of the objectives of the study was to investigate the permanence of SARS-CoV-2 in aerosols mechanically produced using a nebulizer. Nebulizers produce dispersion particles with a very small diameter, between 1.0 to 5.0 micrometers (μm), so that they have the ability to penetrate more deeply into the respiratory tract as desired.[14] The aerosols produced in dental procedures are composed by saliva, body fluids and organic debris and are made up of droplets and droplet nuclei with a diameter of 50 μm or less, concentrating between 0.6 to 1.5 meters away from the patient's mouth.[15,16,17] Baron (2001)[18] demonstrated that the smaller the diameter of the droplets, the longer they will remain in the ambient air and attested that aerosol particles with 1 μm, 3 μm, 10 μm and 100 μm can remain in the air for 12 hours, 1.5 hours, 8.2 minutes and 5.8 seconds respectively. Thus, when we know the dynamics of aerosol dispersion and its direct relationship with particle size, we understand that the period of permanence of aerosols in the environment in the experiments by van Doremalen *et al*.[8] cannot be compared with the reality of the expected permanence of aerosols produced in dental care.

In addition to the particle size, in order to accurately define the time for aerosol clearance after dental care, the environment would need to be equipped with exhaust systems, preferably with negative pressure, and high efficiency

particle filtering as suggested by WHO[1], The Brazilian Public Health Regulatory Agency, Agência Nacional de Vigilância Sanitária, (ANVISA),[19] the US Centers for Disease Control and Prevention (CDC)[20] and the United Kingdom's National Health Service (NHS).[21] This is because this type of controlled environment, in addition to prevent the spread of aerosol and contamination of areas adjacent to the treatment room, allows the monitoring of air changes per hour, which, together with other environmental variables, allows calculations by hospital engineering to define the correct time for the exchange of air ambient air.

However, the adaptation of dental offices to rooms with negative pressure and controlled exhaust systems is not a feasible task in most cases. In view of this, different recommendations have been prescribed to enable service in rooms without differential pressure use (neutral rooms). The NHS[21] recommends that neutral rooms should remain with closed doors and windows open for an hour after treatment before cleaning and disinfecting the environment; the American Dental Association[22] based on the CDC study conducted by Baron,[23] which measured the settling speed of the aerosol particles by virtue of their density, recommended that they wait fifteen minutes before cleaning the office.

Finally, care has been widely recommended in environments that could remain naturally ventilated.[3,5,7,11,13] However, it is important to note that the natural ventilation of the care room compromises the correct maintenance of room temperature, which generates discomfort additional to professionals and patients, allows the entry of vectors and increases the risk of infection by other microorganisms.[24]

Conclusion

In view of the lack of experimental studies that simulate the type of aerosol produced during visits to dentistry in neutral rooms and the permanence time of SARS-CoV-2 viable for contamination in this aerosol, it is not possible to define exactly, what is the minimum time between appointments. However, it seems reasonable, considering the size of the aerosol particles produced in dental care and the behavior of the dynamics of its fluids, the recommendation to wait between fifteen minutes to an hour for cleaning and disinfection of the service room. This time should be adjusted due to the extension of aerosol production during the procedure, the use of aerosol mitigation techniques, the possibility of natural ventilation and the size of the service room.

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