

## Remodeling Dentistry and Dental Technologies after Coronavirus Disease 2019 (COVID-19).

### Remodelación de la odontología y las tecnologías dentales después de la enfermedad por coronavirus 2019 (COVID-19).

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Coronavirus disease 2019 (COVID -19) was an unknown disease before its outbreak in Wuhan, China in December 2019, as an epidemic but which eventually engulfed the whole world and was declared a pandemic leading to huge losses of life and having a great impact on the economy.<sup>1</sup> According to World Health Organization (WHO) definition, COVID-19 is a mild to severe respiratory illness that is caused by a coronavirus, is transmitted chiefly by contact with infectious material such as respiratory droplets and is characterized by fever, cough, and shortness of breaths and may progress to pneumonia and respiratory failure.<sup>2</sup>

The world today is facing one of the greatest challenges that mankind has seen for years to come. It is a war situation between humans and microbes, and as an invisible enemy, the microbes are prevailing. So, when uncommon events occur like this we have to react differently and be prepared for combating it, and for that, we need to quickly change our lifestyle; the very first rule to be followed is social distancing and personal hygiene etiquette. Rapid adjustments also need to be applied to the dentist, dentistry, and technologies of dental equipment.

Dentistry as we all know is one of the professions where we deal with patients at proximity, with exposure to body fluids and respiratory droplets as well. In our daily clinical practice prior to COVID-19 we followed certain protocols to avoid infection of any kind, but as of now we are talking about a very infectious disease which is propagating so fast, we are instructed to take some extra care and remodel our instruments and devices to fit the current situation.

The SARS-CoV-2 virus is found to be present in the saliva and faeces of affected patients.<sup>3,4</sup> Its presence in saliva is due to the ability of SARS-CoV-2 to bind with human angiotensin-converting enzyme 2 receptors that are enormously available in human salivary glands and thus secreted in saliva.<sup>5,6</sup> In a dental clinic setting there is a chance of nosocomial spread of SARS-CoV-2 via aerosol production during dental procedures.<sup>7</sup> So it is advisable to take proper precautions to enter the work field and to help us there are changes needed in the dental equipment as well.

#### Recommendations for Dental Doctors

Dentists work in the head region and mainly within the mouth, which is the main gateway for any infection to get in or out of the human body along with the nose, thus increasing the chances of cross-infection. In

this instance, every patient should be considered as a potential asymptomatic SARS-CoV-2 carrier. When dentists perform dental procedures on patients, everyone in the room becomes susceptible to getting infected. To reduce the risk of transmission of microbes, hand hygiene is considered as the most critical and important measure.<sup>8</sup> After a person coughs in the room, the cough droplets settle down to the bottom of the room within a few minutes.<sup>9</sup>

The droplets carrying the SARS-CoV-2 may remain on the surfaces and dental instruments for a few hours to a few days depending on the kind of surface, the temperature and the humidity of the environment.<sup>10</sup> For removing the viruses from the surface good hand hygiene must be done, hands should be dried using electric dryers, and thorough disinfection of all the surfaces and dental instruments should be done.

The use of Personal Protection Equipment (PPE) including protective eyewear, masks, gloves, caps, face shields, shoe covers, and protective body coverings, is strongly recommended to protect skin and mucosa from infected blood and secretions, for all healthcare workers in the clinic or hospital settings during and after the COVID -19 pandemic.<sup>11</sup>

After every use, the cotton surgical gowns should be sterilized in an autoclave. But disposable surgical gowns are also available which are made of SSMMS 5-layer polypropylene fabric. A triple-layer surgical mask can be worn by all the health care providers who are within 1 to 2 meters from the patient. In routine dental practice, N-95 masks which are approved by National Institute for Occupational Safety and Health or FFP2- standard masks set by the European Union are recommended for particulate respirators should be used.<sup>12</sup>

For the care of COVID- 19 positive patients, a FFP3- standard mask should be used and as there is a scarcity of these, we can go for either extended use or reuse of the N-95 masks. In order to increase the lifespan of N-95 masks a normal surgical mask can be worn over the N-95 and then dispose of the surgical mask after each case.

The use of a face shield would prevent large aerosol splatter clogging the N-95 masks. Studies have shown that SARS-CoV and MERS-CoV have been highly susceptible to povidone-iodine (2%) mouth rinse, so it is recommended for SARS-CoV-2 as well.<sup>7,13,14</sup> On coronaviruses 0.5-1% hydrogen peroxide mouth rinse has a nonspecific virucidal activity.<sup>15</sup>

## Recommendations for Dental Office (Non- aerosol and Aerosol procedures)

Before walking into the dental office, the dentist must follow certain protocols to keep everyone safe around them. Starting from tele-screening of the patients like asking them questions regarding their health if they have any fever, if they have come in contact with a COVID-19 patient, or they had any travel history. While entering the clinic first, hand hygiene should be carried out with an alcohol-based hand sterilizer.

Everyone who enters the clinic must sanitize their hands. Infrared thermometers are used to check the body temperature of the patients. After the patient sits on the chair, which is covered with chair covers and which can be disinfected once work is done, depending on the procedures performed additional care must be taken. There are procedures that can produce aerosols from dental instruments like ultrasonic scalers, dental handpieces, three-way syringes, and other high-speed instruments.<sup>16</sup>

Non aerosol procedures include extractions where no such high-speed instruments are used. Aerosols spread up to 3 meters from the center of the dental chair and this is the area of highest infection. Dental professionals should be diligent in disinfecting this area, the dental chair, and any surfaces with 1% sodium hypochlorite.<sup>17</sup> For the dental waterline, 0.01% of sodium hypochlorite can be used. We should consider using povidone-iodine as an irrigant in high-speed handpieces too, as it has already been a recommended irrigant in the ultrasonic scaler. The recommendation is to use 10% povidone-iodine diluted 1:9 with water.<sup>18</sup>

Ultraviolet Germicidal Irradiation with a wavelength within 200-280nm UV (254nm to be exact) can be used for inactivating the aerosol viruses, though its actual effect on SARS-CoV -2 is still questionable.<sup>19</sup>

For cleaning the atmosphere and air, we can use High-Efficiency Particulate Air (HEPA) filters. A HEPA filter is a type of mechanical air filter that works by forcing air through a fine mesh that traps harmful particles such as pollen, pet dander, dust mites, and tobacco smoke. The SARS-CoV-2 virus that causes COVID-19 is approximately 0.125 micron (125 nanometers) in diameter. It falls squarely within the particle-size range that HEPA filters capture with extraordinary efficiency: 0.01 micron (10 nanometers) and above.<sup>20</sup>

The other dental technology that has been modified for COVID-19 is the suction systems, not only used

for saliva, but also for the aerosols and air we breathe in and out. The new era suction instruments such as the Extraoral Suction and Disinfectant Device, manufactured by a local company in California, provide additional high-volume removal of droplets and aerosols associated with dental care.

With an extensive medical-grade filtration system, along with UV light disinfection, viral and other germ products will be eliminated. But there is limited data on its effectiveness on the COVID-19 virus. For disinfecting an entire area, Ultrasonic Disinfectant Sprayer can be used as a mobile unit, as its sprayer can cover up to 100 square meters, so it is an effective way to disinfect an area without much ado.

## CONCLUSION.

Life and the economy will always rebound, but for a situation like this, we should always be prepared physically

mentally and socially. Dental care providers need to be aware and prepared for tackling any impending infectious disease challenge as might be the case in the current outbreak of SARS-CoV-2 transmission and its associated disease that can be life-threatening to susceptible patients and other people nearby.

As most of the dental procedures create a lot of aerosols, preventive measures and the use of new technologies can help control the infection. Wise decisions and smart moves on the part of both the dental doctors and patients will help to break the transmission chain.

Efforts are being made to develop a vaccine against this virus, but until any vaccination is available to combat this virus and herd immunity has been generated, we must follow all rules and disinfection protocols in order to minimize human to human transmission of SARS-CoV-2 to minimize its impact on humankind.

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