



## “DENTISTRY IN COVID-19”

### Dental Science

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### ABSTRACT

In the current COVID 19 pandemic, Dentists, auxiliaries as well as patients undergoing dental procedures are at high risk of cross-infection. Almost all dental procedures involve close contact with the patient's oral cavity, saliva, blood and respiratory tract secretions. Saliva is rich in COVID 19 viral load. Many patients who are asymptomatic may be carriers. Hence, it is suggested that all patients who visit a dental office should be treated with all due precautions. Thus, the aim of this article is to provide a brief overview of the epidemiology, symptoms, and routes of transmission of this novel infection and protocol for patient screening, infection control strategies, and patient management.

### KEYWORDS

Covid 19, Dentistry, aerosol, antiretraction handpieces, hand hygiene, dental visit, doffing, donning.

### INTRODUCTION

The definition of coronavirus includes a range of respiratory viruses, which can present with mild to severe manifestations and lead to respiratory failure. The name recalls the microscopic appearance of the virus, characterized by the presence of pointed structures on the surface, resembling a crown<sup>1</sup>. The outbreak of coronavirus disease 2019 (COVID-19) in the area of Wuhan, China, has evolved rapidly into a public health crisis<sup>2</sup> and has spread exponentially to other parts of the world.<sup>3</sup> On January 8, 2020, a novel coronavirus was officially announced as the causative pathogen of COVID-19 by the Chinese Center for Disease Control and Prevention.<sup>4</sup> After a rapid escalation, on January 9, 2020, the World Health Organization declared the discovery a new coronavirus, first called 2019-nCoV and then officially named SARS-CoV-2, which had never been identified in humans before. On February 11, the respiratory disease deriving from SARS-CoV-2 infection was named COVID-19 (coronavirus disease; Lu, Zhao, et al. 2020; Mahase 2020).<sup>5,6</sup> Coronavirus particles range from 60 to 140 nanometers (0.06 to 0.14 micrometers), with an average of 0.125 micron, and have distinctive spikes of nine to 12 nanometers that give the appearance of “coronas” around the sun. Cell death is observed 96 hours after inoculation on surface layers of human airway epithelial cells.

Patients with COVID-19 usually show clinical symptoms such as fever, dry cough, and myalgia. In addition, less obvious symptoms such as nausea, diarrhea, reduced sense of smell (hyposmia), and abnormal taste sensation (dysgeusia) have also been reported<sup>7</sup>. In addition, abnormal chest X-ray and computed tomographic findings such as ground-glass opacities are typically found in the chest.<sup>8</sup> Although patients with symptomatic COVID-19 have been the main source of transmission, recent observations suggest that asymptomatic patients and patients in their incubation period are also carriers of SARS-CoV-2<sup>9,10</sup>. This epidemiologic feature of COVID-19 has made its control extremely challenging, as it is difficult to identify and quarantine these patients in time, which can result in an accumulation of SARS-CoV-2 in communities (The Chinese Preventive Medicine Association 2020)<sup>11</sup>.

According to recent research, similar to SARS-CoV and Middle East respiratory syndrome coronavirus (MERS-CoV), SARSCoV-2 is zoonotic, with Chinese horseshoe bats (*Rhinolophus sinicus*) being the most probable origin<sup>5,9</sup> and pangolins as the most likely intermediate host (The Chinese Preventive Medicine Association 2020).

SARS-CoV-2 infections typically spread through respiratory droplets or by contact. Therefore, coughing or sneezing by an infected person can render SARS-CoV-2 airborne, potentially infecting individuals in close contact (within a radius of approximately 6 ft). This led to the recent recommendation of social distancing to minimize community

spread of the disease. Another important route of transmission is if droplets of SARS-CoV-2 land on inanimate objects located nearby an infected individual and are subsequently touched by other individuals<sup>12</sup>. SARS-CoV-2 can bind to human angiotensin-converting enzyme 2 receptors, which are highly concentrated in salivary glands; this may be a possible explanation for the presence of SARS-CoV-2 in secretory saliva.<sup>13,14</sup> Therefore, there is a potential for transmission of COVID-19 via aerosol, fomites, or the fecal-oral route that may contribute to nosocomial spread in the dental office setting.<sup>15</sup>

Severe forms of this disease have a predilection for men with a mean age of 56 years with preexisting chronic illnesses such as cardiovascular disease or immunosuppression. The higher-risk patient population manifests symptoms typical of pneumonia or acute respiratory distress syndrome.<sup>8</sup> The median incubation period was estimated to be 5.1 days (95% CI, 4.5 to 5.8 days) and 97.5% of those who develop symptoms will do so within 11.5 days (CI, 8.2 to 15.6 days) of infection. These estimates show that, while undertaking conservative assumptions, 101 out of every 10,000 cases (99<sup>th</sup> percentile) will develop symptoms after completion of 14 days of active monitoring or quarantine.<sup>16</sup>

Meng et al. (2020) reported the occurrence of 9 cases of COVID-19 among 169 dental practitioners, stressing the high risk of professional contagiousness. Biologic risk of COVID-19 inhalation transmission is extremely high when performing dental procedures due to the use of hand pieces under irrigation, which favors the diffusion of aerosol particles of saliva, blood, and secretions. Moreover, this production of aerosol facilitates the contamination of the environment and instruments, dental apparatus, and surfaces.<sup>17</sup>

Due to close face-to-face contact with patients and frequent utilization of sharp devices, dental personnel are repeatedly exposed to respiratory tract secretions, blood, saliva, and other contaminated body fluids and are always at risk for 2019-nCoV infection. 2019-nCoV transmission in dental office is seen to occur through four major routes:

- (1) Direct exposure to respiratory secretions containing droplets, blood, saliva, or other patient materials;
- (2) indirect contact with contaminated surfaces and/or instruments;
- (3) inhalation of suspending airborne viruses; and
- (4) mucosal (nasal, oral, and conjunctival) contact with infection-containing droplets and aerosols that are propelled by coughing and talking without a mask.<sup>18</sup> Patient Management and prevention protocol:

Dentists are often the first line of diagnosis, as they work in close contact with patients. On 15 March 2020, an article was published in New York Times with the title “The Workers Who Face the Greatest Coronavirus Risk”, where an impressive schematic figure showed that

dentists are the workers who are most exposed to the risk of being affected by COVID-19, much more than nurses and general physicians.<sup>19</sup>

So all the necessary precautions to be taken by dentist for himself as well as for their working staff and for patient.  
Evaluation of Patients.

During the outbreak of COVID-19, dental clinics are recommended to establish precheck triages to measure and record the temperature of every staff and patient as a routine procedure. Precheck staff should ask patients questions about the health status and history of contact or travel.<sup>20</sup>

Initial screening via telephone to identify patients with suspected or possible COVID-19 infection can be performed remotely at the time of scheduling appointments.

The 3 most pertinent questions for initial screening should include any exposure to a person with known or suspected COVID-19 presentation, any recent travel history to an area with high incidence of COVID-19 or presence of any symptoms of febrile respiratory illness such as fever or cough.

A positive response to either of the 3 questions should raise initial concern, and elective dental care should be deferred for at least 2 weeks

Only pre-appointed patients should be entertained in the clinic whose history, problems and procedures are already identified to some extent through previous telephone and remote electronic or web-based systems.<sup>20</sup> Patients should be requested to wear a surgical mask and follow proper hand hygiene protocols while visiting the hospital. Patient's body temperature is recorded using a noncontact forehead thermometer or with cameras having infrared thermal sensors. Patient should Minimise or eliminate wearing a wrist watch, hand and body jewellery and carrying of additional accessories bags etc. Even in the waiting room patients should be asked to maintain a minimum distance of 6 feet from each other. The experience reported by Peng et al. (2020) on the use of antimicrobial mouth rinses prior to dental procedures focuses on the use of oxidative agents to contrast SARS-CoV-2. Mouth rinses containing 1% hydrogen peroxide or 0.2% povidone can be employed to reduce microbial load in saliva, with a potential effect on SARS-CoV-2.<sup>15</sup> According to WHO guideline the patient should distribute mouthwash throughout the oral cavity for 30 seconds and then gently gargle at the back of the throat for another 30 seconds before spitting out.

Patients consent and declaration to be obtained in a physical print out or electronic system.

### Precaution by Dentist

Dentists should pay attention that they avoid contact with their own facial mucosal surfaces including their eyes, mouth, and nose. Since transmission of airborne droplet is considered one of the main routes of infection spread, application of personal protective equipment such as masks, protective goggles, gowns, gloves, caps, face shields, and shoe covers is strongly recommended for all health care personnel

Hand washing and appropriate clothing of the clinicians and mouth rinsing of the patient may reduce the risk. Hand hygiene is a routine measure in dental practice<sup>21,22</sup>, but it is gaining growing importance to limit SARS-CoV-2 transmission. Lotfinejad et al. (2020) highlighted the effect of alcohol-based solutions on inactivated enveloped viruses, including coronaviruses, suggesting the use of solutions containing at least 60% ethanol for hand hygiene. World Health Organization instructions for hand hygiene report that an effective procedure for the use of alcohol-based formulations requires 20 to 30 s, while correct hand washing takes between 40 and 60 s<sup>23</sup>.

The doctor should wear PPE kit and the proper donning and doffing protocol should be followed.

### Donning protocol<sup>24</sup>:

Follow these steps when donning, or putting on, the PPE: NOTE: Open shoes are prohibited. Use boot covers if they are available. If available, please use a disposable cap to cover long hair.

1. Visually inspect the PPE ensemble for any damage.
2. Put your arms inside the sleeves of the fluid-resistant, non-sterile

disposable isolation gown. You can use a gown with a thumb hole located at the wrist area. Place your thumb through this hole to make sure that there is no visible skin between the sleeves and gloves. Then, tie the gown at the back to secure it around your body.

3. Hold the N95 respirator mask in the palm of your hands facing down, letting the straps dangle to the floor. Place the respirator mask around your nose and mouth, secure the top strap at the crown of your head and bring the bottom strap below the ears to the base of your neck. Mold the nose piece around the bridge of your nose until it is secure.
4. Place goggles or a face shield around your eyes and secure them. Make sure the eye protection covers the front and sides of your face. Alternatively, select a surgical mask with a face shield and apply it over your nose and mouth. Cuff the elastic bands around your ears and spread the mask to cover your face from the bridge of your nose to your chin.
5. Slide latex or nitrile gloves onto your hands, pulling them over the sleeves of your gown. Make sure that your wrists are covered and that no skin is visible.

### Doffing protocol<sup>24</sup>:

After patient care, you are contaminated and should take the following steps to take off the PPE:

1. While still in the isolation room, remove your gloves using the glove-to-glove/skin-to-skin technique.
  - 1.1 Grasp the outside of one glove at the wrist, making sure to not touch your bare skin.
  - 1.2 Peel the glove away from your body, pulling it inside out.
  - 1.3 Peel off the second glove by putting your fingers inside the glove at the top of your wrist.
  - 1.4 Turn the second glove inside out while pulling it away from your body, leaving the first glove inside the second.
  - 1.5 Dispose of the gloves safely
2. Remove your gown strap and pull the gown off carefully, away from your body. Roll off the sleeves, taking care to avoid contaminating yourself. Then, roll the gown up into a ball before disposing of it.
3. Prior to removing your eye protection, clean your hands by rubbing all hand surfaces with a 70% alcohol hand sanitizer.
4. Lean forward and gently remove the goggles or face shield, avoiding contact with your body.
5. After leaving the isolation area, take off your mask by grabbing it from behind. Pull the bottom strap off first and then the top strap.
6. Clean your hands once again with a 70% alcohol hand sanitizer or with a proper handwashing method.

Dental drills cause the formation of aerosol and splatter commonly contaminated with bacteria, viruses, fungi and blood.<sup>25</sup> Oral surgery drills also cause aerosol in addition to splatter.<sup>26,27</sup> Aerosols are liquid and solid particles (<50 µm diameter) suspended in air for protracted periods. Splatter is a mixture of air, water and/or solid substances (50 µm to several millimetres diameter). Both are a health risk to the dental team. Regular surgical face masks used in dentistry when correctly worn and frequently changed offer around 80% filtration rate.

As often as possible, the staff should work at an adequate distance from patients; furthermore, handpieces must be equipped with anti-reflux devices to avoid contaminations, improving the risk of cross-infections. Finally, during the operating sessions, the dentist should prefer procedures reducing the quantity of aerosol produced in the environment.<sup>15,17</sup>

Direct inhalation risk is mostly related to the use of handpieces and ultrasonic scalers, which generate aerosol and droplets, often mixed with saliva and blood.<sup>28</sup>

Thus, if possible, it is advisable to

- 1) avoid and reduce the use of handpieces to lower aerosol/droplet production and instead use handpieces with antirefluxive or antireflux valves;
- 2) apply a rubber dam to significantly reduce the diffusion of aerosol/droplets.<sup>29</sup>
- 3) use surgical aspiration to control airborne particles diffusion; and
- 4) perform extraoral x-rays to reduce the risk of saliva stimulation and coughing.<sup>30</sup>

Using rubber dams due to the creation of a barrier in the oral cavity

effectively reduces the generation of droplets and aerosol mixed with patient saliva and/or blood in 1m diameter of the surgical field by 70%<sup>31</sup>. Following the placement of the dam, extra high-volume suction is also required for maximum prevention of aerosol and spatter from spreading.<sup>32</sup>

**Floors:** Double Step Cleaning Procedure (Detergent and freshly prepared 1% sodium hypochlorite with a contact time of 10 minutes. Mopping of the floor starting at the far corner of the room and work towards the door.

**Frequency:** after any patient/ major splash or two hourly.

Rest of the surfaces: Freshly prepared 1% sodium hypochlorite (Contact Time: 10 minutes). Damp dusting should be done in straight lines that overlap one another. Frequency: before starting daily work, after every procedure and after finishing daily work.

**Fogging:** The commercially available hydrogen peroxide is 11% (w/v) solution which is stabilized by 0.01% of silver nitrate. A 20% working solution should be prepared. The volume of working solution required for fogging is approximately 1000ml per 1000 cubic feet. After the procedure has been completed in the operatory (in case of no negative pressure), exit the room and close the operatory for half hour for the aerosols/droplets to settle down. Perform the 2 Step surface cleaning followed by fogging. The fogging time is usually 45min followed by contact time/dwell time of one hour. After that the room can be opened, fans can be switched on for aeration. Wet surfaces can be dried/ cleaned by using a sterile cloth or clean cloth (other surfaces).<sup>20</sup>

The novel coronavirus can be vulnerable to disinfectants such as sodium hypochlorite (1000 ppm or 0.1% for surfaces and 10,000 ppm or 1% for blood spills), 0.5% hydrogen peroxide, 62–71% ethanol, and phenolic and quaternary ammonium compounds if utilized in accordance with the manufacturer's instructions.<sup>18</sup>

Hand pieces should be cleaned using a hand piece cleaning solution to remove debris, followed by packing in the autoclave pouches for autoclaving. Record to be maintained for the same. IMPRESSIONS will be thoroughly disinfected before pouring or sending to the laboratory using an appropriate disinfectant. Proper disposal of waste should be followed in clinic on daily basis.

## CONCLUSION

Overall, dental professionals appear extremely at high risk of SARS-CoV-2 infection, thus should take strict preventive protocol. With all the protocols and preventive measures we can minimize all the infections which ultimately help to protect our patients, our dental staff. In near future we must be constantly aware of the infectious threat in dentistry and accordingly we have to change or modify our working pattern.

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