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Original Research Paper

Endodontics

COVID-19: AN OVERVIEW IN THE FIELD OF DENTISTRY

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ABSTRACT The outbreak of coronavirus disease 2019 (COVID-19) rapidly escalated into a world wide pandemic, creating a global health and economic crisis. Transmission occurs primarily through droplet spread or contact routes. Due to the characteristics of dental settings, the risk of cross infection between dental health care personnel and patients can be very high. By using specific keywords, electronic search of scientific papers was carried out on the PubMed/Medline, Scopus, and EBSCO host databases database. By pooling the extracted data from selected papers, the reviewed data was synthesized. This article provides a brief overview of the structure of the virus, clinical manifestations, modes of transmission, pathogenesis, diagnosis and its role in dental practice.

KEYWORDS : COVID-19, Dentistry, Precaution

INTRODUCTION

The definition of coronavirus includes a range of respiratory viruses, that manifest with mild to severe symptoms and eventually lead to respiratory failure. The appearance of the virus is characterized by the presence of pointed structures on the surface that resembles a crown.[1] [1]These viruses have a positive sense single-stranded RNA genome with an envelope. They are the largest investigated genome among RNA viruses with a helical symmetry nucleocapsid that is approximately 26–32 kb in size. [2,3] Earlier, it was thought that these viruses only cause enzootic infections in animals, birds and few mammals, but recent findings indicate that a variety of these viruses, including antigenic groups 1 (229E and NL63), antigenic groups 2 (OC43), and HKU1, can infect humans. [4,5] Three definite strains of these viruses that are of zoonotic origin, including severe acute respiratory syndrome coronavirus (SARS-CoV), Middle East respiratory syndrome coronavirus (MERSCoV), and 2019 novel coronavirus (2019-nCoV) have recently caused lethal infections in humans.[5,6]

The novel coronavirus was identified in Wuhan, China, in December 2019 in patients presenting with pneumonia of unknown origin. 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). COVID-19 was finally declared a pandemic outbreak of the coronavirus by the World Health Organization on 11th march 2020 due to its rapid and violent escalation worldwide.[7,8]

CLINICAL MANIFESTATIONS

This primarily affects the upper respiratory tract and to a lesser extent the gastrointestinal tract. Symptoms of coronavirus infections can range from relatively mild (similar to the common cold) to severe (bronchitis, pneumonia, and renal involvement). The incubation period of COVID-19 has been estimated to be 1–14 days, and it was shown that asymptomatic individuals may also be involved in the spread of this virus. The infection includes a prodromal phase with malaise, fever, and dry cough. The most commonly reported signs and symptoms are fever (98%), cough (76%), dyspnoea (55%), and myalgia or fatigue (44%). [9,10,11] Ground-glass opacity and patchy shadows can be detected on computed tomography in patients who develop pneumonia. [7] Loss of taste and smell have been recognized lately as one of the symptoms of COVID-19. Complications including respiratory distress syndrome, arrhythmia, multi organ failure and shock are more frequently associated with older age and the presence of comorbidities. [12,13]

PATHOGENESIS

Studies have suggested that the spike glycoprotein (S glycoprotein) plays an important role in host range restriction by attaching virions to the host cell membrane.[14] Generally, coronaviruses primarily replicate in the respiratory and intestinal epithelial cells and subsequently cause cytopathic alterations.[15]In the cycle of infection for most virus, the first step is to attach to the surface and recognize cell surface receptor of the host cell for invasion.[16] With similar external subdomain of receptor-binding domain (RBD), SARS-CoV-2 spike share same hostcell receptor, angiotensin-converting enzyme II (ACE2) with SARS-CoV spike, but in a higher affinity. [17] ACE2 epithelial cells present in the salivary glands were considered one of the main targets such coronavirus infection.[18]

DIAGNOSIS

Following the outbreak, the complete 2019-nCoV genomic sequence was released in public databases. [19] This facilitates for further PCR assays for virus detection. The WHO recommendations respectively include rapid collection and nucleic acid amplification testing (NAAT) of respiratory samples including nasopharyngeal and oropharyngeal swabs as well as sputum and/or endotracheal aspirate or bronchoalveolar lavage.[17]

TRANSMISSION DYNAMICS

The two main routes known for SARS-CoV-2 transmission include (1) direct transmission (coughing, sneezing and inhalation of droplets) and (2) contact transmission (contact with nasal, oral, and ocular mucosa).[20] It is considered that viral respiratory infections spread by direct contact, such as touching an infected person or the surfaces and fomites that the person has either touched.[21] Saliva is a common and transient medium for virus transmission. Among saliva droplets with different sizes generated by breathing, talking, and sneezing large droplets easily fall onto the floor and contaminate. Saliva could form aerosols and reach a distant host along air flow when in a favourable environment. Therefore, wearing masks, disinfection of indoor air, social distancing not to acquire infectious saliva droplets could slow down SARS-CoV-2 pandemic to a certain degree (Fig. 1)

COVID-19 TRANSMISSION RISKS IN DENTAL PRACTICE

Dental professionals are at high risk of contagion due to the exposure to saliva, blood, and aerosol/droplet production

during the majority of dental procedures. SARS-CoV-2 transmission during dental procedures can therefore happen through inhalation of aerosol/droplets from infected individuals or direct contact with mucous membranes, oral fluids, and contaminated instruments and surfaces.[22] Biologic risk of COVID-19 inhalation transmission is extremely high when performing dental procedures due to the use of handpieces under irrigation, which favours the diffusion of aerosol particles of saliva, blood, and secretions. Moreover, this production of aerosol facilitates the contamination of the environment, instruments, dental apparatuses, and surfaces.[22,23] Dentists can play a significant role in disrupting the transmission chain, thereby reducing the incidence of the disease by simply postponing all non-emergency dental care for all patients. The following are prophylactic measures which can be taken to reduce the risk of contamination.

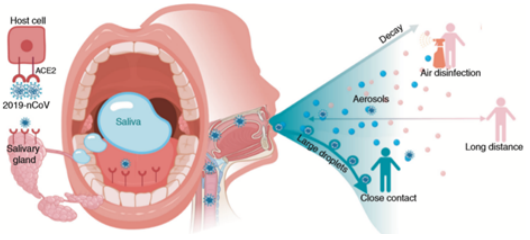

Fig 1: Potential Diagnostic Value Of Saliva And Transmission Of SARS-CoV-2[17]

Patient Triage. An attempt should be made to telephone triage all patients in need of dental care. In particular, patients should be asked whether any contact with infected people occurred or whether they travelled in highly epidemic areas. If a patient had a positive history of contact and/or symptoms, no treatment should be performed, and the patient should be reported to the authorities, to quickly impose quarantine and/or hospitalization depending on the severity of the situation. Meng et al.[22] recommended postponing dental treatments to up to 14 days after the exposure for asymptomatic patients. In cases of the absence of contacts and/or symptoms, dental procedures can be performed, provided that the prevention precautions were implemented. Body temperature should be registered, with a contact-free forehead thermometer, and the presence of suspect should be excluded. [22,23] It is also important to apply the same safety measures to people accompanying the patient. Intraoral imaging should be restricted and extraoral radiographs should be utilised to reduce the excessive salivation and gag reflex associated with intraoral radiographs

Pharmacologic Management. In suspected or confirmed cases of COVID19 infections requiring urgent dental care for conditions such as tooth pain and/or swelling, pharmacologic management in the form of antibiotics and/or analgesics is an alternative. This may provide symptomatic relief and will provide dentists sufficient time todeliver dental care with all appropriate measures in place to prevent the spread of infection.

Hand Hygiene It is crucial to perform thorough hand washing when coming into contact with patients and nondisinfected surfaces or equipment, and it is recommended to avoid touching eyes, mouth, and nose without having hands carefully washed. In particular, a protocol involving 5 hand washings (2 before and 3 after treatment) was proposed to reinforce professionals care.

Mouth Rinses prior to Dental Treatment. Use of antimicrobial mouth rinses prior to dental procedures focuses on the use of oxidative agents. 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.[24]

Personal Protective Equipment (PPE) for Dental Practitioners. Use of protective equipment including gloves, masks, protective outerwear, protective surgical glasses, and shields as recommended by the CDC in fig 2 and also follow safety measures while removal of the PPE as shown in fig 3. is strongly recommended to protect eye, oral, and nasal mucosa.[25] Ensure that the patient and visitors have donned their own cloth face covering, or provide a facemask if supplies are adequate.

Fig 2: Sequence For Doning Of PPE According To CDC

Fig 3: Sequence For Removal Of PPE According To CDC

Limitation of Aerosol-Producing Procedures. Peng et al. (2020)[23] highlighted the risk related to the performance of dental procedures, in particular when handpieces and

ultrasonic devices are employed. As reported by Meng et al. (2020)[22]it is advisable to minimize the operations involving the generation of aerosol and droplets while employing use of personal protective equipment.

Rubber dam isolation. 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% .[26] Following the placement of the dam, extra high-volume suction is also required for maximum prevention of aerosol and spatter from spreading. If it is not possible to use rubber dams for any reason, manual tools such as Carisolvs or hand scalers are preferable.[20]

Anti-retraction handpiece. Throughout the COVID-19 pandemic, the use of any dental handpieces that do not have an anti-retraction function should be avoided. For emergency treatment, anti-retraction handpieces designed with anti-retractive valves can play an effective role in preventing the diffusion and dispersion of droplets and aerosol.[27]

Disinfection. Research has shown that coronaviruses can remain on metal, glass, and plastic surfaces for several days. [28] Therefore, as surfaces in dental clinics serve as venues for droplets and aerosol mixed with patients' saliva and/ or blood, they can effectively help spread infection. Coronaviruses can actively maintain their virulence at room temperature from 2h up to 9days. Their activity at 50% humidity was significantly higher than 30%. Therefore, in the dental environment, it seems that keeping surfaces clean and dry will play a significant role in preventing 2019-nCoV transmission.[20] Coronavirus can be vulnerable to disinfectants such as sodium hypochlorite (1000ppm or 0.1% for surfaces and 10,000ppm 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. Studies show that other biocidal agents such as 0.05–0.2% benzalkonium chloride or 0.02% chlorhexidine digluconate probably have lower efficiency.

Negative-pressure treatment rooms/ airborne infection isolation rooms (AIIRs): For a negative pressure room, the sum of the mechanically exhausted air must exceed the sum of the mechanically supplied air. These rooms are more preferable for dental treatments during his pandemic.

Management of medical waste. Dental office waste should be disposed regularly to the institution's temporary storage facility. Reusable tools and equipment must be properly pre-treated, cleaned, sterilized, and securely stored until the next use. Dental waste resulting from the treatment of suspected or confirmed 2019nCoV patients is considered medically infectious waste that must be strictly disposed of in accordance with the official instructions using double-layer yellow medical waste package bags and "gooseneck" ligation.[20]

CONCLUSION

As there is a steep increase in the number of cases, dental professionals must be fully aware of Covid-19 spreading modalities, identifying patients with this infection, and most importantly, self-protection considerations.

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