International Journal Dental and Medical Sciences Research
Volume 3, Issue 1, Jan-Feb 2021 pp 216-221 www.ijdmsrjournal.com ISSN: 2582-6018

Transmission of Covid -19 in dental practice - A quick review on precautionary measures

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Date of Submission: 25-12-2020 Date of Acceptance: 03-01-2021

ABSTRACT: Covid 19 pandemic has posed significant challenges for dentistry throughout the world and the role of dental professionals in preventing the transmission of infection is critically important. Since the novel Corona virus (n CoV) is associated with human to human transmission and was recently identified in saliva of infected patients, Covid 19 transmission via contact with droplets and aerosols generated during dental clinical procedures can be expected. Dental professionals should be updated on how this pandemic is related to their profession in order to be well oriented and prepared. Conventional protective measures are not sufficient to protect dental professionals from getting infected during this pandemic. In addition to the usual principles of standard precautions some additional precautionary measures should also be implemented during this pandemic. Precautions should be crucial in terms of patient triage, patients entrance into the clinic, during dental treatment, and disinfection after clinical procedure.

Keywords: COVID 19, SARS CoV-2, dentistry, aerosol, precautions

I. INTRODUCTION

Covid 19 is an infection of upper airways which is caused by novel Corona virus officially named as SARS CoV- 2 (Severe Acute Respiratory Syndrome Coronavirus 2) and was declared as a pandemic by WHO on 11th March 2020. The common transmission routes of corona virus include direct transmission and indirect transmission; eye exposure may also provide a way for the virus to enter the body[1] and its infectivity has been demonstrated to be even higher than that of the original SARS[2]. The spread of this novel corona virus defines a new risk for all dental professionals and has posed significant challenges for dentistry in all affected countries and has evoked different speeds of reaction and types of response around the world. Dental practitioners are at high risk of contracting Covid 19 due to their direct exposure to saliva and blood[3].Current studies shows that a large majority of patients infected with Covid 19 may be asymptamatic for upto fourteen days[4] and transmission from these patients may occur before the disease symptoms appear[5].Some strains of virus have been detected in saliva as long as 29 days after infection[6,7]

During the early stages of outbreak, several countries have issued some quarantine measures to flatten the curve and dentists were instructed to provide only emergency treatments. However dental practitioners have to adapt their practices to protect themselves and their patients from this infection until a safe vaccine is available to all. Dental professionals should be updated on how this pandemic is related to their profession in order to be well oriented and prepared. Conventional protective measures are not sufficient to protect dental professionals from getting infected during this pandemic. Even though several authors have suggested different measures, there is still a clear lack of evidence on what the standard should be for dentists. This article aims to suggest some precautionary measures to minimize of risk of transmission of Covid 19 to both dental personnels and patients

Precautions in routine dental practice

In addition to the usual principles of standard precautions some special precautionary measures should also be implemented during this pandemic. Precautions should be crucial in terms of patient triage, patient entrance into the clinic, during dental treatment, and disinfection after clinical procedure.

Pre treatment telephonic triage

Asymptomatic (carrier) patients as well as patients with acute respiratory illness may present for dental treatment at outpatient dental settings. While it is important to provide treatment for patients who present with urgent or emergency dental procedures, the primary goal should be to prevent transmission of infection to patients and dental healthcare personnel. So before admitting

any patient for treatment, any sign of Covid 19 should be properly assessed. This can be done with a short telephonic triage by the dental receptionist or dental assistant by proper history taking including fever, upper respiratory symptoms, contact history, quarantine history, infected member in the family etc. Adult patients should be encouraged to come alone if possible. Ask the patients to avoid bringing children as accompanying persons to clinic.

No routine dental treatment should be carried out on patients at the early stages of infection, and these patients should be encouraged to quarantine and self-isolate themselves. If the results of screening indicate potential for COVID-19 infection, the patient should be advised to self-isolate at home and contact their COVID-19 care center if the symptoms get worse[8]. For suspected/confirmed case of Covid 19 who are medically stable, lab tests and multidisciplinary team consultation shall be performed and the patient should be rescheduled. E- consultancy services and tele medicine can be encouraged in these patients.

Waiting area

When the patient enters the dental office, they should be provided with antiseptic hand disinfection at the entrance of the waiting room, data collection on the patient's history should be repeated and body temperature should be registered with a contact-free forehead thermometer, and the presence of suspect symptoms (coughing, sneezing, respiratory difficulty) should be excluded[9].If body temperature is >37.5 °C, treatment should be postponed unless it is an emergency.Ensure that all patients uses a face mask which properly covers their nose and mouth and instruct them to dispose used tissues into a waste bin immediately after use and ensure hand hygiene. Patients mobile phones and bags are encouraged to be left in the waiting room. It is important to apply the same safety measures to people accompanying the patient. If possible, accompanying subjects should be advised to wait outside the dental office. It is recommended to avoid patients from staying long in the waiting room and to remove all objects that can get potentially contaminated like tables, magazines, toys etc which could facilitate cross-infection. Clean and disinfect any pens and clipboards provided to patients. It is also important to limit the number of patients in the waiting room and spatial separation of at least 1metre should be maintained between patients. Reducing the number of patients at a time will be helpful in avoiding crossinfection in dental patients[3]. This also provides adequate time for the supporting staff to properly disinfect the waiting area. It is advisable to schedule appointments for immunocompromised patients or patients with comorbidities at the end of the day when the waiting room is empty. Thermometers and blood pressure cuffs should be disinfected with 70% ethyl alcohol after each use[10]. Waiting areas should be adequately ventilated and should be cleaned frequently between patients.

Aerosol generation and importance in dental practice

Dental procedures in general are categorized into two groups according to aerosol generation. Generation of aerosol is unavoidable in most of the dental procedures like preparing cavities for fillings, use of rotary instruments for root canal treatment, scaling and polishing of teeth, dental implantation, and surgical removal of teeth. Risk of aerosol transmission requires close physical proximity between an infected individual and a suspected individual. Biologic risk of COVID-19 inhalation transmission is extremely high when performing dental procedures due to the use of handpieces 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 apparatuses, and surfaces[11,12] Water coolant which is used when performing dental procedures generate aerosols and these aerosols when combined with bodily fluids of oral cavity like blood and saliva produce bioaerosols. These bioaerosols may be contaminated with bacteria, fungi and virus and have the potential to float in the air for a considerable amount of time and may be inhaled by dentists or other patients[13,14] Based on the current epidemiological data, 2019nCoV has higher transmissibility than SARS-CoV and MERS-CoV[15]. Therefore, modification of standard precautions and infection control regimen targeted towards aerosol transmission of 2019-nCoV is essential during this pandemic

Precautions during procedure

Pre procedural mouthrinse is the most effective method of reducing the proportion of microorganism in oral aerosols[16,17].Although the effect of preprocedural mouth rinse against corona virus is still unknown, it has been proven that chlorhexidine is effective against herpes simplex virus, human immunodeficiency virus and hepatitis B virus[18]**.** Preoperative mouthwash can be administered before examining the patient as it can

effectively reduce the risk of infection[19] and several reports have proved that Povidone Iodine at a concentration of 7% is effective in reducing the viral count of SARS-COV invitro[20,21]. According to Peng, Cheng 2020 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[8.] The patient should perform a 1-min mouth rinse with 0.2% to 1% povidone, or 1% hydrogen peroxide prior to the dental procedure.

The dental practitioner should perform careful hand washing for at least 60s, prior to wearing gloves with 70-90% alcohol based hand rubs or with soap and water[22.] If the hands are visibly soiled, soap and water should be used. Hand hygiene should be performed before touching a patient, before aseptic procedures, after exposure to body fluids, after touching a patient and after touching a patients surroundings[23] Eyes should be protected with the use of safety glasses/goggles and face shields. It should be worn throughout the treatment and disinfected between patients using 70% isopropyl.

Personal protective equipment can form an effective barrier against the hazards of aerosols generated from the operative site.The use of triple layer /N95 masks, goggles, face shield, long sleeved water-resistant gowns, head cap, shoe cover and gloves is mandatory when treating patients, as every healthy patient may be potentially contagious. Surgical face mask should be used if working at a distance of less than 1metre from the patient. When performing aerosol generating procedures, a particulate respirator N-95 can be used. Face masks should be changed after the performance of the dental procedure and should be worn by the whole team, including nonclinical staff members. The available literature and actual clinical experience are still not able to suggest which protection equipment to use when treating patients with COVID-19 for dental treatment that cannot be postponed. There is still no information available on how to equip for the subjects at potential risk of infection in which treatment cannot be postponed. Although the reduction of aerosol generation has been listed among the preventive measures against SARS-CoV-2 infection, it is recommended to frequently renew indoor air either by opening the windows or using mechanical ventilation, possibly in between patients.

The use of a rubber dam can effectively reduce aerosol production and surgical aspiration may limit aerosol diffusion. It has been reported that rubberdam can reduce airborne particles by 70%[24]. Application of rubber dam during cavity preparation showed significant reduction in microorganisms by 90% [25.]One disadvantage is that it is not feasible in procedures that require subgingival instrumentation like subgingival crown margin preparation, subgingival restoration etc. When application of rubber dam is not feasible, use of handpieces should be limited, and if possible, procedures should be performed with manual instruments such as excavators and hand scalers to keep aerosol generation at a minimal level. Studies shows that the use of an **anti-retraction handpiece** results in a significant reduction in the backflow of bacteria and Hepatitis B virus (HBV) from oral cavity into the tubes of the handpiece and the dental unit in comparison with a handpiece without anti-retraction function[26]. Hence anti-retraction handpieces are advised and encouraged especially during this pandemic.

A high-volume suction can also be useful along with the rubber dam to further minimize the risk of contamination[27] Ge and Zhejiang has recommended certain special precautions to prevent aerosol transmission[28]which include minimising unnecessary hand contact with surfaces and equipments in dental office, avoiding rotary instruments and performing atraumatic restorative techniques, performing manual scaling and polishing whenever possible, taking adequate care while performing procedures to avoid gagging and coughing of the patient, disinfection of dental impression upon removal from patients mouth, treating the patient in supine position to avoid working in the breathway of the patient while performing simple extractions

Disinfection after clinical procedure

After the procedure, all the disposable protections should be removed and high-level disinfection performed. After each patient, at least a 5-min air change is advised. As the transmission of SARSCoV-2 mainly happens through aerosol and droplets and since the virus tends to persists in aerosol for up to 3h and has a relatively long half-life of approximately 1.1 to 1.2h[29] it is recommended not to remove personal protective equipment prior to exiting the contaminated area.

It is always crucial to perform an appropriate disinfection of the potentially contaminated operating room using surface disinfectants containing 60-70% ethanol, 0.5% hydrogenperoxide or 0.1%sodium hypochlorite and the clinician should maintain accurate hygiene between each appointment. Surfaces should be disinfected after each patient visits. All surfaces that may be touched by the patients should be disinfected with sodium hypochlorite 0.1% or 70%

isopropyl alcohol. Careful disinfection of surfaces and particular attention should be given to door handles, chairs,desks,touch screens and monitors. Meng and Peng 2020 recommended a dry environment in the dental office to control diffusion[11]

High volume evacuator (HVE) and High efficiency particulate arrestor (HEPA) filters are the commonly used devices for filtering or removing contaminated air from the operating room.HVE filters are the easiest and inexpensive way to remove aerosols and effectively reduce contaminated air by 90% [30]. It helps to remove air at a rate of upto 2.83m^3per minute. HEPA filter is expensive and removes 99.97% of the particles measuring 0.3µm in diameter. Disadvantage is that the filter can be a source of microbes if the retained microorganism proliferate and enter back into the filtered air [31].

Precautions for dental emergencies

According to Zi-yu Ge, Lu-ming, Zhang 2020 common dental emergencies include facial trauma, facial space infection and carcinoma. ADA has clarified the meaning of dental emergencies as "potentially life-threatening conditions that require immediate treatment to stop ongoing tissue bleeding, alleviate severe pain, or infection"; therefore, the emergency conditions indicated for treatment include uncontrolled bleeding, certain infections such as pericoronitis, postoperative osteitis, dry socket, or abscess/cellulitis; trauma such as symptomatic fractured tooth or avulsion/luxation; as well as certain urgent restorative procedures[32]. When treating emergencies, clinicians should not underestimate the possibility of infection from asymptamatic patients, and all dental treatment should be considered as high risk and thorough medical history should be taken including screening questions. Temperature should be recorded and lower respiratory symptoms monitored.

For suspected/confirmed case of Covid 19 requiring urgent dental treatment, highest level of personal protection should be implemented like use of negative pressure room with a minimum of 12 air changes per hour for atleast 160L/s per patient to facilitate natural ventilation[33]

General precautions to be implemented in clinic

Instruct staff to come in street clothes and change to scrubs in the clinic. Staff should change back to street clothes before leaving and take the worn scrubs home in a sealed bag for washing. Encourage nonclinical staff to stay out of clinical areas. Staff should take their breaks outside or at their desks, and should maintain strict social distancing guidelines.

Remove all nonessential items from the treatment areas and clean and disinfect rooms after each patient use. To avoid cross-contamination neither the dentist nor the assistant should leave the treatment room for any reason while treating the patient.

During the dental treatment, all the necessary dental instruments should have been prepared in advance, to limit contamination and make the procedure faster. Disposable protections should be placed on working surfaces, the dental chair, and devices to avoid direct contamination.

Considering the risk of aerosol remaining in the air, it is advisable to wait atleast one hour before admitting another patient in the operating room, if it is not functioning under negative pressure.

If there is a lift in the building, it should be disinfected frequently, and all lift users should be encouraged to wear masks and avoid direct contacts with any buttons in the lift [8]

Clinical waste management

Clinical waste should be stored in a safe temporary storage area, and all reusable instruments and items should be pre-treated, cleaned, sterilized and properly stored in accordance with the local protocols. The clinical waste generated after treatment of COVID-19 positive patients must be regarded as infectious clinical waste and stored in clinical waste bags and the surface of the package bags should be marked and disposed according to the local regulations and requirement for the management of medical waste[8].

II. CONCLUSION

Although no single method can completely eliminate the risk of COVID-19 transmission, the combined use of all the precautions can reduce the risk of infection and keep transmission of infection to a minimum and help us provide much needed care to our patients. Since many a times we come across asymptamatic Covid 19 patients it is always imperative to treat all patients as corona positive. In short, COVID-19 has made many immediate changes of which some may have further long-term impacts on clinical practice. We might shortly go back to our "routine" dentistry worldwide but cannot exclude the possibility for significant changes in profession in the coming future.

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