

Review Article

SARS-CoV-2 and Dentistry: A Periodontal Perspective

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ABSTRACT

Both COVID-19 infection and periodontitis are inflammatory diseases. The common pathway of inflammatory response points towards a possible association between periodontitis and COVID-19. Oral hygiene intervention has shown improved clinical outcomes and reduced mortality.

Periodontal therapy may therefore be considered a parameter of care in the clinical management of COVID-19 patients. In this review, we will discuss the dental treatment guidelines for safe dental practices during the current COVID-19 pandemic.

Keywords: COVID-19, dental practices, oral hygiene, periodontitis.

INTRODUCTION

Periodontal disease is a microbial disease, there is a physiologic response to the microbial challenge, leading to the recruitment of immune ant-inflammatory cells, and causing the production of cytokines and chemokines.¹

COVID-19 has been declared a pandemic throughout the world. The symptoms seem to be in response to cytokine storms. Cytokine storm shows an elevated level of serum IL-1 beta, IL-10, IL-17, IL-2, IL-8, and IL-9. Elevated Th17 pathway responses have been observed in patients of SARS-CoV-2. The 17 types of inflammatory response is involved in the cytokine storm, leading to pulmonary tissue damage that is caused by SARS-CoV-2.²

There are increased IL-17 producing cells in periodontal tissue of patients suffering from both gingivitis and periodontitis compared to the healthy periodontium. The level of IL-17 falls in both GCF and serum of patients with periodontal disease, after non-surgical periodontal treatment.³

Both COVID infection and periodontitis are inflammatory diseases. The common pathway of inflammatory response points towards a possible association between periodontitis and COVID-19. Hence there is a possible link between the presence of periodontal disease and COVID-19 related adverse outcomes.²

Poor oral hygiene is a modifiable risk factor for COVID-19

According to metagenomics analysis, patients infected with severe acute respiratory syndrome coronavirus 2 have high records of cariogenic and periodontopathic bacteria, suggesting a link between the oral microbiome and COVID-19 complications.³ Evidence suggests the role of oral bacteria in the pathogenesis of respiratory infections is due to aspiration of periodontal pathogens into respiratory organs leading to alteration of respiratory epithelium by inflammatory mechanism rendering the adhesion of respiratory pathogens.⁴

Oral hygiene intervention in pneumonic patients has shown improved clinical outcomes and reduced mortality. Regular oral care has significantly reduced the incidence of ventilator-associated pneumonia in patients in ICU.⁵ This evidence is important to ascertain whether poor oral hygiene is a modifiable risk factor for COVID-19.

Oral expression of SARS-CoV-2 receptor: The believed target cell of the SARS-CoV-2 virus is the respiratory tract, but it also targets other locations like the heart, GI tract. Periodontal pocket could be a plausible niche for SARS-CoV-2 virus. The favorable environment of the periodontal pocket allows the virus to replicate and spread systemically using the capillary of the periodontal complex. The most frequently detected viruses in the periodontal pocket are *Herpes Simplex virus*, *Epstein Barr virus*, and *Human Cytomegalovirus*.⁶

Viruses from the periodontal pocket can migrate to the oral cavity via GCF and can migrate to the systemic blood stream via the periodontal capillary system. *SARS-CoV-2* has an affinity to specific membrane receptors in a periodontal pocket. It could involve outer/inner epithelial lining and gingival/periodontal fibroblast.⁷⁻⁸

Further research is required to determine whether *SARS-CoV-2* could infect inflammatory cells. Data would be required to use periodontal pocket/GCF sampling as a testing tool for COVID-19. Periodontal therapy would be considered a parameter of care in the clinical management of COVID positive patients.

TREATMENT MODALITIES FOR COVID-19

Supportive therapy is the cornerstone of treatment. Recent IDSA and NIH guidelines reinforce this general approach to pharmacological treatment, with data for only a few specific therapies in certain circumstances.⁹⁻¹⁰

Antiviral drugs (Table 1):

- Chloroquine and Hydroxychloroquine
- Lopinavir/Ritonavir
- Remdesivir
- Favipiravir

Adjunctive therapies

- Corticosteroids
- Immunomodulatory agents
- Immunoglobulin therapy

WHO guidance document: The current World Health Organization (WHO) clinical management guidance document (as of March 13, 2020) states “there is no current evidence to recommend any specific anti-COVID-19 treatment for patients with confirmed COVID-19”.¹³ The guidance emphasizes the role of supportive care based on the severity of illness, ranging from symptomatic treatment for mild disease to evidence-based ventilatory management for ARDS and early recognition and treatment of bacterial infections and sepsis in critically ill patients.¹³

Dental treatment guidelines: On March 16, 2020, the

American Dental Association proposed that dentists defer all elective procedures and offer just the dental emergency treatment.¹⁴ Some cases such as progressive fascial space infections or dentoalveolar trauma would certainly require emergency dental treatment. As per the Ministry of Health and Family Welfare, Government of India, dental professionals should consider the following guidelines.¹⁵⁻¹⁹ This guideline provides for safe dental practices to be followed in Dental Clinics located in Government and private sector Dental colleges.

1. Risk assessment and management¹⁹

1.1 Low risk patient:

- ◆ Vaccinated patients.
- ◆ No active COVID-19 symptoms, RT-PCR negative.
- ◆ COVID-19 affected persons in whom 14 days have elapsed after resolution of the COVID-19 symptoms and/or RT-PCR negative.

All dental procedures can be undertaken with appropriate precautions.

1.2 High risk patient:

- ◆ Patients with COVID-19 symptoms.
- ◆ Patients with RAT or RT-PCR positive.
- ◆ Only emergency procedures should be undertaken with standard COVID protocol.
- ◆ If facilities do not exist for COVID appropriate protocol, high risk patients may be referred to higher centers for management.

The dental clinics/hospitals located in the ‘containment zone’ will remain closed; however, they can continue to provide tele triage. Patients in this zone can seek ambulance services to travel to the nearby dental facility in ‘non-containment zones’. All dental professionals including auxiliary staff are to ensure full vaccination.¹⁶

2. Protocols for dental clinic/ OPD

2.1. Teleconsultation²⁰

- ◆ Teleconsultation will be preferable
- ◆ Prior teleconsultation will also facilitate identifying

Table 1: Drugs used for COVID-19 treatment

Hydroxychloroquine	Chloroquine 500 mg orally once or twice daily. ¹⁰ Hydroxychloroquine loading dose of 400 mg twice daily for 1 day followed by 200 mg twice daily. ¹⁰
Lopinavir/ Ritonavir	Lopinavir/ Ritonavir dosing regimen for COVID-19 400 mg/100 mg twice daily for up to 14 days. ¹¹
Remdesivir	The current dose under investigation is a single 200 mg loading dose, followed by 100 mg daily infusion. ¹²
Favipiravir	A loading dose is recommended (2400 mg to 3000 mg every 12 hours × 2 doses) followed by a maintenance dose (1200 mg to 1800 mg every 12 hours). ¹¹

patients requiring physical examination in clinic.

2.2. Appointment system (time-based appointment to limited numbers)

- ◆ One patient at a time in the examination room, if possible, without attendant.
- ◆ Sufficient time should be given for patient evaluation and for time in-between patients.
- ◆ Appoint patients with comorbidities or other vulnerable groups at a separate time or early morning slot.
- ◆ Walk-in patients without appointments should be discouraged.

2.3. Screening of patients at OPD/ dental clinic entry:²¹

- ◆ All patients entering Dental Clinic/ OPD should be screened for symptoms of COVID to avoid / minimize exposure to staff and to patients.
- ◆ Patients having symptoms suggestive of COVID-19 shall be referred to a COVID treatment facility.
- ◆ Regulate entry of patients and ensure use of mask/face cover, hand hygiene, and physical distancing, as per the standard protocols advocated by Ministry of Health and Family Welfare.¹⁶

2.4. Waiting area:^{16,22}

- ◆ Display visual alerts at the entrance of the facility and in strategic areas (e.g., waiting areas or elevators) about respiratory hygiene, cough etiquette, physical distancing, and disposal of contaminated items in trash cans.
- ◆ Install glass or plastic barriers at the reception desk, preferably with a two-way speaker system.
- ◆ Ensure availability of sufficient three-layer masks and hand sanitisers and paper tissue at the registration desk, as well as nearby hand hygiene stations.
- ◆ Ensure physical distancing between waiting chairs, preferably six feet (2 gaj ki doori) apart.
- ◆ All areas to be free of all fomites such as magazines, toys, TV remotes or similar articles.
- ◆ Cashless/contactless payment methods are preferred.
- ◆ A bin with lid should be available at triage where patients can discard used paper tissues, masks etc.

2.5. Within dental operatory:

- ◆ Ensure spacing or barrier in multi-chair operatory. Separate areas for donning and doffing of PPE should be identified.²³
- ◆ In a multi-chair facility, the clinical area should preferably be divided into a screening and treatment area with separate dental chairs.²⁴

- ◆ The dental operator, assistant, and all personnel within two meters of patient care should wear impervious surgical gown/ scrub with well-fitting N-95 mask.²⁵
- ◆ Sensor taps or taps with elbow handles should be preferred.²⁶
- ◆ Avoid use of towels; paper towels are preferred.²⁶
- ◆ Pre-procedural mouthwash (povidone-iodine, chlorhexidine, hydrogen peroxide) for at least 15 seconds may be helpful in a transient reduction of viral load.²⁷⁻²⁹
- ◆ Infection control guidelines with special considerations for aerosol or splatter generating procedures should be followed:³⁰⁻³²
- ◆ High vacuum suction with a minimum suction capacity of 6.6 liters per minute.
- ◆ Use a face shield.
- ◆ Use a rubber dam wherever possible.
- ◆ Keep adequate time in between two procedures.
- ◆ Clean and disinfect equipment and operatory surfaces with 1% sodium hypochlorite or 70% alcohol for appropriate contact times.
- ◆ The patient drape will be removed by the assistant, and the patient is asked to perform hand washing and guided out of the clinic towards reception and handed back his foot wears and belongings.
- ◆ Remove the soiled gown as soon as possible. The procedures and prescriptions are recorded only after doffing the PPE.
- ◆ Patient to perform hand hygiene and to be provided with review /follow up instructions.

For patients with COVID-19 symptoms/tested positive, it is advised that:

- ◆ The emergency procedures should be undertaken with level 3 PPE and standard COVID-19 protocol for surgeries.³³
- ◆ The clinics which do not have the required infrastructure, should refer such patients to higher centers for management.

3. Infection prevention control and waste management

3.1. Disinfection of dental clinic/ dental facility:

- ◆ After the patient leaves the treatment room, the assistant will collect all hand instruments immediately, rinse them in running water to remove organic matter, and as per standard sterilization protocol.
- ◆ All 3 in 1 syringe, water outlets, hand piece water pipelines, etc. should be flushed with the disinfectant solution for 30-40 seconds.¹⁵

- ◆ Remove water containers and wash them thoroughly and disinfect with 1% sodium hypochlorite using a clean cotton/gauge piece and then fill with fresh 0.01% sodium hypochlorite solution and attach it back to the dental chair.¹⁵
- ◆ Then, disinfect the dental chair along with all the auxiliary parts within 3 feet of distance using 1% sodium hypochlorite and clean and sterilized cotton/gauge piece using the inner to outer surface approach and leave for drying. New cotton/ gauge pieces should be used for every surface. The areas include:^{15-19,30}
 - ◆ Patient sitting area and armrests.
 - ◆ Dental chair extensions including water outlets, suction pipe, handpiece connector, 3 in 1 syringe, etc.
 - ◆ Dental light and handle.
 - ◆ Hand washing area slab and tap nozzle.
 - ◆ Clinic walls around the dental chair and switchboards.
 - ◆ Hand washing area slab and tap nozzle.
 - ◆ Handpieces should be cleaned using a handpiece cleaning solution to remove debris, followed by packing in the autoclave pouches for autoclaving. Record to be maintained for the same.³⁰
 - ◆ Delicate electronic equipment should be wiped with alcohol-based rub/spirit (60-90% alcohol) swab before each patient contact.³⁴
 - ◆ Floors: 2 step cleaning procedure (detergent and freshly prepared 1% sodium hypochlorite) with a contact time of 10 minutes. Mop the floor starting at the far corner of the room and work towards the door, two hourly or after a major splash.³⁵
 - ◆ 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).¹⁵⁻¹⁹

3.2. Waste management:

Treat blood, body fluids, secretions contaminants, and human tissues as clinical waste, in accordance with local regulations. Discard single use items coming in contact with body fluids of COVID-19 patients with special caution. Proper provision of covered biohazard bins for disposal should be made available. Used PPEs, masks etc. should necessarily be disposed of in accordance with the guidelines issued by Central Pollution Control Board.¹⁵⁻¹⁹

4. Dental laboratory protocol¹⁵⁻¹⁹

- ◆ Disinfect dental impressions, dental casts, prosthesis, appliances, etc before handing over to laboratory/ clinical staff and vice versa.
 - ◆ Consider all the tissue specimen and body fluids samples collected for laboratory investigations as potentially infectious and recommendations for infection control in laboratories should be followed while handling them.
 - ◆ Consider referral laboratories if unable to meet biosafety recommendations.
- ### **5. Dental imaging protocol³⁶**
- ◆ Minimize intraoral imaging and prefer extraoral radiographs.
 - ◆ Double barrier (impervious covers or sleeves) the dental X ray film or RVG sensor.
 - ◆ Disinfect the X-ray unit handle, tube, casing, computers, and monitors with bleach free disinfectant twice daily.
- ### **6. Ventilation and air quality management in dental clinics**
- ◆ Maintain air circulation with natural air through a frequent opening of windows and using an independent exhaust blower to extract the room air into the atmosphere.³⁷
 - ◆ Avoid the use of a ceiling fan while performing procedure.¹⁵⁻¹⁹
 - ◆ Place a table fan behind the operator and let the airflow towards the patient. A strong exhaust fan to be so located to create a unidirectional flow of air away from the patient.
 - ◆ For air-conditioned facilities, the guidelines of CPWD shall be followed which mentions that the temperature setting of all air conditioning devices should be in the range of 24-30° C, relative humidity should be in the range of 40-70%, intake of fresh air should be as much as possible and cross ventilation should be adequate.¹⁶
 - ◆ The window air condition system/ split AC should be frequently serviced, and filters cleaned.¹⁵⁻¹⁹
 - ◆ Use an indoor portable air cleaning system equipped with HEPA filter and UV light.³²
- ### **7. Instructions to patients visiting dental clinics/hospitals¹⁵⁻¹⁹**
- ◆ Follow tele consultation and visit the dental clinic/ oral health facility only with a prior appointment.
 - ◆ Wear a face mask during transport and before entering the premises.
 - ◆ Minimise or eliminate wearing a wrist watch, hand and

body jewelry and carrying of additional accessories bags, etc.

- ◆ Minimize the number of people accompanying the patient.
- ◆ Use their own washrooms at home to avoid the need of using toilets at the dental facility.
- ◆ Have a mouthwash rinse with 10 ml of the 0.5% solution of PVP-I solution (standard aqueous PVP-I antiseptic solution-based mouthwash diluted 1:20 with water). Distribute throughout the oral cavity for 30 seconds and then gently gargle at the back of the throat for another 30 seconds before spitting out.²⁷
- ◆ To report if suffering from any symptoms suggestive of COVID-19 infection (fever, cough, cold, etc.).
- ◆ Maintain a physical distance of 6 feet while waiting for your turn for consultation.
- ◆ To be vaccinated as appropriate.

CONCLUSION

It is likely that coronaviruses will continue to emerge, evolve, and cause both human and veterinary outbreaks. Periodontal therapy may be considered a parameter of care in the clinical management of COVID-19 patients. However, further research and advances in anti-viral drugs and vaccines against COVID-19 will help develop suitable therapeutics against COVID-19.

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