



Review Article

Changing paradigm in prosthodontics practice post COVID-19 outbreak

Sneha Sekhsaria¹, Abhimanyu Sharma^{2,*}, Bhawana Tiwari³, Ankit Sharma³,
Tanvi Mahajan³

¹Prosthodontist, Kolkata, West Bengal., India

²Dept. of Oral & Maxillofacial Surgery, ESIC Dental College, New Delhi, India

³Dept. of Prosthodontics, ESIC Dental College, New Delhi, India



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ABSTRACT

In last 3 months, COVID-19 has rapidly expanded across various countries. It is a zoonotic which is believed to have originated in bats and pangolins and later transmitted to humans. Human transmission occurs via respiratory droplet/contact. WHO declared COVID-19 as a pandemic due to the alarming levels of spread and severity. In response to the current threat, many countries have employed various containment strategies to protect people from health risk and avoid strain on the national healthcare systems worldwide. However despite the extensive efforts, this outbreak is still on the rise due to the community spread. In such a scenario, dental healthcare workers may deal with patients who have suspected/confirmed SARS-CoV-2 infection. Prosthodontics stands at a unique position in Dentistry because of service to Geriatric patients, procedure such as tooth preparation that needs aerosol generation, involvement of Labs for dentures and crown fabrication and most of treatments requiring multiple sittings. Current article aims to provide brief information pertaining to possible source of spread of COVID-19 in Prosthodontics setup regarding patient management and clinical strategies.

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1. Introduction

A novel human corona virus, also called as Severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) was announced as the causative microorganism of COVID-19 outbreak by the Chinese Centre for Disease and Prevention in January 2020.¹ The COVID-19 pandemic has rapidly become a public health crisis of global concern. Due to the widespread transmission of SARS-CoV-2 and the unique characteristics of dental office (including proximity of oropharyngeal region, generation of aerosol during dental procedures),² both the dental healthcare professionals as well as the patients have an increased risk of cross infection.³ Although the mortality associated with COVID-19 is low, it has a high spreading potential.⁴

Oral health is not separate from general health, but maintaining oral health is definitely difficult and different in old age. Elders above 65 years (old age) have health problems as a result of ageing process, which calls for special consideration.⁵ Considering the vital role of the body's immune system, elderly patients with chronic debilitating diseases such as diabetes, cardiovascular diseases, pulmonary dysfunctions have a higher risk of getting infected compared to young, healthy individuals with a strong immune system.⁶ To date, three quarter of a million cases have been reported, and more than thirty-three thousand patients have died around the world (Source WHO situation report-70). Prosthodontics, which is a speciality of dentistry which deals with services to Geriatric age group in form of Complete Denture, Removable Denture, Implant supported Prosthesis and Crown and Bridge to replace missing teeth in any adult age group. In tough times in all dimensions a constant

* Corresponding author.

E-mail address: asmaxfac@gmail.com (A. Sharma).

debate is going on regarding resuming the dental services in emergency and somewhat elective situation. The challenge to Prosthodontist is going to be much more because of factors such as high concentration of copious saliva in trays & dentures, exposure to blood during pre prosthetic surgeries and implant placement and exposure to aerosols during tooth preparation for crown and bridge. Majority of patients visiting prosthodontist belongs to Geriatric age group who are prone to catch this infection easily. Unlike other routine dental procedures which can be finished in one sitting almost every prosthodontic treatment demands multiple visits by patients, which throws a unique challenge to ensure bilateral safety at every visit. One very crucial aspect in prosthodontic practice is lab service, in any form of prosthodontic treatment, be it complete denture to partial denture, crown to bridge laboratory support is must unlike other specialities of dentistry. It is very important to consider the fact that lab work involves multiple people in a chain starting from the doctor, assistant, runner, lab supervisor, laboratory technician to runner and doctor again. More human in chain increases probability of possible contamination. It is very important to understand Dos & Don'ts for Patients as soon as they arrive in dental clinic or even at telephonic conversation for any dental complaint (Table 1)

2. Elucidation

2.1. Possible transmission routes of COVID-19 in Dental Clinics.

Dental patients and professionals can be exposed to pathogenic microorganisms, including viruses and bacteria that infect the oral cavity and respiratory tract. Dental care settings invariably carry the risk of COVID-19 infection due to the specificity of its procedures, which involves face-to-face communication with patients, and frequent exposure to saliva, blood, and other body fluids, and the handling of sharp instruments. Spread of infection from patient to doctor or vice versa can be divided as following:^{7,8}

2.2. Air borne spread

The pathogenic microorganisms can be transmitted in dental settings through inhalation of airborne microorganisms that can remain suspended in the air for long periods, direct contact with blood, oral fluids, or other patient materials, contact of conjunctival, nasal, or oral mucosa with droplets and aerosols containing microorganisms generated from an infected individual and propelled a short distance by coughing and talking without a mask and indirect contact with contaminated instruments and/or environmental surfaces.

Contact Spread

A dental professional's frequent direct or indirect contact with human fluids, patient materials, and contaminated

dental instruments or environmental surfaces makes a possible route to the spread of viruses. Moreover, salivary gland epithelial cells can potentially be infected by SARS-CoV and become a major source of the virus in saliva.^{9,10} Even after patient recovery, recusancy during the convalescence period was reported.¹¹ This is plausible since the presence of some virus strains in saliva for as long as 29 days have been reported in the literature.^{12,13}

3. Contaminated surface spread

Dental devices such as high-speed dental hand-piece use high-speed gas to drive the turbine to rotate at high speed and work with running water. When dental devices work in the patient's oral cavity, a large amount of aerosol and droplets mixed with the patient's saliva or even blood will be generated. Particles of droplets and aerosols are small enough to stay airborne for an extended period before they settle on environmental surfaces or enter the respiratory tract. Thus, keeping a clean and dry environment in the dental office would help decrease the persistence of COVID-19.

The first step a prosthodontist can do to ensure the well being of his/her patients is prepare a digital written/audio/video message detailing a few common problems faced by the patients using those prosthesis and their maintenance in an event of breakage at the home. Such a set protocol by the clinician, psychologically comforts the patients and also helps guiding the patient virtually through the unfortunate situation with their prosthesis. It is important that the prosthodontist is able to prioritize a condition as an emergency before giving an appointment to the patient for an in person consultation. (Table 2)

In the light of prosthodontic urgency for elderly patients (>65 years of age) due to ill fitting RPD/CD (Table 3), a home care guidance can be explained over tele-consultation. Patient should also be advised to disinfect the dentures at home regularly as well as before sending it to the clinic (Table 4). Any elderly patient who is a denture wearer, if infected with COVID-19 should immediately discard wearing the denture.

In the light of given pandemic & its source of spread and transmission, it becomes the moral duty of the prosthodontist to defer all elective treatment procedures like Crowns, Bridges, Veneers, Inlays, Onlays, which involve the generation of aerosols and handle only urgent and basic procedures. In certain situations where the clinician has to proceed with an aerosol generating procedure complete personal protective equipment (PPE suit, face shield, double gloves, N95 mask, shoe cover) should be donned by the prosthodontist as well as the assistant.¹⁴ The prosthodontists are instructed to use PPE while using the trimmers and buff along with a high vacuum suction to ensure that the flints or fragments are sucked out completely.

Table 1: Standard & Suggested Dental Office Protocols

1. Initial tele-screening of dental patients to identify suspected COVID-19 carriers
2. Considering every patient as a potential asymptomatic COVID-19 carrier.
3. Considering recently recovered patients as potential virus carriers for at least 30 days after the recovery confirmation by a laboratory test.
4. Meticulous screening of even asymptomatic patients is important. Patients should be requested to fill out detailed questionnaire regarding COVID-19
5. Maintenance of proper record, address, contact details are of paramount importance. Since the incubation period of SARS-CoV-2 may extend over 2 weeks, a positive response any of the above queries mandates deferring the appointment for at least 2 weeks. Additionally the patients should be encouraged to self quarantine at home and contact their primary care physician for tele-consultation.^{3,15,16}
6. Those patients who seem fit for appointment scheduling should be advised to wear surgical face mask and preferably come alone or with a single attendant at the time of their dental visit.
7. Dental office and the waiting area should be well ventilated at all times along with spaced out seating of patients.
8. Patients should be instructed to arrive on time for their appointments.
9. Remove magazines, reading materials, toys and other objects.
10. Schedule appointments to minimize possible contact with other patients in the waiting room.
11. Use of contact less thermal screen and pulse oximeter device should be considered even if the patient answers no to the COVID symptoms questions.³
12. Use of pulse oximeter can be expanded in general dental office screening procedures during this pandemic. An oxygen saturation of below 90% is a good marker for some form of oxidative distress in the body. Use of pulse oximeters can help in screening of patients that might be asymptomatic but are actually having the disease.
13. Patients should be instructed for hand sanitization and proper hand washing as soon as he/she enters the clinic.
14. The prosthodontist in his clinic should ensure that entire team is well versed with the universal precautions.¹⁶

Table 2: Prosthodontic emergencies

Although the word 'emergency' may not be applicable to prosthodontic treatment in the true medical sense, there are many situations in which a prosthodontic attention is required urgently as specified in the ADA guidelines for better understand. This urgent care is needed so that the patient can carry on with his usual activities without impairment in oral function or appearance. Some of such situations are:

- Dental trauma due to denture fracture
- Repair of broken dentures
- The need for temporary or immediate dentures
- Final crown/bridge repair or cementation if the temporary restoration is lost or broken.
- Problems with implants or implant prosthesis
- Ulceration due to sharp edges of tooth or prosthesis

Table 3: Management of Prosthodontic urgency related to CD/RPD

- | | |
|---------------------------------|---|
| * Denture causing tissue trauma | - Discontinue wearing the denture. |
| * Fractured denture | - Disinfect it and pack. |
| * ill fitting denture | - Prefer sending it with some young family member |

Table 4: Methods to disinfect dentures at home

- Soaking of denture in 3% Hydrogen Peroxide for 30 mins
- Soaking in 0.2% Chlorhexidine gluconate for 10 mins (More potent than Sodium hypochlorite)
- 100% Vinegar (acetic acid) for 6-8 hours

Table 5: Methods of disinfecting Impressions

- Alginate – 0.5 % Sodium Hypochlorite or iodophors or 2% Gluteraldehyde
- Zinc-oxide eugenol impression paste – 2% Gluteraldehyde or Chlorine compounds
- Elastomeric impression materials – 2% Gluteraldehyde or Cidex

Table 6: Methods of disinfecting Trays & Cast

- Prefer disposable trays • Metal trays to be autoclaved
- Plastic trays/Bite rim 2% Gluteraldehyde solution for 10 mins
- Dental casts & die can be immersed in Sodium Hypochlorite for 10 mins

Table 7: Proposed guidelines for laboratory personnel

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- Minimal staff required for the work.
 - Practice social distancing
 - Routine temperature checks as well as the pulse oximeter readings
 - Hand sanitizers are to be placed at vantage points
 - All lab equipment as well as clinic transfers including impressions, casts & frameworks should be handled strictly using gloves.
 - Hands need to be washed thoroughly with soap and water after every case and avoid touching the face while in lab.
 - All lab personnel without exception should observe the proper infection control protocols including wearing Personal Protective Equipment
 - The protective garment, mask and eyewear that is worn in the lab needs to be left in the lab itself and not taken out of the lab and to be discarded be done through proper channel.
 - While using the trimmers and buff other than using the PPE see that the flints or fragments are sucked out using a high vacuum suction.
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Table 8: Proposed guidelines for the disinfection of the laboratory equipments, surfaces & prosthesis

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- It is of paramount importance that dental impressions, casts, prosthesis or appliances should be thoroughly disinfected prior to handling both at the clinic or operatory, on acceptance of the work at the lab and prior to delivery.
 - Dental prostheses should be stored in diluted mouthwash and not in disinfectant before insertion.
 - Laboratory surfaces can be disinfected using the disinfectant spray or surface wipes.
 - The dental laboratory should be fumigated on a regular basis.
 - If burs, polishing points, rag wheels, or laboratory knives are used on contaminated or potentially contaminated appliances, prostheses, or other material, they should be heat-sterilized.
 - Separate polishing attachments should be kept for all cases coming in the lab.
 - The lathe machine should be cleaned and disinfected daily.
 - Pumice must not be used for more than one case and must be discarded after use.
 - Colonization from airborne and other organisms in warm, wet pumice can be prevented by
 - Articulators can be disinfected by spraying with a hospital-level disinfectant followed by rinsing.
 - Non-sterilizable equipments such as some face bow components must be cleaned with soap.
 - Laundry service should be organized for regular cleaning after every patient.
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Table 9: Instructions to the delivery pickup person

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- Strict instructions that all the staff should be checked periodically for symptoms.
 - If the delivery/ pick up person who picks up the impression from the dentist is a part of lab, then he needs to follow strict hygiene & packaging protocols with labelling.
 - He should always be wearing mask and gloves when travelling.
 - The delivery person should avoid entering the lab or clinic.
 - All packets containing the models etc. needs to be disposed off with BMW protocols.
 - Prosthetic appliance received from a lab rotary should be disinfected prior to insertion in patient's mouth.
 - The work to be sent to the lab should be disinfected and sealed in a single use plastic bag/cardboard box with the lab instruction sheet visible over the container.
 - The assistant should be wearing gloves while receiving the work from lab, proceed with the disinfection process of the cardboard box/plastic bag.
 - The clinic staff should come in minimum contact with the delivery/pick up person.
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4. Requirement of Temporary Dentures/ Provisional Crown.

In certain unforeseen situations where the patient has lost or fractured their RPD/CD and desires to get a new one made immediately due to difficulty in chewing food or following a normal diet, temporary dentures have to be made. The patient is given an appointment for the required procedure of making new impressions. Disinfection of the impressions has to be followed strictly & the assistants should be taught the standard laboratory protocol of disinfecting the impressions & casts. (Tables 5 and 6)

5. Management of Prosthodontic urgency due to dislodged Crown/FPD/Implant Prosthesis

The patient is advised to safely keep the dislodged crown, FPD or implant prosthesis in a box with butadiene solution. Patient is also advised to send a picture of the dislodged prosthesis via email or WhatsApp. If it is urgent & patient is healthy, appointment is fixed. The prosthesis is cleaned any residual cement, disinfected again in the operatory and tried in patients' mouth. If the fit is satisfactory, the prostheses is re-cemented and due instructions is provided to the patient. In case of ill fitting prosthesis, the patient provide with a temporary prosthesis which can be fabricated chair side or sent to the lab as deemed necessary.

6. Hand hygiene and Personal Protective Equipment (PPE)

Basic hand hygiene though has been stressed upon since ages to minimise the risk of transfer of infection & its importance becomes impossible to negate at the time of such a pandemic. The importance of hand hygiene for both the practitioner and associated staffs is very important. The Prosthodontist should ensure that he and his associated staffs have adequate and appropriate PPE during interaction with patient in case a condition arises needing consultation at the clinic. During the aerosol generating procedure the operating dentist and the assistant should have three layers of PPE starting with a minimum N95 mask or higher, a surgical gown, A surgical mask, goggles, surgical mask, face shield and surgical impervious overall with a head cap and shoe cover. The ideal protocol demands the donning and doffing of the entire PPE kit after each patient. The current scenario warrants the rational use of PPE as advocated both by WHO and also MOHFW India. The reception staff should also be equipped with a head cap and N95 mask as basic equipment while getting the formalities done by the patient.

A mandatory pre procedural mouth rinse is also advocated to reduce the microbial load of the oral cavity for each and every patient visiting the clinic for any emergency or urgency consultation. Routine mouth rinse using chlorhexidine might not be useful. Since the virus is susceptible to oxidation a mouth rinse of 1% hydrogen peroxide or 0.2% povidine iodine will prove helpful.¹⁷ Patients should also be covered with a full length drape with their hands tucked in and a head cap and goggles and the immediate extra oral area may be wiped with Betadine solution or a disposable disinfectant face wipe before commencing the procedure.

Ather et al suggests the use of disposable (single use) instrument where possible.³ it is emphasized to minimize the use of aerosol generating high speed airtor handpieces, ultrasonic instruments and 3-way syringes along with saliva ejectors to further reduce the production of droplets and aerosols.¹¹ Slow speed micromotors with contra angle hand-pieces to be given preference. High vacuum extra oral suction used in conjunction with high speed saliva ejectors, should be mandatory to minimize aerosol dissemination. Imaging procedures should use extra-oral techniques including panoramic radiography or computed tomography to avoid contact with oral secretions and minimise gag/cough reflex. However if intraoral sensors are to be used, they should have double barriers to avoid cross contamination.¹⁸

A prosthodontist works in collaboration with a dental laboratory. It is of utmost importance to maintain strict sanitization & disinfection protocols for the dental lab as well as the lab technicians (Table 7). The laboratory should have stringent order of sterilisation & disinfection for all

the machinery & equipments. (Table 8) The clinician should instruct the dental assistants & the lab delivery/pick up staff about the hygiene protocol during the procuring & dropping of the lab work from the clinic. (Table 9)

7. Use of methods to minimise viral load in the operatory

High Efficiency Particulate Air (HEPA) filters and Negative ion generators have also shown promise in reducing the viral load in the air of the operatory. HEPA filters help in removal of particulates from the air of the size as small as 0.3 microns quite efficiently from the surrounding air especially in closed rooms. Negative ion generators also can come in handy in the current scenario which tend to fill the air with millions of negative ions in the air of the room and have an effect on the lipid layer of the virus akin to that by the soap that is it breaks down the lipid layer of the virus and thus helps in reduction of the viral load. After every splatter related /aerosol generating treatment strict fumigation is to be done.

These methods though helpful can't guarantee zero risk from infection but can surely reduce the chances. The prosthodontist in comparison to other specialties faces less emergency cases in their field of specialisation and specific treatment can be deferred and does not actually need emergency attention. However most of the practices in India are not solo speciality clinics. The same dentist in most of the clinics, apart from speciality cases practices general dental treatment as well. Therefore, it is important for the prosthodontist to visualise his or her protective needs for the clinic as a general dentist and not just an specialist. A prosthodontist might have to visit some other clinics during this period to contain any emergencies of the patients of the clinics where he is a consulting prosthodontist. The prosthodontist should confer with the other clinic owners where he goes as a consultant to get an overview of the steps taken by the dentist to prevent the spread of coronavirus through their respective practices. It also gives an insight to the prosthodontist to take his/her necessary steps to equip oneself with the required PPE or of the risk the prosthodontist might have to face. In such cases the highest level of PPE should be ready with the dentist before engaging in any consultations at another clinic.

8. Conclusion

Progressive spread of COVID-19 pandemic is associated with increased possibility that Dental clinicians will be exposed to COVID-19 infected patients. Therefore it has become all the more important for dental professionals to incorporate all precautions in their routine practice and additional safety measures if treatment of patients with COVID-19 becomes necessary. Every patient should be considered potentially infected by this virus, and all dental

practices need to review their infection control policies. To date, no universal protocol or guideline is available for dental care provision to active or suspected COVID-19 cases. In fact, no universal guidelines are available for dental care provision during the times of any epidemic, pandemic, national or global disaster. Due to that lack of a standard, dental care provision has completely stopped or significantly decreased in several affected countries.

This lack of guidelines can also increase the nosocomial COVID-19 spread through dental health care facilities. New specific guidelines need to be developed to be followed stringently & uniformly across all the dental hospitals & private practices. This can help in reducing and preventing new outbreaks. The guidelines given in this work are general guidelines and the final decision will always be provided through the practitioner's judgment.

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None.

10. Conflict of Interest

None.

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Author biography

Sneha Sekhsaria Senior Consultant

Abhimanyu Sharma Senior Research Associate

Bhawana Tiwari Director Professor and HOD

Ankit Sharma Assistant Professor

Tanvi Mahajan Tutor

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