



## Safe Prosthodontics in Covid-19 Era: A Literature Review

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### Abstract

Prosthodontics has become an imperative element in contemporary dentistry. It is now more pertinent than ever, post the COVID-19 pandemic. Prosthetic dentistry has enabled the clinicians momentum, as well as the ability to integrate the myriad options that are available into their armamentarium in order to ensure the highest standards of patient care. Prosthodontics ensures safer procedures and staff protection while restricting the number of patient visits to the treatment facility to a minimum.

During the COVID-19 pandemic, Prosthodontist played a crucial role in Dentistry. It enabled clinicians to adopt necessary precautions, reduced the number of appointments, enhanced digital communication with laboratory and enabled several other procedures that eliminated the possibility of cross infections between the practitioners, patients and dental technicians. The availability of technology in Prosthodontics such as CAD-CAM, stereolithography, rapid prototyping, use of virtual articulators, digital face bows and digital radiographs have revolutionized treatment protocols. Developments in cross-sectional imaging techniques such as spiral tomography and reformatted computerized tomograms have become increasingly popular in preoperative assessment and planning for dental implant treatment. The 3D optical digitising technology allows 3D images to be scanned with a 3D scanner and these can be coupled with computerised milling machines for processing prosthetic restorations.

The pace of Prosthodontics in dental practice is expected to revolutionise the future of dentistry. Continuous research in material science, equipment and treatment techniques can be expected to improve treatment outcomes in the speciality. Further, Prosthodontics permits many newer and effective methods of research.

**Keywords:** Prosthodontics; COVID-19; Dentistry

### Introduction

The human corona virus, also called as Severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) was causative microorganism of COVID-19 outbreak by the Chinese Centre for Disease and Prevention [1]. Due to the widespread transmission of SARS-CoV-2 and the unique characteristics of dental operator (including proximity of oropharyngeal region, generation of aerosol during dental procedures [2] both the dental officers as well as the patients have an increased risk of COVID-19 [3] Although the mortality associated with COVID-19 is low, it has a high spreading potential [4]. Prosthodontics deals with services to old 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. The challenge to Prosthodontist is going to be much more because of factors such as high concentration of copious sa-

liva in trays and dentures, exposure to blood during pre-prosthetic surgeries and implant placement and exposure to aerosols during tooth preparation for crown and bridge One most important aspect in prosthodontic practice is dental lab, 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 the precautions to be taken for Patients as soon as they arrive in dental clinic or even at telephonic conversation for any dental complaint. This review article comprises the COVID-19 disease, its implication and all preventive measure to be consider during prosthodontic treatment.

## Discussion

### SARS - CoV-2 VIRUS

Coronaviruses belong to the family *Coronaviridae* in the order *Nidovirales* [5]. Coronaviruses are minute in size (65–125 nm in diameter) and contain a single stranded RNA as a nucleic material, size ranging from 26 to 32 kbs in length. The subgroups of coronavirus family are alpha ( $\alpha$ ), beta ( $\beta$ ), gamma ( $\gamma$ ) and delta ( $\delta$ ) coronavirus. They can be classified into four genera: *Alphacoronavirus*, *Betacoronavirus*, *Gammacoronavirus*, and *Deltacoronavirus*. WHO announced “COVID-19” as the name of this disease on February 2020, following the guidelines developed with the World Organisation for Animal Health (OIE) and the Food and Agriculture Organization of the United Nations (FAO).

### Mode of transmission of virus

- Person to person by droplets.
- Face to face communication
- Direct contact and fomites.
- Directly or indirectly through saliva.
- Contact with contaminated instruments and or environmental surfaces.
- Poor respiratory hygiene and etiquettes
- Inadequate sterilization protocols

### Symptoms

Patients with COVID-19 usually present with clinical symptoms of fever, dry cough, and myalgia. In addition, less obvious symptoms such as nausea, diarrhea, reduced sense of smell (hyposmia), and abnormal taste sensation (dysguesia) have also been reported [6]. Generally, 80% of these patients have only mild symptoms that resemble flulike symptoms and seasonal allergies, which might lead to an increased number of undiagnosed cases [7] Severe forms of this disease have a predilection for men with a mean age of 56 years with pre-existing chronic illnesses such as cardiovascular disease or immunosuppression. The higher-risk patient population manifests symptoms typical of pneumonia or acute respiratory distress syndrome [8].

### Prosthodontics considerations

#### Prosthodontist and their staff

- As per CDC guidelines, not everyone needs to be tested for COVID-19, which includes prosthodontist and their staff also. It also suggests that the decision on who is to be tested is at the discretion of local and state health departments and individual operator. ICMR guidelines also suggest in their revised testing strategy, that the following people need to be tested

- All symptomatic personnel.
- All symptomatic contacts of confirmed cases.
- All symptomatic health care workers.
- All hospitalized patients with Severe Acute Respiratory Illness.
- Asymptomatic direct and high-risk contacts of a confirmed case should be tested once between day 5 and day 14 of coming in his/her contact.

If the dentist and the clinical staff do not fall in these categories, getting tested for COVID-19 is not warranted. However, as suggested by CDC, it is at the discretion of the individual surgery. Also, since majority of clinical staff in the Indian context do not have health professional background and carry the risk of exposure from neighbourhoods, it would be a wise idea to follow ‘Tele-screening and Triaging’ for clinical staff by conducting initial telephone screening using the screening questionnaire suggested for patients, before they resume their duties in the clinics.

- Staff and all the associate Doctors, Consultants and assistants also should be tested by the owner of the practice.
- In event of active symptoms and/or suspected exposure to COVID +ve, retest as per the ICMR Guidelines.

### Instructions to patients

- Opening of Dental centres should be based on directions as per orders of the administration.
- Further mention clear timings.
- Post a sign at the entrance which instructs patients having symptoms of a cough, sore throat, fever, sneezing, or shortness of breath for more than 48 hours to please reschedule their dental appointment and meet their medical officer.
- If the following conditions are encountered during triage, advise patients to leave and instruct them to go hospital, and clean and disinfect the pre-screening triage area as soon as possible.
- Reschedule appointments if your patients have travel history outside India
- Schedule minimum appointments during the day after tele-triaging patients.

- Patients should be advised that elective treatment options are severely restricted at this time
- In case the patient is identified with any symptoms of COVID-19 then refer the patient or recall after medical officer after primary care is provided.
- In case any patient needs aerosol-based treatment then take detailed medical history and contact history. Follow guidelines for sample collection as per ICMR standard guidelines.
- Take temperature readings as part of the routine assessment of patients.
- Take the contact details and address of all patients treated. Install physical barriers (e.g., Glass or plastic windows) at reception areas.
- Ask patients to wear the surgical or similar masks at all times, wash hands prior to entry and remove footwear.
- Physical/Social distancing should be maintained in clinical areas and patient appointments should be strictly followed.
- Pre-procedure rinses like 1% hydrogen peroxide (15mL of the solution for 30 seconds) should take place when the patient is conscious. Do not use a spittoon. Use the same sink that had been used for washing the hands and face.
- Clean and disinfect public areas frequently, including door handles, chairs and bathrooms.
- Remove magazines, reading materials, and other objects that may be touched by others and which are not easily disinfected.
- Schedule appointments
- Use a rubber dam whenever possible.
- Use high speed evacuation for all dental procedures producing an aerosol.
- Autoclave your hand pieces after each patient.
- Make patient to rinse with 1% hydrogen peroxide before each appointment. Coronavirus is vulnerable to oxidation; this will reduce the salivary load of oral microbes.

#### Aerosol generating prosthodontic procedures

Extensive environmental contamination can occur following an aerosol generating prosthodontic procedure. Given that clinically generated aerosols may be infected with the human coronaviruses and that the virus can survive on hard surfaces and can remain viable for up to 3 days, these procedures should be limited to those associated with delivery of essential care only.

- Aerosol generating procedure in prosthodontics include; triplex syringe (3:1 syringe), high speed handpieces, air abrasion (includes Air-flow, Rondo flex, Prophy flex, Prophy mate) intra-oral sandblasters.
- Where possible any treatment that may generate an aerosol should be delayed.
- If delay is not possible: Pre-procedural mouthwashes for 30 seconds supervised with either: Hydrogen peroxide 1% (dilute 3% to 1%), Chlorhexidine 0.2%, Povidine iodine mouthrinse (0.2%).
- Consider use of hand instrumentation (+/- temporary restorations)
- Use of slow speed handpiece without water spray.
- If an aerosol generating procedure is necessary, close attention must be paid to managing this aerosol: Use appropriate PPE.

#### Precautions during prosthodontic procedures

It is important that each practice has in place a protocol and training for their team on how to screen for patients at risk of COVID-19. These are few approved protocols by New Zealand Dental Association.

#### Clinical procedures

- If a patient does need immediate treatment, the ADA recommends taking the following steps
  - Ask patients to arrive on time for their appointments, rather than too early,

- Use a single patient treatment room (where possible) with the door closed
- Work with an assistant and use four handed dentistry
- Use rubber dam (or Isolite if available)
- Swab teeth and tissues with hydrogen peroxide (1%) or chlorhexidine 0.2% before the procedure especially if a pre-procedural mouth rinse has not been possible (e.g., children)
- Use high volume evacuation with correct tip placement at the source of the aerosol

**Transmission Based Precautions during prosthodontics**

Transmission based precautions (TBP) are applied when standard measures are insufficient to prevent the potential transmission of an infectious agent. TBP are additional precautions required for a patient with a known or suspected infectious agent. They include contact, droplet and airborne precautions.

- All staff must be aware of situations where TBP are required.
- TBP encompass administrative processes, environmental controls and personal protective equipment.
- Accompanying persons should not remain in the treatment area during care delivery if possible.

**Personal protective equipment**

Personal protective equipment (PPE) is a collective term for the clothing and equipment worn by health practitioners which acts as a barrier to protect their own tissues from exposure to potentially infectious material. PPE includes gloves; masks; protective eye-wear; outer protective clothing; and enclosed footwear. The use of dental handpieces, sonic and ultrasonic instruments and air/water syringes produces large quantities of aerosols, with an associated risk of airborne transmission of infectious micro-organisms. (Table 1, Figure 1)

**Dental Protective Face Shield**

Face shields are safety devices designed to protect the face from debris or other hazards. Face guards and face shields must provide protection from hazards but also ensure that an operator’s visibility and mobility are not hindered.

<p>Proper selection and use of recommended PPE.</p> <p>Wear gloves whenever there is potential for contact with blood, body fluids, mucous membranes, non-intact skin or contaminated equipment.</p> <p>Do not wear the same pair of gloves for the care of more than one patient.</p> <p>Do not wash gloves. Gloves cannot be reused.</p> <p>Perform hand hygiene immediately after removing gloves.</p> <p>Use N95 or higher-level respirator during emergency dental care for patients without COVID-19. Disposable respirators should be removed and discarded after exiting the operatory.</p> <p>Wear protective clothing that covers skin and personal clothing during procedures or activities where contact with blood, saliva, or aerosol splatter is anticipated.</p> <p>Reusable eye protection must be cleaned and disinfected according to manufacturer’s reprocessing instructions prior to re-use. Disposable eye protection should be discarded after use.</p> <p>Change gown if it becomes soiled. Remove and discard the gown in a dedicated container.</p>
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**Table 1:** Key recommendations for PPE in Dental Settings.

**Specifications**

Face shields typically cover the entire face and are secured over or around the head with an adjustable band. Face shields may be tinted or metal coated for heat protection. A face guard should be used as additional protection; safety glasses or goggles should always be worn in conjunction. The majority of eye and face protection currently used in the U.S. is designed, tested, and manufactured in accordance with the American National Standards Institute (ANSI)/International Safety Equipment Association (ISEA) Z.87.1-2010 standard [9] The major structural components of a face shield include the following:

- Visor
- Frame
- Suspension Systems.

Face shields provide a barrier to acutely-expelled aerosols of body fluids and are commonly used as an alternative to goggles as they confer protection to a larger area of the face. Lindsley, *et al.* [10] reported 96% and 92% reductions in the risk of inhalational exposure immediately after a cough for a face shield at distances of

18 in (46 cm) and 72 in (183 cm), respectively. Decreasing the aerosol size to 3.4  $\mu\text{m}$  resulted in the face shield blocking 68% of the inhalational exposure at 18 in (46 cm) immediately after the cough and 23% over 1-30 min post-cough (during which time the larger aerosol particles had settled out and droplet nuclei had formed and remained airborne so that flow occurred more easily around the edges of the face shield. Shoham, *et al.* [11] sprayed a fluorescent dye (particle diameter  $\sim 5\mu\text{m}$ ) at a distance of 20 in (50 cm) away from a mannequin head outfitted with various types of PPE.

### NIOSH-Approved N95 filtering facepiece respirator

Even though you see N95 on the package, it still may not be the right kind of respirator, or one that meets NIOSH approval requirements. You may have heard that a NIOSH-approved N95 respirator is recommended for your respiratory protection needs. This is one of the most commonly used respirators. Again, even though you see N95 on the package, it still may not be the right kind of respirator, or one that meets NIOSH approval requirements.

Filtering Facepiece respirators are divided into various classes based on their filtration capabilities. "N95 respirator" is a term used to describe the class of respirators which use N95 filters to remove particles from the air that is breathed through them. The NIOSH respirator approval regulation defines the term N95 to refer to a filter class that removes at least 95% of airborne particles during "worst case" testing using a "most penetrating" sized particle during NIOSH testing. Filters meeting the criteria are given a 95 rating. Many filtering facepiece respirators have an N95 class filter and those meeting this filtration performance are often referred to simply as N95 respirators.

### Prosthodontic procedures protocols

Following the protocols as mentioned by IDA and CDC

- Take the contact details and address of all patients treated and detailed case history.
- Install physical barriers (e.g., glass or plastic windows) near the working area.
- Make sure the personal protective equipment being used is appropriate for the procedures being performed and follow the guidelines mentioned above.
- Use high-speed evacuation for dental procedures producing an aerosol. Autoclave handpieces after each patient. Have patients rinse with a 1% hydrogen peroxide solution before each appointment. Clean and disinfect public areas frequently, including door handles, chairs and bathrooms.
- Make the impression and disinfect it with benzalkonium chloride-based disinfectant. Since conventional sterilization methods, such as dry heat sterilization, cannot be used for eliminating potential pathogen microorganisms that are present on the dental impression surface, liquid chemical immersion disinfection is currently the most widely accepted method. Current commercially available immersion disinfection solutions contain sodium hypochlorite (0.525%), quaternary ammonium compounds, glutaraldehyde, phenols and iodophors in various concentrations and immersion times. Apart from immersion disinfection, alternative methods have been suggested, such as spray disinfection, steam autoclave, ozone, microwave, ultraviolet light, etc. The 10 minute disinfection time for the 0.525% sodium hypo-chlorite immersion disinfection was selected according to ADA specifications [12]. The 2 minute disinfection time for the 0.3% benzalkonium chloride immersion disinfection was selected according to the recommendations by the manufacturer. The 30-minute disinfection time for both immersion disinfectants was selected for the case of extended immersion time due to factors such as impressions being forgotten immersed, which happens in daily practice. The 5-minute ozone disinfection time was selected based on previous work [13] which showed efficient disinfection results. The 15-minute ozone disinfection time was incorporated in case further microbiology experiments (regarding different bacteria or viruses) show that more time is needed for disinfection (Table 2).
- We should consider using Povidone-Iodine as an irritant in high-speed handpieces too, as it has already been a recommended irritant in the ultrasonic scaler. The recommendation is to use 10% povidone-iodine diluted 1:9 with water. So if you have a half litre bottle attached to your chair: Put 50 ml of 10 % Povidone Iodine solution in the bottle and then add water to fill the bottle. So this dilution will be 50: 450 = 1:9
- All the above said precautions should be taken when making impression, jaw relation, insertion and even doing cementation.

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 hr

**Table 2:** Methods to disinfect dentures at home.

**Prosthodontic operatory protocol**

- All the clinical and auxiliary staff should be provided proper PPE and should be trained in sterilization and infection-control protocols.
- Donning and doffing should be regularly practiced as improper donning/doffing will lead to cross-contamination.
- It is preferable to work with minimal staff or use a rotation of your existing staff.
- A hand sanitizer or facility to scrub hands with soap and water along with instructions should be made available outside the clinic.
- Covid related disinfection and personal care protocol might be displayed using posters or audio video means in your clinic for the patients benefit.
- Strictly practice according to appointments The seating arrangement may be re-arranged so as to have a distance of at least six feet between each chairs. The backrest of every alternate chair may be posted a sticker saying OCCUPIED.
- Fumigation with a quaternary ammonium compound must be performed every day, to ensure that all low contact areas are also disinfected in the waiting area as well as the operatory. Minimize use of Air Conditioners and restrict its use while aerosol generating procedures are underway. Regular cleaning of its filters should be done. During fumigation/fogging let the AC on so as to let the fumigant reach its filters. It is preferable to revamp the HVAC system (Figure 6) in the clinic and to adhere to the newer developed guidelines on the same to help address Covid concerns especially so to suck out contaminate air and push in fresh air so that the airborne particles may be shunted out in a clinical environment .The

clinic should also be equipped with a superior quality high vacuum suction and to prevent splatter preferably and Extra-oral suction system ( Figure 7,8 )

- Hand pieces, burs, diagnostic instruments, etc., have to be stringently autoclaved, in sealed pouches. Overlooked practices such as scrubbing the hand piece with a disinfectant and working on multiple patients at a time must be avoided under all circumstances. Used burs should be soaked in a proper disinfectant solution after scrubbing prior to autoclaving. Whenever possible dispose the burs after single use. Scrubbing the diagnostic instruments and hand instruments in a concentrated soap solution for 20 seconds prior to autoclaving may be a good practice as soap is one of the best antiviral means.
- IMPRESSIONS should be thoroughly disinfected before pouring or sending to the laboratory as a standard protocol (Septodent spray, Cidex-Glutaraldehyde).
  - Alginate -0.5% Sodium Hypochlorite or iodophors
  - Zinc-oxide eugenol impression paste-2% Glutaraldehyde or Chlorine compounds
  - Rubber-base impression materials -2% Glutaraldehyde or Cidex (Table 3,4)
- It is preferable to move to digital dentistry with the use of Intra oral scanners for digital impressions, Digital extra oral radiography etc. so that there is minimal transfer and use of materials in and out of the mouth.

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

**Table 3:** Method of disinfecting Impressions.

Prefer disposable trays
Occlusal rim 2% Glutraldehyde solution for 10 mins
Dental casts and die in sodium hypochlorite solution for 10 min

**Table 4:** Method of disinfecting Trays and Cast.

### Digital prosthetic workflow during covid-19 pandemic

Computer-aided design/computer-aided manufacturing (CAD/CAM) technology has become extremely popular among prosthodontist: It significantly reduces costs and working time and requires fewer steps, and the sources of error are diminished compared to conventional workflow [14]. Furthermore, another important aspect is that the digital prosthetic workflow has several benefits in terms of infection prevention, without requiring impression disinfection [15]. During the COVID-19 pandemic, dentists should wear personal protection equipment (PPE) to protect eyes, and oral and nasal mucosa when treating patients and all surfaces of the dental clinic should be carefully disinfected afterward, avoiding the use of handpieces/ultrasonic instruments to limit the production of aerosol/droplets [16]. However, even adopting all these precautionary measures, the conventional prosthetic workflow involves several steps and procedures, which may lead to cross infection and viral contamination inside and outside the dental office (Figure 8). Biological fluids of patients (saliva or blood) can be found in dental impressions and serve as a source of contamination among dental professionals [17]. In addition, a certain amount of time is usually required for dental impressions to reach dental laboratories: In the meantime, viruses can survive and professionals involved are extremely susceptible of cross contamination [18]. At room temperature, SARS-CoV-2 has been reported to remain infectious in the surfaces from 2 hr up to 9 days. A recent article evaluated its stability on various surfaces: Based on their results, the longest viability was on stainless steel and plastic, with an estimated median half-life of approximately 5.6hr on stainless steel and 6.8hr on plastic Stock impression trays most commonly used are made by these two materials and an inadequate cleaning and disinfection might help viral contamination among dental professionals and patients.

Furthermore, saliva and/or blood of patients, droplets, and aerosols containing SARS-CoV-2 generated from an infected individual can contaminate dental impressions and if not adequately disinfected can be transmitted to stone models. As for digital im-

pressions, the scanner tip is inserted in patient's mouth and can be contaminated with saliva and droplets. Disinfection protocols for scanner tips depend mostly on manufacturers' recommendations: Alcohol-based disinfectants prevent mirror damage and are usually applied for several minutes before the sterilization process.

### Prosthodontic laboratory protocol

- The laboratory technician should at best discontinue all services that require direct patient contact until this pandemic has passed.
- When working in the lab it should be strictly with minimal staff required for the work.
- Laboratory personnel should be adorned with full PPE attire as is worn by the clinical staff.
- There is evidence to suggest that there is a risk of transmission of COVID-19 from dental impressions, casts or dental prosthesis or appliances. Also the virus can stay active on various surfaces in the lab including plastic and cardboard for several hours to steel for a few days. So it is of paramount importance that these should be thoroughly disinfected prior to handling both at the clinic or operator, on acceptance of the work at the lab and prior to delivery.
- Labs need to use disinfectants containing virucidal agents that are effective against enveloped viruses, which also apply to coronaviruses including COVID-19. The active ingredients for these agents can include Hydrogen peroxide; Sodium hypochlorite; Isopropyl alcohol among others. The use of soap should be thought of as an adjunct along with the other agents.
- In case of spray, sprinkle the product directly on the surface you are disinfecting. In case of wipe soaked with disinfectant, it is important to wipe thoroughly the surface to be disinfected. In both cases it is essential ensuring that the whole surface to be disinfected has been covered. It is better to let the disinfectant evaporate as opposed to removing it with a wet cloth unless otherwise indicated. Ensure disinfection of models, casts, trays, articulators with at least 70 % isopropyl alcohol-based solutions.

- For disinfection of tables/platforms, floors and sinks preferably use a sodium hypochlorite-based solution.
- All lab personnel without exception should observe the proper infection control protocols, including wearing Personal Protective Equipment that includes mask, gloves, protective eyewear, and protective garment.
- 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. This has to be cleaned/washed, disinfected each day and stored in lab itself and those that are to be discarded be done through proper channel.
- Hand sanitizers are to be placed at vantage points within the lab and to be used routinely when not wearing gloves. Handle all lab equipment as well as clinic transfers including casts or impressions strictly using gloves.
- Hands need to be washed thoroughly with soap and water after every case and avoid touching the face while in lab. Washing hands is critical to practicing standard precautions.
- All technicians or lab personnel need to practice social distancing in their place of work or seating as much as possible and maintain a distance of at least 6 feet from each other.
- If the delivery/pick up person who picks up the impression from the dentist is part of lab, then he needs to follow strict hygiene protocols. He should always be wearing mask and gloves when traveling. The delivery person should not enter the lab if possible and should hand over the impression or model to the receiver at the entrance. All packets containing the models etc. need to be disposed off with utmost care and then the material subjected to disinfection procedures.
- Strictly instruct all staff to stay home if they develop any of the following symptoms- cough, fever, cold symptoms including nasal congestion and runny nose, breathing distress and all the staff should be checked periodically for symptoms of Covid-19.

- 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.
- Encourage the clinics to move to digital platform and use of intra oral scanners instead of regular impressions whenever possible.
- All dental prosthesis coming in and going out of the lab should be thoroughly disinfected
- Ensure regular fumigation of the dental laboratory.



Figure 1



Respirator Standard	Filter Capacity (removes x% of all particles that are 0.3 microns in diameter or larger)
FFP1 & P1	At least 80%
FFP2 & P2	At least 94%
N95	At least 95%
N99 & FFP3	At least 99%
P3	At least 99.95%
N100	At least 99.97%

Figure 2

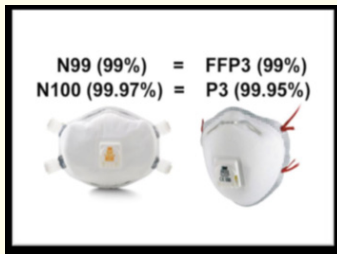


Figure 3

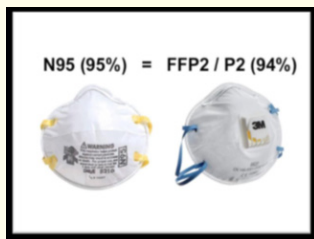


Figure 4

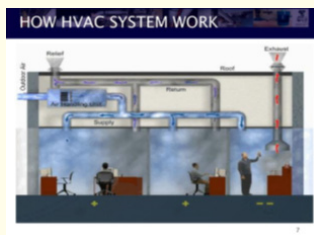


Figure 5



Figure 6

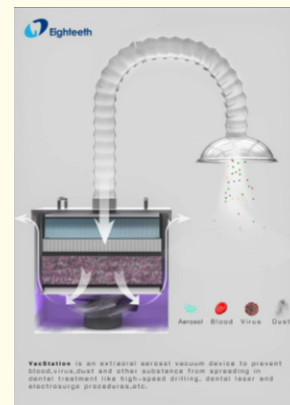


Figure 7

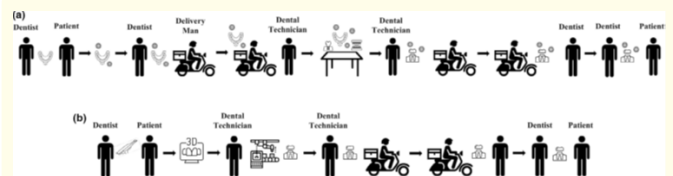


Figure 8: (a) Conventional prosthetic workflow:  
 (b) Digital prosthetic workflow

## Conclusion

The progressive spread of COVID-19 pandemic is associated with increased possibility that prosthodontist 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.

## Bibliography

- Li Q, et al. "Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia". *The New England Journal of Medicine* (2020).
- Emerging understanding of COVID-19". *Lancet* 395 (2020): 311.
- Ather A., et al. "Coronavirus Disease 19 (COVID-19): Implications for Clinical Dental Care". *Journal of Endodontics* 46.5 (2020): 1-11.
- Liu K., et al. "Clinical feature of COVID-19 in elderly patients: A comparison with young and middle-aged patients". *Journal of Infection* 80.6 (2020): e14-18.
- Enjuanes L., et al. "Biochemical aspects of coronavirus replication and virus-host interaction". *Annual Review of Microbiology* 60 (2019): 211-230.
- Giacomelli A., et al. "Self-reported olfactory and taste disorders in SARS-CoV-2 patients: a cross-sectional study". *Clinical Infectious Diseases, CIAA* (2019): 330.
- Wu Z and McGoogan JM. "Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention". *JAMA* (2020).
- Guan W., et al. "Clinical characteristics of 2019 novel coronavirus infection in China". *medRxiv* (2019).
- Centers for Disease Control and Prevention (CDC): "Workplace Safety and Health Topics". Eye Protection for infection Control (2015).
- Lindsley WG., et al. "Efficacy of face shields against cough aerosol droplets from a cough simulator". *Journal of Occupational and Environmental Hygiene* 11 (2014): 509-518.
- Shoham S., et al. "Comparison of Protection against Ocular Contamination with Disposable Eyewear Products". *International Journal International Journal of Oral Health Dentistry* 2.1 (2016): 26-8.
- Bustos J., et al. "Effect of immersion disinfection with 0.5% sodium hypochlorite and 2% glutaraldehyde on alginate and silicone: Microbiology and SEM study". *International Journal of Odontostomatology* 4 (2010): 169-177.
- Poulis N., et al. "Effectiveness of low-flow high-ozone concentration disinfection of dental impressions: A comparative study to immersion disinfection". *British Journal of Applied Science and Technology* 4 (2014): 2528-2537.
- Chochlidakis KM., et al. "Digital versus conventional impressions for fixed prosthodontics: A systematic review and meta-analysis". *Journal of Prosthetic Dentistry* 116 (2019): 184-190.
- Barengi L., et al. "Innovation by computer-aided design/computer-aided manufacturing technology: A look at infection prevention in dental settings". *Biomed Research International* (2019): 6092018.
- Joda T., et al. "Digital technology in fixed implant prosthodontics". *Periodontology* 73 (2000): 178-192.
- Meng L., et al. "Coronavirus disease 2019 (COVID-19): Emerging and future challenges for dental and oral medicine". *Journal of Dental Research* 99.5 (2020): 481-487.
- Peng X., et al. "Transmission routes of 2019-nCoV and controls in dental practice". *International Journal of Oral Sciences* 12.1 (2020): 9.