Review Article

Guidelines for dental implants in the times of COVID-19

ABSTRACT

Since the first reported case in December 2019, COVID-19 has become a worldwide pandemic. Although primarily a zoonotic infection, human-to-human transmission is well reported now and the mode of spread is mainly via respiratory droplets during direct contact or via surfaces contaminated with the virus as it remains viable on the surfaces for a long time. Direct communication and consistent exposure to body fluids such as blood and saliva and the fact that routinely done dental procedures generate aerosols predisposing dental professionals to serious risk for COVID-19 infection. Hence, to ensure the smooth working and safety of dental professionals as well as the patients, a set of directives are of paramount importance. Various guidelines have been released for the efficient operation of dental professionals; however, no such recommendations/directives have been laid out pertaining to dental implants in particular. Here, we are presenting a set of recommendations for managing urgent implant-related treatment procedures.

Keywords: COVID-19, dental implants, SARS-CoV-2, implant guidelines

INTRODUCTION

The novel coronavirus was first identified in Wuhan, China, in December 2019. Since then, COVID-19 has evolved rapidly into a public health crisis[1] and the outbreak has gripped the entire world. The novel coronavirus (SARS-Cov-2) belongs to a family of single-stranded RNA viruses known as Coronaviridae.[2] These viruses are primarily zoonotic[3,4] transmitting the infection from animals to humans. The concerning matter is that human-to-human transmission has also been reported and is now proven and has become a matter of public health emergency. The human-to-human spread can be through respiratory droplets, released while talking, coughing, or sneezing, and the spread can occur via contact with any animate or inanimate surfaces with the virus resting on them. The incubation period can range from 0 to 28 days; thus, transmission can occur even before the patient starts showing symptoms.[5,6] Patients with COVID-19 usually present with clinical symptoms of fever, dry cough, and myalgia along with less specific symptoms such as gastrointestinal symptoms such as nausea and diarrhea, reduced sense of smell, abnormal taste sensation,[7] discoloration of fingers and toes have also been reported.

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Considering the route of transmission and the likelihood of asymptomatic carriers, dental professionals are at a higher risk of contracting the disease-bearing in mind that most of the routinely done dental procedures induce saliva, blood, or aerosol generation. Thus, it is necessary to formulate a direction for the smooth functioning of dental professionals to ensure all the urgent dental needs of the patients are met, keeping in mind the safety of the patients and the clinicians. Various guidelines have been issued by higher authorities for the efficient operation of the dental profession in this time of crisis. Here, we are establishing a directive to manage the implant-related urgent treatment procedures through a simplified approach of categorizing the urgent implant

Neeti Solanki, Lakshya Kumar Yadav, Mayank Singh, Pooran Chand

Department of Prosthodontics, Faculty of Dental Sciences, King George's Medical University, Lucknow, Uttar Pradesh, India

Address for correspondence: Dr. Lakshya Kumar Yadav, Department of Prosthodontics, Crown and Bridge, FODS, KGMU, Lucknow - 226 003, Uttar Pradesh, India.
E-mail: lakshya79@yahoo.com

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procedures and the modifications to be made carrying out the actual procedures.

Three steps are necessary to handle implant-related urgencies;

- Screening
- Triage
- Management

Screening: Virtual/tele-screening becomes imperative at this point in time. In the case of in-person screening, a non-contact thermal infrared scanner[8] and pulse oximeter should be used for pre-screening to rule out raised body temperature and reduced blood oxygen saturation levels respectively. Following this, a detailed screening questionnaire is to be filled out by the patient before proceeding to the next step of triage. According to the latest direction of the government,[9] the following questions should be mandatorily asked for screening;

- *Contact history with any positive or suspected COVID patient*;
- *Recent travel history to an area with a high incidence of COVID-19?*
- *Any symptoms of febrile respiratory illness such as fever, dry cough, shortness of breath, myalgia, nausea, diarrhea, conjunctivitis, loss of taste and smell, shivering, discoloration of fingers or toes?*
- *Residence in high-risk/hotspot/containment areas?*
- *Are you a returnee migrant (past 14 days) and have not been tested and quarantined?*

A positive response to the screening questionnaire is concerning and related authorities should be informed regarding the same and urgent treatment that can be pharmacologically managed/elective treatment should be deferred. A negative response can permit the patient to move to the step of triage. Before proceeding with the treatment, a detailed consent and declaration have to be mandatorily filled by the patient [Figure 1] and "Arogya Setu" app should obligatorily be installed and updated on his/her phone.

Triage: Following the screening, the patient has to be triaged/prioritized according to the treatment needs, whether the patient requires immediate attention and treatment or if the treatment can be deferred.

Hence, the patient's treatment requirements will fall under two broad categories;

- Urgent treatment;
- Elective treatment.

The elective procedures have to be deferred[10] and treated once the disease curve flattens or according to the directions of higher authorities. Urgent treatment procedures, aerosol-generating procedures (AGP), and non-aerosol-generating procedures (NGP) will have to be managed in the current scenario [Table 1].

This categorization and prioritization can vary case-to-case and the judgment of the practitioner is crucial. Once we have categorized the patients under these headings, various treatment modifications have to be made to carry out the actual procedure. If a patient has to undergo treatment for an Urgent AGP, he/she should be tested COVID negative and the appointment has to be scheduled within a day of the results.

Management: Following triage, the management of patients requiring urgent treatment will have to include various modifications such as;

- Treatment modifications,
- Infrastructure modifications, and

Table 1: Urgent aerosol generating procedures (AGP) and urgent non-aerosol generating procedures (NGP)

Urgent AGP	Urgent NGP
Occlusal adjustment of an implant-retained prosthesis wherein interferences is causing pain and/or inflammation.	Placement of gingival formers in cases of previously placed implants wherein delay in prosthetic rehabilitation can hinder functional day-to-day activities like mastication.
Abutment preparation in cases of previously placed implants where delay in prosthetic rehabilitation is not advocated.	Tightening of loose overdenture attachments making the denture unstable or difficult to seat/tightening of loose screws in a screw-retained prosthesis
Exploration of the access hole in case of loosening of the screw in a screw-retained prosthesis.	Placement of prosthesis on already prepared abutments.
Rehabilitation of an anterior region affects the quality of life and hinders the day-to-day functions like speech, mastication, etc.	Repair of the broken dentures/prosthesis supported by implants in geriatric/debilitated patients/in patients affecting the function and quality of life.
Implantoplasty in case of peri-implantitis.	Repair of a broken occlusal splint in cases of full-mouth rehabilitation with high muscular forces.
Full-mouth rehabilitation of a debilitated patient wherein functional rehabilitation is unachievable with a removable prosthesis.	Re-cementation of a dislodged implant supported cement-retained prosthesis.
Welding is required to repair a fractured superstructure in a full-mouth rehabilitation case.	Removal of a failed prosthesis/implant causing pain, swelling, or inflammation.

I, _____, knowingly and willingly consent to have dental treatment Completed during the COVID-19 pandemic.

1. I understand the COVID-19 virus has a long incubation period during which carriers of the virus may not show symptoms and still be highly contagious. It is impossible to determine who has it and who does not, given the current limits in virus testing.
2. If I am an asymptomatic carrier or an undiagnosed patient with COVID 19, I suspect it may endanger doctors and clinic staff. It is my responsibility to take appropriate precautions and to follow the protocols prescribed by them.
3. I am aware that I may get an infection from the clinic or from a doctor, and I will take every precaution to prevent this from happening, but I will not at all hold doctors and clinic staff accountable if such infection occurs to me or my accompanying persons.
4. In case I or my attendant get the COVID 19 infection after the visit to the clinic, I will inform the clinic authorities at the earliest, so that appropriate tracking of the patients/attendants and clinic staff present on the day of my visit can be done.
5. I confirm that I am not presenting any of the following symptoms of COVOID-19 listed below:
   a- Fever
   b- Shortness of Breath
   c- Loss of Sense of Taste or Smell
   d- Dry Cough
   e- Runny Nose
   f- Sore Throat

Initials- _____

6. I understand the government recommends social distancing of at least 6 feet for a period of 14 days to anyone who has shown symptoms or tested positive.
7. I verify that I have not travelled outside of India in the past 14 days to countries that have been affected by COVID-19.
8. I verify that I have not travelled domestic within India by commercial airline, bus, or train within the past 14 days.
9. I verify the information I have provided on this form is truthful and accurate. I knowingly and willingly consent to treatment completed during the COVID-19 pandemic. If I hide my facts and relevant details and because of my knowing or unknowing behaviour or action the clinic staff gets infected, I may be held responsible for appropriate compensation in the court of law.

Name:_____ **Sign/Thumb impression:** _____

Date:_____

Figure 1: Detailed consent and declaration to be filled by the patient prior to treatment commencement

- Infection control and biomedical waste disposal.

Treatment modifications

Deciding on what comes under urgent implant-related procedures will have to be based on the latest directives as well as the clinical judgment of the practitioner. Modifications in treatment protocol as well as adequate precautions will have to be ensured for smooth working and streamlining in the present scenario to ascertain the safety of the patients as well as the clinicians.

General modifications

All the patients are to be scheduled on an appointment basis, with no direct walk-in treatment except pharmacological management. Patients should be asked to maintain hand hygiene and to be provided with adequate protective gear at the entrance like disposable overalls, head caps, shoe covers, and 3-ply masks, before entering the clinic setup. To avoid crowding in waiting areas, chairs should be marked keeping the norm of physical/social distancing in mind. Patient's entry and exit paths are to be clearly marked and "DO NOT TOUCH" signages are to be installed in the setup to minimize the areas to be touched by the patient. A stress reduction protocol and appropriate pharmacological regimen are to be followed before the commencement of the surgical procedure to minimize the chances of gagging during the actual procedure. A pre-procedural mouth rinse with 0.2% povidone iodine[8,11] or 1% hydrogen peroxide for 30 seconds should be compulsorily followed by the patient to reduce the viral load.[12] The clinician is to be adorned with adequate personal protective equipment (PPE) depending upon the procedure whether AGP or NGP and the risk involved. A disposable coverall (90–120 GSM), N95/99 respirators, face shield and protective eyewear, double layer of surgical gloves, shoe cover, and head cap to be mandatorily donned according to guidelines for an AGP.[13] Use of disposable instruments to be advocated during the course of treatment. Waterline treatment is to be encouraged with 0.01% sodium hypochlorite.[14] The use of three in one syringe should be minimized to prevent cross-contamination.[15] Four-handed dentistry can be promoted[15] to increase efficacy and to reduce the appointment/contact time with the patient.

Povidone iodine diluted in saline can be used for treatment as a coolant required in implant handpieces.

The use of certain equipment can be promoted to reduce the risk of transmission. The use of high-volume evacuators (HVE) should be encouraged while performing aerosol-generating procedures[16] to reduce the aerosol load by 90–98%. Electric engine handpieces should be encouraged in place of conventional air rotor handpieces as this minimizes aerosol generation and provides consistently high torque.

Implant-specific modifications

For the surgical procedure of implant placement, various alterations/additions can be made to ensure safety and increased efficacy. Hand instruments are to be preferred over rotary instruments wherever possible. The use of surgical guides/fully guided surgery protocol can minimize radiological exposure and can help increase precision preventing failures and complications.[17] Implant placement procedures can be done at a low torque value (approx. 300 rpm) after the initial drill to reduce the aerosol generation. Using aggressive thread implants/implant systems with less number of sequential drilling systems can minimize the aerosols generated. Small drivers and instruments should be tied with floss to prevent gagging due to the fall of the instrument in the oral cavity. Gingival former should be placed at the time of surgery wherever indicated and resorbable membranes should be encouraged to avoid a second surgical exposure reducing the number of appointments. Nylon and PTFE sutures are preferred as can be used for longer durations, saving a suture removal appointment. To promote healing and avoid complications such as peri-implantitis, patients can be advised to follow a post-procedural mouth rinse with a mouthwash containing active oxygen[18] along with oral irrigation devices.

Immediate loading should be preferred wherever indicated to minimize the number of appointments. One abutment–One-time concept can eliminate all the dis/reconnections occurring during the course of treatment[19] and allow for immediate provisionalization, thus reducing overall treatment time. A screw-retained prosthesis should be preferred in every case, as a provisional as well as a permanent restoration. Angulated screw channel (ASC)[20]/customized abutments facilitate a screw-retained restoration for any given situation. During provisionalization with a screw-retained provisional restoration, packing of the access hole with PTFE tape can be encouraged, avoiding composite or cement on top, thus preventing aerosol generation during removal. If an adjustment has to be made in the prosthesis, it should be done outside the mouth using a low-speed rotary handpiece in an enclosed transparent chamber with a provision for suctioning minimizing the fragments generated.

Switching to technical advancements can also save time and improve accuracy thus ensuring additional safety in the current times. Dynamic 3d navigation system[21] can be recommended to increase the accuracy and to reduce clinical and laboratory contact. Digital impressions are preferred eliminating the need for intraoral impressions. The use of MLS (metal laser-sintered) crowns/CAD CAM prostheses can be promoted to improve the accuracy and fit preventing any further complications. Using advanced materials such as PEEK/Zirconia should be furthered for implant-supported prosthesis.

Infrastructure modifications

During this pandemic crisis, to ensure the safety of the patient along with the clinician and the auxiliaries certain modifications are pertinent to be made to the operatories. The aerosol-generating procedures should be done in isolation negative pressure rooms that are well-sealed, including sealing of the ceiling and gaskets around items that enter the room. The operatory is to be adequately ventilated and should have a minimum of 12 air changes per hour and the negative pressure should exceed the supply by about 30%. Equipment such as HEPA filters H14/H13 and HVE (high volume evacuators) is to be installed in the operatory for air purification and minimizing the aerosol load and risk of transmission. Aerosol-limiting domes can be used in conjunction with this equipment while performing the aerosol-generating procedures. The operatories should be meticulously disinfected and fumigated after each procedure to minimize the risk of cross-infection.

Infection control and biomedical waste disposal

As the SARS-Cov-2 virus can remain viable and stay on the surfaces of inanimate objects especially in humid climates for up to three days,[22] infection control guidelines are to be strictly followed. The operatories are to be fogged regularly with hydrogen peroxide and at least a half an hour window is to be provided between the fogging and the next appointment. All the frequently touched surfaces are to be disinfected with EPA-approved disinfectants such as 1% sodium hypochlorite for 10 min. All the instruments are to be thoroughly cleaned after each use and autoclaved in color-changing sterilization pouches. The impressions, casts, and prosthesis are to be cleaned and disinfected before sending to the laboratory. PPE is to be donned and doffed with extreme care in separate areas assigned. All the biohazardous waste is to be disposed off following the biomedical waste disposal guidelines issued by the government.[23]

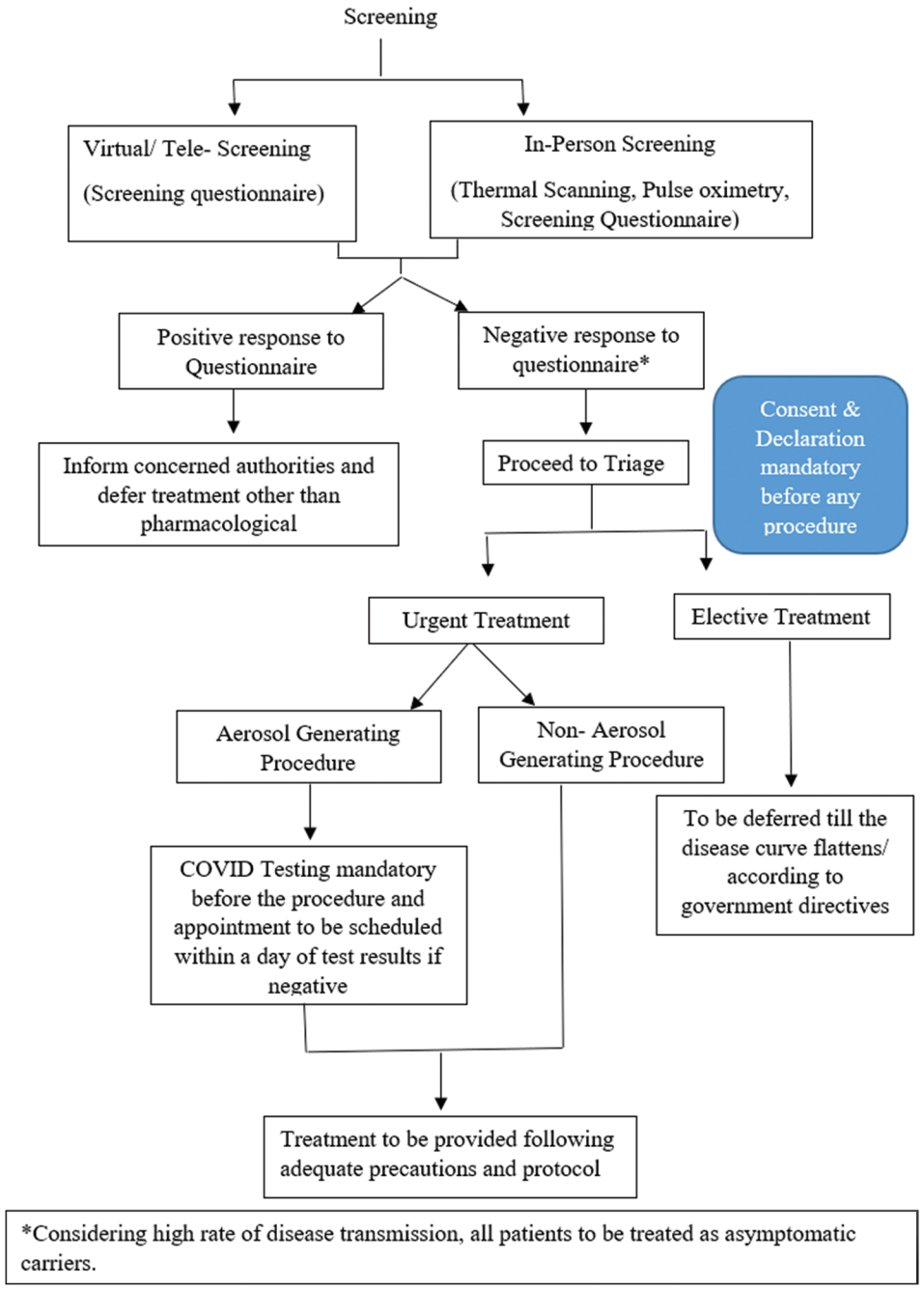

Figure 2: Summary of the steps to follow starting from patient entry to management

DISCUSSION

The outbreak of SARS-CoV-2 worldwide and the probability of asymptomatic carriers have made it likely that a subset of this population will be treated by dental professionals.[24] Conscientiously taken precautions are crucial at this stage to reduce the risk of disease transmission and to minimize the spread of the virus. Considering the range of the incubation period (0 to 28 days), there is a high probability that dental professionals end up treating COVID-positive patients; hence, all the individuals are to be treated as asymptomatic carriers. To make harmlessness certain, a set of guidelines is indispensable. Implant procedure-specific guidelines have not been presented earlier and considering an abundance of implant-related treatments can fall under urgent treatment needs, a simple yet effective set of recommendations are essential for smooth functioning as presented in this article [Figure 2]. Assessment of emergencies/urgencies can vary from case to case and the clinician's judgment is extremely important in decision making. Keeping ourselves up-to-date about this advancing disease and having sufficient training is necessary to mitigate the spread of this infection.

CONCLUSION

Judging by the rate of spread of this virus, we have to learn to live and work with it and we as healthcare workers are responsible to provide adequate treatment and to ensure the safety and well-being of our patients.

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Conflicts of interest

There are no conflicts of interest.

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