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COVID – 19: Influenced alteration in dental OPD management

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Abstract
The spread of Coronavirus disease (COVID 19) caused widespread public health concerns, outbreak is still on a rise and infection control measures are necessary to prevent the virus from further spreading and to help control the epidemic situation. The risk of cross infection can be high between patients and dental practitioners. Dental Surgeons are exposed to risk of infection due to the face-to-face communication and the exposure to saliva, blood, and other body fluids, and the handling of sharp instruments. Thus, this article aims to provide a brief overview of the COVID 19 and specific recommendations for dental practice suggested for patient screening, infection control strategies and patient management control. The precautions and guidelines will help dental practitioners as well as the patients and community in preventing and spread of the disease.

Keywords: COVID 19, viral diseases, sterilization, prevention, pandemic

Introduction
Outbreak of novel coronavirus (now called SARS-CoV- 2) in the Chinese city of Wuhan began in December 2019, has infected millions of people world-wide. WHO raised the threat to the novel coronavirus epidemic to the "very high" level, on February 28, 2020. Once in the human body, this coronavirus is abundantly present in nasopharyngeal and salivary secretions of affected patients, and its spread is predominantly thought to be respiratory droplet/contact in nature. The challenges faced by health-care professionals are its recognition, providing treatment, and preventing transmission of this virus.

SARS-CoV-2 can bind to human angiotensin-converting enzyme 2 receptors, which are highly concentrated in salivary glands; this may be a possible explanation for the presence of SARS-CoV-2 in secretory saliva [10]. The new interim recommendation from the ADA is that dentists keep their offices closed to all but urgent and emergency procedures until April 30 at the earliest. The new interim ADA recommendation is in keeping with the recent U.S. Centers for Disease Control and Prevention's recommendation to perform only emergency or urgent dental care until April 30, 2020 and must be taken seriously by all dental professionals. Unless point of care tests are readily available to the dental practice, no one can be assured that they are treating a non-infected individual.

Dental treatments are deferred in symptomatic cases unless it is an emergency, but various questions have to be discussed before starting dental practice. Post COVID-19 dental practice would be completely different from the conventional methods practiced earlier. The common questions are following.

1. Do we have to treat the unrecognized asymptomatic or mildly infected cases who may come in direct contact with the dentist cases? If yes, then how?
2. What about the clinic environment or the instruments used, could they become a potential source of infection as they host the aerosol droplets and saliva?
3. How to take care of instruments and environment of clinic to make them affordable by dentist as well as patient?

What precaution should be taken to prevent its spread in and through dental clinic?

Overview of COVID (COrona VIrus Disease)-19

Corona viruses (CoV) are a large family of viruses known as *coronaviridae*. CoVs are positive-stranded RNA viruses with a crown-like appearance (*coronam* Latin term for crown) due to the presence of spike glycoproteins on the envelope [7]. In humans, several coronaviruses are known to cause respiratory infections as SARS in 2002, H_1N_1 influenza in 2009, and MERS in 2012 [5]. The most recently discovered coronavirus causes coronavirus disease is very contagious and has quickly spread globally. Genome sequence for this novel coronavirus has a close resemblance with SARS-CoV, so it got the scientific name SARS-CoV-2, even though it is popularly called the COVID-19 virus (term given by WHO) [5, 1]. SARS-CoV could be detected from three major excrements (sputum, faeces and urine) and blood of the patients.

Incubation time for disease could be within 3 to 7 days and up to 2 weeks [8]. Common symptoms are fever, breathlessness, tiredness, sore throat and dry cough. Some other symptoms like bodyache, nasal congestion, nasal discharge, hyposmia, dysguesia, hemoptysis and diarrohoea are also found. Most people (80%) have only mild symptoms. Such persons, can act as "carriers" and also serve as reservoir for re-emergence of infection. Children may be asymptomatic and infectious. Although SARS-CoV-2 is known to be highly transmissible when patients are most symptomatic. Severe forms occur in 1 out of 6 who got diseased [2]. Disease has a predilection for men, mean age of 56 years with pre-existing chronic illnesses such as cardiovascular disease, immunosuppression or diabetes, such persons are more likely to develop serious illness manifesting symptoms typical of pneumonia or acute respiratory distress syndrome. Fatality ratio among medically attended patients is approximately 2% [4].

The disease can transmit through small droplets from the nose or mouth when a person with disease coughs or exhales (major route). The possibility of transmission before symptoms develop seems to be infrequent, although it cannot be excluded [5]. Also, when such droplets land on objects and surfaces around the person. Other people get infection by touching these objects or surfaces, then touching their eyes, nose or mouth. Another way of transmission is direct contact with blood, oral fluids, or other patient materials as in case of health care professionals [12].

The diagnosis can be based on a combination of A) Epidemiologic information (e.g., a history of travel to or residence in affected region within 14 days prior to symptom onset, or in contact with a lab confirmed case). B) Clinical symptoms. C) CT imaging findings. D) Laboratory tests (e.g., reverse transcriptase polymerase chain reaction [RT-PCR] tests on respiratory tract specimens).

Patients of disease are still managed symptomatically, and oxygen therapy represents the major treatment intervention, as there is neither proven vaccine nor medicine for prevention of the infection [5, 6].

Why Dentistry is at risk?

Dentistry in particular, face a higher risk of COVID - 19 transmission due to the nature of dental treatment operations (involves face-to-face communication with patients, frequent exposure to saliva, and blood, and the handling of sharp instruments) [3] as well as some properties of the virus. The relevant characteristics of such treatment and properties of virus are listed as follows:

i. Area of work is in proximity to the patient's oropharyngeal region, which is supposed to be most common habitat of virus responsible for its transmission.
ii. Presence of SARS-CoV-2 in secretory saliva [9].
iii. The water mist generated by the air-driven high-speed handpiece, air polisher, and various other instruments mixes with the saliva and blood of patients, forming aerosols and diffusing into the surrounding air that can remain suspended in the air for long periods [11, 13].
iv. Dental treatment is characterized by relatively long operation times, which results in the persistent existence of aerosols within a large area of the clinical office and introduces a potential risk of spreading disease.
v. Direct contact with blood, oral fluids, or other patient materials.
vi. Conventional protective measures are not 100% effective, and patients have no protection during the treatment process
vii. Saliva, blood, and mixed water droplets carrying the virus would contaminate dental treatment equipment also, which may act as source of secondary infection [10].

Through direct contact in the dentist's operation, both dental workers and patients are likely to become infectors and transmitters of COVID-19.

Literary Approaches to manage such situation

Based on the reasons above, many Chinese dentists and stomatological organizations have promptly reacted by ringing the alarm and calling for more attention to the disease via online platforms. Chinese Stomatological Association issued A Letter to Patients Suffering Oral Diseases During Prevention and Control of Covid-19, which suggested that patients should be cautious when visiting the dentist, and also informed dental workers to protect themselves comprehensively.

School and hospital of Stomatology, Wuhan University, China, the institute has divided its floor and area into four zones [17].

Yellow: triage and waiting area. Staff in the yellow area wear disposable surgical mask, cap, and work clothes

1. **Orange:** Dental clinic. Dental staff is provided with PPE, including disposable N95 masks, gloves, gowns, cap, shoe cover, and goggles or face shield. The area is disinfected once every half day.
2. **Red:** Isolation clinic. It is designed for patients who are Suspected with COVID-19, who are recovering from COVID-19 (but <1 month after they are discharged from hospital), or who need dental procedures producing droplets and/or aerosols. Separate entrances for patients and staff are provided in the area. The entire isolation area is disinfected immediately after the treatment is over and the patient has left
3. **Green:** Resting area for staff only.

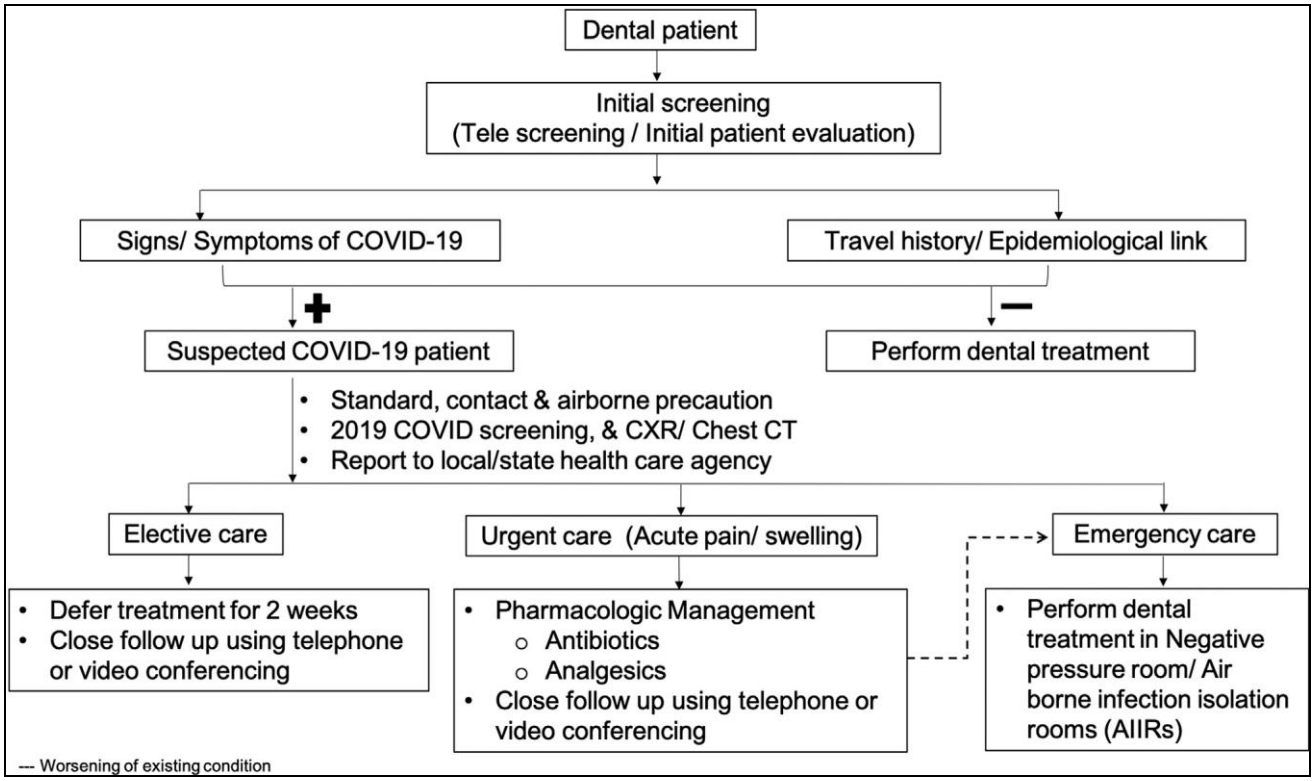
Dental staff should wear protective clothing besides the aforementioned PPE. The grid area behind the red line is for staff only. They are recommended to enter the room by turn and to keep wearing medical masks unless they are eating or drinking.

Management of patient in dental OPD

First of all, a dentist has to decide which patient has to be treated and when. This decision should be taken following the given steps -

1. Initial Screening / Tele screening - 3 most pertinent questions should include
   A. Any exposure to a person with known or suspected

COVID-19,
   B. any recent travel history to an area with high incidence of COVID-19,
   C. Presence of any symptoms of febrile respiratory illness such as fever or cough.
2. If all answer is "No" then perform the procedure accordingly.
3. A positive response to either of the 3 questions should raise initial concern, instruct patient to general hospital and get COVID 19 screening and chest X ray, simultaneously decide which type of dental care to be provided of one of the following
   a. Elective dental care should be deferred for at least 2 weeks
   b. Urgent care managed by pharmacological management
   c. Emergency care performed in negative pressure room with PPE kit and full precaution



Dental patient

Mandatory accessories to restart dentistry:

Non consumables	**Consumables**
Ultrasonic Fumigator	PPE kits
Extra Oral Suction	Face Shields
UV Light Trolley	N5 Masks only for consultant
HEPA Air purifiers	FFP3 Masks for procedures
Electric Hand dryers	Sodium Hypochlorite
IR Thermometer	Povidine iodine mouth wash
NMD Aerosol protection doom	Hand Sanitizers
Pulse Oxymeter	Prophylactic HCQ
Electric Hand pieces	Liquid soap/ Soap bar
Negative pressure chambers	HCQ tablets for the fumigator
	Spirit to wipe patients face
	Gloves
	Shields for the hand piece
	Shoe covers
	Rubber dam
	COVID-19 consent forms

General precautions before appointing the patient

1. Giving appointments or registration online or by telephone in all out-patient clinics to reduce gatherings of people; and arrange patients visits according to different strict time periods to shorten their waiting time for treatment.
2. Avoid appointment cards.
3. Screen for dental emergencies using tele-dentistry or other remote modalities, minimizing the risk of transmission.
4. Patient with proven COVID 19 positive, patients suspected and in quarantine have to completely avoid for the urgent and elective dental treatments.
5. Increase clinic timings to avoid crowding of patients.
6. Prevent patients from bringing companions to their appointment, except for instances where the patient requires assistance (e.g., paediatric patients, people with special needs, elderly patients, etc.).
7. The oral diagnosis and treatment area, as well as the waiting area should be rigidly isolated.
8. Good ventilation conditions are required, while mechanical ventilation should be adopted if necessary.
9. Keeping a clean and dry environment in the dental office would help decrease the persistence.
10. Elevator, if any should be disinfected regularly. People taking elevators should wear masks correctly and avoid direct contact with buttons and other objects.
11. Before the consultation, the room should be disinfected by ultraviolet irradiation and sprayed with a disinfectant containing 2,000 mg/L of effective chlorine.
12. Carry out all treatments in a single treatment room.
13. Training and education for assistants.
14. Dentist and the clinic staff if any experiencing influenza-like-illness (fever with either cough or sore throat, muscle aches) should not report to work.

15. Dentist and the clinic staff who are of older age, have a pre-existing, medically compromised condition, pregnant, etc., are perceived to be at a higher risk of contracting COVID-19 from contact with known or suspected COVID-19 patients and should be avoided.
16. Dentist and the clinic staff should self-monitor by remaining alert to any respiratory symptoms (e.g., cough, shortness of breath, sore throat) and check their temperature twice a day, regardless of the presence of other symptoms consistent with a COVID-19 infection.
17. Dental offices should create a plan for whom to contact if an employee develops fever or respiratory symptoms to determine whether medical evaluation is necessary.
18. Always check prior the available personal protective equipment (PPE) supplies [e.g., surgical masks, surgical gowns, surgical gloves, face shields].
19. Remove magazines, reading materials, toys and other objects that may be touched by others and which are not easily disinfected from clinic space.
20. Put chart in waiting area regarding social distancing.
21. Avoid cash transactions.
22. Air conditioners should be off.
23. No leather accessories and no metallic ornaments to be wore.
24. Strictly follow social/ personal distancing in the reception room.
25. Syringe and needle used for irrigation in slow manner to reduce splash with high vacuum suction.
26. Any appliances or prosthesis must be soak in diluted povidone iodine prior to any procedure.
27. Rinsing and spitting should be prohibited.
28. Minimise the number of appointments for each patient and increase the time interval between appointments, if possible.

Upon Patient Arrival

1. If patients wish to, or if the waiting room does not allow for appropriate "social distancing" (situated at least 6 feet or 2 meters apart), they may wait in their personal vehicle or outside the facility where they can be contacted by mobile phone when it is their turn to be seen. This can be communicated to patients at the moment of scheduling the appointment, based on established office procedures.
2. If possible, the entrance gate should always be open to avoid touch. provide mask and hand sanitizer to the patient at the arrival.
3. Upon patient's arrival, before entering the reception, they should be fumigated, hand sanitised and given mask and gloves to wear.
4. No companions should be invited inside the clinic, they should not sit in the waiting room.
5. If the following conditions are encountered during examination, advise patients to leave the clinic and instruct them to go to the general hospital, and clean and disinfect the reception room as soon as possible.
    1. Body temperature ≥37.3 °C, with symptoms of a cough, runny nose, fatigue, etc.
    2. A history of travel or residence in infected region, or contact with somebody who has a fever or has been to infected region within the past 2 weeks
    3. The patient's living or working area has confirmed cluster cases of SARS-CoV-2 infection.
6. As the patient's mask will come off during dental treatment, it should be placed back on as soon as treatment is complete.
7. Since SARS-CoV-2 may be vulnerable to oxidation, use 1% hydrogen peroxide or 0.2% povidone as a preprocedural mouth rinse before each appointment[3].
8. For paediatric patients who cannot rinse, always have a rubber dam placed for all aerosol generating emergency procedures. The use of pre-procedure rinse should be substituted by the use cotton rolls soaking, as it may difficult for these patients to rinse appropriately.
9. Fully utilize available PPE, understanding that surgical masks, which do not seal around the nose and mouth, are not adequate to completely protect against aerosol-borne disease transmission
10. N95 masks, with a positive seal around the nose and mouth, in combination with a full-face shield, should be worn when treating patients in close proximity to their respiratory system, similar to the protocol for medical teams performing intubations.
11. If N95 masks are not available, surgical FDA approved masks must be worn for each patient and not reused, in conjunction with proper utilization of goggles, gowns and gloves.
12. Members of the dental team within six feet of the treatment aerosol area should be limited to the operator and the assistant.

Precaution during a procedure

1. Dentist and the clinic staff should adhere to Standard Precautions, which "are the minimum infection prevention practices that apply to all patient care, regardless of suspected or confirmed infection status of the patient, in any setting where healthcare is delivered." Standard Precautions include: Hand hygiene, use of PPE, respiratory hygiene/etiquette, sharps safety, safe injection practices, sterile instruments and devices, clean and disinfected environmental surfaces.
2. Reduce chairside time and minimize 'doctor to patient' contact.
3. If basic PPE, including surgical facemasks are not available, do not proceed with any dental procedure, regardless of emergency/urgent patients.
4. Reinforcement for good hand hygiene is of the utmost importance.
5. Wear a surgical mask and eye protection with solid side shields or a face shield to protect mucous membranes of the eyes, nose, and mouth during procedures likely to generate splashing or spattering [(large droplets)] of blood or other body fluids.
6. Surgical facemasks should be selected based on procedure being performed.
7. The working position of the chair should be such that the clinician is operating from 11 o'clock or 12 o'clock position.
8. Use of magnification will help to maintain a safer distance from the patient while working.
9. It is advisable to reduce the air pressure on the three-way syringe to a minimum, so as to prevent any aerosol production while drying a tooth
10. For the treatment of patients with trauma or inflammation without aerosol generation, healthcare workers should use enhanced grade-2 protection.
11. Use a sharp spoon excavator to remove carious tissue
12. Situations where excavation with a spoon excavator is painful or difficult, use a slow speed micromotor handpiece and a carbide bur without irrigation.
13. Change the mask every 4 hours and wash or sanitize the

hands thoroughly. Surgical masks are single use only, and one mask should be used per patient. If your mask is damaged or soiled, or if breathing through the mask becomes difficult, you should remove the face mask, discard it safely, and replace it with a new one.

14. Dentist and the clinic staff should adhere to the standard sequence of donning and doffing of PPE. (Clinical Technique (Handpieces, Equipment, etc.)
15. Dentist and the clinic staff may use "extraoral dental radiographs, such as panoramic radiographs or cone beam CT, [and] are appropriate alternatives" to intraoral dental radiographs during the outbreak of COVID-19, as the latter can stimulate saliva secretion and coughing.
16. Dentist and the clinic staff should use resorbable sutures (i.e. sutures that last 3 to 5 days in the oral cavity) to eliminate the need for a follow up appointment.
17. Digital impressions are preferred in order to prevent spread of infection through cross contamination by making impressions and pouring casts.

Precaution taken after a procedure

1. Remove the protective mask/goggles and protective clothing when leaving the clinic; perform personal hygiene treatment after work, and pay special attention to the protection of the respiratory tract and mucous membranes.
2. Once the consultation/ procedure is over, then the whole treatment chamber should be fumigated (Patient, Dentist, assistants with PPE and the instruments used for the procedure) as it is.
3. After the fumigation, the patient, Dentist and assistants with PPE should leave the treatment chamber.
4. Then the treatment chamber, including the instruments used for the procedure should be UV irradiated for 15 minutes.
5. Now the used instruments should be taken for our regular cycle of sterilisation.
6. Wipe and disinfect the object surfaces as well as the floor with a disinfectant containing 2,000 mg/L of effective chlorine at least twice a day, and disinfect as soon as possible if there is contamination.
7. Pay special attention to high-frequency contact surfaces (such as various handles, buttons, instrument panels, stair walkways, etc.) followed by heat-sterilization.
8. Clean and disinfect public areas frequently, including waiting rooms, door handles, chairs, and bathrooms and sprayed with a disinfectant containing 2,000 mg/L of effective chlorine.
9. Non-disposable equipment (e.g., handpieces, dental x-ray equipment, dental chair and light) should be disinfected 1% sodium hypochlorite.
10. Surfaces such as door handles, chairs, desks, elevators, and bathrooms should be cleaned and disinfected frequently.
11. Dentist and the clinic staff should change from scrubs to personal clothing before returning home. Upon arriving home, dental health care professionals should take off shoes, remove and wash clothing [separately from other household residents], and immediately shower.
12. Call up all the cases seen/ treated every 7 days for 4 weeks to know about their health condition.

Management of medical waste

The medical and domestic waste generated by the treatment of patients with suspected or confirmed 2019-nCoV infection are regarded as infectious medical waste. Double-layer yellow colour medical waste package bags and "gooseneck" ligation should be used. The surface of the package bags should be marked and disposed according to the Bio Medical Waste Management Rules – 2016

Some Department wise recommendations

Conservative and Endodontics

1. Prefer clinical micro motor and a contra angled handpiece with latch type burs without water or irrigation.
2. Intermittent breaks should be given and small quantity of water in a syringe can be used to it cool down the tooth surface.
3. When using high speed turbo-charging handpieces and oral ultrasonic scalers that can generate aerosols and create an immersion environment, dental workers should use enhanced grade-3 protection.
4. Studies has shown that the anti-retraction high-speed dental handpiece can significantly reduce the backflow of oral bacteria and HBV into the tubes of the handpiece and dental unit [14].
5. Anti-retraction dental handpiece with specially designed anti-retractive valves or other anti-reflux designs are strongly recommended as an extra preventive measure for cross-infection.
6. Use of rubber dam could significantly reduce airborne particles in ~3-foot diameter of the operational field by 70% [16].
7. When rubber dam is applied, extra high-volume suction for aerosol and spatter should be used during the procedures along with regular suction [15]
8. If rubber dam isolation is not possible in some cases, manual devices, such as Carisolv and hand scaler, are recommended for caries removal and periodontal scaling, in order to minimize the generation of aerosol as much as possible [3].
9. In young children and in the geriatric population, the carious lesion can be arrested with the application of Silver Diamine Fluoride without removing any carious tissue followed by GI/ RMGI restorative material over the SDF treated carious dentine.

Pedodontics

1. In toddlers and little children, do Non Restorative Cavity Control (NRCC) which involves arresting the carious lesion and postponing restorations.
2. Avoid pulpectomies in primary teeth. Extraction and placement of space maintainer where required are preferable.
3. Partial pulpotomy with a sterile spoon excavator, full pulpotomy (cervical pulpotomy) with a micromotor handpiece

Oral Radiology

1. **Extra Oral:** The Chin Rest and rotary arms to be covered with disposable polythene covers and changed for every patient: 2 layer barriers: 1st layer in contact with patient to be removed by patient himself/ herself and 2nd layer by operator.
2. **Intra Oral:** Films/ RVG sensors/ PSP's : 3 layers: Outermost cover removed by patient himself/ herself and disposed in designated waste receiver. 2nd layer removed by assistant, third layer removed by clinician and then the sensor is put in the machine.

Prostho

1. Fractured prosthesis can be removed using controlled force with crown remover under split dam technique
2. Avoid using plastic impression trays, metal trays used after proper sterilisation. Customised tray are best.
3. Impression disinfection by and packed in two layers of airtight bags prior to dispatch.
4. Fixed prosthesis, Gypsum casts dysinfection

Periodontia

1. Only hand scaling instruments with intermittent rinsing with H2o2 or CHX every 10 mins: remove only subgingival calculus and not stains.
2. All periodontal surgeries are fine as long as there is no usage of power driven/ ultrasonic instruments

Implant dentistry

1. Implant surgeries should be postponed as far as possible.
2. Osteotomies for implant site preparation maybe possible in select clinical situations.
3. Implant site preparations can also be accomplished in select bone situations at speeds as low as 50-100 rpm without the use of saline for irrigation.
4. Slow intermittent drilling using sharp set of drill and following the sequence suggested by the implant manufacturer is essential.

Exodontia

1. Sectioning, if required during exodontia to teeth to be done using high-speed micromotor handpieces with diamond or carbide drills without irrigation.
2. Avoid irrigation with any external source to avoid splatter
3. Patient should be given instructions for a safe method of gauze disposal.
4. Usage of chisel and mallet for the extractions of certain impacted third molars may be considered for treating.

Ortho

1. Orthodontic practice involves minimal aerosol generation.
2. Almost all procedures are elective procedures and can be avoided.

Procedures to be completely avoided are

1. Full coverage crowns needing extensive reduction of teeth. Instead monoblocking with composite resin or Post & core restorations or Stainless-steel crown/ Hall technique can be done.
2. Conventional FPD instead Maryland bridge, Fibre reinforced bridge, Lithium disilicate bonded bridge Can be given
3. Scaling with Ultrasonic devices instead use hand scalers

When to see a patient with a resolved COVID-19 infection in a dental setting

1. At least 3 days (72 hours) since COVID-19 infection symptoms resolved
2. At least 7 days since their symptoms first appeared (defined as resolution of fever without the use of medications and improvement in respiratory symptoms) (e.g., cough, shortness of breath).

Conclusion

It is important that dentists and dental teams thoroughly understand the risks of treating patients, the need to continue treating patients with emergency oral health issues so they do not present to hospital emergency room departments. A dentist should strive to gain confidence of patients by ensuring that all safety measures are in place simultaneously he will have to act diligently not only to provide care but at the same time prevent nosocomial spread of infection. Undoubtedly, much remains unknown about COVID-19. Our measures for the prevention and control of the disease require more detailed optimization and improvements. The specific risk values of various clinical operations in dental practice need to be supported by more scientific data. Thus, related instruments and specifications should be developed and stipulated. We sincerely hope that dental practitioners can undertake an important role in the prevention of the epidemic during its most critical period, treating patients suffering from oral diseases while preventing the spread of the disease. We believe that with the full cooperation of the whole nation, the epidemic situation will be controlled as soon as possible. Victory remains with us.

The most up-to-date source for the epidemiology of this emerging pandemic can be found at the following sources

1. The WHO Novel Coronavirus (COVID-19) Situation Board
2. The Johns Hopkins Center for Systems Science and Engineering site for Coronavirus Global Cases COVID-19, which uses openly public sources to track the spread of the epidemic.

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