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Review Article

Endodontic management during COVID- 19 pandemic: A literature review and clinical recommendations

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ABSTRACT

The COVID-19 pandemic has turned to be a huge international challenge. Being the part of dental care, we hold responsibilities both to the dental staff and our patients so that the cross infection of virus can be avoided. Since dentists mainly have to work inside the oral cavity, the whole dental team, staff and the technician are at the highest risk of getting affected by the virus. Not only they are at risk of getting infected but at the same time they can potentially transmit the virus. According to latest studies, the presence of virus in salivary secretion of many symptomatic as well as asymptomatic patients, the dental professionals especially Endodontist are at the greatest life threatening situation if they do not follow proper guidelines such as sterilization at their workplace. Till today no medicine manufacturing companies have come up with the proper treatment or vaccines which can protect dentist from contracting with the virus. In this pandemic situation, the general practicing dentist and the Endodontist must provide only emergency treatments so as to relieve pressure and pain. As this COVID continues, it is the responsibility of health care workers to come up with more definitive treatment plans that to stick on to just palliative care. This article aims to bring latest updates on treatment considerations in clinical practice in general. However, the article also includes the guidelines to be followed by the endodontist so as to limit the cross infection but at the same time relieve patient from dental pain or any dental disease.

1. Introduction

Coronaviruses (CoVs) are enveloped single-stranded RNA viruses that are zoonotic in nature and cause numerous symptoms ranging from those alike to the common cold to more severe respiratory, hepatic, enteric and sometimes neurological symptoms.[1]

Governments along with medical and dental authorities have published guidelines for dental treatments. Some have taken strict measures to shutdown dental clinics, meanwhile others have allowed emergency and urgent care treatments, with some allowing elective procedures to be continued under firm protocols.[2] The specific guidelines and treatment considerations that dentists are bound to follow will remain region-specific, will rely primarily on the state of the pandemic in each individual country, and cannot be universally standardized. As reported that during the outbreak of COVID-19 in China, the requirement for emergency dental treatments decreased by only 30%.[3] Therefore, emergency dental treatments still remain essential and should be performed in dental practice to drop the burden on the local hospitals and relieve the pain and suffering of the patients. This paper aims to provide up-to-date information on the treatment considerations for dental care in general and discuss the available endodontic guidelines reported in the literature. Also, to propose new

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clinical recommendations on the management of endodontic emergencies.

2. Routes of Transmission

There are three most common transmission routes:[4]

1. Direct transmission (through cough, sneeze, or droplet inhalation).
2. Contact transmission (through oro-ocular route).
3. Aerosol transmission.

2.1. Current recommendations

2.1.1. Provision of dental care

Several criteria have been put forward for the management of dental care during the COVID-19 pandemic.[5–8] All recommend to have a telescreening appointment, through a telephone or video call, to undertake a formal risk assessment and to decrease the chances of cross-infection. In addition to dental-related questions, it is also recommended that patients should also be asked:

1. If they have a fever or flu-like symptoms, respiratory problems, change in taste or smell.[9,10]
2. If they have been in contact with individuals who had these symptoms, or with a confirmed COVID-19 positive patient.

If the patient answer "NO" to these questions, and active dental treatment was deemed necessary, the same questions should be asked to the patients when they come to the dental clinic. This triage screening should be carried out by members of the dental team wearing the proper personal protection equipment (PPE) including, face mask, face shield, and protective gowns.

A pulse oximeter is a must to monitor the oxygen saturation in the blood, and provision of oxygen supplementation should also be taken into consideration.[11] Treatment provided should be definitive not palliative, if applicable, in these patients because of the potential of health deterioration.[12]

2.1.2. Treatment protocols

If clinical treatment is very necessary, specific clinical protocols must be put in place. The patient should be requested to attend the dental facility all alone without company, unless the patient is a minor, or has a physical or mental disability.[13] Patients should be allowed to sit at least approximately 2 meters away from the unaffected care-unit in a well-ventilated room and asked to wear masks until being seated on the dental chair.[14] Just before beginning the oral examination, The CDC has initially directed that patients should be instructed to gargle with 0.23% povidone-iodine or 0.5% to 1% hydrogen peroxide (H2O2) for minimum 15 seconds prior to starting of dental exam/treatment due to their non-specific virucidal activity against coronavirus.[15] Most recently, the recommendation put forward by CDC has changed as there was no evidence of any efficacy in decreasing the viral load with this protocol.

2.1.3. Endodontic intervention

Following the COVID-19 outbreak in Wuhan, China, Yu et al. (2020) characterized the type of dental emergencies and found that patients with symptomatic irreversible pulpitis were the most common form of emergency. It was concluded that pulpotomy was very effective in controlling the patients' symptoms, however, they failed to arrange for any significant statistical data on the level of effectiveness of such treatment, or the management of such patients with complain of acute apical abscess or other endodontic conditions which requires quick root canal debridement. Ather et al. (2020) worked towards categorizing the type of endodontic interventions during the pandemic into primary and secondary treatment protocols.

The British Endodontic Society[16] projected a palliative approach for the treatment of endodontic disease using verbal advice, and detailed analgesic as well as antibiotic regimens for both adult and pediatric patients. They also suggested that only cases with AAA and severe swelling that may be a threat and have potential to compromise the airway would be referred to an emergency department for clinical intervention. Interestingly, no clinical intervention was directed as a first or second protocols of treatment, unlike the aforesaid studies. This guideline was the most conservative. The Indian Endodontic Society (IES) and The International Federation of Endodontic Associations (IFEA) also have proposed the theory that partial or complete pulpotomy must be adopted to manage cases with irreversible pulpitis.[17] They also proposed a pharmacological approach to tackle severe dental pain. However, no other modalities for diagnosis were addressed in thee above guidelines.

2.2. Recommendations for endodontic treatment

Endodontic treatment is profoundly affected by COVID-19. It often requires multiple and longer treatment visits which generates aerosols. This may results in an increased and repeated exposure to the coronavirus for the dentists, their staff and patients. In a study conducted in China, out of all patients attending for emergency dental care during a 10 days period, 50% were endodontic emergencies, with 53% being symptomatic irreversible pulpitis.[18]

Endodontic therapy is one of the most predictable approach through which the signs and symptoms of any endodontic disease can be controlled, and fortunately tooth can be saved. Despite the unwanted circumstances, Endodontists have a special responsibility to play in saving teeth and relieve the patients' symptoms. The timeframe

in relation to the resumption of 'normal' dental activities is unclear in different regions. Even if or when dental care facilities becomes fully operational, special care is potentially required to minimize cross-infection till the time a predictable treatment or vaccine for COVID-19 becomes available. To avoid possibility of cross infection and intervention later, it is advisable to go for definitive treatment.

Endodontic treatments can be classified into three categories:

1. Emergency procedures requiring immediate attention,
2. Urgent care procedures which require quick attention, but not as immediate as a genuine endodontic emergency,
3. Elective procedures that can be time lined at the patients'/providers' convenience.

For patients who have already recovered, clinicians may consider to address both emergencies and urgent care scenarios in a typical dental facility so as to avoid further deterioration of the patients' dental condition.

2.3. Diagnosis

Endodontic diagnosis using pulp sensibility tests can be carried out normally.[19] In COVID positive patients the preferred choice of radiography is CBCT or any other extra oral radiographs as they can guide us in treatment planning and tooth anatomy.[20–22] while minimizing intra-oral manipulation that may cause gagging or a cough reflex. A panoramic radiograph can be used if CBCT is not available. In cases where extra-oral radiographs are not available, or intra-oral radiographs are needed for further treatment/assessment, clinicians should consider limiting the number of radiographs as much as possible to only unsuspected or recovered COVID patients.

2.4. Armamentarium

Endodontists usually perform most endodontic procedures under high magnification using a surgical operating microscope, resulting in fewer procedural errors, and better clinical outcomes.[23] The current CDC guidelines suggests that provider should wear goggles or face shields together with the N95 masks, when aerosols are generated. The use of Endodontic microscopes, in their recent status, are not compatible with the PPE and face shield. Some modifications, however, can be implemented to ensure further protection to the operator from splatter and droplets produced while using the high-speed handpiece. Disposable plastic barrier can be attached to the lenses so as to provide a physical barrier between the clinician and the patient. Another, very important approach would be putting a hard-plastic barrier directly on the surgical microscope with the barriers being disinfected after each and every procedure. Most recently, Russell[24] developed a high-speed vacuum line with a polycarbonate shield that can be mounted on the dental operating microscope to reduce unimpeded oropharyngeal aerosol transmission.

Loupes with proper side coverage can be used, and a face shield and an appropriate mask is also worn. While working in microscopes, eye protection and face shield can be put on as a protective guard but they should be an obstacle or hamper the visibility. One thing should be kept in mind that protective eyewear with gaps in between glasses and the face fails to protect to protect eyes from all the aerosols and sprays generated during any procedure.[25]

Rubber dam has shown to reduce aerosol spread in operating areas. It should be able to comfortably cover the mouth and nose of the patient. Almost 90% reduction in aerosols has been reported with the use of rubber dam.[26] If the operator finds difficulties in placement or application of rubber dam then in such situations split dam technique can be used.[27] It is important to disinfect surface of tooth and rubber dam with disinfectants like sodium hypochlorite just before starting of the treatment. High vacuum suctions is the most effective equipment in reducing aerosol formation. It takes out air up to 2.83 m3 /min and along with it reduces aerosols and contamination almost by 90%.[28] Air borne particles measuring 0.3 mm are efficiently filtered to approximately 99.97% with help of HEPA filters (high-efficiency particulate air).[29] However, if the microbes are retained into it then there exist a possibility that they proliferate back into the filtered air. The disadvantage with HEPA filters are they being expensive, difficult to clean and may not be that effective against very small viruses between 0.06 – 0.14mm.[29–31]

2.4.1. Endodontic treatment

If endodontic treatment is required the only concern is towards the starting of treatment i.e. access opening because that will lead to aerosol generation. The latter steps are do not produce aerosols such as BMP, irrigation Canal filling and so on.

Treatment options like pulp capping or pulpotomy can effectively reduce pain. The whole procedure can be completed in short time and they do have high success rate.[32–35] Proper attention is required to select the case so as to minimize possibility of failure, exacerbation of symptoms. Single sitting RCT is a good treatment option where root canal cleaning is very necessary in clinical situations like symptomatic apical periodontitis or acute/chronic apical abscess. In systematic reviews, Moreira et al (2017) stated that there is no difference between single sitting and multiple sitting root canal treatment. In fact, single sitting RCT have lesser post-operative complications and higher efficacy even in cases with acute apical abscess, provided the canal is drained properly and it is dry at the time of filling.[36]

2.5. Preferred restorative approach

It might happen that permanent intra coronal filling or Full coverage crown cannot be given, in such scenario the endodontist must strengthen and restore the tooth with direct permanent restoration such as composite so as to minimize the chances of fracture.[37,38] Clinical cases in which temporary restorations are to be placed, calcium sulfate based material should not be the choice of material as they have low compressive strength and expansion.[39] To minimize the postoperative pain and risk of tooth/restoration fracture occlusal reduction must be considered.[40]

2.6. Management of traumatic injuries

In the clinic if a suspected or confirmed COVID patient comes with the complaint of avulsion of tooth or luxation injury, it is advised that the patient must be referred to advance equipped clinic which functions according to IADT (International Association of Dental Traumatology) guidelines.[41,42] For avulsion, milk which is readily available should be the choice of storage media.[43] If the patient is recently recovered or is unsuspected of COVID, guidelines issued by IADT must be followed and if any intervention is required then it has to follow the guidelines mentioned above.

2.7. Pharmacological management

In COVID suspected/ positive patients before necessary intervention it is advisable to opt for pharmacological treatment. Use of ibuprofen causes deterioration of symptoms in COVID patients as suggested by case reports.[44] WHO and other health organizations have warned against the use of ibuprofen.[45] Since there were not much evidence to support the disuse of ibuprofen therefore, WHO has recently taken back their restriction on use of ibuprofen. As per the new guidelines, to control dental pain in COVID patients ibuprofen can be given alone or in combination with dexamethasone or acetaminophen. Clinicians may follow to prescribe antibiotics as per the need.[46–48]

3. Conclusion

Extraordinary challenges requires unique solutions. In this pandemic, it is our duty to provide dental care to patients. Though community transmission is always a threat in dentistry to both dentist and patient and can always open channel for community transmission. Therefore we must focus on getting new ideas to work under such circumstances.

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5. Conflict of Interest

The authors have stated explicitly that there are no conflicts of interest in connection with this article.

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