

Endodontic Management During The COVID-19 Pandemic - A Review

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Abstract

Objective: The spread of the severe acute respiratory syndrome corona-virus 2 (SARS-CoV-2) has resulted in millions of confirmed cases and billions of deaths in the world. Despite all efforts to contain the spread of the disease, the number of infections and deaths continue to rise every passing day. Given its presence in the salivary secretions of affected patients, and the presence of many reported asymptomatic cases that have been tested positive for COVID-19, dental professionals, especially, endodontists are at a high risk of becoming infected if they do not take appropriate precautions during the procedure. To have an updated treatment considerations for dental care in general, as well as a protocols and guidelines to be followed during an endodontic treatment during this covid-19 pandemic.

Clinical Relevance: To have an updated treatment considerations for dental care in general, as well as a protocols and guidelines to be followed during an endodontic treatment during this covid-19 pandemic.

This topic has been selected keeping in mind the recent havoc Covid 19 has done especially in field of dentistry, with sole aim of bringing in various protocols for endodontic treatment that has to be followed.

Conclusion: The available endodontic guidelines reported in the literature till now have being reviewed and an endodontic treatment protocol have been suggested which is best available as on today

Keywords: Endodontic emergencies, Palliative care, Calcium hydroxide, Corona virus-2, Aerosol-generating procedure, Pain management.

Introduction

Throughout the world, COVID-19 have a major and devastating impact on healthcare professionals and their day-to-day work. The disease has created very challenging working conditions and chaotic environment, a number of front-line staff have become infected and have died because of the corona-virus. The virus that causes COVID-19, SARS-CoV-2, is profusely present in nasopharyngeal and salivary secretions of

patients infected with SARS-CoV-2, it is believed to be spread primarily through respiratory droplets, as well as aerosols and fomites (Azim A et al 2020).Dental professionals are potentially exposed to the virus due to their close proximity to patients, specifically their mouths and respiratory tracts (Peng et al.2020), the oral cavity can act as an primary site of entry to the body (Ahmed et al.2020) consequently coming into contact directly with the source of the disease. It has been reported that the corona-virus attaches to ACE 2 receptors found in saliva, the floor of the mouth, and other oral tissues (Xu, Khurshid et al 2020).

Ideally, dental procedures should be defined clearly and patients should be allocated to general dental care practitioners and when were deemed necessary, to specialists with additional knowledge and trained skills. Recommendations for non-aerosol-generating interventions have been made to mitigate and protect dental healthcare providers. (Leung N.H.L et al 2020) These include pharmacologic management for pain and infections as well as procedures that do not require a hand-piece such as incision and drainage and nonsurgical extractions. Few clinicians have taken radical measures to shutdown dental clinics, while some allowing elective procedures to be continued under strict protocols (Mallineni et al.2020). Even the water used during the dental treatment must be monitored strictly. (Anitha M et al 2020). It was reported, during the outbreak of COVID-19 in China, the need for emergency dental treatments decreased by only 30% (Guo et al 2020.).

Management of endodontic emergencies through palliative care is a successful interim treatment option when aerosol-generating procedures are restricted. This treatment approach should be preferred to reduce risk of transmission of COVID-19 infection during subsequent

shutdowns. The aim of this article is to provide an up-to-date information on treatment considerations for dental care in general, to discuss the available endodontic guidelines reported in the literature, and to propose new clinical recommendations on the management of endodontic emergencies in our day-to-day clinical practice.

Patient safety challenges

Treatment protocol to be followed based on research articles

- For Walk-in patients

1.Patient attenders should not be allowed, unless the patient is an invalid.
2.Alcohol based hand disinfectant should be preferred for patient
3. Checking of temperature upon arrival at the clinic should be mandatory

- Dental facility considerations for COVID-19 positive patients.

1. Waiting time should be short, proper scheduling of appointments between each patient
2. Double masks should be worn in the waiting room
3. Waiting area should allow social distancing (6-foot/2 meters) apart each.
4. Tissue paper dispenser and foot operated waster bin should be provided
5. Disinfection of frequently touched surfaces with NaOCl and ethanol after each treatment procedure.
6. Disinfection with 1000 mg/L chlorine containing disinfectant for floor mopping and sprays
7. Heat sensitive instruments should be disinfected with 2% glutaraldehyde

- Treatment considerations

1.We Should consider every patient as a potential COVID carrier.
2.Fit tested respirators should be used always
3.Should use personal protective equipment (PPE) (gloves, masks, gowns, and face shields) till the end of the treatment
4.Extra-oral imaging techniques.
5.Only dentists and assistant should be present during treatment
6.Avoided nitrous oxide sedation
7.Use of rubber dam should be mandatory
8.Use of high-volume suction is advisable.
9.Minimally invasive procedures should be performed
10.Semi-supine or upright patient chair position for COVID-positive patients with stable respiratory disease
11.Try to avoid aerosol generating procedures whenever possible, or postponement of such procedures.

Cochran et al. (1989), Harte (2010), Siegel et al. (2007), Narayana et al. (2016), Wang et al. (2020).Abramovitz et al(2020), Ebben et al(2020); Peng et al. (2020); Alharbi et al. (2020), Ather et al. (2020); Kampf et al(2020); Sharma S et al(2020)

Recommendations for endodontic treatment

Based on previously published data,

1. To stabilize the patient’s dental condition long enough to avoid any rebound effects or permanent tooth loss.
2. To protect the patient from potential exposure to the virus during repeated multiple visits.
3. To reduce the burden on hospital emergency clinics.

Table 1: Research articles with guidelines regarding endodontic intervention.

Yu et al. (2020)	<ol style="list-style-type: none"> 1.Analysed the type of dental and endodontic emergencies encountered in Wuhan during COVID-19 pandemic. 2.Suggested vital pulp therapy to reduce the treatment time for endodontic emergencies. 3.Enlightened the importance of using rubber dams, personal protective equipment (PPE), and pre-treatment patient screening
Abramovitz et al. (2020)	<ol style="list-style-type: none"> 1.Review of the operatory considerations, endodontic considerations, and surgical aspects. 2.Suggested various logistics and clinical steps to manage patients. 3.Ways to control cross-contamination and use the appropriate PPE
Ather et al. (2020)	<ol style="list-style-type: none"> 1.Reviewed the symptoms, mode of transmission and epidemiology of the disease. 2.Discussed prevention of nosocomial infection. 3.Recommended management of patients through tele-screening. 4.Split up the endodontic intervention into Primary (pharmacological management) and secondary (pulpotomy/vital pulp therapy) to manage clinical symptoms.
	Suggested verbal advice, and detailed

Bhandari & Tompson (2020)	analgesic and antibiotic regimens to manage endodontic pain.
Krithikadatta et al. (2020), Sharma S et al. (2020)	1.Suggested medications to manage severe dental pain. 2.Recommended vital pulp therapy to reduce the treatment time
Anil C.K, Yenuberry P (2020)	1.Reviewed symptoms, general dental clinical aspects, endodontic considerations. 2.How to control cross-contamination and use the appropriate PPE. 3.Transmission dynamics

Diagnosis

Pulp sensibility tests can be carried for endodontic diagnosis using out normally (Balevi 2019). Extra-oral radiography, such as cone beam computed tomography (CBCT), can be given preference in COVID-positive patients, since it can provide more specificity regarding disease detection, treatment planning and tooth anatomy (Cohenca & Shemesh 2015, Lemagner et al 2015, AAOMR 2016, Chogle et al2020) minimizing intra-oral manipulation that may cause gagging or a cough reflex. In cases were CBCT is not available, a panoramic radiograph can be used, 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 unsuspected or recovered COVID patients.

Armamentarium

The current CDC guidelines suggest that dentist should wear goggles or face shields together with the N95 masks, when aerosols are generated. Some modifications, can be implemented to ensure further protection to the dentist from splatter and droplets produced whilst using the high-speed handpiece. A

disposable plastic barrier should be attached to the scope binoculars to provide a barrier between the clinician and the patient. Most recently, Russel 2020 developed a high-speed vacuum line with a polycarbonate shield that can be mounted on the dental operating microscope to reduce unimpeded aerosol transmission. Clinicians should be aware that protective eyewear with gaps between glasses and the face likely do not protect eyes from all splashes and sprays (CDC).

The most important protocol to reduce aerosol spread into the operatory is the use of a rubber dam (Li et al 2004). It has been shown that the application of rubber dam alone reduces aerosol production up to 90% (Cochran et al 1989). The tooth and the rubber dam sheet should be disinfected with sodium hypochlorite prior to starting treatment. High vacuum suction can be used to reduce the aerosols. It removes air up to 2.83 m³ min⁻¹ and reduces aerosols and contamination by 90% (Narayana et al 2016). The high-efficiency particulate air (HEPA) filter is another device that removes 99% of the airborne particles measuring 0.3 μm (Howard 2003). Additionally, they are difficult to clean, expensive to replace and may not be effective against corona-viruse, due to its smaller particle size that ranges between 0.06 and 0.09 μm (Day et al 2018, Yao et al.2020).

Endodontic treatment

If endodontic intervention is needed to address the patients' symptoms, clinicians should consider a more definitive treatment, whenever applicable. Aerosol production is the only concern at the beginning of most endodontic treatments, for example during caries/restoration removal and access preparation, and at the end of treatment during occlusal adjustments. All the other procedures related to canal instrumentation, irrigation, or even canal filling and restoration placement

do not produce aerosols. Treatments such as vital pulp therapy which are effective in reducing pain can be accomplished in a short time and have a high success rate (Qudeimat et al 2017, Taha & Abdelkhader2018). However, care, should be taken for proper case selection to minimize the possibilities of immediate clinical failure, exacerbation of symptoms and the need for another appointment. Whenever root canal debridement is deemed necessary, the clinician should consider a single-visit root canal treatment. In an overview of systematic reviews, there was no difference in the treatment outcome of root canal treatment between single- and multiple-visit treatments, with a trend of lower postoperative complications and higher efficiency in treatments completed in a single session (Moreira et al 2017). Survivability of teeth with long-term Ca (OH)₂ does not appear to pose a detrimental effect on tooth loss (Athanasiadis et al 2017, Shabbir et al 2020)

Table 2: Different types of endodontic treatments performed in a dental clinic.

Endodontic Emergencies	Endodontic Urgent Care	Elective Endodontic Treatment
Symptomatic irreversible pulpitis	Chronic apical abscess	Normal pulp
Symptomatic apical periodontitis	Concussion/sub-luxation	Asymptomatic irreversible pulpitis/Necrotic pulp/previously initiated/previously treated
Acute apical abscess	Root canal treatment (RCT)	Normal apical tissue
Avulsion	following avulsion/luxation	Asymptomatic apical periodontitis
Intrusion	luxation	Endodontic surgery
Luxation	injuries	
Complicated		

Endodontic Emergencies	Endodontic Urgent Care	Elective Endodontic Treatment
crown fractures	Vertical root fracture (VRF)	Tooth discoloration/ Internal bleaching
Complicated crown-root fracture	Internal/external root resorption	
crown-root fracture	Uncomplicated crown fractures	

Procedures, such as nonsurgical retreatment, which may require a longer treatment time, performing a lengthy procedure can place the patient and the treating clinician at a lower risk of cross-contamination compared to the potential need for two appointments. Case such as acute apical abscess with severe swelling that may compromise the airway, they should be patient referred to an emergency clinic for clinical management as suggested by the British Endodontic Society (Bhandari & Tompson 2020). Endodontic surgery is mostly an elective procedure, but in few cases it might be the only treatment approach to address a patient’s symptom. In such scenario, clinicians might be at a greater risk of exposure to aerosols due to the absence of a rubber dam. Clinicians can also consider using surgical handpieces and ultrasonic units without the built-in coolant, and use instead external irrigation through a plastic syringe.

Preferred restorative approach

Elective dental procedures might be postponed where were. Attempts should be made, in coordination with the referring dentist, to restore the tooth with a direct permanent restoration such as composite or amalgam, to minimize tooth/restoration fracture, crack propagation,

or coronal leakage (Madison & Wilcox 1988, Dammaschke et al 2013). Occlusal reduction should also be considered to minimize postoperative pain and the risk of tooth/restoration fracture, (Nguyen et al.2020)

Management of traumatic injuries

In case of a suspected or confirmed COVID patient arrives with a tooth avulsion/luxation injury, it is recommended not to do any treatment in a typical dental care facility the patient should be referred to a specially equipped dental facility according to the International Association of Dental Traumatology (IADT) guidelines (Andersson et al 2016, DeAngelis et al 2017). For cases such as avulsion, the tooth should be kept in a readily available storage media such as milk (Adnan et al 2018).

Pharmacological management

Prescribing medication should be considered as primary treatment approach to control the symptoms of patients for suspected or confirmed COVID patients. Few case study's report suggested that the use of ibuprofen could cause further deterioration of systematic symptoms in four COVID-19-positive patients (Day 2020). This resulted in statements from several health organizations, including the WHO, warning against the use of ibuprofen for suspected or confirmed COVID-19 patients (Edmunds2020). Recently WHO has retracted their warning regarding the use of ibuprofen due to lack of sufficient evidence. Clinicians can consider the use of ibuprofen alone or in combination with acetaminophen, or dexamethasone to control dental pain for COVID-19positive patients, depending on the severity of pain. (Ather et al 2020, C K Anil et al 2020). Clinicians may follow their normal postoperative pain medication protocols and the guidelines for antibiotics prescription (ESE2018, Lockhart et al2019)

Conclusion and perspective

COVID-19 has impacted how dental care can be safely delivered and the various changes to be considered for a safe treatment delivery The dental profession has got to consider, whether the workflow and layout of dental clinics should be permanently reorganized, expanded, PPE is warranted for care of all dental patients as a part of Standard Precautions. The pandemic presents various opportunities for dental researchers to focus on various key issues. Research priorities should include estimating the costs and benefits of expanded PPE use, developing and testing ingenious approaches to minimize aerosol generation during various dental procedures, testing and validating tele-dentistry models, and evaluating other alternative dental workforce models.

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