International Journal of Research and Review
Vol. 10; Issue: 6; June 2023
Website: www.ijrrjournal.com
Review Paper *E-ISSN: 2349-9788; P-ISSN: 2454-2237*

Managing Endodontic Emergencies Amid the COVID-19 Pandemic

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DOI: https://doi.org/10.52403/ijrr.20230605

ABSTRACT

The impact of Covid 19 on dentistry has been profound with dental clinicians, who are at high risk of exposure to the virus. Initially at the inception of the pandemic, during the periods of lockdown, the elective dental treatment was halted and advice, analgesia and antimicrobials were preferred to manage the dental emergencies. Some patients could not be successfully managed with this approach and required face-to-face consultation. Therefore, dental emergency assessment via telephonic triage, Covid 19 screening and strict adherence to standard operating protocols for the patient, operatory and dentist were ensured while providing dental treatment based on minimum intervention and restraining from aerosol generating procedures. Now three years from the commencement of the pandemic, calls have been made for gradual return to regular clinical practice with extra precautions. Due to the emergence of new variants and ongoing easing and reimplementation of restrictions, it remains imperative to mitigate the risk of disease transmission during the dental treatment. Thus, this article provides an insight into the clinical protocols for the management of endodontic emergencies in the Covid 19 era, making the dentist better prepared to provide dental care in the patient's best interest during such pandemic disease outbreaks now and in future.

Key words: Coronavirus disease 19 outbreak, endodontic emergency, dental care.

INTRODUCTION

The recent outbreak of Coronavirus disease 2019 has posed a significant challenge for all healthcare workers. Coronavirus (SARS CoV-2 [2019-nCoV]) belongs to the lineage of RNA viruses in the Nidovirales order. Starting in November, 2019 from Wuhan, China spreading all around the world like a wildfire, WHO acknowledged it as a Pandemic with around 12,896,855 infected cases and global deaths reaching up to 568,586 by 12 July 2020 [1]. According to Occupational Safety and Health Administration, dental health care personnel are placed in very high exposure risk category as dentists work in close proximity to the patient 's oral cavity [2]. So, the high risk of infection with coronavirus forced dental practices to decline/limit oral healthcare services to emergency and urgent conditions during the periods of lockdown. Silva *et al* in 2021 in his article reviewed that during the COVID-19 epidemic in Wuhan, China, the majority (50.6%) of dental emergencies were of endodontic origin. These endodontic emergencies included symptomatic irreversible pulpitis,

symptomatic apical periodontitis, acute apical abscess, and traumatic dental defects [3]. Therefore, it can be assumed that endodontists were on the front lines for emergency care during the disease outbreak. Presently observing a surge, as of 18 April 2023 there are 61,233 active cases of coronavirus in India [4]. Also, it is well-recognized that minor oral surgical, restorative, periodontal, as well as endodontic procedures produce aerosol and splatter contamination that exceeds permissible limits. The Index of Microbial Contamination reveals that endodontic procedures generate significantly greater aerosol-produced colony-forming units compared with restorative procedures. Also, the aerosols produced during the endodontic procedures disperse as far as 2 m to 6 feet from the patient's head [5]. Hence, it's important to understand the implications of potential transmission of the virus in a clinical setup, considering every patient to be an asymptomatic carrier and treating accordingly with the standard operating protocols along with the updated information regarding the disease.

DISCUSSION

What is an endodontic emergency?

An endodontic emergency can be defined as occurring when a patient has pain associated with inflammation of the pulp and/or peri radicular tissues, or when there is pain (with or without swelling) caused by infection of the root canal system and/or the peri radicular tissues. Patients presenting with endodontic emergencies can be divided into three main groups as [6]:

Before treatment:

1. Pulpal pain
a. Reversible pulpitis
b. Irreversible pulpitis
2. Acute periapical abscess
3. Cracked tooth syndrome

Patients under treatment:

1. Recent restorative treatment
2. Periodontal treatment
3. Exposure of the pulp
4. Fracture of the root or crown
5. Pain as a result of instrumentation
a. acute apical periodontitis
b. Phoenix abscess

Post endodontic treatment:

1. High restoration
2. Overfilling
1. Root filling
2. Root fracture

The management of patients during the Covid 19 crisis, presenting with pain and in emergency requiring endodontic intervention should be done ensuring an aseptic technique and as little aerosol production as possible. A further aim is optimal and efficient endodontic access and instrumentation which prevents any further interventions or acute symptoms, especially during the period where services are not up to normal operational capacity.

Clinical protocols

Pre-operative

- ❑ Scrub the patient's lips and surrounding area with povidone-iodine (PVP-I) or chlorhexidine if available to maintain as aseptic a technique as possible.
- ❑ Preprocedural antiseptic mouth rinses may aid in reducing the number of microorganisms in aerosols during oral procedures. The hydrogen peroxide mouthwash which is more readily available in concentrations of 1.5–9% can be rinsed around the mouth for one minute. Also, PVP-I can be used as a nasal spray and mouthwash for both patients and healthcare workers. A 10% PVP-I solution is diluted down to 0.5% concentration and is gargled in the mouth and held at the back of the throat for one minute and administered into the nostril using an atomising device or syringe. This can be followed by healthcare workers every two to three hours [7].
- ❑ Extended appointments should be avoided.
- ❑ Personal protective equipment is strictly advised. Also, the use of an auxiliary table as a barrier to minimize frontal

aerosol, a face shield along with a dental loupe and headlight, acetate sheets adapted to the binocular of the dental operating microscope are a few barriers which could help provide protection from infection.

Intra-operative:

- ❑ Single use instruments are preferred wherever possible to reduce the need for sterilisation and decontamination.
- ❑ Avoid intraoral radiographs wherever possible.
- ❑ Anesthetize and isolate the tooth using a rubber dam before starting endodontic access. Ideally, isolation should be performed with the clamp on the target tooth and the rubber dam should cover the patient's nose throughout the endodontic procedure.
- ❑ The Oraseal (Ultradent, Colony, Germany) or OpalDam (Ultradent) should be used sparingly to ensure a moisture-tight seal around the tooth.
- ❑ The tooth, clamp, and the surrounding dam is cleaned by using 3% hydrogen peroxide and disinfected with 2.5% sodium hypochlorite [3]. The crown of the tooth was sterilized to prevent cross infection of the pulpal microflora in the classical endodontic microbiology studies and this can be effectively applied to the current situation.
- ❑ To begin the access cavity, utilise a fast handpiece with reduced water or without water and high-volume suction to reduce aerosol production. This practice is different from normal in unusual circumstances. Tungsten carbide burs cut more efficiently than diamond burs and hence produce less haphazard debris. The enamel within the ideal access cavity is removed and once the dentine is breached, switch to using a slow handpiece. Also, caries can be hand-excavated if necessary.
- ❑ Use anti-retraction dental handpieces and ensure the use of high-volume suction as close to the tooth and the handpiece head as possible during drilling to reduce surface contamination with aerosol. The use of high-volume suction has been shown to reduce aerosol surface contamination between 90–93% [7].
- ❑ Refrain from the use of spittoon and 3-in-1 syringe as much as possible.
- ❑ The use of ultrasonic scalers should be avoided.
- ❑ The use of Gates Glidden burs and/or Goose Neck burs which improve access depending on the depth of the dentine overlying the pulp roof and the proximity of the canal orifices is recommended.
- ❑ Once the pulp has been accessed, the inflamed tissue in the pulp chamber can be removed by essentially a pulpotomy.
- ❑ Next, 5% sodium hypochlorite can be utilised to fully dissolve any organic tissue to the best possible level and minimise constant need for irrigation and re-irrigation [7].
- ❑ Pulpectomy could be considered an alternative to pulpotomy, if time and equipment allow. The root canal system should be mechanically instrumented to length aiming to delivering irrigant and intracanal medicament into the canal system to eradicate bacteria. Pulpotomies can be considered in cases of irreversible pulpitis as the radicular pulp is usually vital. Conversely, in necrotic cases, where there is a well-established infection, the intention is to eliminate the microorganisms within the root canal system.
- ❑ Wherever possible, single-visit root canal treatment should be provided. This will reduce the need for a further appointment as well as further risk of aerosol generating procedures.
- ❑ If the clinician is unable to complete the root canal treatment, as in majority of acute cases, an appropriate intracanal medicament dressing is given. A non-setting calcium hydroxide for necrotic pulps and steroid/antibiotic pastes in cases of irreversible pulpitis are preferred. Ideally, the tooth should be restored definitively with a direct restoration under rubber dam isolation if

root canal treatment has been completed which provides the foundations for an extra-coronal restoration at a later date and further reduces the burden of subsequent aerosol generating procedures.

Post-operative:

- Advise the patient to avoid chewing on the affected tooth for 24 hours and analgesics could be prescribed depending on the patient's presenting symptoms.
- Inform the patient that the symptoms may take some time to subside and the treatment provided is not definitive and will require follow-up.
- The virus spreads more rapidly from person to person due to the lack of air circulation and proximity of people. Hence, ventilation is essential. Minimum air changes per hr of dental operatory is 6 and the optimal value is 10-12. Centralized Heating, Ventilation and Air Conditioning system with inbuilt high-efficiency particulate air filters can effectively prevent airborne transmission. Alternatively, a strategically placed industrial grade portable HEPA filter with clean air delivery rate of 300-800 cubic feet/m can be effective. HEPA filter of highest grade like HEPA-13, HEPA-14 are recommended [1].
- It is recommended to clean and disinfect all surfaces after each patient in accordance with national guidelines. The Centers for Disease Control and Prevention recommends to wait 15 minutes after the completion of each patient to clean and disinfect the dental office. In contrast, the Office of the Chief Dental Officer England advises that the rooms should be left vacant with the door closed either for 20 minutes in a negative pressure isolation room or for 1 hour in a neutral pressure room [3]. Also, windows to the outside in a neutral pressure room can be opened for appropriate ventilation.

Pharmacological management

Medications recommended in cases of emergency care of patients reporting with severe dental pain during Covid-19 pandemic are [8]:

- **For acute pulpitis are:**
  - Acetaminophen 1000 mg every 6 – 8 hours or
  - Ketorolac Tromethamine 10mg every 6 hours or
  - Piroxicam 20 mg every 12 hours or
  - Ibuprofen 600 mg every 6 hours [Use with caution]
- Symptomatic irreversible pulpitis may be alleviated by administering 4 mg dexamethasone either orally or through intraligamentary and mainly supraperiosteal injections.
- There is not enough evidence to recommend the use of antibiotics to reduce pain in cases with irreversible pulpitis. If the patient reports with signs and symptoms of acute apical abscess or cellulitis then appropriate antibiotic medications have to be given.

Endodontic intervention

In a study conducted in China by Yu *et al.*, out of all patients attending for emergency dental care during a 10 days period, 50% were endodontic emergencies, with 53% being symptomatic irreversible pulpitis [9]. They indicated that pulpotomy was very effective in controlling the patient's symptoms.

Ather *et al.* grouped the endodontic interventions during the pandemic into primary and secondary treatment protocols [9]. In cases of symptomatic irreversible pulpitis or symptomatic apical periodontitis, pain medication through a combination of ibuprofen and acetaminophen or dexamethasone was advised. If the medication proved ineffective, full pulpotomy was advised as the secondary intervention. In cases of an acute apical abscess, in addition to incision for drainage for fluctuant intra-oral swellings, antibiotics were advised for primary management. Vital pulp therapy, such as pulp capping and

pulpotomy was indicated as a secondary management protocol in cases of symptomatic tooth fracture. These guidelines did not discuss the case selection and management if symptoms persisted. Additionally, no criteria were mentioned for teeth in which treatment had been initiated and no caution related to the use of ibuprofen was specified.

Abramovitz *et al.* addressing some of the limitations in the Ather *et al.* protocol emphasised on providing clinical interventions, instead of pharmacological treatment, reducing the number of treatment visits needed [9]. In cases of symptomatic irreversible pulpitis, cracked teeth with vital pulps and symptomatic complicated crown fractures, pulpotomy was suggested. Mechanical debridement and canal dressing was recommended in cases of symptomatic apical periodontitis, acute apical abscess, primary or secondary endodontic lesion and pupal necrosis. In cases where canal filling material cannot be retrieved, as for retreatment, occlusal reduction and pharmacological management were recommended.

A palliative approach for the management of endodontic disease using advice, analgesic and antibiotic regimens for adults, as well as paediatric patients, was proposed by the British Endodontic Society. They also stated that only cases with acute apical abscess and severe swelling that compromise the patient's airway should be referred to an emergency department for clinical intervention. This guideline was found to be the most conservative one.

The International Federation of Endodontic Associations and the Indian Endodontic Society also proposed through a joint statement that partial or complete pulpotomy would be the recommended protocol for the management of irreversible pulpitis. Also, they proposed a pharmacological approach to manage severe dental pain

So, for a suspected/confirmed COVID patient, only endodontic emergencies should be considered and dental care should be provided using pain medication and/or antibiotics or clinic intervention in a dedicated dental facility. Whereas, for an unsuspected/recovered patient, both emergencies and urgent care scenarios can be considered in a typical dental facility to avoid further deterioration of the patient's dental condition. Clinicians might consider deferring elective endodontic treatments for unsuspected or recovered COVID-19 patients or if very necessary, address them on a case-by-case basis following the standard operating protocols.

Suggestions for managing the endodontic emergencies

- **Pulpitis**

Vital pulp therapy including pulpotomy or pulp capping are helpful in terms of reducing the treatment time. Pulpotomy has been reported to reduce pain symptoms in nearly 90% of dental emergency patients one day after treatment. Partial pulpotomy using mineral trioxide aggregate (MTA) sustained a good success rate (85%) over 3-year follow-ups in mature permanent teeth clinically diagnosed with irreversible pulpitis, and full pulpotomy using MTA showed a 92.7% success rate at a 3-year follow-up for caries-exposed pulps in mature permanent molar teeth. Direct pulp capping with MTA showed a cumulative survival rate of 85% in adult molars with carious pulpal exposure at 36 months [10]. For cases that required root canal treatments, cone-beam computed tomographic imaging and single-file systems should be preferred. Besides the advantages of detecting root canal location and configuration, cone-beam computed tomographic examination could avoid nausea or vomiting for patients that may occur during intraoral x-ray examination and prevent exposure to patient's oral cavity. During root canal preparation, single-file nickel-titanium systems could be used to save working time as well as prevent the risk of re-sterilization.

- **Acute apical abscess**

It presents as severe, spontaneous pain with a swelling and usually pus discharge. The tooth is well localised as tenderness is felt on

biting. Appropriate hospital referral may be required for management by the oral and maxillofacial surgery team, if these patients present with severe symptoms, soft tissue swellings and spreading infection.

- **Dental trauma**

For **suspected or confirmed COVID patient**, in cases of tooth avulsion/luxation injury, it is preferable not to do any intervention in a typical dental care facility and the patient should be referred to a specially equipped dental facility for management according to the International Association of Dental Traumatology (IADT) guidelines[11]. In cases of avulsion, the tooth should be kept in a readily available storage media such as milk.

For **unsuspected or recovered COVID patients**, the IADT guidelines and clinical protocols mentioned previously should be strictly followed during any clinical intervention.

The avulsion and luxation injuries will require repositioning and treatment commonly in the form of a splint. Complicated crown fractures that involve the pulp, also require treatment. So, if teeth require splinting, then consideration can be given to the use of a composite resin using self-etching adhesive or a resin-modified glass ionomer cement, which in turn would also minimise the use of the 3-in-1 syringe and reduce aerosol production. The splint is removed by sectioning the wire using pliers or wire cutters between the restorations. The composite buttons remain on the tooth but can be removed later and the remaining sections of wire or rough sections of composite can be lightly polished with hand abrasive strips and discs or abrasive discs in a slow handpiece to remove any sharp edges, reducing aerosol generation. In some cases, the clinician may decide to keep a flexible splint in situ for the time being.

In cases of complicated crown, rubber dam should be applied and the tooth cleansed in the same manner as described above for endodontic treatment. Once isolated, the exposed pulp can be assessed for either a direct pulp capping or a partial pulpotomy. Partial pulpotomy limits the amount of aerosol generation, as the length of instrumentation is short in reaching healthy pulp tissue. Once healthy pulp tissue is exposed, haemostasis can be attained by a sterile cotton wool pledget soaked in sodium hypochlorite or saline. Also, the tissue may need to be resected until haemostasis is achieved. Non-setting calcium hydroxide or bioceramic materials such as mineral trioxide aggregate or calcium silicate-based materials can be placed over the exposed healthy pulp tissue over which the glass ionomer cement or a composite restoration using a self-etching adhesive is placed preventing further aerosol production.

In cases, where **root canal debridement** is deemed necessary to control symptoms/disease, the clinician should consider a single-visit root canal treatment. In an overview of systematic reviews, Moreira *et al.* reported that there was no difference in the outcome of root canal treatment between single and multiple-visit treatments, with lower postoperative complications and higher efficiency in treatments completed in a single session [12]. Single-visit treatment is a safe, effective and well-tolerated procedure even in cases with acute apical abscess, if complete drainage is achieved from the canal, or via incision and drainage and the canal(s) are dry at the time of filling. Nonsurgical retreatment may require a longer treatment time, so complete debridement and placement of antibacterial intracanal medicament such as calcium hydroxide would be the alternative approach if the treatment cannot be completed in a single visit due to time or treatment related reasons. Hence, an experienced dental practitioner or endodontist should carry out these procedures.

CONCLUSION

Unprecedented challenges, necessitate unprecedented solutions. The variants of this deadly virus are emerging even today and we do not know what the future holds for us. With COVID-19, the biggest fear is the fear of the unknown, the asymptomatic patients

can act as carriers and serve as a reservoir for re-emergence of infection leading to transmission even before the symptoms start appearing. As dental health care providers, our primary goal is to serve our patients during such outbreaks, now and in the future. Emergency endodontic treatment can be challenging both for clinicians and patients during Covid 19 pandemic, but utmost caution could reduce and probably eliminate the risk. Hence, there should be stringent implementation of clinical protocols in regular dental practice to prevent, not only Covid 19 transmission but also, other deadly infections by occupational contacts.

Declaration by Authors

Acknowledgement: None

Conflict of Interest: The authors declare no conflict of interest.

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How to cite this article: Nupur Sharma, Shikha Jaiswal, Vineeta Nikhil et.al. Managing endodontic emergencies amid the COVID-19 pandemic. *International Journal of Research and Review*. 2023; 10(6): 24-30.
DOI: *https://doi.org/10.52403/ijrr.20230605*

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