



## Review Article

# Endodontic implications and innovative preventive strategies during novel COVID-19 pandemic requiring emergency endodontic treatment

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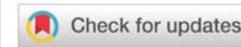
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## Abstract

Endodontics a specialty branch in dentistry frequently deals with endodontic emergencies and during this COVID-19 pandemic Emergency Root Canal Treatment (ERCT) is often required to manage acute pulpitis with or without space infections.

There are various routes of disease transmission in endodontics. When treating patients requiring emergency access opening the treating doctor should be extremely vigilant and cautious regarding its spread and containment of COVID-19 virus by utilizing certain innovative strategies such as HEPA filters, High volume extraoral suction, and other devices manufactured from Polyethylene to safeguard from aerosols generated during emergency endodontic therapy.

## Introduction

An outbreak of pneumonia of unknown cause in Wuhan City, Hubei Province of China was reported to World Health Organization on 31 December 2019. The novel corona virus disease (COVID-2019) was identified as the causative virus by Chinese government on 7 January [1], declared to be a Public Health Emergency of International Concern on 30 January 2020, and recognized as a pandemic on 11 March 2020 [2].

It is an ongoing pandemic of coronavirus disease 2019 (COVID-19), also called as SARS COVID-2 [3]. As of

16 April 2020, more than 2060927 cases of COVID-19 have been reported in 210 countries and territories, resulting in over 134354 deaths. More than 511356 people have recovered. The case fatality rate was estimated to be 4 percent in China [4], but varies significantly between countries and in India it is reported to be around 3.4%.

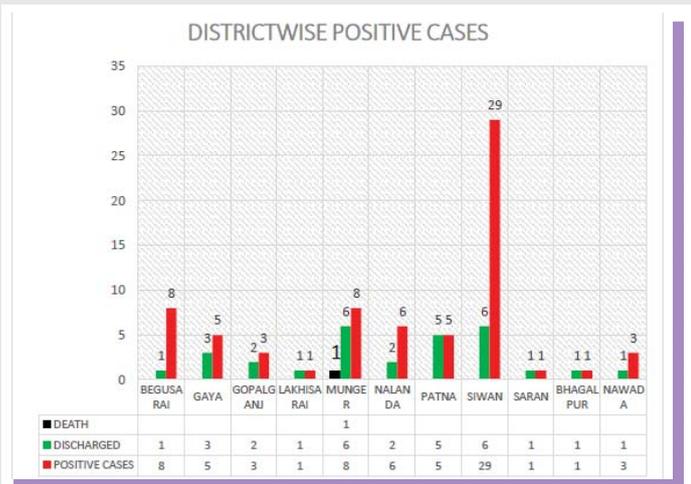
In India the total number of confirmed cases with recovery is 10477 and 1488 respectively. Mortality rate in India has slightly increased from 3.4 to 3.95 in few days i.e from 11<sup>th</sup> April 2020 to 16<sup>th</sup> April 2020 (Figure 1).

The mortality rate in our state is around 1.42% which is

| Active cases | Discharged Cases | Death |
|--------------|------------------|-------|
| 10477        | 1488             | 414   |

**Figure 1:** In Bihar the total number of confirmed case is 70 which is about 0.66% the total cases of India till date.

extremely less in comparison to other affected state or other countries. This is certainly due to proactive and diligent measures taken up by health department and Govt of Bihar (Figure 2).



**Figure 2:** In Bihar 11 districts has so far reported the confirmed case of covid 19.

The virus mainly spread between people during close contact, often via Aerosols (miniature droplets) produced during coughing, or sneezing [5]. This virus spreads at a faster rate when people don't follow social distancing and without knowledge of respiratory hygiene remain in close contact with each other within 1 to 2 metres (3 to 6 feet) [6,7]. Aerosols containing millions of virus usually fall to the ground or surfaces like stainless steel, cardboard, metals, monitors or any other fomites and after the droplets gets dried the virus can remain active for hours to few days and can infect anyone who touches the infected surfaces or fomites and touch their face [8]. Coronavirus major symptoms include dry cough, high fever and difficulty in breathing in later stages [9]. It is most contagious during the first three days after onset of symptoms. Various studies have reported that its spread may be possible before appearance of any symptoms and also in the later stages of the disease so it becomes extremely difficult to contain this virus worldwide [10].

Major complications include pneumonia involving different lobes of both the lungs simultaneously, myocarditis and acute respiratory distress syndrome which requires ventilator support and is life threatening [11,12]. The incubation period range from two to fourteen days but typically symptoms of dry cough and fever appears on average on 5<sup>th</sup> day after exposure to the virus [12]. the mutagenic potential of the virus and its novelty it is prudent to state that till date there is no known vaccine or specific antiviral treatment and primary treatment is predominantly symptomatic and supportive.

World health organisation and various other health agencies has advocated general preventive measures which include hand washing for 20 to 30 seconds with soap and water, covering one's mouth when coughing, maintaining distance of 6 feet from other people and self-isolation for people who are suspected. Person having an infection should be isolated and monitored [13]. India and our state of Bihar has actively implemented lockdown with total travel restrictions, quarantined those who are suspected and effectively managing those infected patients in dedicated covid 19 hospitals. Bihar has a dedicated COVID-19 hospital (NMCH, Patna) which is managing and treating such cases.

Endodontics which is speciality branch in dentistry deals with endodontic emergencies and during this covid 19 pandemic emergency root canal treatment (ERCT) is often required to manage acute pulpitis with or without space infections.

There are various routes of disease transmission in endodontics. When treating patients requiring emergency endodontic treatment the doctor should be extremely vigilant and cautious regarding its spread and containment of this virus:

#### Airborne route (Dental Aerosol And Splatter)

The terms "aerosol" and "splatter" were first coined by Micik and colleagues [14]. Aerosols are particles less than 50 micrometers in diameter and because of their meagre size they can stay airborne for certain period of time before settling on environmental surfaces or enter the tracheobronchial trees by coughing or sneezing or by certain dental procedures like ultrasonics or airtoror handpiece used for cleaning and access cavity preparation for endodontics respectively through mouth, nose or eyes. The smaller particles of an aerosol (0.5 to 10 µm in diameter) have the potential to penetrate and lodge in the smaller passages of the lungs and are thought to carry the greatest potential for transmitting covid -19 infections. Splatter is defined as airborne particles larger than 50 µm in diameter. These droplets are ejected ballistically/forcibly from the dental operating site and follow an arc of a trajectory. They then fall onto the surface or any orther fomites. These particles are too large to become suspended in the air and are airborne only briefly. With time the droplet containing virus/microorganisms begins to evaporate, and its size becomes smaller, and has the potential to stay airborne as a dust particle. In todays scenario splatter droplets also may be a potential source of infection in an endodontic treatment setting. Splatter and droplet nuclei also have been implicated in the transmission of diseases such as TB, SARS, measles, herpetic viruses and even COVID-19 virus.

The potential routes for the spread of infection in endodontics are direct contact with body fluids of a suspected or infected patient, contact with environmental surfaces and instruments containing the virus 1.

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SARS COV-2 or COVID-19 is flulike illness caused by a new form of coronavirus, a family of viruses usually associated with the common cold. This new form of virus is found in bats and probably pangolins. The exact mechanisms of its spread remains uncertain, but it is presumed to be transmitted primarily by aerosolized droplets produced by coughing or sneezing. The Centers for Disease Control and Prevention have recommended that aerosol-producing procedures should be avoided in patients with active illness as most of dental treatment are elective but only emergency endodontic treatment should be carried out with full PPE kit after all precautions are made to do such cases. While other endodontic patients should not undergo any elective procedures during COVID-19 pandemic [6].

### Innovative preventive measures to tackle COVID 19 infection in endodontic speciality

Endodontist or other dental professionals will encounter patients with suspected/infected COVID-19 patients and will have to act diligently to provide care and also to stop the spread of this deadly nosocomial infection in dental operator. Endodontic procedures will invariably use airtors and thus will produce airborne particles from the oral cavity. Airtors handpieces, ultrasonic scalers, air abrasion units produces greatest aerosols and splatter hence there is a potential for the spread of infection. Use of such equipments should be minimized or eliminated to the greatest extent and should be decided on basis of clinical situation individually as most endodontic emergencies will require access opening to relieve the patient from pain. Use of rubber dam, carisolv to remove caries, micromotor with no water spray, personal protection equipments, double masks, double gloves and eye protection with goggles or face shield will eliminate much of the danger inherent in splatter droplets arising from the operative site. Covid 19 virus that is present in aerosol form has the potential to enter the respiratory tract through leaks in masks so mask should be changed after 8 hours. These particles can remain in the air of the operatory for up to 30 minutes after a procedure [6]. hence, after a endodontic/dental procedure, the operator after donning of PPE the potential for contact with this airborne virus still remain for limited period of time. It is a matter of great concern that in centralized AC units of a hospital or endodontic clinic this airborne contaminant can enter the ventilation system and spread to other areas of the hospital or clinic.

Method of reducing viral load produced during endodontic procedures is the use of a preprocedural rinse with povidone iodine 0.2–7.5% for one minute before initiating endodontic procedure as it effective against the virus because chlorhexidine is inaffectiver preprocedural rinse against this virus.

The use of a rubberdam will reduce all contamination arising from saliva or blood from oral cavity to a greater extent. In acces opening during emergency endodontic treatment with rubber dam the only remaining source for airborne contamination is from the tooth that is undergoing treatment. This will be limited to airborne tooth material and any organisms contained within the tooth itself. In other clinical scenario like subgingival

restorative procedure, endo perio lesions requiring subgingival curettage, periodontal surgery, crown lengthening etc rubber dam cannot be used hence, all elective endodontic surgeries can be postponed and only emergency care can be taken with all precautions.

If emergency endo perio lesions have to be taken in hospital setup then following two methods should be taken to reduce airborne contamination arising from the operative site.

1. Equipments to remove the contaminated material from the air of operating room
2. Equipments to remove the contaminated material from the immediate area surrounding the endodontic access opening tooth/site.
3. Removing airborne contamination from the air of the operating room should use high efficiency HEPA filter (Figure 3), and Ultra Violet chambers in the ventilation system and sanitizing with 1% sodium hypochlorie, or 70 % alcholol based sanitizers preferably [14]. The use of Extra/Intra oral a High-Volume Evacuator (HVE), (Figure 3), has been shown to reduce the contamination arising from the operative site by more than 90 percent [7,15,16]. HVE, an innovative product from unicorn dentmart removes a large volume of air within a short period. An evacuator that pulls a high vacuum but does not remove a large volume of air, such as is used routinely for hospital suction, is not considered an HVE. The usual HVE used in dentistry has a large opening (usually 8 millimeters or greater) and is attached to an evacuation system that will remove a large volume of air (up to 100 cubic feet of air per minute). The small opening of a saliva ejector does not remove a large enough volume of air to be classified as an HVE [7].
4. Use of micromotors for emergency root canal opening
5. Using chemical like carisolv to soften dentin.

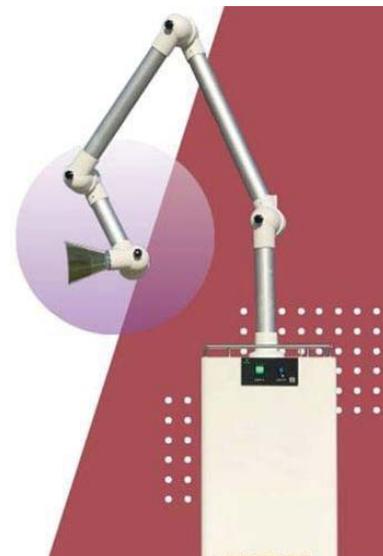


Figure 3: Extra oral suction: It has inbuilt HEPA filter.



6. Utilizing common resources like plumber plastic pipes and polyethylene sheets to make a cover box for endodontic patients.
7. Adding chemical disinfectants like povidone iodine to the water unit to decrease the spread of infections.
8. One other innovative strategy is to utilize UV recirculator at the patient entry and exit point, in endodontic clinic and patient waiting area which can reduce the chances of airborne infection to a bare minimum.

Hence, it is prudent to utilize all the above methods which include various instruments and novel armamentarium to combat this novel corona virus and various emergency endodontic procedures can be safely undertaken in this pandemic.

## Conclusions

Emergency endodontic treatment can be technically arduous and challenging both for clinicians and patients during COVID-19 pandemic but with vigilance risk can be curtailed and probably eliminated. Hand washing is recommended to prevent the spread of the disease. The CDC recommends washing hands often with soap and water for at least twenty to thirty seconds. Surfaces may be decontaminated with a number of solution like 70% ethanol, 50% isopropanol, 0.1% sodium hypochlorite, 0.5% hydrogen peroxide, and 0.2–7.5% povidone-iodine. Chrohexidine gluconate commonly used disinfectant is not effective against this virus.

No single approach or device can minimize the risk of infection to dental personnel and other Patients completely, following procedures are appropriate as universal precautions whenever an aerosol is produced;

1. Preprocedural rinse should be used before treatment;
2. Rubber dam should be used where possible;
3. HVE should be used for all procedures.

To minimize exposure to potentially pathological microorganisms, the Center for Disease Control and Prevention (CDC) recommends that all oral healthcare providers (OHCPs) use barriers to cover clinical surfaces as well as personal protective equipment (PPE) (gloves, masks, goggles and gowns) to cover their skin and mucous membranes of eyes, nose and mouth when performing dental treatments. The CDC also recommends that if a COVID case is suspected or confirmed at a facility such as an office or day care, all areas should be disinfected. All covid Suspected/infected endodontic patients should be referred to dedicated covid-19 centers for further evaluation/treatment.

Infection by the virus can be provisionally diagnosed on

the basis of symptoms, and confirmation is done by reverse transcription polymerase chain reaction (rRT-PCR). Various companies are developing serological tests, which detect antibodies. In the US a serological test developed by Cellex has been approved for emergency use. There is no COVID-19 vaccine so far so prevention is always better than cure.

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