

An endodontic emergency situation with airborne contagious diseases around

Situasi darurat endodontik dengan penyakit menular melalui udara sekitar

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ABSTRACT

Emergency endodontics account for one-third of all dental emergencies. Most cases can only be resolved if the dentist can interact directly with the patient. One of the airborne infectious diseases that need attention is Covid-19, dental procedures have a high risk of transmitting the disease. Therefore, emergency endodontics during the pandemic is a big challenge. This paper reviews how to handle endodontic emergencies in the pandemic era. Teledentistry is one of the options as a first step to solve and help the patient's problem. For emergency endodontic interventions, after teleconsultation, dentists can plan endodontic treatments such as pulpotomy, pulpectomy, or incision and drainage, with proper control protocols to prevent transmission during the visit. It is concluded that emergency endodontics has a much higher risk of transmission. Reducing treatment time and exposure control are ways to reduce the risk of coronavirus spread during endodontic treatment. Following proper protocol procedures in treating patients is a must, so as to protect many people.

Keywords: Covid-19, endodontic, emergencies, pandemic

ABSTRACT

Endodontik emergensi mencakup seperti dari semua keadaan darurat gigi. Sebagian besar kasus hanya dapat diselesaikan jika dokter gigi dapat berinteraksi langsung dengan pasien. Salah satu penyakit menular melalui udara yang perlu menjadi perhatian adalah Covid-19. Prosedur perawatan gigi memiliki risiko tinggi untuk menularkan penyakit sehingga endodontik emergensi selama pandemi merupakan tantangan besar. Kajian ini mengulaskan bagaimana menangani keadaan darurat endodontik di era pandemi. Teledentistry merupakan salah satu pilihan sebagai langkah awal untuk menyelesaikan dan membantu masalah pasien. Untuk intervensi endodontik emergensi, setelah telekonsultasi, dokter gigi dapat merencanakan perawatan endodontik seperti pulpotomi, pulpektomi, atau insisi dan drainase, dengan protokol kontrol yang tepat untuk mencegah penularan pada waktu kunjungan. Disimpulkan bahwa endodontik emergensi memiliki risiko penularan yang jauh lebih tinggi. Mengurangi waktu perawatan dan kontrol paparan adalah cara untuk mengurangi risiko penyebaran virus corona selama perawatan endodontik. Mengikuti prosedur protokol yang tepat dalam merawat pasien adalah suatu keharusan, sehingga dapat melindungi banyak orang.

Kata kunci: Covid-19, endodontik, keadaan darurat, pandemi

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INTRODUCTION

Treatment of endodontic emergencies is one of the most challenging aspects of clinical dentistry which requires expert knowledge and training in diagnosis and a tailored treatment plan. In addition, decision of both factors are needs to be adapted with every patient's condition that may influenced by the level of the teeth problems and systemic diseases. Endodontic emergencies include one thirds of dental emergencies. The purpose of clinical management of emergencies treatment is for alleviate, even to removing those pain causes, for examples, pulpotomy and pulpectomy treatment in pulpitis irreversible cases or drainage by teeth trepanation or incision swelling area in necrosis pulp with teeth abscess cases. Therefore, it can be said, most cases of in the field of endodontics emergencies, can only be overcome if the dentist directly takes care of the patient.¹⁻³

On March 11, 2020, the WHO declared coronavirus disease 2019 (Covid-19) as a pandemic, this situation has made all the countries began to lock down their societies, shutting businesses and nonessential services, with the purpose is to stop the spread of Covid-19. How-

ever, the current situation of the Covid-19 pandemic is still worrying all over the world due to its rapid transmission. Since December 2019, Covid-19 infection is unstoppable and has affected 767,364,883 people globally as on 1st June 2023.⁴ The source of transmission of the *severe acute respiratory syndrome coronavirus 2* (SARS-CoV-2) virus that causes Covid-19 is direct contact with mucous membranes, oral fluids, blood, as well as aerosols and droplets.^{1,2,4-7}

On the other hand, most dental treatment procedures involve a tool that produces aerosols and droplets, also close proximity to patients that it cannot be avoided by the dentist during diagnosis and treatment process. This is made cross-infection between patients and dentist are highly happened, especially if that patient needs dental procedure treatment that involves spraying water. Therefore, dental treatment procedure is the highest risk contagious diseases, so endodontic emergencies management during pandemic is a big challenge. Dental professionals, especially endodontist, need to have a detailed understanding and information regarding effective endodontic emergencies management protocols, as well

as up-to-date knowledge regarding disease infection control and proper self-protection during Covid-19 pandemic in order to prevent the wider spread of the disease.⁶⁻⁸

LITERATUR REVIEW

Emergency classifications

There are three concepts of emergency that are needed to understand. They are 1) urgency is any immediate treatment that alleviates the patient's discomfort who is not at risk, while emergencies are serious occurrences, in which the patient requires quick care, since there is a risk of life involved; 2) a dental emergency is associated with immediate measures whose target is to alleviate the painful, infectious and/or aesthetic symptoms of the oral cavity; and 3) the dental emergency service can be defined as the care provided to patients with oral issues that interfere with their lives or organ functioning. An endodontic emergency is defined as pain or swelling or even both of it, that caused by various stages of inflammation or infection of the pulpal or periapical tissues, also an emergency that occur between treatment sessions or after endodontic procedures (Fig. 1).^{1,9,10}

The causes of dental pain are usually caries, damaged restorations, trauma, or flare-ups. Endodontic flare-ups occurring between treatment visits can be the cause of the patient's acute dental pain and are considered an emergency.¹⁰ Making the right diagnosis and effective and efficient treatment for acute pain experienced by patients is the most important aspect that must be carried out by dentists.

Determining a definitive diagnosis can sometimes be challenging and even frustrating for the clinician. Ac-

Assessment of a True Emergency
(Circle Patient's Response wherever appropriate)

1) Are you in pain?
Yes or No

2) What is your level of pain on a scale of 0-10?

3) When did the pain begin?
.....

4) Do you have a dental abscess (Are your gums and/or face swollen?)
Yes or No
• If Yes, when did you first notice the swelling?
.....

5) Do you have a fever?
Yes or No

6) Are you having any trouble swallowing?
Yes or No

7) Are you having any trouble opening your mouth?
Yes or No

8) Did you experience any trauma?
Yes or No
• Please describe the trauma
.....

Figure 1 Assessment of a true emergency.^{2,11}

COVID-19 Screening Questionnaire

Patient Name: _____ Temperature: _____

1) In the past 14 days, have you or any household member traveled outside of San Antonio?
Yes: Where and Date of return _____
No

2) In the past 7 days, have you or any household member had any contact with a COVID-19 patient?
Yes
No

3) Have you or any household member had history of exposure to COVID-19 biologic material?
Yes
No

4) Have you had any history of fever in the past 14 days?
Yes
No

5) Have you had any respiratory illness such as cough or difficulty breathing in the last 14 days, unexplained muscle aches or nausea, sore throat, diarrhea or recent loss of taste or smell?
Yes
No

6) Do you have uncontrollable dental or oral pain, infection, swelling, bleeding or trauma to your mouth?
Yes
No

Figure 2 Covid-19 screening questionnaire.²

cording to the researchers' surveys, there are seven clinical presentations that are considered endodontic emergencies, those are irreversible pulpitis with normal periapex; irreversible pulpitis with symptomatic apical perodontitis; necrosis pulp with symptomatic apical perodontitis, with no swelling; necrosis pulp, fluctuant swelling, with drainage through the canal; necrosis pulp, fluctuant swelling, with no drainage through the canal; necrosis pulp, diffuse facial swelling, with drainage through the canal; necrosis pulp, diffuse facial swelling, with no drainage through the canal.¹⁰

Emergency endodontic management during Covid-19 pandemic

On consideration of the information and guidelines from WHO, Centers for Disease Control and Prevention (CDC) recommended that dental facilities should postpone elective procedures, surgeries, and non-urgent dental visits, and prioritize urgent and emergency visits and procedures for the coming time. This aligns with recommendations from the American Dental Association and American Dental Hygienists' Association to postpone non-emergency and elective dental procedures.¹

Responding to this statement, dentists need to understand how to assess emergency risk in patients through a screening process that is carried out first as an initial diagnosis and to develop a patient care plan, before a clinical visit is carried out. Below will be described the stages that must be considered and carried out as endodontic emergency management during the pandemic.

According to Suneetha, et al., the effective management of endodontic emergencies during Covid-19 pandemic that must be considered by clinicians, briefly involves the following steps such 1) diagnosis of endodontic emergencies. The procedure for determining the diagnosis can be done through teledentistry. Prescribing oral antibiotics and analgesics and also planning visits for patients requiring immediate emergency care can be determined during telecommunications; 2) pre procedural patient education. Education that can be given to pa-

tients is in the form of brief explanations regarding the pandemic situation, guidelines for protection and spread of Covid-19, the impact of Covid-19 on endodontic procedures, patient visit times must be on schedule, patient companions consist of only one person, and also rules when patients visit such as maintaining distance, washing hands when entering the room, using a double layer-edmask need to be informed; 3) education to dental assistants and clinical and non-clinical staff. Knowledge related to the patient's health status and respiratory symptoms that need to be suspected of the patient must be well understood. Washing hands, wearing masks, maintaining distance, checking the temperature of patients and companions using an infrared thermogun must be carried out by clinical/non-clinical staff. In addition, the protocol for the use of personal protective equipment (PPE) in accordance with their respective roles must be understood by clinical/non-clinical staff; 4) preparation of clinic area and dental operatory room. Sterilization of the room using sodium hypochlorite disinfectant to the entire work area surface, the use of plasma air sterilization of whole dental office, fumigation or fogging of the operating room, and installation of HEPA filters around the operating room should be prepared. Dental equipment must also be sterilized by autoclaving, and supporting equipment such as dental units, x-ray sensors, x-ray views, and microscopes need to be covered with disposable plastic-coated covers; 5) PPE of dental specialist and dental assistant. The use of level 3 PPE is very necessary for dentists and dental assistants to carry out endodontic procedures because these procedures can lead to the production of aerosols that can lead to the spread of Covid-19 and all health workers must be properly trained in the protocol for installing and removing PPE; 6) Decision making in treatment plan and procedure. In endodontic emergencies, the usual treatment measures can be pulpotomy, pulpectomy or incision and drainage. This decision making is still based on subjective, objective and supporting examinations. All treatment procedures in the clinic must be preceded using antimicrobial mouthwash; 7) post procedural patient education. An explanation of the effects of treatment, dietary procedures, oral hygiene cleaning measures, as well as the consumption of necessary drugs can be given after the procedure; 8) post procedural infection control measures. Dental assistants need to perform cleaning, disinfection and sterilization of all tools used and disinfection of all surfaces of the dental procedure room.

DISCUSSION

Initial treatment – Triage

Overcoming endodontic emergencies during a pandemic can be done by starting with teledentistry between dentists and patients. Teledentistry is one option that is feasible during the Covid-19 pandemic as an effort to

Adults	Children
Mild to moderate dental pain, an appropriate 5-day regimen is either:	Paracetamol (500 mg tablets, or 120 mg/5 ml or 250 mg/5 ml oral suspension*), dose depending on age (see below); up to four times daily (max 4 doses in 24 hours):
<ul style="list-style-type: none"> Paracetamol, 2 x 500 mg tablets up to four times daily (i.e. every 4–6 hours) 	<ul style="list-style-type: none"> 6-12 months 120 mg
or	<ul style="list-style-type: none"> 8-9 years 360-375 mg
<ul style="list-style-type: none"> Ibuprofen, 2 x 200 mg tablets up to four times daily (i.e. every 4–6 hours), preferably after food. 	<ul style="list-style-type: none"> 2-3 years 180 mg
For severe dental pain, an appropriate 5-day regimen is either:	<ul style="list-style-type: none"> 10-11 years 480-500 mg
<ul style="list-style-type: none"> Paracetamol, 2 x 500 mg tablets up to four times daily (i.e. every 4–6 hours) 	<ul style="list-style-type: none"> 4-5 years 240 mg
or	<ul style="list-style-type: none"> 12-15 years 480-750 mg
<ul style="list-style-type: none"> Ibuprofen (200 mg tablets or 100 mg/5 ml oral suspension*), dose depending on age (see below), preferably after food, up to three times daily unless indicated otherwise below: 	<ul style="list-style-type: none"> 6-7 years 240-250 mg
or	<ul style="list-style-type: none"> 16-17 years 500 mg-1 g (4 x daily)
<ul style="list-style-type: none"> Ibuprofen and paracetamol together, preferably after food, without exceeding the daily dose or frequency for either drug, as above 	<ul style="list-style-type: none"> 7-9 years 200 mg
<ul style="list-style-type: none"> Diclofenac (1 x 50 mg tablet three times daily) and paracetamol together, preferably after food, without exceeding the recommended daily dose or frequency for either drug. 	<ul style="list-style-type: none"> 1-3 years 100 mg
	<ul style="list-style-type: none"> 10-11 years 300 mg
	<ul style="list-style-type: none"> 4-6 years 150 mg
	<ul style="list-style-type: none"> 12-17 years 300-400 mg (4 x daily)

*Sugar-free preparation is available

Figure 3 Recommended first line analgesic dose.¹

prevent the spread of disease from direct contact with patients, but still helps patients find solutions to emergency problems that they experience. Teledentistry is a combination of the telecommunications and dentistry. Through teledentistry, dentists can obtain the exchange of clinical information and pictures of the patient's dental condition remotely as a form of consultation to determine the patient's diagnosis and treatment plan without making direct contact.^{1,11-14}

In several large countries, teledentistry has been officially recognized with different regulations in its operation. Teledentistry involves electronic communication tools, the internet and image technology, for example through phone calls, video calls, or the use of meeting applications such as ZOOM. Through the conversation, the dentist can assess the patient's condition such as subjective symptoms, clinical findings, and psychological aspects of the patient such as the level of pain experienced through his expression.¹¹⁻¹⁴

Pain is a form of pain that can be influenced physiologically and biologically, so the management of acute dental pain requires consideration of the physical symptoms and emotional status of the patient. The patient's needs, fears and mechanisms of patient care need to be well understood. This assessment and the dentist's ability to build a relationship with the patient are key factors in the success of the patient's management. Quoting from the writings of Patel et al.², Fig. 1 can serve as a guide for questions to be asked by dentists to patients as an assessment of an emergency condition. Apart from the questions posed as an emergency condition assessment, patients also need to be given an initial screening

Adults	Children																								
<ul style="list-style-type: none"> Amoxicillin, 1 x 500 mg capsule 3 times daily <p>or</p> <ul style="list-style-type: none"> Phenoxycephalothin, 2 x 250 mg tablets 4 times daily <p>or</p> <ul style="list-style-type: none"> Metronidazole, 1 x 400 mg tablet 3 times daily. <p>N.B. For severe infections (e.g. extra-oral swelling, eye closing or trismus), the dose of amoxicillin and phenoxycephalothin can be doubled</p>	<ul style="list-style-type: none"> Amoxicillin (250 mg capsules, or Oral Suspension* 125 mg/5 ml or 250 mg/5 ml) dose depending on age (see below); three times daily, <table> <tr> <td>6-11 months</td> <td>125 mg</td> </tr> <tr> <td>5-11 years</td> <td>500 mg</td> </tr> <tr> <td>1-4 years</td> <td>250 mg</td> </tr> <tr> <td>12-17 years</td> <td>500 mg</td> </tr> </table> <p>For severe infection in children aged 6 months to 11 years, increase the dose of amoxicillin up to 30 mg/kg (max 1 g) three times daily. For severe infection in children aged 12-17 years, double the dose of amoxicillin.</p> <p>or</p> <ul style="list-style-type: none"> Phenoxycephalothin (250 mg tablets, or Oral Suspension*, 125 mg/5 ml or 250 mg/5 ml) dose depending on age (see below); four times daily, <table> <tr> <td>6-11 months</td> <td>62.5 mg</td> </tr> <tr> <td>6-11 years</td> <td>250 mg</td> </tr> <tr> <td>1-5 years</td> <td>125 mg</td> </tr> <tr> <td>12-17 years</td> <td>500 mg</td> </tr> </table> <p>For severe infection in children up to 11 years, increase the dose of phenoxycephalothin up to 12.5 mg/kg four times daily. For severe infection in children aged 12-17 years, increase the dose up to 1 g four times daily.</p> <p>or</p> <ul style="list-style-type: none"> Metronidazole (200 mg tablets, or Oral Suspension, 200 mg/5 ml) dose depending on age (see below) three times daily unless indicated below <table> <tr> <td>1-2 years</td> <td>50 mg</td> </tr> <tr> <td>7-9 years</td> <td>100 mg</td> </tr> <tr> <td>3-6 years</td> <td>100 mg (2 x daily)</td> </tr> <tr> <td>10-17 years</td> <td>200 mg</td> </tr> </table> <p>*Sugar-free preparation is available</p>	6-11 months	125 mg	5-11 years	500 mg	1-4 years	250 mg	12-17 years	500 mg	6-11 months	62.5 mg	6-11 years	250 mg	1-5 years	125 mg	12-17 years	500 mg	1-2 years	50 mg	7-9 years	100 mg	3-6 years	100 mg (2 x daily)	10-17 years	200 mg
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Figure 4 Recommended first line antibiotic dose (5-day course regimen).¹

questionnaire related to Covid-19 (Figure 2), to determine whether the patient's condition is infected or uninfected which may affect the treatment provided. If the patient shows symptoms or a positive Covid-19 test, then pharmacological management may be considered with analgesics, corticosteroids and/or antibiotics (Fig.3 and 4) prior to monitoring. However, if face-to-face treatment in an outpatient clinic or hospital is still necessary and important, all health workers must follow proper protocols to maintain the safety of the procedure.^{2,10,14}

Continues treatment—clinical visits

If a patient is scheduled for an outpatient visit to a clinic or hospital, the Covid-19 screening questions still need to be asked again when they enter the dental clinic. This triage screening can be carried out by dental staff who use appropriate personal protective equipment such as surgical masks, face shields, and protective gowns or use level 1 or 2 PPE (Fig.5). Whereas in dental procedures involving the use of dental tools, dentists and dental assistants must use level 3 (Fig.5). This dental treatment is recommended only if the patient is declared free of infection. Meanwhile, four handed dentistry technique is indicated for better infection control. The clinical protocol that must be followed during endodontic treatment:

1) pre-procedural antiseptic mouth rinse (0.5-1.0% polyvidone iodine for 15s); 2) using saliva ejectors with low or high volume can reduce the production of droplets and aerosols in the air; 3) minimized the use of aerosol-generating devices, such as three-way syringes, to minimize; 4) long and repeated visits should be avoided; 5) the use of clear plastic table aids as a barrier to minimize direct aerosol contact with the operator is highly recommended (Fig.6); 6) anesthetize and isolate the tooth using a rubber dam before starting the endodontic treatment procedure (Fig.6); 7) cleaning the work area using 3% H₂O₂ and disinfection using 2.5% NaOCl; 8) dental preparation procedures using handpieces and ultrasonic devices are kept to a minimum with the help of a saliva ejector and an aerosol vacuum that is positioned as close to the patient's face as possible; 9) the use of a dental microscope must be used with a complete protective cover for the tool. Acetate sheets can be used as protective barriers and are adapted to the binocular position of the dental microscope. In this condition, the operator uses a dental loupe and a headlight, which can be adjusted to the use of a face shield (Fig.6); 10) commonly performed emergency endodontic procedures consist of a) pulpotomy. This procedure is recommended in cases of pain originating from the pulp. The purpose of this pulpotomy is to remove the coronal pulp tissue in the pulp chamber without penetrating the pulp tissue in the root canal system of the tooth. This procedure can be very useful for reducing treatment time with a high success rate in managing pain; b) pulpectomy: this procedure is performed in patients who have symptoms of irreversible pulpitis or pulp necrosis with/without swelling. Taking radiographs with the cone beam computed tomographic technique is more indicated, to avoid exposure to the patient's oral cavity through intraoral (periapical) radiographic examination. In addition, single-file systems are more it is recommended to use it with the aim of reducing processing time and preventing the risk of re-sterilization. Dentists specializing in conserving teeth should also consider performing a one-visit

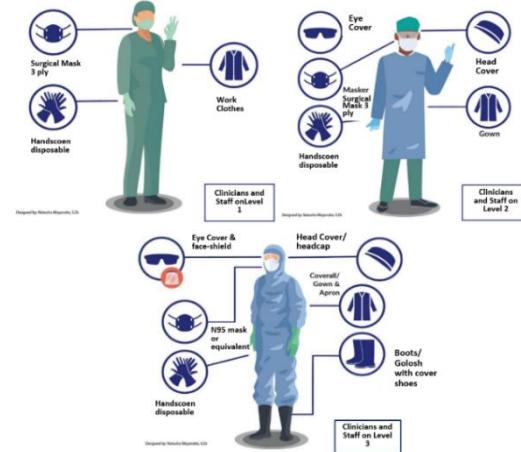


Figure 5 Levels of PPE used in patient care management.¹⁵



Figure 6A,B Table aids for dental treatment to minimize aerosols, **C** use of face shield that is adjusted to the dental loupe and headlight, **D** use of rubber dam and suction during the preparation procedure, **E** acetate sheets were used as protective barriers and adjusted to the binocular position of the dental microscope.³

root canal treatment whenever possible. However, if one-visit treatment cannot be carried out, for example due to time or case-related reasons, then after debridement, intracanal placement of antibacterial medicaments such as $\text{Ca}(\text{OH})_2$ can be an alternative. According to Azim, et al, carrying out a long procedure, provides a lower risk of cross-contamination for patients and dentists compared to having more than two visits; c) incision and drainage that is recommended in endodontic cases that require drainage through a combination of root canal instrumentation and there is fluctuant swelling. The goal of emergency care in a patient with swelling is to obtain a drainage pathway through the soft tissue or root canal. The purpose of drainage is to remove pus from the tissue cavity; 11) cleaning and disinfection of the entire surface area of the work area after each patient is completed is necessary. The CDC recommends reuse of the

room after 15 minutes of the disinfection procedure. In contrast to that suggested by the Chief Dental Office England which suggested that the room needs to be emptied with the door tightly closed for 20 minutes for a negative pressure isolation room and for 1 hour for a normal pressure room. In addition, the normal pressure chamber window can be opened.^{1,3,12,15,16}

Post-treatment education

Patients are advised to go home, and post-operative-instructions should be given via teledentistry, which are related to a) post-operative discomfort/pain/swelling; b) diet recommendations; c) oral hygiene measures; d) use of analgesic drugs; e) use of antibiotics, if needed in case of systemic involvement; f) use of antimicrobial mouthwash; g) decision to schedule repeat visits, depending on symptom level; g) repeat all protocols for Covid-19 prevention procedures, including hand-hygiene guidelines; h) perform virtual check-ups.¹

It is concluded that dental treatment procedure is the highest risk contagious diseases. Dental professionals, especially endodontist, need to have a detailed understanding and information regarding effective endodontic emergencies management protocols, as well as up-to-date knowledge regarding disease/infection control and proper self-protection during Covid-19 pandemic in order to prevent the wider spread of the disease. Reducing the treatment time and exposure control are ways to reduce the risk of coronavirus spreading during endodontic treatment. Following the right protocol procedure in treating the patient, so it can protect many people.

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