

Dental care during the coronavirus disease 2019 (COVID-19) outbreak: operator considerations and clinical aspects

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Objectives: This paper is aimed at addressing the urgent need to develop a protocol that will address the operator and clinical aspects of dental care during the Coronavirus disease 2019 (COVID-19) outbreak. **Data sources:** The epidemiology, clinical signs and symptoms, and modes of transmission of COVID-19 are presented. This protocol was established as an international collaboration of three dental universities: Hadassah School of Dental Medicine, Israel; University of Rochester Medical Center, USA; and the University of Pennsylvania, USA. This protocol is based on a detailed review of the existing English language literature as well on the logistic and clinical experience of each facility and the opinion of the authors. The protocol is designed

for a hospital setting and includes considerations related to dental treatment in both healthy subjects and those suspected or diagnosed with COVID-19. The first part of this review discusses operator considerations; the second part discusses general dental clinical aspects; the third part discusses endodontic considerations; and the fourth part discusses surgical aspects. This protocol may be applicable to other future similar pandemics. **Conclusion:** Logistic and clinical steps are required to provide dental care during the COVID-19 outbreak while preventing cross-contamination and protecting the dental team during the provision of care. (*Quintessence Int* 2020;51:418–429; doi: 10.3290/j.qi.a44392)

Key words: coronavirus, COVID-19, dental, endodontics, infection control, pulpitis

A novel disease emerged in Wuhan, China, in late 2019.^{1,2} The disease was designated by the World Health Organization (WHO) on 12 February 2020, as Coronavirus disease 2019 (COVID-19).³ The disease is caused by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) virus.² The virus exponentially spread in countries around the world,⁴ as can be seen in real-time visualization of the globally confirmed cases.^{5,6} The exponential increase eventually led the WHO to declare COVID-19 a pandemic.⁷ Subsequently, on 16 March 2020, the American Dental Association (ADA) recommended that dental practitioners nationwide postpone elective procedures for the following three weeks,⁸ leading to the Israeli Ministry of Health (MOH) recommendation to postpone elective dental procedures.⁹ The ADA proposed guidance on what conditions to consider as dental emergencies and nonemergency dental care.¹⁰ Within a dental emergency, the ADA guidelines defined the following¹⁰:

- Dental emergencies are potentially life-threatening and require immediate treatment to stop ongoing tissue bleeding or to alleviate severe pain or infection.
- Urgent dental care are conditions that require immediate attention to relieve severe pain and/or risk of infection.

The ADA recommends specifically that dental practitioners should use their professional judgment to determine the need for urgent or emergency care.¹⁰

This paper is aimed at addressing the urgent need to develop a protocol that includes guidelines for dental care during the COVID-19 outbreak. This protocol was established for a hospital setting and includes considerations related to dental treatment in both healthy subjects and those suspected or diagnosed with COVID-19. Operator and clinical considerations are discussed, with particular focus on endodontic and surgical care. The endodontic treatment presents unique chal-

lenges, is complex, requires a longer time compared to other dental procedures, and involves special equipment, such as microscopes and ultrasonic devices. Long-term assessment of treatment outcomes is usually required. The logistic and clinical steps required for the treatment of common urgent dental care procedures, mostly endodontic urgencies, including pulp and periapical diagnoses according to the American Association of Endodontists (AAE) Consensus Conference Recommended Diagnostic Terminology¹¹ will be discussed. The goal is to provide emergency and urgent dental care to patients, to prevent cross-contamination, and to protect dental care providers during the provision of care.

Clinical presentation

Common symptoms of COVID-19 include fever, dry cough, dyspnea, sputum production, fatigue, anorexia, myalgia, and diarrhea.^{7,12,13} While the majority of patients will present with mild symptoms, severe symptoms including high fever, pneumonia, acute respiratory distress syndrome (ARDS), and kidney failure can eventually cause death.^{12,13} While most infected people show mild-to-moderate respiratory symptoms, 5% to 10% of the infected individuals show the full and severe COVID-19 respiratory syndrome.¹⁴ According to a statement of the American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS), anosmia, hyposmia, and dysgeusia in the absence of another respiratory disease should alert physicians to the possibility of coronavirus (SARS-CoV-2) infection and warrant serious consideration for self-isolation and testing of these individuals.¹⁵ The incubation period for COVID-19 is between 1 and 14 days,¹⁶⁻¹⁹ and the virus is shed by asymptomatic infected people.^{20,21} The mortality rate of COVID-19 ranges from 0.2% in young healthy people, increasing with age and comorbidities.²²

Laboratory findings include leukopenia, leukocytosis, and lymphopenia.^{12,13} Radiographic findings in chest computed tomography (CT) scans demonstrate ground-glass opacification with or without consolidative abnormalities, consistent with viral pneumonia.²³

Transmission

Human-to-human transmission has been described mainly through respiratory droplets and contaminated hands or surfaces.²⁴⁻²⁶ The virus remained viable in aerosols under experimental conditions for at least 3 hours²⁷ and has been detected also in blood and stool specimens.²⁸ Coronavirus can persist on inanimate surfaces like metal, glass, or plastic for up to 9 days,

depending on the type of surface, the temperature, and the humidity of the environment.²⁴

Operatory considerations in the dental set-up during the COVID-19 outbreak

Screening procedure to identify a suspected case of COVID-19

Figure 1 presents a flowchart for urgent dental care during the COVID-19 outbreak. Presenting patients, persons accompanying them, and staff can be asymptomatic. Therefore, all patients and accompanying persons to the dental clinic during the outbreak of COVID-19 should be screened to identify asymptomatic and suspected cases of COVID-19.

Triage protocol and patient flow

Telehealth

Strategies to minimize face-to-face contact for initial screening can be accomplished via telephone or synchronous telehealth encounters to identify patients suspected of COVID-19.²⁹ When a patient calls a dental facility to make an appointment, the phone conversation should include the main questions that will be described below. If there is a positive (ie, "yes") answer to any of the questions, a pharmacologic pain and/or infection control-management prescription should be provided, if appropriate.

Every practice should develop a triage protocol, based on the degree of patient and community outbreak.³⁰ This protocol should be kept dynamic, and adapted to changes in the local circumstances. For example, as the number of COVID-19 cases rose to a pandemic, the disease became relevant to people far from Wuhan city and its surrounding areas.

Triage screening procedures can be performed by dentists, hygienists, dental assistants, and dental aids as long as personal protective equipment (PPE) is used. The PPE should include a long-sleeved disposable gown, disposable cap, surgical face masks, and protective eyewear.

Accompanying persons

During the COVID-19 outbreak, accompanying persons are not allowed to enter many dental facilities. However, one guardian of a patient who is a minor or a patient with an intellectual or developmental disability is allowed.

Triage

The triage procedure should include the following records:

Questionnaire A self-administered questionnaire should be completed by the patient or his/her guardian, and include the name, identity number, and signature. This information is of particular importance in cases of tracing or an epidemiologic investigation.

The questionnaire should include questions regarding:

- A history of contact with a person suspected for or diagnosed with COVID-19 within the previous 14 days.
- Experiencing flu-like symptoms including fever, respiratory problems such as dry cough or difficulty in breathing within the past 14 days, or being in contact with another person with these symptoms.
- Experiencing loss/change of smell or taste.*

(*Based on the addition of these symptoms to the list of screening tools for possible COVID-19 infection, proposed by the AAO-HNS.¹⁵)

Temperature Record the temperature of patients and the accompanying person using a contact-free forehead thermometer.^{25,31}

Visible signs and symptoms of respiratory problems

Patients and the accompanying person should be instructed to remove their face masks (if any) to evaluate signs of respiratory problems such as cough and shortness of breath.

In Israel, the Ministry of Health has launched HAMAGEN, a phone application that identifies contacts between diagnosed patients and people who came in contact with them in the 14 days before the patient's diagnosis of the disease.³² Such applications, if available in other countries, may also assist the triage process and identify suspected patients.

Treatment of patients who are found "negative" in the triage procedure

Emergency/urgent care can be performed within the dental facility if all the questions are answered "no," there are no visible signs and symptoms of respiratory problems, and if the body temperature is below 38°C (100.4°F).³³ In Hadassah hospital, 37.5°C (99.5°F) is considered the deciding temperature. The patients and an accompanying person who are allowed to enter the facility wear a bracelet with an identity number, enabling them to move within the building.

Treatment of patients who are "positive" in the triage/screening procedure

Patients who are positive to any of the triage/screening steps

will be referred for medical consultation and will not be allowed to enter the dental facility. Necessary emergency dental care should be performed in properly equipped designated hospitals.³¹ These hospitals should identify a negative pressure room(s) for the dental treatment of suspected/confirmed cases of COVID-19 within the area treating these patients.³¹ In addition to being negatively pressurized, the room should include a dental unit and radiographic equipment similar to rooms where general anesthesia is utilized. Suspected/confirmed patients who need emergency or urgent dental care should transfer to the emergency room in a medical center for examination by an oral and maxillofacial surgeon or an attending dental practitioner. Pharmacologic or noninvasive measures are recommended. However, invasive procedures should be performed by the relevant dental expert in a negatively pressurized and appropriately equipped room, as described in detail below (see section "Clinical guidelines for emergency and urgent general dental care").

Safety considerations for staff during the COVID-19 outbreak

The US Occupational Safety and Health Administration (OSHA) developed planning guidance to prepare workplaces for the COVID-19 outbreak.²⁹ According to the recommendations, workers should be encouraged to self-assess daily for symptoms of COVID-19 as described above and stay home if they are sick.²⁹ Staff should be screened upon entering a facility to identify suspected cases of COVID-19, as previously described.

The individual risk factors of the staff including older age, medical comorbidities, and presence of chronic systemic illness should be assessed.²⁹ Increased risk factors include immunocompromising conditions, pregnancy, as well as nonoccupational risk factors at home and in community settings.²⁹ If absenteeism increases, dental teams should cross-train staff for all essential office and medical/dental functions.³⁰

Infection prevention and control recommendations during the COVID-19 outbreak

Infection control measures should address modes of transmission and persistence of the virus in the air and on surfaces. The general rule is compliance with standard precautions, assuming that every patient may be potentially infected or colonized with a pathogen.³⁰ The US Centers for Disease Control and Prevention (CDC) published interim infection prevention and control recommendations for patients with suspected or confirmed

COVID-19 in healthcare settings.³⁴ The recommendations are modifications and additions to the 2003 CDC guidelines³⁵ and the 2016 CDC summary.³⁶ Proper disinfectants should be used against SARS-CoV-2, as published by the US Environmental Protection Agency (EPA).³⁷ The adequate time between patient appointments must be taken to prepare the treatment room properly, allow for time-sensitive, appropriate disinfection, and environmental cleaning. Proper hand hygiene,³⁸ thorough disinfection of all clinical and administrative surfaces within the dental clinic in addition to the treatment room, proper sterilization processes using chemical indicators, and appropriate waste disposal should be routine and reinforced.^{35,36}

Waiting areas

Patients in the waiting area should be separated by 2 m. Hand sanitizers with at least 70% alcohol should be provided in all waiting and patient care areas. Signs showing proper hand-washing technique should be placed close to soap dispensers.³⁰ Shared items such as toys, pens, and magazines, should not be placed in waiting areas.³⁰ Waiting time should be as short as possible to minimize the number of people present.

Personal protective equipment (PPE)

Access to PPE for health providers is a key concern in most affected facilities as there are PPE shortages, including reports that some supplies and equipment might not meet requirements.³⁹ Unfortunately, as the pandemic accelerates, COVID-19 has spread to health providers.³⁹ PPE should include a long-sleeved disposable gown, a disposable cap, a surgical face mask, and a face shield as well as protective eyewear and gloves. All eyes should be covered by using eyewear with upper, lower, and side shields. All aerosol generation procedures should be performed wearing an N-95 mask.³¹ Guidelines for donning and doffing PPE⁴⁰ and respirators,⁴¹ as well as guidance for extended use and limited reuse of N95 mask,⁴² should be followed. The staff should discard all PPE within the treatment room and not leave the room with any of the disposable items.

General dental considerations: Clinical guidelines for emergency and urgent general dental care

Emergency and urgent dental care treatments should be treated as minimally invasively as possible in a well-ventilated and, if available, negative pressure room.¹⁰ Only the doctor and an assistant should be present during treatment to minimize exposure to other individuals.

General measures required in all dental care include the following.

Medical history and consultation

Before the initiation of emergency/urgent dental care, the dental practitioner should review the medical history of the patient and consider consulting a physician, as needed. The dental practitioner should record the current medical diagnoses, medication, allergies/sensitivities, and other pertinent information.

Patients without COVID-19 symptoms/diagnosis

Emergency/urgent dental treatment should be performed within a typical dental facility.

Patients with suspected COVID-19

When there is a negative triage result, and yet the medical evaluation reveals suspicion for COVID-19 disease, the patient should be referred for proper medical evaluation. Emergency/urgent dental treatment should be performed within the negative pressure room in a properly equipped hospital.

Patients with COVID-19 diagnosis

Patients diagnosed with COVID-19 should be treated in a negative pressure room in a properly equipped hospital. Emphasis should be on the current medical status, symptoms, and complications related to the COVID-19 infection, particularly those related to respiratory disease, its severity, and level of control.

COVID-19 diagnosis with unstable respiratory disease

Before performing emergency dental treatment of hospitalized patients with unstable respiratory symptoms (eg, shortness of breath at rest, and oxygen saturation level < 91%), consult the physician and, if possible, defer invasive treatment until the patient's condition stabilizes. Use alternatives such as pharmacologic agents.⁴³

COVID-19 diagnosis with stable respiratory disease

If breathing and oxygenation is adequate, emergency dental care procedures should be minimally invasive and be performed in a designated room. Depression of respiration or re-

duction in oxygenation should be avoided by treating the patient in a semi-supine or upright chair position, using a pulse oximeter, providing oxygen supplementation, and avoiding respiratory depressing medications.⁴³ Treatment of these patients should be definitive on a single occasion, anticipating the possibility that the respiratory status may deteriorate, obviating any further treatment.

Management of dental anxiety

Dental practitioners recognize that dental and surgical procedures are potential stress- and anxiety-inducing⁴⁴ as a result of physiologic (eg, pain) or psychologic (anxiety, fear) factors.⁴⁵ Pain assessment using a 0 to 10 numeric pain scale is recommended. Stress for people and communities may be exacerbated by public health emergencies such as COVID-19.^{46,47} Moreover, anxiety regarding COVID-19 disease can lead to social stigma.⁴⁶ Resources on handling stress during a pandemic, such as published by the ADA, are recommended.⁴⁸ Stress reduction protocols are recommended during treatment,^{45,49} including the use of premedication, psychosedation during therapy, and adequate pain control during therapy and postoperatively.

Nitrous oxide (N₂O) inhalation sedation should not be administered to patients suspected as coronavirus carriers, or sick with COVID-19, or showing any other upper respiratory tract infection (URTI). N₂O inhalation sedation should be only be performed in settings that can provide proper infection control measures of the equipment used, including autoclaving of face masks and using disposable components.

Dental radiography

Extraoral dental radiography methods (eg, panoramic radiography and cone beam CT) are preferable during the outbreak of COVID-19.³¹ Intraoral sensors should be protected with a disposable barrier, cleaned, and disinfected. Cone extension paralleling instruments should be heat-sterilized and placed in sealed packages after use.

Antibiotic prophylaxis

A dental practitioner treating a patient with active COVID-19 infection should consult the general physician regarding the need for antibiotic prophylaxis to prevent systemic infection from invasive dental procedures. Since many COVID-19 patients are older with comorbidities, there might be other indications for antibiotic prophylaxis. The American Heart Association's

standard regimen to prevent endocarditis is recommended (<http://www.heart.org>) unless another regimen is advised by the general physician.

Prophylactic mouth rinse

Use a prophylactic mouth rinse, such as 1% hydrogen peroxide or 0.2% povidone, before dental procedures.^{25,31} For children under the age of 6 years, the application of the mouth rinse can be done using a gauze pad. It is also recommended to apply the mouth rinse on endodontically treated teeth after rubber dam is placed and the access opening is established. Patients should be encouraged to keep good oral hygiene during the outbreak.

Local anesthesia

The proper use of sharps is crucial, with special emphasis on recapping needles using a one-handed scoop technique. The systemic condition of the patient should be evaluated in the selection of the local anesthetic. The use of a vasoconstrictor may be limited or contraindicated in many patients infected with COVID-19 due to advanced age and comorbidities. Local anesthesia may not be needed in cases of previously endodontically treated teeth and teeth with pulp necrosis. However, local anesthesia may be considered necessary in cases of previously initiated endodontic therapy, and mandatory in symptomatic irreversible pulpitis.

Isolation with rubber dam and extra high-volume suction

Both rubber dam isolation and high-volume suction should be used whenever possible to minimize contact with saliva and reduce contaminated aerosol or spatter.^{25,31}

Anti-retraction handpieces

The frequency of aerosol-generating procedures should be minimized and when necessary high-speed dental handpieces with anti-retraction valves are recommended to avoid aspiration of debris and fluids which can later be expelled.²⁵

Postoperative antibiotics

Postoperative antibiotics should be considered in a patient with active COVID-19 infection, when in addition to endodontic emergency the patient presents with systemic involvement, localized fluctuant swellings, elevated body temperature above

38°C, malaise, lymphadenopathy, or trismus.⁵⁰ The systemic antibiotics should be added to the treatment plan for each endodontic pathology, as described below. The choice of antibiotic should be confirmed with the patient's physician.

Postoperative analgesics

Postoperative analgesics should be considered in all patients. The choice of analgesics should be confirmed with the patient's physician. Although news reports previously stated that the use of nonsteroidal anti-inflammatory drugs (NSAIDs) could worsen COVID-19,⁵¹ the US Food and Drug Administration (FDA) published a statement declaring the FDA is not aware of scientific evidence connecting the use of NSAIDs with worsening COVID-19 symptoms but will be further investigating this issue.⁵² Considering this controversial issue, treatment options other than NSAIDs should be preferred for a patient who suffers from COVID-19.

Endodontic considerations during the COVID-19 outbreak

Urgent endodontic treatment

Endodontic procedures require modifications to the previously discussed recommendations pertaining to general emergency/urgent dental care. The ADA definitions of dental emergency include the management of relevant conditions, many of which are endodontic, including pulpal inflammation, abscess, localized bacterial infection, tooth fracture, dental trauma with avulsion/luxation, dental treatment required before critical medical procedures, and replacement of temporary restorations on endodontic access openings.¹⁰ In this section, the ADA recommendations have been modified, using the currently accepted classification of the AAE Consensus Conference Recommended Diagnostic Terminology.¹¹ During this crisis, the general principle that emergency and urgent dental care treatment should be minimally invasive applies also to endodontic procedures. Special considerations include the possibility of complications following an endodontic intervention (eg, flare-ups), occurring as COVID-19 worsens, leading to an unstable respiratory condition. Moreover, as the patient's immune system is challenged by the infection, endodontic healing might be compromised. A general guideline is to perform not only minimally invasive procedures but also to limit the treatment intervention to a single episode. The model for treating patients who may become hemodynamic and immunologically unstable already exists for

dental clearance before heart transplantation and allogeneic hematopoietic stem cell transplantation.⁵³ The current protocols in the treatment for each AAE diagnostic category were reviewed and appropriate modifications were recommended to develop new protocols during the COVID-19 outbreak. In general, if the tooth is nonrestorable, extraction is recommended.

The protocol for emergency endodontic treatment includes the measures outlined below.

Endodontic equipment

The use of endodontic microscopes and endodontic loops should be minimized. Since the emphasis during treatment is to utilize simple and minimally invasive procedures, the use of these devices in a specially equipped operating room for COVID-19 patients may be contraindicated. Moreover, microscopes may be incompatible with PPE, due to the increased distance from the lenses created by the PPE. The increased distance may lead to an inability to achieve adequate and useful views. Loops may be used as long as there is side coverage, a face shield, and an appropriate mask. There is an urgent need to develop techniques and microscopes compatible with full PPE protection.

Endodontic procedures

Prophylactic mouth rinses should be used as described above. As mentioned, rubber dam should be placed before the establishment of an access cavity. The use of high-speed handpieces should be limited to minimize the generation of aerosol. If possible, use low-speed devices to remove caries and access pulp chambers and root canals. High-power, high-volume suction should be used for all procedures.

Irrigants

Standard practice in endodontic treatment is the use of a disinfectant irrigant such as sodium hypochlorite (NaOCl), chlorhexidine gluconate, or a mixture of tetracycline, citric acid, and a detergent (MTAD). NaOCl is the preferred irrigant due to reports that chlorhexidine gluconate may be ineffective in killing coronavirus.^{25,54}

Temporary restoration

At this time, the calcium sulfate base is not recommended due to low compressive strength, solubility, and expansion.⁵⁵ These characteristics may impact the integrity of the seal, leading to

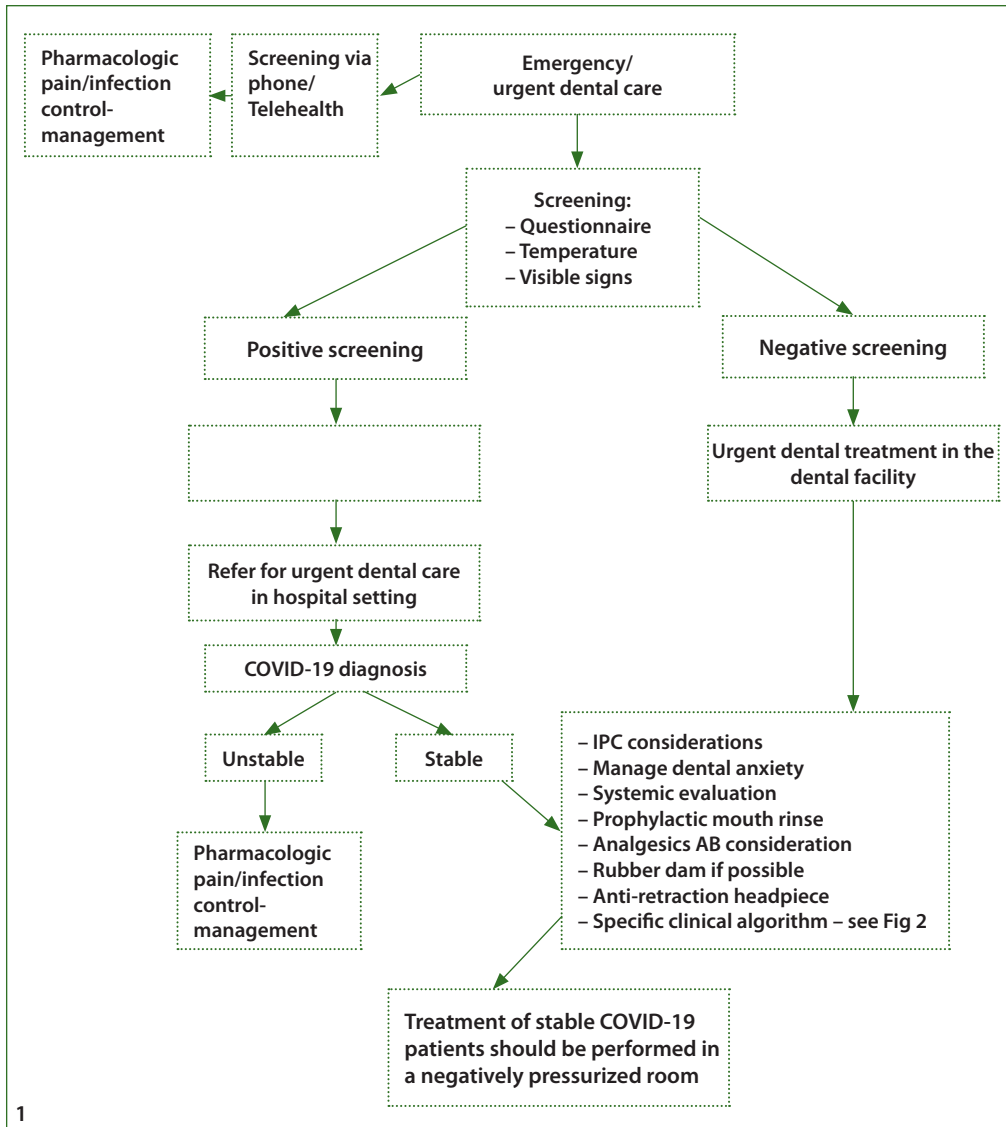


Fig 1 Urgent dental care flowchart during the COVID-19 outbreak.

a cracked tooth,⁵⁶ resulting in further discomfort, and a need for additional emergency dental care. In all cases where a temporary restoration is placed, an occlusal reduction is mandatory for patients with COVID-19 infection. Removal of a temporary restoration should be performed at low speed, if possible.

Suggested treatment plan for urgent endodontic treatment protocol during the COVID-19 outbreak

Figure 2 summarizes the treatment protocol for specific pulp and periapical diagnoses based on the AAE Consensus Conference Recommended Diagnostic Terminology.¹¹ During the COVID-19

outbreak, urgent treatment is focused on providing relief of the patient’s chief complaint as quickly as possible to reduce virus exposure risk, as well as to reduce the need for further visits.

The protocol includes the following treatment modalities for the treatment of urgent endodontic care.

Symptomatic irreversible pulpitis with normal apical tissues

This entity is categorized as “severe dental pain from pulpal inflammation” in the ADA guideline on dental emergency and nonemergency procedures.¹⁰ Pulpotomy should be performed as an emergency procedure for temporary relief of symptoms.⁵⁷ Calcium hydroxide- or bioceramic-based material may be used as

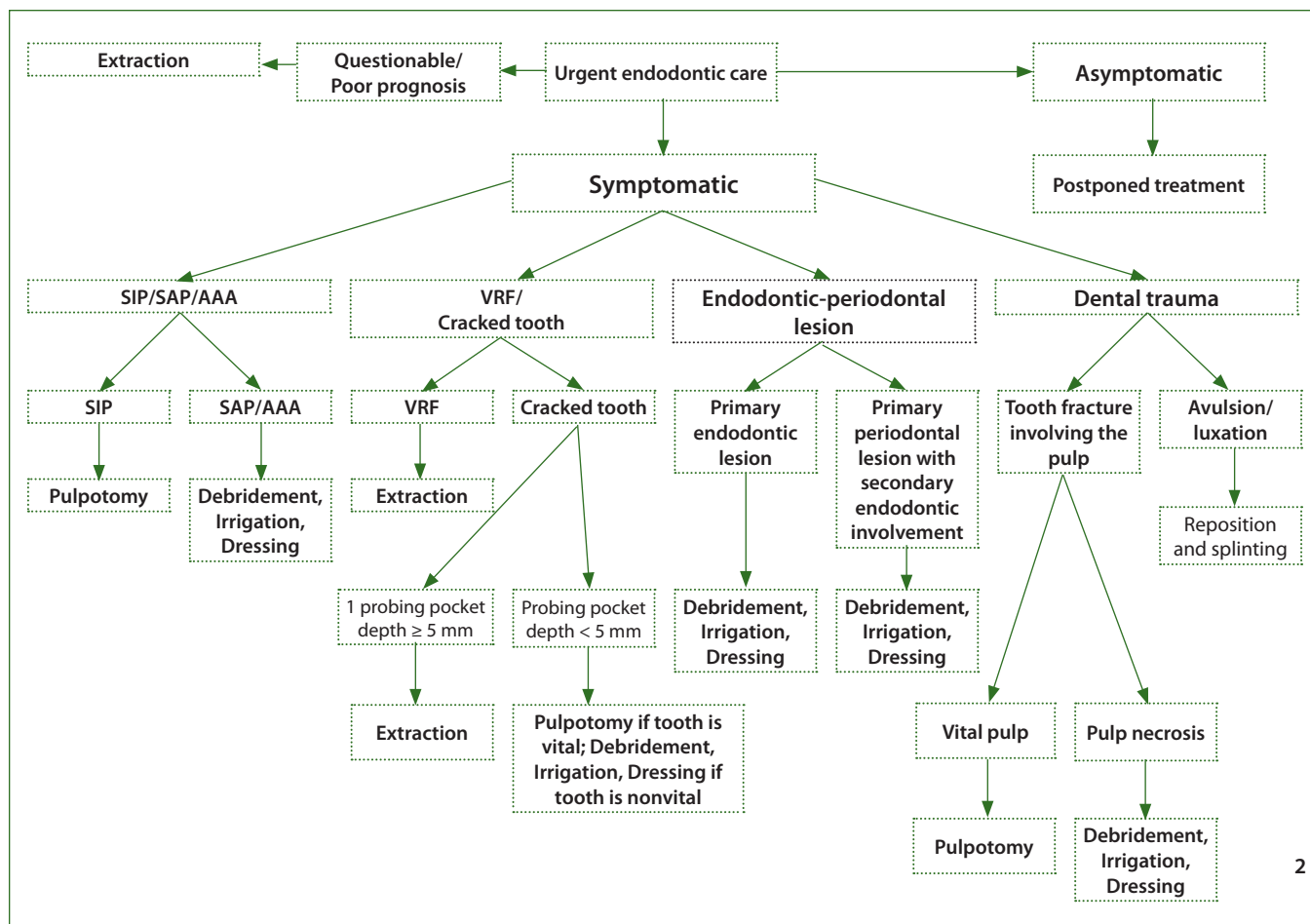


Fig 2 Urgent endodontic treatment flowchart during COVID-19 outbreak. AAA, acute periapical abscess; SAP, symptomatic apical periodontitis; SIP, symptomatic irreversible pulpitis; VRF, vertical root fracture.

a dressing material according to the standard of care of the American Board of Endodontics.⁵⁸ Alternatively, pulpotomy with bio-ceramic material may be used.⁵⁹ Both options should be followed by a temporary restoration and occlusal reduction. However, if irreversible pulpitis is associated with a poor prognosis due to periodontal or restorative reasons that may require subsequent urgent care treatment, extraction is recommended (Fig 2).⁶⁰

Pulp necrosis with symptomatic apical involvement Symptomatic apical periodontitis or acute apical abscesses may be the sequelae of an infected root canal (pulp necrosis or previously initiated treatment) or infected root canal filling (previously treated teeth).⁶¹ In cases of pulp necrosis or previously initiated treatment, the recommendation is to perform root canal debridement, irrigation, and calcium hydroxide dress-

ing.⁶² These procedures should be followed with a temporary restoration and occlusal reduction, to prevent pain from the apical origin and to protect the remaining tooth structure.⁶³ In cases of pulp necrosis with an acute apical abscess and continuous inflammatory exudate, consider endodontic drainage directly through the tooth or soft tissue incision and drainage (I&D) and consider systemic antibiotics.⁵⁰

Previously treated teeth

Previously treated teeth may present with symptomatic apical periodontitis or an acute apical abscess. In both cases, if removal of the previous root canal filling is uncomplicated and achieved, treatment should be provided as described for pulp necrosis. If the removal of root canal filling cannot be achieved, occlusal reduction and a prescription for antibiotics are recommended.⁵⁰

If the tooth presents with an unfavorable prognosis, extraction should be performed.⁶⁰ I&D should be considered in cases of a previously treated tooth with an acute apical abscess and favorable prognosis.

Previously initiated therapy

In the situation where endodontic treatment was previously initiated, continuing treatment of a tooth with normal apical tissue is considered elective and not an urgent dental problem. Treatment can be postponed until elective treatments resume in the future.

Cracked tooth and vertical root fracture (VRF)

Teeth with signs and symptoms of VRF should be extracted.⁶⁰ Meng et al³¹ reported on the treatment of a patient presenting with a caries-free cracked tooth. The patient was scheduled for the last appointment of the day and a high-speed handpiece was used to prepare the cavity. If a visible crack is seen directly without the use of visual augmentation, extraction is recommended. However, if there is a concern that the full extent of a crack can be revealed only with the aid of a microscope and the patient is confirmed for COVID-19, the dental practitioner should rely on basic endodontic examination to diagnose a cracked tooth. A cracked tooth should be suspected when there is pain perceived on sudden release of pressure in a bite stick test and sensitivity in cold/heat tests.^{64,65} Krell and Caplan⁶⁶ showed that cracked teeth with one probing pocket depth ≥ 5 mm had a poor prognosis, and in this case extraction is recommended (see Fig 2).

Endodontic-periodontal lesion

A vitality test for the tooth is required for a suspected endodontic-periodontal lesion. For a vital tooth suggestive of a primary periodontal lesion, consultation with a periodontist is recommended. If a periodontal consultation is not possible and the tooth is symptomatic, consider extraction.⁶⁰

A tooth with a primary endodontic lesion and secondary periodontal involvement should be treated according to the above-mentioned protocol for pulp necrosis if there was no previous endodontic treatment. A tooth with previous endodontic treatment should be treated according to the protocol for previously treated teeth.

Cases with unfavorable/questionable prognosis (periodontal or endodontic) should be extracted.⁶⁰

Dental trauma

Tooth fracture involving the pulp Cases of vital pulp should be managed with a pulpotomy, using bioceramic material⁶⁷ or

calcium hydroxide dressing⁶⁸ and glass-ionomer restoration. If the pulp is necrotic, it should be treated according to the above-mentioned protocol for pulp necrosis. Emphasis should be made to remove sharp edges and to protect the soft tissue.

Avulsion/luxation Tooth repositioning and flexible splinting may be performed in healthy subjects and subjects with mild disease without respiratory symptoms.⁶⁹ However, for hospitalized patients with respiratory symptoms, reimplantation, repositioning, and splinting are not recommended due to risks of aspiration, and the need for ongoing treatment and follow-ups.

Oral and maxillofacial surgery procedures during the COVID-19 outbreak

For the safety of all involved in the care of patients during the COVID-19 outbreak, it is advisable to defer all elective aerosol-producing procedures due to the extreme risk of spreading the virus. Procedures such as incision and drainage of neck fascia space abscess, head and neck cancer, and maxillofacial trauma, although aerosol-producing, are urgent or emergency procedures handled in the hospital and the operating room settings. As such, the specific protocols set in place by the leadership in each hospital regarding personnel and patient management on the use of PPE and place of care should be followed.

Per general surgery guidelines, "Essential surgery is an (operative) procedure that is considered to be vitally necessary for treating a disease or injury. Postponing or deciding against an essential procedure may result in a patient's death or permanent impairment."⁷⁰ Extractions, especially those requiring a high-speed handpiece, generate aerosol and ideally should be postponed unless deemed essential, urgent, or emergency. Appropriate PPE when performing extractions during the COVID-19 outbreak includes the use of an N-95 mask or a higher level respirator and face shield since regular surgical masks do not offer adequate protection. When possible, the use of a high-speed handpiece to perform the extraction(s) should be avoided. Additionally, the procedures should be performed by the most experienced providers available, to maximize efficiency and minimize the time of the operation.

Conclusion

The new COVID-19 outbreak challenges current treatment protocols. Each dental discipline should establish the necessary modifications in logistics and treatment protocols. This updated protocol will assist dental practitioners to treat their patients during the COVID-19 outbreak. This protocol may be applicable to other future similar pandemics.

Declarations

The authors have no conflicts of interest to declare.

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