



COVID-19 Patient in a Dental Office – Literature Review

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Abstract

Introduction. The outbreak of the COVID-19 pandemic caused by the SARS-COV-2 virus affected the functioning of dental care. Dentists performing procedures in the patient's respiratory tract, creating an aerosol, constitute a group of high risk of infection. Over the years, the universal way of cross-matching has changed.

Objective. The aim of the study is to review the current literature and present the impact of the pandemic on dental practices, and the introduced new solutions to existing procedures to prevent infections among workers and patients.

State of knowledge. Dental office workers are exposed to a virus with a high potential for spreading among the population. Most of the infected patients (80%) are asymptomatic, therefore each patient should be treated as a potential carrier of SARS-COV-2. Practice rooms should be adapted by removing unnecessary items, such as newspapers and brochures. Providing a higher level of personal protective equipment, minimum FFP, and covering the body surface create a physical barrier against this pathogen. It is recommended to use manual instruments instead of mechanical ones which generate aerosol during dental procedures. Non-contact channels of communication with the patient (teledentistry) eliminate the risk of infection and should be used in the initial patient assessment and medical advice that does not require a personal visit.

Conclusions. In the face of the pandemic caused by the SARS-COV-2 virus, it is the duty of dentists to properly prepare their offices, provide personal protective equipment to medical staff and patients, and adapt medical procedures to combat the epidemic situation. Dentists should also use teledentistry, which, with certain limitations, allows them to help patients without the risk of transmitting the virus.

Key words

dentistry, coronavirus, stomatology, pandemic

INTRODUCTION AND OBJECTIVE

The COVID-19 disease, caused by the SARS-COV-2 virus, emerged at the end of 2019 in Wuhan, Hubei Province, China, where an increasing number of people with severe pneumonia began to be recorded. In a very short time it reached international levels, causing a health and economic crisis. The new pathogen has also had a significant impact on dental services. The aim of this is to review the current literature and present the impact of the pandemic on dental practices, and the introduction of new solutions to existing procedures to prevent the infection of workers and patients.

STATE OF KNOWLEDGE

Pandemic and its effect on the availability of dental treatment. On 11 March 2020, the World Health Organisation (WHO) declared a pandemic. An increase in infections led to closures and shorter admissions hours in dental practices, except for urgent and emergencies. Routine care and prevention were limited. In the week of 23 March 2020, the American Dental Association's (ADA) survey found that 76% of surveyed offices were only admitting emergency patients, 19% were completely closed, and only 5% remained open, although fewer patients were observed [1]. More than

two-thirds of dentists (78%) in 30 countries surveyed were concerned or appalled by the effects of COVID-19. Despite the high level of knowledge and practice, many dentists were afraid of infecting themselves, their family or patients [2], and felt uncertainty due to the lack of access to personal protective equipment (PPE) [3].

SARS-COV-2. SARS-COV-2 is a positive-stranded RNA virus with an envelope 60–140 nm in diameter that exhibits a corona-like appearance under an electron microscope [4]. The SARS-COV-2 virus uses the membrane-bound angiotensin converting enzyme receptor 2 (ACE2) of the host to penetrate the cell. The ACE2 receptor is found mainly in mucosal tissue cells, gingiva, epithelial cells on the back of the tongue and salivary glands [5, 6, 7]. A high concentration of the virus was detected in saliva and its presence in periodontal pockets was suggested [7]. The incubation time for the virus is 5–14 days [6, 8]. It is highly contagious, one person infected with SARS-COV-2 infects 2–3 people, on average [5]. Based on epidemiological data, SARS-COV-2 has a higher transmission capacity than SARS-COV and MERS-COV [6] from the family of coronaviruses that appeared in 2002 and 2012.

Symptoms of COVID-19. Flu-like symptoms, fever, dry cough, muscle aches, weakness, tightness in the chest and shortness of breath, and loss of smell, are typical of this disease. Less common symptoms include headache, haemoptysis and diarrhea [4, 8]. Loss of taste, xerostomia, blistering lesions, or ulcers can be early symptoms of COVID-19 in the mouth

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and precede other common symptoms of the disease. Self-loss of taste and smell is a much more important predictor of a positive diagnosis than fever [8]. In severe cases, organ dysfunctions, such as respiratory failure, heart and kidney failure, may occur and require care in an intensive care unit. Age and comorbidity were found to be risk factors for severe infection [4].

Spread of the virus. Infected patients, both symptomatic and asymptomatic, are the main source of virus transmission [4], it is estimated that 80% of infected vectors are asymptomatic [9]. The mucosa of the mouth, respiratory tract, and the conjunctiva of the eyes are the main gateways of the virus, especially when talking, sneezing or coughing [4, 5]. In the dentist's office, in addition to droplets, aerosols are formed containing secretions, saliva and blood, transmission can therefore be through direct contact or touching a contaminated surface and transferring the virus to the eyes, nose or mouth [5]. When a person grits, sneezes, talks or laughs, large (> 5 µm in diameter) and small (<5 µm in diameter) droplets or aerosols are produced. Due to gravity, larger droplets quickly fall to the surface. Small droplets and aerosols have a low sinking rate, can remain in the air and travel long distances; some studies have shown that aerosols of highly virulent pathogens can travel more than 2 m [6]. The greatest microbiological contamination in a dentist's office occurs within 1 m from the mouth, both by splashes and aerosols [5]. It has been suggested that there are four categories of SARS-COV-2 transmission:

- 1) symptomatic – directly from the COVID-19 patient;
- 2) pre-symptomatic – direct transmission from a person with COVID-19 without symptoms;
- 3) asymptomatic – direct transmission from a person with COVID-19 who will never develop symptoms;
- 4) environmental transmission – indirect which cannot be traced [5].

Therefore, during a pandemic, any patient treated at a dental office should be considered a carrier of SARS-COV-2.

Specificity of the dentist's work. Given the widespread transmission of the SARS-COV-2 virus, healthcare workers are at increased risk of contracting the disease and becoming carriers of the disease. Dental healthcare personnel are classified as being at a very high risk of exposure during their work involving a patient's respiratory tract [4]. The

patient's mouth is constantly open, which will increase the possibility of direct and indirect exposure to infectious materials. It is related to the intensive production of aerosols and other particles during medical treatments [5]. Dentists always practice increased infection control and take universal precautions. The modern pandemic has made it necessary to revise existing infection prevention protocols in dental offices.

Initial patient assessment. An attempt should be made to segregate patients requiring dental care by using the telephone. Teledentistry may be helpful in the current epidemic situation. Based on the signs and symptoms, a decision should be made as to whether the patient requires urgent medical attention. If treatment can be delayed, medication and detailed home care instructions should be provided [4]. After deciding that the patient needs to visit the dentist's office, the next step should be to evaluate the patient for signs of COVID-19 infection. Questions should be asked whether the patient had a fever within the previous 14 days, had symptoms of shortness of breath, cough, had contact with an infected person, or had larger group meetings. Upon the arrival of the patient, his/her body temperature should be measured using a non-contact forehead thermometer. Fever above 37.5°C occurs in 88% of COVID-19 positive patients [10]. According to the ADA, admission of patients showing symptoms of infection should be limited to dental emergencies. Information on what constitutes an emergency condition has been collected in the table (tab. 1). According to the ADA, the guidance may change as the COVID-19 pandemic progresses and dentists should use their professional judgment in determining a patient's need for urgent or emergency care [11]. Patients who have recovered from COVID-19 may be treated 30 days after symptoms have resolved [10]. Dentists should be aware that the initial evaluation of patients is not currently able to distinguish asymptomatic from healthy patients. Reliable, low-cost, simple tests can become a powerful tool to reduce risks to patients and dental care workers [4, 5]. A simplified scheme of patient management is presented in the form of a diagram (Fig. 1).

Waiting room and reception. According to the ADA and Centers for Disease Control and Prevention, the waiting area for patients should be empty. It is recommended to remove non-essential items such as magazines, brochures, models of dental displays, and chairs should be 2 m apart [8, 12]. The

Table 1. What constitutes nonurgent, urgent and emergency dental care according to ADA guidelines for emergency and non-emergency dental care [11]

| Non-urgent dental care | Urgent dental care | Dental emergencies |
|--|---|---|
| <ul style="list-style-type: none"> - Initial or periodic oral examination and recall visit, including routine radiographs. - Routine dental cleaning and other preventive therapies. - Extraction of asymptomatic teeth. - Restorative dentistry, including treatment of asymptomatic carious lesions. - Aesthetic dental procedures. - Orthodontic procedures other than those to address acute issues (e.g., pain, infection, trauma). | <ul style="list-style-type: none"> - Severe dental pain from pulpal inflammation. - Pericoronitis or third-molar pain. - Surgical post-operative osteitis or dry socket dressing changes. - Abscess or localized bacterial infection resulting in localized pain and swelling. - Tooth fracture resulting in pain or causing soft tissue trauma. - Dental trauma with avulsion / luxation. - Dental treatment: Cementation if temporary restoration is lost, broken or causing gingival irritation. - Extensive caries or defective restorations causing pain; suture removal. - Denture adjustments on radiation/oncology patient. - Denture adjustments or repairs when function impeded; - Replacing temporary filling on endo access openings in patients experiencing pain. - Snipping or adjustments of an orthodontic wire or appliances piercing or ulcerating the oral mucosa. | <ul style="list-style-type: none"> - Uncontrolled bleeding. - Cellulitis or a diffuse soft tissue bacterial infection with Intraoral or extraoral swelling potentially compromising the patient's airway. - Trauma involving facial bones potentially compromising the patient's airway. |

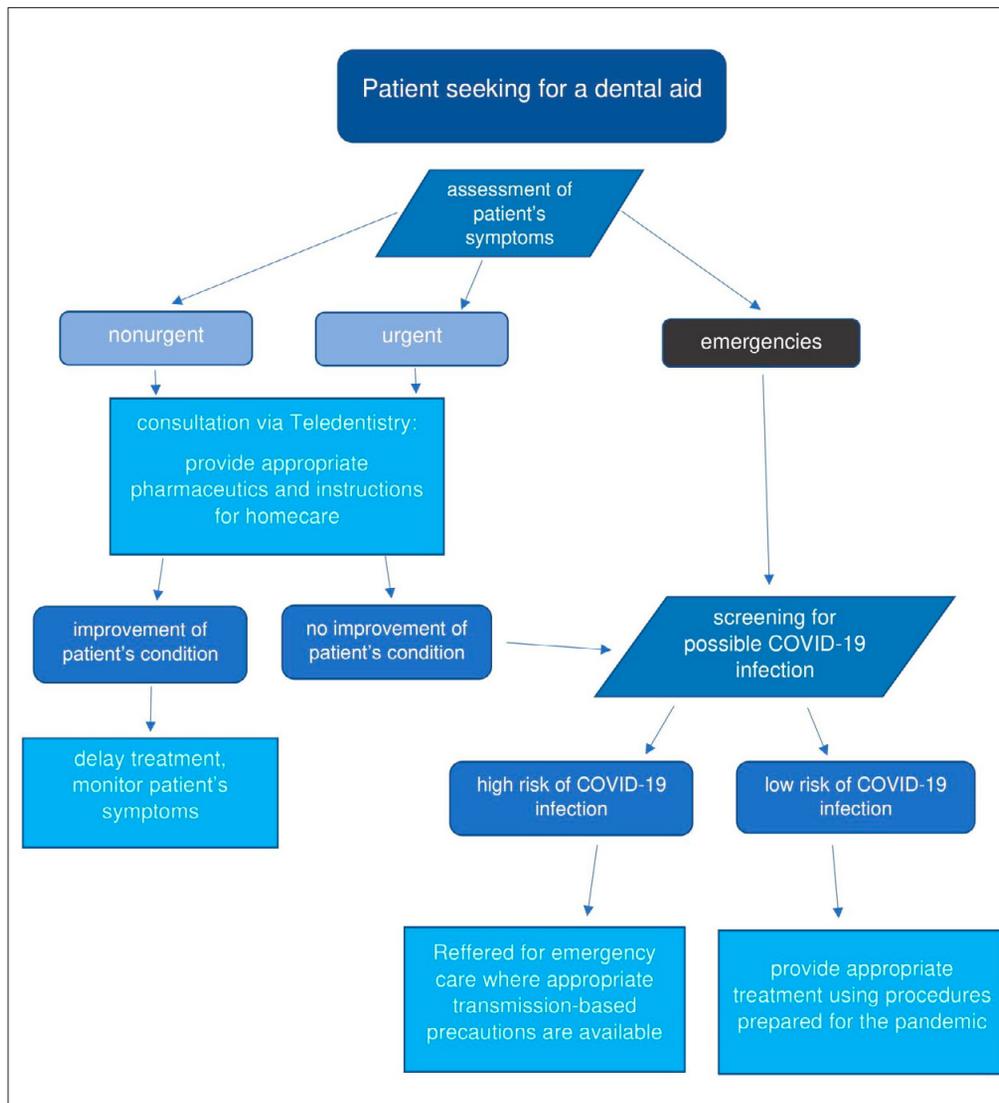


Figure 1. Patient's management during COVID-19 pandemic

best solution is not to overlap visits, or to wait for a call in the car until telephone information from the office and the end of the previous visit [4, 6, 8]. Patients should avoid coming with another person, unless they are minors or in need of care [4, 8]. Patients in the waiting room should have their mouths and noses covered, and after entering, they must wash their hands with an alcohol-based preparation or soap and water, both methods are equally effective. Alcohol-based solutions are preferable unless the hands are visibly soiled; otherwise, soap and water should be used. Patients should be placed in an adequately ventilated waiting room; in rooms with natural ventilation, 60 l / s per patient is considered correct [6]. Additionally, the use of a portable high-performance particulate air filter (HEPA) may be considered [8]. If there is a desk in the reception area, it is advisable to place plexiglass separators to protect staff. The receptionist must wear a surgical mask and disposable gloves, which must be changed after each patient. The receptionist is responsible for the decontamination of all items in contact with the patient during administrative and payment procedures. All clinic employees must maintain a social distance between themselves, wear a protective mask and avoid staying in the same room while eating and resting [13].

Personal protective equipment (PPE). After arriving at the office, employees should change clothes and remove accessories, such as bracelets, necklaces, watches [8]. When treating patients, it is recommended that the highest level of personal protective equipment (PPE) available, including gloves, doctor's gown, headgear, shoe covers, eye protection, face shield, and an N95 or higher mask be used. [4]. The WHO recommendations suggest the use of FFP3 masks [12]. The respiratory tract is the main gateway for the virus and should be covered with an appropriate mask. FFP-2 / N95 / KN95 filtering half masks are much better suited and filter particles more effectively than surgical masks [11]. The European standard qualifying filtering face pieces (FFP) into three categories: FFP1, FFP2 and FFP3, shows their filtration efficiency at 80%, 94% and 99% respectively. FFP2 masks are roughly equivalent to N95 and are effective in preventing infectious diseases [11]. PPE must protect the patient and dentists from micro-organisms, therefore masks with an exhalation valve should not be worn. They do not protect against splashes, and the respiratory micro-organisms of the user are released through the valve in the mask [5]. The mucous membranes of the eyes can also be a gateway for virus entry, therefore goggles or a protective visor should

be used for face protection [5, 14]. The doctor's gown used during a procedure should be discarded immediately after leaving the treatment room. Exposed parts of the body should be covered or disinfected [5]. Patients should remove their masks at the beginning of the treatment and replace as soon as possible [13].

Treatment in a dental office. Dentistry is a part of medicine where the doctor is in close proximity to the patient's mouth. The most common procedures performed require the use of a turbine and an ultrasonic scaler, which require water cooling in order not to damage the hard tissues or the tooth pulp. The use of hand instruments, such as excavators, is recommended to avoid aerosol generation during dental procedures [4, 12, 15] or chemomechanical removal of caries, e.g. with Carisolv [12]. The benefits of reducing pathogens when rinsing the mouth before dental procedures have been known to doctors for a long time [16]. Mouthwash with 1% hydrogen peroxide or 0.2% povidone iodine has been shown to significantly reduce pathogens [12]. Hydrogen peroxide breaks lipid membranes by generating free oxygen radicals. Hydrogen peroxide concentration above 5% can damage hard and soft intraoral tissues, and at lower levels it is quickly deactivated by catalase [6]. Studies with Chlorhexidine, however, have shown that it insufficiently inactivates SARS-COV-2 [5, 12, 15]. It should be remembered that saliva is constantly renewed by the salivary glands and thus the virus becomes available again in the mouth. To reduce the amount of floating pathogens, the use of a cofferdam is recommended which minimizes the amount of particles by 70% [12, 17, 18], and drastically reduces the risk of cross-contamination [12].

When working with a patient, the 10 or 11 o'clock position is recommended in order to avoid splashing. Work at the 8 o'clock position should be avoided [9]. Nowadays, it is impossible to work without X-ray diagnostics. Intraoral X-ray examination is the most frequently used technique, but unfortunately it can stimulate coughing, salivation or the vomiting reflex. Pantomographic or cone beam computed tomography is recommended [9, 12, 13, 18]. It is suggested to use resorbable sutures in surgical procedures, thus reducing the number of visits required at the dentist's office. [8]. All procedures should be performed carefully to prevent coughing and gagging [12].

Disinfection and sterilization. Commonly used sterilization standards performed on a regular basis in dental offices continue to be effective in preventing COVID-19 cross-contamination. The SARS-COV-2 virus can be killed in an autoclave as it cannot survive for more than 30 minutes at temperatures above 56°C [13]. However, it is recommended that tools be pre-washed in mechanical washers to avoid splashing during cleaning [5]. Disinfection should cover all horizontal surfaces in the treatment room, as well as objects and places that may have come into contact with the patient. In addition to chemical disinfection of rooms and surfaces, alternative procedures such as ozone decontamination may be considered as they combine a similar antiseptic capacity as liquid disinfectant and with better surface distribution [13]. Ozone is a gas and one of the most effective environmental sanitation systems. It provides highly reactive free radicals that can oxidize bacteria, viruses and organic and inorganic compounds. Ozone is heavier than oxygen, it deposits and disinfects both air and surfaces. Ultraviolet (UV) light is also

a disinfection option. UV light damages the DNA and RNA of microbes and reduces their harmful effects on the body. Lamps can be installed with a filtering apparatus and used in air circulation systems [18].

Teledentistry. Teledentistry is a remote facilitation of dental care, education, treatment with the use of information technology, thus avoiding direct face-to-face contact. This is not a new concept, the first designs were proposed by the US military in 1994 to facilitate access to the doctor for soldiers around the world. Teleradiology and telemedicine are already known in the field of medical services. In a recent pandemic pilot study, telemonitoring has shown to be a promising tool for remote monitoring of non-surgical as well as surgical patients, especially to reduce costs and waiting times for an appointment [19]. There is still distrust among the dental office staff towards this form of contact with the patient, mainly because fear of technical problems and incorrect diagnosis. The unquestionable disadvantage of teledentistry is the lack of the possibility of physical examination of the patient, and the two-dimensional image in the case of pathological changes. Both dentists and patients need instruction and training about this technology in order to understand its benefits and limitations, and to increase acceptance of this form of medical aid.

The future of stomatology in the age of pandemic. Dentists must be up-to-date with all reliable sources of information regarding COVID-19. They are obliged to follow the latest recommendations of international, national and local public health authorities [8]. As an important element of the health care system, they should help limit the increase in the number of cases to available resources, the so-called 'Curve-flattening' [10]. Currently, a nasopharyngeal swab is the most reliable diagnostic system, requiring a laboratory procedure that cannot be performed in a dentist's office. Rapid immunoassays can aid work by showing whether an employee has had COVID-19 disease or has been exposed to the virus [12]. During the pandemic, 38% fewer patients visited dental offices. The incidence of dental and mouth infections increased from 51.1% to 71.9%. The number of non-urgent patients has decreased by 70%, compared to the pre-pandemic period [20]. There is therefore evidence that the demand for dental services after the COVID-19 era could increase dramatically. It is essential that dentists are aware of the microbiological and social aspects of the COVID-19 pandemic, and adopt the best practices of clinical work to avoid unnecessary risk of surgical transmission.

CONCLUSIONS

In the face of the pandemic caused by the SARS-COV-2, it is the duty of dentists to properly prepare of their offices, provide personal protective equipment to medical staff and patients, and adapt medical procedures to the epidemic situation. Dentists should also use teledentistry which, with certain limitations, allows them to help patients without the risk of transmitting the virus.

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