

Transmission Routes of COVID-19 and Special Measures for Dental Practice

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Review Article

Adel Bouguezzi^{1,2}, Abdellatif Chokri^{1,2}, Sameh Sioud^{1,2}, Hajer Hentati^{1,2} and Jamil Selmi^{1,2}

¹University of Monastir, Faculty of Dental Medicine, Oral Health and Oro-Facial Rehabilitation Laboratory Research (LR12ES11), 5019, Monastir, Tunisia.

²Dental Clinic of Monastir, Department of Medicine and Oral Surgery

*Correspondence author

Adel Bouguezzi
Dental Clinic of Monastir
Department of Medicine and Oral Surgery
5019, Monastir
Tunisia

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Abstract

Background: A novel coronavirus (COVID-19) is associated with human-to-human transmission. Due to the unique nature of dentistry, most dental procedures generate significant amounts of droplets and aerosols, posing potential risks of infection transmission, the routes of transmission are direct contact, and droplet and possible aerosol transmissions.

Objective: The aim of this article is to provide a brief overview of the routes of transmission of this novel infection, in addition specific recommendations for dental practice are suggested for patient screening, infection control strategies and patient management protocol.

Results: Dental practice are focal points for cross-infection, and care must be taken to minimize the risk of infection to, from, or between dental care professionals and patients, also members of dental team have a professional responsibility to keep themselves informed of current guidance and be vigilant in updating themselves as recommendations are changing so quickly.

Conclusion: A better understanding of aerosol transmission and its implication in dentistry can help us identify and rectify negligence in daily dental practice. In addition to the standard precautions, implementation of special precautions could prevent disease transmission from asymptomatic carriers.

Keywords: Corona Virus Disease 2019, Infection Control, Dental Practice Management

Introduction

The transmission routes, treatments, and outcomes of COVID-19 continually receiving much research attention recently. What is clear for now is that the mode of transmission is through contact and in the form of droplets although airborne transmission has not been ruled out [1].

The literature shows that many dental procedures produce aerosols and droplets that are contaminated with bacteria, viruses, and blood, and have the potential to spread infections to dental personnel and other people in the dental office [2, 3].

In this review, we aimed to assess the special precautions of the current COVID-19 epidemic in dentistry, to give clear and easy guidelines to manage dental patients and to make working dentists safe from risk.

What Is COVID-19?

Coronaviruses are a group of viruses that cause a significant percentage of all common colds in human adults and children. Four human coronavirus including 229E, OC43, NL63, and HKU1 are prevalent and typically cause common cold symptoms in immunocompetent individuals. SARS-CoV which causes SARS, has a unique pathogenesis because it causes both upper and lower respiratory tract infections. 2019-nCoV is classified as a novel beta coronavirus belonging to the sarbecovirus subgenus of Coronaviridae family. The genome sequence of 2019-nCoV is about 89% identical to bat SARS-like-CoVZXC21 and 82% identical to human SARS-CoV [4].

Routes of Transmission

Up to present, the main infection source was the patients who

with pneumonia infected by the 2019-nCoV. Respiratory droplet transmission is the main route of transmission, and it can also be transmitted through surface contact, fecal-oral route and by aerosolization during procedures. Transmission by asymptomatic have been reported [5].

Infectious droplets and body fluids can easily contaminate the human conjunctival epithelium. Respiratory viruses can induce ocular complications in infected patients, which then leads to respiratory infection [6]. The analysis of conjunctival samples from confirmed and suspected cases of 2019-nCoV suggests that the transmission of 2019-nCoV is not limited to the respiratory tract, and that eye exposure may provide an effective way for the virus to enter the body [6, 7].

Persistence of Coronavirus on Inanimate Surfaces:

Most data were described with the endemic human coronavirus strain (HCoV-) 229E. On different types of materials, it can remain infectious for from 2 hours up to 9 days. A higher temperature such as 30C or 40C reduced the duration of persistence of highly pathogenic MERS-CoV, TGEV and MHV. However, at 4C persistence of TGEV and MHV can be increased to 28 days. Few comparative data obtained with SARS-CoV indicate that persistence was longer with higher inoculation. In addition, it was shown at room temperature that HCoV-229E persists better at 50% compared to 30% relative humidity [8].

Incubation and contagious period

Based on currently epidemiological survey, the latency period is generally from 3 to 7 days, with a maximum of 14 days [9]. Unlike SARS-CoV, 2019-nCoV is contagious during the latency period [10].

Clinical Manifestations

The majority of patients with COVID-19 represent relatively mild cases. According to recent studies the proportion of severe cases among all patients with COVID-19 in China was around 15% to 25% [11, 12]. The majority of patients experienced fever and dry cough, while some also had shortness of breath, fatigue, and other atypical symptoms, such as muscle pain, confusion, headache, sore throat, diarrhea, and vomiting [13, 11]. Among patients who underwent chest computed tomography (CT), most showed bilateral pneumonia, with ground-glass opacity and bilateral patchy shadows being the most common patterns [14, 11].

Why Dentistry is a Risk Branch?

Dental patients and professionals can be exposed to pathogenic microorganisms, including viruses and bacteria that infect the oral cavity and respiratory tract. Dental care settings invariably carry the risk of 2019-nCoV infection due to the specificity of its procedures, which involves face-to-face communication with patients, and frequent exposure to saliva, blood, and other body fluids, and the handling of sharp instruments. The pathogenic microorganisms can be transmitted in dental settings through inhalation of airborne microorganisms that can remain suspended in the air for long periods, direct contact

with blood, oral fluids, or other patient materials, contact of conjunctival, nasal, or oral mucosa with droplets and aerosols containing microorganisms generated from an infected individual and propelled a short distance by coughing and talking without a mask, and indirect contact with contaminated instruments and/or environmental surfaces [15-18]. Infections could be present through any of these conditions involved in an infected individual in dental clinics and hospitals, especially during the outbreak of 2019-nCoV.

Preventive Measures for Dental Practice

Up to now, there has been no consensus on the provision of dental services during the epidemic of COVID-19. Based on relevant guidelines and research (Guideline for the Diagnosis and Treatment of Novel Coronavirus Pneumonia (the 5th edition) and the Guideline for the Use of Medical Protective Equipment in the Prevention and Control of Novel Coronavirus Pneumonia released by the National Health Commission of the People's Republic of China, certain specific measures are discussed here for dental patient management in this epidemic period of COVID-19 [18-20]. Our recommendations are based on the:

Administrative Controls

The Overarching Question:

- Is this an emergency?
- Assess the urgency of the patient visit, including pain, swelling or trauma.
- All elective dental procedures should be deferred.
- The patient should be rescheduled 30+ days down the road.
- Although this is an imposition on the staff and the patient, everyone will be appreciative of your concern for their welfare.

Prior to the Patient's Arrival:

- In general, one should avoid walk-in visits.
- When the patient calls for an appointment, the front desk should ask if:
 - They are sick with fever, cough, sore throat, muscle pain, GI symptoms.
 - They have had foreign travel within the past 30 days.
 - They have been on a cruise
 - They have been in contact with patients diagnosed to have COVID-19
- All patients who answer in the affirmative should not have dentistry even if it is an emergency because of the risks to other patients and staff. They should be referred to a setting where proper isolation is possible.
- Patients should be instructed to take their temperature before coming to your office. Encourage these patients to reach out to their medical doctor for evaluation and management.
- Patients should be instructed to arrive on time for appointments, not early, to minimize waiting in our office and to decrease the number of people present.

Upon Patient's Arrival

- Dental professionals should make every attempt to keep the waiting room empty.
- Anyone driving patients should be waiting in their automobile until the patient is finished
- There should be a prominent sign directing the patient to use a hand sanitizer from a non-touch dispenser stand and to vigorously rub their hands for 20 seconds.
- Anyone who is coughing should be given a mask and be asked to seek medical help.
- Dental professionals should measure the patient's body temperature using a non-contact forehead thermometer or with cameras having infrared thermal sensors

Environmental Hygiene

The environment where the dental treatments are carried out must be properly disinfected and always well ventilated. Human coronavirus can survive on inanimate surfaces up to 9 days at room temperature, with a greater preference for humid conditions [21, 22]. After any type of treatment, it is necessary to proceed to an adequate disinfection of the environment. Therefore, clinic staff should make sure to disinfect inanimate surfaces using chemicals recently approved for COVID-19 and maintain a dry environment to curb the spread of SARS-CoV2. Common cleaners such as 0.1% sodium hypochlorite, 0.5% hydrogen peroxide or 62-71% ethanol have all been shown to be effective [23, 24].

Hand Hygiene

The reinforcement of good hand hygiene of the reception staff, of the patient, and of the medical staff is of fundamental importance especially in the period of transmission of the epidemic from COVID-19. A Chinese study recommends the "two before and three after" technique as a standard hand hygiene procedure, emphasizing that oral professionals should wash their hands before examining the patient, before dental procedures, after direct contact with the patient, after touching the environment without previous disinfection, and after touching the patient's oral mucosa and skin or coming into contact with saliva and oral fluids [25].

Personal Protective Equipment

Personal protective equipment is designed to protect the skin and mucous membranes of the eyes, nose and mouth from exposure to potentially infectious materials. Recent experience with the coronavirus has shown that vast numbers of health care workers acquired the infection in hospital settings, either as a result of inadequate barrier protection methods or the improper use of these methods [26]. This barrier protection equipment consists of protective eyewear, masks, gloves, face shields and protective overwear. We should note that general work clothes such as uniforms do not protect against a hazard and should not be considered as personal protective equipment. Surgical masks are not designed to provide adequate protection against exposure to airborne infectious agents such as virus smaller than 5 micrometers. For such purposes, particulate respirators (for example, N-95 masks) must be used [27].

Strategies to Reduce Droplet Generation in Different Dental Disciplines:

Preprocedural Mouth Rinse: Although the effect of preprocedural mouth rinse against coronavirus is still unknown, it has been proven that CHX is effective against several infectious viruses, including herpes simplex virus (HSV), human immunodeficiency virus (HIV), and hepatitis B virus (HBV) [28].

Endodontics: Rubber dam must be applied during endodontic treatment. Root canal treatment usually requires a number of endodontic instruments and devices, therefore minimizing unnecessary hand contact with surfaces and equipment in the dental office to reduce possibility of fomite transmission [25].

Restorative dentistry and pediatric dentistry: Avoid using rotary instruments during cavity preparation. In selective cases, consider using chemo chemical caries removal or atraumatic restorative techniques. If rotary instrumentation must be performed, rubber dam isolation should be applied.

Periodontics: Hand and ultrasonic instrumentation are equally effective in removing plaque and calculus deposits; if required, manual scaling and polishing are recommended [29].

Prosthodontics: Salivary suction must be performed with care to avoid gagging. Select and adjust trays to the right size for impression taking to avoid cough reflex. For highly sensitive patients, consider applying oral mucosa anesthesia to the throat before impression taking during fixed partial denture or single-crown preparation, treatment alternation may be considered to incorporate rubber dam application. For example, design supra-gingival margin for posterior bridge or use a split-dam technique [25]. During removable partial denture or complete denture try-in, avoid touching other objects in the dental office after contacting patients' saliva upon removal from patient's mouth, dental prosthesis, impressions, and other prosthodontics materials (e.g., bite registration) should be thoroughly disinfected by a disinfectant having at least intermediate level activity.

Oral-Maxillofacial Surgery: When performing simple extraction, treat the patient in a supine position to avoid working in the breath way of a patient [25].

Pharmacologic Management: Pharmacological management in the form of antibiotics and/or analgesics is an alternative. This approach may offer symptomatic relief and will provide dental professionals some time to develop a plan to deliver dental care with all appropriate measures in place to prevent the spread of infection. It is important to note that the British Medical Journal recommended the use of acetaminophen for analgesia and not ibuprofen in treating COVID-19 infected patients, as ibuprofen may interfere with immune function [30].

Conclusion

Dentists, by nature, are at high risk of exposure to infectious diseases. The emergence of COVID-19 has brought new challenges and responsibilities to dental professionals. A better understanding of aerosol transmission and its implication in dentistry can help us identify and rectify negligence in daily dental practice. In addition to the standard precautions, implementation of special precautions could prevent disease transmission from asymptomatic carriers. These special precautions would not only help control the spread of COVID-19 but also serve as a guide for managing other respiratory diseases.

Competing Interests

The authors declare that there are no conflicts of interest in this study.

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