Clinical Review

COVID-19 Transmission in Dental Practice: Brief Review of Preventive Measures in Italy

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Abstract

The outbreak and diffusion of SARS-CoV-2, responsible for the coronavirus disease (COVID-19), has caused an emergency in the health system worldwide. After a first development in Wuhan, China, the virus spread in other countries, with Italy registering the second highest number of cases in Europe on the 7th of April 2020 (135,586 in total). The World Health Organization declared the pandemic diffusion of COVID-19, and restrictive measures to limit contagion have been taken in several countries. The virus has a predominantly respiratory transmission through aerosol and droplets. The importance of infection control is therefore crucial in limiting the effects of virus diffusion. We aim to discuss the risks related to dental practice and current recommendations for dental practitioners. A literature search was performed to retrieve articles on the management of COVID-19 diffusion in dental practice. The documented clinical experience, the measures of professional prevention, and the actual Italian situation were reported and described. Four articles were retrieved from the literature search. Among the eligible articles, 3 reported measures to contrast COVID-19 diffusion. The infection management protocols suggested were reviewed. Finally, recommendations based on the Italian experience in terms of patient triage, patients' entrance into the practice, dental treatment, and after-treatment management are reported and discussed. COVID-19 is a major emergency worldwide, which should not be underestimated. Due to the rapidly evolving situation, further assessment of the implications of COVID-19 outbreak in dental practice is needed.

Keywords: dental public health, dental education, infection control, practice management, prevention, virology

Introduction

The definition of coronavirus includes a range of respiratory viruses, which can present with mild to severe manifestations and lead to respiratory failure. The name recalls the microscopic appearance of the virus, characterized by the presence of pointed structures on the surface, resembling a crown (Yang, Peng, et al. 2020).

The novel coronavirus was identified in Wuhan, China, in December 2019 in patients presenting with pneumonia of unknown origin. After a rapid escalation, on January 9, 2020, the World Health Organization declared the discovery a new coronavirus, first called 2019-nCoV and then officially named SARS-CoV-2, which had never been identified in humans before. On February 11, the respiratory disease deriving from SARS-CoV-2 infection was named COVID-19 (coronavirus disease; Lu, Zhao, et al. 2020; Mahase 2020).

SARS-CoV-2 has an estimated incubation period of 1 to 14 d, which is also the duration of medical observation and quarantine in exposed patients. Clinical manifestations of COVID-19 include cough, fever, and shortness of breath. Mild respiratory infections occur in about 80% of those infected, though about half will have pneumonia. Another 15% of patients develop severe illness, while 5% need critical care treatment. In rare cases, COVID-19 can lead to severe respiratory problems, kidney failure, or death. However, it is reported that virus spread can happen in the absence of clinical symptoms (Backer et al. 2020; Chan et al. 2020; Del Rio and Malani 2020; Guan et al. 2020; Huang et al. 2020).

Symptoms may vary from the presence of fever and dry cough to nonspecific symptoms such as shortness of breath, conjunctivitis, sore throat, diarrhea, vomiting, fatigue, and muscular pain (Chen et al. 2020; Guan et al. 2020). In patients who develop pneumonia, ground-glass opacity and patchy shadows can be detected on computed tomography (Zhou et al. 2020). Complications include respiratory distress syndrome, arrhythmia, and shock (Chen et al. 2020; Huang et al. 2020; Wang et al. 2020) and are more frequently associated with older age and the presence of comorbidities (Liu, Fang, et al. 2020; Wang et al. 2020; Yang, Lu, et al. 2020).

COVID-19 has seen a violent and fast spread worldwide, which has led to the declaration of a pandemic outbreak of the coronavirus by the World Health Organization.

In particular, Italy has seen a rapid and disruptive diffusion of COVID-19, also related to the relatively easy transmission

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routes through cough, sneeze, and droplets inhalation. In addition, SARS-CoV-2 infection could occur through contact with asymptomatic patients (Chan et al. 2020; Rothe et al. 2020).

As of April 7, Italy is the second country in Europe per incidence of COVID-19, and is reported to have the highest official number of deceased subjects worldwide. Overall, the number of Italian cases accounts for 9.47% of total cases worldwide, with 135,586 cases. Of this sample, 94,067 are presently infected (69.37%); 24,391 (17.99%) have recovered; and 17,127 (12.63%) have died. Strikingly, health care workers are the category with the highest diffusion of the contagion, as the Italian National Institute of Health (Istituto Superiore di Sanità) reports 13,121 cases of infection (https://www.epicentro.iss.it/).

Dental professionals appear, indeed, at high risk of contagion due to the exposure to saliva, blood, and aerosol/droplet production during the majority of dental procedures (Li and Meng 2020; Meng et al. 2020; Peng et al. 2020; Xu et al. 2020). SARS-CoV-2 transmission during dental procedures can therefore happen through inhalation of aerosol/droplets from infected individuals or direct contact with mucous membranes, oral fluids, and contaminated instruments and surfaces (Liu et al. 2011; Chen 2020; Kampf et al. 2020). Given the exposure risk for different working categories, dental practitioners are the workers facing the greatest coronavirus risk.

In this article, we aim to raise awareness on the potential risks of COVID-19 transmission in dental practice and discuss and suggest some preventive measures, such as the ones adopted in Italy for contagion limitation.

Methods

A 2-step procedure was designed. Information available from the literature and the clinical management of dental patients in the era of the SARS-CoV-2 pandemic was enriched with the actual Italian recommendations and our clinical experience. A literature search was performed to retrieve research articles regarding COVID-19 and clinical dentistry. No attempt to exclude any information was performed, to capture all the possible data. Thus, no strict inclusion criteria were applied. Data are then presented by focusing on the documented clinical experience, the measures of professional prevention described, and the actual Italian situation to manage COVID-19 diffusion in the dental setting.

Results

Study Selection

Understandably, overall data on the clinical experience in the dental transmission of COVID-19 are still scarce due to the rapid pandemic outbreak. Four articles in total were found (Li and Meng 2020; Meng et al. 2020; Peng et al. 2020; Xu et al. 2020). All were from mainland China. Three articles described the risks related to dental practice and recommended infection management protocols for dental practitioners (Li and Meng 2020; Meng et al. 2020; Peng et al. 2020). Of these articles, only 1 reported data on clinical activities (Meng et al. 2020). The article by Xu et al. (2020) did not address clinical activity but did provide data on the presence of the ACE2 host cell receptor for SARS-CoV-2 in the oral mucosa to assess the infectious risk of oral cavity.

Clinical Experience

Meng et al. (2020) reported treatment of >700 patients during the outbreak of the virus quarantine and the lockdown of the overall area at the school and hospital of stomatology at Wuhan University, Wuhan, the epicenter of the primary contagion. Emergency dental treatments, such as pulpectomy and dental extractions, were described, although no information was reported on the type of dental emergencies actually performed. A total of 1,600 online consultations were also performed. No information on the treatment of patients affected by COVID-19 was reported.

COVID-19 Transmission Risks in Dental Practice

Meng et al. (2020) reported the occurrence of 9 cases of COVID-19 among 169 dental practitioners, stressing the high risk of professional contagiousness.

Biologic risk of COVID-19 inhalation transmission is extremely high when performing dental procedures due to the use of handpieces under irrigation, which favors the diffusion of aerosol particles of saliva, blood, and secretions. Moreover, this production of aerosol facilitates the contamination of the environment and instruments, dental apparatuses, and surfaces (Meng et al. 2020; Peng et al. 2020).

Given the direct contact transmission, the mucosa of the oral cavity has been recognized as a potentially high-risk route of SARS-CoV-2 infection (Xu et al. 2020), as well as contaminated hands, which could facilitate virus transmission to patients.

Prophylactic Measures to Limit Contagion

In the following paragraphs, we review some preventive measures to be adopted to limit contagion.

Patient Triage. According to the included articles, triage was performed when patients entered the clinics. No telephonic pretriage was described. Performing triage to investigate current health status and/or the presence of risk factors for COVID-19 development is strongly suggested when receiving patients (Li and Meng 2020; Meng et al. 2020; Peng et al. 2020). In particular, patients should be asked whether any contact with infected people occurred or whether they traveled in highly epidemic areas.

If a patient had a positive history of contact and/or symptoms, no treatment should be performed, and the patient should be reported to the sanitary authorities, to quickly impose quarantine and/or hospitalization depending on the severity of the situation (Peng et al. 2020). Meng et al. (2020) recommended postponing dental treatments to up to 14 d after the exposure

event in asymptomatic patients who had contact with infected subjects and/or traveled to an at-risk area, thus suggesting a self-quarantine at home. In cases of the absence of contacts and/or symptoms, dental procedures can be performed, provided that the prevention precautions were implemented.

Body temperature should be registered, possibly with a contact-free forehead thermometer, and the presence of suspect symptoms (coughing, sneezing, respiratory difficulty) should be excluded (Li and Meng 2020). It is also important to apply the same safety measures to people accompanying the patient.

Prescription of Mouth Rinses prior to Dental Treatment. The experience reported by Peng et al. (2020) on the use of antimicrobial mouth rinses prior to dental procedures focuses on the use of oxidative agents to contrast SARS-CoV-2. Mouth rinses containing 1% hydrogen peroxide or 0.2% povidone can be employed to reduce microbial load in saliva, with a potential effect on SARS-CoV-2. In particular, mouth rinses are strongly recommended in cases where the rubber dam is not employed for the dental procedure.

Hand Hygiene. Hand hygiene is a critical measure for reducing SARS-CoV-2 transmission (Meng et al. 2020; Peng et al. 2020). It is crucial to perform thorough hand washing when coming into contact with patients and nondisinfected surfaces or equipment, and it is recommended to avoid touching eyes, mouth, and nose without having hands carefully washed. In particular, a protocol involving 5 hand washings (2 before and 3 after treatment) was proposed to reinforce professionals' compliance (Peng et al. 2020).

Personal Protective Equipment for Dental Practitioners. SARS-CoV-2 transmission predominantly occurs through airborne droplets. In this sense, the use of protective equipment, including gloves, masks, protective outerwear, protective surgical glasses, and shields, is strongly recommended to protect eye, oral, and nasal mucosa (Li and Meng 2020; Meng et al. 2020; Peng et al. 2020).

Limitation of Aerosol-Producing Procedures. Peng et al. (2020) highlighted the risk related to the performance of dental procedures, in particular when handpieces and ultrasonic devices are employed. As reported by Meng et al. (2020), it is advisable to minimize the operations involving the generation of aerosol and droplets while employing use of personal protective equipment. Rubber dam isolation is highly recommended (Meng et al. 2020; Peng et al. 2020).

Cleaning of Potentially Contaminated Surfaces. Careful disinfection of surfaces, with particular attention to door handles, chairs, and desks, was strongly suggested (Meng et al. 2020; Peng et al. 2020). Moreover, a dry environment in the dental office was recommended to control diffusion.

Measures for COVID-19 Management Adopted in Italy

Italy has unexpectedly seen an extremely fast outbreak of COVID-19 (Figure). This has led to unprecedented measures of prevention, which deeply affected all of society, in all aspects of daily life, with a reduction in people's mobility and a limitation of access to hospitals.

Dental practice has been recognized as a necessary service by the prime minister's decree of March 22, 2020, and its update on March 25, 2020 (http://www.governo.it/it/articolo/coronavirus-firmato-il-dpcm-22-marzo-2020/14363).

During pandemic diffusion of COVID-19, dental activities must be limited to the treatments that cannot be postponed. Dentists are encouraged to organize patient flux to not have >1 patient in the waiting room and to employ adequate personal protective equipment to avoid infection (http://www.governo.it/it/faq-iorestoacasa).

Regarding dental activities, recommendations on dental practice, following the indications of the Ministry of Health, have been produced by the Dental Office of the National Federation of Medical Doctors and Dentists (Federazione Nazionale Ordine dei Medici Chirurghi e Odontoiatri, Commissione Albo Odontoiatri; https://portale.fnomceo.it/covid-19/), the National Association of Italian Dentists (https://www.andi.it/), and numerous scientific dental societies coordinated via the Italian Society of Periodontology and Implantology (https://www.sidp.it/).

We have identified, through these documents, 4 phases that are crucial: patient triage, patients' entrance into the practice, dental treatment, and after-treatment management.

All dental practitioners are advised to mandatorily perform phone triage to define the real need for emergency treatment (i.e., treatment of acute pain, abscesses, trauma, and hemorrhagic events). Patients should be asked a set of questions aimed at investigating the risk of exposure to SARS-CoV-2 (Table 1). Patients are allowed to visit the dental office only if the entire questionnaire is negative; otherwise, the appointment must be preferably postponed (https://www.sidp.it/media-download/taxtbu3.pdf?v=11032020174011).

When the patient enters the dental office, data collection on the patient's history should be repeated and, if possible, body temperature registered through a contactless thermometer. If body temperature is >37.5 °C, treatment should be postponed.

Hand disinfection is suggested for patients. Regular disinfection of the ventilation system and a frequent opening of windows should be ensured. It is recommended to prevent patients from staying long in the waiting room and to remove all potentially contaminated objects (i.e., tables, magazines, toys), which could facilitate cross-infection (https://www.andi.it/wp-content/uploads/2020/02/Brochure-Petti_Coronavirus_per-tutti_240220-1.pdf). It is also important to limit the number of patients in the waiting room and to keep the recommended distance of at least 1 m between chairs. Accompanying subjects should be advised to wait outside the dental office. Patients'

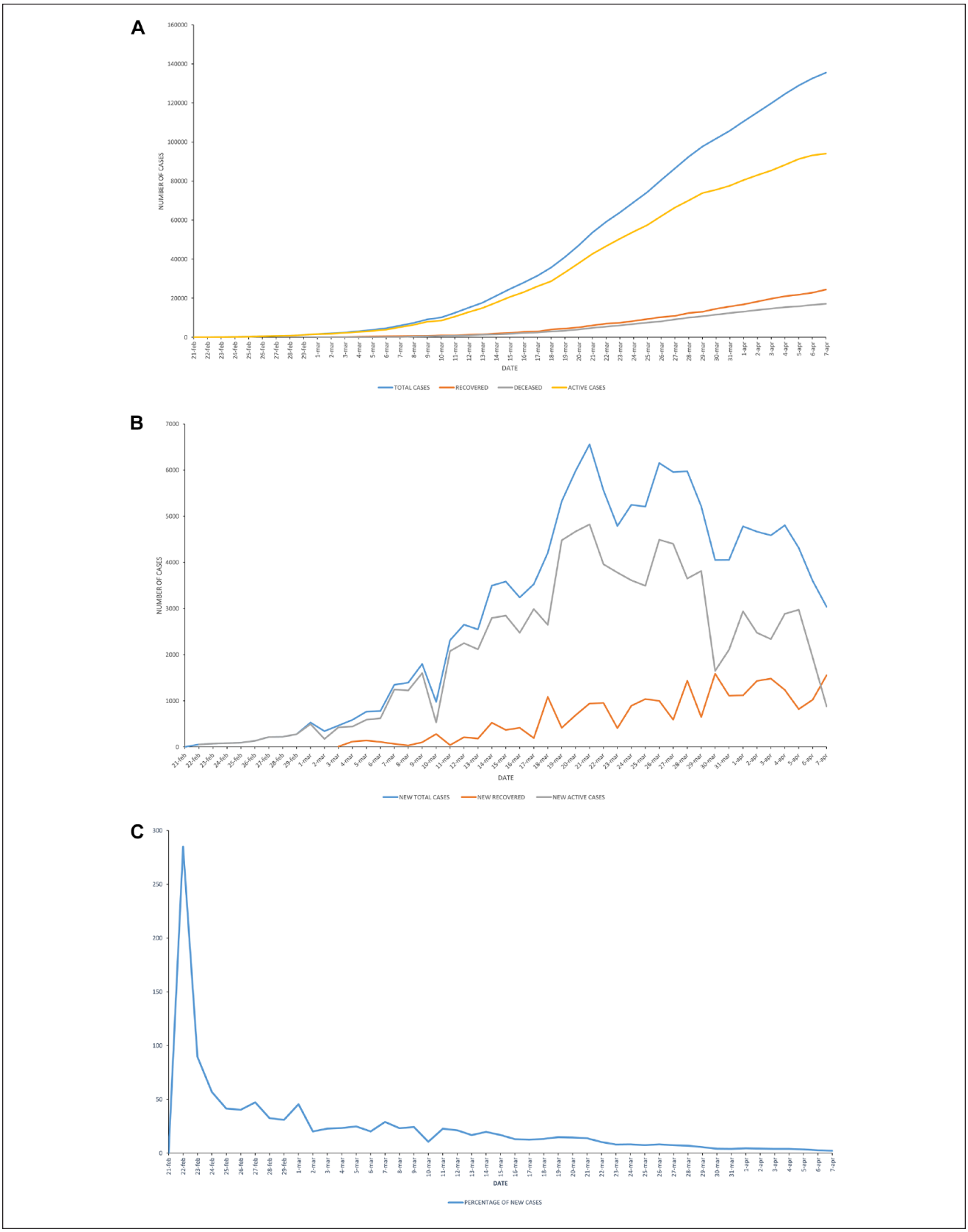

Figure. COVID-19 contagion in Italy. (**A**) Number of total cases, active cases, deceased, and recovered. (**B**) New total, active, and recovered cases per day. (**C**) Daily percentage increase of new cases since the outbreak of the contagion.

Table 1. Pretriage and Triage Questionnaire to Evaluate Patients' Potential Risk of SARS-CoV-2 Infection.

Do you currently have any of the following symptoms, such as fever, cough, respiratory difficulty, conjunctivitis, diarrhea, flu?
Did you have in the previous 14 d any of the following symptoms, such as fever, cough, respiratory difficulty, conjunctivitis, diarrhea, flu?
Did you have any contact with SARS-CoV-2–infected patients in the last 14 d? 4 wk?
Did you have any contact with subjects placed in quarantine, either self-disposed or organized by the health authorities, in the last 14 d? 4 wk?
Did you have any contact with subjects coming from highly epidemic regions in the last 14 d? 4 wk?
Have you been in any situation surrounded by a significant portion of subjects (other than the ones who are normally in quarantine with you) in the last 14 d?

Adapted by the authors and based on Italian recommendation documents.

clothing, cellular telephones, and bags are encouraged to be left in the waiting room (https://www.sidp.it/media-download/taxtbu3.pdf?v=11032020 174 011).

All surfaces that may be touched by the patients should be disinfected with sodium hypochlorite 0.1% or 70% isopropyl alcohol.

It has been suggested that the patient should perform a 1-min mouth rinse with 0.2% to 1% povidone, 0.05% to 0.1% cetylpyridinium chloride, or 1% hydrogen peroxide prior to the dental procedure.

The dental practitioner should perform careful hand washing for at least 60 s, employing a 60% to 85% hydroalcoholic solution, prior to wearing gloves.

Personal protection of eye, oral mucosa, and nasal mucosa should be provided for health care workers (https://www.iss.it/documents/20126/0/Rapporto+ISS+COVID+2_+Protezioni_REV.V6.pdf/740f7d89-6a28-0ca1-8f76-368ade332dae?t=1585569978473). In particular, the use of face masks (filtering facepiece level 2 or 3) is recommended, especially in epidemic areas. Face masks should be changed after the performance of the dental procedure and should be worn by the whole team, including nonclinical staff members. Eye protection should be guaranteed with the use of protective safety glasses and shields, which should undergo thorough disinfection with 70% isopropyl after each procedure (https://www.sidp.it/media-download/taxtbu3.pdf?v=110320 20174011).

During the dental treatment, all the necessary dental instruments should have been prepared in advance, to limit contamination and make the procedure faster. Disposable protections should be placed on working surfaces, the dental chair, and devices to avoid direct contamination.

As said, dental practitioners should perform only emergency treatments and reduce as much as possible the production of aerosol/droplets during the procedure. The use of a rubber dam and surgical aspiration may limit aerosol diffusion. Handpiece use should be limited, and if possible, dental procedures should be performed with manual instruments. Furthermore, the Italian National Institute of Health suggests limiting the time of health care contact with patients to 15 min to reduce the risk of contact. Thus, treatment should be effective and pragmatic, aimed at just the resolution of the emergency.

After the procedure, all the disposable protections should be removed and high-level disinfection performed. After each patient, at least a 5-min air change is advised. Since the virus tends to remain in airborne particles, it is recommended not to remove personal protective equipment prior to exiting the contaminated area.

Table 2 reports a summary of the measures suggested to dental practitioners to contain COVID-19 diffusion based on the retrieved articles and the Italian recommendation documents.

Discussion

Italy has seen a disruptive and sudden outbreak of COVID-19 in the last few weeks, requiring strict measures to limit the contagion. In this extremely difficult moment of pandemic, our community is facing an unexpected and totally new situation. Accordingly, as limited by the available evidence, health authorities have tried to outline some clinical recommendations for dental practice during these times.

The impact of this outburst has been tragic and catastrophic. The epidemy has been characterized so far by dramatic numbers of deceased subjects. Overall, as of April 7, 17,127 subjects have died from COVID-19 in Italy. This highlights a very high mortality rate (12.63%) as compared with the one reported in China (4.03%). According to the Italian National Institute of Health, the mean age of deceased patients is 78 y, while the mean age of infected patients is 62 y. This has the appearance of a catastrophe: in Italy, the population >80 y of age accounts for >3.5 million people, representing an important cultural and social heritage. Most of this specific population often presents several comorbidities and is at higher risk of complications. In particular, 82.3% of deceased patients were affected by ≥2 comorbidities at the moment of contagion (https://www.epicentro.iss.it/).

Importantly, health care workers are deeply affected by the COVID-19 pandemic. In Italy, >13,000 health care workers were affected. The National Federation of Medical Doctors and Dentists reports, at present, the death of 86 medical doctors and 8 dentists (https://portale.fnomceo.it/elenco-dei-medici-caduti-nel-corso-dellepidemia-di-covid-19/). This reinforces the concept that close contact with positive patients, whether symptomatic or not, exposes health workers to a higher risk of infection (Wang et al. 2020).

It is then of utmost importance to highlight the critical contributory role of dentistry in this pandemic outburst in detecting patients with initial symptoms, clinically supporting the population even in these dire times, and working in a safe contagion-reduced environment. Basically, there are potentially 4 types of patients who may be presenting dental emergencies: 1) subjects with known SARS-CoV-2 infection, 2) subjects at potential risk of infection, 3) subjects with unknown

Table 2. Guidelines Adopted in Italy for Dental Practitioners during the COVID-19 Emergency.

Prior to dental treatment (patients at home)	
Phone triage questionnaire	Provide limitations to dental office access
Organization of patient flux	Book appointments to avoid contemporaneity of patients
	No accompanying subjects if possible. When this is unfeasible, the accompanying person will be asked not to enter the practice and to wait outside
Prior to dental treatment (patients entering the practice)	
Body temperature measurement	Assess potential presence of fever via contactless thermometer
Hand hygiene (patient)	Use of hydroalcoholic solutions for hand disinfection when entering the dental office
Waiting room	Provide adequate ventilation
	Removal of all objects that could favor cross-infection
	Avoid long stay in the waiting room
	Avoid the contemporary presence of >2 patients
	Respect the distance of 1 m between patients
	Discourage the presence of accompanying people
Environment disinfection	Use of 0.1% sodium hypochlorite or 70% isopropyl alcohol for the disinfection of all surfaces
Nonclinical staff clothing	Application of face masks (filtering facepiece level 2 or 3), glasses
Preparation to dental treatment (dentist and patient)	
Patient preparation	Use of disposable shoe covers
	1-min mouth rinse with 0.2% to 1% povidone, 0.05% to 0.1% cetylpyridinium chloride, or 1% hydrogen peroxide
Clinical staff hand washing	Hand washing for at least 60 s and then 60% hydroalcoholic solution application prior to wearing gloves
Clinical staff clothing	Application of face masks (filtering facepiece level 2 or 3), shields, surgical glasses, long-sleeved water-resistant gown, surgical cap, shoe cover
Dental treatment	
Instruments	Preparation of all instruments in advance
Surfaces	Total protection through disposable covers
Minimizing aerosol production	Avoid, when possible, use of handpieces/ultrasonic instruments
	Use of rubber dam
	Surgical aspiration system
	If possible, prefer 4-hands technique
	Limit overall treatment time if possible
After dental treatment	
Ventilation	5-min air change strongly advised
Instruments	Removal of disposable protections from the surfaces
Personal protection	Disinfection of shields and glasses with 70% isopropyl alcohol
Hand hygiene (dentist)	Hand washing for at least 60 s and then 60% hydroalcoholic solution application

Operative checklist adapted by the authors and based on Italian recommendation documents.

risk of infection, and 4) subjects who have healed from COVID-19. In fact, every patient who appears healthy should nevertheless be considered at unknown risk of being contagious, as one of the dangerous aspects of COVID-19 is the presence of the virus despite the absence of clinical manifestations (Chan et al. 2020; Rothe et al. 2020).

Our role as dental practitioners is also then to thoroughly evaluate each patient in terms of current health status and/or contacts with potentially infected people to avoid cross-infection. The available literature described a triage in the preclinical and clinical setting, in which the patient is examined for fever and receives a questionnaire (Li and Meng 2020; Meng et al. 2020; Peng et al. 2020). We therefore suggest clarifying the importance of a double-phase triage, telephonic first and subsequently in the clinic, which may help in detecting patients at potential risk of infection by asking in 2 time points about their health. Importantly, pretriage and triage (Table 2) can be critical in 1) identifying potentially at-risk cases and supporting them in contacting the health authorities for their and the community's protection; 2) understanding the real need of a professional consultation and possibly addressing the issue with just pharmacologic prescription (therefore respecting the social measures to limit contagion; and 3) organizing a contagion-reduced treatment for the subjects with unknown risk of contagion who are experiencing an acute dental problem that requires immediate treatment.

Treatment may pose significant risks for practitioners and patients. As for SARS-CoV-1, the transmission of SARS-CoV-2 mainly happens through aerosol and droplets. SARS-CoV-2 can persist in aerosol for up to 3 h and has a relatively long half-life of approximately 1.1 to 1.2 h (van Doremalen et al. 2020). In the dental setting, the intense production and persistence of aerosols during dental procedures expose dental workers to the risk of inhaling small particles and droplets, which are reported to potentially carry microorganisms such as bacteria and viruses (Zemouri et al. 2017). Thus, on one hand, it is important to safeguard our patients' health via establishing a protocol of contagion risk reduction. On the other, it is crucial to work in a safer environment and to protect dental health practitioners form the virus.

Preoperative setting is of utmost importance. Hand washing and appropriate clothing of the clinicians and mouth rinsing of the patient may reduce the risk. Hand hygiene is a routine measure in dental practice (Larson et al. 2000; Kohn et al. 2003), but it is gaining growing importance to limit SARS-CoV-2 transmission. Lotfinejad et al. (2020) highlighted the effect of alcohol-based solutions on inactivated enveloped viruses, including coronaviruses, suggesting the use of solutions containing at least 60% ethanol for hand hygiene. World Health Organization instructions for hand hygiene report that an effective procedure for the use of alcohol-based formulations requires 20 to 30 s, while correct hand washing takes between 40 and 60 s (https://www.who.int/gpsc/5may/Hand_Hygiene_Why_How_and_When_Brochure.pdf). Thus, as a short unorganized session of hand washing might not be effective, we suggest washing for 60 s and then adding 60% hydroalcoholic solution for hand hygiene before and after treatment.

A preoperative mouth rinse with oxidative agents has been suggested (Peng et al. 2020). No information is available on its effectiveness, nor is there further evaluation of the effectiveness of different agents, including nonoxidative agents such as chlorhexidine, on SARS-CoV-2. Dexter et al. (2020) suggested chlorhexidine mouth rinse to treat patients in the surgical theater. In the literature, chlorhexidine has been reported to have an effective virucidal activity on enveloped viruses, such as herpes simplex virus 1 and 2, human immunodeficiency virus 1, cytomegalovirus, influenza A, parainfluenza, and hepatitis B (Park et al. 1989; Bernstein et al. 1990; Baqui et al. 2001; Eggers et al. 2018). At present, there is a lack of systematic data on the use of chlorhexidine mouth rinses for the reduction of the microbial load related to SARS-CoV-2. The Italian recommendation documents are suggesting a preoperative 1-min mouth rinse with 0.2% to 1% povidone, 0.05% to 0.1% cetylpyridinium chloride, or 1% hydrogen peroxide.

The use of personal protective equipment is nowadays part of routine dentistry to protect operators from blood and saliva. However, the equipment for airborne virus protection might be different from our routine setting. The importance of the barrier protection equipment has been stressed by the European Centre for Disease Prevention and Control (https://www.ecdc.europa.eu/sites/default/files/documents/COVID-19-guidance-wearing-and-removing-personal-protective-equipment-healthcare-settings-updated.pdf) to fundamentally protect operators from the SARS-CoV-2 contagion. Among the equipment, the use of masks, goggles, long-sleeved water-resistant gowns, and gloves is mandatory when treating patients, as every healthy patient is potentially contagious. This setting can be easily found in every dental clinic. We believe that this should also be the treatment for subjects who have healed from COVID-19. It is still unclear whether filtering facepiece level 2 or 3 should be worn altogether with a conventional surgical mask.

The available literature and actual clinical experience are still not able to suggest which protection equipment to use when treating patients with COVID-19 for dental treatment that cannot be postponed. Ideally, the operators should work in a hospital setting with the same intensive care dressing of the health care workers dealing with patients with COVID-19. There is still no information available on how to equip for the subjects at potential risk of infection in which treatment cannot be postponed. If intensive care equipment might be suggested, we can then understand the practical and economic burden that this may pose.

Treatments should follow the concept of reducing, as much as possible, droplets, aerosols, and contacts. Indeed, COVID-19 transmission is reported to happen through direct inhalation of droplets, coughing, and sneezing or by contact with mucous membranes of oral cavity, nasal cavity, and eye (Lu, Liu, et al. 2020). These transmission routes expose dental practitioners to a high risk of contagion, with standard protective measures being insufficient in protecting from exposure to aerosol and droplets. Moreover, To et al. (2020) recognized saliva as a reservoir of SARS-CoV-2 in infected individuals. Therefore, the reduction of aerosol-generating procedures is recommended during these phases of COVID-19 diffusion. Direct inhalation risk is mostly related to the use of handpieces and ultrasonic scalers, which generate aerosol and droplets, often mixed with saliva and blood (Cleveland et al. 2016). Thus, if possible, it is advisable to 1) avoid and reduce the use of handpieces to lower aerosol/droplet production and instead use handpieces with antiretractive or antireflux valves; 2) apply a rubber dam to significantly reduce the diffusion of aerosol/droplets (Al-Amad et al. 2017); 3) use surgical aspiration to control airborne particles diffusion; and 4) perform extraoral x-rays to reduce the risk of saliva stimulation and coughing (Vandenberghe et al. 2010).

The production of aerosol and droplets during routine dental procedures contributes to the generation of highly contaminated microbial aerosol (Helmis et al. 2007). Although the reduction of aerosol generation has been listed among the preventive measures against SARS-CoV-2 infection, it is recommended to frequently renew indoor air either by opening the windows or using mechanical ventilation, possibly in between patients.

The disinfection of the dental setting is a well-established routine for the prevention of cross-infections (Sebastiani et al. 2017). The preventive measures normally adopted, which include a first phase of cleaning and a second phase of disinfection, are now becoming crucial in limiting SARS-CoV-2 diffusion. In fact, the peculiar characteristics of a long persistence of SARS-CoV-2 on surfaces may represent a risk for patients and operators (Kampf et al. 2020; van Doremalen et al. 2020). Recommendations have been provided regarding the management of operating rooms to attenuate the environmental contamination and optimize infection control through quaternary ammonium compounds or isopropyl alcohol (Dexter et al. 2020). Similarly, adequate measures should be adopted to keep a safe environment in the dental office, by providing careful disinfection of the surfaces and adequate protection during dental procedures to limit perioperative virus diffusion. In Italy, 0.1% sodium hypochlorite and 70% isopropyl alcohol have been suggested for surface disinfection.

To conclude, in the present scenario, uncertainties and lack of knowledge are dominating the clinical decision-making process. We are aware that the extreme dynamicity of the outbreak

and the relative speed of information gathering may determine sudden change of views and recommendations for the prevention of SAR-CoV-2 infection in the dental setting. Overall, dental professionals appear extremely exposed to the risk of SAR-CoV-2 infection, thus making necessary the adoption of strict preventive measures. At the present, these data are inherent in these clinically relevant conundrums. Given patients' treatment, there is still an unmet need for guidelines on the management of patients at various stages of disease, from positive to asymptomatic to healed ones. Therefore, further prospective assessment of the implications of COVID-19 outbreak in dental practice is urgently needed.

We sincerely hope that we might shortly go back to our "routine" dentistry worldwide. We cannot, however, exclude that the entire profession might change significantly in the coming years.

Author Contributions

R. Izzetti, M. Nisi, contributed to conception, design of the study, data acquisition, analysis, and interpretation of data, drafted the manuscript; M. Gabriele, F. Graziani, contributed to conception and design of the study, drafted and critically revised the manuscript. All authors gave final approval and agree to be accountable for all aspects of the work.

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