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Dealing with dental patients during COVID-19 outbreak: A review

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***Abstract*---**SARS-CoV-2 is a member of the family of coronaviruses. The first cases were recorded in Wuhan, China, between December 2019 and January 2020. Italy is one of the most affected countries in Europe. COVID-19 is a new challenge in modern dentistry. New guidelines are required in dental clinics to avoid contagion caused by cross-infections. A narrative review was performed using both primary sources, such as scientific articles and secondary ones, such as bibliographic indexes, web pages, and databases. The main search engines were PubMed, SciELO, and Google Scholar. Twelve articles were selected to develop the bibliographic review by applying pre-established inclusion and exclusion criteria. Precautionary measures should be applied to control COVID-19 in clinical practice. Several authors have highlighted the importance of telephone triage and/or clinic questionnaires, body temperature measurement, usage of personal protective equipment, surface disinfection with ethanol between 62% and 71%, high-speed instruments equipped with an anti-retraction system, four-handed work, and large-volume cannulas for aspiration. Clinically, the use of a rubber dam is essential. FFP2 (or N95) and FFP3 respirators, if compared to surgical masks, provide greater protection for health workers against viral respiratory infections. Further accurate studies are needed to confirm this.

***Keywords*---**COVID-19, hygiene, infection, PPE, dental practice, mask.

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Introduction

The coronavirus outbreak is a global concern. With each passing day, the situation seems to change for the worst. More and more people are confirmed as infected, the mortality rate goes up slightly with each fatal case, and the virus is making its way outside the Chinese borders.
The Wuhan virus is the first major health threat of 2020, but its far from being the first or the worst health crisis that humanity faced. Before we had the Ebola virus, Avian influenza, and severe acute respiratory syndrome (SARS), with the last on this list actually being a type of coronavirus. All were highly contagious and potentially deadly, but none caused such a visceral reaction from the population. The epidemics of coronavirus disease 2019 (COVID-19) started in Wuhan, China, last December and have become a major challenging public health problem for not only China but also countries worldwide.[1] On January 30, 2020, the World Health Organization (WHO) announced that this outbreak had constituted a public health emergency of international concern.[2]

The novel coronavirus was initially named 2019-nCoV and officially as SARS-coronavirus 2 (CoV-2). As of February 26, COVID-19 has been recognized in 34 countries, with a total of 80,239 laboratory-confirmed cases and 2700 deaths.[3] In the field of dentistry, the risk of cross infection high between dental practitioners and patients. COVID-19 affected countries/or regions made dental practices and hospitals potentially at high risk, in which strict and effective requirements of infection prevention protocols urgently needed. This article is based on the relevant guidelines and research about the COVID-19 and providing the recommended management protocols .The virus that causes COVID-19, SARS-CoV-2, is profusely present in nasopharyngeal and salivary secretions of patients infected with SARS-CoV-2,and is believed to be spread primarily through respiratory droplets, as well as aerosols and fomites. Importantly, emerging evidence shows that normal breathing and talking can produce small droplets that are subject to aerosol transport and that aerosolized SARS-CoV-2 particles can remain suspended in the air for several hours,[4] although it is unclear how much aerosol spread contributes to viral transmission. The widespread transmission of SARS-CoV-2 in many communities, the potential for infected individuals who are pre-symptomatic or asymptomatic to transmit the virus to others, and the unique nature of dental interventions with close proximity of the provider to the patient's mouth and throat, all contribute to the high risk for dental personnel teams becoming exposed and transmitting the virus to other patients or staff. Some dental procedures may lead to aerosol generation, further increasing transmission risk to dental providers or future patients through direct inhalation or contact with contaminated surfaces. [3]

Mode of Transmission

Based on findings of genetic and epidemiologic research, it appears that the COVID-19 outbreak started with a single animal-to-human transmission, followed by the sustained human-to-human spread.[4] It is now believed that its interpersonal transmission occurs mainly via respiratory droplets and contact transmission. Studies have suggested that 2019-nCoV may be airborne through aerosols formed during medical procedures. It is notable that 2019-nCoV RNA

could also be detected by real-time reverse transcription-polymerase chain reaction testing in a stool specimen collected on day 7 of the patient's illness.[5]

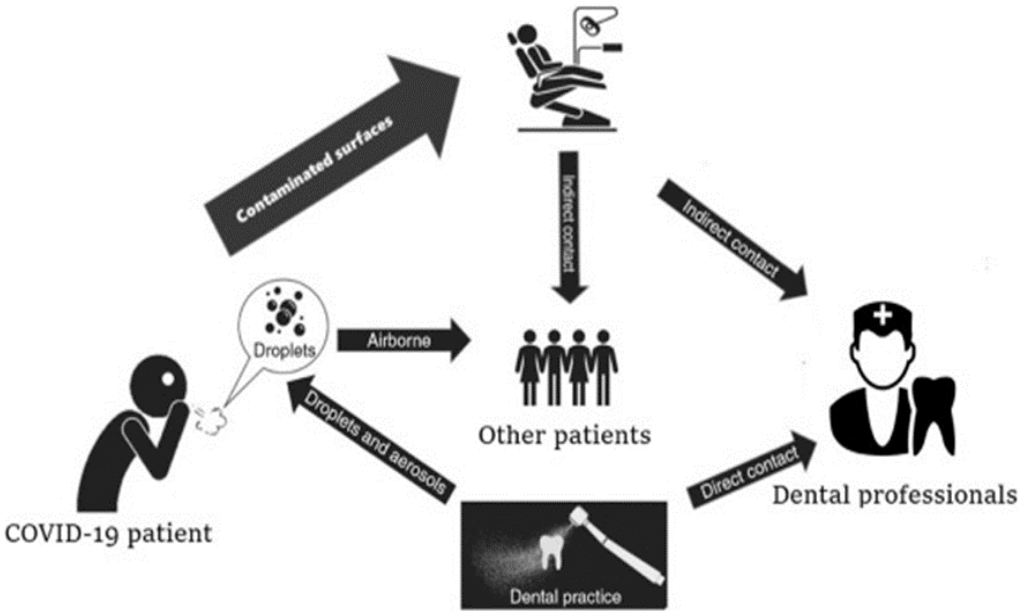
Stages Of Spread Of Corona Virus

- Stage 1: Getting the imported case – People getting infected outside the country having infection
- Stage 2: Local transmission – the infected case came from outside the country, spreading infection to those who came in contact with them
- Stage 3: Community transmission – If the people having infection don't restrict their movement (quarantine) they might spread infection to people whom they don't even know through infected surfaces
- Stage 4: Turning into an epidemic – This chain reaction of the spread of infection leads to huge explosion of the cases.[6]

Effects of Outbreak of Corona Virus Disease 2019 on Dentisry

Risk of nosocomial infection in dental settings

Dental patients who cough, sneeze, or receive dental treatment, including the use of a high-speed handpiece or ultrasonic instruments, make their secretions, saliva, or blood aerosolize to the surroundings. Dental apparatus could be contaminated with various pathogenic microorganisms after use or become exposed to a contaminated clinic environment. Thereafter, infections can occur through the puncture of sharp instruments or direct contact between mucous membranes and contaminated hands.[7] Due to the unique characteristics of dental procedures where a large number of droplets and aerosols could be generated, the standard protective measures in daily clinical work are not effective enough to prevent the spread of COVID-19, especially when patients are in the incubation period, are unaware they are infected or choose to conceal their infection. [7]



Recommendation For Dental Practise During The Outbreak Of Corona Virus Disease 2019

Given the novelty of the disease, no cases of SARS-CoV-2 transmission in a dental setting are identified yet. However, given the high transmissibility of the disease and considering that routine dental procedures usually generate aerosols; during this pandemic, alterations to dental treatment should be considered to maintain a healthy environment for the patients and the dental team. SARS-CoV-2 has been isolated from the saliva of COVID-19 patients.[1] Salivary gland epithelial cells can potentially be infected by SARS-CoV and become a major source of the virus in saliva. Even after patient recovery, recusancy during the convalescence period was reported. This is plausible since the presence of some virus strains in saliva for as long as 29 days have been reported in the literature.[8]

In addition to blood and salivary contamination, the majority of routine rental treatments generate significant amounts of droplets and aerosols. This is usually related to the utilization of devices and equipment such as ultrasonic scalers, air-water syringes, and air turbine handpieces. Closing dental practices during the pandemic can reduce the number of affected individuals, but will increase the suffering of the individuals in need of urgent dental care. It will also incense the burden on hospital emergency departments. This calls for the creation of standard guidelines for dental care provision during the worldwide spread of the pandemic and/or local epidemic outbreaks.[8]

Patient Management And Prevention Of Nosocomial Infection

Based on the experience gained from the previous outbreak of SARS-CoV and the data available on SARS-CoV-2 and its associated disease (COVID-19), certain

specific measures are discussed for dental patient management in this pandemic period of COVID-19. [9]

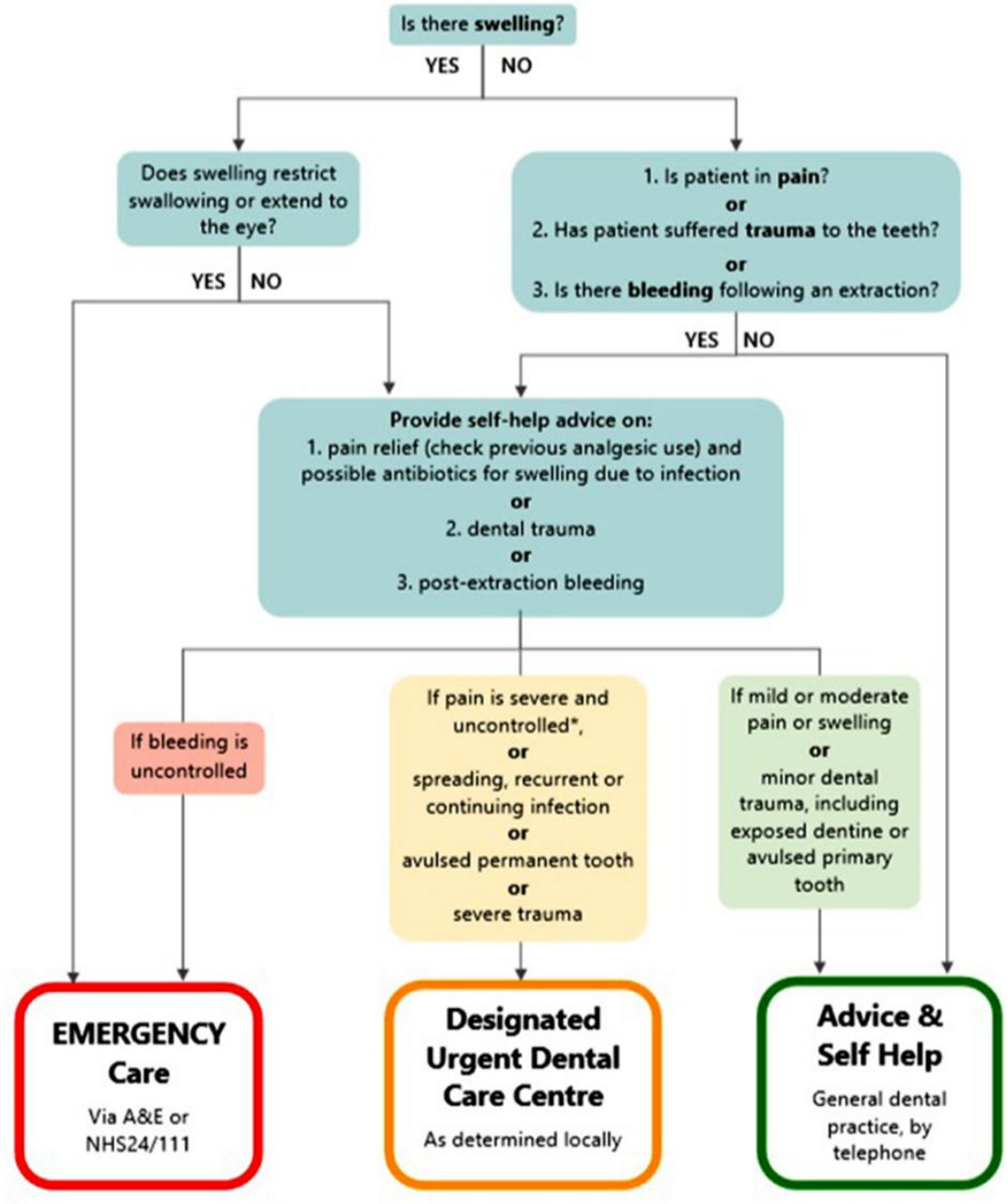
Telescreening and Triaging

Initial screening through telephone to identify patients with suspected or possible COVID-19 infection can be performed remotely at the time of scheduling appointments . The three most pertinent questions for initial screening should include any exposure to a person with known or suspected COVID-19 presentation, any recent travel history to an area with a high incidence of COVID-19, or presence of any symptoms of febrile respiratory illness such as fever or cough.[9]

A positive response to either of the three questions should raise initial concern, and elective dental care should be deferred for at least 2 weeks (Note: the incubation period for SARS-CoV-2 can range from 0 to 24 days). These patients should be encouraged to engage in self-quarantine and contact their primary care physician by telephone or E-mail. [9]

Patient Evaluation

On patient arrival in dental practice, patients should complete a detailed medical history form, COVID-19 screening questionnaire, and the assessment of a true emergency questionnaire . Dental professionals should measure the patient's body temperature using a noncontact forehead thermometer or with cameras having infrared thermal sensors. Patients who present with fever (>100.4°F = 38°C) and/or respiratory disease symptoms should have elective dental care deferred for at least 2 weeks. As per the Centers for Disease Control (CDC) and Prevention guidelines, individuals with suspected COVID-19 infection should be seated in a separate, well-ventilated waiting area at least 6 ft from unaffected patients seeking care. Patients should be requested to wear a surgical mask and follow proper respiratory hygiene, such as covering the mouth and nose with a tissue before coughing and sneezing and then discarding the tissue. After informing the patients to self-quarantine themselves, dentists should instruct the patients to contact their physician to rule out the possibility of COVID-19.[10]



Preventive Measures Against COVID-19 In Dental Practise

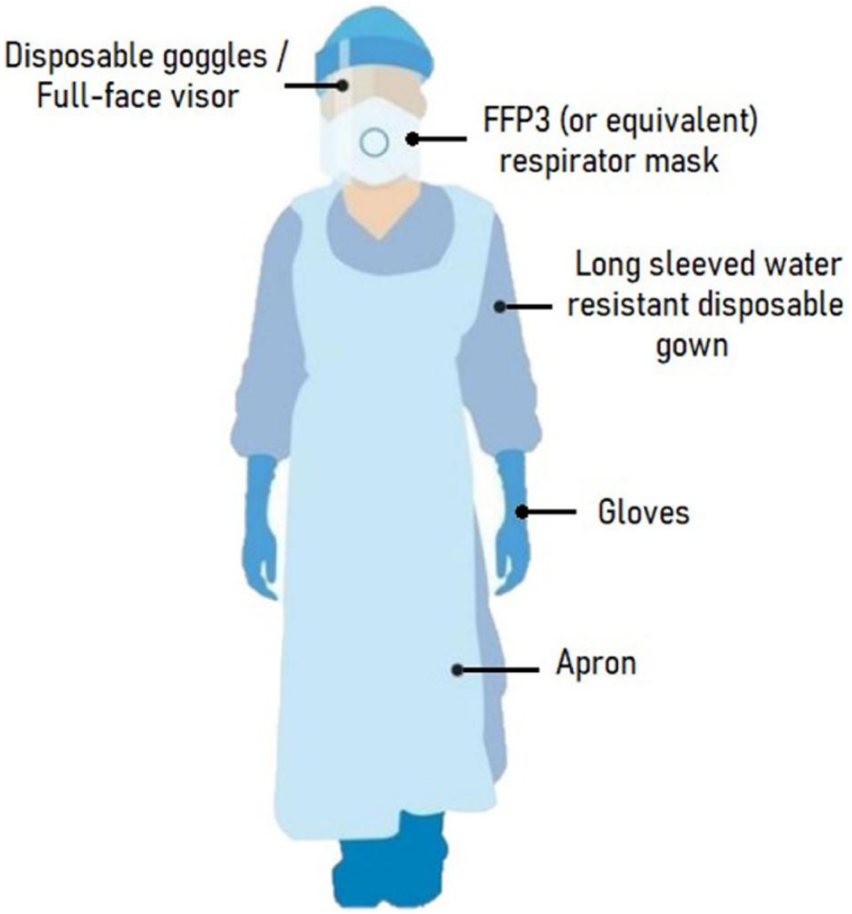
Fundamentally, that it is essential to perform an accurate telephone triage, a subsequent triage in dental clinics, and a complementary questionnaire to collect as much information as possible about the patient and his or her family members, specifically regarding symptoms and movements in the previous 14 days Temperature measurement is recommended when the patient enters the

dental office; if the body temperature exceeds 37.3 °C, it is suggested the treatment be postponed [11]. In patients with a cured COVID-19 infection, the American Dental Association (ADA) guidelines propose to reschedule dental treatment at least 72 h after the resolution of the symptoms, or 7 days after the appearance of initial symptoms, such as fever controlled without antipyretics and spontaneous improvement of breathing Meng et al., in a precautionary way, set the necessary recovery period to 30 days before performing non-deferrable dental care in patients who have been infected [28]. For medical-legal issues, a patient's self-certification is also required with regard to what he/she claims during the telephone and clinical triage phase.[10]

The ADA and the Centers for Disease Prevention and Control (CDC) recommend keeping the waiting room empty, without magazines, and avoiding the overlap of two or more appointments. If this is not possible, the minimum distance between one patient and the other must be 2 m (6 feet) in each direction.[11] In extreme situations, for health protection, it is reasonable to ask patients to wait in their vehicle, if possible, or nearby to the dental clinic, and advise them by telephone call or message when it is their turn. As far as pediatric dentistry is concerned, persons accompanying minor age patients are asked to come to the appointment in the smallest possible number, wear a protective mask, wait in the waiting room, and not attend the patient's treatment to avoid the risk of aerosol inhalation. [12]

Further accurate studies have been carried out to demonstrate the importance of oral rinses just before dental treatment; Costa et al., in a study in 2019, highlighted how the use of chlorhexidine at 0.12% and 0.20% alters the amount of bacteria, viruses, and fungi present in the oral biofilm, reducing the risk of cross-contamination due to aerosol . Since COVID-19 is sensitive to oxidation, Peng et al. proposed rinsing with 1% hydrogen peroxide or, alternatively, with 0.2% povidone-iodine . This must be interpreted with caution: saliva is constantly and cyclically renewed by the salivary glands, making the virus available again. [12]

Regardless of the type of treatment planned, healthcare professionals, especially dentists, hygienists, and dental assistants, must follow rigid protocols related to dressing and personal protective equipment. Hair caps, protective goggles, surgical masks or N95, disposable surgical gowns, special footwears, and protective visors are essential According to the "EN ISO 374-5.2016" regulation, for medical protection gloves to be considered functional against microorganisms, such as bacteria and fungi, must pass the penetration test, which analyzes air and water transition through material pores, seams, holes, and other structural imperfections . "ISO 16604: 2004 method B" is an additional test that is necessary to certify the specific protection of the gloves against viruses.[12] The PPE should be used as asserted in the instructions in the user manual and must be disposed of as special waste. It is always recommended to check the integrity of the PPE, and if any negative findings, eliminate the PPE immediately . [12]



Efficacy of Respirators and Surgical Masks against Viral Respiratory Infections
There are several articles in the scientific literature on the effectiveness of surgical masks in comparison to respirators [13]. The distance and length of time in which particles remain suspended in the air are determined by particle size, settling velocity, relative humidity, and air flow.[13] The European Standard classifies filtering facepiece respirators (FFP) into three categories: FFP1, FFP2, and FFP3 with minimum filtration efficiencies of 80%, 94%, and 99%. Consequently, FFP2 respirators are approximately equivalent to N95, and therefore recommended for use in the prevention of airborne infectious diseases in the US and other countries. [13]

Both Long et al. and Radonovich et al, in their respective analyses did not find significant differences between the N95 and surgical masks in terms of protection from the influenza virus. Similar results were also observed in the study by Offeddu et al., which was performed two years before the current COVID-19 health emergency. On one hand, there is an equal effectiveness between the two types of masks on the influenza virus. However, compared to nonspecific respiratory tract infections, the N95 masks give slightly better results [14]. MacIntyre et al. instead obtained diametrically opposing results; they showed,

through a randomized controlled clinical study on 3591 subjects, that health workers who used N95 masks continuously during the shift or in situations considered to be at high risk, presented an 85% chance of not contracting a viral infection transmitted via droplets.[14]

In addition, the N95 mask group compared to the control group was associated with a significantly lower risk of contracting influenza, as confirmed by the laboratory. The authors suggest updating the classification of infectious transmissions; they consider that focusing only on aerosols and droplets is an oversimplification. In a recent study, Ma et al. analyzed the degree of protection of surgical masks, N95, and home masks (four layers of paper and polyester) against the virus; N95 masks showed greater reliability. [15]

Lee et al., focused on particles between 0.093 and 1.61 μm, and demonstrated that the FFP respirators provided better protection than the surgical masks, suggesting that such surgical masks are not a good substitute for FFP respirators in the case of airborne transmission of bacterial and viral pathogens. The principal limitation of surgical masks is due to the poor face fit and the consequential possibility of aerosol aspiration [15].

In Spain, the Dentists Council (Consejo de Dentistas) reports a maximum of 4 h of use, and if kept in good condition, FFP2 or N95 masks can be sterilized through various techniques: hydrogen peroxide vapor, dry heat at 70 °C for 30 min, or in humid heat at 121 °C; however, not for more than 2–3 times . Pragmatic and Technical Recommendations during Dental Treatment in the COVID-19 Era. Hand hygiene is considered the first step in limiting the spread of the virus; WHO guidelines impose scrupulous hand-washing before and after any contact with the patient . Being previously considered an essential tool for correct operating practice, the rubber dam has become even more so after the viral epidemic of 2020. Various authors underline the utility of the rubber dam on containment and protection from oral fluids; it reduces the particles present in the aerosol by 70% and also drastically reduces the risk of cross-infection . If it is not possible to position it, Peng et al. recommend the use of the Carisolv and an excavator for conservative treatments [15]

High-speed rotating instruments, such as the turbine and the contra-angle, must be equipped with an anti-retraction system, which prevents the release of debris and fluids that can accidentally be inhaled by healthcare professionals during clinical procedures . Meng et al. suggests minimizing the use of these tools; if this is not possible, the last appointment of the day should be intended for those patients who need dental treatments requiring the use of high-speed rotating instruments . They also recommend not to use intraoral radiographs; therefore, they propose the use of orthopantomography or CT if strictly necessary. The authors agreed on the need for four-handed work to reduce the risk of spreading the virus in the dental care unit, to manipulate the water-air syringe with extreme caution, and to use large-volume aspirators Concerning potentially deferred dental emergencies, Luzzi et al. recommend remote telephone or assistance support from the dentist. In the case of pulp pain, therapy with non-steroidal anti-inflammatory drugs, such as ibuprofen, and antibiotics, such as beta-lactams, are recommended, if the patient does not have allergies[16]

Alharbi et al. classified therapeutic dental procedures into five groups: emergencies, emergencies manageable through invasive or non-invasive procedures (minimum aerosol), non-emergencies, and elective treatments, depending on the dentist. Among the emergencies, the authors highlight maxillofacial fractures that compromise the respiratory tract, uncontrolled post-operative bleeding, and bacterial oral soft tissues infections with intra- or extra-oral swelling that negatively affect the patient's respiratory capacity .[17]

Orthodontists are suggested to stop activating the rapid palate expander; parents are instructed to reposition the Ni-Ti arch if it should go off-axis and cause a contact ulcer on the oral mucosa. Any non-urgent treatment must be postponed; if this is not possible, the dentist must follow strict protocols to avoid contagions. Peng et al., advise the elimination of waste using special yellow double-layer bags for special waste and mark them to facilitate their elimination [18]

Importance Of Sterilization Of Dental Clinic

Various disinfectants available on the market, can effectively inactivate the SARS-CoV-2. The Italian Dentists Association recommends covering all surfaces, where possible, with polyethylene wrap The results obtained demonstrate compliance and homogeneity between the authors. [18] Rabenau et al. and Kampf et al. illustrated that various groups of disinfectants, such as propanol, sodium hypochlorite, and ethanol, in percentages ranging from 80 to 95% (as a hand rub) 71% (as a surface disinfectant) can reduce SARS-CoV-2 load to below recording levels in a variable lapse of time. Pertinent papers on this topic are limited. [18]

The WHO guidelines recommend the use of 5% sodium hypochlorite, with a 1:100 dilution, to be applied on surfaces for an average action time of 10 min; constant ventilation of the dental surgery room is also recommended [19]. Studies have shown that other biocidal agents such as 0.05–0.2% benzalkonium chloride or 0.02% chlorhexidine digluconate probably have lower efficiency . The Spanish Dentists Council suggests the use of 1% sodium hypochlorite for the disinfection of the impressions. The action time of the disinfectant varies depending on the material used: 10 min for alginate, and 15–20 min. [18]

Conclusion

Preventive measures against COVID-19 in dental practice include telephone and clinical triage supported by a questionnaire on recent symptoms and movements, body temperature measurement, oral rinses with 1% hydrogen peroxide, and the use of specific PPEs. Pragmatic and technical recommendations for correct clinical practice are the implementation of anti-retraction dental handpieces, four-handed work, the use of a rubber dam, and large-volume cannulas for aspiration.[19]

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