

COVID-19 and dental practice: overview and protocols during pandemic

COVID-19 e odontoiatria: generalità e protocolli durante la pandemia

KEYWORDS

SARS-CoV-2, COVID-19, Dental Practice, Infection Control, Pandemic

PAROLE CHIAVE

SARS-CoV-2, COVID-19, Odontoiatria, Controllo dell'infezione, Pandemia

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Abstract

In December 2019, in Wuhan (China), there were described the first cases of a Severe Acute Respiratory Syndrome caused by SARS-CoV-2 and named COVID-19. Since then the disease has spread in several countries and in March 2020 the WHO declared it pandemic.

COVID-19 is associated with a wide range of manifestations from no symptoms to temperature cough, dyspnea, need for artificial ventilation and eventually death. Mortality has been reported to be around 3%. Cases of spreading from asymptomatic infected individuals have been documented.

It has become clear that among healthcare professionals, dentists are the most exposed category to the risk of such infection as the routes of transmission are contact, droplets and aerosol, therefore the necessity of providing clear guidelines has suddenly arisen.

This article is aimed at analysing the available literature about "SARS-CoV-2" and "COVID-19", and comparing it with the guidelines for other coronavirus infections and dental practice with a view to providing clinical recommendations about prevention and infection control in the dental environment.

Introduction

In December 2019, several cases of viral pneumonia were discovered in Wuhan, Hubei, China. A novel coronavirus was recognised as the pathogen responsible for the infection and named 2019 Novel Coronavirus

Nel dicembre 2019 sono stati descritti a Wuhan (Cina) i primi casi di Severe Acute Respiratory Syndrome causata dal virus SARS-CoV-2 e chiamata COVID-19. La patologia si è successivamente diffusa in diversi Stati fino a che nel marzo 2020 l'OMS ha dichiarato lo stato di pandemia. COVID-19 ha diverse possibili manifestazioni: può essere completamente asintomatica o presentarsi con febbre, tosse, dispnea e talvolta necessità di ventilazione assistita con rischio di morte. La mortalità si attesta attorno al 3%. Sono stati documentati casi di contagio avvenuto mediante portatori sani.

Dato che il virus si trasmette mediante contatto, droplet e aerosol, i dentisti risultano la categoria più a rischio di contrarre la malattia rispetto agli altri operatori sanitari. Per questo motivo delle linee guida sulla gestione della pratica odontoiatrica durante la pandemia sono quanto mai necessarie.

Lo scopo di questo articolo è di analizzare la letteratura disponibile riguardo "SARS-CoV-2" e "COVID-19", comparandola con le linee guida esistenti per gestire i coronavirus nell'ambiente odontoiatrico, al fine di poter dare delle raccomandazioni inerenti prevenzione e controllo dell'infezione da SARS-CoV-2 nello studio odontoiatrico.

(2019-nCoV), then changed in SARS-CoV-2 (1, 2). Since then the virus has spread in 177 countries.

On the 12th of February 2020, the World Health Organisation (WHO) named COVID-19 the disease caused by SARS-CoV-2 and in March 11th, declared it a pandemic (WHO Feb 2020; WHO Mar 2020).

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Healthcare professionals are exposed to this virus that can be spread through contact, droplets and airborne and indeed dentists are one of the most exposed category (Gamio 2020; Peng et al. 2020).

The aim of this article is to collect the available literature and provide guidelines based on literature and guidelines about SARS and MERS epidemic events and from the information so far available on SARS-CoV-2.

A comprehensive MEDLINE search up to 22th March 2020 was conducted using medical subject headings (MeSH) in combination with 'and' or 'or'. The MeSH terms searched were 'SARS-CoV-2', 'COVID-19', 'Dental' and 'Dental Practice'. In addition, the following terms were added, 'Dental Surgery', '2019 -nCoV'.

Because of the lack of scientific papers a comprehensive MEDLINE search up to 22th March 2020 using MeSH 'SARS-CoV-2', 'COVID-19', in combination with 'and' or 'or' was carried out. All the relevant papers regarding infection control and prevention were hand-searched in order to find all possible information that may apply to the dental field.

Review

General features

Coronavirus were isolated for the first time in 1966 from patients with common cold: they are a class of enveloped positive sense RNA viruses with diameter between 60 and 140 nm whose name come from the presence of spike-like projections that may resemble a crown (7, 8).

Coronaviruses are divided in four subfamilies a, b, g, d. SARS-CoV-2 belongs to the B lineage of the b-coronaviruses. It is most likely to have in bats its natural host and appears to have many similarities with the virus SARS-CoV (9, 10).

All ages and genders are potentially affected by COVID-19 even though males seem to be more susceptible to the infection. The range of symptoms goes from a completely asymptomatic state to Acute Respiratory Distress Syndrome (ARDS) and possible death (11). Common clinical features are quite not specific including

high temperature, cough, myalgia, dyspnea, sore throat and conjunctivitis but the virus can be carried by asymptomatic people that are able to infect others (Pan et al. 2020; Rodriguez-Morales; Rothe et al. 2020; Singhal 2020).

Individuals with underlying medical conditions are more susceptible to an unfavourable outcome. The risk of death of patients presenting comorbidities like cardiovascular disease, diabetes, chronic respiratory disease, cancer and COVID-19 is statistically higher (Coronavirus Outbreak 2020).

Intensive care is needed in 25-30% of the cases, with an average hospital stay of ten days. Fatality ranges between 2 and 3 % and it is more common in the elderly and people who suffer from co morbidities (15). Three routes of transmission have been found (table 1).

1) Contact transmission: when someone touches an infected object and subsequently touches his mouth, nose or eyes. 2) Droplets transmission: when the droplets generated by cough and sneezes are ingested or inhaled. 3) Airborne transmission: when droplets mix with the air creating aerosols that may cause infection if inhaled (11, 17). A feco-oral transmission is considered possible as well (18).

Human coronaviruses can stay active on certain surfaces from hours up to few days, but are inactivated within one minute after the disinfection with 0.1% sodium hypochlorite or 62-71% ethanol (19). On the other hand the virus has demonstrated to be viable in aerosols for at least 3 hours (20).

SARS-CoV-2 and dentistry

Possible transmission

Due to the nature of SARS-Cov-2 and its routes of transmission, it is clear that dentists, dental staff and patients are at risk of infection when dental treatments are provided (6).

Contamination can happen directly between operators and patients due to droplets during pre-clinical assessment or discussion of the treatment plan but contamination of air and surfaces plays a strategic role in the diffusion of the virus.

**Table 1****Possible transmission of SARS-CoV2**

Transmission route	Method of transmission	References
Contact	Direct or Indirect contact with mucosae	Kampf 2020
Droplets	Droplets of infected saliva ejected with cough or sneezes	Peng 2020
Airborne	Mix of air and viruses that can be inhaled	Peng 2020
Feco-Oral	Possible transmission through digestive tract	Zhang 2020

It has been demonstrated that dental treatments and in particular dental hygiene procedures produce aerosol and splatters with presence of microorganisms, causing contamination of tools, equipment, gowns, surfaces and air (21, 22).

Contamination of surfaces is unavoidable when aerosol is produced and SARS-CoV-2 can resist several days on surfaces, putting the operators at risk of infection (19). Apparently the virus persists better at room's humidity 50% than 30% (6).

Infection Control

Standard precautions used in dental practices are able to prevent cross-infections originated by direct contacts with body fluids and contaminated surfaces. SARS-CoV-2 though, presenting three routes of transmission including the airborne needs to be dealt with Transmission-Based Precautions (17).

Patient Screening

During the outbreak of SARS-COVs it is not recommended to perform routine dental treatments as the risk of contributing to the spread of the virus is high. Dental care should be provided just for dental emergencies or urgent dental care (6).

Dental emergencies are considered potentially life threatening conditions such as uncontrolled bleeding, cellulitis with swelling that could compromise the airways, facial trauma with possible airways involvement. Hospital emergency departments are overloaded during a pandemic and urgent dental care service should be provided for those patients that otherwise would have to use hospital services. Severe dental pain and conditions like pericoronitis of third molars/surgical

post extractive osteitis should be considered urgent (23).

It is therefore important to perform a telephone triage in order to assess the risks and the severity of the condition. An interview over the phone is then necessary to prevent to bring infected patients into the surgery as much as possible.

The following questions should be asked (6, 24):

1. Have you experienced fever or symptoms like cough, shortness of breath or other respiratory problems in the past 14 days?
2. Have you been in contact with someone affected by COVID-19 in the past 14 days?
3. Have you been in contact with someone reporting fever or respiratory problems in the past 14 days?
4. Did you participate in gatherings, meetings or had contact with many unacquainted people in the past 14 days?
5. Did you travel from areas with Level 3 Travel Health Notice for COVID-19? (this question can be omitted when the virus is declared at community level)

If the patient answers *yes* to any of these questions the treatment should be postponed and the patient invited to contact his physician if the answer to questions number one or two is positive.

Patient Management

When emergency care must be provided, preventive measure should be taken in order to decrease the possible viral load (25). Chlorhexidine is often used in dental practice as an antiseptic, but this will not probably be effective against SARS-CoV2. The virus appears to be vulnerable to oxidation, thus a pre-operative rinse with

1% hydrogen peroxide should reduce the viral load in the oral cavity (6, 19, 23). Other than hydrogen peroxide, Povidone 0.2% has been recommended as rinse, as these two antiseptics have been demonstrated effective to reduce salivary viral load with low risk of causing secondary complications in the oral cavity (26).

Personal Protective Equipment

SARS-CoV-2 infection may occur through direct or indirect contact and aerosol, therefore when the outbreak is at community level Transmission-Based Precautions for contact, droplets and airborne must be taken for all patients. Standard surgical masks are effective against splashes and large-sized droplets but not effective against small airborne particles thus fit-tested N-95 respirators or superior ones are required, even more when aerosol-producing treatments are performed (28, 17, 29, 27).

Protective disposable impermeable gowns and caps are recommended as well as gloves and eye protection. These medical devices should be worn before coming in contact with the patient and discarded safely before leaving the room (28, 17). It is paramount that all the staff is adequately instructed on the use and doffing of Personal Protective Equipment (PPE) as deviation from standard procedures will increase the risk of infection (30).

Air Supply

Airborne Transmission Based Precautions treatments performing aerosol should be treated in Airborne Infection Isolation Room (AIIR) that is a single-patient room designed to maximise the infection control, equipped with special air handling and ventilation capacity compliant with AIIR standards (29). A COVID-19 positive or suspected patient should not be treated in a dental surgery

Table 2

Dental Emergency and Urgent Dental Care (ADA 2020)

	Description	Conditions
Dental Emergency	Potentially life threatening conditions that require immediate care	<ul style="list-style-type: none"> • Uncontrolled bleeding • Diffuse bacterial infection with intra-oral or extra-oral swelling that potentially compromise the patient's airway • Trauma involving facial bones, potentially compromising the patient's airway
Urgent Dental Care	Conditions that require immediate attention to relieve severe pain/infections and to avoid patients to seek for treatment in hospital emergency departments	<ul style="list-style-type: none"> • Severe dental pain from pulpal inflammation • Pericoronitis or third-molar pain • Surgical post-operative osteitis, 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 required prior to critical medical procedures • Final crown/bridge cementation if the temporary restoration is lost, broken or causing gingival irritation • Biopsy of abnormal tissue

**Table 3****Recommended Precautions for SARS-CoV-2**

Transmission	PPE	Indications	Environment	Patient Management	References
Contact	<ul style="list-style-type: none"> • Gloves (Latex or Nitrile) • Isolation Gowns • Disposable cap 	Wear these PPE before any contact with the patient and dispose them safely at the room entrance. Doffing of gowns and gloves must be done following existing guidelines.	<ul style="list-style-type: none"> • Eliminate all unnecessary equipment from the room • Be extremely careful in the disposal of contaminated equipment 	<ul style="list-style-type: none"> • Ask the patient to use hand sanitiser when arrives • Ask the patient to wear a mask until his treatment 	6, 11, 12, 17, 29, 30, 31, 32, 33.
Droplets	<ul style="list-style-type: none"> • Goggles • Face Shields 	<p>Goggles with antifog system have to be preferred.</p> <p>Face shields are more protective, especially if extended from chin to crown</p>	<ul style="list-style-type: none"> • Disposable covers help avoiding surface contamination 	<ul style="list-style-type: none"> • Ask the patient to follow respiratory hygiene and cough etiquette • Use Rubber dam 	
Airborne	<ul style="list-style-type: none"> • N95 Respirators (FFP2) 	N95 Respirators are recommended to avoid airborne transmission. Face fitting is mandatory	<ul style="list-style-type: none"> • Avoid as much as possible to create aerosol • Avoid the use of rotary handpieces and minimise the use of 3 in 1 syringe • If available, patient should be treated in AIIR 	<ul style="list-style-type: none"> • Ask the patient to rinse his mouth with 1% hydrogen peroxide solution 	

that has not the above mentioned equipment as it would be impossible to use airborne precautions. Since infection from SARS-CoV-2 is proven to be possible from asymptomatic patients it is recommended not to treat patients unless it is a dental emergency and, even in case of asymptomatic patients, all PPE for airborne precaution should be used, all possible care has to be used to reduce the amount of aerosol produced and the single patient room has to have the door closed and adequate ventilation to dilute the infected air. Table 2 reports what is recognised as dental emergency and urgent dental care according to the American Dental Association (23). Recommended precautions are summarised in table 3. If the patient is symptomatic or at

high risk to be infected he should attend the practice and, if he does, be asked to wait in a closed room with a surgical mask covering nose and mouth, then the patient should be referred to the hospital or dealt with as regulated by the local health authority (17, 31).

Disinfection

Alcohol based or sodium hypochlorite based disinfectants are active against coronaviruses and they should be used to disinfect not only every component of the dental chair but the surfaces that can be in contact with aerosol spray as well. Removing from the room every not necessary equipment and covering all possible surfaces with disposable covers may help in improving the contact infection control.

Conclusions

Sars-CoV-2 is a very infective virus that causes COVID-19, a disease with a very broad range of manifestations, from lack of symptoms to ARDS and eventually death. Because of the routes of transmission of this pathogen dentists are among the health professionals who are exposed to high risk of infection.

When the disease is at community level, it is paramount that dental care professionals protect themselves, their staff and patients, avoiding any risk of spreading the virus. It is important to remember that completely asymptomatic patients are carriers of the infection.

In this view it is mandatory to postpone any elective treatments and dentists should treat only emergencies or provide care for those whom, if not treated, would need hospital care (table 2). In any case risk assessment over the phone is important to avoid high risk patients to attend the surgery if this is not equipped for proper airborne infection control.

In the dental environment infection may

occur because of direct or indirect contacts with body fluids of an infected person or touching contaminated surfaces and then touching eyes or face. Droplets are a possible route of transmission as well as aerosol generated from dental treatments (table 1). When treating a dental emergency during the outbreak of an airborne transmitted pathogen, Standard Precautions for infection control are not sufficient and Transmission Based Precautions must be applied.

Ideally treatments should be provided in AIIR when treating patients that have possibly come in contact with the virus. Because dental practices are not usually equipped with an AIIR, if an emergency arises it is important to use a single patient room with closed door, ensure adequate ventilation to the room, remove all unnecessary equipment and cover all surfaces that can be contaminated.

Because of the aerosol produced, operator and assistant must wear face fitting N95 respirators, goggles/face shields, isolation gowns, gloves and disposable caps. These PPE must be worn before any contact with the patient and disposed safely before leav-

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ing the room. It is important that dental staff is correctly instructed on the correct use and disposal of protective equipment as incorrect doffing has been linked with increased risk of infection.

Patients should be requested to disinfect their hands on the arrival with an alcohol based hand sanitiser, to follow respiratory hygiene and cough etiquette and to wear a surgical mask until the treatment commences. A rinse with 1% hydrogen peroxide may be helpful to reduce the amount of SARS-CoV-2 in the saliva.

Dental aerosol should be avoided: use of ultrasonic scaler or high speed handpieces is not recommended and the use of the 3 in 1 syringe should be reduced. Rubber dam must be used when possible and should cover mouth and nose.

Dental surgery decontamination has to be carefully performed. The virus is rapidly inactivated by disinfectant containing 0.1% sodium hypochlorite or 62-71% ethanol. Because of the aerosols the room has to be adequately ventilated to reduce the amount of virus present in the air.

SARS-CoV-2 is a challenge for healthcare

professionals. During the outbreak of the disease only emergency treatments are recommended and special precautions and PPE must be used when providing dental care. Training and correct information about prevention and control of airborne infections should be provided to healthcare workers.

Clinical Relevance

COVID-19 is a major concern for public health and dentists are among the healthcare professionals facing the greatest risks of infection.

This article provides an overview on the disease and its routes of transmissions and gives indications for prevention and infection control in the dental environment.

Conflict of Interest

The Authors deny any conflict of interest

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