



How should we as dental surgeons manage our patients during and after the coronavirus pandemic? How can we contribute to reduce it?

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The SARS-CoV-2 (COVID-19 as coined by the World Health Organization [WHO]) pandemic caused by coronavirus started in 2019 in Wuhan, capital of Hubei province, in central China, and has become a major public health challenge all over the world (Meng et al. 2020, Cheng and Shan 2020). As dental professionals, we play an important role in preventing the spread of COVID-19, since we work in close physical proximity to our patients (Gamio 2020). The COVID-19 virus has recently been identified in the saliva of infected patients, and can be transmitted through contact with droplets and aerosols generated during dental procedures. It is extremely important to adopt infection control measures during dental practice, in order to prevent person-to-person spread of the disease, where saliva and aerosols can play a key role (Peng et al. 2020).

The diagnosis of COVID-19 in saliva may be important for rapid and early detection of the infection (Sabino-Silva et al. 2020); further research is needed in this regard to detect COVID-19 in oral fluids and assess the impact of the latter upon transmission of the infection. It is essential to adopt improved and effective preventive strategies, especially on the part of dentists and healthcare professionals who provide treatments that generate aerosols (Sabino-Silva et al. 2020). There is an urgent need for the implementation of strict and effective infection control protocols, with adequate and sufficient resources and means (Meng et al. 2020).

The pandemic, which reached Europe and America a few months after the first cases were detected in China, has caught the rest of the world by surprise, with no sufficient prior preparation to adequately isolate elderly people and individuals with diseases. Likewise,



healthcare professionals have not had the time to receive the isolation equipment they need to avoid becoming contaminated.

Dental professionals are at high risk of suffering nosocomial infections and can become potential carriers of the disease (Fu et al. 2016). As Spanish dental professionals, we therefore must organize and study what our Chinese colleagues have done, in order to learn their intervention protocols and avoid possible errors capable of favoring transmission of the virus. And we must ask ourselves how oral surgeons and dentists must act in this pandemic and how they can contribute to lessen transmission of the disease. Our first aim is to help our patients by closing our dental clinics to routine treatments, and keeping our practice open only to emergencies that cannot be postponed. This is necessary in view of ethical and professional commitment to our patients; the need to decongest public hospital emergency services saturated with COVID-19 infected patients; and the possibility of continuing to work with our teams in our clinics. Is this a good strategy? What must be done to apply it safely?

In a recent letter on this subject, Professor Paul Coulthard (2020), Chairman of the British Association of Oral Surgeons, explained that although it is important to stay calm in the face of adversity - and our training in Oral Surgery prepares us for this in the operating room - we need the best proactive counseling based on evidence and risk assessment in order to manage our patients and ourselves in the context of the current coronavirus (COVID- 19) pandemic.

We need adequate isolation equipment in order to allow dental professionals to work safely without becoming infected or with risk of cross-infection, guaranteeing the safety of the patients and of all the professionals in the clinic and the surroundings. This is a complex issue that not only concerns dental practice but also other specialties such as Ear, Nose and Throat and Ophthalmology (Lai et al. 2020).

General aspects of the disease

The disease first appeared in December 2019 in Wuhan (China), and unprecedented containment and social distancing measures were adopted (Phelan et al. 2020). Singapore made intense efforts to track the contacts of infected patients. China and Singapore closed their dental schools during four months and dedicated their hospital facilities to emergencies. South Korea controlled the infection through early identification based on generalized testing of the population. Other countries such as Italy and Spain have focused on containment measures through isolation and confinement of the population, though without such rigorous control as in China. Russia has few cases following strict isolation. The United States has combined isolation and tests. Germany, with a low mortality rate due to coronavirus, has a health system with more intensive care beds and automatic respirators than other countries, and has focused on isolation measures and tests of the population.

Epidemiological characteristics

Transmission routes. Spread of the infection is from person to person, and also through contact with fomites – though transmission mainly occurs through the aspiration of respiratory droplets that are exhaled when speaking, coughing or sneezing, and by direct contact with the secretions of infected individuals (Chan et al. 2020). In this way the virus can spread from saliva through aerosols (To et al. 2020). The ocular mucosa has also been described as an effective penetration route (Lu et al. 2019). High viral titers have been reported in the oropharynx in the early stages of the disease – a fact that has raised concern about increased infectivity during a period in which the symptoms are minimal and of scant importance (Holshue et al. 2020).

In acute respiratory failure syndrome produced by coronavirus (SARS-Cov), it has been well established that many dental procedures produce aerosols and droplets contaminated with



virus (Wei and Li, 2016). The transmission of COVID-19 through droplets and aerosols is one of the main concerns in dental clinics and hospitals, since it is difficult to avoid the formation of large amounts of aerosols and droplets mixed with patient saliva and even blood during dental treatments. The mechanical devices used in dentistry, such as handpieces, counter-angles, turbines and ultrasound operate with water and air within the oral cavity of the patient, generating large amounts of aerosols of sufficiently small particle size to remain in the air for a considerable time before coming to rest upon surfaces in the surroundings or penetrating the respiratory tract. In this way, COVID-19 can spread through these droplets and aerosols from infected patients to healthy individuals (Peng et al., 2020).

Due to the special characteristics of dental treatments, with the production of abundant droplets and aerosols, and the size of the virus, the standard protection measures adopted in routine dental practice are not sufficiently effective to prevent spreading of the disease. Furthermore, infection can occur as a result of injury with sharp instruments or direct contact between contaminated hands and the oral mucosa (Kohn et al. 2003).

It has been reported that ACE2 is the main host cell receptor of COVID-19 and plays a key role in viral penetration of the cell to cause infection. Curiously, this receptor is strongly expressed by the epithelial cells of the tongue. The cells of the oral tissues that express ACE2 – particularly the epithelial cells of the tongue – can constitute potential points of entry for the virus, thus indicating that the oral cavity may be a potential route for COVID-19 infection. These preliminary findings basically explain why the oral cavity implies a potentially high risk of viral infection, and offer evidence for future prevention strategies in clinical practice and in daily life activities (Xu et al. 2020).

Transmission sources. Although patients with symptoms of COVID-19 infection are the main transmission source, asymptomatic individuals and patients during the incubation period are also carriers of the virus (Chan et al. 2020; Rothe et al. 2020). This epidemiological characteristic of COVID-19 poses a challenge for control of the infection, since it is difficult to identify these people and place them in quarantine on time. Furthermore, patients in the infection recovery period are also a potential source of transmission (Rothe et al. 2020).

Incubation period. The COVID-19 incubation period is estimated to be 5-6 days, but there is evidence that incubation may last up to 14 days, which is the period commonly adopted for the quarantine of exposed persons (Backer et al. 2020; Li et al. 2020). There have been reports of transmission of the infection during the incubation period (Rothe et al. 2020), but there is little information regarding the quantification of viral elimination during the incubation period or subclinical infection phase in comparison with symptomatic infection. It is therefore difficult to assess the risk involved in treating asymptomatic patients.

Individuals with high infection risk. Infection risk is greater among individuals who are in close contact with asymptomatic or symptomatic people with COVID-19 infection, including healthcare workers and other patients in healthcare centers. In Wuhan, during the early stage of the epidemic, an analysis of 138 hospitalized patients with COVID-19 found 57 of them (41%) to have been infected in hospital: 40 were healthcare workers (29%) and 17 were individuals hospitalized for other reasons (12%)(Wang et al. 2020).

Control of infection in dental settings

Effective infection control protocols

The most important measure for preventing the risk of transmission to patients is correct hand hygiene (Larson et al. 2000). COVID-19 can survive on surface for a period between a few hours to several days, depending on the type of surface (metal, plastic, etc.) and the environmental



temperature or humidity. This underscores the importance of thorough disinfection of all surfaces in the dental clinic.

The use of personal protective equipment (PPE), is advised, including a face mask or screen, or eyeglasses, gloves and a gown, in order to protect the skin and mucous membranes from potentially infected blood, saliva or secretions. Since respiratory droplets are the main transmission route for COVID-19, the wearing of FFP2 and FFP3 masks is recommended for routine dental procedures.

Recommendations for dental treatments and oral surgery

In January 2020, the Chinese National Health Commission included COVID-19 among the group B infectious diseases, which also include SARS (Severe Acute Respiratory Syndrome) and influenza A (bird flu). It also suggested that all healthcare workers should use protective measures similar to those indicated for group A, corresponding to extremely infectious diseases such as cholera or the plague. Since then, only emergency dental treatments that could not be postponed were indicated, and always with the adoption of strict infection prevention and control measures. Routine dental treatments were suspended until more information about the disease became available (Li and Meng 2020). At present there is still very little contrasted scientific literature on how to act in the dental clinic.

Relation to professional activity

When China established that COVID-19 spreads from person to person through direct contact or respiratory droplets, all routine dental activities were suspended, and only emergency dental treatments that could not be postponed were indicated. Once the incidence of new cases was drastically reduced, dental treatments were again carried out normally. The Chinese experience indicates that because of the unique characteristics of dental treatments, with the generation of abundant droplets and aerosols, the standard protective measures in daily clinical practice are not effective enough to avoid the spread of COVID-19, especially when the patients are in the incubation phase (Meng et al. 2020).

According to Meng et al. (2020), in 2019 a total of 1098 professionals and 828 students of the Dental School and Hospital of the University of Wuhan treated about 890,000 dental and oral surgery patients. Since 24 January 2020, in the midst of the coronavirus epidemic, and despite the number of confirmed cases in Wuhan, over 700 patients received emergency dental care from 169 professionals, with adequate protective measures. All the dental treatments were recorded on a daily basis, and the patients and their accompanying persons provided their telephone number and address to control possible cases of COVID-19 infection in the future. There were no cases of COVID-19 infection among either the staff or the patients – thus confirming the effectiveness of the measures adopted for the prevention of COVID-19 infection. The four-hands technique was effective in controlling infection. The use of low- or high-volume saliva ejectors was able to reduce the production of droplets and aerosols. Dental procedures should be postponed at least one month in patients recovering from SARS-CoV

(Samaranayake and Peiris 2004). It is not clear whether this same recommendation should apply to patients infected with COVID-19, however. Telephone triage of patients allows the identification of individuals with suspected COVID-19 infection, and it can be decided whether an emergency is involved and an appointment should be arranged.

During the SARS-CoV-2 (COVID-19) outbreak, the Dental School and Hospital of the University of Wuhan had the following resources for the management of dental emergencies: a) A patient assessment (triage) area for measuring and recording the temperature of each patients as a routine procedure. The patients and their accompanying persons received surgical masks. The staff in charge of performing the checks also asked the patients about their health and history



of contacts or travel; b) A waiting area in which the staff wore single-use surgical masks, caps and working clothes, with the observation of a safety distance with respect to the patients of no less than one meter; c) A dental treatment area in which all the assisting staff wore personal protective equipment, including N95 single-use masks (similar to FFP3), gloves, caps, footwear coverings and protective eyeglasses and/or screens. The area was disinfected every 12 hours. It is advisable for patients to perform an oral rinse with 0.2% povidone iodine or 1% hydrogen peroxide before treatment, since doing so may reduce the viral load in saliva. Different studies have shown SARS and MERS to be very susceptible to oral rinses with 0.2% povidone iodine (Eggers et al. 2018), and it has been documented that COVID-19 appears to be vulnerable to oxidation produced by 1% hydrogen peroxide (Selleck et al. 2016).

Patient coughing should be avoided as much as possible, and any coughing should be done carefully in order to minimize the generation of aerosols by the turbine, counter-angle, handpiece, micromotor, ultrasound and use of three-way syringes. Working with rubber dams limits aerosol production. Although the most common radiographic technique in dentistry is the intraoral X-ray, this imaging procedure is not advisable in such patients, because it can stimulate saliva secretion and/or cause coughing. The most adequate radiographic techniques are extraoral panoramic X-rays and cone-beam computed tomography (CBCT)(Marui et al. 2019); d) An isolation clinic designed for patients with suspected COVID-19 infection or who are recovering (though not before one month after hospital discharge), and require dental procedures that produce droplets and/or aerosols. In this regard, the procedures are to be carried out in isolated and well ventilated rooms, ideally under negative pressure, with separate entrances for patients and staff. The dental professionals should wear protective clothing and also use the previously described personal protective equipment. In addition, the isolation area should be disinfected after the treatment of each patient.

The use among healthcare professionals of masks, eyeglasses, gloves and other protective elements against infection can cause skin and/or mucous membrane problems such as acute or chronic dermatitis, secondary infection, or the worsening of underlying skin disorders. The use of hydrating products is recommended in order to secure increased protection (Yan et al. 2020).

The coming new scenario

The coming weeks will bring major changes in medical care in Europe, where the struggle against the virus is ongoing. Isolation and delay seek to control COVID-19 disease and prevent collapse of the healthcare system while contributing to allow the latter to absorb the increase in number of patients. The objective therefore is to stay below the saturation threshold in order to ensure that the pandemic proves less violent and intense. Nevertheless, the number of cases will continue to rise, because “flattening the curve” does not seek to modify the “area under the curve”, and so it can be expected that the pandemic will remain with us for some months.

Dental practice and oral surgery will also experience important changes in the coming months. We therefore need reliable scientific articles, information and consensus on infection risk and treatment protocols. Some professionals in the dental clinic and oral surgeons may experience concern preventing them from offering the care their patients require – and this can only be resolved through adequate scientific knowledge of the subject.

We will have to develop new working protocols in the dental clinic, such as special and more potent aspiration systems to minimize the formation of aerosols and droplets in the environment, with the adoption of screens or isolation measures around the mouth of the patient. A number of devices of this kind are already available on the market, and their use will undoubtedly increase, with the incorporation of improved designs and performance. The dental clinics have been closed in Spain for routine treatments, and they only remain open for



emergency cases. In this current critical scenario we are treating very few patients, with the maximum care possible and with due follow-up of all cases. And once dental clinical activity is restored, we will face great challenges. We must be able to organize ourselves. It is crucial for dental professionals not to resort to abusive purchases driven by panic when professional activity starts again. Likewise, it must be taken into account that we will need many protective masks and screens, gloves, gowns and protective caps.

Given the characteristics of dental treatment environments, the risk of COVID-19 cross-infection may be high among dentists and their assistants and patients, because of close patient-professional communication, short working distances, exposure to saliva, blood and other body fluids secondary to aerosol generation, and the handling of sharp instruments. In the case of dental clinics or hospitals in countries or regions affected by COVID-19 infection, there is an urgent need for strict and effective control protocols to block transmission of the virus. We need to stay calm, plan ahead and make use of adequate personal protective equipment. A balance is required between self-protection and protection of our clinical staff, and social commitment. Due consideration is needed now of the scenario that awaits us presumably towards the confinement is lifted and we can open our practices again. We can ask our suppliers to anticipate the need for the aforementioned materials; ideally these should be produced on a national basis, avoiding dependence upon foreign markets that will experience heavy demands for such materials in the coming months.

The challenge will be great, due to the great infective capacity of COVID-19, and it can be assumed that it will take a long time before oral surgery, our healthcare services and possibly society as a whole can return to normal. We need a collaborative spirit, seeking to protect our staff and our patients – particularly those who are most vulnerable.

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8

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9

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