

REVIEW ARTICLE

DENTISTRY IN COVID ERA, EXPERIENCE OF A SINGLE DENTAL CENTER: A REVIEW

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ABSTRACT

The COVID-19 outbreak has raised concerns about infection control all over the world. Among health workers, dentists are particularly exposed to the COVID-19 infection risk. The aim of this paper is to present a workflow to manage dental procedures already in use at the Dental Center. The proposed workflow accounts for the many aspects of dental practitioners' risk in the COVID-19 era, and focuses on the assessment of patient risk level, a two-phase dental procedure management (remote and face-to-face), and the use of specific preventive measures. No cases of COVID-19 infection were detected among patients and staff of the dental unit in a one month period of time while using this protocol. This workflow seems a promising and effective solution to manage dental procedures during the COVID-19 outbreak, and could be implemented in both public and private practices until the emergency is contained.

INTRODUCTION

In December 2019, in Wuhan city (China), a pneumonia of unknown cause was detected and first reported to the WHO Country office in China on 31 December 2019¹. This pneumonia infection has rapidly spread from Wuhan to most other Chinese provinces and other 24 countries^{2,3}. On 30 January 2020, the outbreak was declared as a Public Health Emergency of International Concern¹. Chinese researchers have quickly discovered and isolated a novel coronavirus, (2019-nCoV), responsible for the onset of pneumonia⁴. On 11 February 2020, WHO announced a name for the new coronavirus disease, COVID-19¹, and increased the assessment of the risk of spread to "very high" on 28 February 2020. On 11 March 2020, WHO General Manager defined the spread of COVID-19 no longer confined to certain geographical areas, but a pandemic spread all over the world⁵.

The first case of COVID-19 in India, which originated from China, was reported on 30 January 2020. On 22

March, India observed a 14-hour voluntary public curfew at the instance of the prime minister Narendra Modi. It was followed by mandatory lockdowns in COVID-19 hotspots and all major cities. Further, on 24 March, the Prime Minister ordered a nationwide lockdown for 21 days, affecting the entire 1.3 billion population of India. On 14 April, the PM extended the nationwide lockdown till 3 May which was followed by two-week extensions starting 3 and 17 May with substantial relaxations. Beginning 1 June the Government has started *unlocking* the country (barring *containment zones*) in three unlock phases.

INCUBATION PERIOD AND SYMPTOMS

It has recently been reported in the literature that the incubation period of 2019-nCoV in humans varies from about 2 to 14 days (possible outliers: 0–27 days)⁶. Viral shedding supposedly begins 2–3 days before symptom onset⁷, after which the viral load decreases monotonically. The virus can be detected after 20 days from symptom onset⁸, however, the live virus can no longer be cultured after 8 days, suggesting a severe reduction in infectiousness⁹. Typical clinical symptoms of the patients who suffered from COVID-19 are fever, cough, and myalgia or fatigue with abnormal chest CT. Less common symptoms are sputum production, headache, hemoptysis and diarrhea^{10,11}.

TRANSMISSION ROUTES

It has been widely documented in the literature that common transmission routes of 2019-nCoV include droplet inhalation generated from coughs and sneezes of infected patients, as well as direct contact with oral, nasal and eye mucous membranes. In addition, studies have shown that 2019-nCoV can be transmitted through saliva¹³; a recent study in Hong Kong on a sample of 12 infected patients showed that coronavirus was present in the saliva of 11 subjects (91.7%)¹⁴.

Authors from Sichuan University suggested that salivary glands might represent a reservoir for COVID-19 asymptomatic infection. In fact, the expression of Angiotensin-converting enzyme 2 (ACE2), a key receptor for COVID-19, is higher in minor salivary

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glands than in the lungs. This could explain the occasional lack of symptoms in infected subjects. Moreover, the positive rate of COVID-19 in patients' saliva can reach up to 100%, and saliva samples can also cultivate the live virus¹³, thus the potential infectivity of saliva should be strongly considered.

STABILITY OF THE VIRUS

A recent in vitro study evaluated the persistence of 2019-nCoV after its nebulization on surfaces such as plastic or stainless steel. It has been shown the virus remains stable up to 72 h on plastic surfaces and up to 48 h on stainless steel surfaces, although the viral count is significantly reduced and it has not been found if these amounts are sufficient to cause infection¹⁴. Dry environments likely impair virus stability the most, and alcohol-based disinfectants (e.g., ethanol) significantly reduce infectivity of enveloped viruses like COVID-19¹⁵.

OPERATOR'S RISK IN DENTISTRY

OSHA (Occupational Safety and Health Administration) published a note on the worker exposure risk to COVID-19¹⁶, identifying four risk levels, from low to very high. Very high-risk exposure level includes occupations with a high potential for exposure to known or suspected sources of COVID-19 during specific medical, postmortem, or laboratory procedures. Healthcare and morgue workers performing aerosol-generating procedures fall into this category.

Dentists routinely perform several aerosol-generating procedures due to the use of different tools, like dental high-speed turbine, spray handpiece, or piezoelectric scaler. These instruments largely increase the aerosol produced inside the work environment, thus exposing both clinicians and patient to the risk of infection.

COVID-19 PREVENTION IN DENTISTRY

It is crucial to improve effective strategies for prevention, especially for dentists, to reduce risk of contagion from COVID-19¹⁷. As of today, one of the main challenges in the dental healthcare is the difficulty in the infected patient identification, due to both the necessity of a proper diagnostic pattern (test swabs) and the chance to manage asymptomatic patients. For this reason, every patient should be treated as infected to avoid any risk. To date, it is not proven that a patient that recovered from a previous infection to COVID-19 developed a complete and lasting immunity to the disease. In fact, reactivation of the disease¹⁸ or even reinfection have been reported¹⁹. Our suggested preventive measures should be followed until herd immunity is achieved and the following patient categories are properly identified:

- A. COVID-19 Symptomatic patient;
- B. Asymptomatic positive patient;
- C. Recovered patient that was previously symptomatic;
- D. Recovered patient that was previously asymptomatic;
- E. Negative Patient:
 - Very high systemic risk **
 - High systemic risk *
 - No systemic risk

** Transplant patients, cancer patients, people with severe respiratory conditions including cystic fibrosis, severe asthma and severe chronic obstructive pulmonary, people with rare diseases and inborn errors, people on immunosuppression therapies, women who are pregnant with significant heart disease (congenital or acquired).

* People aged 70 or older, people under 70 with an underlying health condition (chronic respiratory diseases, chronic heart disease, chronic kidney disease, chronic liver disease, chronic neurological conditions, diabetes, problems with spleen, a weakened immune system due to conditions such as HIV and AIDS or medicines, a body mass index (BMI) of 40 or above), pregnant women⁽²⁰⁾.

EXPERIENCE OF A SINGLE CENTER

To support clinicians in dental management during the COVID-19 epidemic, we want to share our one months of experience based on a workflow centered on the following key points:

1. Assessment of the patient risk level based on a multiparameter analysis related to dental chief complaint, history of COVID-19 exposure, and systemic conditions.
2. Promotion of a two-phase dental procedure management: (a) remote contact via telephone and/or web for preliminary risk level evaluation and tele diagnosis, and (b) face-to-face treatment.
3. Use of the updated preventive measures adopted as from SOP's

CONCEPT OF URGENT AND POSTPONABLE DENTAL PROCEDURES DURING EPIDEMIC

It is well known that the majority of dental restorative, prosthetic and periodontal procedures are considered elective because they are planned and scheduled in advance. In order to avoid a supplemental infectious risk, they must be possibly postponed in all countries

where the COVID-19 epidemic is present until the acute phase ends.

On the other hand, some dental pathologies require urgent treatment, even during an epidemic.

Preliminarily, it is necessary to clarify the concept of urgent and postponable procedures.

They can be divided into two categories as follows:

Category 1. Dental emergencies that are potentially life threatening that require immediate treatment (within 1 h).

- 1A. Uncontrolled bleeding.
- 1B. Diffused soft tissue infection with intra-oral or extra-oral swelling that potentially compromise patient's airway.

Category 2. Urgent dental care (within the 24 h), conditions that require immediate attention to relieve severe pain and/or risk of infection and to alleviate the burden in hospital emergency departments.

- 2A. Severe dental pain from pulpal inflammation.
- 2B. Pericoronitis or third-molar pain.
- 2C. Surgical post-operative osteitis.
- 2D. Abscess, or localized bacterial infection.
- 2E. Tooth fracture resulting in pain or causing soft tissue trauma.
- 2F. Dental trauma with avulsion/luxation.
- 2G. Dental treatment required prior to critical medical procedures.
- 2H. Final crown/bridge cementation if the temporary restoration is lost, broken or causing gum irritation.

Our advice is pointed toward the non-urgent treatments, assuming that even non-urgent procedures will be eventually reintegrated in the common practice, preferably once a better understanding of the COVID-19 immune response is achieved. While we suggested in its Interim Guidance to delay the treatment of non-urgent dental procedures indefinitely during the COVID-19 acute phase, we do not believe this behavior will fit the post-acute phase of the epidemic.

Clinicians should be ready to manage non-urgent dental care to avoid a worsening in the clinical conditions that may lead to urgent or non-treatable scenarios.

Patients appointments should be limited in number, aiming to group as many non aerosol procedures as possible in the single access. This behavior would lead to a more cost-effective practice, mostly due to an optimized use of the ppe that could otherwise be expensive.

For instance, we suggest to complete endodontic treatments in the fewest number of appointments, while restorative and surgical procedures should be performed per quadrant.

Use of resorbable sutures is recommended.

Aerosol-generating procedures, like air-flows or tooth preparation for dental prosthesis, represent the critical moment in the dental practice in the COVID-19 era and should be managed carefully and performed last.

OPERATORS MANAGEMENT

Three units were involved in each patient dental management:

- b. One Janitor member outside the operative area;
- c. One nursing staff member inside the operative area;
- d. One clinician.

Our advice is to shave facial hair, to keep the fingernails short, and avoid the use of any accessories such as watches, rings, bracelets, etc.

It is also advised to wash hands with alcohol-based hand sanitizer for at least 20 s before and after each treatment, and limit contacts with surfaces, computers, drawers etc., as much as possible.

Moreover, clinicians should avoid touching their faces, including eyes, nose and mouth. Sterile preparation criteria should be applied on every step of the clinical practice, including the operator dressing–undressing routine.

The clothing must include: shoe covers, disposable caps, disposable gowns, disposable gloves, protective glasses and visors, and protective masks.

PATIENT MANAGEMENT

An updated literature regarding dental care in the COVID era identified four phases in the patient management:

Patient triage, patient admission into the practice, dental treatment, and patient discharge.

To highlight these four key moments, we opted for a two-step patient management: remote (patient triage) and face-to-face (patient admission into the practice, dental treatment, patient discharge).

In the first step, every patient was managed remotely (e.g., phone, texts, website) adopting a dental triage that consists of an interview able to identify three parameters:

Chief complaint in order to identify emergencies, urgent, undeferrable and/or postponable dental procedures :

1. “Emergencies” : within 1 h, managed through E.R

2. "Urgent" : within 24 h
3. "Undeferrable" : possibly more than 24 h(follow up of existing ortho & implant cases)
4. "Postponable" : to be treated remotely.

COVID-19 personal & travel history obtained through the following questionnaire:

- a. Are you or were you infected with COVID-19?
- b. Have you had a fever, cough, cold, breathing difficulties, muscle pain or headache in the last 28 days?
- c. Have you had contacts with individuals who have had these symptoms in the last 28 days?
- d. Have you been in contact with infected individuals in the last 28 days?
- e. Did you undergo a swab test that returned a positive result for COVID-19?
- f. Have you been in a previously quarantined area?
- g. Have you had contact with individuals coming from quarantined areas?

Systemic risk category, as mentioned above:

- A. COVID-19 Symptomatic patient;
- B. Asymptomatic positive patient;
- C. Recovered patient that was previously symptomatic;
- D. Recovered patient that was previously asymptomatic;
- E. Negative Patient:
 - Very high systemic risk
 - High systemic risk
 - No systemic risk

The interview may be supplemented with additional data, such as personal medical records or clinical pictures that are transmitted to the clinicians via electronic means, such as e-mail, instant messaging platforms, etc.

In case of postponable procedures, remote treatment should focus on two key concepts: advice and self-help. Patient should be informed of the current preventive measure and separation protocols, and clinicians must provide advice and self-help, which might involve the prescription of antimicrobials and analgesics.

In case of a COVID-19 positive symptomatic patient requiring drug prescription, eventual antibiotic and analgesic therapy should be managed together with the clinician in charge of the patient (e.g., family doctor, oncologist, etc.).

Appointments were scheduled in order to admit a single patient per time inside the clinic areas, inviting patients to avoid the presence of unnecessary accompanying persons and to come wearing disposable gloves and mask.

Clinicians should manage only one patient at a time, avoiding contact with other patients and granting a sufficient spawn of time for the work environment sanitation. Our advice is to identify a defined and specific pathway that patients from each risk category must follow whenever they transit inside the clinic rooms, from admission to discharge. Every movement has to be followed by the nurse for safety means.

In the second step, as soon as the patient arrived they were provided with an alcoholic hand sanitizer, they were admitted to a "standby area". Social distancing measures were applied. A PPE Kit must be provided.

Then registered body temperature without coming into contact with them, using infrared thermometers.

They were then invited to waiting area, the interview was then repeated and, in case of discrepancies with the info previously acquired, patient was eventually rescheduled to grant appropriate separation and prevention protocols, and informing the local COVID-District hospital.

Once accessed the operating area and before the exploration of the oral cavity, the patient had to remove the disposable mask, and was invited to rinse for 30 s with a 1% solution of hydrogen peroxide or with 1% povidone iodine. Povidone-iodine may inactivate COVID-19, thus reducing its infectivity.

Use of disposable (single-use) devices such as syringes, to prevent cross contamination is encouraged.

Radiographs: avoid taking iopar, use apex locator

When intraoral imaging is mandated, sensors should be double barriered to prevent perforation and cross contamination.

Dentists should use a rubber dam to minimize splatter generation (of course, this is the standard of care for nonsurgical endodontic treatment). It may be advantageous to place the rubber dam so that it covers the nose.

In this time of public health crisis, endodontic practices can dilute the sodium hypochlorite irrigant solution to 1% concentration, to extend the supplies without compromising on treatment outcome.

Dentists should minimize the use of ultrasonic instruments, high-speed handpieces, and 3-way syringes to reduce the risk of generating contaminated aerosols.

Dear patient,

The following suggestions and advices aim to reduce the risk of COVID-19 infection that you may incur when sharing your home environment with other people.

A. Hand-washing

Coronavirus is also transmitted through the hands. This concept is not often kept in mind when dedicating to daily oral self-care. As already recommended also by WHO, it would be useful to preliminarily wash hands properly.

B. Replace toothbrush and Toothpaste

To avoid contagion with previously infected saliva, it would be advisable to replace the toothbrush, toothpaste and floss with new ones. Sharing even one of the aforementioned medical devices for home oral hygiene among family members could expose every component to the risk of contagion.

Each member of the family should have their own toothbrush, preferably of a different color from the others, as well as their own toothpaste and dental floss. Similarly, the handpiece of the electric toothbrush or Waterpik should not be shared.

C. Rinse toothbrush

After brushing teeth correctly, carefully remove all the toothpaste residues with hot water. These residues can retain microorganisms after brushing.

D. Pay attention to glasses or containers for toothbrushes

In families, people often share the same environment for daily personal hygiene. Mistakenly, in a home environment, we used to put toothbrushes or the heads of the electric toothbrushes of all family members inside the same glass or tray. This is an incorrect practice, since it would expose others to the risk of infection. Any infected saliva on the handle or on the bristles could come into contact with the other toothbrushes, infecting them. For this reason, it is suggested to prepare a dedicated glass for each member of the family, placed far enough from the others. This will ensure that any contact will be avoided. It would also be advisable to avoid storing toothbrushes inside closed containers or drawer in these environments, it is difficult to maintain infection control. It is therefore recommended to keep toothbrush inside clean glasses without using caps, especially if previously used.

E. Getting sick requires starting over

Replacing everything and properly cleaning surfaces

and medical devices would be the optimal solution in case of sickness.

DISCUSSION

The rampant spread of SARS-CoV-2 worldwide increases the likelihood that dental health care professionals will treat this subset of the patient population. Universal precautions are crucial to minimize the spread of this virus and its associated disease. Endodontists are in a unique situation as and management of odontogenic pain, swelling, and dental alveolar trauma in suspected or known COVID-19 patients. It is worth noting that case presentations can be dynamic, and there is a good chance that dental practices might treat some of the patients with asymptomatic COVID-19 infections since the incubation period can range from 0 to 24 days and most patients only develop mild symptoms. Thus, every patient should be considered as potentially infected by this virus, and all dental practices need to review their infection control policies, engineering controls, and supplies. Health care providers must keep themselves up-to-date about this evolving disease and provide adequate training to their staff to promote many levels of screening and preventive measures, allowing dental care to be provided while mitigating the spread of this novel infection.

CONCLUSION

In conclusion, health care professionals have the duty to protect the public and maintain high standards of care and infection control. This new emerging SARS-CoV-2 threat could become a less pathogenic and more common infection in the worldwide population. Indeed, it is predicted to persist in our population as a less virulent infection with milder symptoms, if it follows the same evolutionary pattern of the other coronavirus infections (ie, SARS-CoV and MERS-CoV). Thus, it is important to make informed clinical decisions and educate the public to prevent panic while promoting the health and well-being of our patients during these challenging times. The prudent practitioner will use this review as a starting point and continue to update themselves with useful online information as this outbreak continues

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