



The practice of oral and maxillofacial radiology during COVID-19 outbreak

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Abstract

The current coronavirus disease 2019 (COVID-19) outbreak has brought substantial challenges to the world health system, including the practice of dental and maxillofacial radiology (DMFR). DMFR will carry on an imperative role in healthcare during this crisis. This rapid communication has collected and evaluated all the best current evidence and published guidelines as well as professional recommendations to help maxillofacial radiologists and dental practitioners for safer radiological and imaging examinations on healthy, suspected, or confirmed COVID-19 patients during outbreak. Some strategies have been depicted including procedural indications, infection control, and correct employment of personal protection equipment along with evoking the proper practice environment during and after the COVID-19 outbreak.

Keywords Radiology · Dental radiography · COVID-19 · SARS-COV-2 · Dentistry

Introduction

In mid-January 2020, World Health Organization (WHO) introduced novel RNA coronavirus (SARS-COV-2) as the main cause of acute respiratory distress syndrome which was later named as coronavirus disease 2019 (COVID-19). In late January, WHO announced the COVID-19 outbreak as a major global public health concern. In late March, it has been reported that COVID-19 has spread and affected more than 200 countries and territories around the world [1]. This highly transmissible disease has involved over 8 million people, caused death of more than 436,000 individuals, till June 15th, 2020 (<https://coronavirus.jhu.edu/map.html>).

There is tremendous endeavor to approach for an early diagnosis [2] and also to find the best treatment all around the world. Social distancing measures have been considered by many countries to restrain the spread of infection. Providentially, up to now, it is believed that about 80% of the involved cases present no clinical symptoms [1]. Fever,

fatigue (myalgia), dry coughs, and acute respiratory problems are considered to be the known symptoms in symptomatic cases [1]. The COVID-19 pandemic is creating significant challenges to the global health system, including the practice of dental and maxillofacial radiology (DMFR); however, this eminent profession will continue to play its important role in patient care, during this crisis.

The management of radiological examination

The management of radiographic examination is dissimilar in different care settings considering the radiographic equipment available. Therefore, some general recommendations are given which should be adapted for each individual centre [3].

Throughout the COVID-19 outbreak, after accurate triage of patients, radiological examinations should preferably be performed for those who require emergency dental treatments. These instances more likely include life-threatening emergencies such as airway restriction or breathing difficulties due to facial swelling or other urgent situations such as facial trauma or dentoalveolar injuries, fractured teeth or tooth with pulpal exposure, or dental and soft tissue infections which may cause systemic effects and so on [4, 5].

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Diagnostic quality radiographs should be provided with simple radiographic examinations to reduce the staff-to-patient contact as much as possible. Sectional or full-width dental panoramic radiography (DPR) is the most preferred imaging modality during outbreak when only emergency treatment is being provided for patients [3]. Sectional panoramic imaging is indicated for localized dental pain and swelling and full-field DPR is recommended for more generalized dental problems or when the patient is under general anesthesia [3, 6]. Oblique lateral (extraoral) radiographs can be recommended if proper facility is accessible. Small volume Cone Beam CT (CBCT) can be employed for intricate cases or when diagnostic information has not been obtained by DPR [3]. After a proper risk assessment, intraoral radiographs can be considered carefully where extraoral radiographs are not available. A previous history of strong gag-reflex with intraoral radiographs should be concerned. During intra oral radiography, irritation of the airway should be avoided to reduce the risk of coughing or gag reflex [3, 7]. In these situations, occlusal radiography may be regarded as a substitute modality to periapical radiography [3]. Moreover, simultaneous cooperation of two operators is recommended in oral radiographic examinations in which one is responsible for patient positioning and equipment adjustments and the other one responsible for exposure, computer operation. Unwrapping and handling the unwrapped films or plates can also be done by collaboration of these two operators [3].

Radiological examinations for inpatients and supine patients in hospital

Employing DPRs and CBCT scans have been proposed to have priority over intraoral radiography in patients during COVID-19 pandemic [8]. Since imaging by DPR and CBCT requires the patient to stand or sit immobile during the exposure period (40 s for some CBCTs), these modalities may not be suitable for some supine patients with emergency situations in hospital. With the known advantages of intra oral radiography and its best diagnostic efficacy, Dave et al. [5] stated that this modality can be used by employing a handheld (mobile) dental X-ray unit [9]. Besides, for patients in acute stages who actively shed the virus, entering the radiological wards for CBCT and DPRs, would be challenging and very high risk for possible transmission of COVID-19 through respiratory droplets [5].

Although saliva has a potential role in prevention of COVID-19 [10], stimulated saliva secretion, coughing, gag reflex during intra oral dental imaging can be of crucial concern [8].

Nevertheless, the aerosol and droplet generation through possible gag reflex and coughing during intraoral

radiography may be controlled by proper management and different techniques [7] by dental practitioners and radiography staff. For those patients who may not tolerate intraoral films or receivers, a sectional DPR would be rational in emergency situations [5]. However, considering lower resolution, motion and metallic artifacts, and most importantly, much higher radiation dose [11], it is suggested that CBCT cannot be considered as an alternative modality to intraoral radiography [5].

Infection control

It is crucial to scrutinize the routine guidelines on prevention measures and infection control in oral radiology departments to reduce cross-infection and protect practicing professionals [12]. A study has reported that only 40% of radiology department professional staff had adequate knowledge of infection control practice [13].

Since specific drugs and vaccines are not available during COVID-19 outbreak, protection measures on controlling transmission routes such as saliva droplet, aerosol transmissions, and contact surface in oral radiology departments are the principal stamina [12]. The reception and examination area should be well ventilated by employing proper ventilation apparatus. After the completion of the examination, the contact surface and the air (if possible) should be carefully sterilized. A considerable time space (more than 30 min) may be considered between examinations of patients while the duration of the examination should be reduced as much as possible [12].

For infection control of DPR and CBCT units, barrier wrapping of control panel the surfaces contacting the patient is recommended. It is suggested to cover the bite pegs but preferably not to use them by aligning the lip commissure and asking the patient for an edge-to-edge occlusion [3]. A COVID-19-positive patient should wear a face mask during DPT, and a chin rest should be used instead of a bite peg, and aligning to the canine prominence, or alar line. The barrier wrapping should be removed after radiological examinations are completed, then the contaminated surfaces should be wiped down using disinfectant regarding the protocols [3].

For intraoral radiography, dirty and clean films/sensors and film holders should be kept in different places. A no-touch technique should be employed for processing the imaging films or the photostimulable phosphor plate (PSP) sensors [3]. An operator should dry and then disinfect the intraoral packet with a recommended disinfectant. Then, opens the packet and drops the image sensor plate or film onto a clean surface. Another operator then transfers the sensor/film to the processor. Using gloves during these

procedures and disinfecting the contaminated surfaces after completion of imaging is recommended [3].

Staff safety

The radiologists and their radiography staff should also protect themselves using appropriate personal protective equipment (PPE) following COVID-19 infection control guidance [5, 14]. Local guidelines for appropriate use of PPE during reception and imaging procedures should be followed. While the safety of radiologists and operators should be considered and not compromised, the use of PPE should be optimized to prevent shortage of supplies. Some PPE items can be reused (such as N95 and K95 facial masks). If possible, it is suggested that all referees should wear low fluid resistance face masks on their arrival to the waiting room or centre. This would protect others from respiratory droplets and saliva, which are known to be the most important cause of COVID-19 infection [15].

The diagnosis of potential acute or chronic sialoadenitis after COVID-19 infection

Although no direct evidence presented, Wang et al. [16] hypothesized that the COVID-19 infection might lead to possible inflammatory lesions in salivary glands. They speculated that COVID-19 may cause acute sialoadenitis in its acute phase and subsequently lead to chronic sialoadenitis due to fibrosis repairmen. They stated that animal model studies have proved that the salivary ducts are the first invasion line for SARS-CoV infection and human clinical studies show that this virus can be detected early in saliva specimen [16].

Based on this hypothesis, discomfort, swelling, pain, or secretory dysfunction of the salivary glands can be possibly considered as the early symptoms of COVID-19. They suggest that patients involved with COVID-19 may suffer from acute and chronic sialoadenitis [16]. DMFR professionals should consider the proper examination of salivary glands of patients who recovered from COVID-19 during follow-up visits, particularly when patient suffers from chronic obstructive sialoadenitis and salivary secretion dysfunction [16].

For possible chronic obstructive sialoadenitis, they recommend to employ ultrasound imaging, sialographic examinations, magnetic resonance imaging (MRI), or salivary gland endoscopy to investigate the shape of the salivary gland and to diagnose possible stenosis of ducts. Moreover, salivary flow assessment or radionuclide imaging have been suggested to verify the secretory function of salivary glands in case of potential hyposalivation [16].

Conclusions

Oral and Maxillofacial radiologists have an imperative role to play in the care of patients during COVID-19 pandemic. By managing relevant imaging strategies and infection control policies, radiologists, staff, and out- or inpatients will be safely protected from COVID-19 virus during outbreak. Digital imaging and teleconsultations are emphasized to reduce the risk of cross-infection. DMFR professionals should follow-up COVID-19 patients after recovery for possible acute or chronic sialoadenitis.

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Compliance with ethical standards

Conflict of interest statement Shahram Hamedani and Nima Farshidfar declare that they have no conflict of interest.

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