

Orthodontic Treatment Guidelines during the COVID-19 Pandemic; Mini Narrative Review

Khalid Aldhorae^{1,2}, Ali Mohammed M. Abdulrab³, Mohammed M. Al Moaleem^{4,2*}, Abdullah J. Hakami⁵, Yaser Ali A. Jad⁵, Loay Ebrahim Najmi⁶, Rayan Ali H. Nahari⁶, Hamza K. Khan⁷

¹Orthodontic Department, Faculty of Dentistry, Tamar University, Tamar, Yemen

²Faculty of Dentistry, University of Ibn al-Nafis for Medical Sciences, Sana'a, Yemen

³Department of Oral and Maxillofacial Surgery, College of Dentistry, Aden University, Yemen

⁴Department of Prosthetic Dental Science, College of Dentistry, Jazan University, Jazan 45142, Saudi Arabia

⁵Dental Interns, College of Dentistry, Jazan University, Jazan 45142, Saudi Arabia

⁶6th Year Dental students, College of Dentistry, Jazan University, Jazan 45142, Saudi Arabia

⁷Private Clinic, Almadinah Al Menoarah, Saudi Arabia

DOI: [10.36348/sjodr.2022.v07i11.007](https://doi.org/10.36348/sjodr.2022.v07i11.007)

| Received: 19.09.2022 | Accepted: 24.10.2022 | Published: 16.11.2022

*Corresponding author: Mohammed M. Al Moaleem

Faculty of Dentistry, University of Ibn al-Nafis for Medical Sciences, Sana'a, Yemen

Abstract

The coronavirus (COVID-19) has challenged healthiness careers and techniques and has induced several rates of reaction and forms of reaction worldwide. The responsibility of dental specialists in inhibiting the transmission of COVID-19 is seriously significant. Dental professionals suffered a proper duty to decrease routine care for fear of increasing COVID-19 among their patients and elsewhere but were understandably concerned about the economic concerns. This paper explores comments raised by orthodontists worldwide about offering safe orthodontic service during the ongoing COVID-19 pandemic, as orthodontic treatment procedures increase the possibility of transmission. As proximity between the orthodontist, dental assistant, and patient is required for treatment, it jeopardizes the health of all the parties involved. In this paper, we will highlight five issues: general principles, communication, dental clinic admission, infection control measures, and applied orthodontic treatment emergency. Upon reviewing these issues, we will then attempt to formulate appropriate orthodontic treatment guidelines applicable in this specific era.

Keywords: COVID-19, guidelines, orthodontic emergency.

Copyright © 2022 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

INTRODUCTION

The World Health Organization announced the emergence of a new pneumonia-causing pandemic in 2019—COVID-19 [1] caused by the 2019-nCoV or SARS-CoV-2 virus [2, 3]. In this context, orthodontists face significant challenges and life-threatening situations should they continue to offer orthodontic services and emergency treatment to patients, such as those involving a reverse-curve of spee, a canine retraction procedure, active orthodontic appliances, or any other emergency treatment require dental admission. The scattered droplets of blood, saliva, and water in the air that normally result from orthodontic procedures have raised the risk of cross-infection [4]. The risk of working in a dental environment is that the COVID-19 virus has been detected in saliva, which in turn jeopardizes all persons in a dental clinic [5]. In

recent studies, pediatric orthodontic patients have been reported to be asymptomatic carriers; this comprises a large portion of orthodontic patients [6, 7]. Patients and their guardians can also be considered carriers, posing a significant risk when the virus they carry is in its latency period and is highly contagious [8].

Most orthodontic patients need to follow up their treatment. Strict infection protocols with stringent protective measures for all parties are a must. Non-symptomatic patients must be treated as infected ones as there is a probability that they carry the COVID-19 virus at its incubation period [9]. Thus, in such circumstances, orthodontists must organize their work environment to optimally minimize the COVID-19 transmission risk. We have highlighted five issues that

must be addressed in order to achieve safe treatment delivery:

1. General principles

- Under any circumstance, neither than orthodontic emergency treatment is provided.
- Patients with non-active orthodontic appliances should be remotely serviced.
- All patients must contact orthodontic clinic to resolve and evaluate their complaints.
- Orthodontic clinics must follow the critical infection control guidelines designed for pandemic control [10].
- Aerosol generation procedure must be avoided unless absolutely necessary.

2. Communication

Standard communication means must be established between orthodontists and their patients. If by phone, the consultation must be registered and supported with images or video of the chief complainant sent by WhatsApp (Facebook Inc.,

Mountain View, California) application. The data provided must be kept in the patient's file.

After their communication, the orthodontist will evaluate the case accordingly, they will determine whether the case needs remote management or is an emergency situation necessitating admission to the clinic. Thus, the orthodontist will give instructions to the patient to solve their issues with effective treatment. If the patient faces an emergency, the orthodontist will instruct the patient to undergo a 14-day quarantine with relief emergency instructions to sustain themselves until admission (see Table 1). The patient will be instructed to measure their temperature every eight hours. If their temperature was above 37.5°C, this may be considered a sign of a COVID-19 infection [11]. Four questions can further guarantee their safe admission. These questions are regarding their history in the last two weeks of the following: 1) any fever or use of anti-pyretic medication; 2) signs of a flu or of any upper respiratory tract infections; 3) travel between cities with evidence of an infection; 4) contact with a person suspected or infected by the virus.

Table 1: Suspected Orthodontic Emergencies

Type of appliance	Sub-types	Complaint	Subsequent Instructions
Removable appliance	Functional	The appliance does not fit well or is broken	Send a photo of the appliance outside and inside the mouth. orthodontist will accordingly decide to suspend treatment or to take another impression at the orthodontic clinic.
	Aligner	Broken or lost aligner with availability of previous or subsequent aligners	Return to previous aligner if it fits or switch to the next one and consult the orthodontist for more a convenient plan.
		To stop or move to a second aligner	If there are no problems with the current aligner and the subsequent aligners are in the patient's possession, they will be suggested to continue with subsequent aligner until the treatment phase.
	Retainer	Broken or lost retainer	Consult orthodontist to schedule appointment.
Fixed appliance	Straight wire appliance	Loose bracket	If the bracket remains flush against the tooth, it can be left as it is. If it appears to be separating from the archwire, then remove the hanged bracket with eyebrow tweezers and take a second photo. If the bracket is anchored with an elastic band, immediately suspend the elastic.
		Loose band or tube	Remove it carefully with tweezers and schedule an appointment.
		Soft-tissue irritation from the bracket	Apply wax over the irritated bracket. The orthodontist will instruct the patient to use an appropriate topical analgesic for the ulcerated area.
		Protruding distal wire	With a disinfected wire cutter or nail clipper, cut the distal end of the wire. If this is not possible, apply wax over the end of the distal wire. If the wire has slipped from one side, reposition it with tweezers.
		Loose elastic ligature	Slowly return the elastic to its place with eyebrow tweezers. If the elastic can't be returned or the patient has doubts about inadvertent bracket debonding, schedule an appointment
		Loose metallic ligature	If the ligature is not exactly loose but has protruded out of its bracket, or is completely loose, gently use a pencil eraser to reduce the ligature, and use wax to relieve the area of irritation.
		Periodontal abscesses	The orthodontist will evaluate the case and may suggest

Type of appliance	Sub-types	Complaint	Subsequent Instructions
		around the molar band	admission to remove the cause, for example, a band under the gum, and appropriately prescribe antibiotics and analgesics.
		Broken or loose elastic chain	The protruding part can be cut off using nail clippers or tweezers
		Fixed retainer debonding	If the retainer is loose, remove it from the mouth. If the patient has a removable retainer, use it until the next appointment.
		Irritation from gold chain	Wrap a piece of dental floss around the last link at the loose end of the chain to the bracket and schedule an appointment
		Broken inter-maxillary spring	Using dental floss, wrap the end of the spring to the appliance and remaining archwire and brackets. Schedule an appointment.
		Swallowing of a piece of appliance	Distinguish whether the missing piece had been swallowed or inhaled, noticed by difficulty in breathing or sudden coughing. Upon an emergency, urgent admission to a hospital is a must. Ingestion of the bracket or any other pieces of orthodontic appliance will undergo normal digestion.
	Fixed appliance activated by patient (e.g., face masks, head gears, lip bumpers, palatal expander)	No complaint or existing complaint	The priority must be to suspend the treatment to avoid future emergencies.
		Loose or broken palatal/lingual expander	If the expander is partly attached inside mouth, return it to its position, but appliance activation must suspend. If the expander is fully loose, keep it in a safe place until it is re-fixed in a dental clinic.
	Pre-activated fixed appliance (e.g., Pendulum, Forsus, Distal Jet appliance, trans-palatal bar)	No complaint or has swelling or pain	Take regular photos every three weeks. If there is a complaint, schedule an appointment.

3. Dental admission

The reception area must be properly ventilated, the reception desk must be secured with a plexiglass separator, and no more than two receptionists valid. One receptionist must be responsible for contacting the patients by phone, and the other must be responsible for receiving patients at the clinic. Both must wear personal protective equipment (PPE) at all times. The patient and their guardian must undertake strict safety protocols as well. They must wear masks, and if they hold any items, they must be instructed to place them in a specially sterilized area. Upon arrival, the patient's complete medical history must be taken in addition to a special coronavirus questionnaire and a true emergency questionnaire. The patient's temperature should be measured via a non-contact thermometer aimed at their forehead or through infrared sensor cameras [12]. Any abnormality in the questionnaires' answers or their body temperature will require a further delay of two weeks.

The patients and their guardian must clean their hands with alcohol gel [13], and be given disposable gloves, masks, shoe and head covers, and gowns to wear before being guided to a waiting room. The distance between visitors in the waiting room must be at least six feet [14], and they must keep their hands

away from their face and limit physical contact. The waiting room must be properly ventilated and disinfected with 1% hypochlorite every hour.

Any means of entertainment in the waiting room must be removed, except the television which can be managed remotely by the dental clinic staff. When the patient's turn arrives, they must wear their disposable PPE throughout the treatment procedure and discard it after the treatment is finished. The visitors' used PPE must be discarded in a special closed container.

4. Infection control process

Dental staff measures

Dental clinic staff must attend to the clinic while wearing disposable surgical masks and gloves. Upon arrival, shoe covers must be worn, used masks and gloves must be replaced, and then used items must be thrown into a special closed container. The staff must undertake rigorous hand cleaning with a 60–95% alcohol-based solution for more than 20 seconds and then wear a fresh surgical mask. At the exchange room, lockers must be disinfected, and the room must be ventilated. Washable clothes and footwear that the staff prefer to use, as well as any personal items, should be disinfected and put into their lockers. Maintaining

social distance between dental workers is also strongly recommended. All dental staff members must wear disposable PPE including face shields and triple surgical gloves, maintain a distance of 1–2 meters from the patients, wear N95 masks or regular filtering face piece particles (FFP2) masks, head covers, and safety glasses [15], and all of these measures must be tested for fitness [16]. Waterproof shoes are advised as there is a risk of being infected via the removal of non-waterproof shoes or via the floor during work [17].

Hand washing after coming into contact with any surface must be mandatory. The removal of PPE must follow standard guidelines as there is a risk of infection transmission during its removal [18] and they must be undertaken in an isolated room with low air pressure and high-efficiency air filters. All dental staff members should measure their body temperature at the beginning of the working day and at the end. If there is an increase in temperature, or if at least one of them doesn't feel well, the worker must stop work until they feel better while meticulously monitoring physical signs [19].

Orthodontic clinic surfaces and floors

Coronavirus can survive from 3 hours to 3 days in the air and on different surfaces [9]. As such, the National Health Commission of the People's Republic of China has designed protocols on Surface Cleaning and Clinical Atmosphere Maintenance to be followed during the pandemic [20]. Following this, all surfaces in orthodontic clinics should be thoroughly disinfected using sodium hypochlorite at a concentration of 0.1–0.2% for 1 minute [10,21, 22] with small surfaces being disinfected with ethanol in concentrations of 62–95% [21, 22].

All the control panels of elevators, ventilation, and lights, doors handles, PC keyboards, and remote controls must be disinfected along with the chairs in the waiting rooms. All room decorations must be disinfected using 1% sodium hypochlorite.

In the operating room, disinfectant using hypochlorite at 1% or alcohol in a 70% solution must be sprayed and left to dry for at least 60 seconds [21]. For the changing rooms after treatment, in rooms without windows, the air must be suctioned from the room and left for 50 minutes [23]. A room of 20 m² with a window of 2 m² must be opened out for 10 minutes after each patient has used it [24]. All air filters must be disinfected at the end of the working day with 1% hypochlorite.

Dental chair, equipment, materials, and goods

Every non sterilized part of the dental chair must be wrapped with disposable covering. All items must be handled carefully, with disposable instruments and any other items used for the patient's mouth to be considered hazardous medical waste [16]. An oral suction, dental turbine, or any other part of the waterline unit must be removed immediately after the treatment is finished. Exposed instruments, whether used or unused, must immediately be sterilized and the disposable ones must be discarded. Protocols for other materials and goods are illustrated in Table 2. All waste materials must be placed in a double layered garbage bag, knotted well, and sprayed with 0.5% sodium hypochlorite before being put into special closed containers.

Table 2: Disinfection and Sterilization Protocols after Orthodontic Treatment

Tool	Sterilization method	Disinfection method
Goggles, PPE, and visors		Wipe with 62–71% hydroalcoholic solutions or soak for at least one minute in a 1% hypochlorite or 0.5% H ₂ O ₂ solution
Orthodontic pliers	Steam autoclave	Thermal/ultrasound bath or wipe with 2% glutaraldehyde/ 0.25% peracetic acid
Archwire	Autoclave	
Orthodontic markers	Autoclave	2% glutaraldehyde
Photographic retractors		Washer-disinfectant
Tungsten carbide debonding burs		Washer-disinfectant
Orthodontic bands	Autoclave	
Mini-screws and mechanical properties of elastomeric chains	Autoclave	
Documents		H ₂ O ₂ vaporizer
Dental unit waterline		Flush with water for 2 minutes or use disinfectants

Orthodontic treatment procedure

Patients should enter the treatment room alone unless there is a necessity to have their accompanied, in which case only one attendant is allowed. The guardian must wear disposable PPE during the treatment and take it off at the end. When the patient enters the treatment room, their surgical mask must be removed and kept beside them until the treatment is complete. The patient

will then be instructed to use a 1% hydrogen peroxide or 0.2% povidone mouth rinse [25]. Patient screening will be performed using disposable diagnostic instruments and the use of four-handed techniques. Further, any aerosol generation activities will be minimized. If the use of high-speed hand pieces is necessary, anti-retraction handpieces and high suction volumes are strongly recommended [26]. In case

diagnostic radiology is needed, extra-oral radiography will be performed [27, 28]. If local anesthesia is necessary, topical anesthetic gel will be recommended [29]. Impressions taken must be immediately disinfected and carefully handled during pouring [30]. The diagnostic casts should be disinfected before work is started on them.

CONCLUSION

Orthodontists will continue to face emergencies during this critical time of the COVID-19 pandemic. As a result, well-organized work processes are necessary. Here, we discuss five issues that are highly disputed during the orthodontic treatment process: general principles, communication, dental clinic admission, infection control measures, and applied orthodontic treatment. Thus, we believe that formulating evidence-based guidelines on these issues will be helpful for orthodontists and can be applied in the clinical field.

REFERENCES

- Mahase, E. (2020). China coronavirus: WHO declares international emergency as death toll exceeds 200. *BMJ: British Medical Journal (Online)*, 368. <https://pubmed.ncbi.nlm.nih.gov/32005727>
- Chan, J. F. W., Yuan, S., Kok, K. H., To, K. K. W., Chu, H., Yang, J., ... & Yuen, K. Y. (2020). A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. *The lancet*, 395(10223), 514-523. DOI:[https://doi.org/10.1016/S0140-6736\(20\)30154-9](https://doi.org/10.1016/S0140-6736(20)30154-9)
- Thompson, R. (2020). Pandemic potential of 2019-nCoV. *The Lancet Infectious Diseases*, 20(3), 280. [https://doi.org/10.1016/s1473-3099\(20\)30068-2](https://doi.org/10.1016/s1473-3099(20)30068-2)
- Peng, X., Xu, X., Li, Y., Cheng, L., Zhou, X., & Ren, B. (2020). Transmission routes of 2019-nCoV and controls in dental practice. *International journal of oral science*, 12(1), 1-6. doi:10.1038/s41368-020-0075-9.
- Sabino-Silva, R., Jardim, A. C. G., & Siqueira, W. L. (2020). Coronavirus COVID-19 impacts to dentistry and potential salivary diagnosis. *Clinical oral investigations*, 24(4), 1619-1621. doi:10.1007/s00784-020-03248-x.
- Rothe, C., Schunk, M., Sothmann, P., Bretzel, G., Froeschl, G., Wallrauch, C., ... & Hoelscher, M. (2020). Transmission of 2019-nCoV infection from an asymptomatic contact in Germany. *New England journal of medicine*, 382(10), 970-971. doi:10.1056/NEJMc2001468.
- Oshagh, M., Hematiyan, M. R., Mohandes, Y., Oshagh, M. R., & Pishbin, L. (2012). Autoclaving and clinical recycling: Effects on mechanical properties of orthodontic wires. *Indian Journal of Dental Research*, 23(5), 638-642. doi:10.4103/0970-9290.107382.
- Jin, Y. H., Cai, L., Cheng, Z. S., Cheng, H., Deng, T., Fan, Y. P., ... & Wang, X. H. (2020). A rapid advice guideline for the diagnosis and treatment of 2019 novel coronavirus (2019-nCoV) infected pneumonia (standard version). *Military Medical Research*, 7(1), 1-23. <https://doi.org/10.1186/s40779-020-0233-6>
- Backer, J. A., Klinkenberg, D., & Wallinga, J. (2020). Incubation period of 2019 novel coronavirus (2019-nCoV) infections among travellers from Wuhan, China, 20–28 January 2020. *Eurosurveillance*, 25(5), 2000062. <https://doi.org/10.2807/1560-7917.ES.2020.25.5.2000062>
- World Health Organization. (2020). *Infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected: interim guidance, 25 January 2020* (No. WHO/2019-nCoV/IPC/2020.2). World Health Organization. <https://pubmed.ncbi.nlm.nih.gov/32005727>
- Guan, W. J., Ni, Z. Y., Hu, Y., Liang, W. H., Ou, C. Q., He, J. X., ... & Zhong, N. S. (2020). Clinical characteristics of coronavirus disease 2019 in China. *New England journal of medicine*, 382(18), 1708-1720. DOI: 10.1056/NEJMoa2002032
- Wang, Y., Wang, Y., Chen, Y., & Qin, Q. (2020). Unique epidemiological and clinical features of the emerging 2019 novel coronavirus pneumonia (COVID-19) implicate special control measures. *Journal of medical virology*, 92(6), 568-576. doi: 10.1002/jmv.25748.
- Sax, H., Allegranzi, B., Chraïti, M. N., Boyce, J., Larson, E., & Pittet, D. (2009). The World Health Organization hand hygiene observation method. *American journal of infection control*, 37(10), 827-834. Available from: https://apps.who.int/iris/bitstream/handle/10665/44102/9789241597906_eng.pdf
- Control CfD, Prevention. Infection control: severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). 2020. Infection Control Guidance. 2020. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-recommendations.html>
- Coulthard, P. (2020). Dentistry and coronavirus (COVID-19)-moral decision-making. *British Dental Journal*, 228(7), 503-505. DOI: 10.1038/s41415-020-1482-1
- Ti, L. K., Ang, L. S., Foong, T. W., & Ng, B. S. W. (2020). What we do when a COVID-19 patient needs an operation: operating room preparation and guidance. *Canadian Journal of Anesthesia/Journal canadien d'anesthésie*, 67(6), 756-758. <https://link.springer.com/article/10.1007/s12630-020-01617-4>
- Yuan, L., Zhi, N., Yu, C., Ming, G., Yingle, L., Kumar, G. N., ... & Ke, L. (2020). Aerodynamic characteristics and RNA concentration of SARS-

- CoV-2 aerosol in Wuhan hospitals during COVID-19 outbreak. *BioRxiv*. <https://www.biorxiv.org/content/10.1101/2020.03.08.982637v1>
18. Verbeek, J. H., Rajamaki, B., Ijaz, S., Sauni, R., Toomey, E., Blackwood, B., ... & Balci, F. S. K. (2020). Personal protective equipment for preventing highly infectious diseases due to exposure to contaminated body fluids in healthcare staff. *Cochrane database of systematic reviews*, (4), CD011621. DOI:10.1002/14651858.CD011621.pub4.
 19. Zhang, W., & Jiang, X. (2020). Measures and suggestions for the prevention and control of the novel coronavirus in dental institutions. *Front Oral Maxillofac Med*, 2(4). doi:10.21037/fomm.2020.02.01: <http://dx.doi.org/10.21037/fomm.2020.02.01>
 20. Amato, A., Caggiano, M., Amato, M., Moccia, G., Capunzo, M., & De Caro, F. (2020). Infection control in dental practice during the COVID-19 pandemic. *International journal of environmental research and public health*, 17(13), 4769. doi: 10.3390/ijerph17134769.
 21. Kampf, G., Todt, D., Pfaender, S., & Steinmann, E. (2020). Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. *Journal of hospital infection*, 104(3), 246-251. doi:10.1016/j.jhin.2020.01.022.
 22. Organization World Health. Infection prevention and control of epidemic-and pandemic-prone acute respiratory infections in health care: World Health Organization; 2014. <https://www.who.int/publications-detail-redirect/infection-prevention-and-control-of-epidemic-and-pandemic-prone-acute-respiratory-infections-in-health-care>
 23. Secretariat, M. A. (2005). Air cleaning technologies: an evidence-based analysis. *Ontario health technology assessment series*, 5(17), 1. <https://pubmed.ncbi.nlm.nih.gov/23074468/>
 24. Howard-Reed, C., Wallace, L. A., & Ott, W. R. (2002). The effect of opening windows on air change rates in two homes. *Journal of the Air & Waste Management Association*, 52(2), 147-159. doi:10.1080/10473289.2002.10470775.
 25. Lin, L., & Li, T. S. (2020). interpretation of" guidelines for the diagnosis and treatment of novel coronavirus (2019-ncov) infection by the national health commission (trial version 5)". *Zhonghua yi xue za zhi*, 100, E001-E001. doi:10.3760/cma.j.issn.0376-2491.2020.0001.
 26. Samaranayake, L. P., & Peiris, M. (2004). Severe acute respiratory syndrome and dentistry: a retrospective view. *The Journal of the American Dental Association*, 135(9), 1292-1302. doi:10.14219/jada.archive.2004.0405.
 27. Ather, A., Patel, B., Ruparel, N. B., Diogenes, A., & Hargreaves, K. M. (2020). Coronavirus disease 19 (COVID-19): implications for clinical dental care. *Journal of endodontics*, 46(5), 584-595. doi: 10.1016/j.joen.2020.03.008.
 28. Pereira, L. J., Pereira, C. V., Murata, R. M., Pardi, V., & Pereira-Dourado, S. M. (2020). Biological and social aspects of Coronavirus Disease 2019 (COVID-19) related to oral health. *Brazilian Oral Research*, 34. <https://pubmed.ncbi.nlm.nih.gov/32162995/>
 29. Kim, H. J., Ko, J. S., & Kim, T. Y. (2020). Recommendations for anesthesia in patients suspected of COVID-19 Coronavirus infection. *Korean J Anesthesiol*, 89-91. doi: 10.4097/kja.20110.
 30. Fini, M. B. (2020). What dentists need to know about COVID-19. *Oral oncology*, 105, 104741. doi:10.1016/j.oraloncology.2020.104741.