

COVID-19 – CHALLENGE TO ORTHODONTIC MANAGEMENT IN VIRTUAL ERA

¹Balaji Krishnan, ²Rajesh Raman, ³C.Nirupama, ⁴Raghul Gunasekaran, ⁵Bharath kumar Asokan, ⁶Kalaiselvi Ravi

¹Professor & Head of the department, ²Senior Lecturer, ³Professor, ^{4,5,6}Post graduate (Final Year)

^{1,2,4,5,6}Department of orthodontics&dentofacial orthopaedics, Tagore dental college, Chennai.

³Department of orthodontics, KarpagaVinayaga Institute of Dental Sciences.

To cite: Balaji Krishnan, Rajesh Raman, C.Nirupama, Raghul Gunasekaran, Bharath kumar Asokan, Kalaiselvi Ravi

COVID-19 – CHALLENGE TO ORTHODONTIC MANAGEMENT IN VIRTUAL ERA

J Contemp Orthod 2020;4(4): 16-20.

Received on: 29-11-2020

Accepted on: 24-12-2020

Source of Support: Nil

Conflict of Interest: None

ABSTRACT

The novel coronavirus or severe acute respiratory coronavirus syndrome 2 was a causative agent of acute respiratory disease that resulted in an unexpected outbreak in China in December 2019. Protocols for the provision of dental treatment during the COVID-19 pandemic were created after analysis of the severity of the COVID-19 pandemic and were focused on grouping patients by diagnosis and need, and considering interventions by risk and benefit. The purpose of this article is to comment on the emergence, epidemiology, threats and to safeguard orthodontists during this pandemic crisis. It is hoped that the recommendations proposed in this work would continue to manage dental treatment around the world before and after this pandemic.

Keywords: Covid-19, Orthodontic virtual management, Dental Practice management.

INTRODUCTION

Since the beginning of 2020, coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2; first named as the 2019-novel coronavirus or 2019-nCoV) has rapidly spread throughout the inhabited world and led to unprecedented major health, humanitarian, and financial crises ¹. The routes of transmission of betacoronavirus i.e. biological details can pass from one individual to another through exhaled droplets, aerosols, contamination of surfaces, and possibly through faecal-oral contamination². This viral infection is of great concern due to its high contagiousness and morbidity, as well as its ability to evolve into a potentially lethal form of interstitial pneumonia and its possible evolution into a potentially lethal form of interstitial pneumonia³. We must anticipate and be prepared for the effects of unsupervised orthodontic treatment in case a future lockdown is imposed in the wake of a COVID-19 resurgence.

The National Health Committee keeps receiving an ever-increasing number of confirmed, suspected, and fatal cases reported from all over the world. To date, they are still carrying out world surveillance. There was an estimated human-to-human healthcare-related transmission of about 41% at the beginning of the outbreak. Many health care workers got and still are getting infected ⁴. The use of appropriate personal protective equipment (PPE) is must in avoiding cross infection during clinical procedures between patients and healthcare workers and the embracing of suitable

decontamination measures can benefit to reduce the risks. Although it has also presently been suggested that dental clinics limit their practice only to not deferrable emergencies, this is not always possible ⁵. Some ongoing treatment such as orthodontic therapies and/or critical situations, like conditions that must be identified in the early stages and treated immediately to avoid more serious outcomes, require timely follow-up appointments. Indeed, continuous monitoring by the orthodontist is a must in orthodontic treatment so as to evaluate the efficacy and/or any undesirable effects⁶. COVID-19 manifestations range from a complete lack of symptoms to symptomatic patients with severe complications leading to multi-organ dysfunction, septic shock, and systematic failure. COVID-19 can be classified into mild, moderate, severe, or critical diseases ⁷.

PRECAUTIONS

Based on the experience and cumulative data on COVID-19 outbreak certain measures should be appropriately taken for screening and management of dental emergencies. According to Xu et al⁸, confirmed the presence of ACE2 receptors in oral mucosa and the epithelial cells of tongue bringing into the light the infection susceptibility of oral cavity and potential risk it poses to dentist and dental professionals. VanDoremalen, et al⁹ in the recent research concluded that the virus remained viable in aerosols throughout the duration of the experiment (3 hours) with the reduction in the infectious titre from 103.5 to 102.7.

Patient before entering the clinical area requires:

1. Screening every asymptomatic patient squarely.

2. Identifying the critical need of the patient and aiming on managing it with minimally invasive procedures.
3. Categorising dental treatment according to the urgency of the required treatment and the risk and benefit associated with each treatment.
4. Identifying the required dental treatment for each patient and the risks and benefits associated with that treatment.
5. Using contact, and airborne precautions including proper aerosol-generating procedures personal protective equipment (PPE) for every procedure.

The dental treatment should also be classified according to the severity of the case and the degree of procedure invasiveness and risk¹⁰.

Dental Treatments Categories are:

- a) Emergency
- b) Urgent conditions that can be managed with minimally invasive procedures and without aerosol generation.
- c) Urgent conditions that need to be managed with invasive and/ or aerosol-generating procedures.
- d) Non-urgent
- e) Elective

ORTHODONTIC EMERGENCIES

Removable appliances:

- Functional - If it is broken or does not fit, send photos to the orthodontist and suspend the use.
- Aligners - Remain on the current/go on with treatment following clinician's indications/if broken or lost get back to the previous and ask the clinician
- Retainers - If broken or lost, ask to the dentist to evaluate buying hot customizable preforms on e-commerce sites

Fixed appliances:

- Loose bracket - Send a photo to the dentist, eventually remove it with tweezers
- Poking distal wire - Send a photo to the dentist, use wax, eventually cut with disinfected nail clipper/hardware cutter
- Poking ligature - Send a photo to the dentist, use wax, eventually push it back with eraser of a pencil

- Periodontal abscess around molar band - Send a photo to the dentist, symptomatic therapy with paracetamol, eventually prescription of antibiotic
- Pre-activated, non-removable appliances
- Take a picture every 20–40 days; if the patient feels pain or swelling, see as an emergency in the dental office and . (e.g., Pendulum, Forsus, Distal Jet appliance,transpalatal bar) eventually remove the appliance

IMPLICATIONS FOR ORTHODONTIC MANAGEMENT

All dental professionals, including orthodontists, may be at risk of acquiring COVID-19 through multiple transmission routes, including the following¹¹:

- (1) Respiratory droplets from coughing and sneezing or orthodontic procedure,
- (2) Indirect contact with viral droplets on a surface that orthodontist later contacts,
- (3) Aerosols created during dental or orthodontic procedures,
- (4) Treating patients who may have experienced indirect contact transmission from removing and replacing aligners, appliances, and rubber bands, and
- (5) Being in contact with multiple such persons, including those who accompany the patients.

Orthodontists must be especially cognizant of the available evidence to provide a safe environment for themselves, their patients (and patient family members), and the entire orthodontic team. In the current stage of the COVID-19 pandemic, a true dental emergency is one that deals with swelling, uncontrollable pain, bleeding, infection, and trauma to teeth and or bones should be provided. Orthodontic emergencies may include the embedment of an orthodontic appliance into the gingiva or oral mucosa leading to severe pain and or infection, circumstances related to dental trauma, or conditions where a lack of management would be harmful to the patient¹². In dealing with COVID-19, orthodontist should have a emergency plan in place for the management of the patients.

The following key steps are recommended, based on an accumulation of the recommendations and suggestions of multiple professional regulatory bodies¹:

- (1) Provide patients with a broadcast communication explaining the changes in access to the orthodontic clinic/office as per recommendations of the local public health and or dental regulatory authority,
- (2) Provide active patients with suggestions for treatment advancement on an individual basis as appropriate or in a

correspondence to all patients (eg, when to stop activating an expander, what to do when the patient has reached their final aligner, etc.). Patients should also be reminded to always wash their hands prior to and after placing and removing appliances or elastics, to clean their appliances regularly by wiping with alcohol, and to store appliances in their cases.

- (3) Provide a means of communication (phone number or email) to patients to allow them to contact the orthodontist or an orthodontic team member with any questions or concerns, and send problem related intraoral mobile-phone digital images,
- (4) Use phone calls or, video-calling or appropriate teledentistry facilities to assist patients in resolving any emergent orthodontic problem that can be managed at home.
- (5) Provide emergent orthodontic treatment in a safe manner, where necessary, and
- (6) Exercise evidence-based precautions during the provision of any in-office emergency treatment.

PERSONAL PROTECTION AND INFECTION CONTROL

Orthodontists usually do not perform very intense tissue surgery and do not treat infectious diseases.. It is not possible to obtain a complete sterilization in orthodontics clinics, it is possible to approach ideal sterilization by using new techniques¹³.

During oral operations which are likely to spill blood, saliva and oral fluids, dental gloves, safety goggles, and protective face masks should be worn. If there is a chance of infection of the blood or saliva, wear sterile gowns or lab aprons. Such aprons should be changed when contaminated with blood.

Sterilization of orthodontic pliers:

Soaking in 1% sodium nitrate can be recommended. Metal or ceramic brackets can be disinfected with Chlorhexidine solution.

1. Orthodontic pliers can be sterilized with autoclave sterilization, ultrasound bath and thermal disinfection, or disinfected with chemical substances 2% glutaraldehyde or 0.25% peracetic acid. Instrument cassettes should be used effectively, with pliers ideally sterilized in open place.
2. An autoclave is preferred over cold sterilization, without negatively affecting surface characterization of archwires.

3. Orthodontic markers can be autoclaved or disinfected using glutaraldehyde solution.
4. According to Benson Cleaning photographic retractors with washer disinfectant were reported as the most effective method of decontamination¹⁴.
5. Tungsten carbide debonding burs could be effectively decontaminated from bacterial infection.
6. It is safe to use tried-in orthodontic bands after adequate precleaning and sterilization.
7. Decontamination does not jeopardize clinical stability of miniscrews nor mechanical properties of elastomeric chains.
8. Flushing dental unit waterline for at least 2 min or using disinfectants improves the quality of water within the dental unit and minimize the risk of infection.

CLINICAL MANAGEMENT

Patient should rinse his/her mouth before any procedure using 0.12%- 0.2% chlorhexidine gluconate could help minimize the number of microbes within the oral cavity¹⁵ and hand hygiene measures according to WHO recommendations (washing hands for 20 seconds minimal). Personal protective equipment, including facial mask, face shield, eye protection, gowns, and gloves, are essential protective gear must be worn by the operator during the outbreak.

Bonding:

Polishing the enamel surface with pumice and the use of a three-way syringe for rinsing during conventional bonding produces aerosol. Many non-AGP (non-Aerosol generating procedures) options for bonding are available although it must be emphasized that these can compromise bond strengths¹⁶.

Light-cured resin-modified glass ionomer cement can be used without any prior enamel preparation. Self-etching primers can also be used without prior enamel preparation and etching, but they require the smear layer to be removed prior to use, usually by pumicing or polishing teeth, which would be unnecessary with an AGP. The use of three-way syringe before or after polishing and etching can be avoided by using a dry cotton roll to clean the enamel surface. Suction can still be used because it is non-AGP¹⁷.

Indirect bonding may be another alternative to conventional direct-bonding techniques because it reduces patient exposure. It should be kept in mind that flash removal for indirect bonding is an AGP and must be performed with utmost caution¹⁸.

Leveling and Alignment:

Use of round, light-gauge nickel titanium wires, produces light

forces which have a extensive amount of play that can cause slippage of the wire from brackets, especially on the terminal molars. Square or rectangular nickel titanium wires can be used to avoid emergencies caused by slippage. Additionally, the archwires can be cinched back to prevent the sharp ends from impinging on the gums. Use of flowable composite is also recommended to prevent impingement of the archwire on the soft tissue¹⁹.

Extractions and Expansion:

Orthodontic extractions may be carried out with standard precautions, in a single visit to reduce patient exposure.

Expansion treatment is still possible, but only with close monitoring after the practice reopens. Patients must be clearly instructed regarding the intervals of expansion. Once rapid palatal expansion is complete, it is crucial to retain the achieved results by recalling the patient as soon as possible in case of a future lockdown. Over activation must be avoided to prevent undesirable buccal tipping of posterior teeth, potentially necessitating “roundtripping” and prolonging the treatment¹⁹.

Ligation and Bite Blocks:

Use of stainless steel ligatures instead of elastomeric rings to tie the archwires, since the metal ligatures are more hygienic and offer more robust ligation. Passive self-ligating brackets offer advantages in delayed appointment situations, including fewer emergencies associated with torn or loose elastomeric rings Space Closure²⁰.

Functional Appliances:

Patients with removable functional appliances can be monitored remotely through video conferencing, and appliance use can be stopped once the objectives are met. Retentive phase extended by placing an upper anterior inclined plane to retain the corrected incisor relationship²¹.

Aligners:

Clear plastic aligners may offer some advantages in the COVID-19 era. A series of aligners is commonly provided to the patient for a set period (usually six to 12 weeks) before the patient returns for evaluation and additional aligners. In the infrequent instance of loss or breakage of an aligner, the patient is usually advised to wear the previous aligner⁷¹ or, if unavailable, the next one in the series. If no aligner is available, a replacement “stage retainer can be fabricated with the previous digital record itself²².

IMPACT ON ORTHODONTIC APPOINTMENTS

Dentists should acknowledge only non-deferrable cases, such

as an abscess or permanent pulpitis, according to the Single Nations recommendations during COVID- 19 pandemic in private practice. Orthodontic issues, such as general dental conditions, constitute injuries, not actual injuries, a video call or visual message may be the better ways to determine the situation. This leads to reduced patient flow to the dental office. On the other hand Orthodontic patients are aware of the need for compliance and attendance to the appointments and care with the appliance in order to obtain a good treatment result within the period stipulated by the orthodontist. Some patients (34.7%) had no concern with the impact of the quarantine in their orthodontic treatment. This indicates confidence in the orthodontist. Communication between the orthodontist and the patient, and reassurance by the orthodontist is the mainly reason in predicting patient satisfaction, good dentist-patient relationship and patient cooperation in following the prescribed instructions²³.

Virtual assistance:

Digital technology in imaging and impression taking, that is now commonplace in most dental practices, is a powerful tool for the orthodontist to access, analyse and, if need be, communicate with patients, colleagues, and/or dental technicians. Recently a Smartphone technology has been developed that enables remote control of orthodontic patients using an artificial MonitoringTM intelligence algorithm. This application is called Dental Monitoring. DM was designed to carry out orthodontic follow-up at a distance. It tracks tooth movement through a 3D reconstruction of an intraoral movie taken with the smartphone camera and specific cheek retractors. The patients themselves make a video that is processed into a scan by DM^{TM24}.

WhatsApp Messenger is an instant messaging program created in 2009 and expanded exponentially to users of all ages, for personal relationships, as entertainment, as research aid, and as a virtual contact point with their community. The use of this interface in the health sector reported only a small number of publications, identified by the major database, online. While its impact has been investigated inadequately in the clinical setting, WhatsApp is one of the most widely used communication tools, which may also be valuable in fostering patient-physician communication and relationships.

The best way to deal with orthodontic emergencies is to decide progressively. The first step should always be virtual assistance. The virtual assistance might be performed by using photos, videos (better if with additional light source), or video call. For all emergencies, the patient should send photos or videos to confirm the accident²⁵.

CONCLUSION

In summary, SARS-CoV-2 is the first highly contagious pandemic infection of this millennium. Although cross-

contamination within any dental setting has not been reported, dentists in all disciplines, including orthodontists, need to be constantly aware of the emerging infectious threats and informed of updates in infection control guidelines. It is the responsibility of the orthodontic team to ensure safety and stop cross contamination within the clinical facility. Finally, the impact of COVID-19 on the orthodontic practice, cost of illness, and whether clear aligners that require minimal appointments are superior to fixed orthodontics in the event of a future outbreak.

REFERENCES

1. SunjaySuri et.al, Clinical orthodontic management during the COVID-19 pandemic: DOI: 10.2319/033120-236.1 473 Angle Orthodontist, Vol 90, No 4, 2020
2. Ong SW, Tan YK, Chia PY, Lee TH, Ng OT, Wong MS, Marimuthu K. Air, surface environmental, and personal protective equipment contamination by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) from a symptomatic patient. *Jama*. 2020 Mar 4.
3. Zhu, N.; Zhang, D.; Wang, W.; Li, X.; Yang, B.; Song, J.; Zhao, X.; Huang, B.; Shi, W.; Lu, R.; et al. A novel coronavirus from patients with pneumonia in China, 2019. *N. Engl. J. Med.* **2020**.
4. Wang, D.; Hu, B.; Hu, C.; Zhu, F.; Liu, X.; Zhang, J.; Wang, B.; Xiang, H.; Cheng, Z.; Xiong, Y.; et al. Clinical Characteristics of 138 Hospitalized Patients with 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. *JAMA J. Am. Med. Assoc.* **2020**, 323, 1061–1069.
5. Maspero, C.; Fama, A.; Cavagnetto, D.; Abate, A.; Farronato, M. Treatment of dental dilacerations. *J. Biol. Regul. Homeost. Agents* **2019**, 33, 1623–1627.
6. Dong Y, Mo X, Hu Y, et al. Epidemiological characteristics of 2143 pediatric patients with 2019 coronavirus disease in China. *Pediatrics*. 2020.
7. Dong E, Du H, Gardner L. An interactive web-based dashboard to track COVID-19 in real time. *The Lancet infectious diseases*. 2020 Feb 19
8. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, Zhang L, Fan G, Xu J, Gu X, Cheng Z. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The Lancet*. 2020 Feb 15;395(10223):497-506.
9. Yang J, Zheng Y, Gou X, Pu K, Chen Z, Guo Q, Ji R, Wang H, Wang Y, Zhou Y. Prevalence of comorbidities in the novel Wuhan coronavirus (COVID-19) infection: a systematic review and meta-analysis. *International Journal of Infectious Diseases*. 2020 Mar 12.
10. A. Alharbi et al. Dental care provision during the COVID-19 pandemic Saudi Dental Journal (2020) 32, 181–186.
11. Wang Y, Zhou CC, Shu R, Zou J. [Oral health management of children during the epidemic period of coronavirus disease 2019 (Chinese)]. *Sichuan Da XueXueBao Yi Xue Ban*. 2020;51(2):151–154.
12. American Association of Orthodontists. COVID-19 Resources for Orthodontists. 2020. Available at: <https://www1.aaoinfo.org/covid-19/>. Accessed April 5, 2020.
13. Akçam M.O, Özdiler E. OrtodontideSterilizasyonveDezenfeksiyon. *CumhuriyetÜniversitesiDişHekimliğiFakültesiDergisi*. 1999; 2: 129-133.
14. Benson PE, Ebhohimen A, Douglas I. The cleaning of photographic retractors; a survey, clinical and laboratory study. *Br Dent J* 2010; 208:E14; discussion 306-307.
15. Marui VC, Souto MLS, Rovai ES, Romito GA, Chambrone L, Pannuti CM. Efficacy of preproceduralmouthrinses in the reduction of microorganisms in aerosol: a systematic review. *J Am Dent Assoc* 2019;150:1015-10126.e1.
16. Ireland, A.J.; Knight, H.; and Sherriff, M.: An in vivo investigation into bond failure rates with a new self-etching primer system, *Am. J. Orthod.* 124:323-326, 2003.
17. Gange, P.: Bonding in the COVID-19 Era, *J. Clin. Orthod.*, www.jco-online.com/covid19-resources/bonding-in-the-covid-19-era, published online, April 2020, accessed May 11, 2020.
18. Dalessandri, D.; Dalessandri, M.; Bonetti, S.; Visconti, L.; and Paganelli, C.: Effectiveness of an indirect bonding technique in reducing plaque accumulation around braces, *Angle Orthod.* 82:313-318, 2012.
19. Srirenalakshmi, Venugopal, Pangilinan, Manzano, Arnold, Ludwig, Cope, Bowman, *ORTHODONTICS IN THE COVID-19 ERA: JCO/june 2020*.
20. Pellegrini, P.; Sauerwein, R.; Finlayson, T.; McLeod, J.; Covell, D.A. Jr.; Maier, T.; and Machida, C.A.: Plaque retention by self-ligating vs elastomeric orthodontic brackets: Quantitative comparison of oral bacteria and detection with adenosine triphosphate- driven bioluminescence, *Am. J. Orthod.* 135:426. e1-9, 2009.
21. Clark, W.J.: *Twin Block Functional Therapy*, 3rd ed., Jaypee Brothers Medical Publishers, New Delhi, India, 2014.
22. Gange, P.: Bonding in the COVID-19 Era, *J. Clin. Orthod.*, www.jco-online.com/covid19-resources/bonding-in-the-covid-19-era, published online, April 2020, accessed May 11, 2020.
23. Sinha PK, Nanda RS, McNeil DW. Perceived orthodontist behaviors that predict patient satisfaction, orthodontist-patient relationship, and patient adherence in orthodontic treatment. *Am J OrthodDentofacialOrthop*. 1996;110(4):370-377.
24. Dental Care: Virtual Consultations and Remote Monitoring. Available online: <https://dental-monitoring.com/> (accessed on 30 April 2020).
25. Mars M, Scott RE. WhatsApp in clinical practice: a literature review. *Stud Health Technol Inform*. 2016;231:82–90.