

ORTHODONTIC MANAGEMENT DURING COVID 19 PANDEMIC

Dr. Vaibhav Ambashikar¹, Dr. Yatishkumar Joshi², Dr. Suresh K. Kangane³, Dr. Anand S. Ambekar⁴, Dr. Pravinkumar S. Marure⁵, Dr. Mahesh Choure⁶

¹ PG Student, ² Reader, ³ Professor & HOD, ⁴ Professor, ⁵ Associate Professor, ⁶ PG Student.
Dept of Orthodontics, MIDSr Dental College, Latur.

Abstract:

Since the start of 2020, coronavirus disease 2019 (COVID-19) was caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2; first named as the 2019-novel coronavirus 2019-nCoV) has rapidly spread throughout the inhabited world and led to unparalleled significant health, humanitarian, and financial predicaments. In several such efforts, performing elective tasks, including orthodontic treatment, were required to be suspended on orders of the centralized, regional/state, and local and public health or regulatory bodies. Since orthodontic treatment is a lengthy and continuous process, millions of patients throughout the world were already undergoing orthodontic treatment when planned care was abruptly suspended. It has been nine months since the first lockdown in India and six months since the unlock of the same began. However, still consolidated information and guidelines for patients' clinical orthodontic management during the COVID-19 pandemic are lacking. This review aims to provide an all-inclusive summary of the implications of SARS-CoV-2 and COVID-19 on orthodontic treatment and to discuss the contingency management and provision of orthodontic care, using currently available data and literature.

Keywords: COVID19, Orthodontic Management, Pandemic.

Corresponding Author: Dr. Vaibhav Ambashikar, PG Student, Dept of Orthodontics, MIDSr Dental College, Latur. Email id.: vaibhav16.xperia@gmail.com

INTRODUCTION:

Since the beginning of 2020, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2; first named as the 2019-novel coronavirus or 2019-nCoV) causes coronavirus disease 2019 (COVID-19) has speedily spread all over the inhabited world and led to unparalleled significant health, humanitarian, and financial predicaments. Thus, efforts have been made to contain the spread of the disease led to major disturbances, compelling local and, in most cases, national emergencies and lockdowns, leaving only essential services to continue. In several such efforts, performing elective tasks, including orthodontic treatment, were required to be suspended on orders

of the centralized, regional/state, and local and public health or professional regulatory bodies. Since orthodontic treatment is a lengthy and continuous process, millions of patients are already undergoing orthodontic treatment when planned care was abruptly suspended. The coronavirus disease 2019 (COVID-19) pandemic has therefore posed a threat to public health around the world that even when we have managed to defeat the infection through effective treatment and by developing vaccination. Dramatic and long-lasting changes are anticipated to affect the way we live, work, and relate to each other. Thus, this pandemic will continue to directly impact all social settings and professions, and orthodontics

will be no exception. It has been nine months since the first lockdown in India and six months since the unlock of the same began. However, still consolidated information and guidelines for the clinical orthodontic management of patients during the COVID-19 pandemic are lacking.

This review aims to provide an all-inclusive summary of the implications of COVID-19 on dentistry in general and orthodontic treatment in specific and to discuss the contingency management and provision of orthodontic care, using currently available data and literature.

Background

Coronavirus-19 (COVID-19) is believed to have originated from the country of China in the city Wuhan and is caused due to SARS-CoV-2. Structurally, the COVID-19 virus is a single-stranded RNA virus that belongs to a family called Coronaviridae, which includes the known severe acute respiratory syndrome coronavirus (SARS-CoV) 2002 and even the Middle East respiratory syndrome coronavirus (MERS-CoV) that was seen in 2012. It has been identified that bats are the primary source of the SARS-CoV-2 coronavirus, and therefore COVID-19 is a cross-species viral-mediated disease. The disease is said to be zoonotic, thus suggesting it is a disease that usually occurs in animals but can infect humans and spread from animals to people, or, more specifically. The virus's genomics was mapped, and it was found to share 79.5% of the genomic sequence with the SARS-CoV virus.^{1,2}

Symptomatology and Source of Transmission

On average, for symptoms to develop in a person is exposed to the virus, it usually takes 5-6 days. But it can also be found that it can take up to 14 days and, rarely, even longer.^{3,4}

COVID-19 affects in different ways to different people. The most common symptoms are similar to very much that of the seasonal flu. Patients experience a rising fever, tiredness or shortness of breath and dry cough. Some patients have even been recognized as having joint pains, headache, loss of taste or smell, sore throat, rashes, and diarrhoea. Some asymptomatic patients can act as "carriers" and act as a pool of infection.⁵

Chest radiography studies show ground-glass opacities in patients with progressed infections. Most patients with no comorbidities and good immunity get over these symptoms with time by developing the necessary antibodies. Development of complications like severe respiratory distress or pneumonia, and the downward spiral into the disease is seen in patients who have a compromised state.^{2,6}

SARS-CoV-2 is seen to bind with the human angiotensin-converting enzyme-2 receptors. These receptors are in abundance in the salivary glands of humans. Thus, there is a high possibility for the spread of COVID-19 via respiratory droplets in the air, which can quickly spread to a radius of no less than 4 to 6 feet and thus can enter the body directly through the nose, eyes, ears, or the mouth. On average, a person touches their face 23 times an hour and then some of the other items around. The virus can survive for up to 2-3 days on such objects and surfaces and the spread of the virus can also occur in this way. The incubation period is known to last for 1 to 2 weeks.^{6,7}

At the time of inscription this article, no human vaccine exists to cure this deadly virus, though numerous expedited trials are underway.

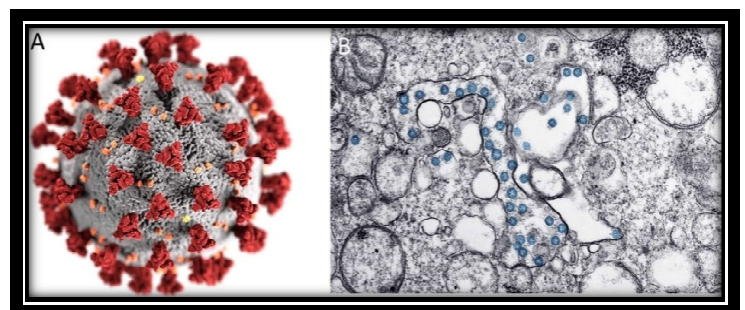


Figure 1. (A) Diagram of the ultrastructure of the coronavirus (Centers for Disease Control and Prevention, CDC); (B) Transmission electron micrograph image of an isolate from the first U.S. case of COVID-19 showing the viral particles (blue) (CDC, Bullock HA, Tamim A).

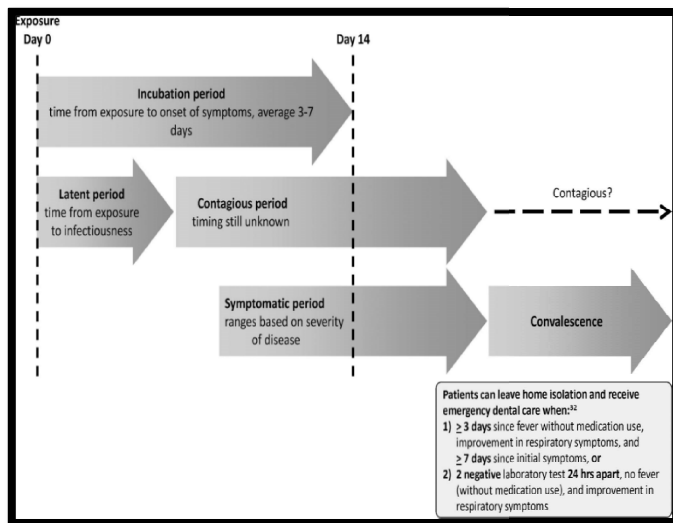


Figure 2. Incubation, latency, symptomatic, and contagious periods of COVID-19.⁵

Populations at Risk

People of all ages are vulnerable to being infected with SARS-CoV-2. The age dispersion of COVID-19 may differ among nations. Based on currently available evidence, individuals with certain risk factors are at higher risk of developing severe illness from SARS-CoV-2. These include older age (particularly individuals aged 65 years and older), presence of pre-existing medical conditions in individuals of any age (e.g., moderate-to-severe asthma, heart disease with complications, diabetes, chronic lung disease hypertension, renal failure, liver disease, immunocompromised), and close contact with a person detected with COVID-19. Although the symptoms usually are less severe in children with COVID-19, young children, predominantly infants, were shown to be more susceptible and also likely to manifest as harsh or critical cases.⁸

The implication of COVID-19 on dental practice

All dental professionals, as well as orthodontists, may be at risk of contracting COVID-19 through multiple transmission routes, including the following:

(1) Respiratory droplets from sneezing and coughing or generated during dental practice.

(2) Indirect contact where viral droplets fall on a surface that the dental professional or Orthodontist later contacts,

(3) Aerosols created during dental or orthodontic procedures,

(4) Treating patients who may have had indirect contact from removing and replacing aligners, appliances, and rubber bands

(5) Coming in contact with multiple such persons, including those who accompany the patients.⁹ As SARS-CoV-2 has also been detected in the saliva of infected individuals,¹⁰ and this poses an additional risk for dental professionals and their patients.¹¹

Dental care procedures may also spread viral particles from saliva during treatment in the same way as coughing and sneezing. Dental aerosol-generating procedures (AGPs) are associated with the use of ultrasonic instruments, air/water syringes, and handpieces.¹² They have been seen to be responsible for the transmission and infection for healthy patients, but at the same time, they also pose a high risk for the dental health care personnel (DHCP).

AGPs can produce droplets having a diameter ranging from 0.1 μm to 900 μm . Liu Y et al. classified the droplets into five groups, with the largest group ranging from 0.25 μm to 1 μm .¹³ The particles with this diameter can spread to the alveolus. Droplets < 0.25 μm , with pathogenic microorganisms, can reach up to 20 feet,¹⁴ so the 1-2-meter distance is recommended by WHO is not always enough to prevent cross-infection between DHCP and patients. The minimal aerosol viral load needed for infection is still unknown; however, in vitro experiments show that aerosol contains viable viruses for up to 16 hours.¹⁵ Infectiveness of aerosol of COVID-19 has shown to cause an outburst in conference rooms and buses.¹⁶ Treatment sittings on the dentist chair should be separated into two groups: without AGP and with AGP. Each of them must be managed with proper Personal Protective Equipment (PPE).¹⁴ The Centres for Disease Control and Prevention (CDC) recommends using N95 respirators and not surgical face masks, whenever AGPs are performed.¹⁷ Moreover, if AGP is required for patients who are suspected of being infected with COVID-19, airborne precautions should be strictly followed in a room

with negative pressure and with adequate PPE and, relative to the surrounding area, becomes mandatory.¹⁸ Unfortunately, there is no reliable and efficient test to identify asymptomatic carriers; therefore, everybody should be suspected to be infective.

Orthodontists must be especially aware of the latest updated evidence to deliver a safe setting for themselves and also their patients, and the entire orthodontic team.

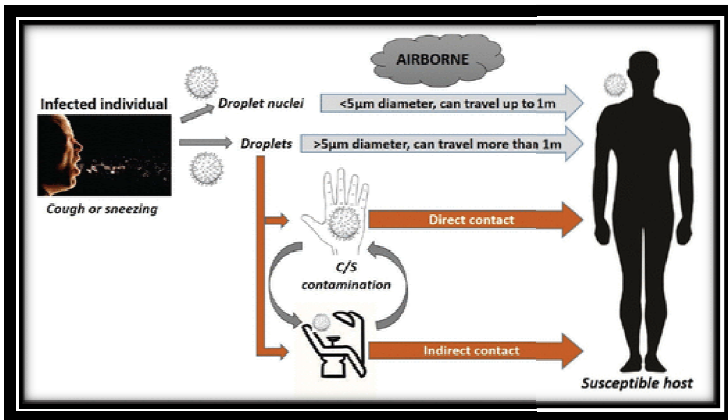


Figure 3 SARS-CoV-2 Virus Route of Transmission in Dental/Orthodontic Care Setup¹⁹

Orthodontic practice in this new reality of COVID-19

The pandemic has affected more than 66 million people all over the world, and India is the second most affected nation after the United States of America has close to 10 million confirmed cases with more than a hundred and thirty-five thousand lives lost to the deadly virus in India as reported until December 5, 2020.



Figure 4: A Snapshot of the COVID-19 Map of the Global Cases²⁰

Although most of the confirmed cases are asymptomatic but contagious, it is crucial to schedule priority triage in appointments. As proposed by Aziz S and Kapoor P, for patient management in orthodontic emergencies, minimal in-person contact, as well as ensuring regular maintenance a customized orthodontic triage is projected.²¹ (Table 1)

Orthodontic treatment can broadly be grouped under emergency, urgent, delayed, and minimal treatment needs, as per severity.²¹

Table 1 Orthodontic Issues or Emergencies Based on Urgent Treatment Need

Emergency	Urgent	Delayed	Minimal
<ul style="list-style-type: none"> Accidental swallowing Chances of inhalation of foreign body Abscess 	<ul style="list-style-type: none"> Severe pain Broken band that cannot be seated back Broken appliance; embedded in gingiva Protruding wire impinging mucosa 	<ul style="list-style-type: none"> Finished or broken elastics Appliance activation Finished or broken aligners Use of functional orthopedic appliances 	<ul style="list-style-type: none"> Loose modules Debonded bracket attached to archwire Broken band which can be seated back

Source: The classification in the Table is original but the various orthodontic emergencies were compiled from online resources available from American Association of Orthodontist, British Orthodontic Society, and Royal College of Surgeons of England.

Virtual Assistance

A virtual triage using pictures, videos, and video-calling can be of immense aid to separate and order the actual orthodontic emergency that needs immediate care in the clinics from the problem that can be self-managed by a home remedy and delayed without reporting to the clinic. A proper dental emergency is one with intractable pain, bleeding, infection, swelling, trauma to teeth or the bones. As concerns, orthodontic emergencies are severe pain or disease that arises due to the embedment of an orthodontic appliance into the gingiva, situations

associated to dental trauma, or a condition in which a lack of intervention that leads to patient injury should be attended.^{22,23}

Several messenger apps and video-calling apps are accessible currently. A dental clinic or hospital can use a smartphone messenger with a video-calling facility to connect with patients. If an orthodontic emergency emerges when the patient is at home, it is suggested that discussion occurs over the phone or using a video-calling service along with the Orthodontist. It is advisable to obtain electronically signed or verbal consent to provide the advice in this way and saved as a record. It is a professional duty to counsel and direct the patient on handling minor orthodontic emergencies at home.

Table 2: Orthodontic Emergency Scenarios and Its Short-Term Management at Home by the Patient under the Guidance of Treating Orthodontist⁵

Orthodontic Emergency	Advice and Guidelines
Ulcer and/or soreness on the lip/check from the orthodontic brackets and wire	<ul style="list-style-type: none"> A small portion of rolled soft orthodontic relief wax is placed over the bracket/wire, which is causing the soreness or discomfort. The area is swabbed with a small amount of topical anesthetic gel. The antibiotic gel is applied on the ulcer 3-4 times/day for a week. Avoid oily and spicy food for a week or until the time ulcer has healed.
Loose or broken brackets, bands, and wires	<ul style="list-style-type: none"> Band or the bracket is broken, but it is still attached to the wire; it is better to leave like that if it is not causing any discomfort until the next orthodontic visit. In case it causes irritation/discomfort to the adjacent soft tissue, put relief on the bracket. Do not put any elastic to the broken band or brackets. If the bracket or the band is broken off, keep it at a safe place and bring it to the orthodontic clinic in the next appointment.
Elastic "O" rings/ligature came out during brushing or having food	<ul style="list-style-type: none"> Elastic "O" ring/ligature can be placed back on the bracket, using a clean tweezer. They can also be removed with the help of a tweezer if the patient thinks he/she cannot place it back.
Stainless steel ligature become loose and/or irritate the soft tissues	<ul style="list-style-type: none"> Loose ligature can be removed with a clean tweezer. If it does not come out, then use a nail clipper—it can be cut and taken out.
Loose/broken elastic (e) chain	<ul style="list-style-type: none"> It can be taken out with a clean tweezer or cut with a nail clipper.
Food caught between the teeth and brackets or soft tissue, leading to discomfort	<ul style="list-style-type: none"> The patient is advised to maintain optimal oral hygiene. Interproximal brushes or toothpick or Waterpik can be used to dislodge food, which has been caught between the teeth and bracket or soft tissue.
Poking/protruding wire at the end of the brackets	<ul style="list-style-type: none"> The wire can be pushed from the back with a clean tweezer to make the wire in flush with a band/bracket. If it is due to slipping away from the wire, then, using a clean tweezer, the wire is repositioned making sure it is equally and symmetrically positioned. In case the wire causes extreme discomfort, it can be cut with a clean nail clipper; before cutting the wire, a small clean gauze is placed near the area to minimize accidental swallowing or soft tissue piercing.
The patient has swallowed the piece of the band/bracket/orthodontic appliance accessories	<ul style="list-style-type: none"> If the orthodontic accessory is small and swallowed, assure the patient that it will pass through the gastrointestinal tract, and there is nothing to worry. In case it has been swallowed, the patient should make sure there are no acute respiratory symptoms associated with it (such as a cough) or acute abdominal pain/colic. If such symptoms are present, patient is advised to visit an emergency department of a hospital for clinical examination or, if required, radiological assessment.
Broken bonded lingual/palatal (BLR) retainers	<ul style="list-style-type: none"> If BLR has come out from one or two teeth with resin pads or without resin pads, it should be trimmed or cut with a clean nail clipper. In cases where whole BLR is loose, and the patient is unable to come to orthodontic clinics, it is advised to take the whole BLR out carefully. In both the abovementioned scenarios, the patient is advised to use the removable retainers, if provided, until the next appointment.
Broken/loose-fitting transpalatal arch (TPA), lower lingual holding arch (LLA), and maxillary expanders	<ul style="list-style-type: none"> If the TPA becomes loose or broken and still in the patient's mouth close to its original position, and the patient cannot visit the orthodontic clinic, it should be placed back. For expander, no further activation/expansion is advised until the next visit to the orthodontists. If the TPA, LLA, or the expander has fallen out completely, patient should keep it safe and bring it to the orthodontic clinic at the next visit.
Orthodontic appliance embedded in the soft tissue leading to severe pain and infection	<ul style="list-style-type: none"> This is one of the true emergencies; ideally, the patient is seen by the orthodontist provided the patient has cleared the triage questionnaire with respect to the COVID-19, and proper infection control protocols have to be followed while treating the patient by the orthodontists and his team. In case the patient is unable to be personally seen by the orthodontist at the clinic, then the patient or home-care provider is advised to use a clean and sterile clipper and cut the orthodontic wire if it is attached to the broken or loose part and remove the broken part of the orthodontic appliance from the mouth using the clean tweezer. If required, tell the patient to send the photos through WhatsApp. If needed, an antibiotic and analgesic can be prescribed to the patient digitally, and the same should be saved in his treatment file.
Poking edges of the aligner	<ul style="list-style-type: none"> If patients feel that the aligner margin is biting on the gum, it can be smoothened with a nail file or by using the previous set of the aligner.
Broken removable retainer/functional appliance or non-fitting of the same	<ul style="list-style-type: none"> Avoid using the broken/distorted appliance. Keep the broken removable functional appliance in water.
Fixed functional appliance	<ul style="list-style-type: none"> The patient is advised to send the photos every 3 weeks. Asymptomatic—nothing to do Mild pain/discomfort—warm saline rinses 3-4 times/day for a week. Mild analgesic Moderate to severe—emergency care at the orthodontic clinic.⁶

It seems that the concept of normality in orthodontics, as in many other areas, will never be the same, and only the professionals who manage to adapt to the new scenario will be able to go ahead. Thus, Orthodontics has to adjust to the ongoing scenario to continue its journey in treating patients and creating better smiles and at the same time, be safe from the deadly virus.

History recording and patient evaluation

A thorough and detailed COVID-19 screening questionnaire, including social history, gatherings, meetings, medical history, and travel history to assess the emergency, is reported as soon as a patient visits the clinic. Trained dental staff must measure the patient's body temperature, using a non-contact infrared thermal sensor.^{24,25} As suggested by Center for Disease Control and Prevention (CDC) guidelines, persons exposed to an individual with COVID-19 or a patient reporting with fever (99.32°F/37.4°C or higher), and any high-risk patient suspected as answered in the questionnaire should wear a mask to cover cough and be offered separate space to wait.²⁶

Suspected patients are informed about checking their health regularly, recording it daily and self-quarantining. Based on the evaluation of the nature of the emergency, clinicians should select the true extent of the dental condition in severity, which might be helpful by either accepting the patient or deferring immediate dental care.^{23,26} Further, the patient should be motivated to make a payment for the related orthodontic services and consultation over online mode only, as the exchange of currency notes might act as a potential source for the spread of the SARS-CoV-2 virus.

INFORMED CONSENT FORMAT FOR ORTHODONTIC TREATMENT DURING COVID 19 OUTBREAK

Name: _____ Age/Sex: _____ Date: _____
 Address: _____ Occupation: _____
 Mobile No: _____ Email Id: _____

1.	Do you have any symptoms like fever, body pain, cough, sneezing, sore throat, difficulty in breathing?		
2.	Have you or any of your cohabitants travelled outside state/country in the past one month?		
3.	Any of your family members have history of fever, body pain, cough, sneezing, sore throat, Difficulty in breathing?		
4.	Have you visited the general physician if your answer is yes for question 1?		
5.	Do you have any medical issues (if yes mention the details)?		
6.	Do you belong to Covid 19 sensitive area or have visited one such place in past one month?		
7.	Have you come into contact with a patient with confirmed 2019-nCoV infection within the past 14 days?		
8.	Have you recently participated in any gathering, meetings, or had close contact with many unacquainted people?		

I,..... have come to the _____ Dental Clinic/Hospital for Orthodontic treatment. The Orthodontist reserves right to **TREAT /DEFER /REFER** me accordingly. If I happen to be an asymptomatic carrier or an undiagnosed patient with covid19 disease, I suspect it may endanger Dentist and clinic staff. It is my Duty and responsibility to take appropriate precautions and follow the protocols prescribed by them. I also know and understand that I may already be an asymptomatic carrier/ undiagnosed COVID-19 positive patient/ may get infected due course of time after my visit to the dental clinic and I will not hold the doctors or the staff of the clinic responsible for any future diagnosis of COVID with me or my accompanying person. The above terms and conditions have been read by me / have been explained to me in my native language to my complete satisfaction. I agree to all terms and conditions mentioned above. I verify, confirm and agree to be held accountable, regarding the details given by me which I state are true to the best of my knowledge.

Patient's signature /Thumb Impression: _____ Parent/Guardian Signature (if minor) _____

Patients accompanying person's signature: _____

Name of the Dentist with Signature: _____

Figure 5. Informed Consent Form for Orthodontic Treatment During COVID-19 Outbreak¹⁹

It is a given that the COVID-19 pandemic will have a long-lasting impact on orthodontic practice the essential adaptations concern four areas of the orthodontist practice

- ✓ Microbiologic control measures
- ✓ Social distancing
- ✓ New ergonomics
- ✓ Bioethical considerations
- ✓ Microbiologic control measures
- ADA recommended antibacterial mouth rinses and thus the orthodontic patient is asked to

perform an oral rinse with 1% solution of H₂O₂ (1 part of 10 vol 30% and two parts of water) or with 0.2% povidone-iodine for 30-45 seconds prior the orthodontic procedure to decrease the viral count in the patient's saliva as viruses are sensitive to structural lysis and oxidation by these agents. It has been observed that SARS-CoV-2 virus is not sensitive to routinely used oral chlorhexidine rinse²⁷ and hence 1.5% hydrogen peroxide is recommended before treatment, to reduce the viral load. Mouth rinses containing β -cyclodextrins combined with flavonoids agents have been proposed for COVID-19. Children should rinse only under adult supervision.²⁸

○ Extended use of personal protective equipment (PPE)

In our regular practice, orthodontists and clinical staff use gloves, surgical masks, and gowns, but as a result of the pandemic, the routine use of complete personal protective equipment may be advisable, not only when required by the health authorities in each country, but also because of an increase in demand moved by a traumatized society experiencing the effects of COVID19.²⁹ The COVID-19 virus is chiefly spread via the oronasal route, as the viral load is mostly in the nasopharyngeal region of the diseased person. Therefore, it is necessary to take actions to avoid the spread of infection from one patient to another by dental instruments and equipment; it is thus recommended to add a layer of airborne contact safety measures to the routine orthodontic practice, minimizing the risk of virus transmission. The drawback of this is that it hinders psychological interaction with the patient—a fundamental tool in the treatment of children and adults.

Table 3: Recommended PPEs for Orthodontic and Dental Setup¹⁹

Face shield and goggles	Contamination of mucous membranes of the eyes, nose, and mouth can occur due to droplets generated by cough, sneeze of an infected person, or during aerosol-generating procedures carried out in a clinical setting. The flexible frame of goggles should provide a good seal with the skin of the face, to cover the eyes and the surrounding areas, and even to accommodate the prescription glasses.
Masks/respirators	SARS-CoV-2 viruses target mainly the upper and lower respiratory tracts. Hence, protecting the airway from the particulate matter generated by droplets/aerosols prevents human infection. The hand which has been contaminated with the virus can allow the virus to enter the host when it touches the eyes, nose, or mouth. Hence, the droplet precautions/airborne precautions using masks are crucial while dealing with a suspected/ confirmed case of COVID-19 during the performance of an aerosol-generating procedure. Masks are of different types. The type of mask to be used is related to particular risk profile of the category of personnel and his/her work. There are two types of masks, which are recommended, for various categories of personnel working in hospital or community settings, depending upon the work environment: <ol style="list-style-type: none"> Triple-layer surgical mask: A triple layer surgical mask is a disposable mask, fluid-resistant, and provides protection to the wearer from droplets of infectious material emitted during coughing/ sneezing/talking. N95 Respirator: An N95 respirator mask is a respiratory protective device with high filtration efficiency to airborne particles. To provide the requisite air seal to the wearer, such masks are designed to achieve a very close facial fit. Such a mask should have high fluid resistance, clearly identifiable internal and external faces, good breathability (preferably with an expiratory valve), and duckbill/cup-shaped structured design that does not collapse against the mouth.
Gloves	Nitrile gloves are preferred over latex gloves because they resist chemicals, including certain disinfectants such as chlorine. There is a high rate of allergies to the latex and contact allergic dermatitis among health workers. Non-powdered gloves are preferred to powdered gloves.
Surgical gown	Surgical gowns are designed to protect the torso of health-care providers from exposure to the virus. By using appropriate protective clothing, it is possible to create a barrier to eliminate or reduce the contact and droplet exposure, known to transmit COVID-19, thus protecting health-care workers working in close proximity (within 1 m) of suspected/confirmed COVID-19 cases or their secretions.
Shoe covers	Shoe covers should be made up of impermeable fabric to be used over shoes to facilitate personal protection and decontamination.
Headcovers	Ideally, anyone using gowns should use a headcover that covers the head and neck, while providing clinical care for patients. Hair and hair extensions should fit inside the headcover.
Source: Based on the recommendation of various health and dental care regulatory authorities like CDC, ADA, AAO, EU, and MOHFW-GOI.	

Table 4: Rationale for using PPEs in Orthodontic and Dental setup¹⁹

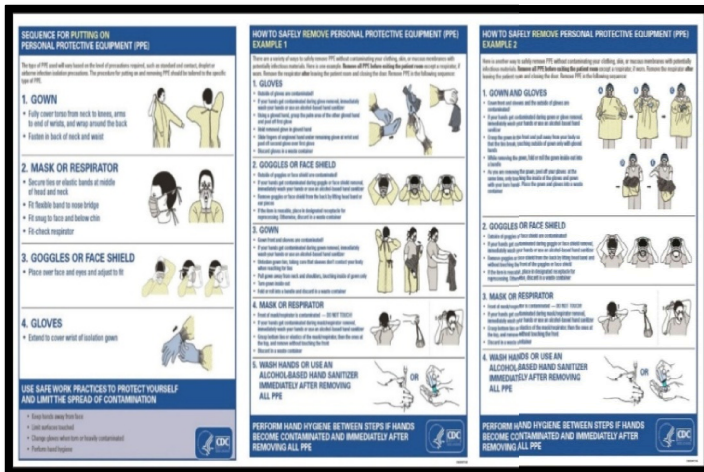


Figure 6. Sequence for Putting on and Removal of PPEs³⁰

Setting	Activity	Risk	Recommended PPE	Remarks
Triage	Triaging patients Provide a triple-layer mask to the patient	Moderate risk	N95 mask Gloves	Patients get masked
Screening area help desk/ registration counter	Provide information to patients	Moderate risk	N95 mask Gloves	
Temperature recording station	Record temperature with the handheld thermal recorder	Moderate risk	N95 mask Gloves	
Waiting area	Nurses/paramedic interacting with patients	Moderate risk	N95 mask Gloves	A minimum distance of 1 m needs to be maintained
Orthodontist/dentist chamber	Clinical management (doctors, nurses)	Moderate risk	N95 mask Gloves	No aerosol-generating procedures should be allowed
Sanitary staff	Cleaning frequently touched surfaces/floor/ cleaning linen	Moderate risk	N95 mask Gloves	
Visitors accompanying young children and elders	Support in navigating various service areas	Low risk	Triple-layer medical mask	No other visitors should be allowed to accompany patients in OPD settings. The visitors thus allowed should practice hand hygiene

Source: Based on the recommendations of various health and dental care regulatory authorities like CDC, ADA, AAO, FLL and MOHFW-GOI

After the end of clinical procedures, it is equally important to remove and appropriately dispose of the PPEs to prevent environmental and cross infection. In this aspect, the CDC has stated clear guidelines that must be strictly followed.

Minimize the use of aerosol-generating procedures

Many orthodontic procedures such as the bonding and debonding of brackets and attachments generate a substantial number of aerosols which, in turn, pose potential risks of infection transmission. Depending on the size of the office, it will be advisable to designate an isolated and adequately equipped space to carry out those procedures that require the use of rotary instruments as handpieces or ultrasonic

scalers and, if possible, concentrate these appointments when organizing the agenda.³¹ If the orthodontic procedure includes the use of rotary instruments such as airtor and water, then negative pressure should be regulated in the operator; this will minimize the spread of aerosol. This is for the reason that long-distance transmission is likely when viral particles become suspended in the air, and they may persist in aerosols for up to 3 hours.⁸ Organizational changes in the dental operator are advised, whenever acceptable. It is recommended to get consultation of a professional before venturing for the same. Additional to this, air change per hour should be kept at least 8 to 10 times for effective removal and to improve the quality of air in the operator; also, it minimizes the hazard exposure to the dental surgeon and supporting the team. High-efficiency particulate air (HEPA) filters should be thought of in a situation where regulated negative pressure operator is not possible. In addition to this, a suitable humidity level must be maintained, i.e. in the range between 40% to 60%. Judicious use of low-volume and high-volume evacuators (HVEs) should be done throughout dental procedures. A reduction of aerosols in the dental operator of up to 90% is observed when using the HVEs.^{32,33} If space is not a limitation, then it is advisable to perform aerosol-generating procedure in a closed space/room with negative pressure airflow, high airflow rate, and with optional Ultraviolet-C (UV-C) lamps for irradiation after each procedure to keep the operator safe for the next procedure.

Treatment considerations

Intraoral imaging (IOPA) should be avoided due to excessive salivation and gag reflex, and thus extraoral radiographs like the orthopantomogram (OPG) should be used.³⁴ If a local anaesthesia application is required, the gel form of local anaesthetics is preferred over the spray type as it might generate the aerosol; this might cause the potential spread of the virus in the air. Disposable, single-use instruments and devices should be preferred whenever possible to reduce the cross-infection risks.³⁵

Various hands-free intraoral lower vacuum evacuators along with HVE and external mobile suction units with appropriate face masks and PPEs must be used during the AGPs like bonding and debonding. Prior to the initial bonding is carried out, the patient must be asked to rinse his/her mouth with 1% H₂O₂ or 0.2% povidone-iodine for at least 30 seconds. Tooth surfaces must be cleaned with pumice and then rinsing with water, followed by blot drying using a cotton roll. Increased viscosity should be present in the etchant so that it should not spread to the nearby area, thus increasing effort into cleaning it.³⁶ Before curing the resin, an excess flash of it should be removed using hand instruments. Care should be taken to reduce the generation of aerosol during debonding. To remove the composite resin, the tungsten carbide burs should be used with adequate water spray and HVEs. Anti-retraction valves should be present in the handpiece to prevent the backflow of water, thus reducing the risk of contamination.³⁷ Additional to this, external mobile aerosol suction units, which can be positioned near the area of operation during the dental procedure, should be used to reduce the aerosol in the dental operatory further.

The COVID-19 pandemic has brought many challenges to the Orthodontist, and changes in the view regarding the various aspects of treatment planning and its execution. For mild-to-moderate malocclusion, the aligner treatment can be considered as an alternate option. The treatment outcome for aligner treatment is similar to the conventional fixed orthodontic treatment with satisfactory clinical results. They decrease the number of follow-up visits for patients to the Orthodontist. Such treatments can improve the practice of social distancing in these challenging situations.^{36,38}

New cleaning and sterilization procedures

In addition to the thorough cleaning and sterilization of instruments and other supplies, which are routinely carried out in dental offices, during the pandemic it has been considered paramount to implement other systematic cleaning protocols between patients regarding the waiting room furniture, toilets, floors, and other surfaces. These

new protocols will probably continue to be applied, at least partially, in the future, even if they slow down the pace of practice. Orthodontic practices must follow rigorous and strict disinfection protocols, after the end of an elective or emergency treatment, to reduce spread via fomites. Between consecutive patients in the operatory area and the waiting room, natural fresh air is always allowed. The means to achieve this: first, by opening a window, which allows the influx of fresh air (if there is provision for a window) and, second, by using a medical-grade purifier with appropriate air filters. Appliance parts and steel wires that are cut or removed should be treated as highly infected medical waste and disposed of as a medical hazard. All surfaces should be carefully sanitized using disinfectants like sodium hypochlorite.³⁵

Numerous studies have recommended that sodium hypochlorite at 0.1% to 0.2% concentration is an effective disinfectant against the SARS-CoV-2 virus when the time of contact is kept at 1 minute compared to the quaternary ammonium compounds.³⁹ Sodium hypochlorite is generally used in the dental operatory as a disinfectant for its broad-spectrum activity against capsulated and non-capsulated viruses, bacteria, and other microorganisms; they are prepared, and they can dissolve the organic materials that come into their contact.⁴⁰ Yet, its major drawback is that it causes corrosion of the carbon steel part of the orthodontic appliance and its smell after regular use.⁴¹ Quaternary ammonium compounds are also believed to be a potential disinfectant, but their potency for the SARS-CoV-2 virus is less than sodium hypochlorite.³⁶ They are comparatively expensive and need more time compared to sodium hypochlorite for sanitizing the inanimate surfaces. The operatory room can be done effectively decontaminated with hydrogen peroxide vapour.⁴²

Dental waterlines remain a worry for a potential source of contamination and thus causing microbial colonization. A valve to stop the backflow of water containing the microorganisms in the modern water systems. However, they can be a probable source and spread of infection in the dental operatory. The waterline system should be adequately purged following the use to prevent a backflow of

pathogens, which can reside in the plastic tubing. The instruments should be appropriately disinfected and sterilized immediately. All used, as well as unused items that were within the exposed area of the operatory, should be presumed to be infected and disposed of as infected medical waste. An earlier study demonstrated that the SARS-CoV-2 virus might become resuspended in the air during the removal of contaminated PPE or from the floor, by the movement of healthcare providers.⁴³ Therefore, the clinician and the assistant must remove the PPE in a separate closed area.

After the completion of clinical procedures of the day, all surfaces must be wiped with 0.1% bleach solution. If any surface is soiled, then it is first cleaned with detergent and water, dried, and wiped with 1,000 ppm of bleach solution. Further, the operatory should have high-efficiency filters for purification of operatory air and, regular checks are essential. Formaldehyde solution is used for the fumigation of the clinic at the end of the working day, and the area should be closed for 2 hours at least. After thorough air ventilation, the next day's operation should be commenced.⁴³

Dental office waste must be routinely disposed of as standard regulated medical waste (RMW) with colour-coded bins/bags/containers. The CDC RMW Guidelines should be strictly adhered, and it states the follows:

- A single, leak impervious biohazard bag is usually adequate for the containment of RMW wastes, provided the bag is sturdy, and the waste can be discarded without contaminating the bag's exterior.
- All bags should be tightly closed for disposal.
- Contamination or puncturing of the bag requires placement into a second biohazard bag.⁴³

Dental waste produced from the treatment of an emergency of confirmed COVID-19 patients are considered as medically hazardous waste and must maintain proper exclusion and must be strictly disposed of. For this, double-layer medical waste package bags, ensuring adequate strength without leaks. Compulsory labelling of "COVID-19" to store COVID-19 waste and separating them in the temporary storage room is carried out before handing them over to the authorized staff of the

common biological waste (CBW) treatment facilities' collection vans.⁴⁴

Of all the PPEs, N95 face mask must be used for a prolonged time up to 7-8 hours and limited re-use up to five times under acceptable circumstances as per the CDC guidelines, following their appropriate decontamination.

MEASURES TO INCREASE SOCIAL DISTANCING⁴⁵

Redistribution of spaces

Orthodontic clinics often have several chairs that are relatively close together in open spaces sharing common facilities. To achieve the appropriate physical distance, it may be necessary to rearrange chairs and place partitions between them. In many cases, this will require costly structural refurbishments, which can make it difficult for the Orthodontist and their staff to move around the clinical area.

Decreasing the number of patients in the clinic

In orthodontics practice, it is common for the Orthodontist to treat several patients simultaneously, especially if they are children. The need to increase interpersonal distances may require changing this form of collaborative and dynamic work in addition to reducing the number of patients seen per day. This approach could potentially have a negative economic impact at a time when the expenses derived from adaptations hinder the survival of many practices.

Reduce the number of companions

The adult patient should go to the office alone. Children should be accompanied by a single adult who, unless instructed to do otherwise, should remain in the waiting room. This change can be a problem for some parents who pick up the patient from school with one or more siblings and go directly to the Orthodontist's office. Moreover, many orthodontists prefer parents (or legal guardians) to be present during procedures to request and offer information and also to involve them in the decision-making process while increasing psychosocial interaction.

NEW FORM OF ERGONOMICS⁴⁵

Throughout its history, orthodontics has undergone many changes, some of them temporary, but a small number have been real milestones in its evolution, among them the advent of brackets, 3-dimensional radiology, skeletal anchorage, digitalization of records, or invisible orthodontics. The effects of the COVID-19 pandemic will accelerate another fundamental change: a new ergonomic approach to our line of work, 1 of those main objectives will be to reduce the number of face-to-face appointments and meetings. To do so, it will be necessary to do the following:

(1) Enhance internet communication, telemonitoring, and virtual assistance for managing continued and urgent patient care.³⁰ this new way of working necessitates learning and a change of attitude from the Orthodontist and his team. Creating and updating the messaging systems and Web sites according to the changing needs is time-consuming. If the professional lacks experience in this area, specialized help will be needed.

(2) Promote the use of appliances and supplies that require fewer changes and activations and avoid devices that can give rise to unscheduled appointments due to damage, debonding, injuries to the oral mucosa, etc. This strategy may compel the Orthodontist to change their habits and preferences concerning some appliances they have always trusted.

NEW BIOETHICAL CONSIDERATIONS⁴⁵

In orthodontics, as in all health professions, the biopsychosocial approach to the patient's pathology has always been critical. At present, and presumably more so in the future, this broad vision will be essential. Many families may be victims of unemployment and the financial repercussions of this pandemic that may extend over time. Orthodontists must consider these circumstances when deciding on issues regarding suitable times to begin treatments or the advisability of postponing them, or when assessing the cost-effectiveness of some treatments. Orthodontics is important for the patient and their family, but in the current circumstances, its importance is only relative in many cases, and orthodontists can never lose the

ethical perspective behind their speciality. In these difficult times and those to come, orthodontists must more than ever prioritize the psychosocial interests of patients and the community, while continuing to convey, without pressure, the role of oral health in society.

References

1. Rothe, C, Schunk, M, Sothmann, P. Transmission of 2019-nCoV infection from an asymptomatic contact in Germany. *N Engl J Med.* 2020; 382(10):970-971.
2. Li, T. Diagnosis and clinical management of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections: an operational recommendation of Peking Union Medical College Hospital (V2.0). *Emerg Microbes Infect.* 2020; 9:582-585.
3. JF-W, Chan, Yuan, S, K-H, Kok . A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. *Lancet.* 2020; 395:514-523.
4. Backer, JA, Klinkenberg, D, Wallinga, J. Incubation period of 2019 novel coronavirus (2019-nCoV) infections among travellers from Wuhan, China. *Euro Surveill.* 2020;25(5):20-28.
5. Suri S, Vandersluis YR, Kochhar AS, Bhasin R, Abdallah MN. Clinical orthodontic management during the COVID-19 pandemic. *Angle Orthod.* 2020 April 27.
6. Ye, G, Pan, Z, Pan, Y. Clinical characteristics of severe acute respiratory syndrome coronavirus 2 reactivation. *J Infect.* 2020;80:e14-e7.
7. Xu, H, Zhong, L, Deng, J. High expression of ACE2 receptor of 2019-nCoV on the epithelial cells of oral mucosa. *Int J Oral Sci.* 2020;12.
8. Dong Y, Mo X, Hu Y, et al. Epidemiological characteristics of 2143 pediatric patients with 2019 coronavirus disease in China. *Pediatrics.* 2020.
9. Wang Y, Zhou CC, Shu R, Zou J. Oral health management of children during the epidemic period of coronavirus disease 2019 (Chinese)]. *Sichuan Da Xue Xue Bao Yi Xue Ban.* 2020;51(2):151-154.

10. To KK, Tsang OT, Chik-Yan Yip C, et al. Consistent detection of 2019 novel coronavirus in saliva. *Clin Infect Dis*. 2020.
11. Sabino-Silva R, Jardim ACG, Siqueira W.L. Coronavirus COVID-19 impacts to dentistry and potential salivary diagnosis. *Clin Oral Investig*. 2020;24(4):1619-1621.
12. Harrel SK, Molinari J. Aerosols and splatter in dentistry: a brief review of the literature and infection control implications. *J Am Dent Assoc*. 2004;135(4):429-437
13. Liu Y, Ning Z, Chen Y, et al. Aerodynamic analysis of SARS-CoV-2 in two Wuhan hospitals. *Nature*. 2020;582(7813):557-560.
14. Froum S, Strange M. Covid-19 and the problem with dental aerosols. *Perio-Implant Adv*. Published 2020, April 7.
15. Fears AC, Klimstra WB, Duprex P, et al. Comparative dynamic aerosol efficiencies of three emergent coronaviruses and the unusual persistence of SARS-CoV-2 in aerosol suspensions. Preprint. medRxiv. 2020;2020.04.13.20063784.
16. Shen Y, Li C, Dong H, et al. Airborne transmission of Covid-19: epidemiologic evidence from an outbreak investigation. Preprint April 2020.
17. Forrester JD, Nassar AK, Maggio PM, Hawn MT. Precautions for operating room team members during the Covid-19 pandemic. *J Am Coll Surg*. 2020;230(6):1098-1101.
18. Banaee S, Claiborne DM, Akpınar-Elci M. Use of negative pressure isolation in the provision of dental care. *Decisions in Dentistry*. Published 2020, April 13.
19. Sharan J, Chanu NI, Jena AK, Arunachalam S, Choudhary PK. COVID-19—Orthodontic Care During and After the Pandemic: A Narrative Review. *Journal of Indian Orthodontic Society*. 2020;54(4):352-365.
20. COVID-19 Map - Johns Hopkins Coronavirus Resource Center COVID-19 Map - Johns Hopkins Coronavirus Resource Center. (2020). <https://coronavirus.jhu.edu/map.html>
21. Aziz SB, Kapoor P. Customized Orthodontic Triage During COVID-19 Pandemic. *Journal of Indian Orthodontic Society*. 2020;54(4):391-393.
22. Centers for Disease Control and Prevention. Infection control: severe acute respiratory syndrome, coronavirus 2 (SARS-CoV-2). <https://www.cdc.gov/coronavirus/2019-ncov/infection-control/controlrecommendations.html>.
23. WHO. Coronavirus Situation Report 83 <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports/>.
24. World Health Organization. Considerations for the provision of essential oral health services in the context of COVID-19. Interim guidance, August 3, 2020. <https://who.int/publications/i/item/who-2019-ncov-oral-health-2020-1>.
25. Centres for Disease Control and Prevention (CDC). Interim infection prevention and control recommendations for patients with suspected or confirmed coronavirus disease 2019 (COVID-19) in healthcare settings. 2020. https://www.cdc.gov/coronavirus/2019-ncov/infectioncontrol/control-recommendations.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fhcp%2Finfection-control.html#manage_access.
26. Ti, LK, Ang, LS, Foong, T.W. What we do when a COVID-19 patient needs an operation: operating room preparation and guidance. *Can J Anaesth*. 2020; 67:756-758.
27. Carrouel F, Conte MP, Fisher J, et al. Covid-19: a recommendation to examine the effect of mouthrinses with β -cyclodextrin combined with Citrox in preventing infection and progression. *J Clin Med*. 2020;9(4):1126.
28. World Health Organization. Infection prevention and control of epidemic- and pandemic-prone acute respiratory infections in health care. Annex G, use of disinfectants: alcohol and bleach. 2014. <https://www.ncbi.nlm.nih.gov/books/NBK214356/>.
29. Torales J, O'Higgins M, Castaldelli-Maia JM, Ventriglio A. The outbreak of COVID-19 coronavirus and its impact on global mental health. *Int J Soc Psychiatry*. 2020 Jun;66(4):317-320.

30. Jena, AK, Sharan, J. Decontamination strategies for filtering facepiece respirators (FFRs) in health care organizations: a comprehensive review. *Ann Work Expo Health*. 2020.
31. Parmar N, Dong L, Eisingerich AB. Connecting with Your Dentist on Facebook: Patients' and Dentists' Attitudes Towards Social Media Usage in Dentistry. *J Med Internet Res* 2018;20(6):e10109.
32. Harrel, SK. Contaminated dental aerosols. *Dimens Dent Hyg*. 2003; 1:16-20.
33. Devker, NR, Mohitey, J, Vibhute, A A study to evaluate and compare the efficacy of preprocedural mouth rinsing and high-volume evacuator attachment alone and in combination in reducing the amount of viable aerosols produced during ultrasonic scaling procedure. *J Contemp Dent Pract*. 2012; 13:681-689.
34. Liu, Y, Ning, Z, Chen, Y Aerodynamic characteristics and RNA concentration of SARS-CoV-2 aerosol in Wuhan hospitals during COVID-19 outbreak. *bioRxiv*. 2020.
35. World Health Organization. Considerations for the provision of essential oral health services in the context of COVID-19. Interim guidance, August 3, 2020. <https://who.int/publications/i/item/who-2019-ncov-oral-health-2020-1>.
36. Eliades, T, Koletsi, D. Minimizing the aerosol-generating procedures in orthodontics in the ear of a pandemic: current evidence on the reduction of hazardous effects for the treatment team and patients. *Am J Orthod Dentofacial Orthop*. 2020.
37. Srirengalaksmi, M, Venugopal, A, Pangilinan, PJP. The way forward. Part 1. Office environmental and infection control. *J Clin Orthod*. 2020.
38. Chaudhary, P, Sharan, J, Amerco, KKA. COVID-19. Precautions and recommendations. *Am J Orthod Dentofacial Orthop*. 2020;158:312.
39. Infection prevention and control recommendations for patients with suspected or confirmed coronavirus disease 2019 (COVID-19) in healthcare settings. March 19, 2020. U.S. Centers for Disease Control and Prevention. https://www.cdc.gov/coronavirus/2019-ncov/infectioncontrol/controlrecommendations.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fhcp%2Finfection-control.html
40. Ansaldi, F, Banfi, F, Morelli, P. SARS-CoV, influenza A and syncytial respiratory virus resistance against common disinfectants and ultraviolet irradiation. *J Prevent Med Hyg*. 2004; 45:5-8.
41. Oliet, S, Sorin, SM. Inhibition of the corrosive effect of sodium hypochlorite on carbon steel endodontic instruments. *J Endodontol*. 1978; 4:12-16.
42. Xie, X, Li, Y, Sun, H Exhaled droplets due to talking and coughing. *J R Soc Interface*. 2009;6:S703-S714.
43. Centers for Disease Control and Prevention (CDC) . Regulated medical waste, chapter I, part 1 of guidelines for environmental infection control in healthcare facilities (2003). July 2019. <https://www.cdc.gov/infectioncontrol/guidelines/environmental/background/medical-waste.html>.
44. Coronavirus Disease 2019 (COVID-19) Coronavirus Disease 2019 (COVID-19). (2020). Retrieved December 10 2020, from <https://www.cdc.gov/coronavirus/2019-ncov/hcp/using-ppe.html>
45. García-Camba P, Marcianes M, Varela Morales M. Changes in orthodontics during the COVID-19 pandemic that have come to stay. *Am J Orthod Dentofacial Orthop*. 2020 Oct;158(4):e1-e3.