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Clincal implications of orthodontic patients during covid -19 pandemic: A review article

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Abstract
Introduction: Corona-virus 2019 also known as COVID-19 is highly contagious and rapidly growing disease. A severe acute respiratory condition syndrome SARS-COV-2 affected more than 200 countries. The quick advancing of the pandemic has gripped the entire community making it as Public Health Emergency. Dentists, including Orthodontist are at a very high risk of acquiring and transmission of infection. The transmission mainly occurs through respiratory tract, aerosol and droplets. Clinical symptoms mainly vary from mild, moderate and severe type of sickness. So, the objective of this review is to give an expansive overview of the clinical implications of orthodontic patients during COVID-19 pandemic and to increase awareness about the strategies for infection control and prevention.
Methods: A comprehensive literature from orthodontic relevant sources and information was searched with the help of Pubmed, Medline, Google scholar, Scopus, World Health Organization and various National Orthodontic associations.
Results: Due to rapidly evolving nature of disease, this review mainly emphasizes on the strategies for infection control measures, minimizing aerosol production, restricting appointments to emergencies only during the outbreak.
Conclusion: During the outbreak, electric orthodontic treatment should be suspended and should only be resumed when allowed by the state, local health regulatory authorities. Emergency orthodontic treatment should be followed with the help of proper strict control measures and guidelines. Minimizing personal contact and aerosol production are keys to prevent contamination with the orthodontic settings.

Keywords: communications, COVID-19, dentistry, infection control, orthodontics, SARS-COV-2

Introduction
An acute respiratory condition caused by novel Corona Virus 2 (SARS-COV-2), earlier known as 2019-novel Coronavirus or 2019-nCov began in late 2019 in Wuhan, China, gained worldwide attention making it a Public Health Concern.
Because of the fast and contagious spread of virus worldwide, On 30 January 2020, World Health Organization (WHO) has declared Corona Virus (Covid-19) as a major Public Health Emergency of International Concern [1, 2] and had declared the restrictive measures to limit the transmission of the disease. Various undertakings have been made to prevent the spread of the disease yet had incited huge interferences, leaving simply fundamental organizations to continue [3]. During such conditions, performing elective procedures such as orthodontic treatment, is required to be suspended. Since the orthodontic treatment is a long, comprehensive and a non-stop procedure, moreover adding to the situation, many patients were experiencing orthodontic treatment before the crisis so there planned arrangements were unexpectedly suspended which led to prolong treatment time and various issues due to breakage of the appliances. Due to this highly contagious pandemic outbreak and the indefinite length of time for which the elective treatment may remain suspended and due to lack of concentrated information and guidelines for the management of orthodontic patients during the COVID-19 pandemic, all together would affect the orthodontic patients in different regions of the country [4]. Thus, this article aims to provide summary and recommendations for management of orthodontic patients during the Covid-19 Pandemic by using available data and literature.

Materials and Method

A literature search was performed to retrieve research articles regarding COVID-19 pandemic and clinical implications of orthodontic patients. No attempt to exclude any information was done to capture all the possible data. Thus, no strict inclusion criteria were applied [1]. The searched sources included peer-reviewed literature publications from electronic databases such as PubMed and Google Scholar using the following search terms: ‘‘Coronavirus,’’ or ‘‘COVID-19,’’ or ‘‘SARS-CoV-2,’’ or ‘‘2019-nCoV,’’ separately combined with ‘‘structure,’’ ‘‘incubation,’’ ‘‘latency,’’ ‘‘transmission,’’ ‘‘symptoms,’’ ‘‘dentistry,’’ “orthodontics” ‘‘infection control,’’ ‘‘treatment,’’ and ‘‘protocol.’’ Up-to-date reports and communications from major health bodies such as the Centers for Disease Control and Prevention (CDC), World Health Organization (WHO), National Institutes of Health and major national orthodontic associations and health professional regulatory bodies were also referred [2].

Results

As a result of the rapidly evolving infection the evidence is still not clear, an enormous part of the assessments was clear in the given literature, little investigational examines, narrative reviews, and ace notions are given in the available data. Currently, there is limited information available so more recent studies are preferred. So overall synthesis were performed to provide a summary for clinical implications of orthodontic patients during COVID-19 pandemic with latest available data and literature.

Discussion

Corona virus

Corona virus are large group of virus. They consist of a core, a genetic material surrounded by a lipid envelop with protein spikes which gives the appearance of crown; crown in latin is called as corona thus the name given is corona virus. There are different types of corona virus that can cause illness in animals and humans. In humans Corona virus such as SARS-Cov, MERS-Cov and SARS-Cov2 can cause respiratory infections ranging from common cold to severe diseases [5].

Origin of virus

According to recent findings, it is believed that bats are the natural host of disease[5]. It might be transmitted from bats via unknown intermediate host to infect humans. Sometimes these viruses jump from animals to human being and this is called as spillover and could be due to a range of factors such as mutations in the virus or increase contact between human and animals. Genomic sequencing of corona virus SARS-CoV transmitted from civet cats to humans in china in 2002 and MERS-CoV from dromedary camels to humans in Saudi Arabia in 2012 whereas origination of SARS-CoV2 is still not known [6].

Epidemiology

By the end of 2019, an outbreak of severe pneumonia of unknown etiology firstly reported in Wuhan, China. Bats are suspected to be the natural host of the virus that is transmitted to humans through an intermediate host [7].

The risk of infection and severity of disease is higher for all the age groups [8]. But the serious illness is highest in people aged >65 years and those who are already ill. Health care workers are also at great risk of transmission. Various studies have reported cross-transmission of this infection among Health care staffs. The infection can spread through one to another, healthcare staff to patient, or from patient to patient [9, 10, 11].

The highest risk of transmission of COVID -19 is seen in those who have any of these underlying systemic conditions when it is not controlled [12, 13],

- Hypertension
- Cardiovascular disease
- Diabetes
- Chronic respiratory disease
- Cancer
- Renal disease
- Obesity

Routes of SARS-CoV-2 transmission

The most common two main routes known for 2019-nCoV transmission include direct transmission and contact transmission [14, 15].

Direct transmission include cough, sneeze, droplet inhalation and contact transmission occurs mainly through contact with nasal, oral, and ocular mucosa [16]. Some studies have reported direct and indirect exposure of 2019-nCoV through saliva which is main field of concern for dental settings. There can be more routes of transmission of infection. Recent studies have also found SARS-CoV-2 in blood, saliva, and fecal swabs, as well as potential transmission through respiration. According to various studies it is evident that now that SARS-CoV-2 could use angiotensin-converting enzyme 2 (ACE2), the same receptor as SARS-CoV, to infect humans [17, 18].

Incubation period

The incubation period of COVID-19 has been estimated 1 to 14 days on average, but there is evidence that it could be as long as 21 days, it is found that asymptomatic individuals can also spread the virus [19]. The infection is highly contagious during its latency period [20].

Clinical presentation

The clinical manifestations of Covid-19 patients vary from relatively mild cases to severe condition. The onset of disease may be relatively mild, moderate, severe or critical [21, 22]. But the progression of disease may range from asymptomatic infection to severe pneumonia with acute respiratory distress syndrome (ARDS) leading to multiple organ failure and finally death [23]. The common symptoms of Covid-19 patient are fever, cough, sneezing, fatigue, shortness of breathe and severe pneumonia [24-28].

Laboratory Diagnosis

According to WHO Recommendations, screening protocols should be available to the local authorities. An infection can be confirmed:

- By detection of viral nucleic acid, or
- By possibly using serology to demonstrate antibodies.

So far, the best diagnosis method of COVID -19 is detection of nucleic acid in the nasal and throat swab sampling by real PCR of other respiratory tract samplings further confirmed by next generation sequencing [29].

The cases and patients with more severe conditions include Rapid collection and nucleic Acid Amplification testing (NAAT).

Infection control

The most common Infection Control measure to reduce the risk of transmission is Hand hygiene. Health care workers,

medical practitioners should strictly follow the infection control policies and procedures provided by the higher authorities.

Recommendation

Airborne droplet is considered to be one of the most common spread of infection, so the use of Personal Protective equipment (PPE) such as masks, gloves, protective gowns, caps, face shields, shoe cover is strongly recommended. Dental apparatus could be contaminated with various pathogenic microorganisms after use or become exposed to a contaminated clinic environment. Thereafter, infections can occur through the puncture of sharp instruments or direct contact between mucous membranes and contaminated hands [30].

Precaution and Recommendations for orthodontic management during the COVID-19 pandemic

Dentistry, including orthodontics, requires face to face contact with patients while performing operatory procedures [31]. Unfortunately, the dentist are at very high risk of acquiring infection [32]. Orthodontists may see many patients in a single day. So, there should be a strict infection control measures to reduce the risk of SARS-Cov-2 transmission. Children comprises the vast majority of the orthodontic patients. Studies have also reported that children infected with COVID-19 can be asymptomatic [33, 34].

Aerosol generation is confirmed route of infection transmission in the orthodontic clinical settings. Thus, due to rapid spread of highly contagious disease it is very important to strictly follow infection control measures within the orthodontic practice.

Preventive measures

- **Patient evaluation and screening:** In general, during pandemic it is recommended to postpone any routine appointments and restrict patient's visits to emergency treatment only. Screening of patients for COVID-19 symptoms and recording their body temperature is mandatory. Proper patient's medical history which includes asking targeted questions (using preformed structured questionnaire) relevant to COVID-19 should be taken prior to any procedure is mandatory [35]. This includes:
  - History of fever (37.3 ºC or higher) or use of antipyretic medication in the past 14 days.
  - Symptoms of lower respiratory tract infection including dyspnea in the past 14 days.
  - Any history of travel in the past 14 days.
  - Any history of contact with aasymptomatic or confirmed COVID-19 patient in the past 14 days.

If the patient doesn't have any signs and symptoms of infection then reschedule the appointment for the next visit and advise the patient to be self-quarantine at home for 14 days [36].

- **Self-evaluation:** If the orthodontist feel any symptoms he or she is not allowed to work. Daily self-evaluation of healthcare provider is advised
- **Mouth Rinses:** Use of 1% Hydrogen Peroxide Pre and 0.2% chlorhexidinegluconate are found to be very effective in reducing microbial loads of oral cavity fluids.
- **Infection Control:** Personal protective equipment (PPE) including facial mask, face shield, eye protection, gowns and gloves strongly recommended for health care workers.
- **Anti-Retraction Hand pieces:** Aerosol production should not be allowed, it can be highly contagious in the orthodontic practices especially when using high speed hand piece during dental cleaning at bonding, bracket repositioning.
- **Hand Hygiene:** To reduce the risk of transmission the reinforcement of hand hygiene measures with minimum 20secs before is essential.
- **Social Distancing:** Minimum no. of patients in the waiting area should be allowed with adequate social distancing.
- **Disinfection protocol:** It has been found that corona viruses can remain on metal, glass, plastic surfaces for several days.
- **Medical Wastes:** Medical wastes during the pandemic should be strictly disposed in accordance with the official instructions and should immediately be disposed [37].
- **Teledentistry:** Tele communication can assist in remote assessment and continuity of dental care during the pandemic.

Orthodontic supplies and instruments

Recommendations to reduce risk of cross contamination will protect the patients as well as orthodontist are.

- Orthodontic pliers can be sterilized with steam autoclave sterilization, thermal disinfection or disinfected with chemical substances 2% glutaraldehyde or 0.25% Para Acetic Acid [38].
- Arch wires are preferably sterilized with the help of autoclave rather than cold sterilization.
- Orthodontic markers can be autoclaved or disinfected using glutaraldehyde solution [37].
- Cleaning photographic retractors with washer-disinfector was reported as the most effective method of decontamination [39].
- Tungsten Carbide Debonding Burs could be effectively decontaminated from bacterial infection.
- Use of Disinfectant improves the Quality of water within the dental unit or flushing Dental Unit Water Line for at least 2 minutes.

Recommendations for orthodontic emergencies at home [40]

Table 1: Recommendation for removable appliances

Removable appliance	Functional	If it is broken or does not fit, send photos to the orthodontist and suspend the use
	Aligner	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
	Retainer	If broken or lost, ask to the orthodontist to evaluate and form a retainer with the help of telecommunication.

Table 2: Recommendations for fixed appliances

Fixed Appliance	Loose bracket	Remove the bracket and send a photo to orthodontist
	Poking distal wire	Cut it with the help disinfected nail clipper /hardware cutter and send a picture to the orthodontist.
	Poking ligature	Send a photo to orthodontist, use wax, eventually push it back with eraser or a pencil
	Periodontal abscess around molar band	Click a picture and send to orthodontist, use symptomatic therapy with paracetamol and eventually use of prescribe antibiotics.
	Mouth sores	Click a picture and send to orthodontist, use symptomatic therapy with application of topical anesthetic.

Table 3: Recommendations for extraoral and intraoral appliances

Non-removable appliances activated by the patient (e.g., face masks, headgears or lip bumpers, palatal expanders)	To avoid future emergencies it should be suspended
Pre-activated, non-removable appliances, (e.g., Pendulum, Forsus, Distal Jet appliance, transpalatal bar)	If the patient feels pain or swelling, click a picture and send to orthodontist and ask him/her to remove the appliance to avoid future emergencies.

Recommendations

- Apart from the orthodontic emergency, a clear guideline for COVID-19 testing and types of personal protective equipment (PPE) is needed in orthodontic practice.
- Tele dentistry should be of utmost importance in routine practices.

With the increased knowledge of viral features, epidemiologic characteristics, clinical spectrum, and treatment, efficient strategies have been taken to prevent, control, and stop the spread of COVID-19. Further discussion and research are needed to improve the current infection prevention and control strategies after the pandemic, especially in dental practices and dental hospital and universities.

Conclusion

During the COVID-19 pandemic, it is imperative that Elective treatment, including routine orthodontic treatment, should be suspended and resumed only when permitted by state/provincial, and local health regulatory authorities. Emergency orthodontic treatment can be provided by following a contingency plan founded on effective communication and triage. Treatment advice should be delivered remotely first whenever possible and, where necessary using tele-dentistry, in-person treatment can be performed in a well-prepared operatory following the necessary precautions and IPAC protocol.

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