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Review article: Impact of Covid-19 on Orthodontics

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ABSTRACT: Coronavirus disease (COVID-19) is a highly infectious disease caused by Coronavirus, SARS-CoV-2. Human-to human transmission occurs via the respiratory tract through droplets, secretions or direct contact, where the virus enters the mucous membrane of the mouth, nose, and eyes. The virus can remain stable for days on different materials. Most infected people experience a mild form of disease, but those with advanced age or underlying conditions may suffer severe respiratory and multiorgan complications.
With COVID-19 declared as a worldwide pandemic, a nationwide lockdown was implemented overnight in India on March 24, 2020. With no prior warning, patient appointments were temporarily ceased as institutions and clinics were indefinitely closed.
Due to the unprecedented nature of this pandemic and the unknown length of time, it has changed the life of many and members of the orthodontic fraternity are of no exception. A state of uncertainty has engulfed with panic and fear during these challenging times.Since orthodontic treatment is a long and continuous process, millions of patients were already undergoing orthodontic treatment whose scheduled care was abruptly suspended. The aim of this review is to provide a comprehensive summary of the implications of COVID-19 on orthodontic treatment and to discuss the contingency management and provision of emergency orthodontic care.

I. INTRODUCTION

COVID-19 was first reported in Wuhan, Hubei province, central China in December 2019, wherebats were suspected to be the primary host. Although many coronaviruses primarily infect animals, human infection occurs only when animal-human species barrier is crossed.COVID-19 spread worldwide due to travel and, on March 11, 2020, COVID-19 was declared a pandemic by WHO. Currently, it can be spread within cities through local transmission from an infected person or community transmission, where the source of infection is unknown.

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. Keep in mind that the key to Infection =Exposure to Virus × Time. Efforts to contain the spread of the diseasehave led to major disruptions, forcing regional and, in many cases, national emergencies and lockdowns, leaving only essential services to continue. In many such efforts, performing elective tasks, including orthodontic treatment, are required to be suspended on orders of public health or professional regulatory bodies.

II. CORONA VIRUS

2.1. Structure-Part of the beta-coronavirus genera, SARS-CoV-2 is a lipid bilayer enveloped nonsegmented positive-sense RNA virus.
Coronavirus virions are spherical and their surface appears crown-like (hence the name corona) due to spiked glycoprotein projections. [1]

2.2. Lability and stability- Human coronaviruses have been reported to remain infectious on inanimate
surfaces in the range between 2 hours to up to 9 days. More importantly for dentistry and orthodontics, SARS-CoV- 2 was detected in aerosols for up to 3 hours when created using a nebulizer.SARS-CoV-2 did experience an exponential decay in all experimental conditions, where the longest viability of the virus was on stainless steel and plastic.

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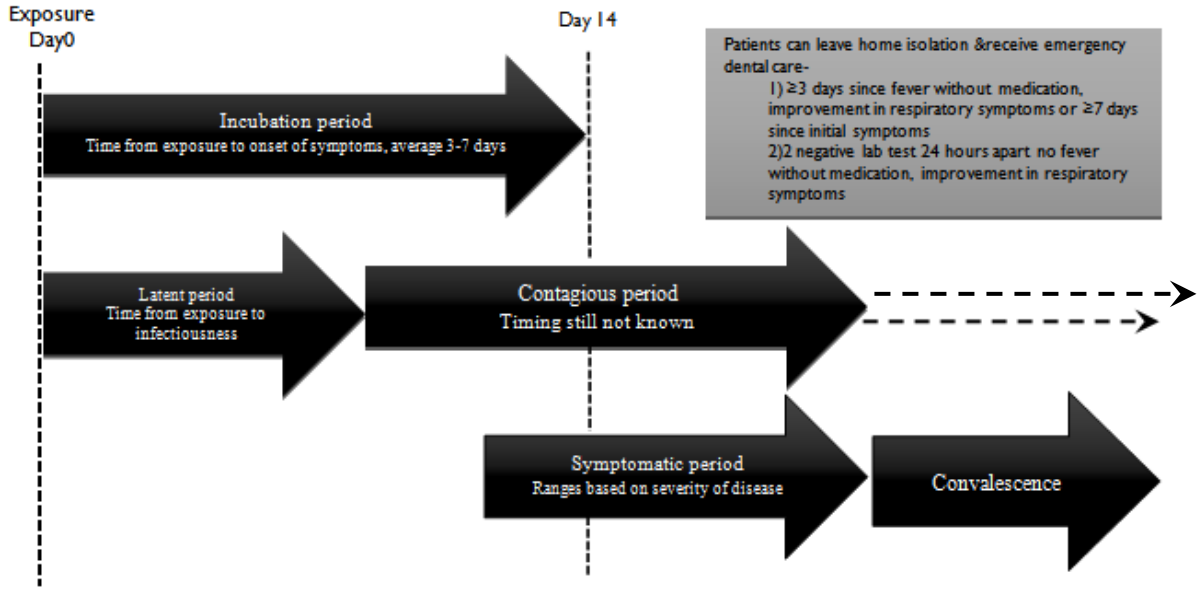
2.3. Transmission- Human transmission is predominantly through the respiratory tract via droplets, respiratory secretions (cough, sneeze), and or direct contact,where the virus enters the mucous membrane of the mouth, nose, and eyes.Asymptomatic individuals or those within the viral incubation period may also be able to transmit COVID-19.

2.4. Incubation, latency, and contagious period-

The incubation period of SARS-CoV-2 ranges from 1 to 14 days. The latent period is shorter than the incubation period, as COVID-19 can transfer through asymptomatic or mildly symptomatic carriers. Generally, patients are considered to be in convalescence when they present with the following: (1) a normal temperature for more than 3 days, (2) resolved respiratory symptoms, and(3) two negative oropharyngeal swab reverse transcription polymerase chain reaction (RT-PCR).Viral ribonucleic acid (RNA) tests that are taken at least 24 hours apart.However, SARS-CoV-2 detection can also occur after this, as seen from RTPCR test results 5–13 days later. Currently, there is insufficient evidence to determine if patients can be contagious during convalescence.[1]

2.5. Clinical manifestations

COVID-19 manifestations range from a complete lack of symptoms to symptomatic patients with severe complications leading to multiorgan dysfunction, septic shock, and systematic failure. COVID-19 can be classified into mild, moderate, severe, or critical diseases. Most COVID-19 patients experience a dry cough, fatigue, and fever. Shortness of breath and gastrointestinal symptoms (diarrhea, vomiting), as well as atypical symptoms, including sore throat, severe headache, confusion, and muscle pain, may also occur. A small proportion of patients develop severe complications, including respiratory distress syndrome, shock, and arrhythmias, and some complications can lead to death. [1]



III. QUESTIONS RAISED BY ORTHODONTISTS

3.1When can one "safely" get back to our profession?

With all the PPE and the other sterilization protocols in order, one is "free" to work even now. But the main question is will it ever be the same old normal and we almost wished we could predict it. Now that we can't and with so much ambiguity still wonder about the SARS- CoV-2 virus ,when to get back to normal work should be at the orthodontist'ssole discretion based on relevant scientific guidelines .It is our duty as health care professionals to look especially into emergency needs of our patients. However in dealing with elective procedures especially aerosol generating, it is preferable to be on the side of caution. [2]

3.2. Will there be a drop in orthodontic cases that we expect in our profession?

Yes there might be a drop in new cases for a short period. Due to the overall financial loss to

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the common man and fear of contracting the disease, the number of new orthodontic cases might dwindle.[2]

3.3. What about the dilemma whether to continue with visiting practice?

Yes, one can visit dental clinics that strictly follows sterilization/disinfection protocols and follow COVID guidelines issued by the government. If not, these patients should be given the option to continue treatment at any other clinic in their vicinity which is standardized as per COVID requirements.[3]

3.4. How to managefinancial liabilities?

The current and impending economic losses is attributed to accentuated expenditure and the lack of resources to fulfil them.There is a plethora of knowledge available and various guidelines have been provided to form contingency plans for orthodontic practices.It's time to rethink our strategies in regard to finance and take into consideration the importance of caution over monetary benefits. There is also an immediate need to identify and support members among our society who are going through severe financial liabilities.[4]

IV. EFFECT ON PATIENTS

The way lockdown affected the treatment progress, as well as understanding the difficulties faced, surveys revealed that most patients undergoing treatment were concerned about their restriction to orthodontic clinic visits. Many individuals said that it had been over 2 months since their last follow up. [5]

4.1. Need for follow up-

Orthodontic therapy usually consists of brackets or appliances fixed into the patient's mouth, and thus the accumulation of plaque is inevitable. A study by Huser et al,concluded that "the demineralization associated with orthodontic therapy is an extremely rapid process caused by a high and continuous cariogenic challenge in the plaque developed around brackets and underneath ill-fitting bands."

Bartsch et al stated that compliance is a major problem in orthodontics. Due to inevitable plaque accumulation, andpatients' reduction in adherence to oral hygiene instructions, proper prophylactic therapy is very essential. To improve the subsequent oral health, disclosing tablets can be administered to patients after instructions on how to use them for improving oral health is properly understood.

Certain treatment mechanics require regular follow-ups. The elastics used for retraction or space closure mechanics decay over time, add to the accumulation of plaque and deterioration of oral hygiene. This often goes unnoticed by patients as they are unaware of the same. Until there are evident inconveniences such as poking distal wires,or lacerations, most teeth-related problems are overlooked.

4.2. Orthodontic emergency

According to Merriam-Webster Dictionary,"emergency" is defined as "an unforeseen combination of circumstances or the resulting state that calls for immediate action" or "an urgent need for assistance or relief."

Going by the definition, though not life-threatening in all situations, certain inconveniences, might need immediate attention to reduce the chances of further complications. Is also seen that emergencies such as sudden swellings and aspiration or the accidental swallowing of appliances need to be considered as potential life-threatening emergencies.

Advice That Can Be Provided to Patients for the Short-Term Management of Orthodontic Emergencies at Home	
Orthodontic Emergency	How the Patient Can Attempt to Handle it at Home
Irritation of lip and/or cheek from the brackets	- Push/pinch a small piece of rolled relief wax over the bracket or long wire that is causing the irritation. - Mouth sores can be relieved by applying a small amount of topical anesthetic directly to the ulcerated surface using a cotton swab.
Metallic ligature has come loose from a bracket or is irritating the lips and cheeks.	- If the ligature is loose, a sterile tweezer can be used to remove it. - If the ligature is not loose but is sticking out, a cotton swab /cotton bud or a clean pencil eraser can be used to bend the ligature back down.
Broken or loose elastic chain	- The extra segment can be removed with a sterile tweezer or cut with a sterile clipper.

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Loose orthodontic attachment (bracket, tube, or band)	- If the loose bracket is rotating around on the wire and causing discomfort, a sterile tweezer can be used to correct this problem. First the bracket is moved along the wire so that it is in between two teeth. The bracket is then rotatedback (unflipped) to its proper relation (as noted from the other brackets) and is then moved along the wire back to the center of the tooth. - If the loose bracket is the last attachment in the arch, it can be slid off the wire if it is safe for a care provider to do so.
Protruding wire at the end of the braces	- A cotton swab/cotton bud or clean pencil eraser can be used to push the wire so that it flattens against the tooth. - Using a sterile tweezer, the wire can be gripped and moved back so that it is equally secure on both sides, and comfortable. - If the wire cannot be moved to a comfortable position, the wire can be covered with relief wax.
Broken bonded retainer	- If the whole bonded retainer is loose, the retainer should be left outside of the mouth. The patient should be advised to wear their removable retainer until their next visit with the orthodontist when the clinic/practice reopens for routine treatment.
Piece of appliance or a bracket is swallowed	- Most small orthodontic appliances (eg, brackets) that are swallowed will passthrough the digestive tract uneventfully. - If an object is swallowed, it should be confirmed that the patient did/does not have difficulty breathing or experience sudden coughing after the object wasswallowed. In the case of sudden difficulty breathing or sudden coughingfollowing ingestion of the broken appliance or bracket, the patient should go toan emergency department of a hospital to seek clinical examination and or radiographic assessment.
Part of orthodontic appliance embedded in the gingiva leading to severe pain and or infection	- This would represent a true emergency that could be seen by the orthodontist in office. - If the patient cannot be seen in person by the orthodontist, the patient or home care provider can use a sterile clipper to cut the wire if it is attached to the broken or loose part and remove the broken part from the mouth using sterile tweezers.

4.3. Treatment duration

Many patients were worried about not being able to go for regular follow-ups, the most common cause being an increase in the treatment duration. Rokyo et al stated that compliance and the length of the orthodontic treatment were indirectly proportional to each other.

Some patients were worried that something could go wrong with their treatment. This shows the awareness of the need for regular follow-ups, which is in accordance with patients stating that lockdown had made them realize the importance of regular follow-ups.

Many times, certain treatment mechanics (such as Begg'smechanotherapy, Tip Edge mechanotherapy) require the use of elastics changed by the patient daily. Some individuals stated that they did not have the material required to carry out the practices instructed to them by the orthodontist leaving both the orthodontist as well as patients in a helpless situation.

4.4. Treatment cost

Response to fear of increased treatment costs, though a small fraction shows the importance for the orthodontist to re-ensure patients that, provided no additional treatment is essential

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andtreatment cost would remain the same post the lockdown period.

If at all any additional cost is charged to the patient, it would be for the personal protection equipment to ensure safety for both the health care professional as well as the patient.

4.5. Contact with orthodontist

When asked if the patients were regularly in touch with their orthodontists, results showed that approximately 50% patients did keep in touch and 50% did not. These results can again be attributed to the level of interest in treatment, fear as well as problems encountered during the treatment. Another reason could be the lack of transport or facility to visit the orthodontist, despite the need.Looking at it from the perspective of orthodontists following up on their patients in whichever way possible, many of the patients replied that they did not receive calls from their orthodontists.

V. ORTHODONTIC IMPLICATIONS

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.

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

(1) respiratory droplets from coughing and sneezing or created during a dental or orthodontic procedure,

(2) indirect contact where viral droplets fall onto a surface that the dental professional or orthodontist later contacts

(3) aerosols created during dental or orthodontic procedures,

(4) treating patients who may have experienced indirect contact transmission

(5) being in contact with multiple such persons, including those who accompany the patients.

In the current stage of the COVID-19 pandemic, most authorities have suggested that all elective and routine dental treatment should be suspended and that only emergency dental treatment can be provided.

The following key steps are recommended, based on an accumulation of the recommendations and suggestions of multiple professionalregulatory bodies:

(1) Use phone calls or appropriate teledentistry facilities to assist patients in resolving any emergent orthodontic problem that can be managed at home, or to determine which patients need in-person attendance.Provide active patients with recommendations on treatment progression.

(2) Provide a means of communication (phone number or email) to patients to allow them to contact the orthodontist with any questions or concerns, and send problem related intraoral mobile-phone digital images.

(3) Provide emergent orthodontic treatment in a safe manner, where necessary, and exercise evidence-based precautions during the provision of any in-office emergency treatment.

When telecommunication is made by the orthodontist, the patient's health history should be obtained to elicit symptoms or contact history relevant to COVID-19. The patient should be advised to seek appropriate medical treatment or hospitalization based on the analysis of this history. In-person orthodontic treatment should be deferred for 2 weeks if the patient has been in contact with someone who has been infected or if the patient has travelled.[6]

Its proposed to divide orthodontic appointments into the following: short duration (10–15 min), intermediate duration (15–20 min), and long duration (>20 min) according to time required for procedure. Short duration appointments may include change of elastomeric modules or chains, adjustments of removable appliances, or managing orthodontic emergencies. Intermediate duration procedures are rebonding or cementation of any attachment, change of wires, and placement of fixed retainers. Long duration procedure includes full mouth bonding of orthodontic brackets and placement of mini implants.[7]

Sterilization protocol-The ADA recommends that all surfaces of the clinic, especially those frequently touched, be wiped with Environmental Protection Agency (EPA)-registered surface disinfectants and that instruments be autoclaved along with dental handpieces.

Medical waste, including disposable personal protective equipment (PPE) after use, should be transported to the temporary storage area of the dental facility in a timely manner. Reusable instrumentsand other clinical items should be cleaned,sterilized, and properly stored. Medical waste(trash) coming from healthcare facilities treatingCOVID-19 patients is no different than waste comingfrom facilities without COVID-19 patients."

Pre-appointment screening & triage-Triage includes establishing an office hotline for tele-consultation that can be used to determine the need for a patient to visit a health-care facility or provide support in following social-distancing protocols. A verbal or electronically signed consent should be obtained to provide advice in this manner and orthodontists should record all advice that was given in accordance with normal record keeping. Teams should also inform patients on preventive measures to undertake before they come to our offices.

In-office precautions-The clinical staff should be segregated from reception and administrative staff. Patient screener asks screening questions, provides information about what to expect during the appointment, records a screening temperature.

Other persons accompanying a patient will remain in their "waiting room"or in their own vehicle. To avoid contact between people, magazines or other materials that cannot be disinfected should be removed from the waiting room.

Patients are directed to wash their hands or use provided hand sanitizer.

Arranging orthodontic chairs to create a minimum of social distancing may half the capacity of chairs, or possibly separating units with room dividers. While one chair is occupied by a patient, the other is disinfected and left vacant.

Aerosol mitigation-N95 and ASTM Level 3 masks should be used. Plastic barriers include not only sneeze guards and face shields, but also improvised plastic screens that can be moved over the patient's head and even devices like the plastic "boxes" used as isolation for anesthesiology intubation. Laser-induced graphene (LIG)water and air filters are being developed to reduce contamination in the HVE system. The PPE should include hair covers and hoods and eyewear with side shields or full-face shields. Fluid-impermeable shoes are preferred. Airborne infection isolation rooms (AIIR) with negative suction and air purifiers with high-efficiency particulate air filters may significantly reduce the risk of transmission.[6]

Radiographs should be deferred but, if required, extra oral radiography is preferred over intraoral radiography to reduce saliva and aerosol production due to gagging and coughing. If local anesthesia is required, a local anesthetic gel is preferable over sprays due to potential virus spread in the air.

VI. CONCLUSION

With the passing days, it seems inevitable that COVID-19 has and will forever change the way we practice orthodontics, but with unity and collegiality in the orthodontic community, we can surmount this together. The pandemic has led to a drastic change in the work environment for orthodontists, and it is the need of the hour to adapt to the change, adopt the newer protocols. Guidelines should provide (1) clear legislation that explains which emergencies are ones that orthodontists can attend to in their clinics and which are ones that they should defer, (2) priority for COVID-19 testing and guidelines for PPE needed in orthodontic practices for specific procedures, and (3) comprehensive protocols for proper virtual consultations and appointments that assure adequate patient care. It was seen that majority of patients had some or the other problem associated with the lockdown, regarding their orthodontic treatment. The need for understanding the psychology of patients undergoing orthodontic treatment is extremely essential.

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