

**Panorama of Orthodontics after COVID-19: A critical literature review**

**Panorama da Ortodontia após COVID-19: Uma revisão crítica da literatura**

**Panorama de Ortodoncia después del COVID-19: Una revisión crítica de la literatura**

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**Abstract**

A new Coronavirus (2019-nCov, renamed SARS-CoV-2) was identified in the Chinese city of Wuhan in late 2019, and was declared a pandemic by the World Health Organization, on March 11, 2020. As it is a highly infectious disease, major regional and national changes have been made, social isolation was recommended, which led to the interruption of various services, including elective dental treatments. This review aimed to identify the changes that occurred in the post-COVID-19 orthodontic practice scenario. For such, a search was made for articles published in the bibliographic bases PubMed, Scopus and SciELO, using the keywords “Orthodontics” and “Covid-19”. From the eligibility criteria, 11 articles were selected for analysis. It was found that social isolation impacted the scheduling of orthodontic appointments and patient’s anxiety about the duration of treatments. The use of teleodontology proved to be an ally in screening and in patient care. Preventive infection control must be adopted for safe orthodontic practice.

**Keywords:** Coronavirus infections; Orthodontics; Dentistry.

## **Resumo**

Um novo Coronavírus (2019-nCov, renomeado SARS-CoV-2) foi identificado na cidade chinesa de Wuhan no final de 2019, sendo decretado pandemia pela Organização Mundial da Saúde, em 11 de Março de 2020. Por ser uma doença altamente infecciosa, mudanças regionais e nacionais foram feitas, o isolamento social foi recomendado, o que gerou a interrupção de variados serviços, dentre eles, os tratamentos odontológicos eletivos. Esta revisão teve por objetivo identificar as mudanças ocorridas no cenário da prática ortodôntica pós COVID-19. Para sua realização, foi feita uma busca de artigos publicados nas bases bibliográficas PubMed, Scopus e SciELO, utilizando-se as palavras-chave “Ortodontia” e “Covid-19 e suas respectivas versões em língua inglesa. A partir dos critérios de elegibilidade, 11 artigos foram selecionados para análise. O isolamento social impactou o agendamento das consultas ortodônticas e a ansiedade dos pacientes com relação à duração dos tratamentos. O uso da teleodontologia mostrou-se um aliado na triagem e assistência ao paciente. Medidas preventivas de controle de infecção devem ser adotadas para uma prática ortodôntica segura.

**Palavras-chave:** Infecções por Coronavirus; Ortodontia; Odontologia.

## **Resumen**

Un nuevo coronavirus (2019-nCov, rebautizado como SARS-CoV-2) fue identificado en la ciudad china de Wuhan a fines de 2019, siendo declarado pandemia por la Organización Mundial de la Salud el 11 de marzo de 2020. Como es una enfermedad altamente infecciosa, se realizaron cambios regionales y nacionales, se recomendó el aislamiento social, lo que provocó la interrupción de diversos servicios, incluidos los tratamientos odontológicos electivos. Esta revisión tuvo como objetivo identificar los cambios que ocurrieron en el escenario de la práctica de ortodoncia post-COVID-19. Para su realización, se realizó una búsqueda de artículos publicados en las bases bibliográficas PubMed, Scopus y SciELO, utilizando las palabras clave “Ortodoncia” y “Covid-19 y sus respectivas versiones en inglés. A partir de los criterios de elegibilidad, se seleccionaron 11 artículos para su análisis. El aislamiento social afectó la programación de citas de ortodoncia y la ansiedad de los pacientes sobre la duración de los tratamientos. El uso de la teleodontología resultó ser un aliado en el cribado y la atención al paciente. Se deben adoptar medidas preventivas de control de infecciones para una práctica ortodóncica segura.

**Palabras clave:** Infecciones por Coronavirus; Ortodoncia; Odontología.

## 1. Introduction

Due to the identification of a high number of cases involving a new Coronavirus in the Chinese city of Wuhan (Zhu et al., 2020) (2019-nCov, renamed SARS-CoV-2) (Gorbalenya et al., 2020; WHO, 2020), a pandemic was declared by the World Health Organization (WHO) on March 11, 2020 (WHO, 2020). In an attempt to contain the spread of the highly contagious COVID-19, major regional and national changes have been made, leaving only essential services open (Sunjay Suri et al., 2020).

It was recommended to suspend elective dental treatments except for emergencies, to help in social isolation measures, reduce the consumption of individual protective equipment (IPE), reduce aerosol production and the consequent risk of infection (Martina et al., 2020).

With the postponement of orthodontic consultations, the concern with the prolongation of the treatment arose among patients (Peloso et al., 2020), as well as anxiety about scheduling the next visit to the orthodontist (Cotrin et al., 2020), as social isolation became a regulation adopted by several countries (Xiong et al., 2020).

Without the possibility of face-to-face consultations, professionals and patients undergoing orthodontic treatment had the opportunity to use technology to offer and receive virtual assistance, using photo, video or video-call applications, thus allowing the orthodontist to evaluate the need to be seen at the office (Sunjay Suri et al., 2020; Martina et al., 2020). These technological communication tools, aside from keeping the patient-professional relationship active, decrease anxiety, since there is no risk of contamination, contrary to what happens during face-to-face care (Cotrin et al., 2020).

In order for a full return to orthodontic practice to happen, effective infection control measures must be routinely adopted by all the dental team members, such as the correct washing of hands, disinfection of all surfaces in the dental office, and the complete understanding and acceptance of protocols recommended by WHO (Peloso et al., 2020).

Considering the importance of information about the current situation, this study aimed to identify the changes that occurred in the post-COVID-19 orthodontic practice scenario.

## 2. Methodology

Documentary technique based on pre-existing literature on the subject was used to carry out this bibliographic review. Two trained researchers (Pires AC and de Souza SLX)

independently performed the electronic search in PubMed, Scopus and SciELO. As keywords, the terms “Orhodontics” and “Covid-19” were used in both Portuguese and in English. Both terminologies were extracted from the Health Sciences Descriptors (DeCS) of the Latin American and Caribbean Center on Health Sciences on Health Sciences Information (BIREME).

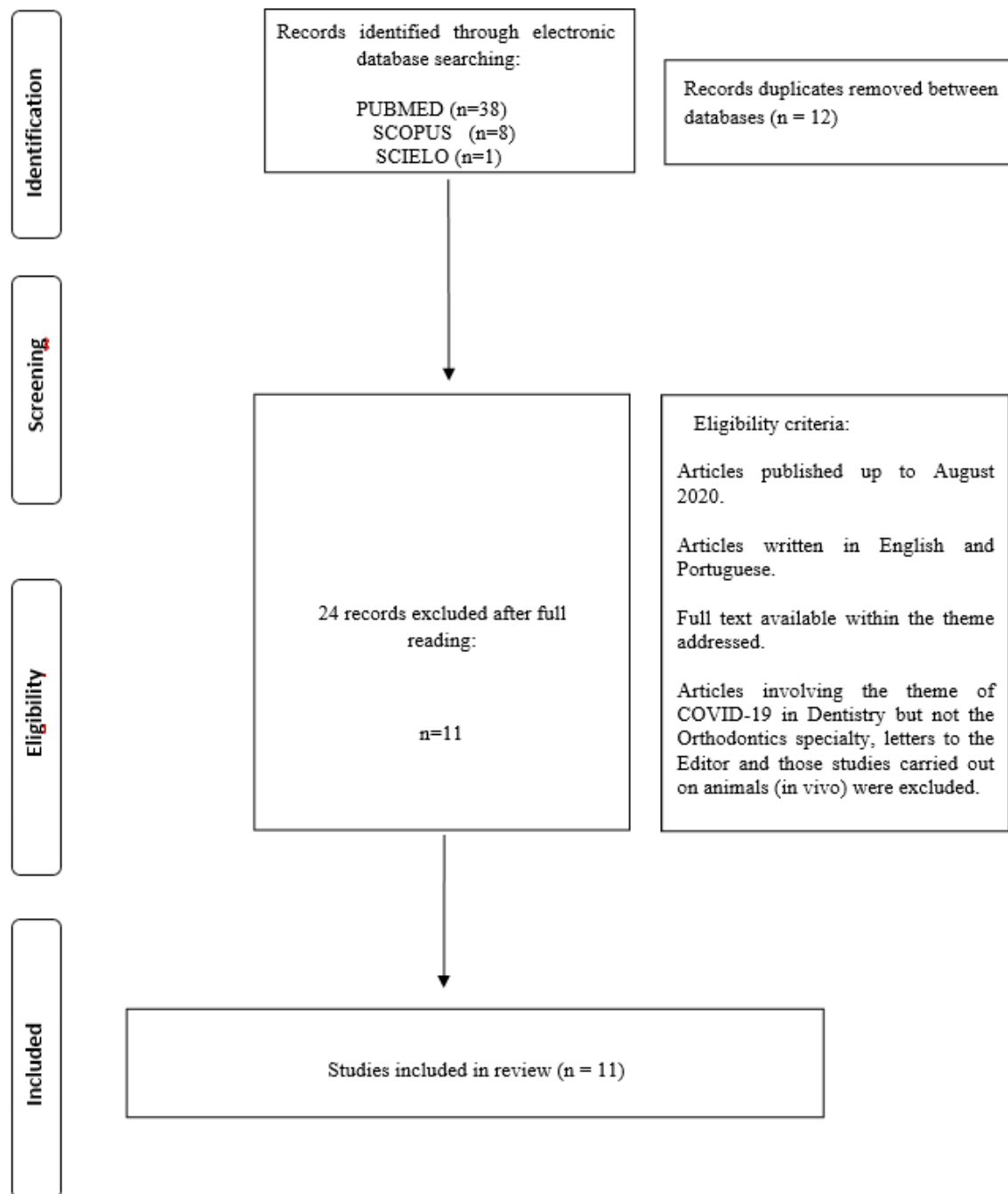
After identified through electronic database searching, records were imported to the bibliographic software Mendeley© Reference Manager, and duplicates removed between databases. Initially, the titles and abstracts were analyzed and those selected, the full texts were read.

As eligibility criteria, articles published up to August 2020, written in English and Portuguese, which had the full text available within the theme addressed, were included. Articles involving the theme of COVID-19 in Dentistry but not the Orthodontics specialty, letters to the Editor and those studies carried out on animals (in vivo) were excluded.

### **3. Results**

Forty-seven articles were found, 38 in the PubMed, 8 in the Scopus database, and 1 in SciELO. Of these, 12 that were duplicated were excluded. The remaining 35 articles were read by two independent reviewers, of which 11 were selected for analysis according to the inclusion criteria, as can be seen in Figure 1.

**Figure 1.** Flowchart of identification and selection of articles for review.



Source: Authors.

Chart 1 shows the author, the year and country of the study, the objectives, the main results, and the conclusions of the 11 selected articles. Data found served as a compass for discussing the results of this article.

**Chart 1.** Description of works involving the theme of Orthodontics and COVID-19.

Author	Country	Objectives	Main results	Conclusions
Suri et al., 2020	Canada	To provide a comprehensive summary of the implications of SARS-CoV-2 infection and COVID-19 on orthodontic treatment, contingency management, and provision of emergency orthodontic treatment.	Human-to-human transmission of SARS-CoV-2 occurs predominantly through the respiratory tract via droplets, secretions, and or direct contact, where the virus enters the mucous membrane of the mouth, nose, and eyes. The virus can remain stable for days on plastic and stainless steel. Most infected persons experience a mild form of disease, but those with advanced age or underlying comorbidities may suffer severe respiratory and multiorgan complications.	During the spread of the COVID-19 pandemic, elective orthodontic treatment should be suspended and resumed only when permitted by federal, 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 when possible, and where necessary, in-person treatment can be performed in a well-prepared operatory following the necessary precautions and infection prevention and control protocol.
Martina et al., 2020	Italy	To investigate if dentists are anxious about returning to their daily activities, and what the perception of the risk is for dentists and orthodontists regarding orthodontic procedures.	A total of 349 dentists, including 183 orthodontists, completed the survey. Returning to their daily work activity was a source of anxiety for 192 participants and this was associated with the level of distress. 67.6% of the orthodontists thought that they would increase the number of working hours during the week.	Italian dentists were mostly scared to return to their daily activities because they considered their jobs a high risk to them and their families. Dentists with an exclusive/prevaling orthodontic activity were forced to increase their working day during the week.
Peloso et al., 2020	Brazil	To evaluate the impact of quarantine resulting from the COVID-19 pandemic on dental appointments and patients' positions and concerns regarding	Five hundred ninety five patients answered the questionnaire. Most patients reported they were receiving orthodontic treatment and would attend to a dental appointment; meanwhile, those patients not receiving treatment would not attend or would visit	The quarantine recommended due to the COVID-19 pandemic was shown to have an impact on dental appointments and the anxiety levels of patients, since there was a significant association between patients' feelings and their willingness to attend a dental appointment. Overall, patients undergoing dental

		their ongoing dental treatment.	only in the case of an emergency. Males reported to be calmer than females, who were more anxious and afraid; as such, males reported more willing to go a dental appointment while, in general, females were not worried about how quarantine could affect dental treatment. Orthodontic patients were concerned about delay in treatment.	treatment and orthodontics were more willing to attend an appointment and were more concerned about an increase in treatment duration.
Cotrin et al., 2020	Brazil	To evaluate the impact of the coronavirus pandemic and the quarantine in orthodontic appointments, and patient's anxiety and concerns about their ongoing orthodontic treatment.	The questionnaire was answered by 354 patients with mean age of 35.49 years. Most patients are respecting the quarantine, more than 40% related to be calm and afraid or anxious. The level of anxiety was greater for females than males. There was significant association of the level of anxiety and the willingness to attend an appointment. The greatest concern of patients was delay in the end of treatment.	The quarantine and coronavirus pandemic showed to have impact on orthodontic appointments and patients' anxiety. Patients willing to attend an orthodontic appointment presented significantly lower level of anxiety than patients that would not go or would go only in urgency/emergency. Females were more anxious than males about coronavirus pandemic, quarantine and impact on their orthodontic treatments. Delay in treatment was the greatest concern of patients undergoing orthodontic treatment.
Xiong et al., 2020	China	To evaluate the mental distress of orthodontic patients and to investigate the level of their anxiety on treatment duration and outcome during the early stage of the pandemic.	Questionnaires were collected from 458 patients. The prevalence of mental distress was 38%. Higher odds ratios were associated with female participants, missed appointments and Hubei residence. Types of orthodontic appliance were associated with anxiety of prolonged treatment duration. The manner of communication with patients regarding the postponement of appointments was associated with patients' concern of prolonged treatment duration. Frequency of contact from dentists was associated with patients' independence.	Over one third of orthodontic patients experienced mental distress during the pandemic. Multiple factors affected the level of anxiety of orthodontic patients, such as the typo of orthodontic appliance, interval from the last dental visit, manner of communication with the orthodontist, and the localities of the pandemic progression.



<p>Caprioglio et al., 2020</p>	<p>United States of America</p>	<p>To summarize guidelines on the management of orthodontic patients during COVID-19 emergency focusing on virtual assistance devices and classification of emergencies.</p>	<p>The first step should always be virtual assistance, and WhatsApp may be considered a good tool to do that. The virtual assistance might be performed by using photos, videos or video call.</p> <p>Orthodontic emergencies is classified on the basis of the type of the appliance used by the patient: removable or fixed appliance.</p>	<p>A good method to manage emergencies, reassure, and follow patients remotely, while they are in their home, is via WhatsApp web.</p> <p>At the moment, it is necessary to manage in the office only the real cases of urgencies that cannot be resolved remotely by the patient, following the guidelines dictated by the WHO and local authorities.</p>
<p>Eliades &amp; Koletsi, 2020</p>	<p>Switzerland</p>	<p>To list the sources of aerosol production during orthodontic standard procedure, analyze the constituent components of aerosol and their dependency on modes of grinding, the presence of water an type of bur, and suggest a method to minimize the quantity and detrimental characteristics of the particles comprising the solid matter of aerosol.</p>	<p>Minimization of water-spray syringe utilization for rising is anticipated on bonding related procedures. Before any procedure, must be done mouth rinse with CHX 0.2% in attempt to reduce the load of aerosolized pathogens. Water cooling rotary instruments might not be the treatment of choice, whereas hand-instruments for remnant removal might represent better and effective strategy.</p>	<p>Wide and consistent adoption of occupational measures to control generation of aerosol in orthodontic practice should be universal, with microbiologic considerations, particulate matter production as well as toxicity related perspectives being on the spot, even more within the course of a pandemic. Realistic management in practice should focus on bonding and debonding strategies. In-office measures of self-protection should never be neglected.</p>
<p>Guo et al., 2020</p>	<p>China and United States of America</p>	<p>To summarize the preventive strategies for control of SARS-CoV-2 transmission to protect both staff and patients during the orthodontic practice.</p>	<p>In orthodontic practice, there may be transmission when bonding and removing brackets, moldings, oral scanning, photographs, wire changes, and placement of mini implants. Orthodontic instruments and materials that are not individually packaged can be a risk of contamination. High speed use should be avoided in order not to generate aerosols. During the pandemic</p>	<p>All procedures related to the orthodontic practice should be strictly performed with preventive measures to control the potential transmission of SARS-CoV-2. The control strategies include, but are not limited to, pre-examination and triage of patients, hand hygiene, personal protective measures, mouth rinse, reducing the use of high-speed handpieces while increasing the use of high-volume saliva ejectors during bracket or attachment bonding and removal, disinfection during</p>



			period, emergency procedures are recommended.	archwire changing or bending and removable appliance adjustment, disinfection of dental settings between patients, instructions to patients, management of reusable items and medical wastes, air and environment disinfection, and digital patient follow-up.
Maspero et al., 2020	Italy	To reduce in-office appointments by providing an overview of the technologies available and their reliability in the long-distance monitoring of patients (teledentistry).	Available Technologies that can be used in Teleorthodontics are: high-speed Internet connection, digital videos and photographs, smartphones, and websites.  Teleorthodontics reduces costs and provides treatment access to a wider range of persons without compromising the quality of care. It also allows the orthodontist to maintain treatment control in situations where the patient cannot go to the clinic.	Teleorthodontics can manage most emergencies, reassuring and following patients remotely, reducing patient's office visits without compromising the results.
Saccomanno et al., 2020	Italy	To explain how tele-orthodontics represents the only way to perform orthodontics during a period of restriction as the one subsequent to COVID-19 emergencies.	Tele-orthodontics allowed to perform some orthodontic follow-ups with less chairside time, reduced time spent by the patients in the dental office from up to 45 min, less risk of infection, fewer to no missed appointments, specific troubleshooting solutions, and more follow-ups with odontophobic patients.	The need to respect safety distance and the fears patients have about the risk of infection make tele-orthodontics a fundamental tool during a pandemic lockdown and in its immediate post-emergency phase. Tele-orthodontics demonstrated to be a viable tool to continue at least some orthodontic care in times of emergency, but it may be considered an appropriate solution and addition even in normal times to ease therapy demands for both the orthodontist and the patients, while reducing time and money spent, without an excessive decrease in orthodontic quality.
Turkistani, 2020	Saudi Arabia	To report to orthodontists in the emergence, epidemiology, risks, and precautions during the disease crisis.	Minimize aerosol production and reinforce strict infection control measures are important. Compliance with the highest level of personal protection and restriction of	Reinforce strict infection control measures and minimizing personal contact and aerosol production are keys to prevent contamination within orthodontic settings. Although no cases of COVID-19 cross-

			treatment to emergency cases is recommended during the outbreak. Surface disinfection, adequate ventilation, and decontamination of instruments and supplies following the guidelines are required.	transmissions within a dental facility have been reported, the risk exists, and the disease is still emerging. Further studies are required.
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Source: Authors.

#### 4. Discussion

There are concerns regarding the appearance, epidemiology, risks and precautions during the disease crisis (Turkistani, 2020) and implications of coronavirus infection for orthodontic treatment (Sunjay Suri et al., 2020). Preventive strategies for infection control (Guo et al., 2020) and aerosol reduction (Maspero et al., 2020) have been reported. Additionally, there was the recommendation to use virtual assistance (Eliades & Koletsi, 2020; Maspero et al., 2020; Saccomanno et al., 2020) and assessments regarding the impact of the pandemic on orthodontic consultations and on the anxiety generated in patients and professionals (Martina et al., 2020; Peloso et al., 2020; Cotrin et al., 2020; Xiong et al., 2020).

Due to the pandemic caused by the coronavirus, dental professionals must be aware of the occupational risks caused by COVID-19, and stay up to date on infection control guidelines. It is the orthodontist's responsibility to ensure the safety of his/her team and prevent cross-contamination within the dental office (Sunjay Suri et al., 2020; Turkistani, 2020).

The risk of acquiring COVID-19 can occur by several ways, including droplets of saliva from coughing or sneezing, indirect contact with droplets of saliva that have stuck to surfaces, aerosols generated during orthodontic procedures (Eliades & Koletsi, 2020), during removal and replacement aligners, fixed or removable appliances and elastic and being in contact with several people and companions, bonding and removal of brackets, moldings, oral scanning, photographs, wire changes, and placement of mini implants (Sunjay Suri et al., 2020). Orthodontics instruments and materials that are not individually packaged can be a source of contamination (Guo et al., 2020). As the coronavirus was also identified in the saliva of infected individuals (To et al., 2020), this biological fluid represents an additional risk for professionals and their relatives (Sabino-Silva, Jardim & Siqueira, 2020).

Among the situations that can be considered urgent in Orthodontics, are the insertion of a wire from a fixed orthodontic appliance in the gum, oral mucosa leading to severe pain and/or infection, circumstances related to dental trauma in patients who use fixed or removable appliances, or other conditions in which the lack of care would be harmful to the patient, such as gingival inflammation resulting from the loosening of an orthodontic band or the detachment of brackets (AAO, 2020).

As tools for teleodontology, photos, videos or video calls, communication applications such as WhatsApp and Telegram, and websites (Caprioglio et al., 2020; Maspero et al., 2020) were used. Virtual assistance proved to be a good way to provide assistance to patients, with

reduced costs, greater access to treatment, less risk of infection, less consultations, problem solving and more follow-up with odontophobic patients (Caprioglio et al., 2020; Maspero et al., 2020; Saccomanno et al., 2020). Remote monitoring is a viable way for some orthodontic care in times of pandemic, and can be considered a solution in normal times to facilitate the demands of orthodontic therapy (Sacomanno et al., 2020).

Assessments regarding the impact of the pandemic on the orthodontic consultations and on the anxiety generated in patients and professionals were carried out through questionnaires. It was observed that the level of anxiety was more related to women than to men and that the greatest concern was associated with delayed treatment (Martina et al., 2020; Peloso et al., 2020; Cotrin et al., 2020; Xiong et al., 2020). Fixed lingual appliances and invisible aligners were less associated with high levels of anxiety about the duration of treatment compared to conventional fixed appliances (Xiong et al., 2020). Professionals, on the other hand, reported fear of returning to their daily activities because they considered it a high risk for them and their families (Martina et al., 2020).

As can be seen, procedures related to orthodontic practice must strictly follow preventive measures to control the transmission of SARS-CoV-2, reducing the use of aerosol to minimize infections and avoid contamination of environments. Treatment guidelines can be provided in a remote format at first, and when necessary, treatment can be performed if the infection prevention and control protocol is followed. Finally, Teleorthodontics is a way of reassuring patients and professionals, and accompanying patients without compromising treatment results.

## **5. Conclusions**

The need for social isolation imposed by the coronavirus has been shown to have an impact on scheduling orthodontic appointments, as well as on patient's anxiety about prolonging their treatments. The use of communication technologies has been of great value in patient care, as well as in the initial screening before a face-to-face consultation. Strict infection control protocols must be adopted so that orthodontic practice is fully performed without offering risks to patients and professionals.

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#### **Porcentagem de contribuição de cada autor no manuscrito**

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