

# Orthodontic Emergencies and Perspectives During and After the COVID-19 Pandemic: The Italian Experience

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## ABSTRACT

**Objective:** To investigate the types of dental emergencies that occurred during the lockdown period in Italy (12th March—4th May) and to investigate future therapeutic preferences related to the use of different types of appliances. **Material and Methods:** A questionnaire dedicated to assessing dental emergencies during the lockdown period and surveying the resumption of orthodontic practice was submitted to clinicians in digital form. The first part of the questionnaire, focused on the orthodontic emergencies that were encountered in relation to the different types of orthodontic appliances and how these were resolved. The second part of the questionnaire was devoted to the resumption of clinical practice; in particular, it was designed to assess whether and what percentage of clinicians are willing to change the duration of appointments in relation to the different types of appliance used, asking them whether their approach to orthodontic treatment would change in the coming months as compared to the pre-COVID-19 era. **Results:** Results show that in most cases (82%), the percentage of patients who experienced a dental emergency was less than 5% and that far fewer emergencies were attributable to removable (5.7%) than to fixed appliances (94.3%). Looking ahead, clinicians expressed a greater preference for using removable (60.8%) rather than fixed appliances (39.2%). **Conclusion:** During the lockdown, there relatively few orthodontic emergencies, many of which were handled by telephone consultation. However, a far lower percentage of emergencies were generated by removable (e.g., clear aligners) as opposed to fixed appliances (e.g., multibracket equipment), likely influencing the decision of the majority of clinicians to opt for removable appliances in the wake of the COVID-19 pandemic.

**Keywords:** Pandemics; SARS Virus; Coronavirus; Dentistry; Orthodontics.

## Introduction

COVID-19, aka coronavirus disease, has spread rapidly worldwide since 2019 thanks to its greater transmission potential than SARS-CoV and MERS-CoV. This led to a "public health emergency crisis of international concern" [1], and the WHO accordingly declared pandemic status in the first quarter of 2020.

The new virus was initially referred to as novel coronavirus 2019-nCoV, then as SARS-CoV-2 virus, by the International Committee on Taxonomy of Viruses [2]. Infection occurs through respiratory aerosols and droplets, and consequently, through person-to-person contact [3-5]. To prevent further spread of the disease, social distancing was implemented, which encouraged people to maintain a distance of 1–2 meters (6 feet) from each other. In addition, important restrictive measures were put in place, and national and international blocs established, ensuring only strictly essential services were in place.

In light of the way in which the disease is transmitted, health professionals are at particularly high risk, not only of infection but also of transmitting the virus [5]. Hence, the practice of dentistry must suffer considerable repercussions in the wake of COVID-19. Indeed, orthodontists can see dozens of patients in a single day [6]. Considering that transmission of the virus can also take place during the incubation period, which varies from 14 to 24 days [7,8], their clinics are at great risk of becoming infection hotspots. In addition, the generation of aerosols, which is part of routine dental and orthodontic procedures, has been confirmed as one of the main routes of transmission [3,4]. Therefore, it is crucial not only to re-evaluate infection control within the dental practice but also, where possible, to reduce the number of appointments, emergencies and sources of contagion, in particular the generation of aerosols.

With this in mind, the purpose of this study was, on the one hand, to investigate the types of orthodontic emergencies that occurred during the lockdown period in Italy (12th March—4th May), when all non-essential services were suspended by law, in relation to the types of appliances in question, and on the other to investigate orthodontists' views regarding the organization of daily clinical practice and treatment choices in the future.

## Material and Methods

Considering the recent emergence of COVID-19, a digital questionnaire was drafted to be compiled anonymously by specialist and non-specialist orthodontists to investigate their ongoing experiences of the lockdown period and their views regarding future clinical practice.

To this end, the link for our online questionnaire was sent to 2700 randomly selected e-mail addresses belonging to orthodontists. The questions were devised to investigate, on the one hand, the type and number of orthodontic emergencies that occurred during the period of reference (12th March—4th May), and on the other whether and how clinicians were willing to change the organization of their daily orthodontic practice and/or the type of appliances they preferred as a result of the pandemic.

In more detail, the first part of the questionnaire, in addition to investigating some general parameters, focused on the orthodontic emergencies that were encountered in relation to the different types of orthodontic appliances and how these were resolved (i.e., clinic appointment vs. telephone advice alone). Among the different therapeutic approaches considered in the questionnaire were the following types of appliance: vestibular multibracket, lingual multibracket, removable aligners and finally removable and fixed devices used for interceptive orthodontics (Phase I).

The second part of the questionnaire was devoted to the resumption of clinical practice; in particular, it was designed to assess whether and what percentage of clinicians are willing to change the duration of

appointments in relation to the different types of appliance used, asking them whether their approach to orthodontic treatment would change in the coming months as compared to the pre-COVID-19 era. The percentage of appointments involving the generation of aerosols in relation to the aforementioned appliances was also investigated.

## Results

Of the 2700 subjects initially contacted, the questionnaire was fully completed by 194 orthodontic practitioners, 61.9% of whom were specialists in orthodontics, 30.4% general dentists and 7.7% undergoing specialist orthodontic training. 54.1% of participants had been practicing orthodontics for more than 20 years, while only a small proportion, 11.9%, for less than 5 years (Table 1). Table 2 shows the percentage of the appliances considered used by each orthodontist in relation to their clinical practice.

**Table 1. General descriptive statistics of orthodontic practitioners.**

Variables	N (%)
<b>Qualification</b>	
Orthodontic Specialists	61.9
General Dentists	30.4
General Dentists Specializing In Orthodontics	7.7
<b>Gender</b>	
Male	57.7
Female	41.8
Not Specified	0.5
<b>How Long Have You Been Practicing Orthodontics?</b>	
<5 Years	11.9
5–10 Years	8.8
10–20 Years	25.2
>20 Years	54.1

**Table 2. Distribution of the appliances used by each orthodontist in relation to their clinical practice.**

Appliances	Percentage				
	0%	1–25%	25–50%	50–75%	75–100%
Vestibular Multibracket	0.5	4.6	23.3	51	20.6
Lingual Multibracket	63.9	31.4	3.2	1	0.5
Aligners	8.8	62.9	19.6	6.6	2.1
Fixed & Removable Phase I Devices	0	26.8	42.3	23.7	7.2

As for the orthodontic emergencies that occurred during the lockdown period, in most cases (82%), the percentage of patients who experienced an emergency was less than 5%, while in 1% of cases, emergencies represented over 10% of the total number of cases being treated (Table 3). On the whole, emergencies involved fixed-type appliances, while very few were linked to removable appliances or skeletal anchorage, which was examined separately. Although emergencies related to any type of appliance had a rate of less than 5% of the total number of cases, there was a striking difference in the way these cases were distributed among the appliance types investigated. In fact, our results show that only 5.7% of emergencies were linked to removable appliances (clear aligners and removable phase I appliances), while 94.3% were associated with fixed appliances (Tables 3 and 4). As highlighted in Tables 5 and 6, among the emergencies reported, most were resolved by telephone consultation without having to resort to a visit to the clinic.

**Table 3. Breakdown of orthodontic emergencies encountered during the lockdown.**

Variables	N (%)
What percentage of your orthodontic patients contacted you with an emergency during lockdown?	
0%	4.6
<5%	82.0
5–10%	12.4
>10%	1
Did these emergencies involve more fixed or removable appliances?	
Fixed	94.3
Removable	5.7
What percentage of your patients reported an emergency involving skeletal anchorage?	
0	58.7
<5%	12.5
5–10%	0.5
>10%	0.5
I don't use it	27.8

**Table 4. Emergencies as a percentage of total orthodontic patients.**

Appliances	Percentage					I don't use the appliance
	0%	<5%	5–10%	>10%		
Vestibular Multibracket	3.6	73.7	13.4	8.8	0.5	
Lingual Multibracket	27.8	10.4	1	1.5	59.3	
Aligners	58.8	31.5	1	1.5	7.2	
Fixed Phase I Appliances	44.4	47.9	4.1	1.5	2.1	
Removable Phase I Appliances	69.1	26.8	0.5	1	2.6	

**Table 5. Percentage of urgent issues resolved over the phone.**

Appliances	Percentage						I don't use the appliance	No emergencies reported
	0%	<25%	25%–50%	50%–75%	75%–99%	100%		
Multibracket Appliances*	16	21.7	11.8	9.8	18	15.5	2.6	4.6
Aligners	23.2	8.2	3.1	3.6	7.3	14.9	9.3	30.4
Fixed Phase I Appliances	21.4	20.5	3.6	6.7	12,3	10.3	2.1	23.1
Removable Phase I Appliances	26.3	12.9	2.6	4.1	6.7	13.9	4.1	29.4

\*Vestibular and/or Lingual.

**Table 6. Percentage of urgent issues requiring face-to-face treatment.**

Appliances	Percentage						I don't use the appliance	No emergencies reported
	0%	<25%	25%–50%	50%–75%	75%–99%	100%		
Multibracket Appliances*	26.2	45.6	9.2	7.2	3.6	3.6	1	3.6
Aligners	52.1	11.3	1.5	1	1	0.5	9.3	23.2
Fixed Phase I Appliances	38.7	29.9	4.6	1.5	0.5	3.1	1.5	20.2
Removable Phase I Appliances	50.8	14.9	2.1	1	1.5	1.5	3.6	25.1

\*Vestibular and/or Lingual.

In relation to the variables examined concerning the resumption of clinic activity and the use of aerosol-generating instruments, responses indicate that this occurs to a greater extent in fixed multibracket appliance treatment than with either clear aligners or interceptive phase I devices (fixed and removable) (Table 7). Furthermore, the data suggest that the type of treatment for which clinicians will increase the duration of

appointments the most is with vestibular and/or lingual fixed multibracket appliances; responses indicate that this trend would tend to decrease in the case of treatments with phase I appliances, and even more so for clear aligners (Table 8).

**Table 7. Percentage of appointments that require aerosol.**

Appliances	Percentage					I don't use the appliance
	<25%	25%-50%	50%-75%	75%-99%	100%	
Multibracket Appliances*	57.2	25.3	6.2	7.7	3.1	0.5
Aligners	76.3	7.8	3.1	1.5	1.5	9.8
Fixed Phase I Appliances	77.3	11.9	5.1	2.1	2.1	1.5
Removable Phase I Appliances	87.6	4.7	0.5	0.5	0.5	6.2

\*Vestibular and/or Lingual.

**Table 8. Percentage of type of treatment for which clinicians will increase the duration of appointments.**

Appliances	Percentage					I don't use the appliance
	0%	25%	50%	75%	100%	
Multibracket Appliances*	1.5	13.9	37.1	9.4	36.6	1.5
Aligners	6.2	30.9	30.9	6.2	16.5	9.3
Fixed & Removable Phase I Appliances	6.2	26.3	37.1	5.2	24.2	1

\*Vestibular and/or Lingual.

Likely with this in mind, it appears that in the future, roughly a third of clinicians (34%) report that they intend to make changes in their treatment choices, and more expressed a preference for the use of removable (60.8%) as opposed to fixed (39.2%) appliances. In more detail, the preferences expressed were 60.8% for clear aligners, 35.6% for vestibular multibracket appliances, and in the last place, at 3.6%, lingual multibracket appliances, thereby confirming the emerging tendency to prefer removable appliances (Table 9).

**Table 9. Percentage of changes in the organization of daily orthodontic practice and/or the type of appliances preferred as a result of the pandemic.**

Variables	N (%)
Changes in the Therapeutic Approach in the Phase of the Resumption of Clinical Practice	
Yes	34.0
No	46.9
I don't know	19.1
Appliances Preference	
Fixed	39.2
Removable	60.8
Appliances Preference (Phase II)	
Vestibular Multibracket	35.6
Lingual Multibracket	3.6
Aligners	60.8

## Discussion

COVID-19 was first reported in December 2019 in Hubei province, Wuhan, China. From there, it spread rapidly around the world, prompting the WHO to declare pandemic status on 11th March 2020 [9]. Transmission of the virus occurs mainly through the airways via secretions (cough, sneezing) and/or direct or transferred contact with respiratory droplets [3-5,10] via the mucosa of the nose, mouth and/or eyes [11-13]. Although the typical source of transmission is symptomatic subjects, asymptomatic individuals can also

transmit the virus during the incubation period [14]; the main clinical manifestations range from a complete lack of symptoms to complications leading to septic shock and multi-organ failure; for this reason, COVID-19 can be classified as mild, moderate, severe or critical [15,16].

Human coronaviruses can remain infectious on inanimate surfaces for a period of between 2 hours and 9 days, depending on the area considered [17]. They have also been found in aerosols, which can spread up to 2 meters away, for up to 3 hours [18]. Given the mode of transmission and persistence of the virus within aerosols, dentists are among the categories most at risk of infection and transmission [5,19]; for this reason, the dental practice runs the risk of becoming a contagion hotspot and has and will inevitably suffer considerable repercussions as a result. During the lockdown period, the practice of dentistry was effectively suspended, except non-deferrable emergencies, and, looking to the future, it is clear that precautionary measures must be taken to minimize the risk of dental clinics becoming centres of new outbreaks of COVID-19.

In light of what has been discovered, this study had a dual purpose: on the one hand, to investigate the types of orthodontic emergency that occurred during the lockdown period, and on the other assessing the prospects for future therapeutic choices among orthodontists in relation to organization of their daily clinical practice.

Although the emergencies that occurred during the lockdown only affected a small percentage of patients undergoing orthodontic treatment, it is interesting to note that the vast majority (94.3%) had fixed appliances (e.g., vestibular and/or lingual multibracket appliances), while only a small percentage (5.7%) had removable appliances (e.g., clear aligners or removable appliances used for phase I treatment). As for the emergencies related to the use of skeletal anchorage, the proportion of patients that needed to urgently consult with their orthodontist during lockdown was even smaller. Among the emergencies reported, most were resolved via telephone consultation, without having to schedule a face-to-face appointment [20-22]. Nonetheless, the COVID-19 pandemic does appear to have had an influence on the way the respondents will organize their practices and offer treatment in the future. In particular, more clinicians expressed that they would be more likely to prescribe removable (60.8%) as opposed to fixed (39.2%) appliances in the future. On the other hand, they also expected that reorganization of their clinic to adhere to more stringent safety protocols would lead to an increase in the time required for each appointment, which they thought would be doubled in some cases. With regard to the latter, it is clear that orthodontists plan to extend the duration of sessions to a greater extent in the case of patients with multibracket equipment than patients in interceptive or aligner treatment. This is largely as a consequence of the fact aerosols are more likely to be generated when handling multibracket equipment, especially during bracket debonding and repositioning [23].

Indeed, several studies have now shown that it would be better to avoid generating aerosols — a possible contagion source — during dental procedures [20], and it would therefore be wise to opt for treatment options that generate the least. It would also be desirable to minimize the number and duration of appointments and urgent consultations; although the cross-transmission of COVID-19 has not yet been reported within a dental facility [6], taking into account that the virus can be transmitted from one healthcare provider to another but also from patient to patient, the risk of this occurring is very high, especially considering the long latency period of the disease and therefore a large number of patients and colleagues who could unwittingly be infected by an asymptomatic member of the orthodontic team [24].




In the orthodontic field, therefore, there is an urgent need to not only re-assess how to limit the spread of infection within the dental clinic by minimizing risk factors such as the generation of aerosols but

also to consider how best to reduce the number of appointments, and urgent consultations, that a patient is likely to need. In this regard, our results clearly show that removable appliances not only require less use of aerosol-generating instruments, but also reduce the risk of disease transmission by warranting fewer urgent appointments. It is heartening to see that the majority of our respondents have recognized this and state that they will be preferentially offering patients removable appliances in the future.

## Conclusion

During the lockdown period, in which dentistry in Italy was effectively suspended, being limited only to non-deferrable emergencies, only a small proportion of patients in orthodontic treatment sought urgent care and only very few of these required face-to-face interventions as opposed to remote consultation. However, of the patients who required urgent treatment, the very great majority had fixed appliances, which is presumably why more orthodontists said that they would be opting for removable appliances in the future.

## Authors' Contributions

AC		<a href="https://orcid.org/0000-0002-5869-2068">https://orcid.org/0000-0002-5869-2068</a>	Conceptualization, Formal Analysis, Investigation, Writing - Original Draft and Writing - Review and Editing.
GS		---	Supervision.
LL		---	Methodology, Data Curation, Writing - Review and Editing and Visualization.

All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

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None.

## Conflict of Interest

The authors declare no conflicts of interest.

## Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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