

# TREATMENT OF CLASS II/2 MALOCCLUSION WITH CLEARCORRECT® ALIGNERS - CASE REPORT



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## ABSTRACT

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The aim of this research was to address the planning and treatment of a Class II/2 malocclusion treated without extractions, using orthodontic clear aligners. In the treatment of this malocclusion it is necessary to consider the severity degree, whether it is dental or skeletal (assess whether it affects only maxilla, mandible, or both), whether there is growth or not, patient collaboration, among other factors. Currently, many patients seeking orthodontic treatment wish to use more aesthetic appliances, especially those who have already used conventional fixed appliance. Thus, there was a great increase in the demand for removable clear aligners, providing benefits such as aesthetics, easier hygiene and shorter treatment time. In this case report, we tried to maintain good maxillo-mandibular relationship, the profile and good lip sealing. For this, ClearCorrect® aligners were used, we have chosen not to extract premolar and perform sequential distalization on the Class II malocclusion side, associating with Class II intermaxillary elastics, interproximal wear (IPR) and attachments. The results achieved were highly satisfactory, restoring good molars and canines relationship, adequate upper and lower incisors buccolingual inclinations, overjet, overbite and middle line correction. Therefore, it was concluded that the treatment of this clinical case with aligners was relatively fast, as efficient as the treatment with conventional fixed appliance and met the aesthetic expectations of the patient.

**Descriptors:** Orthodontics, Angle Class II malocclusion, ClearCorrect®, clear aligners.

## RESUMO

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O objetivo deste trabalho foi abordar o planejamento e o tratamento de uma má oclusão de Classe II/2 tratada sem extrações, utilizando alinhadores transparentes. No tratamento dessa má oclusão é necessário considerar o grau de severidade, se é dentária ou esquelética (avaliar se acomete somente a maxila, somente a mandíbula ou ambas), se há ou não crescimento, a colaboração do paciente, dentre outros fatores. Atualmente, muitos pacientes que procuram o tratamento ortodôntico desejam utilizar aparelhos mais estéticos, principalmente aqueles que já utilizaram o aparelho fixo convencional. Dessa forma houve um grande incremento na demanda pelos alinhadores transparentes removíveis, proporcionando benefícios como estética, maior facilidade de higienização e menor tempo de tratamento. No presente caso clínico, procurou-se manter o bom relacionamento maxilo-mandibular, o perfil e o bom selamento labial. Para tanto foram utilizados os alinhadores da ClearCorrect®, optou-se por não extrair pré-molar e realizar a distalização sequencial do lado da má oclusão de Classe II, associando com elásticos intermaxilares de Classe II, desgastes interproximais (IPR) e attachments. Os resultados alcançados foram altamente satisfatórios, restabelecendo o bom engrenamento dos molares e caninos, as inclinações vestibulo-linguais adequadas dos incisivos superiores e inferiores, o overjet, o overbite e a correção das linhas médias. Portanto se concluiu que o tratamento desse caso clínico com alinhadores foi relativamente rápido, tão eficiente quanto o tratamento com aparelho fixo convencional e atendeu às expectativas estéticas da paciente.

**Descritores:** Ortodontia, má oclusão de Classe II de Angle, ClearCorrect, alinhadores transparentes.

## INTRODUCTION

Orthodontic treatment has been increasingly sought by adult patients and conventional fixed appliances, with brackets and bands, have always been the Gold Standard in Orthodontics<sup>1</sup>. However, these devices are much more prone to the accumulation of bacterial plaque and make oral hygiene difficult, which can result in white spot lesions, caries and periodontitis<sup>2,3</sup>. Periodontal health should be considered one of the success factors of orthodontic treatment and, during fixed orthodontic treatment, pathological phenomena such as gingival bleeding, gingivitis, gingival hypertrophy and worsening of periodontal pockets may occur<sup>4-10</sup>.

Another important factor for patients seeking orthodontic treatment is the concern with aesthetics. Many patients who have previously undergone orthodontic treatment, using conventional fixed appliances, request treatment with removable clear aligners. In addition to better aesthetics, they can cause less root resorption and discomfort<sup>6,9,11-14</sup>. Aligners are capable of treating many types of malocclusion with great predictability in dental movements<sup>13</sup>.

Class II malocclusion is a frequent problem and can be unilateral, named by Edward H Angle as a subdivision. In treatment planning, the orthodontist should consider the asymmetry etiology and its correction, which generally involves Class II elastics, extractions, extraoral traction, orthodontic distalizers, temporary skeletal anchorage devices and fixed functional appliances<sup>15</sup>. The proportion of Class II malocclusion successful treatment may be influenced by factors such as malocclusion severity, patient

age, and the collaboration with treatment<sup>16</sup>. For the treatment of Class II without extraction, distalization of the upper molars is often the method of choice to obtain 2mm to 3mm of space in the arch<sup>4,17</sup>. This distalization can be performed by means of extra or intraoral forces, but some devices produce unwanted inclination of the upper molars and/or loss of anterior anchorage during movement<sup>18</sup>. On the other hand, for Simon et al (2014)<sup>19</sup>, aligners can promote translational movements such as molar distalization, incisor torque and premolar rotation, however they considered that incisor torque and premolars rotation are challenging movements for this treatment modality.

Therefore, the aim of this research was to address the planning and treatment of Class II/2 malocclusion treated without extractions, using ClearCorrect® aligners associated with intermaxillary elastics, interproximal reduction (IPR) and attachments.

### Clinical case report

A 20-year-old caucasian female patient reported as her main complaint the upper and lower anterior crowding and that she would not like to be submitted to treatment with a conventional fixed appliance. For the preparation of diagnosis and treatment plan documentation was requested for aligners, consisting of extra and intraoral photographs, panoramic radiography, profile telerradiography and digital scanning of both arcades (STL file).

In the facial evaluation, we found a patient with facial symmetry, straight facial profile, adequate nasolabial angle and pleasant smile (Figure 1).



Figure 1 - Extraoral views: A) frontal, B) profile, C) smiling.

In the intraoral assessment, ClassII/2 right subdivision malocclusion was found. The upper midline was 0.5mm diverted to the left and the lower line was 1.0mm to the right, there was a marked overbite, adequate overjet, tooth 13

rotation, upper and lower anterior teeth crowding. The upper and lower arches presented moderate atresia, presence of the third upper and lower molars and element 37 required endodontic treatment (Figure 2).



**Figure 2** - Intraoral views at the beginning of treatment: **A)** right lateral view in the study model, **B)** frontal view with mouth slightly open, **C)** left lateral view in the study model, **D)** right lateral view, **E)** frontal view, **F)** left lateral view, **G)** upper occlusal view, **H)** Lower occlusal view.

In the profile telerradiography, there is a good relationship between bone bases, balanced profile and verticalized upper incisors (Figure 3). And in the panoramic radiography, there is the presence of the third upper and lower molars, tooth 37 with endodontic problems, root resorption in teeth 16, 26 and 35 (Figure 4).

After preparation of the treatment plan, the case was submitted to the ClearCorrect® to perform the virtual setup. In the virtual planning it was verified that the treatment would be performed in 14 *steps* in both arches, as the aligner was changed every 14 days, the total treatment time was approximately 7 months (Figure 5).



Figure 3 - Initial profile telerradiography.

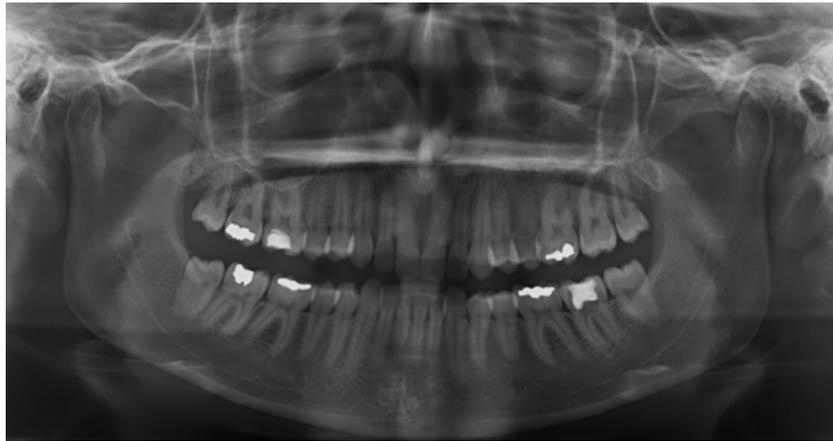


Figure 4 - Initial panoramic radiography.

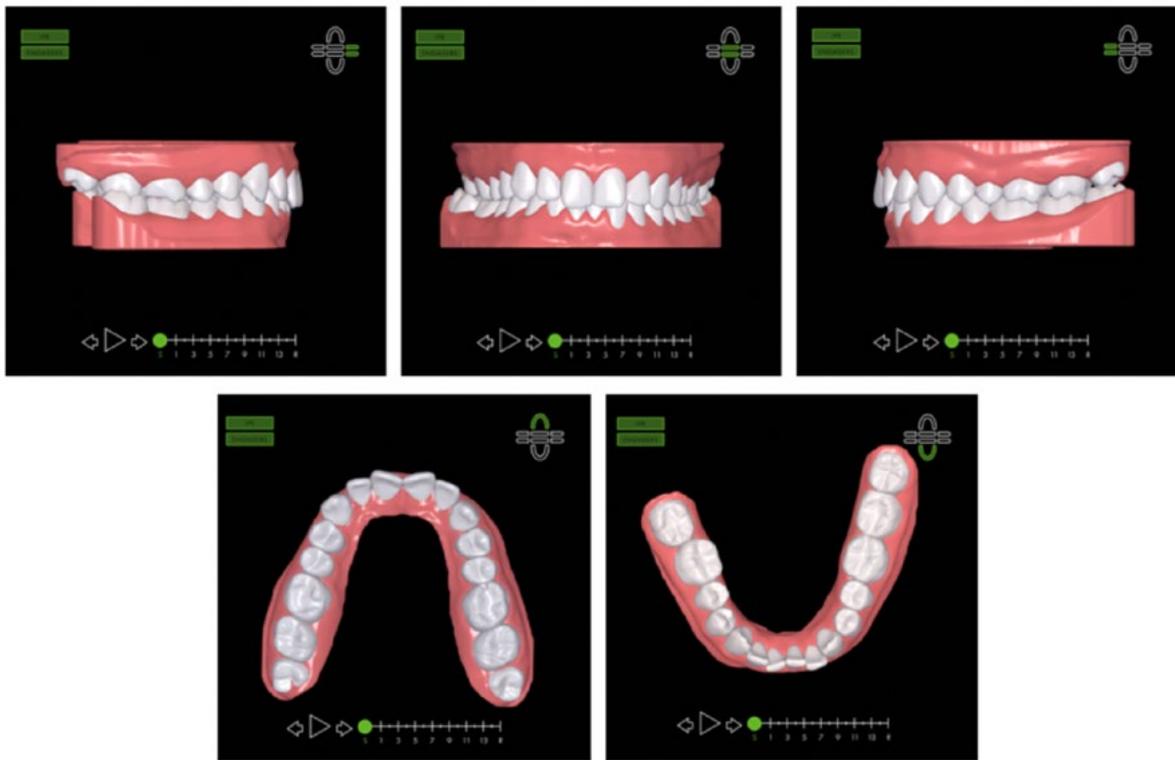


Figure 5 - Initial ClearCorrect® virtual setup.

Dental appointments were scheduled once a month to make the necessary adjustments. There was need of interproximal wear (IPR) of 1.8mm throughout the treatment and attachments bonding to enhance aligners stabilization and optimize the movements required for the correction of malocclusion.

The IPR procedures and attachment bonding in the ClearCorrect® protocol are always performed in odd steps so that the patient can be programmed for every one month from step 1. In step 3, attachments (which appear in blue in the setup) were bonded and IPR was also started (Figure 6).



Figure 6 - ClearCorrect® virtual setup: step 3 with attachments bonding and IPR start.

In step 5, the use of medium Class II 5/16 elastics on the right side was initiated to establish the Class I molar and canine relationship, as seen in Figure 7. And in step 9, Class II elastics are recommended for both sides to improve the final meshing.

In the clinical case presented in this study, the patient used Class II intermaxillary elastics (5/16 medium) 22 hours a day from step 5 on the Class II side and after step 9 until the end of treatment, she used elastics on both sides.



Figure 7 - Intraoral views with the use of unilateral Class II elastic: A) right lateral view, B) frontal view, C) left lateral view.

In step 7, the crowding was partially corrected, as well as there was a better mesh between the dental arches, as seen in Figures 8 and 9.

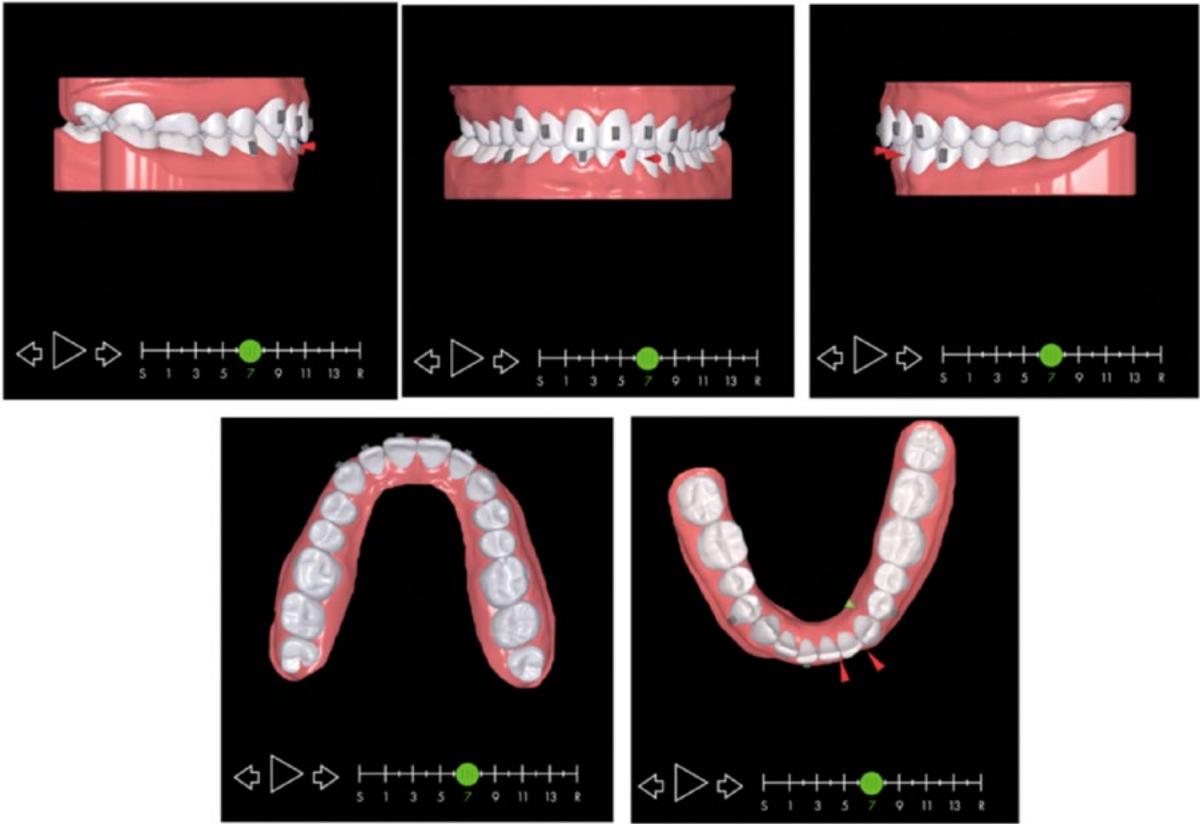


Figure 8 - ClearCorrect® virtual setup - step 7 of treatment indicating IPR need.

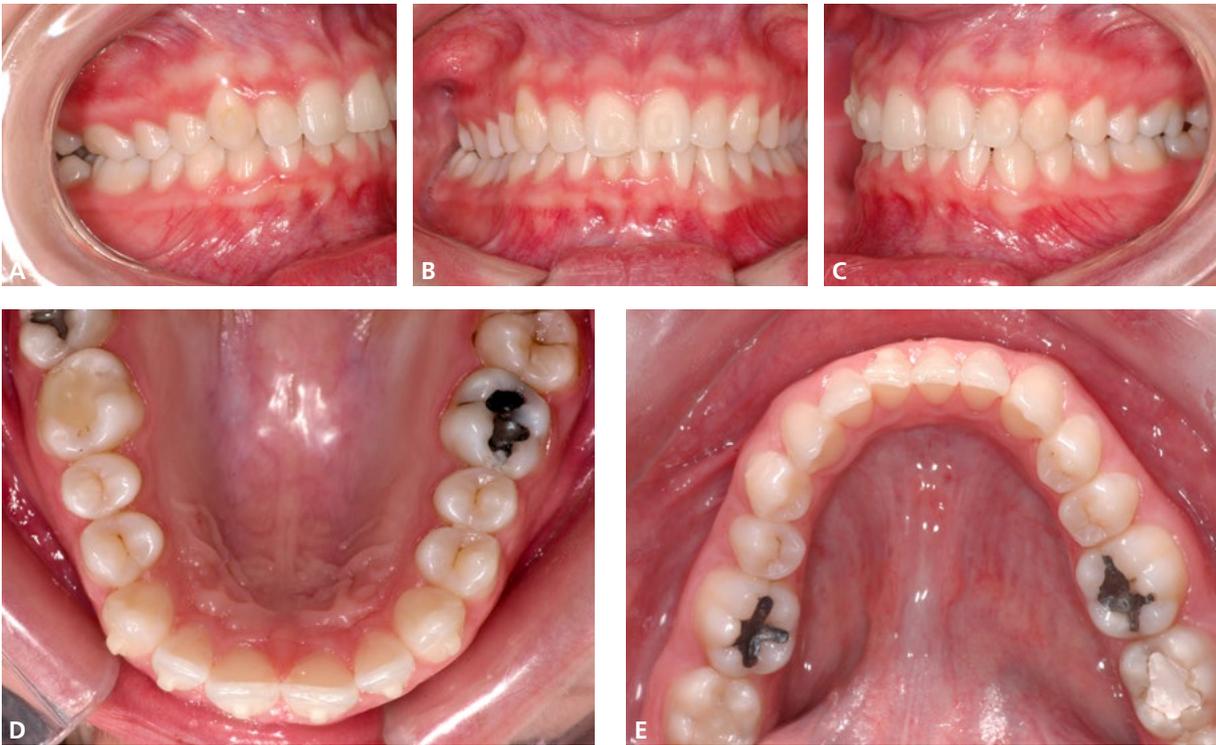


Figure 9 - Intraoral view of the treatment in step 7: A) right lateral view, B) frontal view, C) left lateral view, D) upper occlusal view, E) lower occlusal view.

After 14 steps, a very balanced face, a nice profile and a harmonic smile were seen (Figure 10). In intraoral photos, correction of the upper and lower middle lines, an increase in the gingival recession of tooth 13 may be verified due to

rotational movement (recession present at the beginning of treatment due to the small amount of ceratinized gums), a good meshing and significant improvement in the relationships between canines and molars (Figure 11).

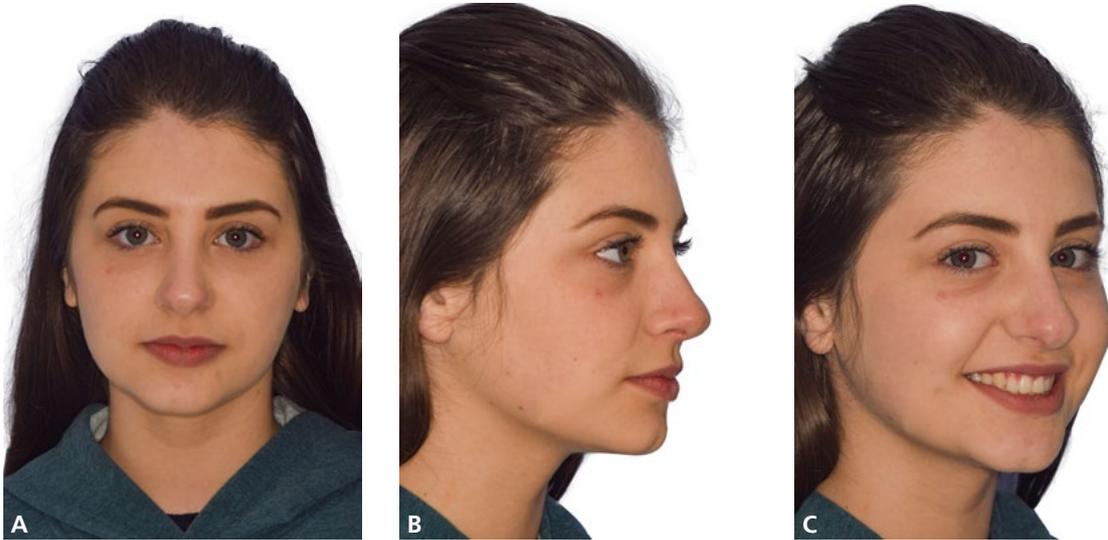


Figure 10 - Extraoral views: A) frontal, B) Profile, C) Smiling.



Figure 11 - End of treatment intraoral views: A) right lateral view, B) frontal view, C) left lateral view.

In the final assessment of profile telerradiography, an adequate restoration of the inclination of the upper incisors and the maintainance of the profile that was already very good and the harmony between the bone bases may be verified (Figure

12). And in Figure 13, the extractions of the third upper molars (the patient opted for the extractions of the lower after treatment), control of the root resorptions present and the endodontic treatment of the tooth 37 are seen.



Figure 12 - Teleradiography of final profile.



Figure 13 - Final panoramic radiography.

## DISCUSSION

The correction of Class II malocclusion can be performed by several forms of treatment and is influenced by skeletal or dental malocclusion severity, degree of patient collaboration, age and aesthetics<sup>4,13,16</sup>. The protocol with extractions basically consists of extracting four premolars (upper and lower) or two upper premolars. In cases in which extractions can be avoided, distalization of the upper molars is preferred, being a more conservative treatment<sup>16</sup>. Therefore, according to Ravera et al 2016<sup>4</sup> the third upper molars, when present, should be extracted to allow distalization movement. Extraoral appliances are traditionally used for this mechanics, but as reported by Bolla et al (2002)<sup>18</sup> and Higa (2015)<sup>20</sup> depend on patient the collaboration. Other methods indicated for Class II treatment are pendulum appliances, Herbst, Forsus, Carriere distalizer, interproximal wear, use of Class II intermaxillary elastics and temporary anchorage devices<sup>13,15,16,21,22</sup>.

According to Garino et al (2016)<sup>17</sup> attachments inserted in the vertical direction increase the posterior anchorage and present greater control in the inclination during the distalization movement. In the present clinical case, six attachments were used in the upper arch - anterior region - and three in the lower arch, all in the vertical direction, optimizing movements control during anterior teeth retraction. Although Djeu et al (2016)<sup>4</sup> have stated that aligners are deficient in the malocclusions correction in the anteroposterior direction, in the present clinical case it was possible to correct Class II malocclusion with the use of aligners associated with IPR, attachments and intermaxillary elastic of Class II during molars sequential distalization and anterior retraction. Another advantage presented by aligners is the lower incidence of root resorption when compared to conventional orthodontic treatment<sup>11,12,23,24,25,26</sup>. Both Yi et al (2018)<sup>23</sup>, and Fang et al (2019)<sup>25</sup> reported a lower incidence and severity of root resorption when compared to conventional fixed appliances. In a recent study by Li et al (2020)<sup>26</sup>, aiming to investigate and compare the prevalence and severity of apical root resorption (ARR) in patients treated with conventional aligners and fixed appliances, using Cone Beam Computed Tomography (CBCT), they concluded that both the prevalence and severity of ARR were lower in patients with clear aligners.

Although this clinical case presents root resorption at the beginning of treatment, it was verified that there was no increase after the intervention with the use of aligners.

It is important to emphasize that in the treatment with aligners individual movements are performed, that is, certain teeth are selected in a priority way, and are corrected sequentially. This causes there to be no back and forth movements, providing, when well indicated, a shorter treatment time<sup>27</sup>.

Class II treatment time depends on patient's age and malocclusion severity. Cases in which early treatments are performed in children (two phases) require more time, when compared to one only phase treatment in adolescent or adult patient with a lighter degree of malocclusion. According to the results of Yin et al (2019)<sup>21</sup>, treatment with the use of Class II elastics, despite the need for longer use is faster, when compared with the Carriere distalizer and Forsus appliance, since after removal the Carriere distalizer it is necessary to assemble the conventional fixed device. However, Shupp, Haubrinch and Neuman (2010)<sup>28</sup> found that treating a young Class II patient with Carriere distalizer appliance, prior to treatment with aligner, becomes faster and equally efficient, as demonstrated by the authors in a patient who used Carriere distalizer for 4 months and after another ten months of aligner with the use of intermaxillary elastics and attachments. For them, the treatment of Class II patients with aligners is almost impossible without associating with anchorage provided by the Class II elastic, which should be used all night and for at least three hours during the day. Fischer (2010)<sup>29</sup> reported three clinical cases of young patients with Class II malocclusion, in which he did not use auxiliaries as elastics or a technique combined with conventional fixed appliance. Treatment was successfully performed, but the longest took 26 months, and 51 upper and 6 lower aligners were required. For Lombardo et al (2018)<sup>13</sup>, the combined use of clear aligners with auxiliaries is one of the ways to solve Class II malocclusion, within a period of time comparable to conventional fixed Orthodontics. However, they stated that without the use of auxiliaries, aligners cannot achieve 100% predictability of movements. In the clinical case presented in this study, the patient used Class II intermaxillary elastics (5/16 medium) 22 hours a day from step 5 on the Class II side and, after step 9 until the end of treatment, she used elastics on both sides.

The extrusion and torque control of the upper central incisors were not fully achieved during the previous/anterior retraction with the aligners<sup>30</sup>. This lack of control can affect final occlusion quality, as the crown lingual torque and the incisors extrusion can hinder or prevent perfect intercuspitation during previous/anterior retraction. Probably due to the higher resistance generated by polyurethane – material used in ClearCorrect® aligners – and its 2mm cut out above the gingival zenith, there was an excellent control of the upper incisors torque, including increasing their vestibularization.

According to Li et al (2016)<sup>31</sup>, the amount of activation substantially influences the magnitude of force generated by the aligners and, therefore, stated that the activation should not exceed 0.5mm to produce a translational movement of the upper central incisor. They also stated that the aligners presented a rapid relaxation in the first 8 hours and then slowly decreased until they stabilized on the 4th or 5th day, concluding that these first 4 or 5 days are important for orthodontic treatment. However, for White et al<sup>32</sup>, patients treated with conventional fixed devices reported greater discomfort and consumed more analgesics than patients treated with clear aligners. In the present clinical case, the patient reported a strong pressure on the teeth whenever she changed the aligners, but that decreased considerably after the first days.

Regarding periodontal disease, the authors Bollen et al (2008)<sup>2</sup>, Karkhanechi et al (2013)<sup>9</sup> and Levrini et al (2019)<sup>6</sup> concluded that patients treated with clear aligners had better periodontal health status, when compared to patients treated with conventional fixed devices. Because they are removable, they facilitate oral hygiene, evidencing decrease in plaque levels, gingival inflammation, bleeding at probing and depth of periodontal pockets. Thus, these results suggest that patients at risk of periodontitis are more indicated for treatments with orthodontic aligners.

## FINAL CONSIDERATION

It was observed that for the present clinical case, ClearCorrect® aligners were efficient in correcting Class II malocclusion and met the patient's aesthetic expectations.

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