Treatment of Class II Malocclusion and Unerupted Upper Canines with Self-ligating Appliance

Abstract
Treatments without tooth extractions have become more popular over the last two decades. In this context, expansion of the maxillary arch is an interesting treatment option for cases in which space is required and other factors not favoring extractions (such as the facial profile) are present. According to several authors, this posterior expansion can be obtained using a system comprising self-ligating brackets and superelastic nickel-titanium arches. The present article aims to report a case of a young patient with Class II, Division 2 malocclusion, with impacted upper canines and significant arch length-tooth discrepancy. Methods: The case was treated by means of a passive self-ligating appliance in association with Class II elastics and coil spring for distalizing the molars. This treatment alternative was effective for correcting Class II and obtaining space to correct tooth positioning.

Keywords: Malocclusion Class II, molar distalization, orthodontic brackets

Introduction
Class II malocclusion can be managed using different methods, depending on its nature, severity, and type. One of the treatment alternatives consists of distalization of molars, which can be performed through a variety of devices specially designed for cases of dentoalveolar nature. These devices include coil springs, which can be used in association with certain anchoring mechanisms such as miniscrews or intermaxillary elastics.[1]

Expansion of the arches is an alternative for cases that present lack of space and in which tooth extraction is not a favorable option. According to Damon,[2] self-ligating bracket systems promote posterior expansion in cases without extraction, without significantly changing the anteroposterior position of the incisors owing to the use of light forces allowing tooth movements to areas of lower resistance.

The orthodontic movement may be greatly affected by resistance to the sliding movement. This resistance is due to the frictional force opposing the tooth movement, which is encountered as the sliding movement of the bracket applied through the wire. The main characteristic of self-ligating brackets is that they reduce friction.[3]

Some authors have highlighted certain advantages of these brackets. These include elimination of the elastomeric ligature, thereby reducing the friction, elimination of cross-contamination, lower risk of decalcification of the enamel, application of lighter forces, thus resulting in smaller side effects, less time taken to insert the arch, faster treatment, less pain, and fewer consultations.[4]

The present case report aims to show the treatment for Class II, Division 2 malocclusion, with significant arch length-tooth size discrepancy and unerupted upper canines.

Case Report
A Brazilian boy, age 9 years and 7 months, straight profile and Class II, Division 2 malocclusion. He was in good general health, and her chief complaint was lack of space for his teeth.

Frontal and lateral facial analyses showed the following: slight facial asymmetry; passive lip sealing and normal nasolabial angle; straight profile; and normal chin-neck line and angle [Figure 1a and b].

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Intraoral and dental examinations showed that the patient was in the mixed dentition phase, in transitory period, Class II, Division 2 malocclusion, increased overbite and normal overjet; significant arch length-tooth size discrepancy with unerupted upper canines and lower midline was not coincident with the facial midline and was shifted to the left [Figure 2a-c].

The panoramic radiography [Figure 3a] revealed no caries and good bone morphology, but without space for the upper canines. The lack of space for canines in the arch was confirmed through Moyers analysis realized in models.

Cephalometric evaluation [Table 1] demonstrated normodivergent facial pattern, good maxillomandibular relationship and upper and lower incisors lingualized and retruded [Figure 4a].

Treatment objectives
- Elimination of dental crowding
- To correct the overbite
- To correct the Class II malocclusion;
- To correct the inclination of the upper and lower incisors
- To correct the lower midline deviation
- To gain space for unerupted upper canines.

Treatment alternatives
Four treatment options were presented to the patient and the adults responsible for him:
- 1st option – rapid expansion of the maxilla and use of a Pendex intraoral distalizer
- 2nd option – rapid expansion of the maxilla and use of a cervical headgear appliance
- 3rd option – fixed appliance and extractions of the upper first premolars
- 4th option – self-ligating brackets and use of open coil springs to expand the arches and gain space for the canines.

The fourth option was chosen because it would be simple and less painful. Moreover, this would not require use of other appliance such as a distalizer and headgear appliance, which might reduce the patient’s collaboration. In addition, treatment without extractions was preferred because of the patient’s unfavorable profile.

Treatment progress
The treatment was started bonded with a 2 × 4 appliance in maxillary arch using passive fixed self-ligating brackets (Damon Ormco® MX standard prescription), with a 0.014-in thermoactivated copper-nickel-titanium wire and wire protector, initially in the spaces occupied by deciduous teeth. Twelve weeks later, a 0.014 × 0.025-in thermoactivated copper-nickel-titanium wire was put in place, and nickel-titanium open coil springs were inserted between the first molars and the permanent lateral incisors, to gain the spaces. The stop was positioned in the region of the midline.

Archwire 0.018 × 0.025-in copper-nickel-titanium was inserted 22 weeks later, and the nickel-titanium open coil
springs were activated every 10 weeks. After 12 months of treatment, the upper teeth presented good alignment and leveling, including the teeth 13 and 23. At this stage, because of the successive removals of bonded orthodontic accessories and because of the patient’s financial conditions, the brackets were substituted for a Portia Abzil® Roth prescription.

After the deciduous teeth had been replaced by the permanent teeth, brackets were bonded in lower arch and buildup of composite resin were inserted on the lower first molars. The initial leveling began with 0.014-in thermoactivated copper-nickel-titanium wire. The patient was instructed to use intercuspatation elastics (3/16 in, 2.5 oz) on the right side and on the left side, Class II elastics (3/16 in, 2.5 oz) [Figure 5]. The wires were progressively increased, and 0.019 × 0.025-in stainless steel archwire was installed in the upper and lower arches.

After 1 year and 3 months of treatment, the fixed appliances were removed, and the patient was instructed to use passive acetate retainers on the upper and lower arches during the day and an active retainer comprising a simple planas appliance during the night, to avoid relapse of the overbite.

Results

Frontal and profile photographs taken after the treatment showed that the straight profile, passive lip sealing, and balance of the patient’s face had been maintained [Figure 2c-e]. Evaluation of the occlusion showed that the Class II malocclusion had been corrected and the canines were well positioned. The patient’s overbite was reformed, and the midline was coincident [Figure 2e]. The cephalometric analyses showed that normodivergent facial pattern and good maxillomandibular relationship remained unchanged. Evaluation of the dental relationship showed that the upper and lower incisors were lingual inclined, thus improving the positions of these teeth [Table 1 and Figures 3b, 4b]. After a 3-year control of the case, it was observed that stability was maintained successfully [Figure 6 and Table 1]. In addition, follow-up in 3 years showed second molars at the right side were in good position.

Discussion

Tooth extraction for orthodontic treatment of Class II malocclusion is contraindicated when the patient has an unfavorable profile (straight or concave). In these cases, the treatment plan should involve other alternatives, such as headgear appliance, functional orthopedic appliance, Class II elastics used in association with fixed appliance.

| Table 1: Cephalometric analysis |
|-------------------------------|
| Normal | T1 | T2 | T3 |
| SNA | 82° +2 | 83.15° | 84.00° | 84.21° |
| SNB | 80° +2 | 80.31° | 81.22° | 81.15° |
| ANB | 2° +2 | 2.84° | 3.22° | 3.10° |
| FMA | 25° +5 | 21.99° | 21.4° | 20.9° |
| S-N,Gn | 67° | 65.41° | 65.82° | 54.94° |
| S-N,Ocl | 14° | 12.35° | 9.69° | 9.53° |
| (S-N), (Go-Me) | 32° | 31.54° | 30.29° | 30.15° |
| (Go-GN), | 18° | 17.46° | 18.83° | 19.01° |
| Ocl | 1/1 | 131° | 137.72° | 131.20° |
| 1/NS | 103° | 99.99° | 106.09° | 107.01° |
| 1/NA | 22° | 16.84° | 21.64° | 21.53° |
| 1/-NA | 4 mm | 3.50 mm | 5.18 mm | 5.08mm |
| /1/NA | 25.0° | 22.60° | 23.93° | 22.53° |
| /1-NB | 4 mm | 3.01mm | 4.69 mm | 4.32mm |
| T1: Pretreatment | T2: Posttreatment | T3: Follow up 3 years |
intraoral distalizers,[9] and most recently, self-ligating brackets used in association with open coil springs.[10‑13] In the case reported here, the patient presented a straight profile, which is unfavorable regarding tooth extractions. For this patient, it was decided to use self-ligating brackets in association with open coil springs and Class II elastics, to achieve distalization of the molars and Class II correction.

Fleming et al.[14] compared the effects of self-ligating brackets and conventional Edgewise brackets for angular and linear changes to the lower incisors and for transverse dimensional changes to the lower arch. They observed that the self-ligating brackets produced greater expansion in the molar region. Therefore, our decision to use self-ligating brackets also had the aim of promoting expansion of the arch since the patient presented length-tooth size discrepancy.

In this clinical case, lingual inclination of the lower and upper incisors could be seen, which was favorable for the profile and was concordant with the data found in the literature.[9,15,16]

It has been reported in the literature that treatment using self-ligating brackets takes a shorter time because the frictional activity is considerably reduced and because lighter but more continuous force is used. The case presented here was concluded after 1 year and 3 months, and the total treatment time can be considered fast for correcting this type of malocclusion.[17‑20]

In this paper, after a 3-year control of the case, it was observed that stability was maintained according to some articles that demonstrated the stability of treatment outcomes after using passive self-ligating.[21‑23]

**Conclusion**

The treatment plan consisting on the use of self-ligating brackets in association with open coil springs and Class II elastic was efficient for correction the Class II malocclusion with arch length-tooth size discrepancy since it provided good results over a short period of time and ensures stability in treatment.

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**Conflicts of interest**

There are no conflicts of interest.

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