

Clinical case

Anterior Crossbite Correction with Self-Ligating System. Case Report

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Abstract

Introduction: Anterior crossbite is one of the most common problems in growing patients with class III malocclusion, both skeletal and functional. The correct diagnosis of this malocclusion is key to its correction and a good treatment plan. **Objectives:** obtain class I canine, maintain class I molar, obtain correct anterior guidance, maintain profile and improve function. **Case presentation:** A 13-year-old male patient comes to the clinic with the following reason for consultation: "my teeth are crooked and my jaw has moved forward". Class III Skeletal due to a retruded maxilla,

straight dolichofacial profile, , class I molar, canine class not established, canines 13, 23 and 33 retained, anterior crossbite. Treatment with "3M™ Unitek™ Gemini SL Self-Ligating Brackets MBT 0.022" brackets, lingual arch and transpalatal arch, bite lifting through *build-ups* on mandibular first molars, alignment and levelling phase, occlusion detailing and final retention (upper and lower removable) . The anterior crossbite was corrected by obtaining adequate anterior guidance and good chewing function. The profile and class I molar were maintained. **Conclusions:** treatment with self-ligating brackets is a good option to achieve correction of anterior crossbite, as long as a correct diagnosis and treatment plan is made.

Keywords: anterior crossbite, self-ligation system, class III.

INTRODUCTION

Patients with Class III malocclusion are considered the most complex cases to treat orthodontically, mainly due to their unpredictable nature and the unfavourable growth of those with this skeletal pattern^{1,2}. Class III aetiology is multifactorial, genetics play an important role in its development, being a polygenic transmission not sex-linked³. Some studies mention that the frequency of this condition differs according to the geographical area and the population under study; in a population of Mexican Americans, a prevalence of 8.3% was found³. There are different characteristics that these patients may present, such as: maxillary retrognathism, mandibular prognathism or a combination of both, reverse bite, anterior and buccal crossbite, proclination of maxillary incisors and retroclination of mandibular incisors¹.

Focusing specifically on one of these characteristics, we find that the term anterior crossbite is used to describe an anomaly of occlusion in the anteroposterior plane where the mandibular teeth are in front of the maxillary teeth, which can have different aetiologies, these can be of functional or skeletal origin⁴. There is also pseudoclass III, which is identified as an anterior crossbite that develops as a result of mandibular displacement. The reported prevalence of anterior crossbite varies between 2.2% and 12%, depending on the age of the children and their ethnic origin⁵. Currently the optimal timing of treatment for orthodontic problems remains one of the most controversial issues in this field, especially for the correction of Class III malocclusion⁶. There are reports in the literature that suggest treatments for the correction of anterior crossbite, which include different appliances, both fixed and removable with heavy intermittent forces (inclined bite plane, tongue blade) or light continuous forces (removable appliance with auxiliary springs). However, solid evidence supporting any treatment technique is lacking^{5,7}. One of the reported treatment options is the use of a self-ligating system, because it has many advantages over traditional brackets and is a good orthodontic treatment option for certain cases in need of slight expansion and mild to moderate crowding⁸.

A clear understanding of the factors involved in the development of anterior crossbites is fundamental for their timely treatment, and differential diagnosis is the key to planning treatment in accordance with the complexity of anterior crossbite⁴. The following clinical case shows the treatment of a patient with a Class III malocclusion with anterior crossbite and included canines. The treatment included the placement of self-ligating appliances and placement of *build-ups* on molars to correct the crossbite, as well as including the canines in the arch by traction.

CLINICAL CASE PRESENTATION

A 13-year-old male patient came to the orthodontic clinic with the following reason for consultation: “my teeth are crooked and my jaw has moved forward”. In his medical history he referred a syndrome that could not be diagnosed because the studies carried out did not reveal any problems. In addition to asymmetric septal hypertrophic heart disease, for which he takes propranolol, and renal tubular acidosis, for which he ingests sodium bicarbonate. He presented a normal respiratory pattern and mentioned not having operations and poor diction, for which he attended speech therapy, with much improvement.

Facially, he had a straight profile, square face, symmetrical thirds, everted lower lip, enlarged middle fifth, large and broad nose, flat chin, medium smile, 100% of the mandibular teeth and closed nasolabial angle (Figure 1A). Intraorally he had Class I molar, Class I canine not established, permanence of teeth 63, 13, 23 and 33 retained, anterior crossbite, overbite 5 mm, overjet -3 mm, Spee's curvature 1 mm, ovoid maxillary and mandibular arch form, severe maxillary crowding (-11 mm), mild mandibular crowding (-1.2 mm), upper and lower midline deviated to the right and left respectively, retruded maxillary incisors, protruded and proclined mandibular incisors (Figure 1B).

Orthopantomography shows the retained right canine due to lack of space, good bone level and immature apices of canines, premolars and molars. Permeable nasal sinuses and nasal turbinates, symmetrical condyles and gonial angles. Maxillary and mandibular third molar germs present (Figure 1C). Vertical growth pattern, incipient dolichofacial, Class III skeletal by a retruded maxilla (Figure 1D). Steiner cephalometric analysis measurements were performed with *Dolphin Imaging Software* version 11.0 (Dolphin Imaging, Chatsworth, CA) in which we can observe the inclinations of the incisors and the skeletal discrepancy (Figure 1E). Functionally without alterations or joint pain (Table 1).

The aim of the treatment was to obtain Class I canine, maintain Class I molar, obtain correct anterior guidance, maintain profile and improve function. The possibility of orthognathic surgery was discussed in order to achieve maxillomandibular advancement, in conjunction with orthodontic treatment, and thus correct the skeletal discrepancy, improve facial aesthetics

Table 1.
Values of the Steiner cephalometric tracing before and after treatment.

	Standard	Initial patient	Final patient
SNA	82°	72°	74°
SNB	80°	74°	77°
ANB	2°	-2°	-3
GO-GN-SN	32°	40°	39°
SN-Occlusal Plane	14°	23°	15°
Inc Superior- NA	22°	22°	42
Inc Superior-NA Seg	4 mm	4 mm	8 mm
Upper Inc-PlaneS-N	103°	100°	117°
Lower Inc-NB	25°	29°	23°
Lower Inc-NB sec	4 mm	4 mm	4 mm
Lower Inc-Mandibular Plane	90°	97°	88°
Interincisal	131°	124°	116°

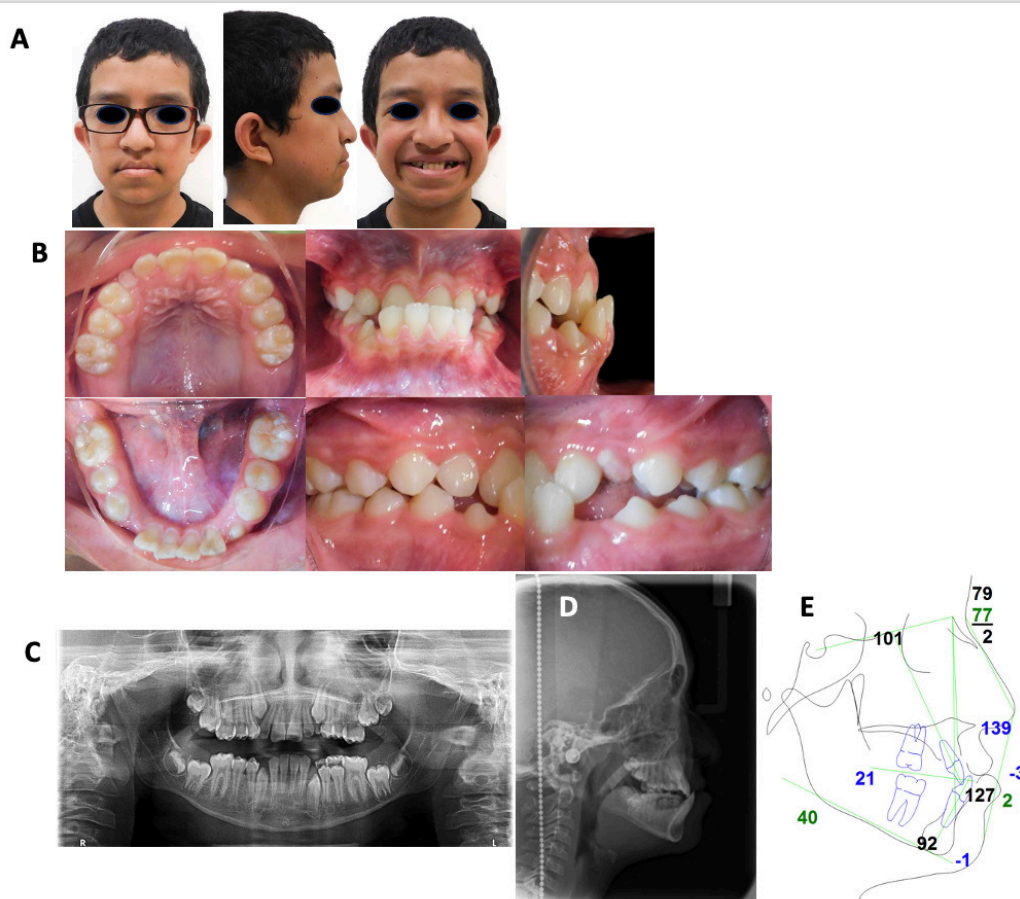


Figure 1. Initial studies. A. Extraoral photographs. B. Intraoral photographs, showing the level of crowding, anterior crossbite, overjet and overbite. C. Orthopantomography. D. Lateral cranial radiography. E. Initial Steiner cephalometric tracing performed in *Dolphin Imaging Software* version 11.0.

as well as establish ideal occlusion. Nevertheless, the patient rejected this alternative due to the surgical risks and his financial restrictions, therefore, non-surgical treatment alternatives were chosen.

Orthodontic treatment using non-extraction camouflage, maxillary arch expansion and protraction of the maxillary anterior teeth, using fixed orthodontic appliances, was the alternative chosen. The use of a self-ligating bracket system was chosen, since some studies have reported that the self-ligating system produces a significant increase in the maxillary transverse dentoalveolar width and results in a greater maxillary intermolar width than the conventional ligation system⁹.

The treatment plan consisted of placing "3M™ Unitek™ Gemini SL Self-Ligating Brackets MBT 0.022" brackets, bands on maxillary and mandibular first molars with double tube and upper and lower lingual boxes. It began by placing lingual arch and transpalatal arch (TPA), *build-ups* on teeth 16 and 26, upper brackets with 0.016" heat activated (HA) archwire and lower brackets with 0.014" nitinol archwire; the following month the upper arch was changed for a 0.014" leftover steel arch to procline the maxillary incisors. Subsequently, a 0.016" x 0.022" steel arch, open coil between teeth 12 and 14 (Figure 2A) and ¼ 2.5 oz class III elastics were placed in the maxillary arch.



Figure 2. Treatment progress. A. Placement of springs and *build-ups*. B. Intraoral photographs showing the beginning of traction on tooth 13 with a button and a flexible archwire.

Once the space was obtained and tooth 23 began to erupt, traction began. An ulectomy was performed to uncover tooth 13 and a button, 0.016" upper steel archwire and a 0.014" nitinol accessory archwire were placed, since it was in supra-occlusion, and it was not desired that the adjacent teeth suffer unwanted movements (Figure 2B). After two months, the bracket on tooth 23 and a 0.016" nitinol archwire were placed. When it was in a better position, the bracket on tooth 13 and 0.016" HA archwires were placed. The sequence of 0.016" x 0.022" HA arches in the maxilla and 0.017" x 0.025" nitinol in the mandible was continued and the *build-ups* were worn. The maxillary and mandibular teeth 6 were ligated (ligated 6 to 6) with a 0.018" x 0.025" upper and lower nitinol archwire (Figure 3A), box elastics were placed on $\frac{1}{4}$ 3.5 oz premolars to settle the bite. Orthopantomography was indicated (Figure 3B) and brackets for canines and first premolar of the maxilla and mandible were repositioned with 0.016" HA upper and lower archwires. A chain from maxillary teeth 3 to 3 was placed.

Subsequently, the upper and lower brackets were removed and an upper circumferential appliance and lower aligner were fitted. Extraorally, the patient's straight profile was maintained (Figure 4A). Class I canine and Class I molar were obtained (Figure 4B). The anterior crossbite was corrected, obtaining adequate anterior guidance and good masticatory function. In the orthopantomography the included third molars were observed, so indications for extraction were given (Figure 4C). In the lateral skull radiography, as well as in the Steiner cephalometric tracing, the maxillary anterior teeth are observed proclined and the mandibular

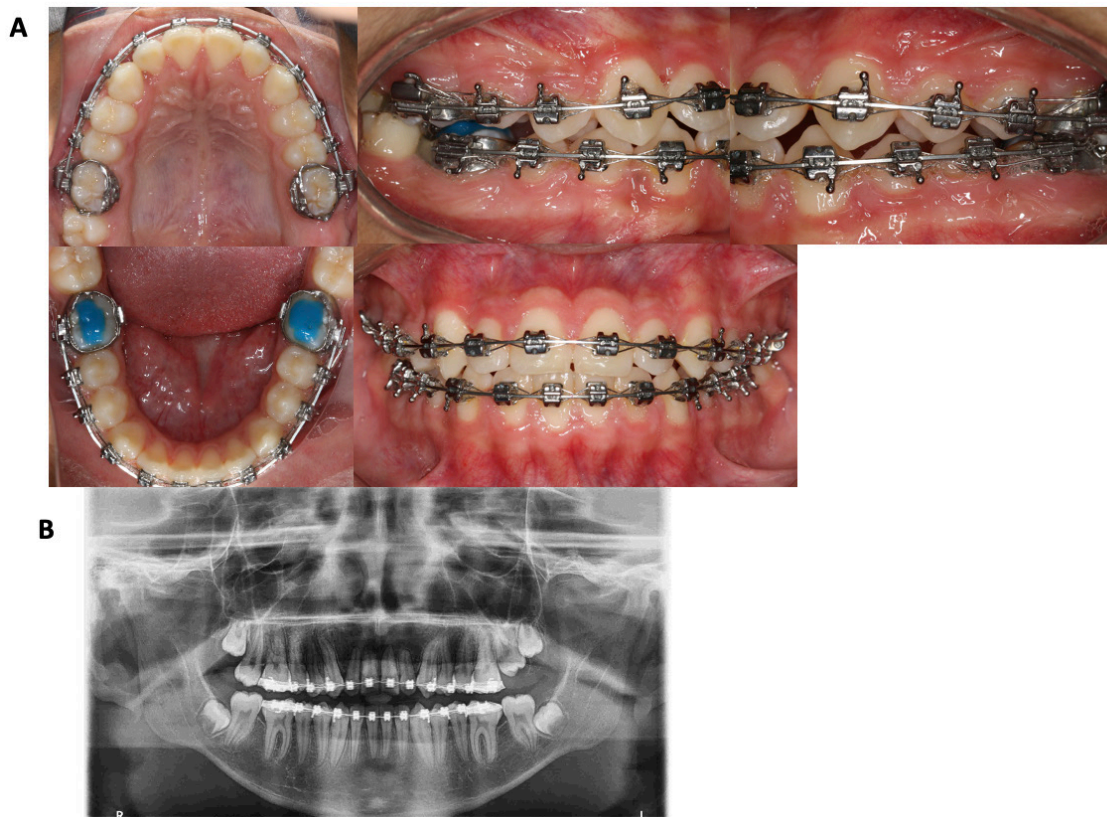


Figure 3. Treatment progress. A. 0.018" x 0.025" nitinol archwire and ligation of teeth 6 to 6. B. Advance orthopantomography for repositioning of maxillary and mandibular canine and first premolar brackets.

anterior teeth to be retroclined due to the compensation that was performed to correct the anterior crossbite (Figure 4D-E). Figure 4F shows the changes obtained in the superimposition of the Steiner cephalometric tracing. Referral to the extraction of third molar with the maxillofacial surgeon.

DISCUSSION

The incidence of anterior crossbite in children is considerably high. Amarilis *et al.* reported 9.2% of school-age children affected by this malocclusion, slightly predominating of males among the affected individuals. These results coincide with the age and sex of our patient, whose treatment achieved total correction of the anterior crossbite, as reported by these authors¹⁰.

Kanas *et al.* make a classification of Class III malocclusion, in which they suggest the type of treatment necessary and the ages at which its correction is most predictable. The types of treatment for Class III malocclusion that were conclusively identified were: 1) early orthodontics; 2) early combined orthodontics and orthopedics; and 3) combined orthodontics and orthognathic surgery. According to Kanas *et al.* the ideal treatment of our patient with a retruded maxilla and deep bite, should be performed at an early age, before the age of 10, using combined dentofacial orthopedics (palatal expansion/facemask) and fixed appliances,

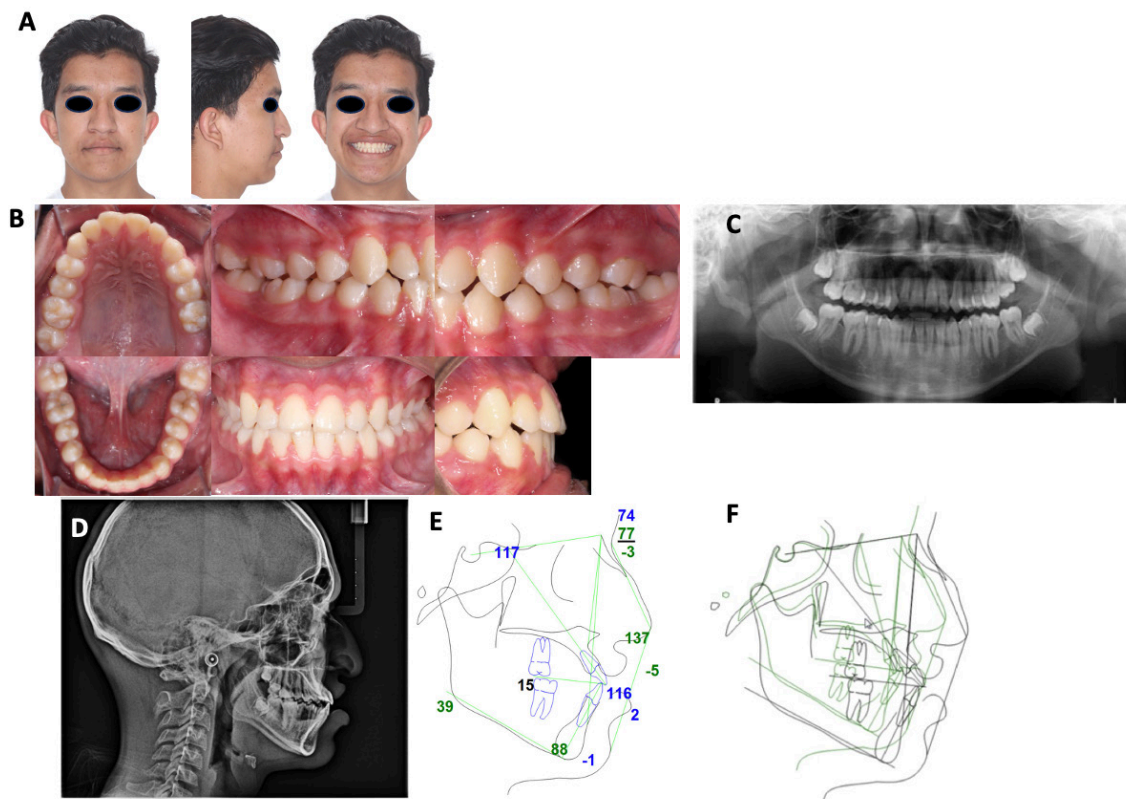


Figure 4. Final studies A. Extraoral photographs. B. Intraoral photographs and canine guidance. C. Orthopantomography. D. Final lateral cranial radiography. E. Steiner cephalometric tracing. F. Superimposition.

which will give very predictable results. Because our patient came for consultation at the age of 13, it was not possible to treat him as suggested in this article; however, the results obtained with fixed appliances alone were satisfactory and the correction of the anterior crossbite was achieved¹¹.

The case reported by Pratiwi and Soegiharto, Class III skeletal and molar, which was corrected through the use of a palatal expander and facemask, followed by orthodontic treatment without extraction with a self-ligating system, presents similar characteristics to our case; however, it was not resolved in the same way. This may be because our patient did not have the Class III molar and concave profile mentioned by the authors, so we can conclude that the use of a palatal expander and facemask was not necessary in this particular case, due to both the facial and dental characteristics, we only opted for the use of a self-ligating system, successfully correcting the patient's malocclusion¹.

According to various studies, such as those by Alami *et al*, Ramirez *et al* and Borrie and Bearn, patients with class III malocclusion should be treated as soon as possible, with the aim of allowing normal growth, improving the function and psychosocial well-being of the children, in whom removable appliances, with proper patient cooperation, are a good tool for correction. However, our patient's treatment was not carried out in the manner suggested, since he did not present for consultation at an appropriate age, and therefore the mechanics described above were chosen, which allowed us to achieve satisfactory dental, functional and facial objectives^{3, 5, 7}.

There are studies that show that the protraction mask is effective in young children, but not in patients over 10 years of age, so in the study presented by Konno *et al*, based on the unfavourable growth characteristics of their patient, who had a mandibular prognathism, he opted for a camouflage treatment to improve the occlusal relationship, and just as in our case, the results obtained were classified as successful^{2, 12}.

In another case presented by Park *et al*, a Class III patient with an anterior crossbite, but older than our patient and with similar characteristics, was also treated with a camouflage orthodontic treatment; the results were satisfactory facial aesthetics and adequate occlusion, as well as proclination of the anterior maxillary teeth and retroclination of the anterior mandibular teeth, which are the effects obtained by compensating for this type of malocclusion. This can lead us to the conclusion that orthodontic treatment can also lead to a favourable and functional outcome^{9, 13, 14}.

The comparison carried out by Miamoto *et al*, of two protocols for the correction of the anterior crossbite, did not find statistically significant differences when a spring-loaded anterior bite plane was used and when glass ionomer cement was placed on the occlusal surface of the first molars of the mandible, since both protocols achieved the correction of the anterior overjet; the same was observed in our patient, in whom *build-ups* were placed on mandibular molars that in conjunction with self-ligating brackets, achieved the correction of the anterior crossbite^{15, 16}.

CONCLUSION

Although the ideal age to treat Class III malocclusions, according to what different authors report, is at an early age, in this case the crossbite was successfully corrected with a self-ligation system and the placement of *build-ups*, meeting the objectives indicated from the beginning of the treatment. However, a long-term study will be necessary to determine the effectiveness and stability of this treatment.

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