

Correction of Anterior Crossbite, Using Removable Appliances in Mixed Dentition: 5-Year Follow-Up

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ABSTRACT

The anterior crossbite (ACB) is a malocclusion where the upper anterior teeth are occluding lingually with respect to the lower anterior teeth. Moyers describes anterior crossbites as dental malocclusions resulting from abnormal axial inclinations of the anterior teeth.

This type of malocclusion can be dental, functional or skeletal and can occur in the primary, mixed and second dentition. Diagnosis is made using diagnostic aids. While the treatment was carried out through interceptive orthodontics, with the use of different removable appliances.

The objective of the study is to present the diagnosis and treatment for 5 years with the use of removable appliances.

The results were favorable, being able to uncross the bite in 4 months, it was maintained throughout the dental replacement. One of the conclusions reached is that the treatment time is slightly longer since the use of preventive and interceptive orthodontics takes more time because these treatments are performed during the growth of the patients.

Keywords

Anterior Crossbite, Diagnosis, Treatment, Removable Appliances.

Introduction

Anterior crossbite (ACB) is the term used to describe an occlusion abnormality in the anteroposterior plane where the lower teeth lie in front of the upper teeth, when the patient occludes in centric relation. This alteration can be formed during dental replacement from the first dentition to the mixed dentition or develop due to deficiencies in maxillary growth or due to an increase in the size of the mandible [1].

Moyers, describes anterior crossbites as dental malocclusions resulting from abnormal axial inclinations of the anterior teeth, which must be clearly differentiated from skeletal class III mesiocclusions or malocclusions. Occasionally they can present an

ACB when there is an anterior displacement of the mandible, due to local causes, this habit can create an anterior crossbite or pseudo class III, which over time can develop a true class III [2].

It is important to mention that normal occlusion at the transverse level is when the palatal cusps of the upper molars and premolars occlude in the main fossa of the lower molars and premolars. At the antero-posterior level, the upper incisors occlude vestibularly from the lower incisors, presenting an anterior projection that should generally cover the lower ones. Broadly, classified the anterior crossbite as: type 1.- Functional, there is a discrepancy between the centric relation and centric occlusion due to premature occlusal points. Type 2.-Tendency to a true class III. Type 1 can be classified as type 1a simple, with no abnormal dentition or without dentoalveolar changes, and type 1b, complex, with an abnormal dentoalveolar relationship that mimics true class III [3].

Anterior crossbite (ACB) is a malocclusion that can occur in the primary, mixed, and second dentition as a result of these disharmony in the child's skeletal, functional, or dental components. This can be characterized because one or more upper anterior teeth are occluding on the lingual side of the lower anterior teeth, being of great importance since it clinically affects the aesthetics and masticatory function of the individuals who present it [4].

The etiology is of multifactorial origin and heredity has an important factor, as well as ectopic eruption, tooth germ in a bad position (dental trauma) which sometimes causes a palatal displacement of the developing permanent tooth, forcing it to erupt in a palatal position [5,6].

Prolonged retention of deciduous teeth or inadequate length of the dental arch are some of the causes that can cause lingual deviation of the teeth of the second dentition during eruption, as well as supernumerary teeth when they are located buccally and crowding of the upper anterior teeth [5].

The non-nutritive habit of biting with the jaw forward forces the upper incisors to recline. This habit can cause either a retrusion of the maxilla or a protrusion of the mandible, or a combination of both (skeletal type crossbite); but when it affects one or several teeth in isolation, the cause is usually dental, finding the upper teeth lingually, behind the lower incisors. The bone support is well related to each other, and dentition is the origin of the anomaly. This type of occlusion may be a predisposing factor in the development of a skeletal class III malocclusion [7].

When it is dental, one or two teeth are involved, the facial profile is straight in occlusion and centric relation. It presents class I molar and canine relationship, in the cephalometric analysis the SNA, SNB and ANB angles are in the norm, and it is generally the product of a dental axial inclination.

Developing class III malocclusions usually express themselves clinically as an anterior crossbite in the mixed dentition. The functional anterior crossbite or pseudo class III, occurs when it affects the four upper incisors. This is caused by mandibular hyperpropulsion, causing, in turn, a low position of the tongue and premature contact of the canines, which trap the maxilla. It is the product of a mandibular advancement that is sometimes necessary to achieve maximum intercuspation [8].

Several authors recommend that functional dental crossbites in the primary dentition should be corrected at the time they are identified, in order to promote normal dental and skeletal development.

While the skeletal or class III anterior crossbite presents a class III molar and canine relationship, both in centric occlusion and in centric relation, edge-to-edge in centric relation is not achieved. It presents a concave profile accompanied by upper retrochelia, a prominent chin and a diminished lower third. In the cephalometric analysis, the SNA angles are decreased, SNB increased and

ANB negative; or a normal SNA, increased SNB and negative ANB; and usually a horizontal growth direction. For diagnosis, cephalometric evaluation is important, which determines the positions of the maxilla and mandible, as well as the position of the upper and lower incisors, in order to determine the skeletal and dental relationships of a class III. Therefore, a class III malocclusion can be classified as a dentoalveolar malocclusion, a skeletal malocclusion or a malocclusion pseudo class III [9].

The prevalence of anterior crossbite in primary dentition is 6.7% reported by Carvalho, while in mixed dentition 12.8% reported by Mendoza et al., and 2.4% by Montes et al. and 8% in Shanghai in children at the aged 3 to 5 years and Taiwanese 13.83% which varies according to the population and age group. The etiology of ACB can be skeletal, dental, and functional. The skeletal class III has a prevalence of 50% in Asians and 5% in Caucasians with a predisposition for the female gender [10-14].

For the diagnosis, cephalometry, intraoral and extraoral clinical photographs, analysis of models and tomography are necessary. Regarding treatment, it can be preventive, interceptive, orthopedic or surgical orthodontic [15].

The objective of this study is to present a clinical case with a 5-year follow-up of interceptive treatment of anterior crossbite performed with removable orthodontic appliances during mixed dentition.

Material and Methods

Case Report

A 9-year-old female patient who demands care at the Venustiano Carranza Peripheral Clinic of the Faculty of Dentistry of the National Autonomous University of Mexico, the reason for the consultation was that the mother reported that she had cavities, the lower teeth bit in front of the upper ones whilst those above were crooked. In the facial analysis, the 3 thirds are of the same size, with a straight profile (Figure 1).



Figure 1: Relationship of front thirds, slightly convex profile.

The front intraoral picture shows mixed anterior crossbite in the first temporary molars and first-degree cavities in the second dentition. The intraoral front picture shows mixed anterior crossbite involving the 4 superior anterior teeth, presence of diastema, loss of space for the lateral found without erupting on the left side and in the other side the teeth is rotation (Figure 2) [6].



Figure 2: Intraoral Pictures.

In the posteroanterior and anteroposterior radiographs of the tomography, open apices are observed in the upper centrals, slightly dilacerated and with short roots, laterals, unerupted canines, ugly duck phase. In addition, the teeth of the second dentition with formation of 2/3 of the root and without eruption (Figure 3).

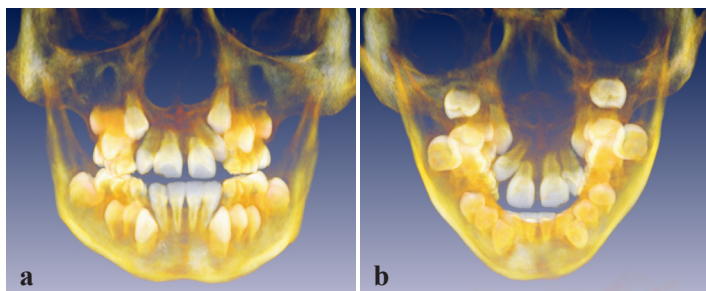


Figure 3: Radiography's, a) anterior and b) posterior.

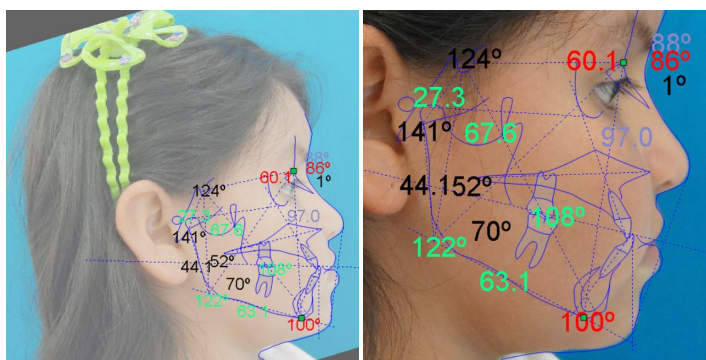


Figure 4: Roth Jaraback análisis.

In the Roth Jaraback cephalometric analysis, it presents a class I biprotrusive skeleton, with horizontal growth with mandibular hyperflexion, slightly lower incisal proclination and straight profile. Dentally it presents an anterior crossbite and class I molar

and a relationship of the anterior cranial base with a 59.8 with respect to the mandibular body of 57.1, Ia, IS to the palatal plane 103.8°, anterior facial height at 95.0, the posterior facial height between anterior facial height at 70.7, with a SNA 88°, SNB 86°, ANB 2°, IMPA 100°, while the angles of the saddle, articular, ramus height, are in the norm (Figure 4).

The analysis of the models in the table shows a discrepancy in the jaw's anterior length of -3 millimeters, and in the anterior and posterior width of the arch of -5 millimeters with respect to the mandible, resulting in maxillary deficiency in the anterior sector and maxillary compression (Table 1).

Table 1: Model analisis.

Maxillary	Mandible
4:4: 34mm.	4:4: 39mm
6:6: 45mm.	6:6: 50mm.
Anterior Length: 14mm	Anterior Length: 15mm

The diagnosis according to the realized analysis was A 9-year-old female patient presents a biprotrusive skeletal class I, with horizontal growth, protrusion and proclination of the lower incisor with a straight profile with proclia of the lower lip, presents a vert, severe brachi, in the Jarabak analysis shows a biprotrusive skeletal class I, with growth counterclockwise, dentally presents the lower incisors proclined with a straight profile.

The treatment consisted in first phase, the elaboration of an active plate with a screw in the sagittal form and a posterior bite plane to uncross the anterior crossbite, in addition, a spring was placed at the upper lateral level in order to bring it towards the vestibular area [16].

The patient was asked to activate the screw twice a week indicating the use of the device throughout the day, night and even for eating. Also, the temporary molars were restored by placing steel crowns to avoid deeper caries; preventive measures were applied as brushing technique and plaque control (Figure 5) [17].



Figure 5: Used Appliances.

Results

During the first two months bring the bite edge to edge was achieved, first of one of the central ones and later the other, managing to completely uncross at 4 months. In addition, the diastema was gradually closed by activating the screw twice a week (Figure 6).



Figure 6: Fourth month of progress.

Subsequently, once the anterior bite was uncrossed, the upper teeth continued to erupt, improving their occlusion. At that time, selective carving with a 45° inclination on the cusp of the lower primary canine was considered, using a diamond fissure bur to allow vestibularization of the upper lateral while waiting for the eruption of the lower canine of the second dentition (Figure 7).

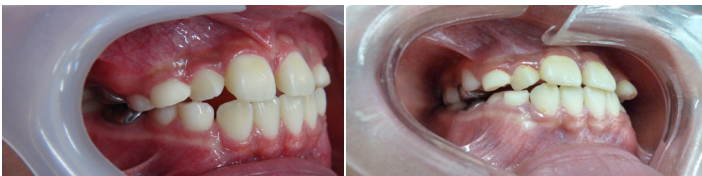


Figure 7: Selective tore down in the lower canine.

Then an upper lingual reminder was placed to prevent the patient from placing the tongue between the teeth and causing an open bite, since the tongue was in a low position. Also, a screw was placed transversely to help in the transverse development of the maxillary (since it presented a transversal discrepancy) with an activation of a weekly quarter turn. Exercises were directed to bring the tongue into the normal position, and the left temporal canine was maintained to conserve space naturally (Figure 8) [18].



Figure 8: Lingual reminder with spring.

Closure of the diastema, presence of mixed dentition, the upper central have yet to be erupted, the upper canines are still unerupted, while the upper canine and the upper and lower primary molars were exfoliated (Figure 9).



Figure 9: Progress.

After achieving the necessary space, a button was placed in the upper left canine to bring it towards the vestibular area (Figure 10).



Figure 10: Available space for the canine.

The superimposed radiograph shows the correction of the anterior crossbite with the following cephalometric data that can be seen in figure 11.

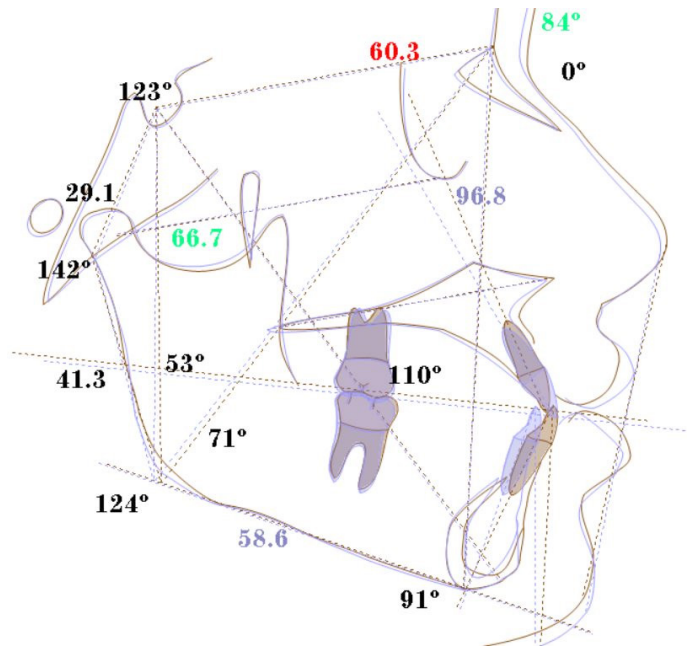


Figure 11: Superimposed radiography.

At the end of the treatment with removable appliances, the patient is recommended to undergo corrective orthodontics to correct the tipping and torque of the upper and lower sides and thus be able to have an adequate occlusion (Figure 12).



Figure 12: Final occlusion.

Finals Results of the front and profile of the patient show that the straight profile was preserved after interceptive orthodontic treatment after treatment with the use of removable orthodontic appliances (Figures 13 and 14).

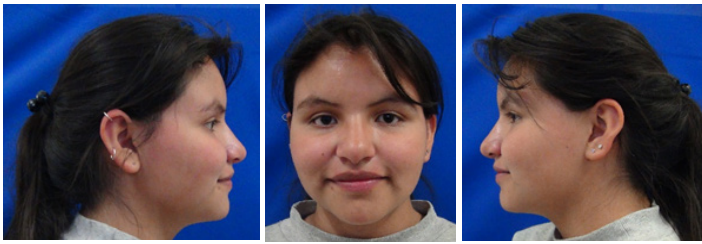


Figure 13: Final extra-oral photographs of the patient.

The final results of the treatment during the 5 years.



Figure 14: Pictures from beginning, between and at the end of treatment.

Discussion

Many authors mention that the objectives of preventive and interceptive treatments are not only to restore masticatory function and facial aesthetics, but also to help eliminate the severity of the existing problem, achieving favorable growth development that contributes to improving psychological development of the child.

Other authors mention that early correction in deciduous dentition must be performed to prevent abnormal growth of bone and dentoalveolar structures. Some orthodontists are using a series of clear aligner to correct the anterior crossbite, but the cost of the treatment is higher than with removable appliance [19-21].

In addition, others mention that with the eruption of the teeth of the second dentition this type of malocclusion is self-correcting. While others consider treating ACB in the primary dentition, with preventive or interceptive appliances, avoiding the development of a bone discrepancy [8]. Cosgun et al., utilized composite with inclined planes applied to the opposing tooth contacting with the maxillary teeth in crossbite [22,23].

On the other hand, Tollaro, Baccetti and Franchi, mention that the disharmony of the maxilla with respect to the length of the mandible is more evident in 6 years old children than in those of 4 years, they mention that the corrections can also be achieved with removal mandibular retractor in early dentition without producing significant skeletal changes as it would in the mixed dentition [7]. Naif A, et al, in his study, they used an upper removable appliance with screw for correct the anterior crossbite, then for the posterior segment, they used a second appliance to correct the transverse plane. In this study we used similar appliances, and the results were similar. A rapidly corrected anterior crossbite was associated with a more favorable maxillary growth pattern [7,16,24,25].

In this study, it is mentioned that the use of removable appliances during the growth of patients with mild to moderate malocclusions

is very useful since it allows malocclusion to be modified with greater control and thus prevents the formation of caries and periodontal disease such as demineralization of molars with the use of bands. Because it is a removable appliance, it is easy to use and to clean, allowing the patient to have greater hygiene.

Conclusions

The results that were achieved were very favorable, although the treatment time is slightly longer, since the use of preventive and interceptive orthodontics takes more time because these treatments are carried out during the growth of the patients.

Therefore, it is essential that the patient is cooperative to obtain satisfactory results, in addition, anterior crossbites are easier to treat in patients who are growing (early mixed dentition), improving masticatory function.

Interceptive treatments of anterior crossbites allow reducing malocclusion even when it is a dental ACB in order to avoid future surgeries, reducing corrective orthodontic treatment time.

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