

A Management of Anterior Crossbite with Removable Posterior Bite Riser, Composite Inclined Plane, or Fixed Appliance

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Abstract

Anterior crossbite interferes with appearance, causing a lack of self-confidence, especially for women. Although the prevalence of anterior crossbite is small, the anterior teeth have an important aesthetic role due to being related to smiling, laughing, and speaking.

This study aims to review of four cases of anterior crossbite treatment. Clinical related presentation and intervention: an acrylic tool with a posterior bite riser is used to correct the anterior crossbite and align the incisors. Another case of anterior dental crossbite was treated using a composite inclined plane and fixed appliance. The final result of the treatment showed that the occlusion between the maxilla and mandible was quite good, and the anterior crossbite was corrected. What is unique about this case report is that the anterior crossbite differs in its treatment due to the difference in age and the difference in space available in the maxilla.

In conclusion, anterior crossbite accompanied by incomplete root formation can be treated using a composite inclined plane. Whereas, complete root formation can be treated using a posterior bite riser or fixed appliance. Proper management of anterior crossbite from both functional and aesthetic perspectives is of utmost importance for the overall success of orthodontic treatment.

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Introduction

Anterior crossbite is an odd labiolingual connection involving one or more maxillary and mandibular teeth. When the patient is in centric occlusion, this abnormality shows a reversed bite on the maxillary incisor, more palatal to the lower incisors.^{1,2} According to the circumstances, the anterior crossbite can be distinguished, whether it be teeth or bones. In contrast, anterior dental crossbite originates from an odd axial tendency of the anterior upper teeth.^{2,3} Anterior skeletal crossbite is often frequently connected with jaw matters, such as lower jaw protrusion, upper jaw retrusion, or midface deficiency.⁴ The dental

factor that causes anterior crossbite is the persistence of the primary tooth, supernumerary teeth. That can change the direction of eruption, causing the permanent teeth to be more palatally. Lack of space due to the large shape of the teeth in a narrow jaw can result in a more palatally eruption. A 4-5% incidence of anterior dental crossbite has been reported and is usually due to palatal malposition of the upper incisors due to the lingual eruption pathway.⁵⁻⁸ Anterior crossbite is one of the matters often faced in patients at the growth and development stage.⁵⁻⁸ Anterior crossbite usually occurs in the period of primary teeth and mixed dentition due to misalignment of dental, skeletal, and functional components in children.⁹

Bad habit factors such as biting the upper lip can cause anterior dental crossbite. Problems that will arise if the anterior crossbite is not treated are aesthetic problems, including crowding teeth, which can cause caries, gingivitis, and calculus. Anterior crossbite can affect enamel abrasion on the incisal surfaces of both upper and lower incisors, which leads to labial

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alveolar plate resorption and gingival recession.^{1,6,10,11} Anterior crossbite that occurs in both primary and mixed dentition should be treated immediately. Delayed treatment can lead to more severe malocclusions. The severe malocclusions are maxillary growth inhibition and uncontrolled growth of mandibular anteriorly.^{5,6,12,13} According to research, anterior crossbite modification needs opening adequate space first, leading the displaced teeth across occlusion into the appropriate position.^{6,14,15} Therapy may include the lingual motion of the lower tooth, labial motion of the upper tooth, or both.

Several ways have been used to attain this purpose, such as tongue blades, composite sloped planes, bonded resin-composite slopes, reversed stainless steel crowns, acrylic tools that can be removed with lingual springs, and fixed equipment.^{16,17} What is unique about this case series is that the anterior crossbite differs in its treatment due to the difference in age and the difference in space available in the maxilla. For the 8-year-old patient, the root of the maxillary incisor has not been completely closed, so the treatment of choice is using a composite inclined plane. While the treatment is aimed for a completed incisor root, acrylic tools that can be removed with a posterior bite riser or fixed device can be used. This article records four cases in which an anterior crossbite was effectively modified using various bite risers.

CASE REPORT

CASE REPORT DESCRIPTION

Case 1

An 8-year-old girl patient complained of poor position anterior teeth and needs to be treated. Extra-oral examination, standard facial profile, no have maxillary or mandibular growth abnormalities. Intra-oral examination; good oral hygiene, no significant history of oral habits was present, anterior crossbite on the maxillary right central incisor (Figure 1a). This patient's therapy goal is to improve maxillary right central incisor crossbite, using a 45° composite inclined plane angulated to the long axis. A composite sloped plane was used to straighten the anterior crossbite.¹⁸ The making of the tool is as follows: Prepare a patient working model. The materials needed are composite, light curing, cold mold seal (CMS), and lecron wax carver. In the

working model on regions 31, 41, 42, were smeared by CMS, the CMS was left to dry itself, then applied composite resin layer by layer to the teeth and then irradiated by light-curing until it was 3 mm higher than the occlusal plane. A composite inclined plane is shaped in such a way that it allows the maxillary right central incisor to move labially. This tool is then tried on the patient to the teeth 31, 41, 42, and the inner layer is reduced slightly to place the cement. A composite inclined plane was attached on the lower incisor of 31, 41, 42 with zinc oxide eugenol cement (Figure 1b). After the composite sloped plane was attached, the only point of contact at the incisor section was occlusion. After two weeks of placing the composite inclined plane, the maxillary right central incisor was in the jumping the bite position. After two weeks, a composite inclined plane was removed, and the crossbite was corrected (Figure 1c).



Figure 1a. Anterior crossbite before treatment.



Figure 1b. A composite inclined plane was cemented on 31, 41, 42.



Figure 1c. Anterior crossbite had been corrected.



Figure 2a. Anterior crossbite before treatment.



Figure 2b. Anterior crossbite had been corrected.



Figure 3a. Anterior crossbite before treatment.



Figure 3b. Anterior crossbite had been corrected.



Figure 4a. Anterior crossbite before treatment.



Figure 4b. Anterior crossbite had been corrected.

Case 2

A 13-year-old girl comes to a private clinic need to correct the poor position of her teeth. Extra-oral examination showed no abnormalities, the patient's facial profile was standard, maxillary and mandibular growth was average, general medical history was good. Intra-oral examination: No caries were detected, no significant previous history of bad habits, anterior crossbite on maxillary right central incisor (Figure 2a). According to history, at a 7-year-old, there was the persistence of the upper front teeth. There is an anterior crossbite on maxillary right incisors—treatment plan, fixed appliance, and posterior bite riser without a labial bow. Treatment; there is not sufficient mesiodistal space available to move the maxillary right incisors labially. On the first visit, the patient was enamel reduction by interproximal strip on the maxillary right incisors on mesial and distal side sufficiently, then topically fluor was given. A fixed appliance was used to straighten the anterior teeth. Next visit, a removable posterior bite riser without a labial

bow was used, wherein the maxillary right and left first molar were installed a ball clasp. After that, in regions maxillary right and left canine were installed a short c clasp as a balance for the stable device. Using the posterior bite riser only takes two weeks, maxillary right incisors had jumped the bite and bodily movement using the fixed appliance, and the crossbite was fixed in 1 month (Figure 2b).

Case 3

A 15-year-old male patient attended by his parents with the main complaint of an unaesthetic history of the maxillary four incisors. His health history did not contribute, and the family patient had no history of class-III malocclusion. Intra-oral examination; the upper four incisors were palatoversion, the patient had a class-I molar relationship on the left, and a half-cusp class III on the right side with a 2 mm reversed overjet and 2 mm overbite (Figure 3a). An ectopic of left maxillary canine, maxillary ALD was 9 mm, and mandibular ALD was 3mm. The upper dental midline coincided with the centre line of the face. However, the lower dental midline has diverged 1mm to the right. The teeth of 12, 11, 21, and 22 were crossbite. The

mandibular teeth can be backward until they reach an edge-to-edge relationship. A panoramic radiograph presented has no bone or dental pathology, and the lateral cephalometric radiographic view displayed no sign of basal problems between upper and lower arches. The goal of therapy for the patient was to modify the anterior crossbite, correct an ectopic of the left upper canine, straighten the anterior teeth for good inclination, and improve the patient's face and dental look. Because maxillary ALD was 9 mm and mandibular ALD was 3mm, then Left maxillary first premolar and left mandibular first premolar had been extracted. There is an anterior crossbite, treatment plan, fixed appliance, and posterior bite riser without a labial bow. A fixed device was used to straighten the anterior teeth and protrude to labially to improve the crossbite. An initial 0.014 nickel-titanium aligning archwire, the archwire sequence was 0.016 nickel-titanium. After that, using 0.018 stainless steel archwire to retract 23 and 33 to the proper position, 0.018 x 0.025 nickel-titanium, then 0.018x 0.025 stainless steel. An active treatment time is about ten months. Then teeth 12, 11, 21, and 22 were protracted labially. An

acrylic tool removed with a posterior bite plane was used to improve the crossbite and straighten all incisors. This acrylic tool with a posterior bite plane does not have a labial bow. After three months of fitting the posterior bite riser, the anterior inclination teeth have changed, and the teeth' position is an edge to edge. The bodily movements of the teeth 12, 11, 21, and 22 are changed to labial by using a fixed appliance. Anterior teeth were already labioversion, and the anterior crossbite was fixed (Figure 3b).

Case 4

A 10-year-old female patient presented with the chief complaint of an unaesthetic of the maxillary three incisors. Her profile is flat, and the patient was in mixed dentition phase. Intra-oral examination: the maxillary teeth of 12, 11, 21 were palatoversion (Figure 4a). The patient had a class-I molar connection on both sides with a 2 mm reversed overjet and 2mm overbite, the posterior left crossbite. Mild spacing existed in the upper arch, and there was enough mesiodistal spacing to achieve labial motion of 12, 11, and 21. The goal of treatment requires 2-phases. The first phase used the posterior bite plane, with z springs on teeth 12, 11, and 21. After being activated for four months, the teeth jumped the bite, and then the posterior bite plane was removed. Next, a two-by-four device is placed until the anterior teeth are straightened. With 0.016 nickel-titanium aligning archwire, then 0.018 x 0.025 nickel-titanium, next 0.018x 0.025 stainless steel. Active treatment time is about ten months. The second phase waits for the change of teeth 55, 53, 63, and 65 to be replaced with teeth 15, 13, 23, and 25. After teeth 13 and 23 erupted, a fixed device is used to improve the teeth to align. Then the bodily movement is performed on the anterior teeth until the teeth are in a normal position. Anterior teeth were already labioversion, and the anterior dental crossbite was fixed (Figure 4b).

Discussion

One of the main purposes of pediatric dentistry is to preserve or repair the wholeness of the dental arch to allow appropriate eruption of permanent teeth and prevent the development of a more complex malocclusion.^{5,13,14} Anterior crossbite cases is a scarce shape. Nevertheless, teeth alignment is a primary aesthetic and

functional interest for both children and parents.^{14,19} An anterior crossbite is a form that rarely resolves on its own because the upper incisor lock behind the lower incisors and continue to develop, causing serious malocclusion.⁵ The perfect age for anterior dental crossbite correction is between 8 to 11 years when the root is forming, and the teeth are an inactive phase of the eruption.⁶ This statement is consistent with cases 1 and 4, patients aged were 8-year-old and 10-year-old. An important role plays the patient's age and the encouragement for treatment and understanding the problem.

Diverse therapy methods for repair of anterior crossbite may also be worn in the early mixed dentition time. There are options for the treatment of anterior crossbite using active or passive devices. The active device used to correct anterior crossbite is the upper Hawley appliance, heavy labial arch 2-by-4 appliance, upper light labial arch, or upper lingual arch. The passive tools used include tongue blade, inclined bite plane, composite inclined plane, bonded resin composite slopes, and reversed stainless steel crown.¹⁶

Anterior crossbite can be improved by using a composite inclined plane that is cemented on mandibular incisors. 2-3 mandibular incisors must support one tooth crossbite maxillary as in case 1. In this case, the tooth is still erupting. The early mixed dentition period is the period of root formation, and the teeth are in the active phase of the eruption to allow a better eruption.^{6,10,13,21} In case 1, an anterior dental crossbite on the maxillary right central incisor has changed to labioversion. Treatment only takes two weeks. This method is fast and straightforward results.²¹ The advantages of using a composite inclined plane are short treatment time, low cost, and an esthetically acceptable alternative for improving anterior crossbite.^{22,23}

When anterior crossbite is guided into normal a position, there should be enough proximal width to accomplish labial motion of the upper tooth.^{6,13} In case 2, there is not sufficient mesiodistal space available to move the maxillary right incisors labially. In this matter, the proximal parts of the right upper incisors were treated with adequate enamel reduction with an interproximal strip.^{24,25} Interproximal enamel reduction is used

to reduce the width of the tooth, to fit the available space. After reducing interproximal enamel, next, topically fluor was given. Then the posterior bite riser was used; treatment only takes two weeks. In addition to the patient's age, treatment decisions should also consider the number of teeth embroiled and the encouragement of the child and parent for therapy.¹⁸ The patient was told to consistently apply the posterior bite riser appliance, except for eating and cleaning teeth. The patients are encouraged to preserve good oral health. Using a removable acrylic tool also needs patient collaboration and parental care.²⁶ The advantages of using removable acrylic tools to being economical and being easy to place and take out. Then convenient and efficiently tolerated. Within a 2-weeks, the tooth has jumped the bite, and the anterior crossbite was corrected two weeks later by the fixed appliance.

In the third case, the crossbite treatment took a long time because it required two-step; first, because maxillary ALD was 9 mm and mandibular ALD was 3 mm, then needs to extract 24 and 34. A fixed orthodontic device was used to align the upper incisors and correct the anterior crossbite as well. Then the next step is to retract 23 and 33 to the proper position. The appliance was activated for 10-months. Following removable acrylic tools with posterior bite riser were installed. After four months, the upper and lower incisors displayed an edge-to-edge bite contact, and the crossbite was improved in increased 4-months. Removable acrylic tools with posterior bite riser were then dislodged. Then the bodily movement is performed on the anterior teeth until the teeth are in a normal position. This treatment took 24 months.

In the fourth case, there was a mild diastema in the anterior maxilla to facilitate the teeth 12, 11, and 21 could be moved labially. The first phase used a removable posterior bite plane with z spring to protrude teeth 12, 11, and 21 labially, which took four months. After the teeth have jumped the bite, the posterior bite plane is removed. Next, a two-by-four appliance was installed to facilitate the four incisors were in a normal position. The two-by-four appliance consists of 4 brackets bonded to the four maxillary incisors, two molar bands are attached using cement to the upper first molars, and a continuous archwire.^{26,27} This appliance is

practical for moving four incisors in the mixed dentition period.^{26,27} After 10-months, the device was removed. The second phase is waiting for teeth 13 and 23 to erupt. A fixed orthodontic device was installed, the archwire sequence was 0.016 nickel-titanium, then 0.018 nickel-titanium, and retract both canines to a proper position using archwire 0.018 stainless steel. Then the bodily movement is performed on the anterior teeth until the teeth are in a normal position. The keys to effectual early therapy include careful and proper diagnosis, complete therapy planning, and continuous active observation until the eruption of the permanent teeth.

Conclusions

Anterior dental crossbite accompanied by incomplete root formation can be treated using a composite inclined plane. Whereas, complete root formation can be treated using a posterior bite riser or fixed appliance. Proper management of anterior crossbite from both functional and aesthetic perspectives is of utmost importance for the overall success of orthodontic treatment.

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The article is original. It has never been published before.

Declaration of Interest

The author reports no conflicts of interest in this work.

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