

Treatment of Anteriorcrossbite and Tongue-Thrusting Habitin Early Mixed Dentition with a Series of Removable Orthodontic Appliances

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Abstract: A young girl 5.8 years old was diagnosed an anterior crossbite canine to canine deciduusteeth and having tongue thrusting habit while speaking or singing. A series of removable orthodontic appliances with three ways expansion screws and posterior bite-raisers was used to correct anteriorcrossbite. After anteriorcrossbitewas corrected and tongue thrusting habit also were eliminated without any special treatment. The permanent dentition erupted in good occlusion and smile esthetics were significantly improved with hprofile mild class III tendention. Follow up at 15 years old, her permanent occlusion and interditationdentition remained good, event third molar was not yet extracted.

Keywords: Anterior crossbite, Tongue habit, Early mixed dentition, Removable acrylic appliance

1. Introduction

Anterior crossbite is a malocclusion in which anterior maxillary teeth are palatal to the mandibular anterior teeth. Anterior crossbite can be dental, skeletal, or functional in origin and may involve one or several teeth (Jirgensone et al., 2008 and Moyers, 1973). The etiology of anterior crossbite includes over-retained primary anterior dentition, lingual displacement of primary maxillary incisors, trauma, supernumerary anterior teeth, and inadequate arch length (Park et al., 2009 and Prakash, 2011). Anterior crossbite in early mixed dentition requires special attention and must be treated properly as early as possible. Early treatment is easier to perform, less expensive, and can prevent crossbite eruption of the permanent dentition and any further complicated problems (Russell, 1996; Vadiakas et al., 1992; and Kurol, 2002). Various types of orthodontic appliances that can be used to treat anterior crossbite during mixed dentition, such as tongue blade, removable inclined plane, reversed stainless steel crown, removable appliances with lingual springs, fixed appliance, lower inclined bite plate with or without orthodontic bracket bonding on crossbite teeth or Planas direct tract (Vadiakas et al., 1992; Bayrak et al., 2008; Joyson et al., 2018; Kuo, 2016; and Ramirez-Yanez, 2011). Treatment of anterior crossbite in early mixed dentition ideally include prevention against

dental caries as well as against loss of leeway space, and provide guidance for the eruption of permanent teeth (Keski-Nisula et al., 2003).

2. Diagnosis and Treatment Planning

A 5.8-year-old girl came to our private clinic accompanied by her mother, who expressed concern about her daughter's anterior teeth and habit of frequently sticking out her tongue while speaking or singing. A review of her medical history, as well as temporomandibular joint evaluation, was under normal circumstances. Extraoral examination showed class III tendency with a concave profile (fig.1) and symmetrical face, tongue-thrusting habit was evident for one second when the child spoke or sang (fig.1), profile tendency to class III malocclusion. Intraoral examination showed anterior crossbite from canine to canine of deciduous teeth, class I molar, overjet -1 mm, and 3 mm overbite, with no abnormalities of the tongue. Panoramic radiograph confirmed that she has normal growth and development of permanent dentition. Lateral cephalometric analysis at 7,7 years, revealed a skeletal Class III, SNA 77,5⁰, SNB 78.5, ANB -1, Li-NA 29/5mm, Li-NB 24/6.5 mm. Upper lip -2 mm, and lower lip 4 mm.



Figure 1: Extra and intra oral photographs at 5.8 years old, shows anterior crossbite from canine to canine of deciduous teeth. Profile class III malocclusion tendency.

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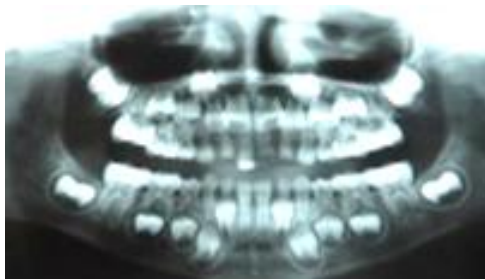


Figure 2: Panoramic radiograph at 5.8 years old, shows normal growth and development of permanent teeth.

3. Treatment Objectives

The objective of the treatment was correct anterior crossbite canine to canine deciduous teeth, began when the child was 6.4 years old, after the right central incisor exfoliated and the first right incisor teeth had emerged, to correct overbite, and frequent tongue-thrusting habit while speaking and singing. Event there was many option of orthodontic treatment, in this case orthodontic treatment was selected using a simple removable orthodontic appliance.



Figure 3: Treatment began when patient was 6.4 years old, after exfoliation the right first deciduous incisor and involved removable appliances with three ways screws expansion and posterior bite-raiser. A. Extraoral photograph before treatment with class III profile tendency. B. Intra oral photograph shows removable appliance.

4. Treatment Alternatives

To prevent maxillary growth interference, to correct of posterior crossbite, to guidance the eruption of permanent teeth, to obtain good occlusion and inter digitation and to improve her profile.

5. Treatment progress



Figure 4: Extra oral and intra oral photographs patients at 8.9 years old. Treatment progress showed that anterior crossbite of permanent incisors had been corrected with small overjet, permanent posterior teeth under eruption, and surprisingly the tongue- thrushting habit had been eliminated without any special of treatment



Figure 4: Lateral cephalogram at 8 years 9 months, shows class III tendency



Figure 5: Extra oral and intra oral photographs of patients at 10 years old, with profile mild class III. Treatment progress shows anterior crossbite of permanent incisors had been corrected with small overjet, permanent posterior teeth under eruption. posterior teeth continued to erupt, with a Class II left canine relationship, right canine to second premolar, still in the process of eruption, cross bite of right first molar. Activation screw expansion was continued.

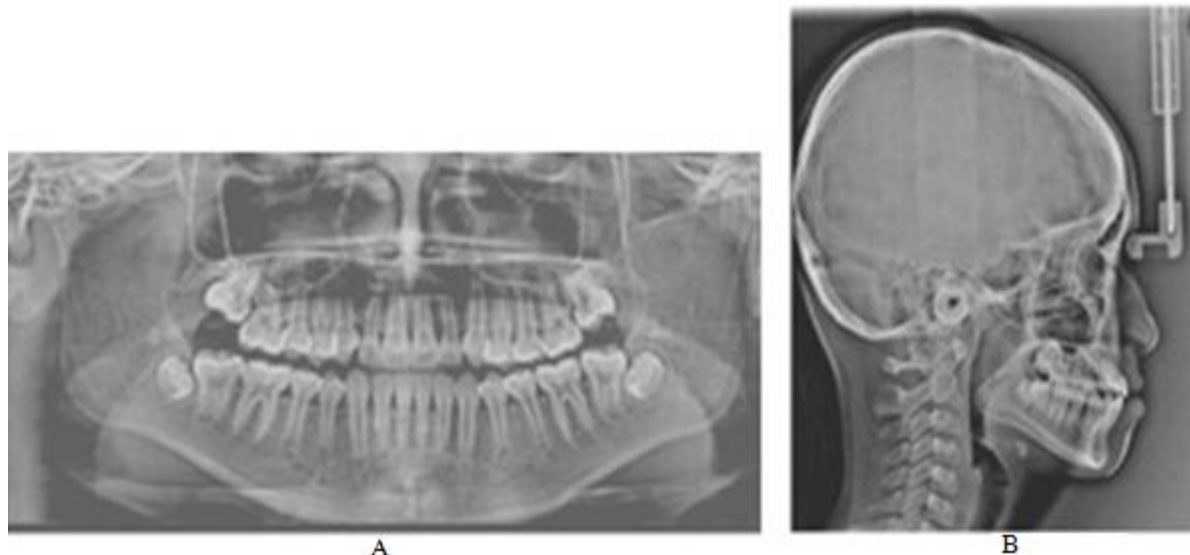


Figure 6: Panoramic radiograph and lateral cephalogram at 10 years old. (A). Panoramic radiograph shows good angulation of teeth, and impacted of lower third molars. (B). Lateral cephalogram shows mild class III.



Figure 7: Extra oral and intra oral photographs of patients at 12 years old. Profile shows class III tendency, the occlusion and interdigitation of posterior teeth was good. There were right first molar crossbite. Removable appliance with three ways expansion screws was changed to a lateral expansion screw to correct right first molar crossbite, and activation was done for 5 months

6. Treatment Result



Figure 8: Extra oral and intra oral photographs at 13 years old, after period of retention, shows profile mild class III, good occlusion and interdigitation, with mild crowding at the right lower premolar. right molar first molar crossbite was corrected.



Figure 9: Extraoral and intra oral photograph at 15 years old, profile shows straight face, while intra oral shows good occlusion and interdigtation, right canine class I while left canine was remain class II relationship. There was mild crowded in the lower premolar region.

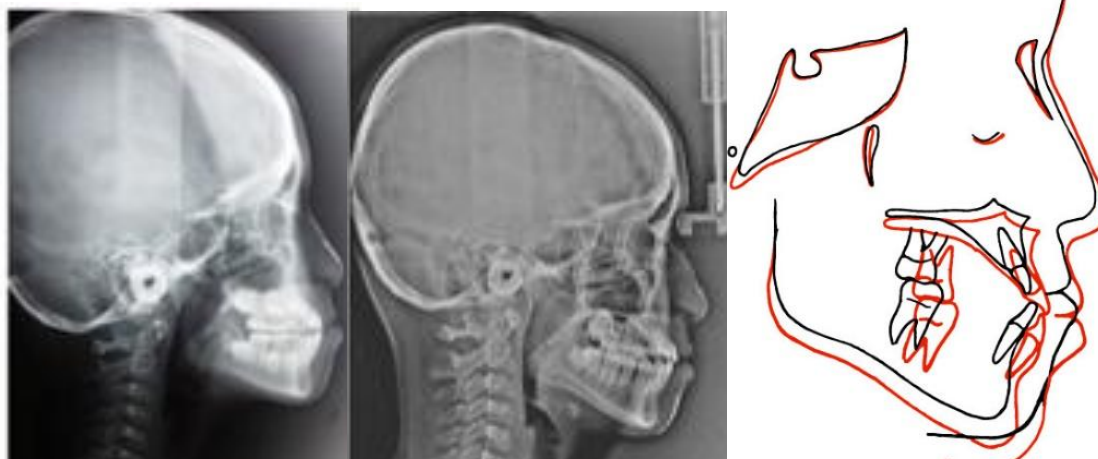


Figure 10: Superimpose of lateral cephalograms at 8 years 8 month (black line) and at 10 years 3 months (red line), shows the growth of dentocraniofacial structures

Table 1: Cephalometric analysis

	I (7 y, 7 m)	II (8 y, 8 m)	II (10 y, 3 m)
SNA	77.5°	79.5°	81°
SNB	78.5°	79°	80°
ANB	-1°	0.5°	1°
< Convexity	-2.5°	-1°	2°
Facial Angle	85°	85°	87°
Y angle	62°	62°	62°
GoGn-Sn	35°	36°	36°
Occ-Sn	18°	17°	15°
Pog-Nb	1 mm	1 mm	2 mm
Li-NA	29° / 5 mm	28° / 6 mm	32° / 7 mm
Li-NB	24° / 6.5 mm	25° / 7.5 mm	23.5° / 6.5 mm
I-I	123.5°	124°	124°
Wit's	4 mm	2.5 mm	2 mm
Soft tissue			
Upper lip	-2 mm	0 mm	0 mm
Lower lip	4 mm	4 mm	4 mm

7. Discussion

Treatment of anterior crossbite in early mixed dentition is highly recommended because this malocclusion will not

diminish with age[15]. There are many effects of untreated anterior crossbite in early mixed dentition, such as enamel abrasion due to proclination of mandibular incisors, thinning of the labial alveolar plate and/or gingiva in the area of mandibular incisors, and effects on the growth and development of the teeth and jaws [4,16].

The main purpose of anterior dental crossbite treatment is to jump upper anterior teeth labially to lower anterior teeth to get a normal and stable overbite relationship[17]. Treatment of anterior crossbite in early mixed dentition requires an understanding of the normal development of dentition, patient psychology, and biologic development. The decision to initiate orthodontic treatment in younger children must be based on patient readiness and awareness[7,18]. There are many appliance for treatment anterior crossbite in deciduous teeth or mixed dentition, one of them is a removable appliance with three ways screw expansion as the first choice to correct more than one tooth in anterior dental crossbite [19]. Patient instructed to wear the orthodontic appliance at least 22 hours a day except for meals and tooth brushing and control for every 4 weeks. One of advantage of

removable appliance is oral hygiene will be easy to maintain.

In treatment involving a removable orthodontic appliance, patient and parental cooperation is very critical. During the age of early mixed dentition, children may not understand the need for orthodontic treatment; therefore, the procedure must be carefully explained, with a sense of empathy. According to Kiyak et al., good communication during the initial period of treatment is key to identification of the psychological well-being of the patient [20].

Orthodontic treatment of anterior crossbite in early mixed dentition will improve the integrity of the arch for the eruption of the permanent teeth, prevent the development of more complicated malocclusion, restore normal occlusion, and eliminate the need for further orthodontic treatment [7,14]. Anterior and lateral crossbites are the most frequently mentioned for orthodontic treatment indications during primary and early mixed dentition, and the results show significantly reduced need for future orthodontic treatment [18,20,21]. In this case, besides the treatment of anterior crossbite, attention was also directed toward guidance of the eruption of permanent teeth, as well as oral hygiene and caries control, and the maintenance of leeway space to accommodate the eruption of posterior permanent teeth [22].

As we know, there are many types of oral habits in children, including thumb-sucking, lip-sucking, and tongue-thrusting, and the effects of these habits on the occlusion depend on their frequency, intensity, and duration [17,23]. In this patient, there was no indication of tongue malfunction causing her to stick out her tongue for one second during speaking or singing, and after the anterior crossbite was corrected, the tongue-thrusting habit was eliminated. It was hypothesized that this habit correlated with the palatal position of six anterior deciduous teeth and the reduction of space for the tongue. Study shows a positive association between deleterious oral habits and malocclusion, in this case shows that tongue thrust habit was stopped after anterior crossbite was eliminated [24,25].

The key to success in this case, was the cooperation of the patient and her mother, who was very supportive, always on schedule for every control visit. The patient was also cooperative with the treatment procedure. The growth response was good, and the anterior crossbite and tongue habit were corrected. The permanent dentition erupted in good occlusion and remains good in the 15-year-old patient. This case report proves that a series of removable appliance with 3 ways expansion screw and posterior bite raiser, effectively correcting the anterior crossbite in early mixed dentition. The lack of this treatment is no panoramic and lateral cephalogram after orthodontic treatment was finished and patient refused to extract the lower third molars.

8. Conclusion

Based on the results of this case, we concluded that a series of orthodontic acrylic removable appliances, with three ways expansion screws and a posterior bite-raiser, effectively corrected anterior crossbite in early mixed dentition. The tongue-thrusting habit while speaking and singing was

eliminated after the anterior crossbite was corrected without any treatment. Cooperation patient and her parent is an important role to the successful of this treatment

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