

Case Report

Interceptive orthodontics for correction of anterior tooth crossbite: report of two cases

Amit Bhanushali¹, Dinesh Rao², Sunil Panwar³, Surabhi Gupta⁴

¹ Postgraduate Student, Department Pediatric Dentistry Pacific Dental College & Hospital Udaipur

² Professor and Head, Department of Pediatric Dentistry Pacific Dental College & Hospital Udaipur

³ Professor, Department of Pediatric Dentistry Pacific Dental College & Hospital Udaipur

⁴Senior lecturer, Department of Pediatric Dentistry Pacific Dental College & Hospital Udaipur

ARTICLE INFO



Keywords: Crossbite, Short-span wire-fixed orthodontics, removable Z-spring appliance

ABSTRACT

Single tooth anterior dental crossbite is the commonly encountered malocclusion trait during the development of occlusion in children. Failure in addressing this problem can bring about detrimental effect to the developing dentition and increases the probability of a complex orthodontic treatment in later years. Many treatment modalities ranging from simple to complex means are available to correct anterior crossbite; such as removable appliances and fixed appliances. This article describes two cases of successful correction of anterior crossbite of patients in mixed dentition using short-span wire-fixed orthodontic appliances and removable Z-spring appliance.

Introduction

Anterior crossbite is a major aesthetic and functional concern to the parents during the growth of a child. It is one of the major duties of a pediatric dentist to guide the developing dentition to a state of normalcy in line with the stage of orofacial growth and development.¹ The duration of mixed dentition offers the highest opportunity for occlusal guidance and interception of malocclusion.² If delayed to a later stage of maturity, treatment may become more complex.³

Graber defined 'crossbite' as a condition, where one or more teeth may be abnormally malposed either lingually or labially with reference to opposing teeth.⁴ Anterior crossbite can also be defined as a malocclusion resulting from the lingual positioning of the maxillary anterior teeth in relationship to the mandibular anterior teeth.⁵ The occurrence of anterior crossbite ranges from 4.5% to 9.5% based on the individual studied populations.⁶ In children with malocclusion, it is found to be around 27%.⁷

Variety of factors may contribute towards the development of anterior crossbite, and the causative factors can be

categorised based on the nature of the crossbite into skeletal, dental, and functional entities.⁸ In the anterior crossbite of dental origin, one or two teeth are frequently involved and the involved tooth/teeth are either upright or retroclined without any significant maxilla-mandible discrepancy.⁹ The suitable method to treat anterior crossbite depends on the etiology of the crossbite, the patient's age and compliance, eruption status of the teeth, space availability and treatment affordability. An easy method such as tongue blade can be used in the early stages of anterior crossbite development as the tooth/teeth are in erupting phase. Appliances like short span fixed orthodontic appliance, Catlan's appliance and removable appliances with Z-spring(s) or expansion screw or microscrew(s) are commonly used to correct anterior crossbite related to dental factors in the preadolescent age group.⁸

This article highlights two cases of successful correction of anterior crossbite using a simple short-span wire-fixed orthodontic appliance and removable appliance with Z-spring.

Clinical Report

Case 1: An 8-year old girl reported to the department of pediatric dentistry with a primary complaint of maligned teeth. Parents noticed that one of their upper teeth of the child was erupting behind her lower teeth. The patient had previous history of dental treatment in relation to her mandibular right primary second molar and her medical history was non-contributory. Intraoral examination revealed the patient in mixed dentition stage, with the first permanent molars in a Class I relationship. The permanent maxillary right central incisor was in a crossbite relationship. (Figure 1) Space analysis using the Moyer's mixed dentition analysis showed the availability of adequate space within the arch for realignment of teeth. After discussing the treatment modalities with the parents, removable appliance with Z-spring and posterior bite plane was given for the correction of crossbite. In the first visit, appliance was delivered without activation in order to increase patient compliance. (Figure 2) After a week, Z-spring was activated. At two weeks follow-up second activation was done. Within three weeks after the initiation of treatment, the anterior crossbite was corrected successfully. At 3-month review, the incisor teeth were still in positive overjet. (Figure 3)

Case 2: A 12-year, two months old boy came with his parents to the department of pediatric dentistry with a primary complaining of maligned teeth. Parents noticed that child's one of the upper teeth was behind his lower teeth. The patient had no previous history of dental treatment, and his medical history was non-contributory. Intraoral examination revealed the patient in mixed dentition stage with the first permanent molars in a Class I relationship. Permanent maxillary left maxillary central incisor was in a crossbite relationship. (Figure 4) Slight enamel attrition was noted on the labial surface of tooth 21 close to the incisal edge due to traumatic occlusion. Space analysis using the Moyer's mixed dentition analysis showed the availability of adequate space within the arch for realignment of teeth. After discussing the treatment modalities with parents, treatment using short-span wire-fixed orthodontic appliance with four preadjusted edgewise brackets with a 0.022" slot was done. The labial aspects of the four maxillary permanent incisors were bonded with brackets. A short-span nickel-titanium (Ni-Ti) 0.012" round archwire was cut equally on both sides of the centerline and placed into the bracket slots. (Figure 5) The wire was stabilised in its position using elastic ties. The patient's bite was raised

using 2 mm thickness of glass ionomer cement mixed with methylene blue stain (GIC) placed on the occlusal aspects of both the mandibular first permanent molars (tooth 36 and tooth 46). One week later, there was some evidence of anterior movement of the maxillary teeth that were in crossbite. Within three weeks after the initiation of treatment, the anterior crossbite was corrected successfully. The 0.012" round Ni-Ti archwire was changed to the 0.014" round Ni-Ti archwire and retained for further two weeks before debonding of the brackets. At 3-month review, the incisor teeth were still in positive overjet. (Figure 6)

Photographs of cases



Figure 1: Preoperative intraoral photograph showing crossbite i.r.t.11

Discussion

Anterior crossbite is a frequently seen malocclusion in children during the early mixed dentition stage, and a majority of the cases are found to be of dental origin.¹⁰ Probable causes of anterior crossbite, which is dentally related are the presence of supernumerary teeth, odontomas, ectopic position of permanent tooth germ, trauma to the primary precursor, retained primary tooth, anomalies in tooth size and shape, arch length inadequacy and upper lip biting habit.⁸ Early treatment permits harmonisation of the occlusion with time, as the permanent teeth are still erupting during this stage of the dentition.¹¹ Though, delivery of early treatment has its own sets of difficulties such as reduced patient compliance and refusal of treatment and the patient may need a final phase of orthodontic treatment later. However, early treatment can prevent some of the

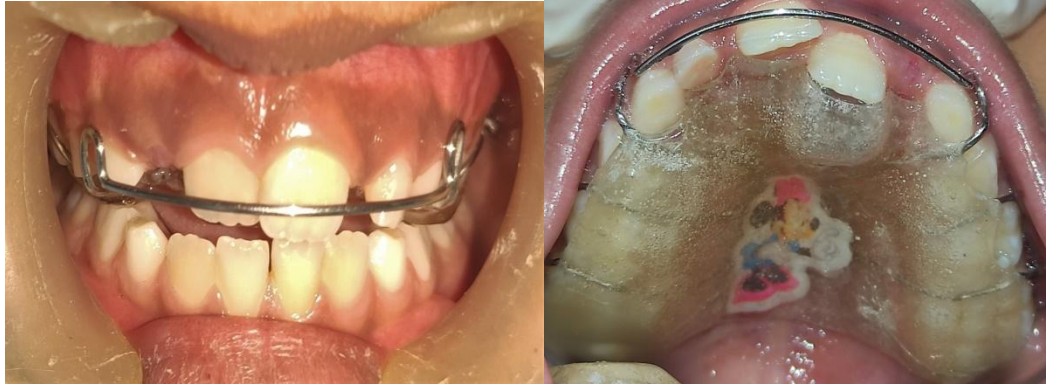


Figure 2: Use of removable appliance with Z-spring and posterior bite plane



Figure 3: Correction of crossbite (follow up after 3 months)



Figure 4: Preoperative intraoral photograph showing crossbite i.r.t. 21

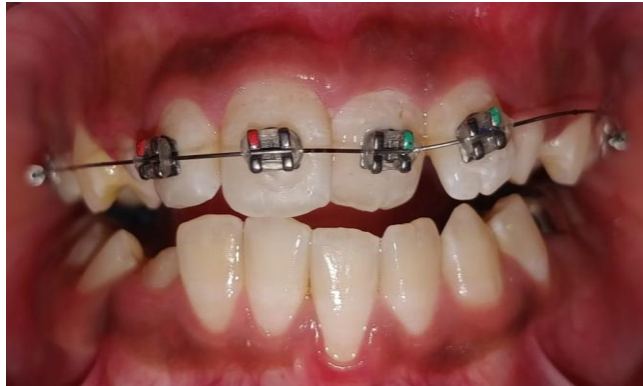


Figure 5: Use of short span wire fixed orthodontic appliance



Figure 6: Correction of crossbite (follow-up after 3 months)

commonly seen damaging effects of anterior crossbite such as enamel wear, gingival stripping and attachment loss, tooth mobility and jaw deviation.¹² Usage of the fixed orthodontic method to treat anterior crossbite during the preadolescent period has not been extensively reported in the literature as compared to other methods.¹³ One of this simple fixed orthodontic appliance is the two-by-four (2×4) appliance which results in three-dimensional tooth movement that enables correction of the crossbite as well as the rotated teeth, teeth with incorrect angulation and inclination, and diastema.¹³ One of the drawbacks of using the 2×4 appliance during the early mixed dentition stage is the placement of bands on the maxillary first permanent molars. Placement of the molar band could be difficult if the permanent molar has not fully erupted or it has a short clinical crown height.

Occasionally, placement of the band also can cause discomfort, and some children may refuse further treatment. Furthermore, as the brackets are only bonded to the permanent incisors, there will be a long span of a flexible round Ni-Ti archwire extending from the molar bands to the incisors. The wire can be a problem to the young patients particularly during eating and tooth brushing as the wire dangles can simply come out from the molar tube. One more disadvantage of the 2×4 appliance is plaque retentiveness around the bands and brackets. Nevertheless, this could be easily overcome with good oral hygiene care. The cases presented in this article shown the usage of the sectional short-span wire-fixed orthodontic appliance in correcting anterior crossbite. The short-span wire-fixed orthodontic appliance technique is handy for correction of simple anterior crossbite and specifically in cases where the first

permanent molars are either not erupted or partially erupted for successful placement of orthodontic bands. Although this is a simple method for anterior crossbite correction, the clinician should perform a detailed clinical assessment of the patient's facial and dental profiles and make a suitable diagnosis to determine the cause of the crossbite.

Removable orthodontic appliances characterize another safe, easy and esthetically satisfactory substitute for the treatment of anterior crossbite that has three major advantages:¹⁴ (a) the appliances are made in the laboratory rather than directly in the patient's mouth, thus reducing chair time; (b) they can be removed on socially sensitive occasions; and (c) they are easily cleaned, providing good oral hygiene. The amount of desired movement of the teeth can be controlled by the activation of spring in acrylic appliances, thereby, its management is easy and fewer tendencies to dislodge.¹⁵

Conclusion

The above-mentioned cases well describe use of removable as well as short span fixed appliances for correction of anterior dental crossbite. In all the cases reported here, correction of anterior dental crossbite was observed within three to four weeks, with no damage to teeth or marginal periodontal tissue. However, the choice and selection of the appliance depends on the clinician's skills, patient compliance and space availability. Further studies are required to evaluate other treatment modalities in comparison with this traditional method of correcting anterior dental crossbite.

References

1. F. Al-Sehaibany and G. White, "A three dimensional clinical approach for anterior crossbite treatment in early mixed dentition using an Ultrablock appliance: case report," *J Clin Pediatr Dent.* 1998;23(1):1-7.
2. I. Kocadereli, "Early treatment of posterior and anterior crossbite in a child with bilaterally constricted maxilla: report of case," *ASDC J Dent Child.* 1998;65(1):41-6.
3. C. S. Tse, "Correction of single-tooth anterior crossbite," *J Clin Orthod* 1997;31(3):188-90.
4. T. M. Graber, *Orthodontics: Principles and Practice*, W. B. Saunders, Philadelphia, Pa, USA, 3rd edition, 1988.
5. H. H. Tsai, "Components of anterior crossbite in the primary dentition," *ASDC J Dent Child.* 2001;68(1):27-32.
6. M. Shalish, A. Gal, I. Brin, A. Zini, and Y. Ben-Bassat, "Prevalence of dental features that indicate a need for early orthodontic treatment," *Eur J Orthod.* 2013;35(4):454-9.
7. S. N. Vithanaarachchi and L. S. Nawarathna, "Prevalence of anterior cross bite in preadolescent orthodontic patients attending an orthodontic clinic," *Ceylon Med J.* 2017;62(3):189-92.
8. G. Singh, "Management of crossbite," in *Textbook of Orthodontics*, pp. 655–670, Jaypee Publisher, New Delhi, India, 3rd edition, 2015.
9. K. Ustun, Z. Sari, H. Orucoglu, I. Duran, and S. S. Hakki, "Severe gingival recession caused by traumatic occlusion and mucogingival stress: a case report," *Eur J Dent.* 2008;2(2):127–33.
10. G. Vadiakas and A. D. Viazis, "Anterior crossbite correction in the early deciduous dentition," *Am J Orthod Dentofacial Orthop.* 1992;102(2):160–2.
11. A. T. Ulusoy and E. H. Bodrumlu, "Management of anterior dental crossbite with removable appliances," *Contemp Clin Dent.* 2013;4(2):223-6.
12. I. Jirgensone, A. Liepa, and A. Abeltins, "Anterior crossbite correction in primary and mixed dentition with removable inclined plane (Bruckl appliance)," *Stomatologija.* 2008;10(4):140–44.
13. H. F. Mckeown and J. Sandlerd, "The two by four appliance: a versatile appliance," *Dent Update.* 2001;28(10):496–500.
14. Fields HW. Treatment of nonskeletal problems in preadolescent children. In: Proffit WR, editor. *Contemporary Orthodontics*. 4th ed. St. Louis, Missouri: Elsevier; 2007. p. 433-94.
15. Fields HW. Biomechanics, mechanics, and contemporary orthodontic appliances. In: Proffit WR, editor. *Contemporary Orthodontics*. 4th ed. St. Louis, Missouri: Elsevier; 2007. p. 397-402.