



INTERCEPTION OF ANTERIOR CROSSBITE USING 2×4 APPLIANCE: A CASE STUDY

Dental Science

Dr. Neha Priya*	Post-graduate Student, Department Of Pedodontics And Preventive Dentistry Kothiwal Dental College And Research Centre, Moradabad-244001, Uttar Pradesh, India. *Corresponding Author
Dr. Naveen Manuja	MDS Professor, Department Of Pedodontics And Preventive Dentistry Kothiwal Dental College And Research Centre, Moradabad-244001, Uttar Pradesh, India.
Dr. Seema Chaudhary	MDS Professor And Head, Department Of Pedodontics And Preventive Dentistry Kothiwal Dental College And Research Centre, Moradabad-244001, Uttar Pradesh, India.
Dr. Insha Showkat	Post-graduate Student, Department Of Pedodontics And Preventive Dentistry Kothiwal Dental College And Research Centre, Moradabad-244001, Uttar Pradesh, India.

ABSTRACT

Anterior crossbite is a relatively common presentation in the mixed dentition stage. If left untreated, it can lead to a host of problems and may complicate future orthodontic treatment. One of the major difficulties in performing anterior crossbite correction in young children is treatment compliance. In most cases, poor compliance is due to the unacceptability of the removable appliance used. This article describes three cases of successful correction of anterior crossbite of patients in mixed dentition using 2×4 fixed orthodontic appliance. This sectional appliance provides an alternative method of correcting anterior crossbite of dental origin and offers many advantages compared to the use of removable appliances.

KEYWORDS

Reverse Articulation, Catlan's Appliance, Glass Ionomer Cement.

INTRODUCTION

Anterior crossbite is defined as an abnormal reversed relationship of a tooth or teeth to the opposing teeth in the buccolingual or labiolingual direction and it is also known as reverse articulation. The prevalence of anterior crossbite ranges from 4.5% to 9.5% based on the respective studied populations.¹ Many factors may contribute towards the development of anterior crossbite, and the contributory factors can be categorized based on the nature of the crossbite into skeletal, dental, and functional entities.²

Skeletal anterior crossbite arises due to either genetic or hereditary influence or discrepancy in the size of the maxilla and mandible. The skeletal entity usually involves a segment of maxillary teeth that are proclined at normal angulation but positioned behind the mandibular incisors. In the anterior crossbite of dental origin, one or two teeth are often involved, and the affected tooth/teeth are either upright or retroclined without any significant maxilla-mandible discrepancy. In the functional type crossbite, a premature contact between the opposing tooth/teeth could result in the deflection of the mandible to the sides or anteriorly, and this leads to the development of pseudoclass-III.³ Anterior crossbite may give rise to enamel wear mainly close to the incisal edge due to heavy contact between the opposing tooth/teeth. Functional crossbite due to the premature contact could lead to a possible jaw deviation and temporomandibular pain dysfunction.⁴

Many treatment modalities ranging from simple to complex means are available to correct anterior crossbite; some use removable appliances and others use fixed appliances. The appropriate method to treat anterior crossbite will depend on the etiology of the crossbite, the patient's age and compliance, eruption status of the teeth, space availability and treatment affordability. A simple method such as tongue blade can be used in the early stages of anterior crossbite development as the tooth/teeth are erupting. Appliances such as Catlan's appliance and removable appliances with z-spring(s) or expansion screw or microscrew(s) are often used to correct anterior crossbite related to dental factors in the preadolescent age group. Crossbite of skeletal origin often requires complex methods, such as rapid maxillary expansion and Frankel III appliances. Occasionally, use of extra-oral devices such as a face mask and a chin cup may be necessary.²

This article highlights the cases of successful correction of anterior crossbite using simple short-span 2×4 orthodontic appliance. The use of this type of appliance provides an alternative treatment modality to correct anterior crossbite with good patient compliance and minimal

disruption of oral functions.

Case Report:

An 8-year 5-month old girl came with her parents to the Department of Pedodontics and Preventive Dentistry at Kothiwal Dental College and Research Centre, Moradabad with the primary complaint of maligned teeth. Parents noticed their daughter's upper teeth behind her lower teeth. The patient had no previous history of dental treatment, and her medical history was noncontributory (Figure 1).



Figure 1: Frontal and Lateral profiles of the patient

Intraoral examination revealed that the patient is in mixed dentition stage with the first permanent molars in a Class I relationship. Two of her permanent maxillary teeth, right central incisor (tooth 11), right lateral incisor (tooth 12) were in crossbite relationship (Figure 2).



Figure 2: Pre-treatment photograph of crossbite in 11, 12

Slight enamel attrition was noted on the labial surface of tooth 11 close to the incisal edge due to traumatic occlusion. Space analysis using the Moyers' mixed dentition analysis showed the availability of adequate space within the arch for realignment of teeth. Orthopantomogram was advised to the patient to check for skeletal abnormality (Figure 3). After discussing the treatment modalities with parents, a short-span

fixed orthodontic treatment by 2×4 appliance was planned with four preadjusted edgewise brackets with a 0.022" slot in maxillary and mandibular teeth. Bands were fabricated on the first molars and brackets were bonded on the labial aspects of the four maxillary and mandibular permanent incisors. A short-span nickel-titanium (Ni-Ti) 0.014" round archwire was cut equally on both sides of the centre line and placed into the bracket slots (Figure 4).

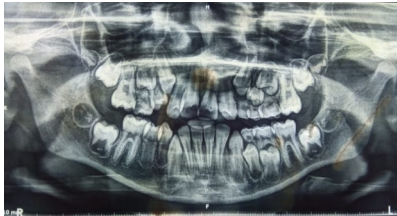


Figure 3: OPG of the patient



Figure 4: Bracket Placement in the upper and lower arches

The wire was stabilised in its position using elastic ties. The patient's bite was raised using 2mm thickness of glass ionomer cement (GIC) placed on the occlusal aspects of both the mandibular first permanent molars (tooth 36 and tooth 46). Two weeks later, there was some evidence of anterior movement of the maxillary teeth that were in crossbite. Within a month after the initiation of treatment, the anterior crossbite was corrected successfully. The 0.014" round Ni-Ti archwire was changed to 0.016" round Ni-Ti archwire and retained for further two weeks before debonding of the brackets.



Figure 5: Post treatment photograph after 2 months of crossbite correction

DISCUSSION:

Anterior crossbite is a common presentation in children during the early mixed dentition stage, and a majority of the cases are of dental origin.⁷ Possible causes of dentally related anterior crossbite are the presence of supernumerary tooth, odontomas, trauma to the primary predecessor, ectopic position of permanent tooth germ, retained primary predecessor, anomalies in tooth shape and size and arch length inadequacy.^{6,7} These dentally related factors are responsible for deflection of the normal eruption path of the permanent successor tooth/teeth. Early treatment to correct the anterior crossbite is often advisable to prevent complications and treatment at a later stage. Early treatment allows harmonisation of the occlusion with time, as the permanent teeth are still erupting during this stage of the dentition.⁷ However, provision of early treatment has its own set of problems such as poor patient compliance and refusal of treatment, and the patient may need another phase of orthodontic treatment later. Nevertheless, early treatment can prevent some of the common detrimental effects of anterior crossbite such as enamel wear, gingival striping and attachment loss, tooth mobility, and jaw deviation. Research has shown that patients oral health quality of life improves with early treatment.⁸ Although the use of the intraoral and extraoral appliances can produce the desired tooth or functional jaw movement. The patients compliance very much dictate the treatment success. Common problems encountered with the use of removable appliances include initial speech difficulty due to palatal coverage of the appliance, progressive loosening of the appliance used, and tendency of the patient to flick the loose appliance in and out with the tongue. Besides that, breakage and loss of appliances also happen due to patients

carelessness. Other disadvantages of removable appliances include limited tooth movement range, appliance bulkiness, and poor oral hygiene maintenance. Similarly, patients are also not very much in favour of extra oral devices because of their visibility and social stigma attached to its usage. These adverse effects of both the intraoral and extraoral devices often lead to poor patient compliance and failure of treatment.⁹

Use of the fixed orthodontic method to correct anterior crossbite during the preadolescent period has not been widely reported in the literature as compared to other methods as described above. Few cases using a simple fixed orthodontic to correct anterior crossbite and alignment of ectopic teeth have shown good clinical outcome. Many of the problems related to the usage of removable appliances can be overcome with the use of a simple fixed orthodontic appliance.¹⁰ One of the described simple fixed orthodontic appliances is the two-by-four (2×4) appliance which allows three-dimensional tooth movement that enables correction of not only the crossbite but also the rotated teeth, teeth with incorrect angulation and inclination, and diastema. Besides that, the 2×4 appliance is also suitable for mixed dentition patients with reduced number of teeth, where the retention of the removable appliance used can be a problem.⁹

One of the disadvantages of using the 2×4 appliance during the early mixed dentition stage is the placement of bands on the maxillary first permanent molars. The dangling wire can be a problem to the young patients especially during eating and tooth brushing as the wire dangles can easily come out from the molar tube. However, this could be easily overcome with good oral hygiene care. The case presented in this article demonstrated the 2×4 fixed orthodontic appliance method for correction of simple anterior crossbite. The clinician should perform a thorough clinical assessment of the patient's facial and dental profiles and make an appropriate diagnosis to determine the cause of crossbite. The 2×4 fixed orthodontic appliance is very reliable to correct simple labiolingual discrepancies of the dental origin. However, even if the labiolingual difference is vast, use of the 2×4 appliance is justifiable because it produces a well-controlled movement of teeth.

CONCLUSION:

One of the keys to achieve a successful orthodontic treatment result lies in the hands of the parents as well as orthodontist. Identifying a malocclusion at an early stage and diagnosing the malocclusion at a correct age can lead to achieve stability in the treatment results. Correction of simple malocclusions need not be waited till the eruption of all the permanent teeth. A 2 x 4 appliance is a versatile, easy to use and effective appliance which can intercept simple malocclusions at an early stage with shorter treatment time duration compared to the traditional treatment. Due to this, the malocclusions can be treated early boosting the self-esteem of the child at an early stage.

REFERENCES:

1. S. N. Vithanaarachchi, L. S. Nawarathna. Prevalence of anterior cross bite in preadolescent orthodontic patients attending an orthodontic clinic. *Ceylon Medical Journal*. 2017;62(3):189-192.
2. G. Singh et al. Management of crossbite. *Textbook of Orthodontics*. 2015;3:655-70.
3. K. Ustun, Z. Sari, H. Orucoglu, I. Duran, S. S. Hakki. Severe gingival recession caused by traumatic occlusion and mucogingival stress: a case report. *European Journal of Dentistry*. 2008; 2:127-133.
4. V. Wohlberg, C. Schwahn, D. Gesch, G. Meyer, T. Kocher, O. Bernhardt. The association between anterior crossbite, deep bite and temporomandibular joint morphology validated by magnetic resonance imaging in an adult nonpatient group. *Annals of Anatomy-Anatomischer Anzeiger*. 2012;194(4): 339-344.
5. G. Vadiakas, A. D. Viazis. Anterior crossbite correction in the early deciduous dentition. *American Journal of Orthodontics and Dentofacial Orthopedics*. 1992;102(2):160-62.
6. S. M. Yaseen, R. Acharya. Hexa helix: modified quad helix appliance to correct anterior and posterior crossbites in mixed dentition. *Case Reports in Dentistry*. 2012;1-5.
7. A. T. Ulusoy, E. H. Bodrumlu. Management of anterior dental crossbite with removable appliances. *Contemporary Clinical Dentistry*. 2013;4(2):223-26.
8. E. Piassi, L. S. Antunes, M. R. T. C. Andrade, and L. A. A. Antunes. Quality of life following early orthodontic therapy for anterior crossbite: report of cases in twin boys. *Case Reports in Dentistry*. 2016;1-5.
9. P. Dowling and J. Sandler. How to effectively use a 2 × 4 appliance. *Journal of Orthodontics*. 2004;31(3):248-258.
10. R. S. Asher, C. G. Kuster, L. Erickson. Anterior dental crossbite correction using a simple fixed appliance: case report. *Pediatric Dentistry*. 1986;8(1):53-55.